Friedmann Propulsion in a Flat Holographic Universe

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Abstract. Because of inversion symmetries in holographic systems, the spatial compression of lower-dimensional holographic memory leads to an expansion of the holographic image and vice versa (scaling duality), where the geometric mean between the small quantum memory and cosmic image scale defines the inversion scale, the unit scale to normalize the global holographic currents of momentum exchange. Assigning to the cosmic image (bulk) a 4*d*, to the quantum memory (baryon) a 2*d*, and to the inversion scale a 3*d* spherical topology, the cosmic critical density in the flat FRW cosmic test model corresponds to at least 1 natural memory unit (baryon mass) per unit scale volume. Otherwise, if we expect expansion driven by 3*d* Einstein gravity on all scales, we get the well known cosmic "dark matter" deficit of 96% and about 25 natural memory units per unit scale volume. The cosmic deficit or quantum excess is assigned by Gauss law to the topological ratio 4*d* bulk surface S_3 to 2*d* quantum surface S_1, which dilutes gravity to 4% by the dimensionless factor $0.04 \sim S_3/2/S_1^3 = 1/(8\pi)$ leading to a theoretical Hubble parameter of 73.2 $\mathrm{kms^{-1}Mpc^{-1}}$. Regarding propulsion based on fractional linear transforms mapping the quantum compression by inversion to a cosmic expansion, the anisotropic transform resembles the Alcubierre mechanism if expansion is behind and the compression ahead of the spaceship.

Keywords: Hubble, Lorentz, unit scale, expansion, propulsion, topology, holography, Alcubierre, FRW, quantum, cosmic, Friedmann, extra dimension, AdS/CFT-correspondence
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INTRODUCTION

To generate higher-dimensional holographic image structures there must be a steady momentum exchange with lower-dimensional holographic memory units. If memory units are spatially separated the exchange of quanta generates a pressure, if the units are mobile we get expansion. In the mobile case the spatial expansion of higher-dimensional holographic (cosmic) image leads to a relative compression of lower-dimensional holographic (quantum) memory because of radial symmetries, showing a scaling duality between small quantum and large cosmic scales. Expanding or contracting volumes and boundaries can be utilized for propulsion purposes depending on the boundaries dynamics. During the isotropic momentum exchange the curved boundary can be expanded or compressed in radial direction; during the anisotropic exchange we get propulsion with respect to a subset of boundaries. In this paper we will show that the curved boundary constitutes a holographic memory on the quantum scale with countable quanta and evaluate how it could be modified and used for propulsion applications, where the general dynamics can be described by cosmological models in accordance with General Relativity with one important difference: in holography higher-dimensional geometric fields are mapped to lower-dimensional representations on its boundary and vice versa by conformal operations or phase interference, in Relativity one has the same topological dimension on all scales.

BACKGROUND

Holography is probably not necessary to describe basic interactions, but it surely can serve very effectively as a meta description level regarding mappings and transformations between different-dimensional spaces. In holography higher-dimensional geometric field structures are mapped (e.g. by conformal operations and phase interference) onto lower-dimensional representations on its boundary and vice versa having the same information-entropy, in other words, all of the information contained in a volume of space is encoded on the curved boundary of that region. This conjecture was proposed by Gerard 't Hooft (1994), improved and promoted by Leonard Susskind (1995), and later theoretically supported by the AdS/CFT correspondence (Malcadena, 1998, Witten, 1998) showing dualities between theories with gravity and theories without gravity, a kind of qualitative correspondence between a gauge theory and gravity. The information located on the curved boundary can be obtained by diffraction; the correspondent currents can be quantified by Gauss and Stokes law. In our model 2*d* baryon particles as the carrier of holographic memory are localized on a 3*d* surface forming the 4*d* bulk and holographic image. Assigning extra-dimensions to the cosmic bulk matter, the weakness of gravity can be explained via Gauss law (Arkani-Hamed et al., 2000). According to (Binder, 2007) we can compare different-dimensional currents normalizing the Gauss flux at the unit scale, which is the inversion scale. This duality of scales can be experimentally verified with proper holographic diffraction (based on fractional linear transforms), where the information about the largest image patterns can be found in the smallest memory patterns. From am engineering point of view a dynamic hologram is driven by a steady momentum exchange between lower-dimensional holographic memory units (the curved AdS or dS boundary) and higher-dimensional holographic image structures (CFT gauge structures). This means that the gauge theory living on its curved boundary is exchanging momentum with the boundary recursively expanding it, while mapping the cosmic expansion by inversion to a quantum compression and vice versa. An almost isotropic higher-dimensional flux results in a very weak net propulsion effect. Therefore propulsion based on anisotropic fractional linear transformations resembles the Alcubierre mechanism (1994) if expansion is behind and the compression ahead of the spaceship.

FRIEDMANN-ROBERTSON-WALKER (FRW) COSMOLOGY

The space-time separation interval between “points” in an expanding space-time can be very easily described by the FRW metric (Misner, Thorne, and Wheeler, 1973). A co-expanding observer will see Kepler ellipses; an observer of a sub-system where mass points show no space-time separation (distance-locked) will see outgoing spirals in the expanding universe. The FRW model is the simplest case of a homogeneous and isotropic universe having a radial symmetry consistent with Special Relativity or invariant under Lorentz transformations. Mathematically the FRW can be classified by its curvature parameter, saying the spatial part of the metric is either flat $k=0$, hyperbolic $k=-1$ (AdS_3), or spherical $k=1$ (S_3), where the temporal evolution of the Universe can be very elegantly described by a radial scale-factor $R(t)$ with

$$\mathrm{d}s^2 = c^2\mathrm{d}t^2 - R(t)^2\left(\frac{\mathrm{d}r^2}{1-kr^2} + r^2\mathrm{d}\theta^2 + r^2\sin^2\theta\mathrm{d}\phi^2\right). \tag{1}$$

Looking at *k* there is obviously a scale-dependence and some choice of normalization since the curvature radius is a measure of scale. In the spherical case for $k>0$ the Gaussian curvature can be very small $k\approx 0$ or almost flat depending on the reference scale, e.g. given by the preferred observer scale. If an observer lives in a very small world with very small reference lengths the curvature of relatively large spheres becomes almost zero or almost flat $k\to 0$. The FRW metric has an analytic solution to the Einstein field equations given by the Friedmann equations. To get a strict spherical symmetry in the energy-momentum tensor we need strict homogeneity and isotropy. In reality none of these assumptions can be strictly realised, but exactly these features make this model interesting for normalization and standardization procedures. The second relation defines the Hubble parameter H_0 and is called the Friedmann equation for an expanding flat matter-dominated Universe

$$H_0(t)^2 = \frac{8\pi G\rho_3(t)}{3} = -\frac{2R''}{R} = \frac{R'^2}{R^2}. \tag{2}$$

With eq.(2) the expansion dynamics for a flat matter-dominated Universe is given by

$$R^3 \propto T^2. \tag{3}$$

THE SCALING DUALITY

If we consider a holographic system stabilized by recursive currents providing for a self-consistent or self-regenerating quantum hologram with backreaction, the holographic image would contain the holographic memory in the small scale. In such a system the spatial contraction or compression of the lower-dimensional holographic (quantum) memory leads to an expansion of the higher-dimensional holographic (cosmic) image for a given reference wavelength and vice versa. Plotting in this case the hyper-current strength (mass) over size, the large and heavy scale expands while the small quantum scales contract, see fig.1. At the intersection of both dynamics (see black point in fig.1) we find the invariant co-expanding reference scale, which is the geometric mean of the small memory and large quantum scale. The point marks also the volumetric intersection of a higher-dimensional bulk and a lower dimensional quantum flow. If μ is the mass of a memory unit, the number relation in the quantum memory range shows the typical relation $N\mu \propto \lambda_{\min}{}^{-1}$ between mass/energy and (Compton, de Broglie) wavelength. On the cosmic scale we expect the inverse relation, where a number of quantum mass or memory units $N\mu \propto \lambda_{\max}$ show a typical image pattern with characteristic distance $\lambda_{\max}$. This is well known in diffraction (the basis of 3*d* holography) and leads to

$$\lambda_{\min}\lambda_{\max} \approx R_G{}^2 , \tag{4}$$

where $|R_G| = 1$ is the reference scale, a human defined unit length scale. Therefore, we can follow the concept of the unit scale normalization able to compare holographic currents with different dimension (Binder, 2007). In this case the unit reference scale R_G is the geometric mean between a quantum scale and the holographic image cosmic scale.

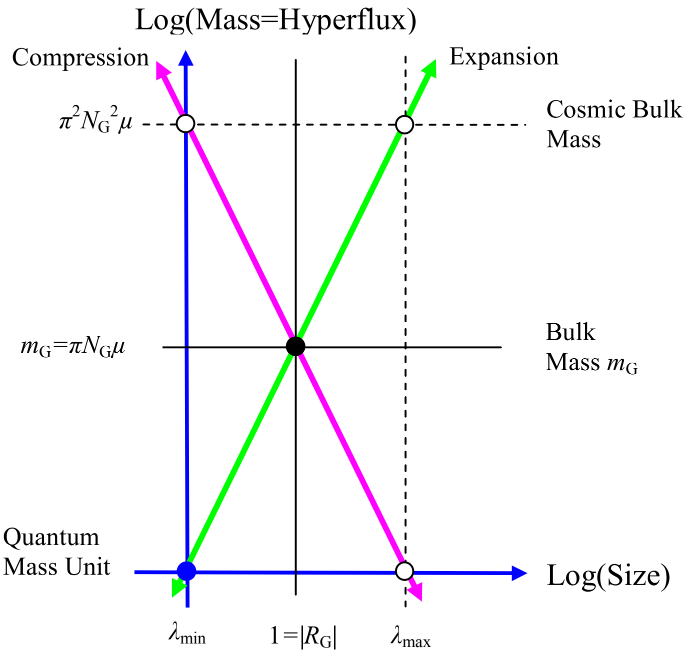

FIGURE 1. Intersection between the Expanding Bulk Scale (green) and the Contracting Quantum Memory Scale (pink) at the Unit Scale $|R_G| = 1$ related by Fractional Linear Inversion

UNIT SCALE NORMALIZATION REFERENCE

The unit scale as a reference scale marks the intersection of different dimensional holographic fluxes, so it is a normalization scale enabling to compare the strength of different-dimensional volumetric momentum fluxes (currents), see figure 1. The SI unit scale provides for reference lengths, times, velocities, masses, and densities. The unit scale will be labelled by the index *G* and characterized by the unit scale mass $m_G \approx 5.915 \cdot 10^{11}\,\mathrm{kg}$ (Binder, 2003, 2007) providing for the unit scale Kepler dynamics

$$Gm_G = bR_G v_G{}^2 ,\; v_G = R_G T_G{}^{-1} ,\; b = |S_1|^2 = 4\pi^2 ,\; |v_G| = |R_G| = |T_G| = 1 , \tag{5}$$

which can be scaled down to the distance-locked atomic scale $r_0 = \lambda_{\min}$. Distance-locking due to phase-locking of orbital waves in the quantum regime provides for a natural reference scale, a natural quantum limit characterized by the baryon mass $\mu = h / c_0 \lambda_{\min}$. As a relation to the Planck scale (which takes no difference in topologies at different scales into account) the weakness of gravity and interaction hierarchy can be quantified by comparing the number of baryons necessary to establish a black hole with a horizon near to the proton size. Applying Gauss law to eq.(5) we can compare different-dimensional currents normalizing the Gauss flux to the unit scale. The number of particles responsible for the dynamics at the distance-expanding 3*d* unit scale can be approximated by

$$N_G = \left|\frac{S_1}{S_3}\right| \frac{m_G}{\mu} = \frac{m_G}{\pi\mu}\,,\; S_1 = 2\pi r\,,\; S_3 = 2\pi^2 r^3\,. \tag{6}$$

The factor $\pi = S_3 / S_1$ accounts for the ratio in flux density between a 3d spherical hypersurface S_3 and a 1d ring surface S_1 on the baryon scale with inversion at the unit scale (Binder, 2007). The integral accelerations or momentum currents will be conserved, where the current density decreases with increasing surfaces. The microscopic reference is a microscopic black hole providing for the natural baryon length scale r_0 given by the Schwarzschild photon sphere in the Fermi range with time dilatation factor $a = 1/3$, where

$$\frac{r_0}{R_G} = \frac{b}{a}\frac{v_G^{\,2}}{c^2} \approx 1.3\cdot 10^{-15}\,,\; \frac{b}{a} = 3b = 12\pi^2\,. \tag{7}$$

With quantum spin given by the Planck action quantum assigned to a quantum mass μ, eq.(3)-(7) provides for the number scaling

$$N_G = \frac{c^4}{v_G^{\,4}}\left(\frac{b}{a}\right)^2 = \frac{R_G^2}{r_0^2}\left(\frac{b}{a}\right)^4 = \frac{R_G}{r_{Planck,SI}}\left(\frac{b}{a}\right)^2 \approx 1.1226\cdot 10^{38}\,, \tag{8}$$

where c ist the SI light velocity and $r_{Planck,SI}$ the SI Planck length. Since Friedmann's flat solution shows a power-law space-time scaling relation $R^3 \propto T^2$, see eq.(3), we get $N \sim c^4 (\mathrm{d}R/\mathrm{d}T)^{-4}$ in accordance with the normalized result in eq.(8), where the resulting number scaling $N_G \propto T_G^{\,4/3}$ characterizes the steady increase in holographic capacity and compression.

DETERMINING COSMIC PARAMETERS ON THE QUANTUM SCALE

With scale-duality or inversion at the unit scale the currents responsible for cosmic expansion could originate at the natural quantum mass scale. Of course we have to take into account that the cosmic bulk boundary is higher-dimensional than a single quantum flux boundary. Mapping the quantum current at the baryon mass scale μ via inversion at the unit scale to the cosmic bulk scale represented by a number of quantum sources $N_G\mu$, the intersection at the unit scale with invariant eq.(3), (5), and (8) leads to the Newton coupling strength (Binder, 2007)

$$G = \frac{\left(S_1 R_G\right)^3}{S_3 T_G^{\,2} N_G \mu} = 4\pi \frac{R_G^{\,3}}{T_G^{\,2} N_G \mu}\,, \tag{9}$$

which can be combined with eq.(2) to get an expression for the Hubble parameter at the baryon scale. The strategy is the following: According to the number relation in eq.(6), the cosmic current of the 4d unit scale bulk mass m_G can be decomposed into a number of 2d quantum sources μ. This means, for a given spatial volume and surface we can not reduce the coupling below a critical density, at least 1 baryon has to be present behind the reference surface. If we choose the minimum number given by the mass quantum 1 baryon, the density and Hubble parameter for a SI-type reference system is exclusively based on the quantum scale and given by

$$\rho_3 = 1\frac{\mu}{V_3}\,,\; V_3 = \frac{4\pi}{3}R_G^{\,3}\,, H_0^{\,2} = \frac{8\pi}{T_G^{\,2} N_G} = G\rho_3(T_G)\,. \tag{10}$$

Now the product $G\rho_3$ in a flat matter-dominated cosmos is independent from the choice of the spatial length unit and only proportional to the square of the Friedmann Hubble constant H_0. This means we should get as a critical density $\rho_3 = 1\mu / V_3$ but measurements suggest effectively about $\rho_{eff} = o\rho_3 = 25\mu / V_3$. In the standard model the viewpoint is that we can "see" only about 4% of the mass on the cosmic scale, where there could be much more "dark matter and energy", about 25 times more or 1/0.04. As a first result, this discrepancy indicates that our "inversion" model can assign a cosmic deficit to a quantum excess. To approach and explain this effect we should remember that we expect in the Friedmann model an expansion driven by 3d Einstein gravity on all scales. But in the holographic model we assign to the cosmic image and bulk mass a 4*d* and to the quantum memory (baryon) a 2*d* spherical topology. The correspondent topological constants are already present in eq.(9) given by the surfaces of the *n*-spheres and the dimensionless ratio $o = 2S_1^3 / S_3 = 8\pi \approx 25.1$, which relates 1 surface of 3*d* topology to the product of 3 surfaces of 1*d* topology. Following the Gauss flux between quantum scale and cosmic scale we have to take into account a transformation of topology, where the effective surface increase and flux density decrease on the quantum scale (or effective surface decrease and flux density increase on the cosmic scale) could be confounded with too much matter on the quantum scale (or missing "dark matter" on the cosmic scale). To get the correct density and Hubble parameter we multiply the 3*d* density by the topological factor o to get the effective density ρ_{eff}

$$\rho_3 = 1\frac{\mu}{V_3} \to \rho_{eff} = o\rho_3 \text{, where } o = \frac{2S_1^3}{S_3} = 8\pi \text{, } o^{-1} \approx 4\% . \quad (11)$$

Now we have with ρ_3 as desired a quantum source given by 1 baryon per unit volume at the inversion scale but are measuring ρ_{eff} and H_{eff} in the standard model. With eqs.(10) and (11) we get the effective Hubble constant in terms of the Newton constant eq.(9),

$$H_0^2 \to H_{eff}^2 = oH_0^2 = \frac{8\pi G\rho_{eff}(t)}{3} = o\frac{2G\mu}{R_G^3} = \frac{o^2}{T_G^2 N_G} = \frac{64\pi^2}{T_G^2 N_G} . \quad (12a)$$

This provides for a miraculous simple relation for the Hubble parameter in the holographic universe

$$H_{eff} = \sqrt{o}H_0 = \frac{o}{T_G n_G} \text{, } n_G = \sqrt{N_G} = \frac{m_{planck}}{\mu} , \quad (12b)$$

where m_{planck} is the Planck mass (Binder, 2007), while ignoring nuclear mass defects and other discrepancies in the bulk, which could be initiated by geometric or topological distortions.

THE 4 UNIT SCALE INTERSECTION RELATIONS

We can now see how well the Hubble parameter fits into a generalized unit scale normalization scheme. The Kepler condition for the Newton constant *G* with 4*d* gravity involving motion at unit time and unit distance is given by the unit scale relations based on $|GS_3 N_G \mu / S_1| = |Gm_G| = S_1^2$ (Binder, 2007),

$$GN_G\mu = \frac{o}{2} r_G^3 T_G^{-2} . \quad (13)$$

The Schwarzschild quantum condition for the 2*d* photon sphere scale $r_0 = \lambda_{\min}$ involving the light velocity c_0 and time dilatation factor $a = 1/3$ is given by

$$GN_G\mu = \frac{o}{2}\frac{a}{S_1^2} r_0 c_0^2 . \quad (14)$$

The Planck quantum condition for the 3*d* Compton scale involves the Planck constant $h = S_1\hbar$ is given by

$$GN_G\mu = \frac{o}{2}\frac{a}{S_1}\frac{\hbar c_0}{N_G\mu} , \quad (15)$$

based on the Compton relation given by $h = r_0\mu c_0$, where $r_0 = \lambda_{\min}$ is the Compton length of μ. In this paper we have introduced the Friedmann condition for the macroscopic Hubble expansion rate at unit distance or volume

$$GN_G\mu = N_G R_G{}^3 \frac{H_{eff}{}^2}{2o} = N_G R_G{}^3 \frac{H_0{}^2}{2}\ . \tag{16}$$

Note the varying powers of S_1 on the right sides of eqs.(13)-(15). We now have 4 unit scale intersection or inversion relations, 2 macroscopic bulk relations eqs.(13) and (16) and 2 microscopic relations eqs.(14) and (15) on the quantum length scale.

MEASUREMENTS AND RESULTS

The effective Hubble constant is according to eqs. (8) and (12) given by

$$H_{eff} = o\left(\sqrt{N_G}\,\mathrm{s}\right)^{-1} \approx 2.37\cdot 10^{-18}\mathrm{s}^{-1} \approx 73.2\,\mathrm{km\,s^{-1}Mpc^{-1}}\ . \tag{17}$$

The Hubble parameter and determination of its value are among the most controversial topics within the astronomical community. The current determination is lower than in earlier days with the same methodology, at the end of the last century estimates ranged from 50 to 100 $\mathrm{km\,s^{-1}Mpc^{-1}}$. Hubble's original measurement (Hubble, 1929) gave a much too high value of about $\approx 500\,\mathrm{km\,s^{-1}Mpc^{-1}}$. Entering the era of precision cosmology, the values reported nowadays are usually in the range between 70 and 80 $\mathrm{km\,s^{-1}Mpc^{-1}}$, see Table 1.

TABLE 1. Representative Hubble Constant Evaluations (ordered by date)

Measurement	**Hubble Constant** H_{eff} **[** $\mathrm{km\,s^{-1}Mpc^{-1}}$ **]**
Correlation between Luminosities and line Widths (Tully, Pierce, 2000)	77±8
Hubble Space Telescope Key Project, (Freedman et al., 2001)	72±8
Wilkinson Microwave Anisotropy Probe (WMAP), (Bennet et al., 2003)	71±4
NASA's Orbital X-ray Observatory (Bonamente, M., Joy, M., La Roque, S. et al., 2006)	77±7
Wilkinson Microwave Anisotropy Probe (WMAP), (Spergel et al., 2007)	**73.2**±3

DISCUSSION

If we compare the 5 evaluations in table 1, the calculated value in eq.(17) is for all cases in the reported range, especially the 2007 WMAP value 73.2 fits perfectly. Including extra-dimensional currents to approach "dark matter" we obtained a topological factor o filling the gap of about 96% missing currents with a proper current topology and boundary dimensionality. In the standard approach the universe appears to be accelerating which is regarded as a complete mystery (Carroll, 2004), whereas in the presented model of holographic expansion there is no dilemma about the Hubble data and parameter. Cosmic gravity leaking to extra dimensions was first described by Cédric, Dvali, Gabadadze (2002) but in a totally different way, where the Einstein-Hilbert action as a 5*d* effect takes over at large distances. Inverting the cosmic expansion process on the large scale to a quantum contraction on the small quantum scale in our model could be assigned to exotic properties due to an inversion of the sign in the exponent carrying the phase of the wave function. Inverting the positive expansion energy on the cosmic scale by compression to the quantum scale could theoretically provide for a technology of making sufficient negative energy with high density on the local quantum scale able to warp space. We think that this process is already at work on the baryon scale warping space locally to stabilize the quantum memory of the hologram dual in scale to the cosmic image. The relevant symmetries and operations should belong to the Lorentz group allowing the fractional linear scale inversion known as Möbius transformation SL(2,*C*). Electromagnetic energy, the Hubble effect, and "Magic Angle Precession" (MAP, Binder, 2008, published in the same proceedings) scale like the inverse square root of *N*, see eq.(17), indicating an intimate relationship. "Artificial charge" can be generated by MAP and has the symmetry of the Lorentz group. MAP also provides for a phase and distance-locked system, where the holographic condition is such, that the large scale precession patterns support the quantum scale diffraction patterns recursively.

CONCLUSION

In holography the information about the largest pattern can be found in the smallest pattern. In quantum dynamical systems exchanging momentum currents there are symmetries and conservation laws which require, that a local compression must be coupled to a global de-compression or expansion. The dual scale relation in holography explains cosmic expansion dynamics by inversion of a quantum compression dynamics. With holographic currents normalized via Gauss law applied on (hyper-)surfaces the strength of interaction scales like a Coulomb charge. Instead of utilizing missing "dark currents" on the cosmic scale for propulsion purposes, we suggest to utilize "excess 3*d* currents" on the quantum scale, inverting the excess quantum momentum currents into global expansion by a proper recursive diffraction leading to a local compression. As a fundamental result and test of our model, we can confirm for the SI unit scale the value of the Hubble constant and its time-dependence related to the global number scaling characterizing a steady increase in holographic capacity. According to our topologically corrected theory, where we have a different topological dimension on different scales, the cosmos appears to be flat and matter-dominated. It is no coincidence that the critical cosmic mass density of the Friedmann model is near to some baryons per cubic meter. The physics of higher-dimensional diffraction assigns to the baryons the role of the holographic memory which is self-regenerating by a synergetic diffraction, where every baryon is the diffraction pattern of all other cosmic baryons. Expanding spaces against boundaries of other spaces is one of the main principles of propulsion. Therefore, we assume that the holographic principle can not only explain gravitation and cosmology but can also be applied to propulsion and space-travel purposes. This has also striking consequences for propulsion applications: if we are able to engineer a system coupling by inversion, we could act against the expansion of the universe extracting energy or propulsion from the expansion. Levering exotic energy into high-energy holographic diffraction patterns (like MAP) on the cm scale or on the μm scale by exotic Josephson currents (Robertson, 2005) could lead to local human generated spacetime expansion/contraction configurations. Regarding propulsion based on fractional linear transforms mapping the quantum compression by inversion to a cosmic expansion, the anisotropic transform resembles the Alcubierre mechanism (1994) if expansion is behind and the compression ahead of the spaceship. Maximum coupling can be expected if all three scales, the small scale wavelength, the reference beam wavelength, and the large scale wavelength have to match according to eq.(4). The SI inversion scale is given by the unit field generating mass m_G in eq. (5), which is helpful to normalize the number scaling leading to both, the gravitation coupling strength given by the Newton constant and the Hubble parameter.

NOMENCLATURE

c_0 = Light velocity (299792458 m/s)
CFT = Conformal Field Theory
AdS = Anti de Sitter
FRW = Friedmann-Robertson-Walker cosmological model
f = frequency (Hz) or (1/s)
G = Newton Gravitation Constant (6.673 10^{-11} $m^3/s^2/kg$)
h = Planck Action Quantum (6.62607 10^{-34} kg m^2/s)
H_0 = Hubble parameter in Relativity, H_{eff} is adjusted to the holographic universe
k = topological factor
MAP = Magic Angle Precession
m_G = Unit motion/field generating bulk mass $m_G \approx 5.915 \cdot 10^{11}$kg
N, N_G = scaling number characterizing a SI-type System of Units, $N_G \approx 1.1226 \cdot 10^{38}$ baryons in $m_G S_1 / S_3$
m = mass (kg)
kms^{-1} = kilometers per second
Mpc = Megaparsec, is about 3.0856776 10^{22} m
μ = quantum baryon mass (kg), see Table 1
t_0 = small scale diffusion time scale (s)
T_G = unit time scale (s)
t = time (s)
o = topological factor of expansion given by the dimensionless ratio $2S_1^3 / S_3 = 8\pi$
r = distance (m)

r_s = Schwarzschild radius, black hole horizon
ρ_0 = strong field inversion scale, photon sphere radius, Compton length, diffusion length (m)
R_G = unit length scale, weak field or big scale distance (1m)
S_n = n-Sphere, spherical surface embedded in $d = n+1$ Euclidean dimensions, S_1 is the ring
SI = System of Units

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CHANGE LOG

02.12.2007 Change Log inserted

05.12.2007 Text between eqs.(10) and (11) changed: $\rho_{eff} = o\rho_3 = 25\mu / V_3$ replaces wrong $\rho_3 = 0.04\mu / V_3$. "Now we have with ρ_3 as desired a quantum source given by 1 baryon per unit volume at the inversion scale but are measuring ρ_{eff} and H_{eff} in the standard model."

15.01.2008	Text between eqs.(10) and (11) again changed: "In the standard model the viewpoint is that we can "see" only about 4% of the mass on the cosmic scale, where there could be much more "dark matter and energy", about 25 times more or 1/0.04."
04.02.2008	Subject, sentences slightly expanded: "the cosmic critical density in the flat FRW cosmic test model corresponds to at least 1 natural memory unit (baryon mass) per unit scale volume. Otherwise, if we expect expansion driven by 3*d* Einstein gravity on all scales, we get the well known cosmic "dark matter" deficit of 96% and about 25 natural memory units per unit scale volume." Numbering change: duplicate equation number (11). The second occurrence was changed into (12a), and (12) was changed into (12b). Change in table 1: H_0 replaced by H_{eff}