The model of the universe as thermodynamics inwardly open system flattened by the velocity of light

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Abstract

The limit for causality relating to each other events is the Planck time of 10^{-45} s. Strangely enough provides a causality of origin to indeterminism. Hence, showing that a causal determinism could coexist in smaller expand of time with the different reality of quantum mechanics. Hence, entanglement defined by spooky by Einstein could be part of a unitary description. Thus, characterizing the Planck as bosons structure that could occupy the same quantum state, allows for simultaneous events, which do not require an inflationary stage. Moreover the Planck dissipation through uncoupling of forces could be unidirectional by their rotation state at origin. Hence, asymmetry could reduce pair annihilation and exclude quarks. Thus, allowing their characterization as the particles representing quantum gravity by absorbing the energy from unstable particles to produce more quarks. From the uncoupling of the electromagnetic force emerge electrons that could orbit the quarks within the protons. Consequently, results in the heat producing synthesis of hydrogen and helium and relates gravity to their emergence creating the 3D space. The 4^{th} dimension links together the local-micro within the macro-overall continuum by the emergence of an arrow of time. The primordial universe as a function of 10^{60} Planck bosons could be thermodynamically characterized as an inwardly functional open system. The galactic recession by the Hubble's law generates internalized entropy, within emerging voids. Hence at the stage of galactic formation, the voids distend space as dark energy with a cooling effect with a dispersion of entropy. The recoil pressures over galaxies increments the inertial mass, contributing to the gravitational forces exerted as dark matter. The recoil increases the linear momentum, and when approaching *c* results in a decrease in the rate of increase of the inertial mass. At very long distances, the values of $z > 1$ appear as due to the lack of resolution and cannot be differentiated by their contribution to impulse and the angular momentum. The Sloan Digital Sky Survey (SDSS) telescopically observes primordial galaxies by a *lookback on time*, describing the primordial galaxies by their light arrival time distance within the space. The Planck bosons in expansive disintegration avoid an inflationary period and could be scaled by parametric down-conversion (PDC) in recurrent quantum sequence: 2^n ($n = 0, 1, 2\ldots$) were used to model the causal space-time continuum. Density fluctuations due to the decoupling of forces generated the primordial resonances and gravitational waves, affecting the plasma state, causing the acoustic waves printed in the universe to emerge. The contribution of the angular momentum of the primordial universe to the quantification confers the spin to the particles axis, allowing acquiring distention configurations between two focuses. In quarks these may be characterized in the pulling vs contraction. In electrons could determine orbits, which delocalized their position vs momentum.

Introduction

The Sloan Digital Sky Survey (SDSS) [1] and its Baryon Oscillation Spectroscopic Survey (eBOSS) [2] show the primordial acoustic oscillations and its elongation imprinted in the universe, as a space-time function of the universe expansion.

The Planck or theoretical maximal aggregation of energy, within the Planck volume, characterized as bosons. Hence, there is not a restriction over their number, to occupy the same quantum state. Consequently, is not dependent of an inflationary period to transfer from a dimensionless point the theoretical information between all points as it is required for simultaneous concerted changes on their quantum state. Hence, avoiding the limit of having to changes the velocity of light to reach the connectivity required to allow the emergence into a dimensional space-time.

The cosmological constant implicated that the energy could act as a force opposed and repulsive to gravity. This depends in that the pressure exercised is acting as positive or negative.

Usual approaches are that energy associated to vacuum because accelerates the rate of generation of the expansion impulse. Hence, if gravity is positive an opposite force of unknown nature denominated dark energy.

Thus, in the matter self-generated space-time gravity creates an indentation an attractive force that produces entropy, an opposite sense dispersive force, developing momentum and explaining why dark energy is characterized as a negative very weak force, acting within voids.

Symmetry is conserved by an equal amount of positive vs negative energy, but entropy could also be characterized by its much lower density than baryonic matter, allowing it to occupy a much larger space. The intergalactic space will contain the entropy as voids distancing from matter by an inertial momentum that is contained by the opposite pressure on the constitutive attractive force of gravitational galactic matter, preserving the galactic contour. Hence, the conceptual implications of the cosmological constant are not transgressed.

The flatness or cosmological fine-tuning of the Big Bang relates of the initial conditions of the universe in which small deviations produce extreme geometrical conformations on the astronomical appearance determined by SDSS as equal to $\Omega_0(t)=1\pm0.02$.

The relative universe density (Ω) is less than equal to or greater than 1.

Spherical: $\Omega>1$, with greater critical density;

Hyperbolic: $\Omega<1$, under dense;

Flat universe: $\Omega=1$, exactly critical density.

The spatial distribution between the wave shape and intergalactic distances could differentiate the predominance of Lyman-α, Quasars, Young blue Galaxies, old red galaxies and nearby galaxies. At low scales there are fractal behaviors [3]. The Navarro-Frenk-White model has shown that a slowing logarithmic changing curve for an energy density model, could also include rotational curves about flatness for the larges scales [4].

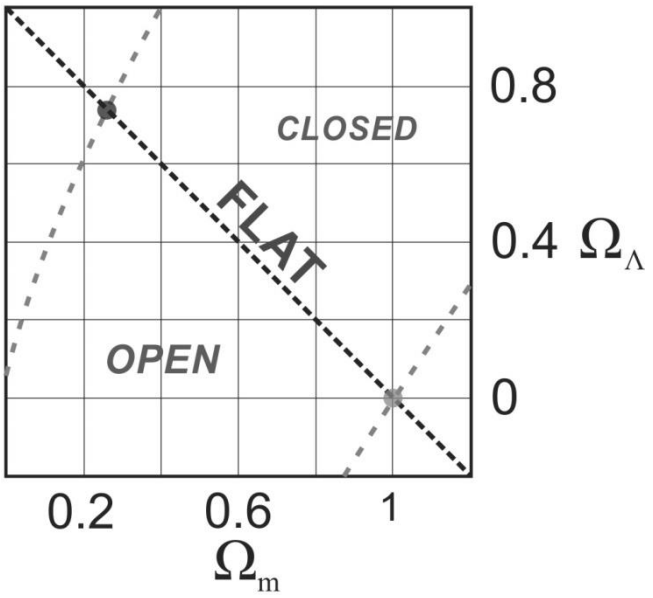


Figure 1: current fractional matter density (Ωm) vs cosmological constant density (ΩΛ).

The non-linear electromagnetic relation could occur in a vortical high energy dense plasma, due the conservation laws in classical and quantum electrodynamics (QED), which only display linear U(1) symmetry [5].

The work methodology by the cosmic microwave background (CMB)-cartographers [6] reprograms by geometric tensors to obtain an equivalence, which does not distorts the equivalence of three-dimensional space in a plane projection. The interpretation of the CMB-cartographers by an equivalent homolographic treatment could not be accurate because requires a more precise angular deviations than obtained from the available data.

Cartographers do not need any more equivalence of a horizontal to a perpendicular line, to draw ellipsoidal maps that show rapid convergence using the Newton-Raphson iteration. However, do not project the depth dimensionality by parallelism, using a time axis. By the Boomerang experiment they obtain an ellipsoidal cut of observations of 1 degree. However, do not allow observation of the much smaller open angle, required for dimensionality of an inwardly open thermodynamic system. Thus, the ellipsoidal maps may eventually need to be scaled, to include the angular momentum required for the Planck bosons dissipative state.

The Friedman equation relating the density with the curvature of space by k=1: positive curvature (like a ball), k=0: zero curvature (flat like paper) and k=-1:

negative curvature (saddle-like). Hence, it could be incomplete if it could not incorporate an integrative solution of tendencies, like an inwardly curvature. This could configure a thermodynamic system, functioning as phi-open but with tendency to never reach a π-closed curvature. The commensurate angular relationship of curvatures used support the tendency to a flatness: 2phi (3.2) with a limit never closing: π (3.14).

The flatness of the universe accordingly to electromagnetism vs gravitational forces reflects the proportionality of the thermodynamic states maintained between recession-enthalpy and recoil-entropy. The latter, may be calculated as a local persistence of the flatness tendency to equilibrium and its treatment by a formulation: $\Delta G = -RT \ln K\text{eq}$. This one may be used to represent a thermodynamic curvature tendency. However, equilibrium is avoided by coupling the dissipative volumes of galaxies that are much smaller than the corresponding in *voids*, which are continuously decreasing its internal entropy by decreasing its heat density.

Gravitational waves and its incidences over the plasma state produce baryon acoustic oscillations along the universe, with contributions to the primordial energy dissipation thermodynamics state that can be treated by acoustic inhomogeneity of the photons distribution.

The manifestation of virtual energy could be treated as a local PUC input equilibrating the predominant PDC to support the flatness of the universe. Hence, the Casimir experiment reflects that in the laboratory the contraction of the space between two electromagnetic plates by PUC could allow the low energy CMB permeating everywhere allows a lower number of higher energy photon could emerge. At has been shown the experiment decreases the larger CMB volume of photon localization in the relation decreasing their number represented by a 100% volume of photon localization by the emission of a much smaller number of high frequency of photon compressed into only a 6.25% volume. These higher frequency photons allow that by their smaller volume of localization could escape the internal space of the parallel plates.

The cosmological constant implicates a positive energy and the antagonistic one negative or black. Both are illustrated within a circle, showing mass and ordinary energy as positive.

The gravitational force associated to the vacuum energy or repulsive forces could indeed be located in the vacuum but does not emerge from it. Both split-out by the emergence of Planck bosons in the nothingness itself which is not existential.

The first step or impulse enthalpy development allows the second step or entropy increase, volume-expansion that allows the emergence of the iterative events in chronological cycles. This time dependent enthalpy-entropy thermodynamics integration allows the symmetry breaking, and the causal relationship generating the arrow of time.

The negative energy represents recoiling according to the summa of momentum conservation. This one is complementary to the impulse-expansion.

This one enlarges the universe at 3D expansion, represented by energy conservation in the relationship preserved by $\Omega_0(t)=1\pm0.02$.

The time-asymmetry of these two phases' dynamics could be analyzed by classic physics terms, and illustrated by ballistic motion.

In a rifle design the fueling energy is the gun-powder that divides into an impulse for the projectile and its recoil. The latter, is entropy reheating the gun and has to be released. Accordingly, the optimal function became time dependent cycling, which introduces causality by ordering the events. Hence, the impulse phase for the projectile associated as positive movement is followed by the negative recoil, follow for dissipation of entropy by expelling the heat released, both of very different density since entropy by inflationary cooling, distending over a greater volume than that of the missile itself.

Table 1: Property of present-day observable universe.

Property of present-day observable universe	Approximate number of Planck units	Equivalents	
Age	$8.08\times10^{60}\ t_P$	4.35×10^{17} s	13.8×10^{9} years
Diameter	$5.4\times10^{61}\ l_P$	8.7×10^{26} m	9.2×10^{10} light-years
Mass	$8\times10^{60}\ m_P$	3×10^{52} kg	1.5×10^{22} solar masses
Density	$1.8\times10^{-123}\ \rho_P$	9.9×10^{-27} kg.m^{-3}	---
Temperature	$1.9\times10^{-32}\ T_P$	2.725 K	---
Cosmological constant	$5.6\times10^{-122}\ t_P^{-2}$	1.9×10^{-35} s^{-2}	---
Hubble constant	$1.18\times10^{-61}\ t_P^{-1}$	2.2×10^{-18} s^{-1}	67.8 km/s/Mpc

Thermodynamics of Planck bosons

Thermodynamics systems are defined as close by reaching equilibrium, or as open in dissipative state. In a self-contained universe the characterization as open implicates an inwardly dissipative state as a function of dissipative enthalpy and its cumulative heat-entropy. Thus, creates intergalactic space (*voids*) that by its rate of expansion dissipates heat by a cooling tendency dimensioning the flatness.

Introducing *voids* evolution allows inferring that the effect of gravity could become less and less significant, because the continuous increment of *void* volume, restricts in their enclosed space how far could reach the influence of gravity.

The dissipative expansion of 8×10^{60} Planck bosons determines the initial causality state equivalent to arrow of time, which has been astronomical observed as a *lookback on time*. This finding requires a theoretical integrative description for space fluctuation by the decoupling of the constitutive forces of the Planck bosons. These emitted gravitational waves, which dispersed in the state of plasma, generate the baryon acoustic oscillations measured by the Baryon Oscillation Spectroscopic Survey (eBOSS) project, a part of the Sloan Digital Sky Survey (SDSS).

This expansion shows non-equilibrium of inwardly-open thermodynamics state. It was found that the latter geometrically could be illustrated by a natural growth from an initial centrality state with later has expanded according to the Hubble's law restricted by the velocity of light, acting as a bottleneck flattening expansion. It role would be equivalent to slow-down any abrupt tendency, to reach equilibrium before the system exhaustion of the critical energy generation of enthalpy.

The number of Planck particles that the primordial universe breathes can be calculated from the total mass of the current observable universe ($\boldsymbol{m_{total}}$).

The total mass of the universe can be calculated by multiplying the critical density by the volume:

$$m_{total} = Density \times Volume = \rho \times \frac{4}{3}\pi(r_V)^3$$

$$m_{total} = 9.557625\times10^{-30}\frac{g}{cm^3}\times\frac{4}{3}\pi\left(1.66723\times10^{28}cm\right)^3$$

Total mass of the observable universe:

$$m_{total} = 1.85534\times10^{56}g$$

The value obtained coincides with the bibliography.

The total energy of the universe:

$$\boldsymbol{E_{total}} = \boldsymbol{m_{total}} \times \boldsymbol{c}^2 \Rightarrow E_{total} = 1.04077\times10^{83}\text{MeV}$$

The sequential decoupling of strong, weak, electromagnetic and gravitational forces allows fluctuations in density and generation of gravitational waves with velocity of light, which at the periphery of the observable universe can contribute to the increase in inertial mass (or dark matter).

Number of Planck particles:

$$\boldsymbol{n_{Planck}} = \boldsymbol{m_{total}}/\boldsymbol{m_{Planck}} \quad \therefore$$

$$\boldsymbol{n_{Planck}} \approx 1.86\times10^{56}\,\boldsymbol{g}/2.18\times10^{-5}\,\boldsymbol{g} \quad \Rightarrow$$

$$n_{Planck} \approx 8.525\times10^{60}$$

The mechanism by which Planck particles emit energy would be the transformation of orbital angular momentum into rotational kinetic energy in new particles. That is, the kinetic energy would be transformed into the mass of the new particles.

$E_{rotational} = \frac{1}{2} \mathrm{I_x} \times \omega^2$, where $\mathrm{I_x}$ is the inertia tensor and ω is the angular velocity.

In terms of the angular momentum $E_{rotational} = \frac{1}{2} \vec{\omega} \times \vec{\mathrm{L}} = \frac{\vec{\mathrm{L}}^2}{2\mathrm{I}}$, where $\vec{\mathrm{L}} = \mathrm{I} \times \vec{\omega}$

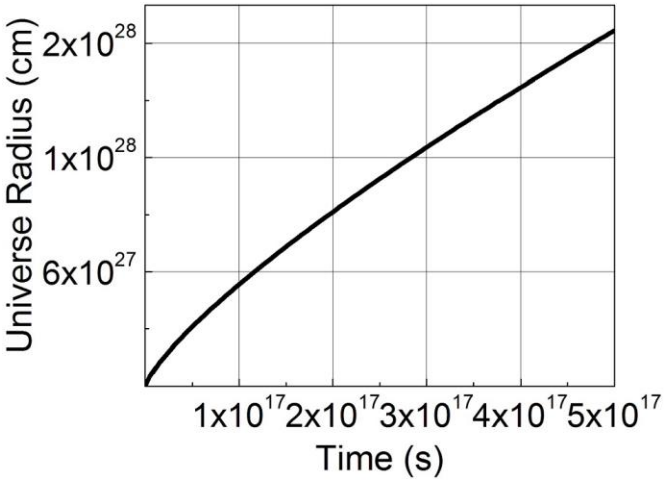
The sum of the relativistic energies of the particles arising from the Planck would be:: $E_{rotational} = \frac{1}{2} \vec{\omega} \times \vec{\mathrm{L}} = \sum \sqrt{\left(m \times c^2\right)^2 + \left(\mathrm{pc}\right)^2}$, where ***m*** is the rest mass of the new particles.

The mechanism would be opposite to the contraction of a mini-black hole consuming mass-energy. The particles would emerge as a jet of particles radially perpendicular to the axis of rotation.

The radius of the visible universe is commonly expressed as: $r_{\mathrm{V}} = \int_{t_E}^{t_0} \frac{c}{a(t)} dt = c \int_{1100}^{0} (1+z) \frac{dt}{dz} dz$.

In this case it is assumed that the expansion parameter evolves as: $\frac{1}{a(t)} = \left(\frac{t_0}{t}\right)^{2/9} = 1+z$ and the result is expressed below in general form: $r_{\mathrm{V}} = \int_{t_E}^{t_0} \frac{c}{a(t)} dt = c \int_{t_E}^{t_0} \left(\frac{t_0}{t}\right)^{2/9} dt = \frac{9}{7} c \times {t_0}^{2/9} \times t^{7/9}$.

Numerically, from the time of the Age of Last Scattering Surface to the present, it is equivalent in seconds to the interval from $t_E \approx 1.19 \times 10^{13} \mathrm{s}$ to $t_E \approx 4.33 \times 10^{17} \mathrm{s}$, respectively: $r_{\mathrm{V}} = 1.67 \times 10^{28}$ cm.



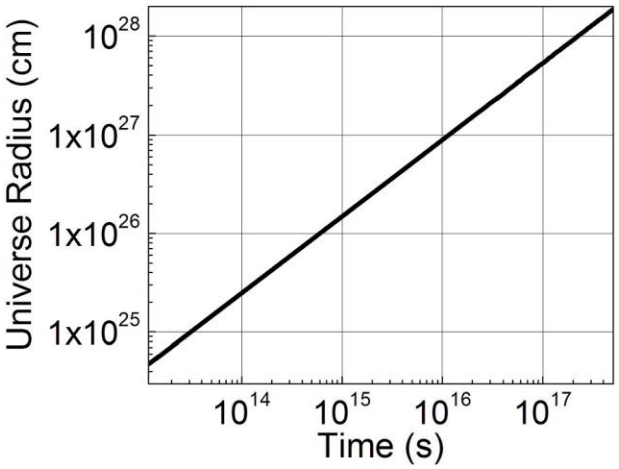


Figure 2: Universe radius vs time.

Expansion as a function of recession-enthalpy vs recoil-entropy

In 2005 it was described that for galaxy structures such as pairs of galaxies and their compact clusters there is some evidence for a nonzero angular momentum of the entire structure. The qualitatively and quantitatively examination of the orientation of the galaxies in clusters found a strong alignment within the number of clusters, reflecting that a non-zero angular momentum, showing that galaxies and their compact groups do not allow the vanishing of their angular momentum.

The galactic rotation curve, which shows the rotation velocity versus distance from the center of the galaxy, cannot be explained by visible matter alone. The simplest explanation is to assume that visible matter makes up only a small part of the cluster. The galaxies show signs of being composed mainly of a halo of dark matter concentrated at their center, with almost spherical symmetry. Galaxies with weak surface brightness are important sources of information for the study of dark matter, since they have a low ratio of visible matter to dark matter, and they have several bright stars in the center that facilitate the observation of the curve of rotation of peripheral stars.

The rotation sense acquired by the universe determines asymmetry at origin, allowing a dissipative anisotropy state to Planck bosons that shaking the space-time by uncoupling of forces, generating gravitational waves that originate perturbations of overdensities at the plasma state.

The angular momentum integrates in a single rotational axis [7] that at the time of galaxies conformation has aggregated matter in a proportion of

93% for those recessing according to the Hubble's law and the rest with opposite gyratory sense.

Giant sound waves propagated through the blazing hot matter that filled the Universe shortly after the Big Bang. These squeezed and stretched matter, heating the compressed regions and cooling the rarefied ones.

This sound was similar to what seismologists describe as a large earthquake. Traces of sound survive because in the beginning the universe was very dense and had resonance. In such compact material, sound could spread easily.

Hence, baryon oscillatory sound of decreasing frequency across the universe and observed at the most distant curvature like a sound horizon. The projection of *lookback on time* may allow estimating that the photon-baryon pressure at the distant border, plus the kinetic energy as inertial mass, could be present as dark matter.

Another effect of the rotational angular momentum of the universe would be the momentum ratio and the recoil entropy. The latter is internalized outside the galaxies, that is, in the *voids* and its expansion presses on the galactic edges. By transferring angular momentum to the primordial galaxies, they emit jets of radiation that fill the primordial *voids*, expanding vacuum according to the Hubble's law.

The outward pressure from the intergalactic recession could lead to an increase in relativistic mass.

Einstein's formula that relates the rest mass ($\boldsymbol{m}_0$) with the inertial mass ($\boldsymbol{m}$) due to the velocity is: $\boldsymbol{m} = \gamma \times \boldsymbol{m}_0$, where $\gamma = \dfrac{1}{\sqrt{1 - \mathrm{v}^2 / \boldsymbol{c}^2}}$ called the Lorentz factor and c is the velocity of light.

A quick calculation would be to assume that the 5% mass increases to 30% due to the intergalactic recession, then: $30 = \gamma \times 5 \;\Rightarrow\; 30 = \dfrac{5}{\sqrt{1 - \mathrm{v}^2 / c^2}} \;\Rightarrow$ $\mathrm{v} = 0.986 \times \boldsymbol{c}$, that is, 98.6% of the velocity of light. This value would be the current limit for the accumulation of kinetic energy in relativistic mass form.

An explanation for a non-radiating mass includes hydrogen in an acreation disk, which if restricted by a magnetic field allows its velocity to increase its inertial mass without significant photon emission. The material in the accretion disk was shown to have a highly magnetic field and electrical conductance. The result of all these collisions is that angular momentum is transferred to the outer reaches of the disk while the gas whirls inwardly to the central star.

In the rotational system, the increase in linear momentum, when approaching *c*, results in an incremental resistance that at very large distances values of z> 1 appear and that due to lack of resolution the contribution of the impulse and that of the angular momentum cannot be distinguished to that value. Therefore, should not be assumed velocities greater than *c*, because spectroscopic measurements at short distances can separate these contributions and observe redshifts z <1.

Expansion model of the *voids* by dissipative heat-entropy limited by ZPE

The contribution of the partial pressures to the total pressure $\mathrm{P} = \sum \mathrm{P}_i = \sum \omega_i \varepsilon_i$ can be replaced by the pressure of an equivalent system, composed of a single species of particles $\sum \omega_i \varepsilon_i = \bar{\omega}\, \varepsilon_T$, where ε_T the total density is considered in this work and $\bar{\omega}$ is the value that verifies equality. Zero point energy (ZPE) is considered a replacement for dark energy $\varepsilon_{ZPE} = \varepsilon_\Lambda$.

Then, the expansion parameter of the universe can be calculated assuming $\mathrm{P_T} = \dfrac{1}{3}\varepsilon_r + \dfrac{\mathrm{v}^2}{c^2}\varepsilon_m + \varepsilon_{\mathrm{ZPE}} = \bar{\omega}\, \varepsilon_{\mathrm{c}}$, where it is assumed that the pressure of the mass tends to zero $\dfrac{\mathrm{v}^2}{c^2}\varepsilon_m \to 0$.

$\dfrac{1}{3}\varepsilon_r - 0.7\,\varepsilon_{\mathrm{c}} = \bar{\omega}\, \varepsilon_{\mathrm{c}}$ The solution is $\bar{\omega} \approx -0.7$.

The calculated expansion rate is $\dfrac{a_0}{a} = \left(\dfrac{t_0}{t}\right)^{2/9} = 1 + z$. Where t_0 is the present time that is estimated to be between: 4.27921×10^{17} s and 4.37388×10^{17} s.

Current measurements show that the universe began to expand rapidly for a redshift value of around $\mathrm{z} \approx 1.7$. Said value introduced in the expression of the expansion parameter allows determining the time t where said expansion acceleration would begin.

For a present time mean value of $t_0 = 4.32655 \times 10^{17}$, the expression

$\left(\frac{4.32655\times10^{17}}{t}\right)^{2/9}=1+1.7$ returns a time value of $t=4.95456\times10^{15}$, a mean value for the time where the acceleration of the expansion parameter of 4.48 billion years after the Big-Bang begins.

Primordial quantization of energy in particles formation

The universe, as a function of velocity of light, functions by acting as an energy dissipative bottleneck to self-contain a flat evolutionary structure. It is assumed that the primordial universe rotated with greater velocity on itself and was slowing down transferring to the particles the orbital angular momentum and spin.

The rotational state allows that the quark-antiquark formation is asymmetric. Thus, the survival of ordinary matter allows the synthesis of hydrogen in the 3 primordial minutes. Therefore, this leads to the fusion of quarks into protons, but avoids their association as neutrons to explain the only resulting formation of the lightweight elements: hydrogen, helium and lithium. These elements anisotropic dispersion occur thereafter generating space with gravitational secondary effects in spatially flatness curvature continuum.

Other author's previous publications in order to unify general relativity and electromagnetism added a 5^{th} dimensions supposed to be rolled up in a tiny pipe with a radius of the order of magnitude of 10^{-33} cm. However, a discrepant analysis has been developing to describe the quantum role of the energy dissipative potential of Planck bosons [8].

The role of the stabilizing frictional forces is totally absent from Hamiltonian systems and quantum mechanics but has a dependence of the winding number (the ratio of the resonance frequencies), which allows more stable periodic orbits and greater stability as elementary particles as closely related by KAM theory. On the other hands, a derivation of the inverse electromagnetic fine structure constant the integral value α=137 plays a role in the enunciation of E-infinity theory [9]. However, does not dabble over the possibility of inwardly open thermodynamics system.

Electrons are arranged around protons in elliptical orbits that absorb heat energy and emit photons. Experimental studies show that when the incident on the electron, photons in the high frequency ultraviolet-blue range, they can add up to emit a photon of even higher frequency. Low-energy photons are dimensionally much larger than the high energy ones and therefore, these ones from the yellow to infrared spectrum could not penetrate into containing compressing internal space of the electron.

Hence, could not merge into quantum of higher frequency since are not fastened by electromagnetic compression, regardless of any numerical increase. This was long interpreted as elusive quantum behavior.

However, not relating the condition for the input of the photon volume (or capacity to locate) within the contracting electromagnetic contour of electron. The beta radiation voltage potential allows penetrating into crystals atoms and be re-emitted proportionated as many photons that could act as nuclear energy batteries [10].

Electron microscopy, which prevents radiation escape by electromagnets devices, allows energy to accumulate in the electron and allows to reduce their size in order to reach very high image resolutions. A galaxy magnetic field can contain the tendency of hydrogen electrons to radiate. According to the mathematical development of the Schrödinger box treatment acquire boson properties showing that very high energy could be accumulated into electron orbitals. The electromagnetic edges of the electron are inclusive for the dimensions of much higher energy input (electric power dimensioning electrons), with highly potent electromagnets preventing excitatory energy to be dissipated in order to reach the electron sizes, for construction of nuclear colliders that are able to explore into the quark structure [11].

The orbitals of ellipsoid shape of particles configuration around axis with 2 focal positions are capable of oscillatory movements to either contract or elasticize these distances. Hence, this effect is transduced into dimensioning many kinetics parameters related by linear or angular momentums stability to the generated particles, could be related to quantic uncertainty. Therefore, the strong force when uncoupled allows the emergence of quark-antiquark which annihilates leaving a remnant of ordinary matter, with colors integrated into differentiated protons and neutrons.

Parametric down-conversion (PDC) and parametric up-conversion (PUC) had been experimentally observed as spontaneous energy conservation processes. The first one could increase

cosmic entropy, by dissipation of heat density leads to prevent an early exhaustion, which maximize the enthalpy. This process could be described as a potential for the quantization of heat in the black-body radiation increased as a function of temperature [12], which allows quantum atomization and its delocalization of structural space-time relationships.

The decay of particle populations generates an increment of enthalpy which supports free energy expenditures. The energy enters into the thermodynamics system by decay, equivalent to dissipation structures maintaining an open system in non-equilibrium.

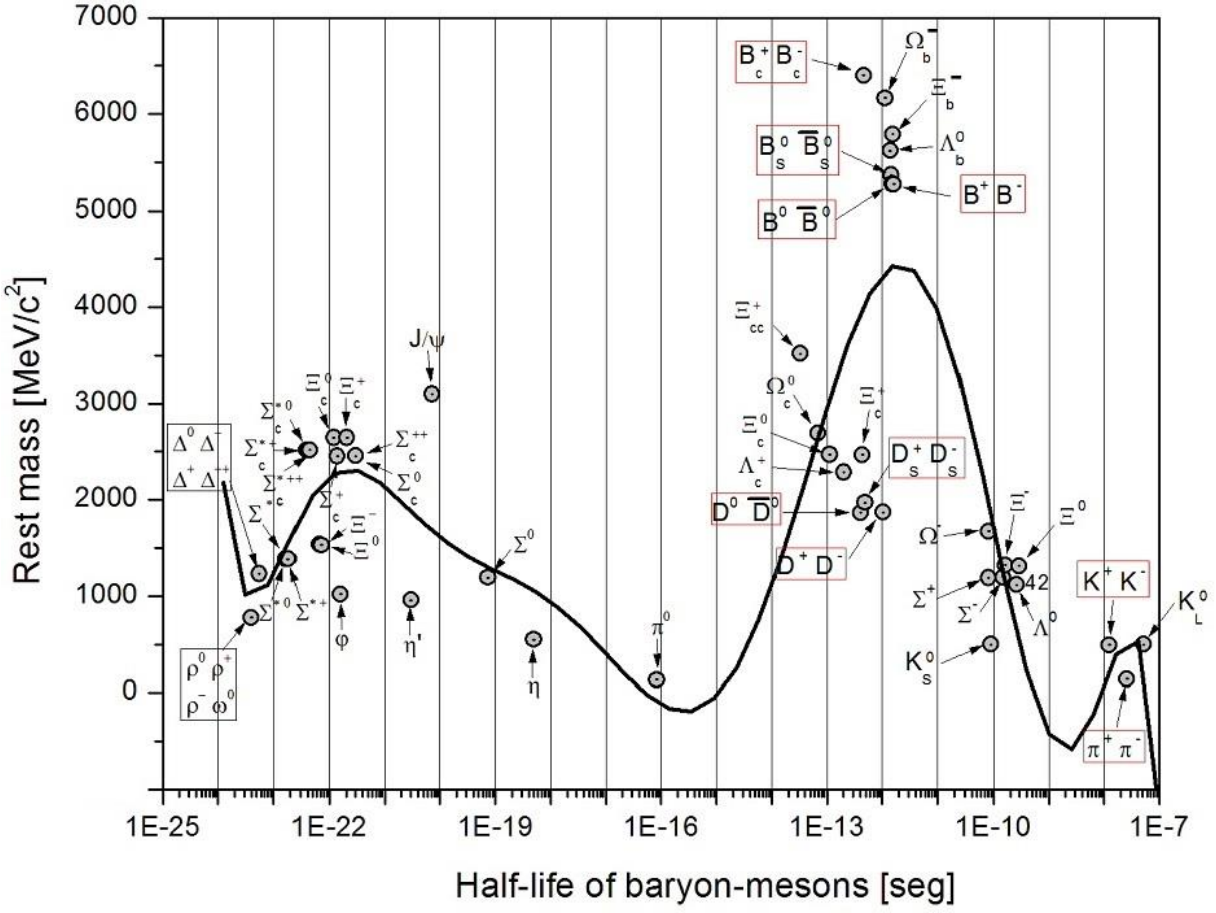


Figure 3: Plot according to their half-life: $t_{1/2}$, and resting-mass: m. *Particles which surge in high-energy colliders like HLC were plotted. The first band groups particles with a $t_{1/2}$ around 10^{-22} s corresponds to strong interaction predominance. The second band groups particles with a $t_{1/2}$ around 10^{-11} s that correspond with electroweak interaction. The resultant unstable particles with early disappear preceding the hydrogen constitution of the primordial universe.*

The pattern of energy distribution suggests a chronology, by the changing population of particles showing a tendency of longer half-life: $t_{1/2}$, which configures a chronological self-selection process.

The fit-plot can be used as a model assimilating collider's generated particles to dissipative states of same or similar primordial particles within cosmic chronology. Hence, the obtained tendency curve may manifest a correlation between deconfinement and reconfinement of uncoupling of forces acting as contour and spin configuration.

These particles detected from collider would respond to the symmetric annihilation, a possible asymmetry of origin of the matter emerging from Planck bosons in a rotational asymmetric universe may not. However, the figure represents peaks resulting from a decay-time relating the generation of particles characterized by energy density. Hence, it is proposed that the pressure of acoustic oscillations could displace the local space-time distribution of particles.

Particles surge in high-energy colliders like HLC. If these particles are present in the primordial

plasma state the acoustic oscillations would tend to differentiate according to energy density. Hence, the first band could manifest the presence of the strong interaction:

Mesons: Rho, $\rho^{\pm}$, ρ^0, and Omega, ω^0: 4×10^{-24} s ; Phi, φ, 1.6×10^{-22} s; Eta prima, η', 3×10^{-21} s; J/Psi, J/ψ, 7.2×10^{-21} s; Eta, η, 5×10^{-19} s. Baryons: Delta, Δ^{++}, $\Delta^{\pm}$, Δ^0, 5.58×10^{-24} s; Sigma, $\Sigma^{*-}(1385)$, 1.67×10^{-23} s; $\Sigma^{*0}(1385)$, 1.8×10^{-23} s; $\Sigma^{*+}(1385)$, 1.84×10^{-23} s; $\Sigma_c^{*+}(2520)$, 3.9×10^{-23} s; $\Sigma_c^{*0}(2520)$, 4.1×10^{-23} s; $\Sigma_c^{*++}(2520)$, 4.4×10^{-23} s; Xi, $\Xi^{*-}(1530)$, 6.7×10^{-23} s; $\Xi^{*0}(1530)$, 7.2×10^{-23} s; $\Xi_c^{*0}(2645)$, 1.2×10^{-22} s; Σ_c^{+}, 1.4×10^{-22} s; $\Xi_c^{*+}(2645)$, 2.1×10^{-22} s; Σ_c^{++}, 2.95×10^{-22} s; Σ_c^{0}, 3×10^{-22} s; Σ^0, 7.4×10^{-20} s; [13].

When the distance between quarks becomes very short, the intensity or interaction decreases. Hence, in between to 10^{-30} to 10^{-10} s the plasma quark-gluon would show asymptotic freedom. This mechanism allows that each quark or antiquark maintains an unstable state of attraction with the others [14].

The particles interact via the strong force, have half-life of 10^{-23} s. The strange particles, which are characterized by the electroweak interaction, have half-lives between 10^{-10} and 10^{-8} s.

Particles and antiparticles have the same spin and mass, but opposite electrical charges, and quantum numbers strangeness S, $S=-(n_s-\bar{n}_s)$, isospin I_3, lepton number L and baryonic number B. However, Σ^+ and Σ^- are not antiparticles have the same B=1 and masses are not identical. Strong interaction conserves the strangeness S, but after to 10^{-10} s the weak interaction dominates which ignores S and I_3.

Recognition of the specific direction of the longitudinal-spin and handedness for neutrino emission allows selecting different reaction paths.

The rotational dissipation of Planck bosons in the asymmetric inwardly thermodynamics universe may produce local pair annihilation. The short lived particle decays [15] allow the predominance of the more stable quarks and electrons, which are required for the synthesis of hydrogen, helium and lithium.

A second band results from a latter drop of temperature allowing particles in which electroweak interaction became manifest and the deconfined energy becomes substrate of subsequent reactions, supports the creation of new particles.

As the distances between pions became greater than 1 Fermi, the energy involved by an attempt of quarks separation, becomes greater than the mass of the pions and these multiply [16]. Production of pions $\pi^+[u\bar{d}]$, $\pi^-[\bar{u}d]$, $K^+[u\bar{s}]$, $K^-[\bar{u}s]$, $p^+[uud]$, has been detected at 900MeV with ALICE at the LHC [17]. These processes at primordial universe could be expected to prevent accumulation of high energy photons and favor the increase in the population of quarks and antiquarks conforming the quark-gluon plasma at 10^{-10} s [18].

Mesons: Pion, π^0, 8.4×10^{-17} s; neutral D, D^0 and $\overline{D}^0$, 4.1×10^{-13} s; Charmed B, $B_c^{\pm}$, 4.6×10^{-13} s; Strange D, $D_s^{\pm}$, 4.9×10^{-13} s; Charged D, $D^{\pm}$, 1.04×10^{-12} s; Strange B, B_s^0 and $\overline{B}_s^0$, 1.46×10^{-12} s; Neutral B, B^0 and $\overline{B}^0$, 1.53×10^{-12} s; Charged B, $B^{\pm}$, 1.63×10^{-12} s; Kaon-short, K_S^0, 8.9×10^{-11} s; Kaons, $K^{\pm}$, 1.24×10^{-8} s; Pions, $\pi^{\pm}$, 2.6×10^{-8} s; Kaon-long, K_L^0, 5.2×10^{-8} s. Baryons: Xi, Ξ_{cc}^+, 3.3×10^{-14} s; Charmed Omega, Ω_c^0, 6.9×10^{-14} s; Ξ_c^0, 1.12×10^{-13} s; Charmed lambda, Λ_c^+, 2×10^{-13} s; Charmed Xi, Ξ_c^+, 4.42×10^{-13} s; Bottom Omega, Ω_b^-, 1.13×10^{-12} s; Bottom Lambda, Λ_b^0, 1.391×10^{-12} s; Xi, Ξ_b^-, 1.56×10^{-12} s; Σ^+, 8.018×10^{-11} s; Omega, Ω^-, 8.21×10^{-11} s; Σ^-, 1.479×10^{-10} s; Ξ^-, 1.639×10^{-10} s; Λ^0, 2.631×10^{-10} s; Ξ^0, 2.9×10^{-10} s.

Kaons [19] $K^{\pm}$: m=493.7 MeV/c^2 and pions $\pi^{\pm}$: m=139.6 MeV/c^2, the higher half-life mesons: 1.24×10^{-8} s and 2.6×10^{-8} s respectively.

I.a.1. $K^+[u\bar{s}]\rightarrow\mu^++\nu_\mu\ \wedge$

$$K^+[u\bar{s}]\rightarrow\pi^+[u\bar{d}]+\pi^0[\frac{u\bar{u}-d\bar{d}}{\sqrt{2}}]$$

I.a.2. $K^-[\bar{u}s]\rightarrow\mu^-+\bar{\nu}_\mu\ \wedge$

$$K^-[\bar{u}s]\rightarrow\pi^-[\bar{u}d]+\pi^0[\frac{u\bar{u}-d\bar{d}}{\sqrt{2}}]$$

I.b.1. $\pi^+[u\bar{d}]\rightarrow\mu^++\nu_\mu$, μ^+ antimuon,

I.b.2. $\pi^-[\bar{u}d]\rightarrow\mu^-+\bar{\nu}_\mu$, μ^- muon,

At the lepton Era occurs the annihilation of muons at 9×10^{-5} s, $\mu^{\pm}$: about 200 times the electron mass [20].

I.c.1. Antimuon, 2.2×10^{-6} s and 105.6MeV/c^2: $\mu^+ \rightarrow e^+ + \nu_e + \bar{\nu}_\mu$,

I.c.2. Muon, 2.2×10^{-6} s and 105.6MeV/c^2: $\mu^- \rightarrow e^- + \bar{\nu}_e + \nu_\mu$,

The muon-antimuon pair's annihilation in order to conserve symmetry was analyzed in the context of 1% asymmetry [21]. This allows inferring reactions progresses from a primordial CP-violation process, at constant total energy capable to increment the relationship matter/radiation at differences steps of the chronology.

Overall assessment of the sequence allows inferring that the decay of particles produced new ones, gradually more stable. In addition, residual high-energy photons trying to separate the quark-antiquark inside mesons, allows an increment of mesons number.

Structure and function thermodynamics of the universe

A thermodynamic close system allows only the exchange of energy to reach equilibrium. It allows bypassing equilibrium if one or more of its components could be released as a gas or as a precipitate, etc.

An open system adds matter to that input and output of energy. A self-contained universe is not a closed one because lack the tendency to reach thermodynamic equilibrium. On the other hand, to be open requires a pathway for dissipation of entropy. In order to create a better fitting between structure and function a new thermodynamic concept has been modeled. Thus, allowing a path for entropy disposition by internalizing it as *voids*. Hence, preserve the functional openness within limits precluding interaction with the exterior nothingness itself.

Hence, the characterizations as open system allowing internalized functional dissipation of entropy within the internal space (*voids*) growing at the expansionary rate. Thus, the *lookback on time* findings could be dimension under equilibrium, between gravitation and kinetics [22].

However, to qualify as showing open curvature of irreversible thermodynamics requires accepting that there is coupling between a continuous dissipation of enthalpy and a continuous accumulation of entropy-heat in *voids*, and its dissipation by the continuous expansion cooling effect.

Hence, the latter involves recognition that the creation of the space is coupled to entropy absorption into *voids*. The *voids* expansionary rate disperses heat by incremental volume, cooling effect that decreases curvature to maintain flatness. This heat dispersion allows characterizing the *voids* pressure over galactic contour as dark energy.

The velocity of light (c) acts as a bottleneck delimiting the dissipative rate of enthalpy and heat-entropy accumulative increase, leading to the extinction of the initial energy input or critical. In the rotational asymmetric state of the universe an increment in the linear momentum occurs by approaching c. Thus, the relativistic equation shows at greater and greater velocity magnifies a resistance to further increment of mass. Thus, the energy excesses became as a tendency to increment the angular momentum. Hence, allowing the sum of linear and angular momentum to explain redshift above the value of c. Hence, the $z\approx1.7$ could contribute to the gravity exerted as dark matter.

The Hubble constant measures the expansion rate of the recession of galaxies from its primordial origin centrality of 10^{60} bosons by naturally distending space. An open system never reaches equilibrium because maintains enthalpy in a continuous dissipative state $dH = T \times dS$ leading to extinction of the initial energy input.

Accordingly, it can be modified the thermodynamics perspective because entropy in a self-contained universe the usually concept as the heat released by a system reaching equilibrium cannot escape to non-existential outside. Hence, it can change the meaning of entropy by its role in dimensioning the universe, distending space, the position of galaxies and its pressure over the galaxies containing their contour as dark energy.

Enthalpy expression requires a refrigeration system to prevent entropy-heating. Hence, thermodynamics could reformulate the term T if applied like a differential instead as usually done, $\Delta G = \Delta H - T\Delta S$, in which case ΔG (critical), a reinterpretation of entropy as an energy potential exercising a distension of the *voids* and by its cooling internalizing pressure over superclusters borderlines.

At the most external curvature limits *lookback on time* may allow to discover primordial events as uncoupling of forces distorts space and originates a resonance effect of gravitational waves, generating at

the plasma state the acoustic oscillations that permeate the universe.

A geometric solution is obtained by angular aperture in iterative connection between every two arcs, extending from phi (1.618) (k= -1) to $1/2\pi$, which does not allow to close curvature (k=1), in order to maintain tendency to flatness (k = 0). This model allows a self-contained thermodynamics system, by its non-equilibrium dissipative function, allows its characterization as internally open. Thus, could also integrate the flatness tendency with the causality of the velocity of light, as a bottleneck.

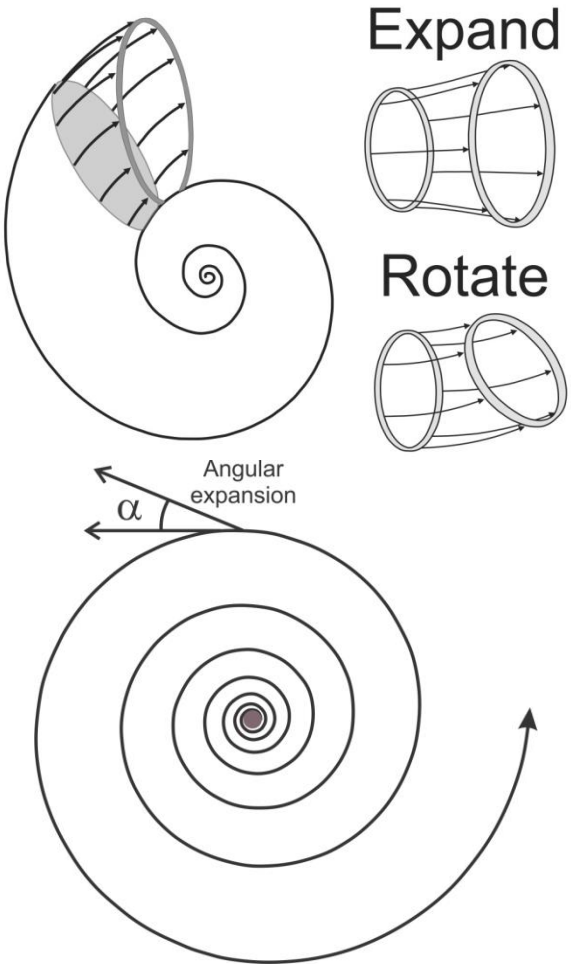


Figure 4: Logarithmic spiral expansion *showing at its center the primordial universe of 10^{60} bosons and that by the lookback on time project energy from its center to the iterative growth until reaching its most distant curvature borders. Thus, could be used to represent how the more recently formed galaxies are located close from its initial center whereas the older primordial galaxies are observed at the far more distant distending arms.*

The recurring pattern during the prolonged and dissipative expansion of a Planck boson is integrated into the causality of the ensemble. Thus, a structure with internalized function is created that disperses the entropy and entails in non-equilibrium, to enhance the impulse-enthalpy.

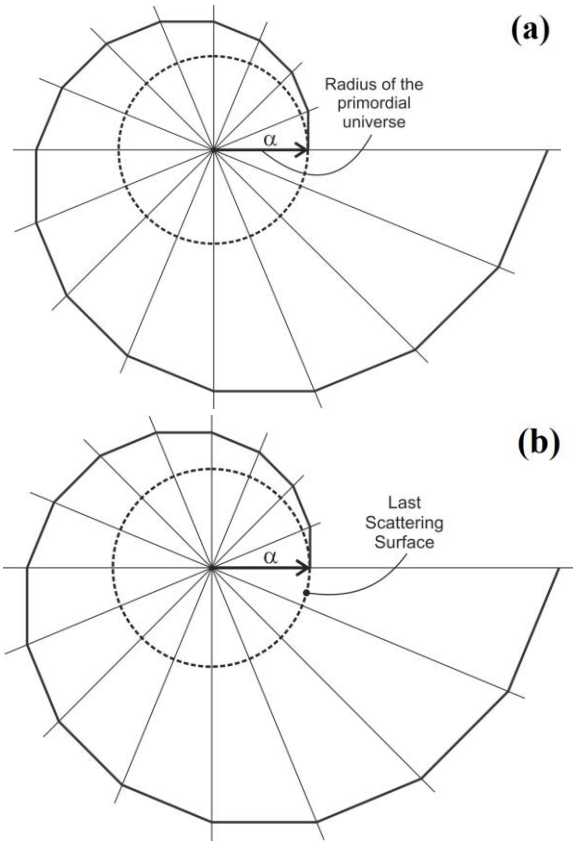


Figure 5: a) The initial Planck bosons expansionary spiral obtained scaling the dissipative state by PDC. *An iterative structure of arcs could prolong into subsequent curvature of the dissipative state. The relationship was calculated from bosons division into two, according to the logarithmic coupled expansionary sequence 2^n, (n=0, 1, 2, ...etc.). Each boson by recurrent increasing their energy location, within a space-time function coupled to the angle rotation (α) and angular momentum expansion. Hence, critical energy is sum of synchronized dissipative Planck events.* ***b) The CMB emitted from the Last Scattering Surface.*** *This shows density correlations with angular aperture to the self-contained universe by its internalized entropy into voids in expansionary rate. Thus, could be shown similar constitutive curvatures at other scales.*

A logarithm spiral scaled from Planck bosons dissipative state by PDC has been represented as showing a primordial gyratory geometry. Hence, it does

not require the postulation of a symmetric complementary universe, and its flatting curvature could have a reiterative value of inwardly open thermodynamics space. Thus, relating a phi angle exceeding the close curvature value of π. The restriction of a flatness progression may have as a consequence the emerging of one black hole per 200 stars, which at its event horizon destroys causality and eliminates matter curvatures. Thus, prevents a local tendency to the emergence of curvatures, which could exceed flatness.

A similar role could be attributed to the 250,000 quasars that had been located, over a very broad range of distances, with its concentration peak at a distant past of about 10 billion years ago.

Discussion

The simultaneous emergence of the total number of primordial 10^{60} Planck bosons (E_P) is equivalent between the frequency limits of a primordial quantum up to the present λ_{CMB} (2.35×10^{-10}MeV). The energy dissipative structure of the Planck bosons emerges as a Big-Bang. The dissipative state is applicable to elemental structures calculated for the rate of half-life.

This thermodynamic explains the concatenated cycles present in nature, as dissipative events within self-contained systems, for all energy structures from the life cycle of stars, which the lineal correlation between the cause and effect.

Hubble's law of linear relations redshift and distance (D): $c \times z = H_0 \times D$, can be interpreted thermodynamically in the relation of decreasing enthalpy and entropy growth, as an expansive function of a center containing Planck bosons to the periphery. The time arrow as hereby is modeled as a role of voids as dissipative limit of heat-entropy, reaching zero point energy (ZPE).

The open nonlinear thermodynamics systems that are far from equilibrium allow the emergence of complex life since involves an excess of dissipative enthalpy to decrease the tendency to entropy, by a dynamic irreversible rupture of symmetry blocking any tendencies to equilibrium. This one depends of the preponderance of the velocity of dissociation of one component into two preventing reverse kinetic order, relating the rate probability of molecular collisions to irreversible thermodynamics.

Self-organization was described by Prigogine as "order through fluctuations" or "order out of chaos" [23]. Negative entropy (i.e. increased order, structure or self-organization) can spontaneously appear in an open nonlinear thermodynamic system, which is far from equilibrium. This also applied to complex life species, but requires the emergence of thermodynamics structure capable to accelerate the overall flow of entropy in the total system.

The universe shows a *lookback on time*, which has a similitude on the characterization of complex life by its evolutionary genetic-dependence, structured by nuclei acids. Hence, the integrated H-bonds to constitute a polymeric state of water are transfer to proteins for the conformational changes required for their turnover function.

Thus, H_2O maintains an inward-open state by its coupling to the turnover of conformational structuring of proteins (Hb) and those of the kinetic intermediates of enzymes. Hence, the H-bonds loss in released exhausted water, as an irreversible event, far from equilibrium [24]. At invariant body temperature the water molecules without H-bonds (transported in a liquid state by their polarity complementary) could be released as entropy within the 5% of vapor contained in exhaled air.

Conclusions

The Sloan Digital Sky Survey (SDSS) continuous progression could integrate tendency to a flatness continuum, like the astronomically observed *lookback on time*. The primordial Planck bosons had been projected into a dissipative energy logarithmic spiral function (figure 5).

A magnetic field at the peripheral galaxies by hydrogen accretion disks allows electrons decreasing its electromagnetic contour to absorb a greater energy, restricting photon emission. A unidirectional rotating primordial universe allows asymmetry of origin and decreases the probability of collision between galaxies.

Cosmic expansion could be explained to become non-equilibrium asymmetry of irreversible preponderance of the rate of PDC, which bottleneck determining the arrow of time and the rate of annihilation, etc. The λ-elongation was assayed by a simulation of the mechanism of PDC, this one show that the evolution of the CMB radiation spectrum is

consistent with the Big-Bang coupling of cooling with expansion.

The chronology, after the Last Scattering Surface, describes expansion of the universe by the evolution of voids, integrating the quantum structure with the continuum of non-equilibrium open thermodynamics of the universe.

The results create a chronology order as a density function, which allows the calculation of the re-acceleration Era. Hence, it naturally predicts that the expansion parameter "a" defines a relationship $a_0/a = k$ and appears a link to the accumulation of zero point energy (ZPE).

Accordingly to results either the quantum treatments by photon elongation and division (PDC) could produce a chronology for the evolution of voids. Hence, allowing the perspective of a quantum integrated Universe under a thermodynamic continuum. Thus, results predict expansion reacceleration at 4400 million light years after Big-Bang, which is close to the observational value [25].

The Planck's scale dynamics allow to weight the thermodynamics structuring for the functional development of the universe. Thus, allows to relate the Schwarzschild radius of a black hole as roughly equal to the Compton wavelength at the Planck scale [26].

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