The Christmas Gifs of 2018:《Framework of Natural Cosmology》

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Abstract: As an application of *Universal and Unified Physics**, the *Natural Cosmology* is harvested as a new theory prevailing over the current "*Physical Cosmology"* by transcending both *Einstein's* field equations and *Friedmann* equations with the *ontological field equations* and *horizon field equations.* Positioned at the third horizon of spacetime manifold*,* our *cosmological field equation has not only* substituted "general relativity"*,* but also extended the cosmological constant to the matrices of superphase modulations, dark energy waves and blackhole emissions.

Consequently, we are presented the *Christmas Gifs of 2018*, revealing exceptionally secrets of the *Natural Cosmology* with horizon infrastructure, superphase modulation, entropy of dark energy, and lightwave or gravitation fields in the forms of dispersive or non-dispersive wave-packets, which orchestrate all types of life events essential to the operations and processes of creation, annihilations, reproduction and communication for natural formations and evolutions.

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INTRODUCTION

In our universe, the laws of nature strike aesthetically a harmony of duality not only between symmetries, but also between symmetry and asymmetry. Because of the yinyang ($Y^{-}Y^{+}$) duality, a symmetric system naturally consists of asymmetric ingredients or asymmetric constituents. A universe finely tuned, almost to absurdity, is a miracle of asymmetry and symmetry together that give rise to the next horizon where a new symmetry is advanced and composed at another level of consistency and perpetuation. In cosmology, we define two types of *Asymmetric Dynamics*: *Ontology* for the massless matters, and *Cosmology* for massive objects. Their interrelations are as the following:

1. Because of the massless matter or dark objects, *Ontology* is intrinsic, evolutionary, dominant and explicit at the first and second horizons, perceptible mathematically by two-dimensions of *World Planes*. As the actions of the scalar potential fields, it characterizes interrelationships of the living types, properties, and the natural entities that exist in a primary domain of being, becoming, existence, or reality. It compartmentalizes the informational discourse or theory required for sets of formulation and establishment of the relationships *asymmetrically* between creation and reproduction, and between animation and annihilation.
2. *Cosmology* is the living behaviors, motion dynamics, and interrelationships of the large scale natural matter or supernovae at the third horizon and beyond, perceivable mathematically by tetrad-dimensions of *Spacetime* clusters, each of which exists in the evolution and eventual trends of the universe as a whole. In a spacetime manifold, the vector potentials compartmentalizes the infrastructural dynamics required for sets of formulation and constitution of the relationships *asymmetrically* between motion gesture and action forces, and between universal conformity and hierarchy.
3. Symmetry exists in one horizon can be cohesively asymmetric in the other simultaneously without breaking its original ground system that coexists with its reciprocal opponents. Similar to a duality of the flux commutation and continuity of potential densities, symmetry and asymmetry represents a duality of the $Y^{-}Y^{+}$ cohesive and progressive evolutions aligning with the working of the topological hierarchy of our nature.

The scope of this manuscript is at where a set of mathematical formulae is constituted of, given rise to and conserved for ontological and cosmological horizons *asymmetrically*. Through the performances of the $Y^{-}Y^{+}$ actions, laws of conservation and continuity determine the asymmetric properties of interruptive transformations, dynamic transportations, and entangle commutations for photon, graviton and dark fields of *Asymmetric Ontology* and stellar galaxy evolutions of *Natural Cosmology*.

I. REVIEW OF PHYSICAL COSMOLOGY

In November of 1915, *Albert Einstein* culminated in the presentation to the *Prussian Academy of Science* of what are now known as the *Einstein Field Equations* [1]. These equations specify how the geometry of space and time is influenced by matter as a moving object, and form the core of *Einstein's* general theory of relativity. Two years later in 1917, cosmology began with Einstein's postulating "cosmological considerations on the general theory of relativity" [2] under the philosophical principles of a homogenous, static, and spatially curved universe.

$$R_{\mu\nu} - \tfrac{1}{2} R\, g_{\mu\nu} + \Lambda g_{\mu\nu} = G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \qquad (1.1)$$

The cosmological constance Λ was originally introduced to counterbalance the effects of gravity and achieve the model of a static universe. From the special theory of relativity in 1905, this "physical cosmology" took about ten years with numerous detours and false starts that fundamentally based on a simple thought experiment for an observer in free fall. Evidently, this stereotype has missed the truth of nature by a large margin. However, the theory has been excessively respected as one of the most profound discoveries of the 20th-century physics to account for general commutation in the context of classical forces.

During 1920s, *Alexander Friedmann, Georges Lemaître, Howard Robertson and Arthur Walker* (FLRW) derived a set of equations that govern the universe with the expansion of space in all directions (isotropy) and from every location (homogeneity) within the context of general relativity. The FLRW model declares the cosmological principle as that a universe is in homogeneous, isotropic, and filled with ideal fluid [3]. For a generic synchronous metric in that universe, a solution to *Einstein's* field equations in a spacetime is expressed as a pair of the *Friedmann* equations with *Hubble* parameter:

$$ds^2 = (c\,dt)^2 - a(t)^2\left[\frac{dr^2}{1-kr^2} + r^2 d\vartheta^2\right] \qquad : d\vartheta^2 = d\theta^2 + \sin^2\theta\, d\phi^2 \qquad (1.2)$$

$$\frac{3}{c^2}\left(\frac{\dot{a}}{a}\right)^2 + 3\frac{k}{a^2} = \Lambda + \frac{8\pi G}{c^2}\rho \qquad (1.3)$$

$$\frac{2}{c^2}\frac{\ddot{a}}{a} + \frac{1}{c^2}\left(\frac{\dot{a}}{a}\right)^2 + \frac{k}{a^2} = \Lambda - \frac{8\pi G}{c^4} p \qquad (1.4)$$

$$v_r = H(t_0)D, \quad H(t) \equiv \frac{\dot{a}}{a} \qquad : H_0 = H(t_0),\ v_r = cz,\ z = \frac{\lambda_{obsv} - \lambda_{emit}}{\lambda_{emit}} \qquad (1.5)$$

In cosmological observation, the movement rate of the universe is hypothetically interpreted by the model of time-dependent *Hubble* parameter $H(t)$ to describe a galaxy at distance *D* given by *Hubble Law*: $v_r = H_0 D$. Remarkably, for a constant cosmological constant Λ, the equation (1.3) includes a single originating event, the mass density ρ. This is what appear as if the universe were not an explosion but the abrupt appearance of expanding spacetime metric.

At *Pasadena* from January to February 1931, *Edwin Hubble* showed *Einstein* the redshifted nebular spectra [4] and convinced him that the universe was in a state of expansion, and the cosmological constant was superfluous [5]. Meanwhile, *Lemaître* went further and suggested that all the mass of the universe was concentrated into a single point, a "primeval atom" where and when the fabric of time and space came into existence [6]. In January 1932, Einstein and *Willem de Sitter* teamed up to write what would be known as the *Einstein-de Sitter* universe [7], in which *Einstein* set the cosmological constant to zero $\Lambda = 0$ in the *Friedmann* equations, resulting in a model of the expanding universe known as the *Friedmann-Einstein* universe.

In the 1920s and 1930s, almost every major cosmologist preferred an eternal steady state universe. However, the above historical activities led to a hypothetical universe, the "*Big Bang*" [8], such that its inception were immediately (within 10^{-29} seconds) followed by an exponential expansion of space by a scale multiplier of 10^{27} or more, declared as cosmic inflation. From then on, the above equations become the basis of the standard *Big Bang* model as a key prediction.

In 1949, Thirty-four years after discovery of *General Relativity*, *Einstein* claimed, "The general theory of relativity is as yet incomplete .... We do not yet know with certainty, by what mathematical mechanism the total field in space is to be described and what the general invariant laws are to which this total field is subject." Next year in 1950, he restated "... all attempts to obtain a deeper knowledge of the foundations of physics seem doomed to me unless the basic concepts are in

accordance with general relativity from the beginning." [9]. It turns out to be impossible to find a general definition for a seemingly simple property such as a system's total mass (or energy), photon or graviton; and proves to be fundamentally impossible to localize that energy [10]. Indeed, for about a century, no *Nobel Prizes* have ever been awarded to these hypotheses as a "physical cosmology".

Since the discovery of cosmic microwave background by *Arno Penzias* and *Robert Wilson* [11] In 1964, many of alternative models have been in proposals such as the *Lambda Cold Dark Matter* (ΛCDM) [12] model in the 1980s, *MOND* theory [13] in 1983, *TeVeS* theory in 2005 [14] or *MOG* theory [15] in 2006. By reinventing gravity, astronomers and astrophysicists attack the dark matter portions from the perspective of galaxy formation models that require modification to the *Einstein* field equations and the *Friedmann* equations. Obviously, today, the philosophical interpretation has remained a challenge or scientific problems are unsolved.

Philosophically, limited in its decoherence interpretations or physical existence only, a duality of the physical-virtual dynamics and their event interweaving have been hidden in our current physics. Therefore, the hypothetical model of *Big Bang* has the apparent blindness to the following artifacts:

1. Cosmological field equation - Evidenced by the observable universe empirically, the *Einstein's* field equation (1.1) is incomplete, because the outright equations must interpret the obvious characteristics or emissions of cosmic waves from gravitons, photons, dark or quantum energies. Lack of a profound philosophy and limited by the free-fall thought experiments, the newborn equation has been improperly led to unrealistic interpretations and especially carried on to its inherit models: *Friedmann* equations.
2. Horizon structure - Although the *FLRW* (1.2-1.4) is well developed to align with the conceptual horizons between the regimes of world planes and spacetime, a physical reality is hardly modeled as a hierarchical structure, wherein every possible outcome is not realized or rising from horizons, gracefully. For example, states of matter are aged or timeworn from the two-dimensional coordinates on *World Planes* to the tetrad-coordinates on *Spacetime Manifolds*, but may not be uniformly on both.
3. Single metric - Similar to the entire practice of current physics, almost all theories have sticked to one choice of a single metric (+ − − −) regardless of the other (− + + +), although both are discovered since 1908 [17]. Consequently, any behaviors with the two "relative states" is "collapsed" at its physical state with the same collapsed or static outcome or simply without interweaving dynamics.
4. Cosmic waves - Including all wavelength of lightwaves, the cosmic wave background can be either electromagnetic radiation or dark energy emission, or both. Without sufficient empirical or philosophical verifications, it becomes an inconceivable hypothesis that electromagnetic radiation be a remnant from an early stage of the universe when the universe began.
5. Cosmic Singularity and Inflation - Since natural principles of the universe is ambiguous or enigmatic in current physics, it might be superfluous in deliberating the affection to what means to the early universe dating to the epoch of recombination. Especially under the inexplicable philosophy, one has invented an incredible burst expansion at temperatures from 100 nonillion (10^{32}) Kelvin down to 1 billion (10^{9}) Kelvin, imagined inflation of the universe, and attempted to reconcile the cosmic data with the *Big Bang* hypothesis from the flawed foundation of singularity.

Apparently, the current approaches have resulted in and limited itself towards the decoherence interpretations or physical existence only. Without the most distinctive features of the universe, it deviates significantly from the *Universe Topology* of the horizon hierarchy and of the $Y^{-}Y^{+}$ interwoven operations that lies at the heart of all life streams of events, instances or objects, essential to the workings of our universe. In mathematics, this means that, instead of a single manifold, a oneness of the real world of our universe must be modeled by a duality of the conjugate $\{\mathbf{r} \pm i\mathbf{k}\}$ *World Planes*,

$$(i\Delta s)^2 = (\Delta r - i\Delta k)(\Delta r + i\Delta k) = (\Delta r)^2 - (c\Delta t)^2 \qquad : k = ict \qquad (1.6)$$

where i represents a virtual state of matter or instance. More critically, the current physics has the total ignorance to the basic principles of the *Operational Events between the virtual and physical* reality.

Based on *Principles of Universal and Unified Physics* [16], this manuscript demonstrates systemically, comprehensively and essentially how to orchestrate an integrity of philosophical and mathematical solutions to surpass beyond both *Einstein*

field equations and the *Friedmann* equations, to escape from the "*Big Bang*" hypothesis, and to forward into, but not limited to, the obvious phenomena of cosmological photon emissions, transport gravitation fields, dark energy radiations and more critically superphase modulations.

II. HORIZON HIERARCHY

Horizon is the apparent boundary of a realm of perception or the like, where unique structures are evolved, topological functions are performed, various neighborhoods form complementary interactions, and zones of the worlds are composed through multi-functional transformations. Each horizon rises and contains specific fields as a construction of the symmetric and asymmetric dynamics within or beyond its own range. In other words, fields infer and vary from one horizon to the others, each of which are a part of and aligned with *Universal Topology* of the worlds concisely.

Illustrated by the review article [16], the picture below depicts three horizons of the manifolds: spacetime, world plane, and xingspace, where each scope of the states is characterized by physical, semi-physical or virtual formations of matters and associated with their field equations.

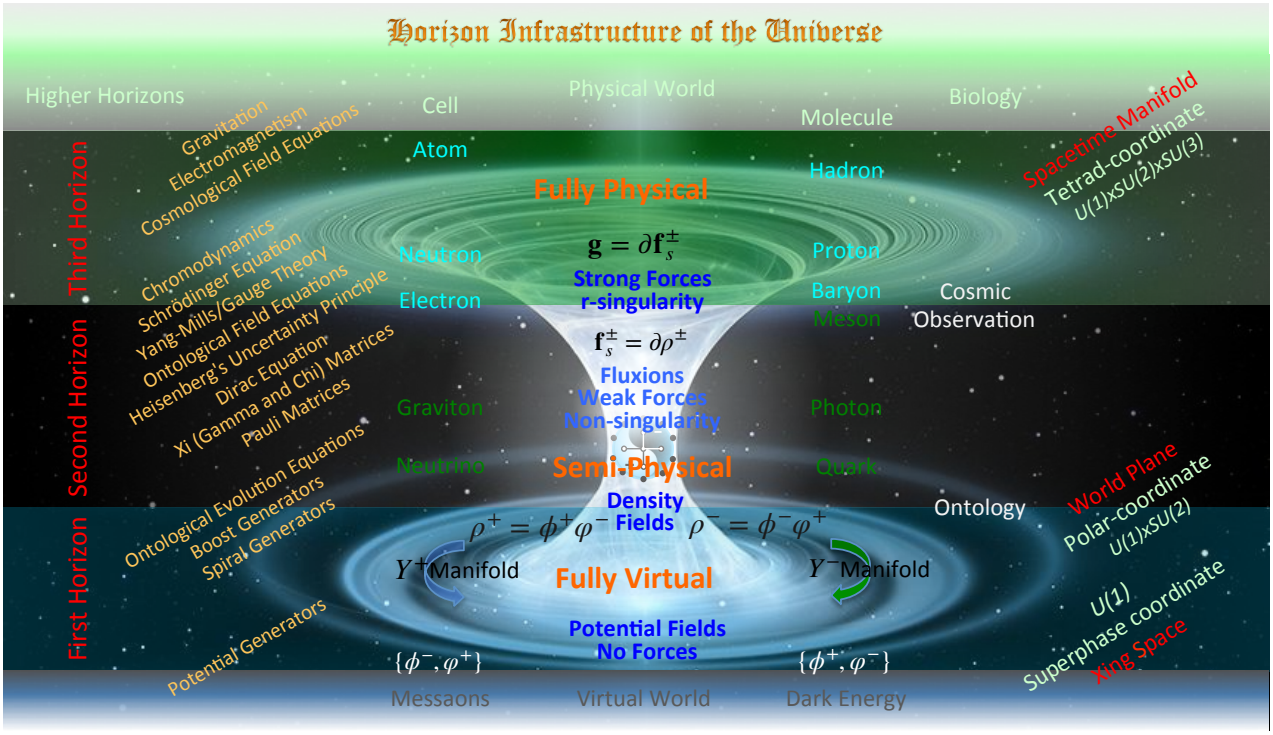

Figure 1: Horizon Infrastructure of the Universe

As a part of *Universal Topology*, the virtual (Y^+) and physical (Y^-) duality architecturally defines further hierarchy of the event evolutions, its operational interactions and their commutative infrastructures. In the yinyang (Y^-Y^+) manifolds, each serves the state environment of universe with a pair of the scalar potential functions of $\{\phi^+,\varphi^-\}$ for Y^+ primary or of $\{\phi^-,\varphi^+\}$ for Y^- primary, named as *Ground Fields*. Among the fields, their localized entanglements form up, but are not limited to, the density fields ($\rho^+ = \phi^+\varphi^-$, $\rho^- = \phi^-\varphi^+$) as *First Horizon Fields*. Known as fluxions, the derivatives to each of the density fields $\mathbf{f}_s^{\pm} = \partial\rho^{\pm}$ is an event operation of their motion continuity with interweaving commutations, and generates an interruptible tangent space as *Second Horizon Fields*, which further gives rise to *Third Horizon* and beyond. In physics, the *Horizon Hierarchy* can be interpreted by the following structure:

a. Ground Horizon: fields of elementary particles ($\{\phi^+,\varphi^-\}$, $\{\phi^-,\varphi^+\}$)
b. First Horizon: state density of *World Planes* ($\rho^+ = \phi^+\varphi^-$, $\rho^- = \phi^-\varphi^+$)
c. Second Horizon: flux continuity and commutation of interweaving densities ($\mathbf{f}_s^{\pm} = \partial\rho^{\pm}$)
d. Third Horizon: symmetry and asymmetry of force fields in spacetime manifolds ($\mathbf{g}_s = \partial\mathbf{f}_s^{\pm}$)
e. Fourth Horizon: continuity and commutation of symmetric and asymmetric force fields ($\mathbf{g}_v = \partial\mathbf{f}_v^{\pm}$)

Rigorously in mathematics, the fields of $\phi^{\pm}$, $\varphi^{\pm}$, $\mathbf{f}_s^{\pm}$, $\mathbf{g}_s^{\pm}$, and $\mathbf{g}_v^{\pm}$ are interactively cross boundaries between the neighborhoods functioning as the building blocks to gracefully give rise to the horizons constituting a oneness of the real world of our universe.

III. ONTOLOGICAL FIELD EVOLUTIONS

For the entangling streams between the manifolds, the ensemble of an event λ is in a mix of the Y^- or Y^+-supremacy states such that each pair of the reciprocal states $\{\phi_n^-, \varphi_n^+\}$ or $\{\phi_n^+, \varphi_n^-\}$ is performed in alignment with an integrity of their probability $p_n^{\pm} = p_n(h_n^{\pm})$, where $h_n^{\pm}$ are the $Y^{\pm}$ distributive or horizon factors, respectively. The parameter p_n^- or p_n^+ is a statistical function of horizon factor $h_n^-(T)$ or $h_n^+(T)$ and fully characterizable by thermodynamics (5.12, 5.13). Under the event operations, the interoperation among four types of scalar fields of $\phi_n^{\pm}$ and $\varphi_n^{\pm}$ correlates and entangles an environment of dual densities $\rho^{\pm}$:

$$\rho^+ = \sum p_n^+ \phi_n^+ \varphi_n^-, \quad \rho^- = \sum p_n^- \phi_n^- \varphi_n^+ \tag{3.1}$$

By means of the derivatives ∂ as natural events to form a pair of fluxions, the reciprocal entanglements of fluxion fields define the Y^- or Y^+ *Continuity Bracket* $\langle \hat{\partial}, \check{\partial} \rangle^{\pm}$, representing a duality of the Y^- or Y^+ scalar density in symmetric continuities:

$$\langle \hat{\partial}, \check{\partial} \rangle^+ = \sum\nolimits_n p_n^+ \left(\varphi_n^- \hat{\partial} \phi_n^+ + \phi_n^+ \check{\partial} \varphi_n^- \right) \equiv \langle \partial \rangle_s^+ + (\partial)_s^+ \qquad : \{\phi_n^+, \varphi_n^-\} \tag{3.2}$$

$$\langle \check{\partial}, \hat{\partial} \rangle^- = \sum\nolimits_n p_n^- \left(\varphi_n^+ \check{\partial} \phi_n^- + \phi_n^- \hat{\partial} \varphi_n^+ \right) \equiv \langle \partial \rangle_s^- + (\partial)_s^- \qquad : \{\phi_n^-, \varphi_n^+\} \tag{3.3}$$

$$\langle \partial \rangle_s^{\pm} = \sum\nolimits_n p_n^{\pm} \varphi_n^{\mp} \partial \phi_n^{\pm}, \qquad (\partial)_s^{\pm} = \sum\nolimits_n p_n^{\pm} \phi_n^{\pm} \partial \varphi_n^{\mp} \tag{3.4}$$

where, in addition, the bracket $\langle\ \rangle_s^{\mp}$ and $(\ )_s^{\mp}$ are called Y^- or Y^+ *Asymmetry Brackets* for scalar potentials. They are essential to cosmological and ontological dynamics (section 15 of reference [18]). In a parallel fashion, as another pair of the operational symbols $[\ ]^{\mp}$ under respective Y^- or Y^+ supremacy, the reciprocal entanglements of fluxion fields define the *Commutator Bracket*:

$$[\hat{\partial}, \check{\partial}]^+ = \sum\nolimits_n p_n^+ \left(\varphi_n^- \hat{\partial} \phi_n^+ - \phi_n^+ \check{\partial} \varphi_n^- \right) \equiv \langle \partial \rangle_s^+ - (\partial)_s^+ \tag{3.5}$$

$$[\check{\partial}, \hat{\partial}]^- = \sum\nolimits_n p_n^- \left(\varphi_n^+ \check{\partial} \phi_n^- - \phi_n^- \hat{\partial} \varphi_n^+ \right) \equiv \langle \partial \rangle_s^- - (\partial)_s^- \tag{3.6}$$

They represent a pair of the flux commutation of the Y^-Y^+ entanglements, each of which extends its meaning to the classic anti-commutator or commutator, $\langle a, b \rangle = ab + ba$, $[a, b] = ab - ba$, known as *Lei Bracket*, introduced in 1930s [19].

For entanglement between Y^-Y^+ manifolds, considering the parallel transport of a *scalar* density of the fields $\rho_n = p_n^+ \phi_n^+ \varphi_n^-$ around an infinitesimal parallelogram. The chain of this reactions can be interpreted to formulate a commutation framework of *ontological dynamics* (section 16 of reference [18]), which consists of a set of the unique fields, illustrated by the following components of the *entangling commutators*:

$$\mathbf{g}_s^+ / \kappa_s^+ \equiv \left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda \right]_s^+ = \dot{x}_\nu \dot{x}_m \left(\frac{R}{2} g_{\mu\nu} + G_{\mu\nu} \right) \qquad : \{\phi^+, \varphi^-\} \tag{3.7}$$

named as *Ontological Field Equations*. Like the metric itself, the *Ricci* tensor R is a symmetric bilinear form on the tangent space of the manifolds. Both R and $G_{\mu\nu}$ are the interactive tensors with the relativistic derivatives $\{\hat{\partial}_\lambda, \check{\partial}^\lambda\}$. The curvature measures how movements ($\dot{x}_\nu$ and $\ddot{x}_\nu$) under the Y^-Y^+ *Scalar Fields* $\{\phi^+, \varphi^-\}$ are balanced with the inherent stress $G_{\mu\nu}$ at curvature R during a parallel transportation between the Y^-Y^+ manifolds. The equation represents a symmetric duality of the Y^-Y^+ *Scalar Commutation of Residual Entanglement*.

Because of the Y^-Y^+ duality, a symmetric system naturally consists of asymmetric ingredients or constituents. Together, asymmetry and symmetry give rise to the next horizon where a new symmetry is advanced and composed at another level of consistency and perpetuation. The asymmetric commutation is operated by one of the interpretable and relativistic features exchanging the information carried by the scalar fields and given by *Third Universal Field Equations*:

$$\left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda \right]_s^+ = \mathcal{O}_{\nu m}^{-\sigma} \qquad : \{\phi^+, \varphi^-\} \tag{3.8}$$

At the constant speed *c*, the matrix $\mathcal{O}_{\nu m}^{-\sigma}$ is defined as *Ontological Modulator* on a *World Plane:*

$$\mathcal{O}_{\nu m}^{-\sigma}=\begin{pmatrix}0 & -\frac{\partial}{c\partial t}\mathbf{B}_a^- \\ \nabla\cdot\mathbf{B}_a^- & -\nabla\times\mathbf{E}_a^-/c\end{pmatrix}-i\mathcal{O}_{\bar{d}}^- \qquad :\mathcal{O}_{\bar{d}}^-\equiv\begin{pmatrix}\left(\frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right\rangle_n^- & 0 \\ 0 & -\left\langle\partial_r^2\right\rangle_n^-\end{pmatrix} \tag{3.9}$$

where the $\mathbf{E}_a^-$ and $\mathbf{B}_a^-$ fields are the intrinsic modulations in the form of a duality of asymmetry and anti-asymmetry cohesively and implicitly. For further details, please refer to the section 16 of reference [18].

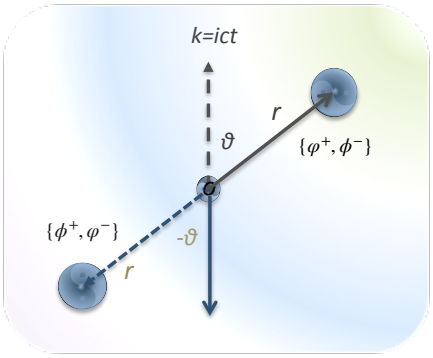

Figure 2: Virtual Coordinates of *World Planes*

To our expectation, superphase propagations of lightwave and gravitation are in the diagonal elements of the $\mathcal{O}_{\bar{d}}^-$ matrix, which is observable external to the system explicitly. This equation of asymmetric ontology represents a part of the virtual creation fields on the *World Planes* to give rise to the physical horizons on *Spacetime Manifolds*. Remarkably, the asymmetry of ontology features that i) *Residual Dynamics* closely resembles the objects under a Y^-Y^+ duality of the real world; and ii) *Transformational Dynamics* operates the potential $\{\phi^+,\varphi^-\}$ processes under the Y^+ event actions.

Together with the equations (3.7-3.9), the ontological dynamics can now be fabricated into a simple conservation form that the symmetric metric $g^{\nu m}$ and stress tensors $G_{\nu m}^{-\sigma s}$ are balanced by asymmetric ontological matrix $\mathcal{O}_{m\nu}^{-\sigma}$ as the following:

$$\frac{R}{2}\mathbf{g}^+ + \mathbf{G} = \mathbf{O}^- \qquad :\mathbf{g}^+ = g^{\nu m},\quad \mathbf{G} = G_{\nu m}^{-\sigma s},\quad \mathbf{O}^- = \mathcal{O}_{m\nu}^{-\sigma} \tag{3.10}$$

In differential geometry, the *Ricci* curvature tensor R, introduced by *Gregorio Ricci-Curbastro* in 1903 [37], represents the amount by which the area of a small geodesic circle in a curved *world line* deviates from that standard point of the world plane. The *Ricci* tensor is a scalar curvature and defines a trace of the curvature tensors on the *World Plane*. Operated under the Y^+-supremacy, this *Ontological Field Equation* implies that the conservation is inherent in the *Virtual Creation of Ontological processes*. Compare to the equation (1.1), *Riemannian* curvature tensor $R_{\nu\mu}=0$ vanishes on a world plane.

Apparently, the processes are the sophisticated message transformations and relativistic commutations, embedded in and superphase-operated by the $\mathcal{O}_{\nu m}^{-\sigma}$ matrices of the potentials $\{\phi^+,\varphi^-\}$ ontologically. It represents that the resources are composited of, supplied by or conducted with the residual activators and motion modulators primarily in the virtual world. It implies further that, in the physical world, the directly observable parameters are the coverture R, stress tensor $\mathbf{G}$ and wave propagation $\mathcal{O}_{\bar{d}}^-$. Aligning with the dual world-lines of the universal topology, the commutation of energy fluxions animates the resources, modulates messages of the potential transform and transports the performing actions or reactions. To unfold the details, the above conservation of *Ontological Field Equation* describes the following principles:

1. The ontological dynamics is conserved and carried out by the area densities for creations or annihilations, which serve as *Law of Conservation of Ontological Dynamics*.
2. In the world planes, the symmetric curvature R and stress tensor $G_{\nu m}^{\sigma s}$ is dynamically sustained during the asymmetric modulations over the gesture movements.
3. Operated and maintained by the superphase potentials, the conservation of energy fluxions supplies the resources, modulates the transform, and transports potential messages or virtual forces, alternatively.
4. The commutative fields of the superphase potentials transform and entangle between manifolds as the resource propagation of the asymmetric dynamics.

5. The torque fields of the superphase potentials transport and entangle between manifolds as the virtual force generators driven by the ontological processes of motion dynamics.

In short, from the scalar potentials $\{\phi^+, \varphi^-\}$, the $Y^{\pm}$ events conjure up the entanglements of eternal fluxions as a perpetual streaming for residual motions traveling on curvatures of the world lines, which is the persistence of an object without deviation in its situation of movements at conservations of its states and energies. The term $\mathcal{O}_{\nu m}^{-\sigma}$ or $\mathcal{O}_{\nu m}^{+\sigma}$ implies the left-hand or right-hand helicity and modulations balanced to its opposite motion curvatures, reciprocally. The term "residual dynamics" is described by or defined as: an object is not subject to any net external forces and moves at conservation of energy fluxions on the world planes. This implies that an object continues its Y^-Y^+ interweaving at its current state superposable until some external interactions or internal modulations causes conservation of its dynamic states or energies to change.

IV. HORIZON FIELD EQUATION

A homogeneous system is a trace of diagonal elements of tensors where an observer is positioned external to or outside of the objects. The source of the fields appears as a point object and has the uniform conservations at every point without irregularities in field strength and direction, regardless of how the source itself is constituted with or without its internal or surface twisting torsions. In this respect, the observable states of cosmology are embedded in a trace of diagonal elements of tensors, which is the focus of this section.

Whereas, a heterogeneous system is the off-diagonal elements of tensors where an observer is positioned internal to or inside of the objects. A duality of virtual annihilation and physical reproduction is balanced to form the local *continuity* or *invariance*. Especially for the dark energy, this scope opens up our new era for *Natural Ontology* as a foundation of future cosmology.

Although the ontological dynamics is at the second horizon on world planes with two-dimensional coordinates, one can apply a similar approach in acquisition of the *FLRW* model to extract the trace of the diagonal elements of the equation (3.10), shown by the following:

$$\frac{\ddot{a}}{a}+\left(\frac{\dot{a}}{a}\right)^2+\frac{kc^2}{a^2}=ic^2S_A+\frac{8\pi G}{c^2}(\rho c^2-p) \qquad : S_A=Tr(\mathcal{O}_d^-) \qquad (4.1)$$

$$R=-2\big[\frac{1}{c^2}\frac{\ddot{a}}{a}+\frac{1}{c^2}\left(\frac{\dot{a}}{a}\right)^2+\frac{k}{a^2}\big], \qquad G_{tt}=\frac{8\pi G}{c^4}\rho, \quad G_{rr}=\frac{8\pi G}{c^4}p \qquad (4.2)$$

Named as *Horizon Field Equation*, it serves as conservation of the second horizon fields. One can further rewrite it to the following:

$$H_2^2+H_2H_3+\frac{kc^2}{a^2}=ic^2S_A+\frac{8\pi G}{c^2}(\rho c^2-p) \qquad : H_2=\frac{\dot{a}}{a},\ H_3=\frac{\ddot{a}}{\dot{a}} \qquad (4.3)$$

where H_2 or H_3 is named the second or third horizon function, respectively. Representing the arisen ratios, these horizon functions extend the classical *Hubble* parameter H_2 into a hierarchy of the natural topology of universe. Because, *Horizon Functions* are a collection of the complex states, it implies an eternal yinyang-steady state universe that dynamically orchestrates the mass, density, photon, graviton, thermodynamics, weak and strong forces, packed all together.

At near the third horizon, the curvature *k* might be zero. The horizon equation (4.3) becomes a quadratic equation, resolvable for the second horizon function H_2. Solving the quadratic equation $H_2^2+H_3H_2-K_2=0$, one has the roots for the second horizon function H_2 to extend the classical *Hubble* parameter as he following:

$$H_2=\frac{1}{2}\big(-H_3\pm\sqrt{H_3^2+4K_2}\big) \qquad : K_2\equiv K_2(\omega,T)=ic^2S_A+\frac{8\pi G}{c^2}(\rho c^2-p) \qquad (4.4)$$

For transmissions at the second horizon, the third horizon function H_3 can be treated as the boundary conditions. Accordingly, because K_2 is a complex function, the scalar metric $a(t)$ is a complex function, representing a harmonic duality of the Y^-Y^+ interwoven dynamics for life streams entangling on both of *World Planes*. Obviously, the equation (4.1) is contradict to the hypothesis that universe is described by the equation (1.3) for the abrupt appearance of expanding spacetime metric.

In principle, the horizon function H_2 can now be used to determine the intrinsic brightness and masses of stars in nearby galaxies, examine the amount of dark matter present in the universe, obtain the scale size of faraway galaxy clusters, and serve as a test for theoretical models of natural cosmology.

V. THERMODYNAMICS AND BLACKHOLE EMISSIONS

As a fluxion flow of dark energy, it balances statistically at each of the states $E_n^{\mp} : mc^2 \rightleftharpoons \hbar\omega$, where $\hbar\omega$ is known as the *Planck* quantum-energy, introduced in 1900 [23,24]. Applicable to the conservation of mass creation and annihilation in thermal equilibrium, an area energy fluxion of the potential transportation is equivalent to the entropy of the electro-to-photon $S_{A1}(\omega_c, T)$ and dark-energy-to-mass $S_{A2}(\omega_c, T)$ for lightwave radiations, given by artifact 14.5 of reference [18]:

$$S_A(\omega_c, T) = S_{A1}(\omega_c, T) + S_{A2}(\omega_c, T) \mapsto 4\frac{E_c^- E_c^+}{(\hbar c)^2} \tag{5.1}$$

$$S_{A1}(\omega_c, T) = 4\Big(\frac{\omega_c^2}{4\pi^3 c^2}\Big) = \eta_c\Big(\frac{\omega_c}{c}\Big)^2 \qquad : \eta_c = \pi^{-3} \tag{5.2}$$

$$S_{A2}(\omega_c, T) = 2\frac{m\omega_c}{\pi c} = \eta_h\Big(\frac{\omega_c}{c}\Big)^2 \qquad : \eta_h = \frac{2}{\pi} \tag{5.3}$$

In a free space for the massless objects, a summation of the above equivalences results in a pair of the complex formulae:

$$E_c^{\pm} = \mp\frac{i}{2}\hbar\omega_c \qquad : \eta = \eta_h + \eta_c = 66.9\,\% \tag{5.4}$$

The coupling constant at $\eta = 66.9\,\%$ implies that, accompanying lightwave radiation, dark energy can be transformed to (creation) or emitted by (annihilation) the triplet quarks: an electron, a positron and a gluon. For a blackhole, apparently, the electromagnetic radiation $\eta_c = \pi^{-3} = 3.22\,\%$ might be trivial for photon emission unless the massive radiation, annihilation or physical flexion is in progress predominantly.

Inherent to the blackhole thermal radiance, gravitational fluxion has the transportable commutation of area entropy S_A and conservable radiations of a *Schwarzshild* blackbody, introduced in 1916 [25]. Given by Artifact 14.5 of reference [18], it is equivalent to associate it with *Bekenstein-Hawking* radiation [26,27], shown by the following:

$$S_A(\omega_g, T) = 4\Big(\frac{c_g^3}{4\hbar G}\Big) \mapsto 4\frac{E_g^- E_g^+}{(\hbar c_g)^2} \tag{5.5}$$

Consequently, the gravitational energies $E_g^{\pm}$ contain not only a duality of the complex functions but also an irreducible unit: *Graviton*, in a pair of the entangling units:

$$E_g^{\pm} = \mp\frac{i}{2}E_p \qquad : E_p = \sqrt{\hbar c_g^5 / G} \tag{5.6}$$

where E_p is the *Plank* energy. For the blackhole emanations, a coupling constant 100% to emit gravitational radiations implies that graviton is a type of dark energies accompanying particle or dark radiations with a duality of the reciprocal resources. Similar to a pair of photons emitted by dark energy, the nature of graviton is associated with the superphase modulation of the $Y^- Y^+$ energy or dark energy entanglement for all particles. In the center of entanglement, the colliding duality has neither net momentum nor r-singularity transported at the second horizon (Artifact 7.4 and 14.7 of reference [18]), whereas gravitons always have the temperature sourced from their spiral torques and modulated by superphase of the nature.

To concern the density and pressure in equation (4.4), we consider a system with entropy $S(E, V, N_n)$ that undergoes a small change in energy, volume, and number $N_n^{\pm}$, one has the change in entropy

$$dS = \frac{\partial S}{\partial E}dE + \frac{\partial S}{\partial E}\frac{\partial E}{\partial V}dV + \frac{\partial S}{\partial E}\sum_n\Big(\frac{\partial E}{\partial N_n^{\pm}}dN_n^{\pm}\Big) = \frac{1}{T}\big(dE + pdV - \sum_n \mu_n dN_n^{\pm}\big) \tag{5.7}$$

The principles of thermodynamics were established and developed by *Rudolf Clausius*, *William Thomson*, and *Josiah Willard Gibbs*, introduced during the period from 1850 to 1879. Furthermore, convert all parameters to their respective

densities as internal energy density $\rho_E = E/V$, thermal entropy density $\rho_s = S/V$, mole number density $\rho_{n_i} = N_i/V$, and state density of $\rho_\psi \sim 1/V$, the above equation has the entropy relationship among their densities as the following:

$$S_\rho = -k_s \int \rho_\psi dV = -k_s \int \frac{d\rho_E - Td\rho_s - \sum_i \mu_i d\rho_{n_i}}{T\rho_s + \sum_i \mu_i \rho_{n_i} - (p + \rho_E)} dV \qquad (5.8)$$

where k_s is a positive constant. Satisfying entropy equilibrium at extrema results in the general density equations of the thermodynamic fields:

$$Y^- : d\rho_E^- = Td\rho_s^- + \sum_i \mu_i d\rho_{n_i}^- \qquad : max(S_\rho) \qquad (5.9)$$

$$Y^+ : P + \rho_E^+ = T\rho_s^+ + \sum_i \mu_i \rho_{n_i}^+ \qquad : min(S_\rho) \qquad (5.10)$$

The first equation indicates that entropy increases towards Y^- maximum in physical disorder, so that the dynamics of the internal energy are the interactive fields of thermal and chemical reactions as they influence substance molarity. The second equation indicates that entropy decreases towards Y^+ minimum to favor for physical order, so that both external forces and internal energy hold balanced macroscopic fields in one bulk system. Consequently, the internal energy can give rise to macroscopic fields as virtual force suppliers for creation or reproduction, gracefully.

As a result, the horizon equations (4.1, 4.4) are integrated with the entropies of thermodynamics for lightwave and gravitation radiations as the following:

$$Tr(\mathcal{O}_d^-) = \left[S_A(\omega_c, T)N_n^\pm + S_A(\omega_g, T)N\right] \qquad : N = N^o + N_n^\pm \qquad (5.11)$$

$$h_n^\pm = \frac{N_n^\pm}{N} = \frac{1}{e^{\pm\beta E_{\vec{n}}^\pm} + 1} \qquad : \beta = \frac{i}{k_B T} \qquad (5.12)$$

$$p_n^\pm = \frac{h_n^\pm}{\sum h_\nu} = \frac{e^{\pm\beta E_n^\pm}}{Z} \qquad : Z \equiv \sum_\nu e^{\pm\beta E_\nu^\pm} = \frac{e^{\pm\beta E_\nu^\pm/2}}{1 - e^{\pm\beta E_\nu^\pm}} \qquad (5.13)$$

For a bulk system of N particles, $h_n^\pm$ is the horizon fact with $N_n^\pm$ particles at non-zero charges and $N^o = N - N_n^\pm$ neutrinos at neutral charge (section 13 of reference [18]). These entropies are observable $Tr(\mathcal{O}_d^-)$ externally to the system, whereas the intrinsic entropy is implicit and embedded in the arisen pressure, chemical potentials and energy density.

VI. COSMIC FIELD EQUATIONS

Embodied at their mass enclave under spacetime manifolds, the energy potentials conserve asymmetric commutations as one of the transient astronomical events, feature propagation of the curvature dynamics with acquired freedom of the extra rotations, and carry out the vector fields of entanglement, shown by the Y^- commutative equations (artifact 18.1 of reference [18]):

$$\mathbf{g}_v^-/\kappa_g = \left[\check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]_v^- = \dot{x}_n \dot{x}_\nu \left(\frac{R}{2} g_{m\mu} - R_{m\mu s}^\sigma + G_{m\mu}^{\sigma s} + C_{m\mu}^{s\sigma}\right) \qquad : \{\phi^-, V^+\} \qquad (6.1)$$

where the index v refers to the vector potentials. This equation represents the physical dynamics of cosmology at the third or higher horizons. Applying to the spacetime metric $S_k(r,t)$, one may have what is known as *Robertson-Walker* metric:

$$d\Sigma^2 = dr^2 + S_k^2(r) d\Omega^2 \qquad : ds^2 = -(cdt)^2 + b(t)^2 d\Sigma^2 \qquad (6.2)$$

$$d\Omega^2 = d\Omega^- d\Omega^+ = d\theta^2 + \sin^2\theta\, d\varphi^2 \qquad : d\Omega^\pm = d\theta \mp i \sin\theta\, d\varphi \qquad (6.3)$$

where $S_k(r)$ is time-independent metric. The superphase $d\Omega^\pm$ is transitioned to the extra degrees of physical freedoms $\{\theta, \phi\}$. Compliant to the principle of a homogeneous and isotropic universe, *Robertson and Walker* in the 1930s independently proved there are only the three possible spacetime metrics [28]:

$$S_k(r) = r\ \mathrm{sinc}\,(r\sqrt{k}) = \begin{cases} \sin\left(r\sqrt{k}\right)/\sqrt{k}, & k > 0 \\ r, & k = 0 \\ \sinh\left(r\sqrt{|k|}\right)/\sqrt{k}, & k < 0. \end{cases} \qquad (6.4)$$

In hyperspherical or curvature-normalized coordinates, the dimension *r* is proportional to radial distance. At the time when the world plane metric $b(t) = 1$, the *k* is the *Gaussian* curvature [29] of the space and $d\mathbf{r}$ measures comoving distance. Under a duality of the $Y^{-}Y^{+}$ spacetime manifolds, the motion dynamics of all life streams is scoped within a oneness of a universe (a galaxy system of stars, stellar remnants, interstellar gas, dust, and dark matter) orbiting their curvatures physically and aligning to its galaxy's center of a dark system virtually.

Contingent on the continuously arising horizons, the events determine the derivative operations through the vector potentials giving rise to the matrix fields for further evolutions at the Y^{+}-supremacy. From definitions of the *Lorentz-matrices*, one can convert the left-side equation (6.1) to the asymmetric vector entanglers of commutators explicitly in the following formula:

$$\left[\hat{\partial}_{\lambda}\hat{\partial}_{\lambda}, \check{\partial}^{\lambda}\check{\partial}^{\lambda}\right]_{v}^{-} = \Lambda_{m\mu}^{+\sigma} \qquad : \{\phi^{-}, V^{+}\} \tag{6.5}$$

At the constant speed *c*, the matrix $\Lambda_{m\mu}^{+\sigma}$ is named as Y^{+} *Cosmological Modulator* on a *spacetime* manifold that extends to the classic cosmological constant:

$$\Lambda_{\nu m}^{+\sigma} = \Lambda_{d}^{+} - i\begin{pmatrix} 0 & -\frac{\partial}{c\partial t}\mathbf{D}_{v}^{+} \\ \nabla\cdot\mathbf{D}_{v}^{+} & \nabla\times\mathbf{H}_{v}^{+}/c \end{pmatrix} \qquad : \Lambda_{d}^{+} \equiv \begin{pmatrix} \left(\frac{1}{c^{2}}\frac{\partial^{2}}{\partial t^{2}}\right\rangle_{n}^{+} & 0 \\ 0 & -\left(\nabla^{2}\right\rangle_{n}^{+} \end{pmatrix} \tag{6.6}$$

where the operator ∇ is in the *Cartesian* geometry. The off-diagonal elements of the vector $\mathbf{D}_{v}^{+}$ and $\mathbf{H}_{v}^{+}$ fields are the intrinsic modulations in the form of a duality of asymmetry and anti-asymmetry cohesively and implicitly. The trace of diagonal elements of the Λ_{d}^{-} matrix is observable external to the system explicitly. For further details, please refer to the section 18 of reference [18].

With the above equations together, the spacetime dynamics can now be fabricated in a conservation form as asymmetric equation of cosmology, or named as *Cosmic Field Equation*:

$$\mathfrak{R}^{-} + \mathbf{\Lambda}^{+} = \frac{R}{2}\mathbf{g}^{-} + \mathbf{G} + \mathbf{C}^{-} \qquad : \mathfrak{R}^{-} \equiv \mathscr{R}_{\nu m\mu}^{-\sigma},\ \mathbf{\Lambda}^{+} \equiv \Lambda_{\nu m}^{+\sigma},\ \mathbf{g}^{-} \equiv g_{\nu m}, \tag{6.7}$$

$$\mathbf{g}_{v}^{-}/\kappa_{g}^{-} = \frac{R}{2}\mathbf{g}^{-} - \mathfrak{R}^{-} + \mathbf{G} + \mathbf{C}^{-} = \mathbf{\Lambda}^{+} \qquad : \kappa_{g}^{-} = \frac{\hbar c}{2E^{-}}, \tag{6.8}$$

The *Riemannian* curvature $\mathfrak{R}^{-} \equiv \mathscr{R}_{\nu m\mu}^{-\sigma}$ [39,40] associates the metric $\mathbf{g}^{-}$, relativistic stress $\mathbf{G}$ and contorsion $\mathbf{C}$ tensors (Artifact 16.4 of reference [18]) to each world-line points of the Y^{-} manifolds that measures the extent to the metric tensors from its locally isometric to its opponent manifold or, in fact, conjugate to each other's metric.

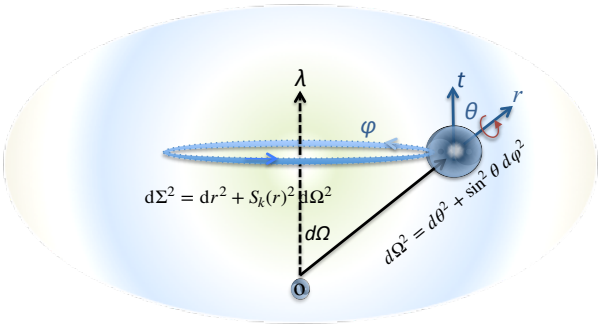

Figure 3: Tetrad Coordinates of Physical Spacetime Manifold

Naturally, the intrinsic dynamics of the cosmological matrix $\mathbf{g}_{v}^{-}/\kappa_{g} = \mathbf{\Lambda}^{+}$ is also a virtual acceleration tensor of the sophisticated processes for the message transformations, relativistic commutations, and superphase modulations that operate the physical motion curvature and life animations. The above equation servers as *Law of Conservation of* Y^{-} *Cosmological Motion Dynamics* that the Y^{-} fields of a world-line curvature are constituted of and modulated by asymmetric fluxions, given rise from the Y^{+} vector potential fields not only to operate motion geometry, but also to carry out messages for reproductions and animations. It implies that the virtual world supplies energy resources in the forms of area fluxions, and that the cosmological modulator $\mathbf{\Lambda}^{+}$ has the intrinsic messaging secrets of the dark energy operations, further outlined in the following principles:

1. During the $Y^{-}Y^{+}$ entanglements between the world planes, the asymmetric potentials dynamically operate spacetime curvatures $\mathfrak{R}^{-}$ and supply the area energy at a horizon rising from symmetric fluxions of vector potentials.
2. The Y^{-} motion curvature $\mathfrak{R}^{-}$, stress $\mathbf{G}$ and contorsion $\mathbf{C}$ dynamically balance the transformation and transportation through the asymmetric fluxions entangling between the dual manifolds.
3. The Y^{-} asymmetric motions are internally adjustable or dynamically operated through the potentials of the Y^{+} modulator $\mathbf{\Lambda}^{+}$ through the energy fluxions. In other words, a cosmic system is governed by the modulator $\mathbf{\Lambda}^{+}$ symmetrically and the commutation asymmetrically.
4. The $\mathbf{\Lambda}^{+}$ modulator evolves, generates and gives rise to the further horizons which integrate with the dynamic forces, motion collations, or symmetric entanglements.
5. Remarkably as its resources of symmetric counterpart, it associates the diagonal components that embed and carryout the horizon radiations, wave transportations, as well as the force generators spontaneously.
6. The trace of moderation tensor $Tr(\mathbf{\Lambda}_{d}^{+})$ is observable externally and might be dependent only to the frequency and temperature $\Lambda_{d}(\omega, T)$ in a free space. As expected, the smaller the Λ_{d} contributing to a physical force, the greater stability the universe.
7. Besides, the antisymmetric strength $\mathbf{D}_{v}^{+}$ and twisting $\mathbf{H}_{v}^{+}$ fields of the asymmetric $\mathbf{\Lambda}^{+}$ components are a part of the propagational entanglements throughout the system intrinsically, resourcefully, modularly, and gracefully.

In short, unlike the *Einstein Field Equations* (1.1), the cosmological matrix $\mathbf{\Lambda}^{+}$ institutes dynamic modulations internally. Similar to the equation (5.11), the asymmetric area fluxions $\mathbf{\Lambda}_{d}^{+}$ and the reactors are observable externally to the system.

VII. ASYMMETRIC WAVE PROPAGATION

A coherent wave is the synthesis of the state packet or specific oscillations, often described as a duality of the $Y^{-}Y^{+}$ dynamics most closely resembling the oscillatory behavior of wave propagations bidirectionally, representing a state in a system for which the ground-state wave-packet is displaced from the origin of the system. These states, for example, can be expressed as eigenvectors of the ladder operators to form an overcomplete family, or related to the solutions by a pair of the reciprocal oscillators with an amplitude equivalent to the classical progressive displacement. In the horizon infrastructure, two of remarkable characteristics of wave packet propagations are non-dispersive at the second horizon and dispersive at the third or higher horizons.

Non-dispersive packet is the wave-packet preserved from spreading that travels in one direction, multiplied by a plane wave traveling in the opposite direction, reciprocally. Especially suitable for photons and gravitons at the second horizon, it has the appealing features that the waves, undergo only local variations in the stabilizing envelopes, do not spread out as they propagate in free space, and travel with the speed of light in straight lines. This virtual behavior is under a $Y^{-}Y^{+}$ interweavement on the world planes that can be conveniently expressed natively by polar coordinates $\{r, \vartheta\}$, where r depicts the physical manifold as a whole aligned with its virtual twin and positioned at the natural superphase ϑ. On the two-dimensional world planes, this polar system simplifies the following formulae observable externally to the system.

$$ict = r\cos(\vartheta) \tag{7.1}$$

$$\frac{1}{r}\frac{\partial}{\partial r}\Big(r\frac{\partial}{\partial r}\psi_{n}\Big) + \frac{1}{r^{2}}\frac{\partial^{2}}{\partial \vartheta^{2}}\psi_{n} = 4\frac{E_{n}^{-}E_{n}^{+}}{(\hbar c)^{2}}N_{n}^{c}\eta_{n}\psi_{n} \qquad \because \psi_{n} \in \{\varphi_{n}^{-}, \phi_{n}^{+}\} \tag{7.2}$$

$$-i\hbar\frac{\partial}{\partial t}\psi_{n} = \Big[-i\frac{(\hbar c)^{2}}{2E_{n}^{-}}\frac{\partial^{2}}{\partial r^{2}} + V(r, \vartheta)\Big]\psi_{n} \tag{7.3}$$

where the η_{n} is the coupling efficiency. Given by the section V, the N_{n}^{c}=$N_{n}^{\pm}$ is for the particles at nonzero charges and N_{n}^{c}= $N^{o} = N - N_{n}^{\pm}$ for neutrinos at neutral charge. Under superphase modulation of the first equation, the second equation is the enhanced *Klein–Gordon* equation (Eq. (9.43) of reference [18]) and the third equation is the one-dimensional *Schrödinger* equation. Because of the $Y^{-}Y^{+}$ duality, the wave function ψ_{n} contains two types of the packets $\psi_{n} \in \{\varphi_{n}^{-}, \phi_{n}^{+}\}$, where the scalar potential packet is the $Y^{-}Y^{+}$-wave propagating and interweaving simultaneously and reciprocally. As a result, under

the second horizon, a solution to the *Horizon Field Equation* (4.3) and the above *Non-dispersive Packet Equations* is at a world plane as the virtual medium, characterizable simply by the two-dimensions of a polar coordinate system with one r for physical space and the other ϑ for virtual space. The carrier wave propagates at the phase speed, the modulation envelope propagates at the group speed that governs the propagation of information.

For the fields of dark energy in a free space, the right-side of the equation (7.2) might be considered as the resources of the dark energy. Multiplied by $\delta(r)$, it becomes a boundary condition of the emission source. Furthermore, the state of any virtual energy E_n^- or E_n^+ is an imaginary function with the wave-frequencies $E_n^{\pm}(\omega_n)$ of photon, graviton, neutrino, etc., illustrated by the following examples:

$$E_m^{\mp} = \pm\, imc^2\,,\ \hbar\omega \rightleftharpoons mc^2,\ \eta_m = 66.6\,\% \qquad : \textit{Mass acquisition} \qquad (7.4)$$

$$E_c^{\pm} = \mp\,\frac{i}{2}\hbar\omega_c,\ \eta_c = 2/\pi = 63.7\,\% \qquad : \textit{Photon radiation of blackhole}\ [18] \qquad (7.5)$$

$$E_g^{\pm} = \mp\,\frac{i}{2}E_p,\ E_p = \sqrt{\hbar c_g^5/G},\ \eta_g = 100\,\% \qquad : \textit{Graviton radiation of blackhole}\ [18] \qquad (7.6)$$

$$E_e^{\pm} = \mp\,\frac{i}{2}\hbar\omega_e,\ \eta_e = \pi^{-3} = 3.2\,\% \qquad : \textit{Planck Electron-photon radiations} \qquad (7.7)$$

$$E_{pm}^{\pm} = \mp\,\frac{i\hbar^2 c}{2\sqrt{2\mu}}\Big[cos\,\frac{\pi\nu}{2} + cos(\frac{\omega}{2} + \frac{\pi\nu}{4})sin\,\frac{\pi\nu}{2}\Big]^{1/2\nu} \qquad : \textit{Electron capture in polar molecules}\ [30] \qquad (7.8)$$

In the last equation, the weakly bound states and electron energy is an example for the point dipole model of the polar molecule, classically known as scaling anomaly to the inverse square interaction. Relevant to a relational $\{r, \vartheta\}$ model, such as $\psi(r,\vartheta) = R(r)\Theta(\vartheta)$ or $\psi(r,\vartheta) = e^{ikrcos(\vartheta)}\phi(r)$, the exact solutions to the (7.2,7.3) equations can be comprehensive in order to decompose the scalar waves into bidirectional, forward and backward, traveling plane wave-packets.

Approximated as blackbody ejections, the thermal state characterizes the radiation either spontaneously emitted by many ordinary objects or naturally operated by dark energies. In cosmology, a perfectly insulated enclosure is in thermal equilibrium internally, contains blackbody radiation, emits radiations at the second horizon, and has negligible effects upon the equilibrium at the spacetime horizon. In equation (7.2, 7.3), three virtual states are the important ingredients: frequencies ω_n, temperature T, and chemical potential μ_n, each of which has a scope of its domain significance. For instance, at the second horizon, it features the well-known *Fermi–Dirac* statistics with $E_n^c = \epsilon_n - \mu_n$, introduced in 1926 by *Enrico Fermi* [31] and *Paul Dirac* [32], independently, as the following:

$$N_n^c = h_n^c N = \frac{1}{e^{iE_n^c/k_B T} + 1}N \qquad : c \in \{-,0,+\} \qquad : \textit{At a second horizon of world planes} \qquad (7.9)$$

Because, in the second horizon, a superposing collection of indistinguishable objects may occupy a set of available discrete energy states at thermodynamic equilibrium, a distribution of particles over energy states in systems consists of many identical objects that obey the *Pauli* exclusion principle, introduced in 1925 [41].

Dispersive packet is the wave-packet travelling in the third or higher horizon or a spacetime cluster as the physically three-dimensional medium. The propagation of waves in a dispersive medium is under the Y^- supremacy of a spacetime manifold with the bidirectional representation in connection with the boundary conditions as well.

$$\frac{1}{c^2}\frac{\partial^2}{\partial t^2}\psi_n - \nabla^2\psi_n = 4\frac{E_n^- E_n^+}{(\hbar c)^2}N_n^c\eta_n\psi_n \qquad : \nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2} \qquad (7.10)$$

$$-i\hbar\frac{\partial}{\partial t}\psi = \hat{H}\psi,\ \hat{H} \equiv -\,i\frac{(\hbar c)^2}{2E_n^-}\nabla^2 + V(\mathbf{r},t) \qquad (7.11)$$

$$\nabla^2 = \frac{1}{r^2}\frac{\partial}{\partial r}\Big(r^2\frac{\partial}{\partial r}\Big) + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial\theta}\Big(\sin\theta\frac{\partial}{\partial\theta}\Big) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2}{\partial\varphi^2}, \qquad (7.12)$$

For thermodynamics, the average energy in a bulk mode can be expressed by the partition function of energies (Artifact 13.2 of reference [18])

$$\tilde{E}^{\pm} = \pm\, iE_n^{\pm}\Big(\frac{1}{2} + \frac{1}{e^{\pm iE_n^{\pm}/k_B T} - 1}\Big) \qquad : \textit{At a third horizon of spacetime manifold} \qquad (7.13)$$

The last term of this equation represents the well-known *Bose–Einstein* statistics with $E_n^{\pm} = \epsilon_n - \mu_n$, introduced by *Satyendra Nath Bose* in 1924 [33]. The aggregation in the same state is a bulk characteristic and accounts for the cohesive streaming fluxions of, for example, laser light and the frictionless creeping of superfluid helium. At the physical horizons, a solution to the *Cosmic Field Equation* (6.7) or *Dispersive Packet Equation* (7.10, 7.11) is at a spacetime manifold as the physical medium, characterizable by the tetrad-dimensions with *Cartesian* or spherical coordinate system.

Travelling through a physical spacetime or a galaxy, light from its original path in non-dispersive packet becomes dispersive until it exists the physical horizon and continues on its deflection waves in the non-dispersive packet. Under this principle, since the dispersive packets behave like gravitational fields and interfere with spacetime manifold physically, the deflection wavelengths can reveal some characteristics of the spacetime galaxy such as its size, massive type, motion activity, or distance. In "physical cosmology", however, this is interpreted as the motion of undisturbed objects in a background curved geometry or alternatively as the response of objects to a force in a flat geometry, known as gravitational lensing. Under this classic interpretation, the observer has limited itself towards the decoherence features of the universe, such as the angle of deflection light in a simple form of either relativistic *Newtonian* or *Schwarzschild* radius $\theta = 2r_s/r$ [34].

Mathematically, both of the dispersive and non-dispersive wave-packets have been researched extensively for the three-dimensional spherical coordinates in physical space [35, 36, 37]. It can be as easy to evaluate asymptotically or numerically as those to be converted to the polar wave equations in virtual world planes. Besides, while a luminosity distance is applicable within a spacetime only, it can be utilized to estimate the radius of a remote galaxy as well.

VIII. NATURAL COSMOLOGY IN A NUTSHELL

Powered by *Horizon Topology* philosophically, this manuscript prevails over both *Einstein*'s field equation (1.1) and *Friedmann* equations (1.3, 1.4) with *Natural Cosmology* of *Ontological Field Equation* (3.10) and *Horizon Field Equation* (4.1, 4.3). The second horizon function H_2 is reevaluated for the world-line metric (4.4) to extend the classical *Hubble* parameter. These solutions integrate the natural *complex* states together, demonstrating a duality of virtual and physical coexistence, the entropy of thermodynamics, radiation of photons, emission of gravitons, particle interactions. In addition, the "general relativity" is substituted by the *Cosmic Field Equation* (6.7) with the inconceivable cosmological matrix (6.6).

For the second horizon, the figure below highlights the formulae of the cosmological field theory of ontological evolutions, which is mathematically epitomized on the two-dimensional world planes.

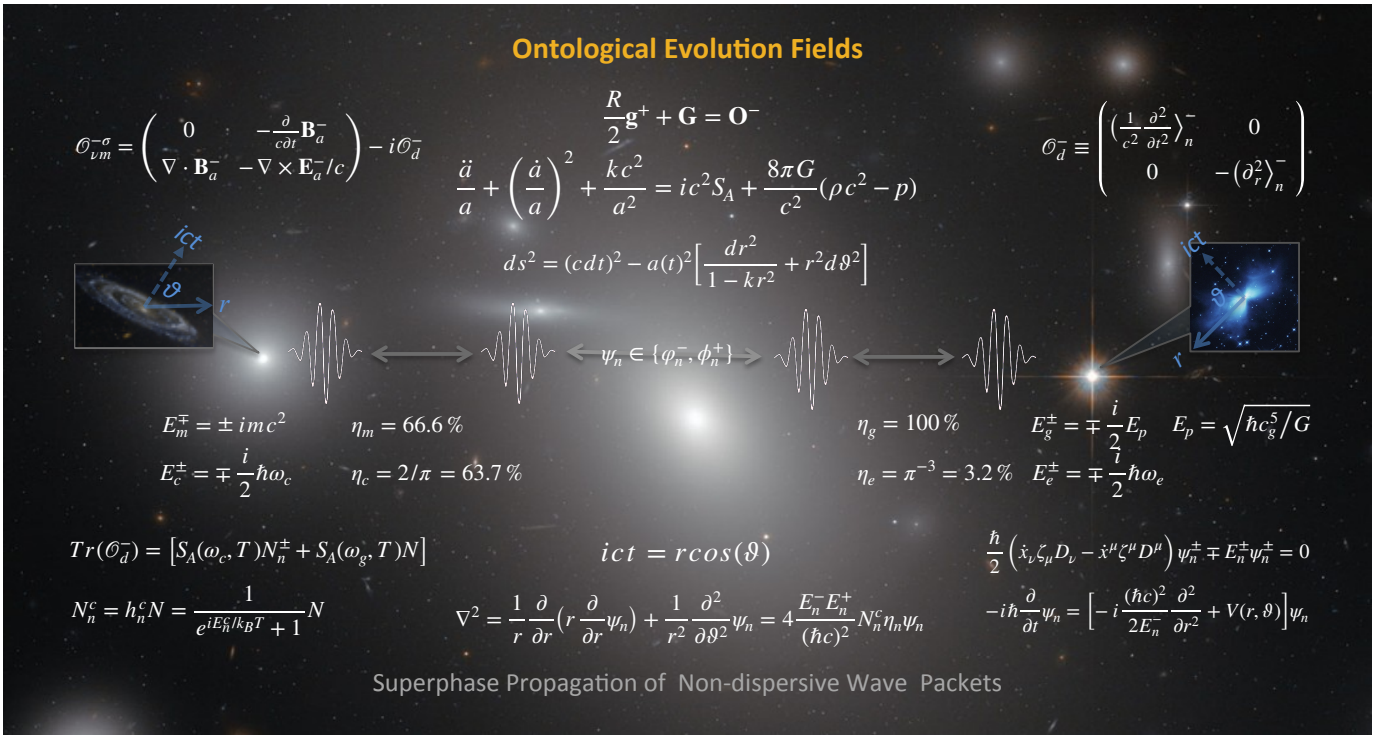

Figure 4: Intergalactic Virtual Commutations at Second Horizon of World Planes

At the second horizon, intergalactic commutations of the photon and graviton emissions are predominant in the polar fields without singularity, where the light traveling at non-dispersive is hardly relevant to the motion dynamics of its physical object at the third horizon. In fact, the redshift implies the dark energy was and has been continuously operating the physical dynamics at the ontological regime, a process of which is always accompanied by radiations of lightwaves and interweave of gravitations.

At the third horizon, the world planes are further evolved into *spacetime* manifolds, where the physical fields inaugurate the full mass enclave, acquire freedom of the extra rotations, and are transited to gravitational forces with a central-singularity. As another collection, the figure below highlights the formulae of the cosmological field theory of asymmetric dynamics, which is mathematically sketched on the tetrad-dimensions of spacetime manifolds.

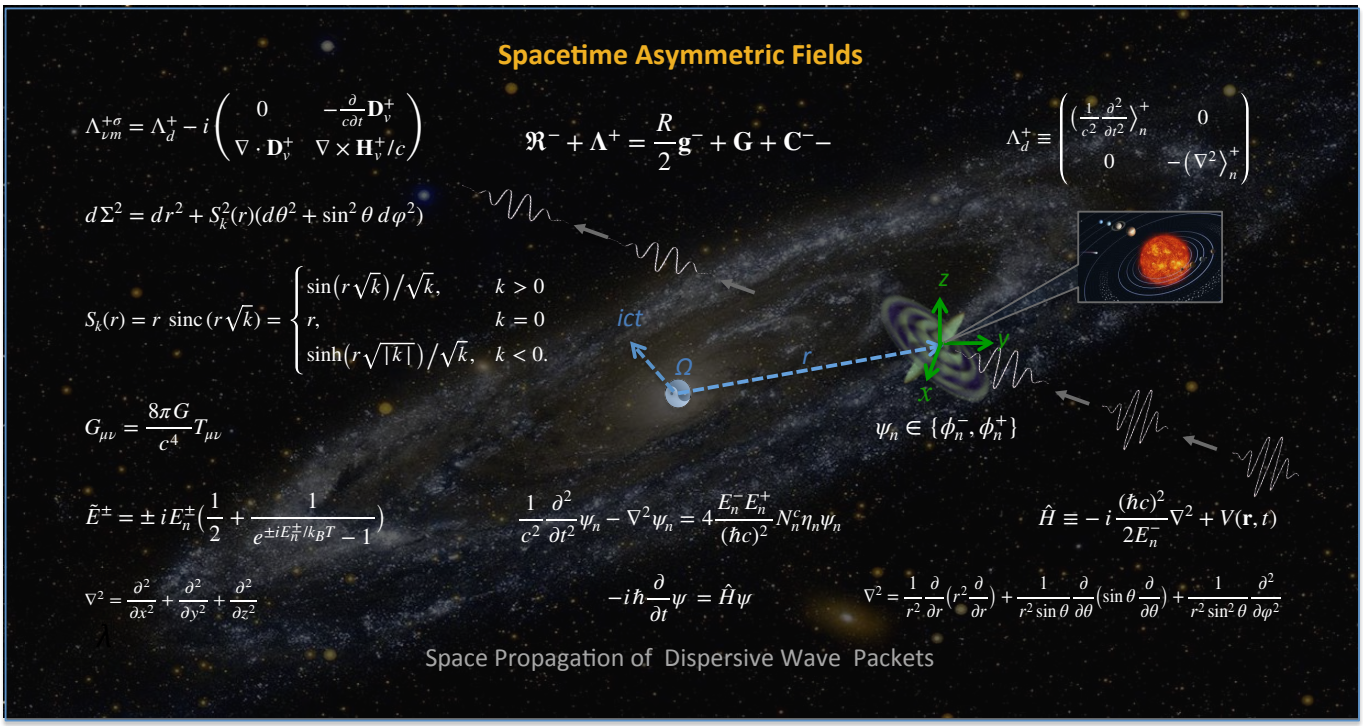

Figure 5: Heliosphere Physical Interactions at Third Horizon of Spacetime Manifolds

Because Y^-Y^+ entanglement is a part of mass enclave processes, the superphase fluxions exert a pair of the gravitational fields in a spacetime manifold, appearing as if there were from nothing with abrupt appearance of expanding spacetime metric. This was the course of how the “physical cosmology” has been misled to the flawed hypothesis that universe were expanding from the primordial "*Big Bang*". Since the dispersive lightwave packet is the known characteristics of physical medium in spacetime horizons, the redshift occurs at the conversion from the second to third horizon, which might appear as or equivalent to “expanding”. As expected, the time-lapse conversion to the physical horizons is equivalent to “expanding” that is the known characteristics of the virtual world imposing or exposing on the physical world.

Our universe has a perfect environment, neither inflate nor deflation, pertaining to and suitable for a duality of the two-sidedness lying at the heart of all events or instances as they are interrelate, opposite or contrary to one another, each dissolving into the other in alternating streams that operates a life of creation, generation, or actions complementarily, reciprocally and interdependently. The nature consistently emerges as or dynamically entangles with a set of the Y^-Y^+ fields between matter interruptions that communicates and projects their interoperable states to its surrounding environment, alternatively arisen by or acting on its opponent through the reciprocal interactions.

In conclusion, the universe is naturally eternal and dynamically yinyang-steady. The entire universe is orchestrated as a whole rather than a phenomenon that applies just to one part of the universe or from the physical observation only, which, in the current model of “physical cosmology”, is at the "collapsed" states of the interweaving dynamics. Therefore, our astronomers shall bid farewell to the “*Big Bang*” theory.

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