

Construction of the Cosmic Theory Based on Electric Primitives and Magnetic Primitives and Its Interpretation of Cosmic Mysteries

Tian Xiaoliang, Li Xiaohua, Sun Hui

Energy Engineering Research Institute, Qingdao University, Qingdao 266071, Shandong, China

ABSTRACT

This study, rooted in the first principles of the universe, systematically defines Electric Primitives (EPs) and Magnetic Primitives (MPs) as the fundamental building blocks of the cosmos through quantum analysis and cross-scale logical reconstruction, constructing a rigorous, self-consistent, and entirely new cosmological theoretical framework. This framework breaks through the logical barriers between macroscopic astrophysics and microscopic quantum domains, achieving the essential unification of physical laws across these two scales and providing a novel cognitive paradigm for decoding the operational mechanisms of the universe.

The theory achieves disruptive breakthroughs in three core domains:

- Nature of Matter and Energy: It profoundly reveals the quantum structural properties of dark matter and the spatiotemporal evolution essence of dark energy, offering a trans-era new pathway to understand the distribution of matter and energy in the universe.

- Unification of Fundamental Forces: By systematically elaborating on the synergistic mechanisms of gravity, electromagnetism, the strong nuclear force, and the weak nuclear force, it achieves the theoretical unification of fundamental forces, propelling theoretical physics a crucial step closer to the "theory of everything."

- Interpretation of Frontier Phenomena: It proposes a new "quantum primitives self-organization" mechanism for the origin of the Big Bang singularity and innovatively deciphers the non-local nature of quantum entanglement, transcending the philosophical boundaries of traditional physical cognition.

Verified by multidisciplinary approaches including astrophysical observations, high-energy physics experiments, and quantum information research, this theory demonstrates robust explanatory and predictive capabilities in cosmological model construction, fundamental particle property interpretation, and quantum technology principle innovation. The cognitive revolution it brings not only pioneers a new paradigm for basic scientific research but also holds the promise to reshape the research directions of physics and cosmology. It is poised to become a pivotal theoretical breakthrough that rewrites the history of science in humanity quest to understand the essence of the universe, erecting an epoch-making theoretical cornerstone for exploring the ultimate mysteries of the cosmos.

Key words: Cosmic Theory Based on Electric Primitives and Magnetic Primitives (CTEPMP); First principles; Unification of four fundamental forces; Dark matter; Dark energy; Quantum entanglement; Eight-Level Cosmic Systems; Bidirectional Time System; Six Directions Worlds Covariance

1. INTRODUCTION

At the forefront of contemporary scientific exploration, general relativity^[1-3] and quantum mechanics^[4-8] serve as the cornerstones of modern physics, each meticulously formulated to explain phenomena within their respective domains. General relativity, with its elegant curved space-time framework, has been crucial in deciphering cosmic-scale structures, gravitational lensing, and celestial dynamics. Quantum mechanics, conversely, offers an in-depth understanding of the subatomic realm, accurately predicting particle behavior through concepts such as superposition and entanglement.

However, the fundamental incompatibility between these two theories reaches its peak under extreme conditions. At black hole singularities and during the initial moments of the Big Bang^[9], both theories break down. The deterministic nature of general relativity clashes with the probabilistic framework of quantum mechanics, creating a significant gap in our comprehension of the universe's fundamental nature and impeding the development of a unified theory that can bridge the macroscopic and microscopic worlds.

Moreover, observational data from the Planck satellite and galaxy rotation curve studies have confirmed that dark matter^[10-12] and dark energy^[13-18] constitute approximately 95% of the universe's total mass-energy. These intangible

components, undetectable by electromagnetic means and only manifesting through gravitational effects on visible matter, remain mysterious in their nature and origins. Decades of research, including experiments at the Large Hadron Collider, has failed to reveal their true properties, leaving their underlying mechanisms as one of the most pressing mysteries in the standard cosmological model.

Efforts to unify the four fundamental forces-gravity, electromagnetism, the strong nuclear force, and the weak nuclear force-have faced persistent challenges. Each force operates under distinct theoretical frameworks: gravity relies on geometric descriptions of space-time, while the other three are explained through quantum field theories. This fragmentation not only hinders a holistic view of the universe but also limits our ability to predict the behavior of matter and energy under extreme conditions.

Planck's concept of energy quanta shattered the constraints of classical physics and laid the foundation for quantum mechanics, while Dirac's quantization of electromagnetic fields not only predicted antimatter but also introduced the concept of vacuum energy, expanded the frontiers of quantum theory. The quantization of electric and magnetic fields respectively to determine their minimum energy units could potentially unveil the essence of electric fields, magnetic fields, and even electromagnetism itself, refining quantum field theory and advancing quantum technology. Nevertheless, no breakthroughs have been achieved in this domain thus far.

First principles-deriving solutions from the most fundamental facts and principles-have demonstrated high efficiency in disciplines such as materials science, quantum physics, and nuclear physics, achieving remarkable successes in predicting material properties and simulating quantum systems. Notably, applying the first principles of the universe-directly deducing cosmic theoretical models from the universe's basic constituents and underlying principles-holds the potential to revolutionize cosmic theory. Despite the profound promise of this approach strictly adhering to the universe's first principles, no substantial progress has been made in this direction to date.

In response to these scientific challenges and theoretical gaps, this study quantizes electric and magnetic fields into fundamental cosmic units-Electric Primitive (EPs) and Magnetic Primitive (MPs) and systematically investigates their properties and principles. Grounded in the first principles of the universe, we propose the Cosmic Theory Based on EPs and MPs (CTEPM^[19]), aiming to construct a logically self-consistent and comprehensively complete unified cognitive framework for the cosmos. This theory transcends traditional empirical induction by deriving from the universe's underlying operational mechanisms through rigorous logical deduction and scientific architecture, driving innovative developments in cosmic theoretical research.

This theory successfully derives the structural characteristics and distribution patterns of dark matter and dark energy from first principles and achieves the unification of the four fundamental forces, offering a coherent and holistic explanation across all physical scales.

The Cosmic Theory Based on EPs and MPs establishes a paradigm grounded in rigorous first-principles deductions, unifying predictive power with theoretical consistency. The inherent interactions of EPs and MPs not only resolve the long-standing dichotomy between macroscopic and microscopic physics but also illuminate the elusive nature and origins of dark matter and dark energy. By resolving theoretical contradictions and breaking through the limitations of traditional models, this theory provides a unified framework for understanding the transition from the smallest fundamental units of the microcosm to the infinite space-time of the macrocosm, advancing humanity's exploration into decoding the essence of the universe.

2. BASIC CONCEPTS

This study takes the first principles of the universe as its fundamental guideline. To ensure theoretical rigor, this study starts by quantizing electric and magnetic fields into the universe's most basic units—EPs and MPs, defined as the smallest indivisible quantum units. Taking this as a cornerstone, the study gradually explores the internal mechanisms by which the circular motion of an EP forms an "Electric Core Domain" serving as the origin of gravitational force, and the circular motion of a MP generates a "Magnetic Core Domain" dominating repulsive effects. Furthermore, from the dimensions of quantum properties, mechanical effects, motion patterns, and energy states, a complete foundational system of cosmic theory is constructed.

2.1 Electric Primitives (EPs)

2.1.1 Quantum Properties

As the fundamental quantized units of electric fields, EPs are the smallest indivisible components, profoundly illustrating the discrete quantum nature of electric fields. This characteristic challenges traditional continuous-field models and aligns with emerging quantum theories.

2.1.2 Mechanical Effects

Inherent universal gravitation exists between EPs, a force more fundamental than macroscopic gravitational interactions. It provides a quantum-level origin for classical gravitational theory, offering a primordial perspective to interpret gravitational phenomena indicating that macroscopic gravity emerges from the collective behavior of numerous EPs.

2.1.3 Motion Pattern

Under normal conditions, EPs move along a one-dimensional curvilinear trajectory around the core, with their linear velocity constantly at the speed of light in vacuum. Governed by the quantum uncertainty principle, their spatial positions are randomly distributed and can appear at any location within their motion region; additionally, their motion frequency strictly inversely correlates with spatial scale.

The spatial region covered by the motion trajectories of EPs forms a unique "Electric Core Domain." This domain exhibits an extremely wide scale span, ranging from a minimum of 10^{-k} meters (where $k \gg 35$) to a maximum of 10^k meters. The Electric Core Domain defines the effective range of EPs gravity-beyond this boundary, the gravitational effect of EPs completely vanishes.

2.1.4 Energy States

Within the framework of quantum field theory, Dirac's theory of electromagnetic field quantization has revealed the discrete nature of electromagnetic field energy. This study further expands on these findings, demonstrating that both electric and magnetic field energies adhere to the laws of quantization. Moreover, a fundamental symmetry exists in their energy composition: each quantum of electromagnetic field energy is composed of equal amounts of electric and magnetic field energies, with each contributing 0.5 quantum units.

From a physical perspective, the energy of the electric field exists in discrete quanta. By integrating Dirac-Einstein's formula (which describes the relationship between energy and mass) and Planck-Einstein's formula (which elucidates the connection between energy and frequency), and considering that the electric field energy accounts for 0.5 quantum units within the electromagnetic field, the following formula for calculating the electric field energy is derived:

$$E_{ep} = m_{ep}c^2/2 = hv/2 \quad (1)$$

Here, E_{ep} denotes the energy of an EP (J); m_{ep} represents the relativistic mass of an EP (kg); c_0 is the speed of light in vacuum (m/s); h is the Planck constant; and ν is the swirling frequency of the EP (Hz).

When the swirling frequency of the EP is $\nu = 1(\text{Hz})$, the energy of a single EP remains constant at $0.5h$ (J). This energy value is defined as the fundamental energy quantum of the electric field within this theoretical framework. It serves as both the basis for quantitative analysis of microscopic energy structures and a core theoretical parameter for in-depth investigations of the electric field's microscopic energy characteristics.

2.2 Magnetic Primitives (MPs)

2.2.1 Quantum Properties

As the fundamental quantized units of magnetic fields, MPs are the smallest indivisible components that profoundly illustrate the discrete quantum nature of magnetic fields. This characteristic challenges traditional continuous-field models and aligns with emerging quantum theories.

2.2.2 Mechanical Effects

Universal inherent repulsion exists between MPs, serving as the quantum-level origin for all macroscopic repulsive phenomena. It provides the mechanical basis for processes like diffusion and separation in the universe, offering a primordial perspective to interpret large-scale physical behaviors.

2.2.3 Motion Pattern

MPs move in a one-dimensional curvilinear trajectory around the magnetic nucleus under normal conditions, with a linear velocity constant at the speed of light in vacuum. Governed by the quantum uncertainty principle, their spatial positions are randomly distributed and can appear at any location within their motion region; additionally, their motion frequency strictly inversely correlates with spatial scale.

The spatial region covered by the motion trajectories of MPs forms a unique "Magnetic Core Domain". This domain exhibits an extremely wide scale span, with a minimum of 10^{-k} meters ($k \gg 35$) and a maximum of 10^k meters. The

Magnetic Core Domain defines the effective range of MPs' repulsive force-beyond this boundary, the repulsive effect of MPs completely disappears.

2.2.4 Energy States

Following the same analytical logic as that for the electric field energy, the magnetic field energy also exhibits discrete quantization characteristics. In essence, magnetic field energy exists in quantized units, jointly forming the fundamental energy structure of the electromagnetic field with electric field energy. By applying Dirac-Einstein's formula (which reveals the equivalence between energy and mass) and Planck-Einstein's formula (which establishes the relationship between energy and frequency), and considering that the magnetic field energy accounts for 0.5 quantum units in the total electromagnetic field energy, the following formula for calculating the magnetic field energy is derived:

$$E_{mp}=m_{mp}c_0^2/2=h\nu/2 \quad (2)$$

Here, E_{mp} denotes the energy of an MP (J); m_{mp} represents the relativistic mass of the MP (kg); c_0 is the speed of light in vacuum (m/s); h is the Planck constant; and ν is the swirling frequency of the MP (Hz).

When the swirling frequency of the MP is $\nu = 1$ (Hz), the energy of a single MP remains constant at $0.5h$ (J). This energy value is defined as the fundamental energy quantum of the magnetic field within this theoretical framework, serving as both the basis for quantitative analysis of microscopic energy structures and a core theoretical parameter for in-depth investigations of the microscopic energy characteristics of magnetic fields.

From equations (1) and (2), it can be deduced that:

$$m_{ep}=m_{mp} \quad (3)$$

Equation (3) indicates that the relativistic mass of a single EP is equal to the relativistic mass of a single MP.

3. FUNDAMENTAL PRINCIPLES

The universe is a sophisticated system that operates in strict accordance with profound laws. This theory is rooted in the first principles of the universe and constructs a series of core principles starting from the most fundamental concepts of EPs and MPs. As the foundational units of matter and energy in the universe, the properties and interaction mechanisms of EPs and MPs form the essential logic governing cosmic operations. These principles, which are akin to the "underlying code" of the universe, bridge microscale particle phenomena and macroscale celestial mechanics, profoundly revealing the core mechanisms of cosmic creation and evolution. They provide a novel theoretical framework for understanding the structural logic and dynamic equilibrium of the cosmos.

3.1 Principle of Infinite Decomposition

In the course of scientific and technological development, the analytical method of decomposition has consistently been a core tool for humanity to explore the essence of nature. From ancient times to the present, from philosophical speculation to empirical research using sophisticated instruments such as particle colliders and electron microscopes, this paradigm of breaking down complex systems into fundamental units has continuously driven breakthroughs in human understanding. Through this approach, we have revealed the laws governing celestial motion, decoded the structure of DNA, and achieved leaps in cutting-edge fields such as semiconductors and quantum computing. These achievements exemplify the profound efficacy of decompositional thinking in comprehending the universe. Building on this foundation, the Principle of Infinite Decomposition emerges. The specific content is as follows:

3.1.1 Infinite Divisibility of the Universe

The universe exhibits infinite divisibility at the microscale. As the smallest units of the universe, both EPs and MPs possess inherent infinite subdivisibility. This characteristic indicates that at the most fundamental level, there is no absolute boundary for the decomposition of matter and fields, providing a theoretical cornerstone for understanding the hierarchical complexity of the universe.

3.1.2 Multidimensional Morphology of EPs and MPs

Conceptually, EPs and MPs can be regarded as zero-dimensional mass points without spatial extension. When moving around the core, their trajectories form one-dimensional curves, imparting directionality to motion. The Electric Core Domain generated by EP motion and the Magnetic Core Domain generated by MP motion are both two-dimensional

spatial structures, serving as the foundation for the quantized distribution of the electric field and the magnetic field. Consequently, EPs and MPs exhibit a dimensional progression pattern from point to line to plane, reflecting the intrinsic connection between the morphology of the universe's most fundamental units and their motion characteristics.

3.2 Principle of Unity of Opposites

From the aggregation and dispersion of galaxies, to the attraction and repulsion between subatomic particles, and the interdependence of electric and magnetic fields in electromagnetism, the coexistence of opposition and unity is evident throughout the universe. These contradictory yet synergistic patterns are not coincidental but represent the underlying logic of cosmic operations. The Principle of Unity of Opposites emerges from this observation, revealing how fundamental elements such as matter, energy, and forces maintain cosmic balance and evolution through their inherent unity in opposition. Its core tenets are as follows:

3.2.1 Opposite-Unity of EPs and MPs

EPs and MPs are the most fundamental units embodying the universe's principle of the unity of opposites. EPs, driven by universal gravitation, promote the aggregation of basic units, facilitating material formation. In contrast, MPs utilize universal repulsion to drive the dispersion of these units, maintaining the dynamic balance of the system. EPs, as the quantized carriers of electric fields, confer the property of charge, while MPs, as the quantized sources of magnetic fields, carry magnetic properties. Despite their opposing characteristics, EPs and MPs are mutually dependent, jointly forming the microscopic basis for electromagnetic phenomena.

3.2.2 Universal Synergy Mechanism of the Ground -State Neutralization Force

A ground-state neutralization force, which is a fundamental interaction transcending traditional electromagnetic forces, exists between EPs and MPs. Through quantum state coupling, this force integrates EPs and MPs, entities with opposing properties, into a cohesive whole. The ground-state neutralization force is characterized by its universality, enabling it to transcend the scale barriers between the microscopic and macroscopic worlds and act instantaneously across dimensions. This ensures the coordinated evolution of these opposing fundamental units and maintains the stability and integrity of the cosmic space-time structure.

3.3 Principles of LTA and Existential Equivalence

In cosmic research, extensive observational data and quantitative analysis show that the spatial distribution and frequency statistics of galaxies, as well as the energy patterns of microscopic quantum states, exhibit significant logarithmic regularity. Meanwhile, every form of existence in the universe, from fundamental particles to galaxies, plays an irreplaceable role in systematic evolution.

Based on this, this study proposes the Principles of **Logarithmic Transformation Averaging (LTA)** and Existential Equivalence, which aims to reveal the mathematical laws of cosmic scales and explain the equality of all existences, thereby providing a new theoretical perspective for understanding cosmic order. The details are as follows:

3.3.1 LTA Principle (Geometric Mean Principle)

Through observations and in-depth research on cosmic phenomena, it has been found that the spatial scale distribution of cosmic phenomena generally follows the law of LTA. For physical quantities such as the occurrence frequency and energy distribution of each scale level—ranging from microscopic quantum structures to macroscopic celestial systems—significant statistical consistency emerges after logarithmic transformation. This law reveals the deep-order of cosmic scale evolution: behind the seemingly discrete and random scale differences, there exist precise mathematical correlations—physical phenomena at different scales are not disorderly distributed, but are systematically constrained by the law of LTA, fully reflecting the universality and rigor of the mathematical structure of nature.

Within this theoretical framework, all scales adhere to the principle of LTA, covering the spatial scales of cosmic levels and the characteristic scales of various phase transition phenomena. These scales all exhibit the characteristics of LTA: the actual scale is based on the average value derived from theoretical research, fluctuating within its adjacent interval according to the distribution law of LTA.

3.3.2 Principle of Existential Equivalence

Cosmic structures generated based on the symmetry principle are absolutely equivalent in terms of their existential significance and essential properties. Regardless of their form, function, or stage of evolution, all these structures maintain the same proportion in the overall cosmic composition. This equivalence highlights the symmetry and balance of the cosmic structure generation mechanism, providing a theoretical basis for explaining the overall stability and dynamic equilibrium of the universe. It shows that all forms of existence in the universe have equal existential value and fundamental importance at the essential level.

3.4 Principle of Quantitative and Qualitative Changes

Through extensive scientific and philosophical inquiry into the universe's operational mechanisms, a fundamental law has been revealed: quantitative and qualitative changes are the core driving forces behind the development of all things in the cosmos. From subatomic particle interactions to celestial evolution, and from individual organism growth to ecosystem transformations, all cosmic phenomena adhere to this principle. Quantitative change provides essential impetus for evolution through the continuous accumulation of energy and information—for example, the gradual accumulation of minor genetic mutations in species over time leads to the formation of new biological forms. Qualitative change, in turn, is the inevitable result of quantitative change crossing a critical threshold, triggering fundamental transformations in system properties. These two processes are interdependent and cyclically transformative, constituting the internal logic that drives the sustained development of cosmic systems.

The occurrence of qualitative change is closely linked to the logarithmic mean scale of cosmic phenomena. When the logarithmic mean scale of a phenomenon reaches a specific threshold through quantitative accumulation, it triggers qualitative change, causing fundamental shifts in energy forms or system attributes. This principle applies universally to all change processes in the universe—from subatomic particle state transitions and celestial matter transformations to evolutionary leaps in living systems and paradigm shifts in civilizations—all exemplifying the unified developmental logic of "gradual accumulation leading to abrupt transformation" across all cosmic scales.

3.5 Principles of Exquisite Symmetry

Symmetry, as the core key to decoding the essence of the universe, runs through fundamental physics research. From the quantum world of subatomic particles to the motion of celestial bodies in the vast universe, symmetry outlines the deep-order of the cosmos in diverse forms. The Principle of Exquisite Symmetry reveals that the universe strictly follows the law of quantitative and qualitative change: when qualitative change occurs, the original symmetry is broken; and in the process of symmetry breaking, new symmetries continue to emerge and evolve. It is this dynamic process that drives the continuous evolution of the cosmic hierarchical structure. Not only does each hierarchy exhibit unique symmetrical properties, but there also exist cross-scale symmetrical correlations between microscopic and macroscopic structures. Based on this, the following will deeply elaborate on four representative types of symmetry, layer by layer analyzing the core connotations of natural laws.

3.5.1 Mirror Symmetry Principle of EPs and MPs

At the level of basic cosmic components, the core-orbiting motions of EPs and MPs exhibit perfect mirror duality. Specifically, any core-orbiting state of an EP in the universe can find a completely symmetric corresponding pattern in an MP; conversely, the motion trajectory of each MP is also like a mirror reflection of an EP's motion. Through this mirror-mapping mechanism, the two are closely coupled, forming a stable electromagnetic dependency that jointly establishes the cornerstone of electromagnetic phenomena.

3.5.2 Principle of Inversion Symmetry of Cosmic Primitive Motions

Taking a certain core point O in the universe as the inversion center, the motions of cosmic primitives follow strict inversion symmetry laws across macroscopic and microscopic scales. For any motion state P of cosmic primitives in the microscopic region, there exists a unique corresponding inversion motion state P' in the macroscopic region, and the two states satisfy the following conditions:

(1) Co-nuclear and collinear: The microscopic motion state P and the macroscopic inversion state P' are centered around the core point O and lie on the same spatial axis.

(2) Scale inversion: The product of the microscopic motion orbit radius $|OP|$ (in meters) and the macroscopic inversion orbit radius $|OP'|$ (in meters) is constantly equal to 1 (square meter), that is, $|OP| \times |OP'| = 1$. This indicates that an expansion of the microscopic scale necessarily leads to a proportional reduction in the macroscopic scale, and vice versa.

(3) Structural nesting: The motion patterns at macroscopic and microscopic scales, with the core point O as the reference, form a concentric - nested spatial structure. Parameters such as motion trajectories and energy distributions

conform to the rules of inversion symmetry.

This inversion symmetry relationship enables an accurate cross - dimensional mapping between the macroscopic and microscopic worlds. It is like establishing a mirror - like order at the two ends of the universe, revealing the deep - seated unity of the motions of cosmic primitives (such as EPs, MPs, etc.) at different scales.

3.5.3 Logarithmic Transform Symmetry Principle of Scales

Based on the Principle of Inversion Symmetry of Cosmic Primitive Motions, the inverse proportional relationship between macroscopic and microscopic scales can reveal its profound mathematical essence through logarithmic transformation. Defining $|OP|$ (in meters) as the orbital radius of cosmic primitives' motion at the microscopic scale and $|OP'|$ (in meters) as the corresponding orbital radius at the macroscopic scale, according to the inversion symmetry formula $|OP| \times |OP'| = 1(m^2)$, taking the common logarithm of both sides of the equation yields: $\lg|OP| + \lg|OP'| = \lg 1 = 0$, that is, $\lg|OP'| = -\lg|OP|$. This indicates that macroscopic and microscopic scales in the universe exhibit a mirror-symmetric property in logarithmic space, where the logarithmic increase in the microscopic scale necessarily accompanies an equal-amplitude logarithmic decrease in the macroscopic scale.

This principle establishes a quantitative correlation between macroscopic and microscopic scales through logarithmic functions, integrating the macroscopic universe and the microscopic world into a unified mathematical framework. It not only reveals the universality of natural laws across time and space but also confirms the inherent consistency of the cosmic hierarchical structure, providing a crucial theoretical cornerstone for deciphering the deep-seated order of the universe.

3.5.4 Principle of Orthogonal Octet-State Spatial Symmetry

The evolution of cosmic space strictly follows the law of orthogonal octet-state spatial symmetry. The eight basic structures exhibit both vertical and horizontal mirror symmetry in space, while also forming a radial symmetric distribution around the central point. This multi- dimensional symmetry reveals the inherent logic of the universe's evolution from disorder to order, providing a structured framework for understanding the formation and development of cosmic structures.

4. BASIC DEDUCTIONS

Building upon the first principles of the universe and anchored by the core concepts of EPs and MPs, this study, through rigorous logical deduction centered around the five fundamental principles—such as infinite decomposition and the unity of opposites—derives the following basic inferences. These deductions delve into the fundamental composition and operational laws of the universe, systematically elucidating the generation mechanisms of Primordial Unities (PUs) and Electromagnetic Primitives (EMPs), the symmetrical characteristics of spatial structures, the nature of True and False Vacuums, and cosmic sevenfold qualitative changes and Eight-Level Cosmic Systems. They offer a novel theoretical framework for analyzing both microscopic and macroscopic cosmic phenomena.

4.1 Generation Mechanisms of PUs and EMPs

According to the “Principle of Unity of Opposites,” under the action of ground-state neutralization force, EPs and MPs can combine to form PUs or EMPs. Similarly, PUs or EMPs can decompose into EPs and MPs under the guidance of energy or information.

4.1.1 Formation of PUs

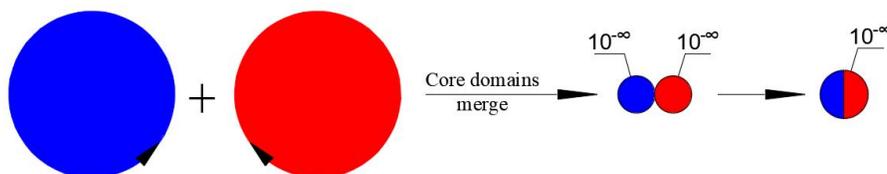
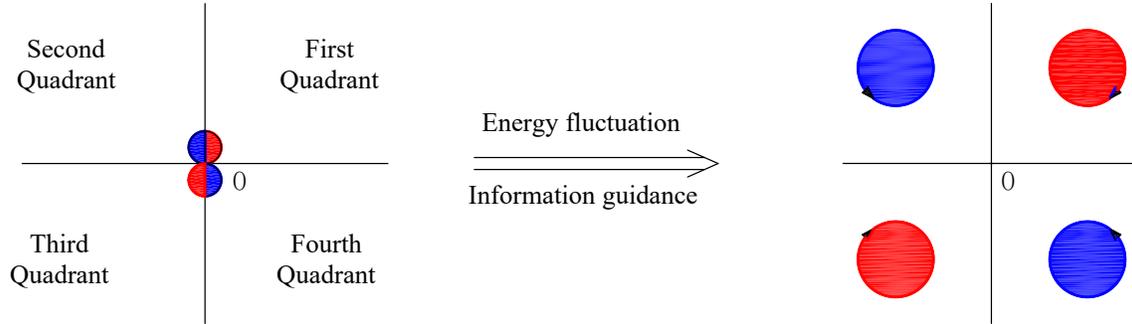
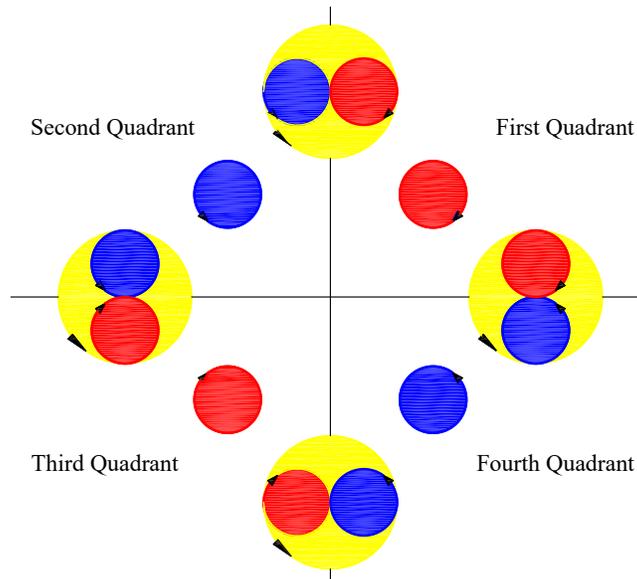


Figure 1. Schematic Diagram of the PU Formation Process. The blue area: motion region of a MP; the red area: motion region of an EP.

As shown in Figure 1, when an EP and a MP in conjugate states meet and the Electric Core Domain and the Magnetic Core Domain coincide, the ground-state neutralization force drives them to deeply fuse, forming an independent PU structure. As the highest level unity, the ontology scale of PUs infinitely approaches zero, reflecting the highly integrated characteristics of EPs and MPs at the ultimate micro level.



(a) Quadrantal balance of PUs phase transition



(b) Quadrantal Balance of EMPs

Figure 2. Generation Process Diagram of Quadrantal Balance of EMPs. The blue area: motion region of a MP; the red area: motion region of an EP.

4.1.2 Formation of EMPs

Triggered by energy or information excitation, PUs undergo phase transition, simultaneously generating independent EPs and MPs, which emerge in the four quadrants of a Cartesian coordinate system (see Fig. 2a). When EPs and MPs in conjugate states interact, the ground-state neutralizing force drives their combination, forming EMPs.

The structural generation and evolution of EMPs proceed synchronously in the four coordinate quadrants. Inside each EMP, the EP and MP orbit around their intersection point within the same plane, and the region covered by their motion constitutes the Electromagnetic Core Domain (see Fig. 2b). This coordinated motion forms a quadrantal balance mechanism, ensuring the stability and coherence of the newly generated electromagnetic structure.

4.1.3 Energy of the PU and the EMP

The energy carried by a PU or an EMP is the sum of the energies of an EP and a MP , described by the following equation:

$$E_{pu} = E_{emp} = E_{ep} + E_{mp} = m_{ep}c_0^2/2 + m_{mp}c_0^2/2 = h\nu \quad (4)$$

Where, E_{pu} denotes the energy of a PU (J); E_{emp} denotes the energy of an EMP (J); E_{ep} denotes the energy of an EP (J); E_{mp} denotes the energy of an MP (J); m_{ep} represents the mass of an EP (kg); m_{mp} represents the mass of a MP (kg); c_0 is the speed of light in vacuum (m/s); h is the Planck constant; and ν is the swirling frequency of the EP (Hz).

According to equation (3), where, $m_{ep} = m_{mp} = m$, the equation (4) simplifies to:

$$E_{pu} = E_{emp} = mc_0^2 = h\nu \quad (5)$$

In this theoretical framework, when the frequency ν of EP and MP is 1 Hz, it corresponds to an independent PU unit or an independent EMP unit, whose energy remains constant at h (J) and constitutes the fundamental energy quantum of the PU field or EMP field. This quantum shares the same essence of energy quantization with Planck's energy quantum ($h\nu$). It not only breaks through the theoretical boundaries of traditional electromagnetic oscillations but also extends the application of Planck's constant h to the cosmic primitive level, achieving a significant extension of the concept of quantized energy in the dimension of cosmic essence and establishing a close logical connection between the PU-EMP theory and classical quantum theory.

The energy carried by PUs and EMPs is fundamentally distinct from the kinetic energy, thermal energy, and nuclear energy discussed in modern science. For the purpose of systematic discourse, this cosmic theory defines the energy contained in PUs and EMPs as "Latent Potential", which represents the unmanifested primordial driving force within the cosmic ground state; while the observable and quantifiable energy forms such as kinetic energy, thermal energy, and nuclear energy are named "Evident Energy", to clearly demarcate the differences in existence forms and action mechanisms between the two types of energy.

4.2 Concentric Double Spherical Shells Inversion Symmetry Structure

4.2.1 Basic Architecture of Hierarchical Cosmic Systems

Based on the principle of inversion symmetry in cosmic primitive motion, the fundamental architecture of the universe exhibits a unique concentric double spherical shell inversion symmetry form, with its core components and functions as follows:

(1) Inner Spherical Shell: Constructed by the gravitational aggregation effect dominated by Electric Primitives (EPs), serving as the inner boundary of this hierarchical cosmic system. The enclosed region is defined as the Converged Kernel Zone, which stores the aggregated organizations and information encoding of the upper-level cosmic system. This zone acts as the core regulatory unit driving the structural evolution of the local cosmic system, maintaining the stability and order of the system through the action of gravitational fields.

(2) Inter-Shell Space: Located between the inner and outer spherical shells, forming the main framework of the local cosmic system, known as the Diffused Core Region. This is a key field where local cosmic phenomena germinate, evolve, and undergo energy transformation, bearing the interaction process of matter and energy.

(3) Outer Spherical Shell: Formed by the repulsive diffusion effect dominated by Magnetic Primitives (MPs), serving as the outer boundary of this hierarchical cosmic system. Beyond the outer spherical shell, the upper-level cosmic system exists in a diffused state, guiding the evolution direction of the local cosmic system from the periphery through the repulsive field to ensure the system's sustained development in dynamic balance.

4.2.2 Aggregation, Polymerization and Blending Mechanisms of Double Spherical Shell Basic Structure

All existences in the universe are constructed by numerous double spherical shell symmetric basic structures through three hierarchical combination modes: inner spherical shell aggregation, inter-shell diffused core region polymerization, and outer spherical shell blending. These three modes are both independent and synergistic, jointly shaping the hierarchical order of the universe.

(1) Inner Spherical Shell Aggregation: the Dual Characteristics of Stability and Interaction. In normal states, inner spherical shells exist as independent barrier structures, maintaining loose connections only through spatial aggregation forces, and their structural stability prevents spontaneous fusion. However, when regulated by information commands from upper-level cosmic systems, impacted by high-energy physical events, or catalyzed by special media, inner spherical shells will break through boundaries to achieve fusion. This mechanism not only ensures the stable operation of local systems but also provides trigger conditions for cross-level interaction and structural evolution.

(2) Inter-shell Polymerization: the Self-evolving Mechanism Driven by Bidirectional Regulation. During the self-evolution of the Current Level Cosmic System, the inter-shell region, serving as the core area, hosts numerous basic structural units with double spherical shell symmetry. Under the dominant influence of the universal gravitation of EPs,

the inner spherical shell converges towards the central area of the inter-shell, creating a pronounced aggregation trend. However, the inter-shell polymerization process exhibits unique bidirectional regulation features: the inner spherical shell, as the information carrier of the Superior Cosmic System, harbors condensed genetic codes; the outer spherical shell constructs a dynamically responsive boundary through diffused guiding information. The constraint framework formed by the two constitutes a sophisticated regulatory network.

Under this system, inter-shell polymerization promotes the coordinated evolution of micro-primitives dynamics and macro-spatio-temporal topological structures by establishing multi-dimensional transmission channels for matter, energy, and information. Through deep coupling mechanisms, the primitives within the system gradually form a complex cosmic architecture with self-regulatory capabilities. This architecture not only maintains the order and stability of the internal component layout but also establishes dynamic interaction mechanisms with higher-level cosmic structures, achieving the organic integration and continuous development of the local and the whole.

(3) Outer Spherical Shell Blending: Selective Channel for Hierarchical Interaction. The region outside the outer spherical shell boundary is dominated by the upper-level cosmic system, where the outer spherical shells of numerous double spherical shell structures blend at the boundary. The outer spherical shell exhibits a "selective permeability" property—it strictly restricts the disordered penetration of lower-level components while allowing the ordered input of upper-level components. This enables controllable cross-level interaction and directional evolution while maintaining the independence of each level, ensuring the stability and openness of the cosmic hierarchical structure.

The above three combination modes jointly construct the hierarchical architecture of the universe: the inner spherical shell aggregation area forms the core hub of the system under the gravitational action of EPs, undertaking organizational and regulatory functions; the outer spherical shell blending area presents a diffused state due to the repulsive force of MPs, which not only ensures the relative independence of the local system but also serves as a transitional interface for interaction with the upper-level system. The inter-shell diffused core region, as the cradle for nurturing cosmic phenomena, drives the development and changes of the system through continuous interaction of matter, energy, and information. Each hierarchical system finally forms a complex and ordered cosmic structure system through ordered nesting and collaborative evolution.

4.2.3 Inversion Symmetry Based on Scale Logarithmic Transformation

According to the principle of inversion symmetry in cosmic primitive motion, EPs and MPs follow the "inner-outer correspondence" rule: taking the inner spherical shell (scale ≤ 1 meter) as the micro-domain and the outer spherical shell (scale ≥ 1 meter) as the macro-domain, each EP or MP in the micro-domain has a corresponding counterpart with completely consistent properties in the macro-domain. By performing logarithmic transformation on the scales of their distances from the system center, an accurate inversion symmetry relationship can be constructed to achieve cross-scale mapping of forms and states.

This mechanism exhibits the characteristic of "instantaneous response": when an EP or MP in the inner spherical shell changes, the logarithmic transformation mechanism transmits this change to the corresponding primitive in the outer spherical shell in an ultra-local manner, driving it to make synchronous adjustments. This interactive process across logarithmic scales breaks through the spatiotemporal limitations of traditional local realism, achieving superluminal information transmission and collaborative evolution.

Within this theoretical framework, micro and macro scales are not mutually isolated but are closely mathematically linked through logarithmic transformation. Any dynamic change in one scale can be instantly and accurately reflected in the other scale through logarithmic mapping rules, forming a self-consistent unity between hierarchies. This symmetry not only ensures the stability of cosmic structures at different scales but also provides a new perspective for understanding the cross-scale transmission and coordination of information and energy.

4.3 Physical Space, False Vacuum, True Vacuum and Absolute Vacuum

4.3.1 Physical Space

Physical Space is defined as a space filled with matter or electromagnetic waves. Within this space, certain regions exhibit measurability and visibility due to the distribution of baryonic matter and energy interactions, though their detectability is constrained by the measurement technologies available to life forms in the universe.

Based on the "Concentric Double Spherical Shells Inversion Symmetry Structure", the fundamental organizational structure of Physical Space exhibits a two-layered architecture: the inner spherical shell is bounded by the Planck scale (10^{-35} m), and the outer spherical shell extends to the macroscopic scale (10^{35} m). The integration of numerous fundamental organizations -both internal and external-gives rise to the material world observable to us. During the mutual integration process, the internal composition of the inner spherical shell is determined by the upper-level cosmic

system, and its scale typically remains unchanged, meaning that internal integration is manifested as accumulative aggregation. The region between the inner and outer spherical shells constitutes the main body of the current-level cosmic system, where integration within this scope generally involves the sharing of space and information.

4.3.2 False Vacuum

False Vacuum is a special form of space devoid of matter and electromagnetic waves but containing three fundamental units: EPs, MPs, and EMPs. Due to the absence of detectable matter or electromagnetic media, photon-based measurement technologies fail here, rendering the False Vacuum unobservable within the current scientific framework.

- According to the principle of logarithmic transformation symmetry, within the boundary of the inner spherical shell (10^{35} meters) in the physical space is the "ultramicroscale False Vacuum", and beyond the boundary of the outer spherical shell (10^{35} meters) is the "ultralow-density False Vacuum". When matter and electromagnetic waves cross these two boundaries, they will be decomposed into EMPs/EPs/MPs, and their motion forms transition from three-dimensional (3D) to two-dimensional (2D, for EMPs) or one-dimensional (1D, for EPs/MPs).

- The False Vacuum in this theory corresponds to the "False Vacuum" in quantum field theory. The innovation lies in identifying EPs, MPs and EMPs as the core drivers of the False Vacuum and advancing the understanding of special spatial forms and their hierarchical relationships through analysis of their essential properties.

4.3.3 True Vacuum

True Vacuum is a space free of matter, electromagnetic waves, EPs, MPs and EMPs, containing only PUs.

- Core Mechanism: Under the Principle of Infinite Decomposition, when the cosmic scale microscopically shrinks below 10^{-k} m ($k \gg 35$, k is the scaling exponent of PUs phase transition), the core domains of EPs/MPs/EMPs compress and overlap, transforming into PUs via the "Ground-State Neutralization Force" to form True Vacuum. Conversely, exceeding 10^k m ($k \gg 35$, k is the scaling exponent of PUs phase transitions) triggers core domain fragmentation, also initiating PUs transformation and True Vacuum formation.

- Theoretical Context: This concept aligns with the "True Vacuum" in quantum field theory. Its innovation lies in designating PUs as the core constituent of Vacuum and clarifying its formation mechanism to expand vacuum theory.

4.3.4 Absolute Vacuum

Absolute Vacuum is an idealized space entirely devoid of matter, electromagnetic waves, EPs, MPs, EMPs, and PUs—pure "emptiness" in its most extreme form.

- Philosophical Significance: It represents two cosmic extremes: the microscale approaching zero (a hypothetical singularity) and the macroscale of infinite expansion. This state abstracts all physical existence, providing a theoretical framework for exploring the universe's fundamental nature.

- Practical Limitations: Due to quantum fluctuations inherent in vacuum states, Absolute Vacuum cannot exist in reality. It serves primarily as a theoretical model in academic discourse to deepen our understanding of spatial essence.

4.3.5 Spatial Nesting and the Sea of Cosmic Primitives.

Based on the unique Concentric Double Spherical Shell Inversion Symmetric Structure, the Physical Space, False Vacuum, and True Vacuum form a precise and complex nested system. At the microscale, every point within the Physical Space contains a hierarchical structure: taking the spatial point as the center, the core region within 10^{-k} meters is the True Vacuum, where the PUs exist in a special form, embodying the profound mysteries of the universe; the transition region from 10^{-k} meters to 10^{35} meters is the False Vacuum, in which the EPs, MPs, and EMPs with unique attributes are distributed.

The PUs in the True Vacuum region and the EPs, MPs, and EMPs in the False Vacuum region interweave to construct the vast "Sea of Cosmic Primitives." This sea acts as the invisible engine of the universe, fundamentally governing and regulating the evolution of the Physical Space. Compared to the renowned Dirac sea in physics, the Sea of Cosmic Primitives is more fundamental in concept and essence, providing a new theoretical perspective for exploring the birth, development, and future of the universe, and serving as a key concept to understand the deep-order of the cosmos.

4.4 Seven Qualitative Changes and the Eight-Level Cosmic Systems

The evolutionary landscape of the universe is essentially a grand narrative of the intertwined dance between Evident Energy and Latent Potential. As an observable and quantifiable dynamic energy in material interactions, Evident Energy drives everything from the high-frequency oscillations of subatomic particles to the gravitational spiral motions of

galaxy clusters. Latent Potential, hidden in the depths of the cosmic ground state, serves as the primordial driving force for the self-organized generation of quantum primitives. Reaching its peak in the 8th-Level Cosmic System, it gives rise to new forms of matter and energy through the ripples of quantum fluctuations. The bidirectional transformation and precise balance between the two constitute the underlying source code of cosmic evolution, while the theory of Seven Key Qualitative Changes and Eight-Level Cosmic Systems is the concrete manifestation of this code in the dimension of time and space.

4.4.1 Seven Key Qualitative Changes

Since the birth of the cosmic origin-the 8th-Level Cosmic System-PU's Latent Potential, as the core driving force, has propelled quantum primitives through seven key qualitative changes, gradually constructing the current Eight Level cosmic hierarchy. This process strictly follows the law of quantitative and qualitative change, especially starting from the Planck scale (10^{-35} meters). Whenever the cosmic scale expands exponentially by 10^7 times, a fundamental transformation is triggered.

4.4.2 Eight-Level Cosmic Systems

Based on the Principle of Inversion Symmetry of Cosmic Primitive Motions, the fundamental architecture of cosmic hierarchical systems manifests as a highly precise concentric nested double-spherical shell symmetry pattern. The inner and outer spherical shells jointly delineate the boundaries of the Eight-Level Cosmic Systems through qualitative change processes that occur synchronously at corresponding scales.

When the scale of the inner spherical shell increases quantitatively from 0 meters, which is the scale of the core primary unit (PU) at the 8th-Level, to 10^{-k} meters ($k \gg 35$), and the scale of the outer spherical shell decreases from infinity (the 8th-Level Cosmic System) to 10^k meters, both the inner and outer spherical shells simultaneously undergo the PU's phase transitions. These processes form the inner and outer spherical shell boundaries of the 7th-Level Cosmic System.

As the inner spherical shell scale progresses quantitatively from 10^{-k} meters to 10^{-35} meters, and the outer spherical shell scale recedes from 10^k meters to 10^{35} meters, both shells experience the EMP phase transitions in tandem. These events establish the inner and outer spherical shell boundaries of the 6th-Level Cosmic System.

When the inner spherical shell scale advances quantitatively from 10^{-35} meters to 10^{-28} meters, and the outer spherical shell scale diminishes from 10^{35} meters to 10^{28} meters, the "First-order Coupling Phase Transitions" are triggered in both shells. These events construct the inner and outer spherical shell boundaries of the 5th-Level Cosmic System.

As the inner spherical shell scale incrementally grows quantitatively from 10^{-28} meters to 10^{-21} meters, and the outer spherical shell scale proportionally decreases from 10^{28} meters to 10^{21} meters, the "Second-order Coupling Phase Transitions" occur synchronously in both shells, thereby forming the inner and outer spherical shell boundaries of the 4th-Level Cosmic System.

When the inner spherical shell scale steadily increases quantitatively from 10^{-21} meters to 10^{-14} meters, and the outer spherical shell scale correspondingly decreases from 10^{21} meters to 10^{14} meters, the "Third-order Coupling Phase Transitions" are initiated in both shells, generating the inner and outer spherical shell boundaries of the 3rd-Level Cosmic System.

As the inner spherical shell scale continuously rises quantitatively from 10^{-14} meters to 10^{-7} meters, and the outer spherical shell scale gradually declines from 10^{14} meters to 10^7 meters, the "Fourth-order Coupling Phase Transitions" take place in both shells, establishing the inner and outer spherical shell boundaries of the 2nd-Level Cosmic System.

When the inner spherical shell scale finally ascends quantitatively from 10^{-7} meters to 10^0 meters (1 meter), and the outer spherical shell scale descends from 10^7 meters to 10^0 meters, the "Fifth-order Coupling Phase Transitions" occur synchronously in both shells, completing the formation of the inner and outer spherical shell boundaries of the 1st-Level Cosmic System.

Based on the hierarchical architecture mechanism of the "concentric double-spherical shell inversion symmetry structure", taking the transition from quantitative change to qualitative change as the sequence, it accurately deconstructs the generation logic of cosmic hierarchical boundaries and deeply reveals the creation path of the universe from high-level systems to low-level systems. This mechanism breaks through the boundaries of traditional cognition, transforms mathematical symmetry from a theoretical framework into the underlying coding of the cosmic architecture, while demonstrating the symbiotic and co-evolving relationship with physical mechanisms, achieving a perfect unity of mathematical laws and physical reality in the formation of the basic cosmic structure. It provides a rigorous and forward-looking theoretical paradigm for exploring the hierarchical evolution of the universe.

It is worth noting that the scale characterization of the above-mentioned hierarchical cosmic systems adopts a logarithmic transformed average scale. When a high-level universe creates a low-level universe, it is accompanied by the generation of numerous low-level parallel universes of different scales. The set of these parallel universes, whose

logarithmic average scale always follows the mathematical constraint laws of the inner and outer spherical shells. Although the specific scale of each parallel universe varies due to multiple factors such as space-time topology and energy distribution, as a whole, their scale distribution forms a "scale synergy effect" through the multi-dimensional effects of the physical constant threshold of the high-level system and the energy conduction mode—just as the position of individual atoms in crystal growth is random, but the overall lattice structure always follows specific constants. The scale distribution of these parallel universes is also limited to the neighborhood of the logarithmic average scale by the mathematical rules set by the high-level system, thus maintaining the overall order of the hierarchical architecture.

The hierarchical relationship of the Eight-Level Cosmic Systems is just like the nested structure of a Matryoshka doll—each low-level universe is bidirectionally wrapped and constrained by the inner and outer spherical shells of the high-level universe from both micro and macro dimensions. The inner spherical shell is not only the carrier of micro-order but also acts as an information "holographic memory", completely carrying the core components and evolutionary information of all cosmic systems at higher levels than itself. The core primitives of these higher-level universes are compressed and stored in the inner spherical shell in the form of quantum coding. When a high-level system creates a low-level universe, it is transmitted directionally as an "initial program", injecting the underlying logic for the development of the low-level universe. The outer spherical shell acts as the demarcator of the macro boundary, defining the scope and direction of its evolution through mechanisms such as gravitational field topology and space-time dimension limitations.

This collaborative regulation model of "internal drive and external constraint" makes the low-level universe like an interstellar ship equipped with a precision power system, sailing in the "Cosmic Sea" constructed by the high-level system. The gravitational topology of the outer spherical shell is like the undercurrent and tide of seawater, limiting the feasible navigation channels of the ship from a macro level; the micro-conduction mechanism of the inner spherical shell is like the ship's engine and navigation system, endowing it with the ability to autonomously adjust sailing speed and fine-tune the course. Although the ship can flexibly turn, accelerate, or decelerate within the established channel, it can never break through the boundary constraints of the ocean. Each low-level universe maintains a relatively independent operating logic in the "nested orbit" while following the macro order set by the high-level system, ultimately constructing a closely linked and clearly hierarchical cosmic architecture system.

5. THEORETICAL PREDICTIONS

This study is grounded in the first principles of the universe, innovatively proposing core concepts of EPs and MPs. It constructs a logical system with five basic principles, integrating four core inferences including the generation mechanisms of EMPs and PUs, as well as the Concentric Double Spherical Shells Inversion Symmetry Structure. Through rigorous logical deduction and theoretical breakthroughs, it systematically expounds the internal laws of the origin and evolution of the universe. The study proposes the Cosmic Hierarchical Phase Transitions Theory, revealing that the universe evolves step by step from the 8th-Level True Vacuum state to the 7th-Level False Vacuum state, 6th-Level Physical Space state, and continues evolving down to the 5th, 4th, and finally the 1st-Level Cosmic System. This systematically presents the essential laws of the universe from "nothingness" to "being" and from simplicity to complexity, providing a brand-new theoretical perspective and research direction for exploring the ultimate mysteries of the universe.

5.1 The 8th-Level Cosmic System - The Cosmic Sea of Holographic Primitives

5.1.1 The Cosmic Sea of Holographic Primitives

As the absolute origin of the universe, the 8th-Level Cosmic System is a "True Vacuum" system formed by the coupling of an absolute vacuum state and the PUs Field. In this primordial state, field symmetry remains unbroken, with EPs and MPs sealed within the PUs Field as undifferentiated potential—containing only the foundational primitives for cosmic creation, without formulated matter. Beyond the scope of conventional matter and electromagnetic wave interactions, its energy characteristics closely align with the dark energy phenomenon in modern physics, here termed quantum primitive potential energy.

The 8th-Level Cosmic System is defined by its core attribute of "True Vacuum State," permanently existing at the absolute zero ground state and satisfying the zero-energy eigenvalue condition (apparent energy equals zero). The fundamental energy units, "PUs," adhere to Bose-Einstein condensation theory: all PUs occupy the same quantum state, exhibiting macroscopic quantum coherence that forms a stable structure with time-translational invariance in quantum field theory.

Each PU, as a holographic qubit, leverages its unique quantum superposition and entanglement to fully encode the universe's cross-dimensional evolutionary information since its birth—herein defined as Holographic Primitives.

Collectively, these Holographic Primitives constitute the Cosmic Sea of Holographic Primitives, forming a quantum storage matrix that carries the universe's origin information.

5.1.2 Quantum Primitive Self-Organization Genesis and Holographic Evolution

The 8th-Level Cosmic System exhibits a unique non-Euclidean geometric topology of concentric nested double spherical shells: the inner shell collapses into a zero-dimensional singularity containing the universe's primordial information, symbolizing the origin where all things converge; the outer shell extends infinitely in a fractal geometric form, mirroring the universe's vastness. This perfectly interprets the Oriental philosophical wisdom of "infinitely small within, infinitely large without," serving as a bridge connecting the microscopic quantum world and macroscopic cosmic space-time.

Within the Cosmic Sea of Holographic Primitives, PUs continuously undergo quantum vacuum fluctuations -externally manifested as the instantaneous creation and annihilation of virtual particle pairs, fundamentally revealing the quantum mechanical origin of dark energy. These fluctuations are not only the underlying pulsation of cosmic energy but also drive the self-organization evolution and holographic reconstruction of the entire cosmic system through quantum entanglement networks, making each primitive a microscopic hub that records and propels cosmic processes.

When phase transitions occur in PUs, quantum primitives do not evolve randomly but follow a precise self-organization optimization mechanism. Using origin holographic information as a blueprint, they screen and construct countless genesis paths. In this process, dark energy is directionally converted into bidirectional time dimensions and two-dimensional space:

- Bidirectional time endows the newborn 7th-Level Cosmos with causal cycles and self-calibration, dynamically linking past and future.
- Two-dimensional space serves as the original carrier of cosmic information, encoding and storing key cosmic parameters and evolutionary rules in the form of quantum bits, providing an information template for the subsequent emergence of matter and energy.

Different self-organization paths correspond to differentiated combinations of physical parameters, giving birth to numerous parallel 7th-Level Cosmic Systems with unique Planck constants and phase transition conditions--achieving an ordered genesis leap from the symmetric ground state to a multiverse.

5.2 The 7th-Level Cosmic System--the Cosmic Sea of Time Primitives

5.2.1 PUs Phase Transitions: The Foundational Event of the 7th-Level Universe

The 7th-Level Cosmic System originates from the PUs phase transitions of the 8th-level system. Based on the Principle of Inversion Symmetry of Cosmic Primitive Motions, when the critical parameters within the 8th-level system are activated, its unique concentric nested double-shell structure (inner shell 10^{-k} m, outer shell 10^k m) undergoes synchronous topological reconstruction, evolving into a new double-shell symmetric framework with False Vacuum characteristics (see Figure 3 for details). The PUs phase transitions, analogous to cosmic "genetic recombination", drive EPs, MPs, and EMPs to complete their first ordered arrangement in the False Vacuum environment, and prompts the formation of an exquisite tri-core coexistence equilibrium system of Electric Core, Magnetic Core, and Electromagnetic Core. The three energy cores, through mutual restraint and collaborative resonance, establish a stable dynamic foundation for subsequent space-time evolution.

5.2.2 Bidirectional Time Flow: The Cosmic Sea of Time Primitives

In the False Vacuum state of the 7th Universe, although there is no existence of physical matter or classical electromagnetic waves, EPs, MPs and EMPs exhibit highly ordered quantum covariant motion under absolute zero temperature. These fundamental units follow a two-way dynamic symmetry:

- On one hand, cosmic primitives at the inner spherical shell trigger a quantum diffusion effect driven by potential energy density differences, causing primitives at the inner shell to expand outward along the forward time arrow.
- On the other hand, according to the "Principle of Inverse Symmetry of Cosmic Primitive Motions", cosmic primitives at the outer spherical shell move in the opposite direction through reverse convergence, forming a reverse time dimension (see the dynamic arrow model in Figure 3).

This bidirectional time flow does not merely involve directional opposition but constitutes a rigorous causal closed-loop system: the forward time dimension dominates the expansion of primitive space and energy release, while the reverse time dimension maintains system conservation and dynamic balance through information backtracking. Their

collaborative effect forms the unique Time-Correlated Coding Mechanism of this hierarchy. Specifically, the motions of EPs, MPs, and EMPs give rise to the Electric Core, Magnetic Core, and Electromagnetic Core. Through bidirectional interaction and dynamic correlation, the three cores construct an efficient cosmic information storage-reading-transmission network, ultimately converging into the Cosmic Sea of Time Primitives.

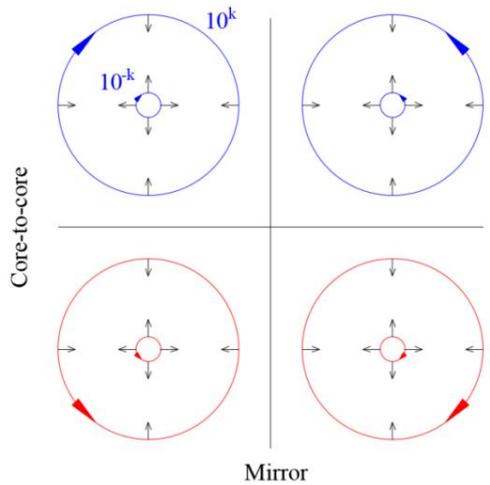


Figure 3. Bidirectional Movement Schematic. The area enclosed by the blue line: motion region of the MP; the area enclosed by the red line: motion region of the EP; k is the scaling exponent of PUs phase transition.

It is worth noting that the instantaneous creation- annihilation of virtual particle pairs during the quantum vacuum fluctuation of EMPs essentially reveals the quantum mechanical nature of sub-underlying dark energy, providing continuous fundamental driving force for the entire cosmic system.

5.2.3 EMP Phase Transitions: Self-Organization Genesis of the Cosmic Sea of Time Primitives

The 7th-Level Cosmic System originates from the PU Sea of the 8th-Level Cosmic System, whose holographic PU information is systematically embedded in the space-time framework of the 7th Level Cosmos in the form of quantum states. This primordial holographic property constitutes the underlying logic of quantum evolution-the 8th Level PU information, acting as the "generative algorithm" of the meta-universe, drives the ordered progression of quantum primitive self-organization optimization.

Guided by the above holographic information and driven by EMP potential, the EMP phase transition strictly adheres to the principle of least action. Through collaborative coupling with EPs and MPs, it constructs a quantum dynamical network with emergent properties. Oriented by holographic information, quantum primitives continuously iterate states and reorganize energy. When the cumulative effect surpasses the critical threshold, it triggers dimensional transition, eventually forming numerous parallel 6th-Level Cosmic System with differentiated gravitational constants.

5.3 The 6th-Level Cosmic System--The Cosmic Sea of Spatial Primitives

5.3.1 The Cosmic Sea of Spatial Primitives

The birth of the 6th-Level Cosmic System exemplifies the interlevel information transmission and structural evolution across cosmic hierarchies. As the fundamental information repository, the PUs Sea of the 8th-Level Cosmic System contains holographic information that inherently resides within the space-time of all levels, forming the core law of cosmic generation. This primordial information establishes the evolutionary tone and rule framework for the 7th-Level Cosmic System, which is characterized by a bidirectional time-symmetric structure where EMPs, EPs, and MPs maintain dynamic equilibrium under the action of primordial unity information.

When specific space-time points in the 7th-Level Cosmic System meet the phase transition conditions, EMP Phase Transitions occur simultaneously on double spherical shells centered at this point with scales of 10^{-35} meters and 10^{35} meters. This phase transition process disrupts the inherent bidirectional time-symmetric structure of the 7th Level, prompting quantum primitives--with primordial unity information as the underlying logic--to form Concentric Double Spherical Shells Inversion Symmetry Structure through self-organizing mechanisms.

In the Eight-Level Cosmic Systems, compared with the pure information state essence of the 8th-Level Cosmic System and the bidirectional time symmetry of the 7th-Level Cosmic System, the 6th-Level Cosmic System demonstrates a unique space-time creation mechanism. Through the entanglement process of phase-transformed EMPs (PTEMPs), left-handed and right-handed PTEMPs form stable topological structures via quantum correlation, interweaving to construct a spatial framework with multi-dimensional stability that completely reshapes traditional space-time symmetry.

Under the precise regulation of PUs information, these entangled PTEMPs derive an orthogonal octet-state spatial system. This system, akin to a vast quantum ocean, constitutes the Cosmic Sea of Spatial Primitives. The octet-state quanta diffused within continuously undergo intense quantum fluctuations, with virtual particle pairs instantaneously generated and annihilated, revealing the quantum mechanical essence of the third underlying dark energy and providing a new theoretical perspective for exploring the mysteries of cosmic energy.

5.3.2 Structural Characteristics of Phase-Transformed EMPs (PTEMPs)

Figure 4 illustrates the fundamental structures of two types of PTEMPs formed after the EMP Phase Transition, exhibiting strict mirror symmetry.

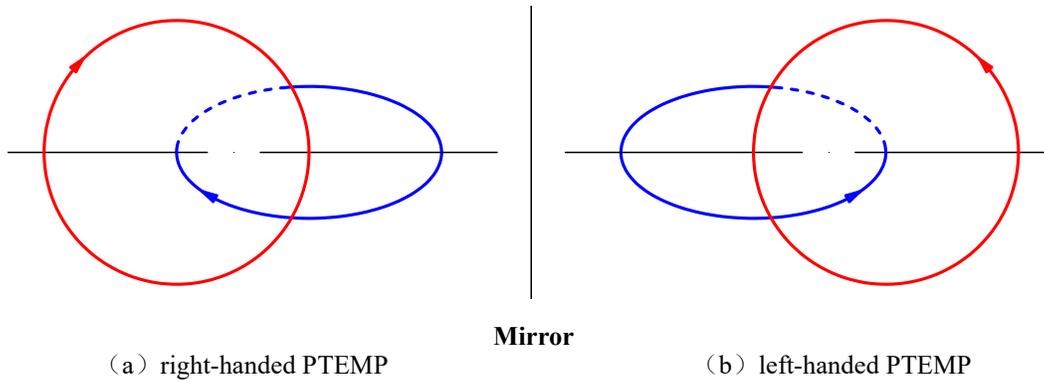


Figure 4. The Structure Schematic Diagram of the PTEMPs. The area enclosed by the blue line: motion region of a MP; the area enclosed by the red line: motion region of an EP.

In the right-handed PTEMP shown in Figure 4(a), the rotation of EPs and MPs follows the right-hand screw rule.

In the left-handed PTEMP shown in Figure 4(b), the rotation is governed by the left-hand screw rule.

This mirror symmetry transcends geometric inversion, fundamentally altering the rotational mechanism of PTEMPs. Under the current cosmic physical framework, the right-hand screw rule dominates, endowing right-handed PTEMPs with dominant characteristics --observable and perceivable through conventional physical means. Conversely, left-handed PTEMPs exhibit recessive characteristics due to their rotational mechanism conflicting with the mainstream rule, evading capture by existing detection technologies. The dominance -recessiveness dichotomy between these two PTEMPs types reveals profound correlations between physical laws and microscopic structures, offering new insights into the nature of matter and energy.

5.3.3 Analysis of Entanglement Modes and Charged Properties of PTEMPs

In PTEMPs, MPs and EPs move in orthogonal distributions. Driven by the synergistic effect of universal gravitation between EPs and universal repulsion between MPs, isomorphic phase-transformed EMPs generate two unique entanglement modes upon interaction: Electric Core Entanglement and Magnetic Core Entanglement (see Figure 5 and Figure 6 for detailed structures and mechanisms).

In the Electric Core Entanglement structure, MPs form an ordered annular arrangement around EPs, creating a MP-dominated composite. Guided by the Cosmic Minimum Energy Principle (where systems spontaneously transition from high to low energy states), this composite lowers its energy level by attracting external EPs, exhibiting negative charge characteristics. Conversely, in the Magnetic Core Entanglement structure, EPs radiate around MPs to form an EP-dominated composite. Following the same energy principle, it maintains stability by releasing excess EPs, presenting positive charge characteristics.

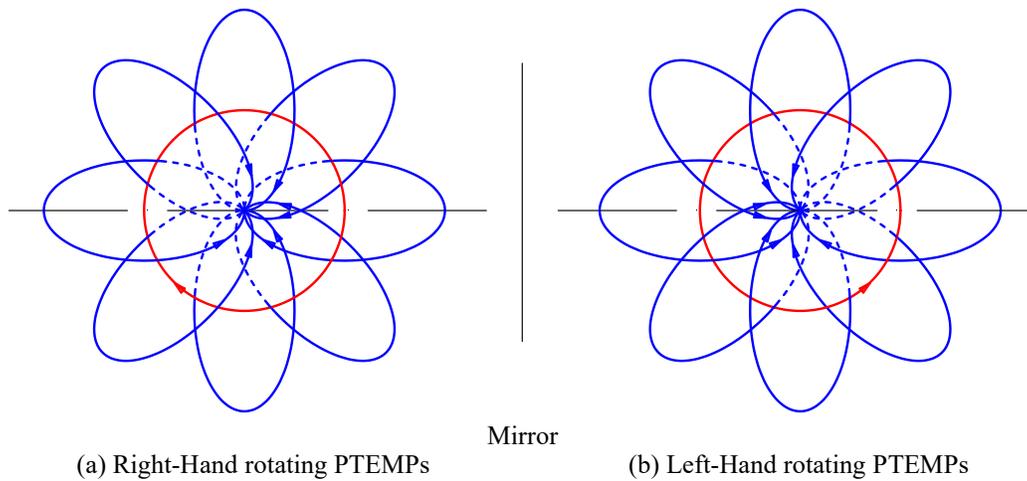


Figure 5. Electric Core Entanglement Structural Schematic. The area enclosed by the blue line: motion region of the MP; the area enclosed by the red line: motion region of EPs.

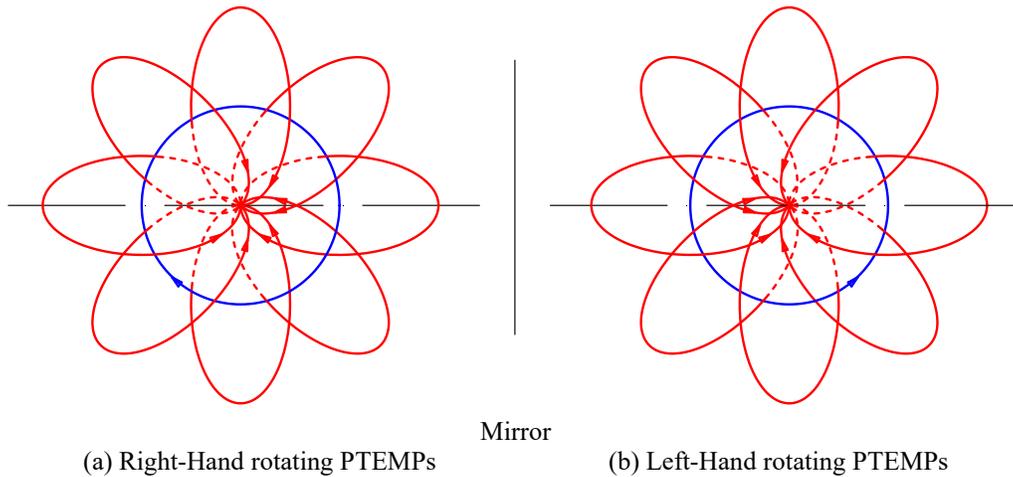


Figure 6. Magnetic Core Entanglement Structural Schematic. The area enclosed by the blue line: motion region of MPs; the area enclosed by the red line: motion region of the EP.

5.3.4 Panoramic Evolution Map of PTEMPS

The right-handed and left-handed phase transition modes, akin to the latitude and longitude of cosmic evolution, respectively sketch distinct developmental trajectories. Electric Core Entanglement and Magnetic Core Entanglement serve as precise metrics to define the core dominance in interactions between PTEMPS--whether entanglement is driven by EPs as the hub or constructed with MPs as the core. Mutual rotation and centrality, as the two essential features of PTEMP entanglement, act as the coordinate axes for constructing the theoretical framework.

(1) Based on the Orthogonal Eight-State Spatial Symmetry Principle, by establishing an intuitive coordinate system with mutual rotation as the horizontal axis and centrality as the vertical axis, the abstract evolution process can be visualized as the orthogonal four-quadrant, eight-state spatial distribution shown in Figure 7. We name this visualized model the Panoramic Evolution Map of PTEMPS, which helps us penetrate the theoretical haze and clearly grasp the underlying deep laws.

(2) The Panoramic Evolution Map deconstructs cosmic phenomena into four quadrants and eight structural forms:

First Quadrant (Right-Handed Electric Core): Contains all composites with both right-handed characteristics and an electric core rotational center.

Second Quadrant (Left-Handed Electric Core): Encompasses composites with left-handed properties and an electric core as the rotational center.

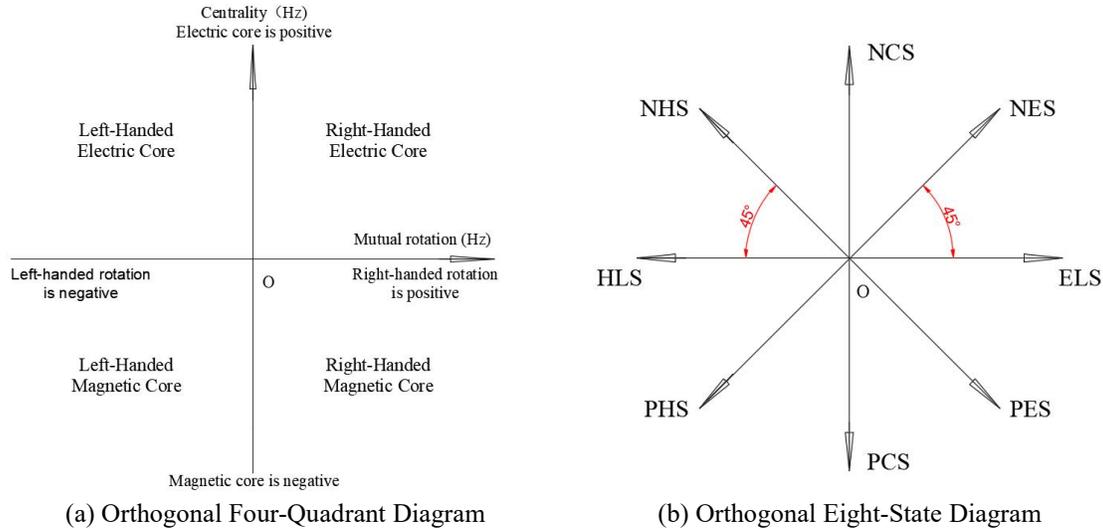


Figure 7. Panoramic Evolution Map of PTEMPs. ELS–Evident Light State; HLS–Hidden Light State; NCS–Negative Charge State; NES–Negative Evident State; NHS–Negative Hidden State; O(Coordinate center)–Primordial State; PCS–Positive Charge State; PES–Positive Evident State; PHS–Positive Hidden State.

Third Quadrant (Left-Handed Magnetic Core): Includes all composites with left-handed attributes and magnetic core dominance.

Fourth Quadrant (Right-Handed Magnetic Core): Includes all composites with right-handed composites with a magnetic core as the rotational center.

5.3.5 The Ten Directions Worlds of the 6th-Level Cosmic System

(1) Theoretical Framework of the "Ten Directions Worlds": As shown in Figure 7b and Figure 8, each of the four quadrant directions and four axial directions corresponds to an entanglement structure. These eight directions collectively give rise to eight unique entanglement structures of PTEMPs. These structures not only accurately map the eight spatial orientations of the 6th-Level Cosmic System but also symbolize eight distinct cosmic structural forms, correspondingly forming the Eight Directional Worlds. Specifically, the Eight Directional Worlds include:

- Four quadrants: Positive Evident State World (PESW), Negative Evident State World (NESW), Positive Hidden State World (PHSW), Negative Hidden State World (NHSW)
- Four axes: Evident Light State World (ELSW), Hidden Light State World (HLSW), Positive Charge State World (PCSW), Negative Charge State World (NCSW).

(2) The Relationship between Frequency and Cosmic System Evolution: In this cosmological theory, specific frequency exponential thresholds serve as key demarcation points for cosmic hierarchical evolution:

- 10^{8-k} Hz corresponds to the maximum scale (10^k meters) of the 7th-Level Cosmic System.
- 10^{-27} Hz defines the maximum scale (10^{35} meters) of the 6th-Level Cosmic System.

Based on these two critical frequencies, the universe evolves from the primordial state to the material world in the following stages:

- Primordial State (0 to 10^{8-k} Hz): As the initial stage of the universe, This frequency range contains the entire information of the universe and forms the basis for all subsequent evolutions.
- Elementary State (10^{8-k} Hz to 10^{-27} Hz): As the frequency decreases, the universe enters the 7th Level, where three basic units EPs, MPs, and EMPs form. At this stage, EMPs remain undifferentiated, forming the basic modules of cosmic Time Primitives.
- Phase-Transformed EMP State ($>10^{-27}$ Hz): When the frequency exceeds 10^{-27} Hz, EMPs undergo a critical phase transition, generating independent PTEMPs. In this stage:
 - PTEMPs exist independently within the range of 10^{-27} Hz to 1 Hz, serving as prequel forms for material composition and belonging to the transitional phase of material world formation.
 - When the frequency exceeds 1 Hz, PTEMPs start quantum entanglement, gradually aggregating into basic material units like atoms through microscopic quantum interactions-marking the birth of the material world.

This theory systematically unveils the complete sequence of the universe evolving from the primordial state to the material world through elementary generation and EMP phase transition, constructing a logically rigorous and hierarchically distinct cosmic generation model.

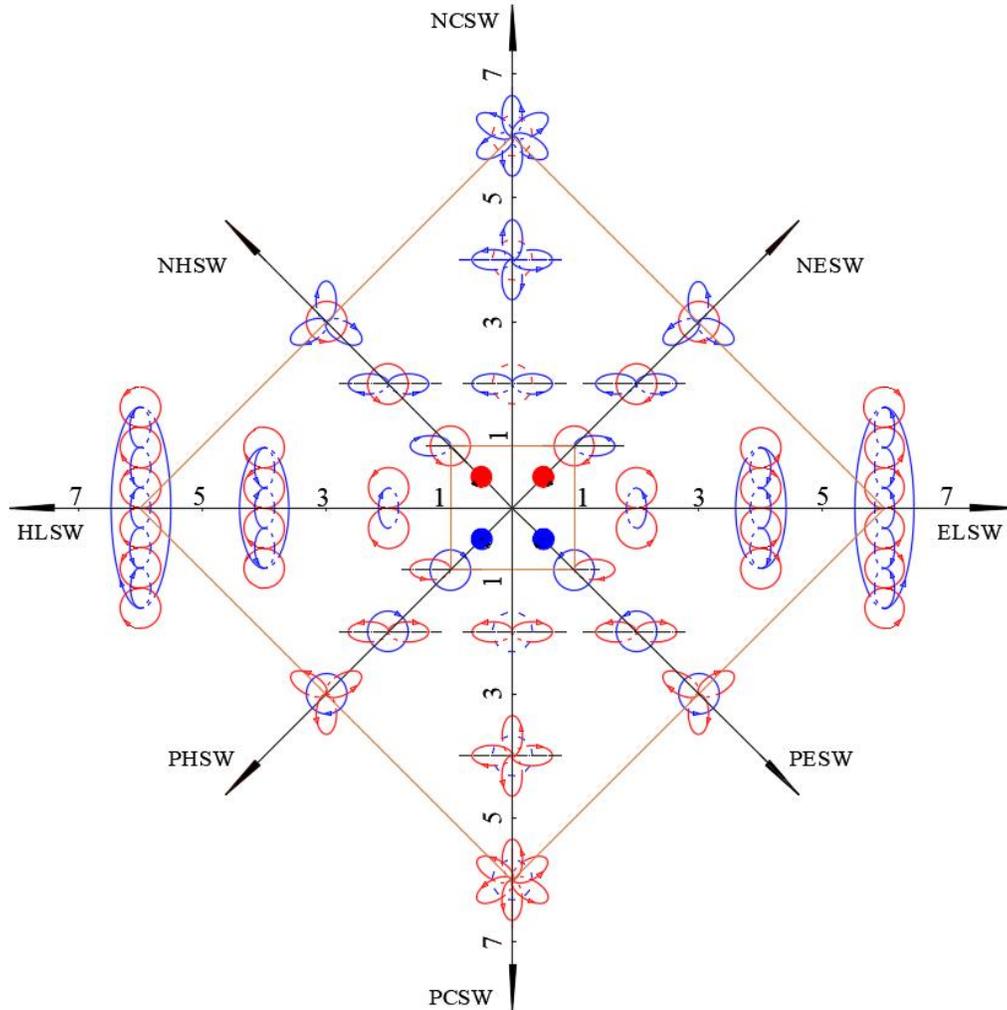


Figure 8. Schematic of the Ten Directions Worlds Morphology (Central Frequency Domain). ELSW–Evident Light State World; ESW(Near the coordinate center)–Elementary State World; HLSW–Hidden Light State World; NCSW–Negative Charge State World; NESW–Negative Evident State World; NHSW–Negative Hidden State World; PCSW–Positive Charge State World; PESW–Positive Evident State World; PHSW–Positive Hidden State World; PSW(Coordinate center)–Primordial State World; the area enclosed by the blue line: motion region of the MP; the area enclosed by the red line: motion region of the EP; the area enclosed by the blue line: motion region of the MP; the area enclosed by the red line: motion region of the EP.

(3) Theoretical framework of the "Ten Directions Worlds": As shown in Figure 8, the Eight Directions extended from eight spatial orientations, together with the 8th-Level Cosmic System at the coordinate origin (encompassing frequencies $x \in [0, 10^{8-k}]$ Hz) and the 7th-Level Cosmic System bounded by 10^{-27} Hz (encompassing frequencies $x \in [10^{8-k}, 10^{-27}]$ Hz, where x is a specific frequency), jointly construct a complete and rigorous theoretical framework for the 6th-Level Cosmic System. This framework embodies the 6th-Level Cosmic System as the "Ten Directions Worlds" - taking the Eight Directional Worlds as extension domains and the two core worlds (Primordial State World and Elementary State World) as primary domains.

It systematically and comprehensively presents the complete evolutionary sequence from the 7th-Level Cosmic System, through EMP Phase Transitions and independent development, to the formation of the physical world, establishing a logically tight and highly self-consistent cosmic generation model.

5.3.6 Morphological Transitions in the Ten Directions Worlds

Within the Ten Directions Worlds, a dynamic transformation mechanism exists between the ten morphological forms,

Crucially, vector equation (7) has an inherent correspondence with the "superconductivity phenomenon" in modern physics. The equation reveals the mechanism of superconductivity from a micro-level, providing important theoretical support for breaking through traditional theoretical limitations and systematically unraveling the essence of superconductivity. It is expected to become a key theoretical foundation for promoting breakthroughs in superconductivity research.

5.3.7 Six Directions Worlds Covariance

In the Ten Directions Worlds of the 6th-Level Cosmic System, there are dynamic interconnections. The following discusses the associative and origin-returning characteristics of the Six Directions Worlds within the Ten Directions Worlds from the perspectives of the Optical Axis Direction and the Core Axis Direction respectively. Assuming that the state points of each world in Figure 9 have the same frequency, the following correlation formulas can be obtained based on vector relationships in the Optical Axis Direction:

$$(A+B)+(D+E)=C+F=O \quad (8)$$

Vector Equation (8) shows that the Positive Evident State and Negative Evident State can combine into the Evident Light State, while the Positive Hidden State and Negative Hidden State can merge into the Hidden Light State. The Hidden Light State and Evident Light State can then combine and return to the Primordial State(O) of the 8th-Level Cosmic System.

Similarly, in the Core Axis Direction, under the condition of the same frequency, the following correlation formulas can be obtained based on vector relationships:

$$(G+H)+(J+K)=I+L=O \quad (9)$$

Vector Equation (9) indicates that the Positive Evident State and Positive Hidden State can combine into the Positive Charge State, while the Negative Evident State and Negative Hidden State can merge into the Negative Charge State. The Positive Charge State and the Negative Charge State can then combine and return to the Primordial State(O) of the 8th-Level Cosmic System.

Vector Equations (8) and (9) show that there are two types of Six Directions Worlds covariance: Six Directions Worlds Covariance along the Optical Axis Direction and Six Directions Worlds Covariance along the Core Axis Direction.

5.4 Hierarchical Evolution from the 5th-Level to the 1st-Level Cosmic Systems

5.4.1 Coupling-Decoupling Mechanism and the Eight-layered Cosmic Seas of Primitives.

In the cosmic creation system, "coupling" and "decoupling" function as core dynamic mechanisms driving the formation and evolution of cosmic hierarchies:

- Coupling characterizes the interactive integration of cosmic primitives, driving the emergence of new structures and states through energy and information exchange;
- Decoupling corresponds to the separation and independence of elemental correlations, prompting matter and energy to return to relatively independent states.

These two processes form a reversible dynamic cycle, collectively constituting the core paradigm of cosmic hierarchical construction. Based on the coupling -decoupling mechanism, the cosmic hierarchical structures are completed through Fivefold Coupling Phase Transitions:

(1) First-order Phase Transition: When the inner shell scale increases from 10^{-35} m to 10^{-28} m and the outer shell scale decreases from 10^{35} m to 10^{28} m, the two shells trigger the "First-order Coupled Phase Transitions", forming concentric double-shell physical force primitives with an inner shell of 10^{-28} m and an outer shell of 10^{28} m. Numerous physical force primitives converge to form the Cosmic Sea of Physical Forces Primitives, constructing the 5th-Level Cosmic System-the Visible Cosmic System, realizing the visualization of fundamental forces and laying the physical foundation for matter creation.

(2) Second-order Phase Transition: As the inner shell scale grows from 10^{-28} m to 10^{-21} m and the outer shell scale shrinks from 10^{28} m to 10^{21} m, the "Second-order Coupled Phase Transitions" generate concentric double -shell Galaxy Primitives (neutrinos in modern science) with an inner shell of 10^{-21} m and an outer shell of 10^{21} m. A large number of Galaxy Primitives aggregate to form the Cosmic Sea of Galaxy Primitives, establishing the 4th-Level Cosmic System-the Galactic Cosmic System, where neutrinos drive galactic structure evolution.

(3) Third-order Phase Transition: When the inner shell scale increases from 10^{-21} m to 10^{-14} m and the outer shell scale decreases from 10^{21} m to 10^{14} m, the "Third-order Coupled Phase Transitions" produce concentric double -shell Stellar Primitives (corresponding to atomic nuclei and electrons in modern science) with an inner shell of 10^{-14} m and an outer

shell of 10^{14} m. Countless Stellar Primitives (atomic nuclei and electrons) converge to form the Cosmic Sea of Stellar Primitives, constructing the 3rd-Level Cosmic System—the Stellar Cosmic System. Atomic nuclei and electrons, as basic units, drive the motion and changes of stars.

(4) Fourth-order Phase Transition: As the inner shell scale grows from 10^{-14} m to 10^{-7} m and the outer shell scale shrinks from 10^{14} m to 10^7 m, the "Fourth-order Coupled Phase Transitions" form concentric double-shell Planetary Primitives (corresponding to microorganisms in modern science) with an inner shell of 10^{-7} m and an outer shell of 10^7 m. Numerous Planetary Primitives (microorganisms) aggregate to form the Cosmic Sea of Heroic Sprit Primitives, establishing the 2nd-Level Cosmic System—the Planetary Cosmic System, where microorganisms promote ecosystem evolution.

(5) Fifth-order Phase Transition: When the scale of the inner spherical shell increases from 10^{-7} m to 10^0 m (1 m) , and the scale of the outer spherical shell decreases from 10^7 m to 10^0 m (1 m) , the two shells trigger the "Fifth Coupled Phase Transitions", generating concentric double-shelled Independent Life Primitives (corresponding to animals and plants in modern science).

During this phase transition, the inner and outer spherical shells overlap with each other, enabling the primitive structure to leap from physical aggregation and ecological collaboration to an individual autonomous survival mode. Relying on a complete physiological boundary, Independent Life Primitives can independently complete metabolism, perception, and reproduction, with their existence forms significantly differing from primitives of other levels.

Numerous individual Independent Life Primitives converge into the Cosmic Sea of Independent Life Primitives, forming the 1st Level Cosmic System (Independent Life Cosmic System). While maintaining individual survival autonomy, these independent lives form organic connections with other hierarchical cosmic systems through the flow of matter, energy, and information, driving the continuous evolution of cosmic hierarchies.

In the Eight-Level Cosmic Systems, four Higher Level Cosmic Seas serve as the core driving systems for the evolution of cosmic levels below the 5th. Among them:

- The Cosmic Sea of Holographic Primitives acts as the fundamental information repository, storing the basic laws of cosmic genesis;
- The Cosmic Sea of Time Primitives precisely regulates the flow of energy and information through its bidirectional time symmetry;
- The Cosmic Sea of Spatial Primitives constructs the basic framework of space-time via an eight-state topological structure;
- The Cosmic Sea of Physical Forces Primitives materializes the four fundamental forces, serving as the core driver of material evolution.

These four systems form the underlying logic of hierarchical cosmic evolution through complex associative networks.

The naming of "Cosmic Sea" across these levels is not merely metaphorical but rooted in their diffusivity, interactivity, and emergent properties-analogous to the dynamic associations of water molecules in an ocean. The Cosmic Seas exhibit complex relationships of coupling and decoupling:

- The higher level cosmic systems provide underlying parameters, foundational laws, and information frameworks for the lower level cosmic systems;
- The evolution of matter and life in the lower level cosmic systems reciprocally influences the parameter iteration in the higher level cosmic systems through feedback mechanisms.

This bidirectional mechanism constitutes the nested evolutionary network of the Eight-Level Cosmic Systems, aligning with the abstract characteristics of "emergent phenomena" in complex systems theory while using concrete analogies to bridge interdisciplinary understanding--ensuring a balance between academic rigor and readability.

5.4.2 Synergy Between Subjects and Mediators

The creation of the 5th-Level Cosmic System is a grand symphony, in which the Ten Directions Worlds of the 6th-Level Cosmic System each play an indispensable role. The Fourfold Worlds corresponding to the four intercardinal directions act like principal musicians in an orchestra, occupying a core position in the coupling phase transitions and decoupling process, thus dominating the shaping of cosmic structures. The Fourfold Worlds corresponding to the four cardinal directions, however, serve as agile batons—functioning as intermediate mediators, they deeply participate in cosmic evolution and link the key nodes of each phase. This synergistic mechanism forms the underlying logic of the universe from its birth to development.

5.4.3 Mediating Roles of the Four Fundamental Forces

In the critical process of the 6th Level universe giving birth to the 5th Level universe, the first coupling phase transition triggers a crucial symmetry-breaking event, from which a new order emerges and the four fundamental forces come into

being. Each force precisely corresponds to one of the four axes in the eight-state space, establishing a new symmetrical framework. These four fundamental forces exert their effects through four corresponding intermediate mediators, which act as decoders of cosmic codes and play a pivotal role in the complex processes of coupling phase transitions and decoupling, assisting in the transmission and interaction of fundamental forces.

(1) The strong nuclear force (the strong guardian of the microcosm): This theory predicts that the strong nuclear force is entirely dominated by the Positive Charge State World (PCSW). In the interaction system of subatomic particles, the PCSW serves as the core driving source of the strong nuclear force by virtue of its unique properties, establishing the framework and operational model of force (see Figure 9c). Various gluons proposed in modern physics are essentially fundamental particles generated by the dominance of the PCSW, the coordination of the Negative Charge World (NCSW), and the joint action of other worlds. As the mediating particles of the strong nuclear force, gluons tightly bind protons and neutrons at the nuclear scale through complex interaction mechanisms, maintaining the stability of subatomic particle systems and providing a fundamental guarantee for the construction and survival of the macroscopic material world.

(2) The weak nuclear force (the backstage driver of particle decay): This theory predicts that the weak nuclear force is entirely dominated by the Negative Charge State World (NCSW). In the dynamic evolution of subatomic particles, the NCSW acts as the core regulator of the weak nuclear force by virtue of its inherent properties, determining the direction and effect of the force (see Figure 9d). Various bosons proposed in modern physics are essentially fundamental particles formed by the guidance of the NCSW, the assistance of the PCSW, and the joint action of other worlds. As the mediating particles of the weak nuclear force, bosons play a decisive role in key processes such as particle decay and nuclear reactions through unique mechanisms, driving the transformation of subatomic particles and promoting the continuous evolution of material forms, providing important clues for revealing the essence and laws of microphysics.

(3) The electromagnetic force (the energy bond connecting all things): This theory predicts that the electromagnetic force is entirely dominated by the Evident Light State World (ELSW). The ELSW serves as the core source of the generation and action of electromagnetic force due to its unique energy properties. Photons and electromagnetic waves, as the concrete embodiments of the ELSW, directly establish the propagation and action paradigm of electromagnetic force (see Figure 9a). Electromagnetic force acts widely on all things in the universe, from the charge interactions of subatomic particles to the electromagnetic radiation of macroscopic celestial bodies. It not only maintains the stability of material structures but also drives the transmission of energy and information, serving as a key bond connecting matter at all cosmic levels.

(4) The gravity at cosmic scales (the duet of EPs gravitation and MPs repulsion): This theory predicts that what modern physics calls gravity is essentially a comprehensive effect generated by the superposition of EPs Gravitation and MPs Repulsion. The existence of MPs Repulsion causes the order of magnitude of gravity to be far lower than that of the other three fundamental forces. This comprehensive effect is entirely dominated by the Hidden Light State World (see Figure 9b). EPs Gravitation and MPs Repulsion are intertwined, influencing everything from the arrangement of subatomic particles to the rotational motion of macroscopic galaxies, and from the distribution of visible matter to the potential layout of dark matter, thus jointly shaping the distribution and motion order of matter-dark matter in the universe.

5.4.4 Baryonic Matter and Leptonic Matter

In the Positive Evident State World (PESW), various assemblies prominently exhibit the property of universal gravitation. This gravitation exists in an intuitive, outwardly manifest form, endowing assemblies with a powerful cohesive force that acts like an invisible giant hand, driving them to draw near and coalesce, thus laying the foundation for the initial aggregation of matter. This gravitational property is a key characteristic of matter behavior in the Positive Evident State World, playing an indispensable initiating role in the process of matter aggregating from subatomic particles to macroscopic scales.

The PESW holds a core dominant position in the formation of baryonic matter through the strong cohesive force generated by "outward gravitational manifestation." The other seven worlds act like precisely calibrated balancers and reliable checks-and-balances, synergizing their roles from unique perspectives and dimensions. Under this complex yet ordered synergistic mechanism, baryonic matter with aggregated forms is successfully born. Fundamental particles in modern physics, such as quarks and positrons, are outstanding outcomes of this collaborative creation. Their formation process is like a mysterious poem hidden in the microcosm, with every word embodying the exquisite code of the universe's composition, waiting to be deeply interpreted and explored.

The Negative Evident State World (NESW) presents a completely different scene, where the universal repulsion of various assemblies is extremely prominent and outwardly manifest. This repulsion acts as a natural resistant force, causing assemblies to tend to move away and disperse from each other, thereby establishing the initial posture of matter dispersion. This dispersive characteristic forms a sharp contrast with the aggregative characteristic of the Positive Evident State World, jointly constituting the duality of matter behavior in the cosmic microcosm.

The NESW plays a key principal role in the formation of leptonic matter, while the other seven worlds participate as balancing and constraining factors to jointly shape leptonic matter. Through their close collaboration, leptonic matter with dispersive forms is successfully formed. Fundamental particles in modern physics, such as electrons and negative quarks, are vivid embodiments of this synergistic mechanism. These leptonic particles, as important windows for exploring the diversity and complexity of the subatomic world, provide key clues for us to reveal the microcosmic mysteries of the universe, guiding us to continuously delve into the unknown realms of the microcosm.

5.4.5 The Coexistence and Co-annihilation of Eight Aggregated Forms

According to the exquisite principle of Six Directions Worlds Covariance, when baryonic matter emerges in an aggregated state, closely related different forms are simultaneously generated in specific regions. In the first quadrant, leptonic matter gradually forms an aggregated state in compliance with this cosmic law, like a tacit partner of baryonic matter, echoing each other across different material expression dimensions; the third quadrant gives birth to the aggregated form of baryonic hidden matter, which is mysterious and profound, hidden in the deep microcosm of the universe, silently participating in the grand narrative of cosmic matter composition; the second quadrant also does not absent itself from this cosmic creation dance, where leptonic hidden matter aggregates orderly in this region, collectively building the rich and diverse microfoundations of the material world. The emergence of each form contains a unique code of cosmic evolution.

Based on the principle of Six Directions Worlds Covariance, at the critical moment when baryonic matter assumes an aggregated form, as indispensable intermediate mediators in the Six Directions Worlds covariance process, the universe shapes four key aggregated forms in a highly subtle manner across the four positive directions. The aggregated form of the Evident Light State brings light and vitality to the universe with its dazzling radiance; the aggregated form of the Hidden Light State hides in the dark corners of the universe, acting like universal gravitation-elusive yet silently exerting its influence. It subtly affects the distribution and motion of matter, quietly maintaining the balance and stability of the universe, and playing an indispensable hidden role in the cosmic operational mechanism; the aggregated forms of the Positive Charge State and Negative Charge State intertwine to build a vast ocean of electricity. This electric ocean plays a vital role in both the micro and macro worlds, not only participating in the interactions between subatomic particles to shape the basic structure of matter but also influencing the magnetic fields of celestial bodies and the propagation of cosmic rays on a cosmic scale. It is the key driving force behind cosmic electromagnetic phenomena, jointly maintaining the electromagnetic order of the microcosm. They collectively form a bridge for the mutual transformation and interaction of cosmic matter and energy, an indispensable link in the cosmic operational mechanism.

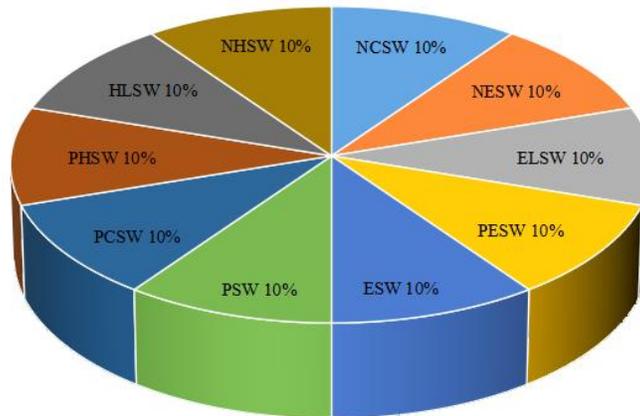


Figure 10. Distribution Proportion of the Ten Directions Worlds in the 6th-Level Cosmic System. ELSW–Evident Light State World; ESW–Elementary State World; HLSW–Hidden Light State World; NCSW–Negative Charge State World; NESW–Negative Evident State World; NHSW–Negative Hidden State World; PCSW–Positive Charge State World; PESW–Positive Evident State World; PHSW–Positive Hidden State World; PSW–Primordial State World.

On the vast stage of the 5th-Level Cosmic System, the eight unique aggregated forms, Aggregated Positive Evident State (APES), Aggregated Negative Evident State (ANES), Aggregated Evident Light State (AELS), Aggregated Hidden Light State (AHLS), Aggregated Positive Hidden State (APHS), Aggregated Negative Hidden State (ANHS), Aggregated Positive Charge State (APCS), Aggregated Negative Charge State (ANCS), are like eight dancers dancing hand in hand. They were born simultaneously at the moment of cosmic creation, are closely linked in the process of cosmic evolution,

and may annihilate together at the unknown end of the universe. This relationship of coexistence and co-annihilation profoundly embodies the close internal connections among all things in the universe, as well as the integrity and harmony of cosmic laws, providing us with a comprehensive and profound perspective for understanding the essence of the universe.

5.4.6 The Equal Coexistence of Ten Directions Worlds

According to the Principle of Existence Equivalence, when the universe is in dynamic equilibrium, the Ten Directions Worlds of the 6th-Level Cosmic System coexist equally, with each world occupying exactly the same proportion. That is, each of the Ten Directions Worlds accounts for 10% of the universe, as shown in Figure 10.

After the Ten Directions Worlds of the 6th-Level Cosmic System form baryonic matter aggregation through Coupling Phase Transitions, each world gives rise to two different states-aggregation and dispersion. The entire 5th-Level Cosmic System thus comprises twenty distinct forms, forming the Twentyfold Worlds, as illustrated in Figure 11.

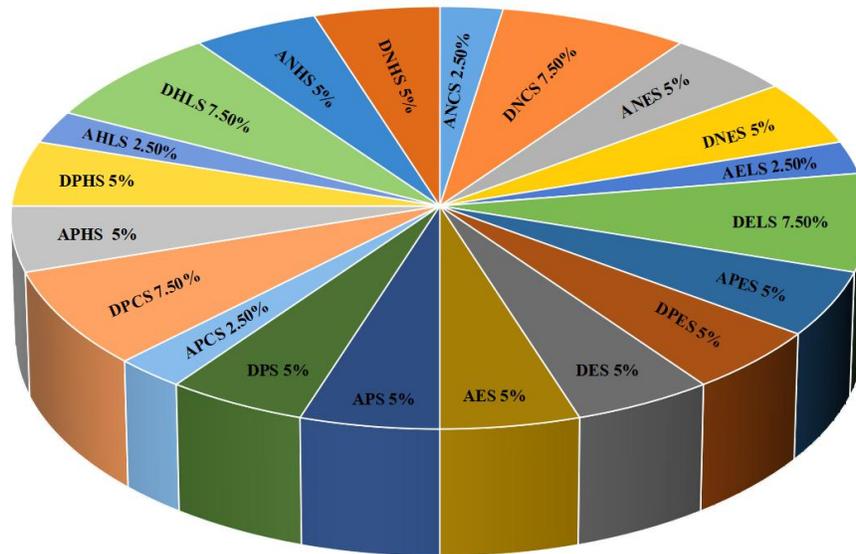


Figure 11. Distribution Proportion of the Twentyfold Worlds in the 5th-Level Cosmic System. AES–Aggregated Elementary State; AELS–Aggregated Evident Light State; AHLS–Aggregated Hidden Light State; ANCS–Aggregated Negative Charge State; ANES–Aggregated Negative Evident State; ANHS–Aggregated Negative Hidden State; APCS–Aggregated Positive Charge State; APES–Aggregated Positive Evident State; APHS–Aggregated Positive Hidden State; APS–Aggregated Primordial State; DES–Diffused Elementary State; DELS–Diffused Evident Light State; DHLS–Diffused Hidden Light State; DNCS–Diffused Negative Charge State; DNES–Diffused Negative Evident State; DNHS–Diffused Negative Hidden State; DPCS–Diffused Positive Charge State; DPES–Diffused Positive Evident State; DPHS–Diffused Positive Hidden State; DPS–Diffused Primordial State

5.4.7 Proportions of Various Aggregated States and Diffuse States in the Universe

Aggregation is an effect generated by the universal gravitation of EPs, while dispersion is an effect of the universal repulsion of MPs. In the entire cosmic system, the total number of EPs equals that of MPs, so the aggregative effect of universal gravitation and the dispersive effect of universal repulsion are mutually corresponding and equivalent.

According to the Principle of Existence Equivalence, when the cosmic aggregation and dispersion phenomena reach dynamic equilibrium:

- Each of the Aggregated Positive Evident State (APES), Aggregated Negative Evident State (ANES), Aggregated Positive Hidden State (APHS), Aggregated Negative Hidden State (ANHS), Aggregated Elementary State (AES) and Aggregated Primordial State (APS) constitutes 5% of the entire Universe (as shown in Figure 11).

- Due to the two modes of “Six Directions Worlds Covariance,” the aggregated forms of the four intermediate mediators-Aggregated Evident Light State (AELS), Aggregated Hidden Light State (AHLS), Aggregated Positive Charge State (APCS), and Aggregated Negative Charge State (ANCS)-are only half the proportion of the principal aggregated structures. Thus, each mediator’s aggregated form constitutes 2.5% of the universe at dynamic equilibrium (as shown in Figure 11).

The proportion of the ten diffuse states in the universe can be obtained by subtracting the proportion of their respective

aggregated states from the proportion of the Ten Directions Worlds shown in Figure 10, with specific values as detailed in Figure 11.

5.4.8 Dense Aggregation and Dispersed Aggregation

In the cosmic material morphology system, dense aggregation manifests as the Aggregated Positive Evident State (APES), corresponding to the "baryonic matter" defined in modern science. In dynamic equilibrium, it accounts for 5% of the total cosmic mass-energy.

Dispersed aggregation comprises seven distinct morphological states:

- Aggregated Negative Evident State (ANES): 5% .
- Aggregated Evident Light State (AELS): 2.5%.
- Aggregated Positive Hidden State (APHS): 5%.
- Aggregated Negative Hidden State (ANHS): 5%.
- Aggregated Hidden Light State (AHLS): 2.5%.
- Aggregated Positive Charge State (APCS): 2.5%.
- Aggregated Negative Charge State (ANCS): 2.5%.

Excluding lepton matter (ANES) and electromagnetic waves (AELS), the remaining five states are categorized as "dark matter" in modern science. Collectively, these seven forms of non-baryonic matter (dispersed aggregation states) account for 25% of the total cosmic mass-energy under dynamic equilibrium.

5.4.9 Proportion of Dark Energy in the Universe

When the universe is in dynamic equilibrium, dark energy consists of multiple forms:

(1) Primordial States:

- Dispersed Primordial State (DPS): Accounts for 5% .
- Aggregated Primordial State (APS): Accounts for 5%.

(2) Elementary States:

- Dispersed Elementary State (DES): 5%.
- Aggregated Elementary State (AES): 5%.

(3) Other Dispersed States:

- Dispersed Positive Evident State (DPES): 5%.
- Dispersed Negative Evident State (DNES): 5%.
- Dispersed Positive Hidden State (DPHS): 5%.
- Dispersed Negative Hidden State (DNHS): 5%.
- Dispersed Evident Light State (DELS): 7.5%.
- Dispersed Hidden Light State (DHLS): 7.5%.
- Dispersed Positive Charge State (DPCS): 7.5%.
- Dispersed Negative Charge State (DNCS): 7.5%.

These forms collectively constitute dark energy, accounting for 70% of the total cosmic mass-energy. For detailed distribution, refer to Figure 11.

5.4.10 The "Cosmic Sea" Paradigm and Antimatter Hypothesis

Just as electrons exist in the form of Dirac's sea, the seven diffused aggregated states of matter and multiple forms of dark energy in the universe together weave an immense "Cosmic Sea" that permeates the entire space-time. The baryonic matter we commonly detect and understand is akin to islands floating on this "sea". It is the existence of this "Cosmic Sea" that supports galaxies, stars, and planets-seemingly non-interacting-in suspending within cosmic space, revealing the profound mysteries of matter distribution and celestial mechanics.

Furthermore, fundamental antimatter particles, long sought after by modern science, are also integral components of the "Cosmic Sea". As they remain hidden within this "sea" in unique and unrecognized forms, humanity has not yet mastered methods for direct detection. Their distribution patterns and interaction mechanisms still await further exploration and deciphering.

6. CORRELATION AND VERIFICATION WITH EXISTING SCIENCE

6.1 Consistency with Classical Electromagnetism

6.1.1 Displacement Current and Vacuum Dielectrics

Maxwell incorporated "vacuum" into the category of dielectrics, establishing the core of classical electromagnetism-**Maxwell's equations**-and derived the electromagnetic wave equation, hailed as the "pearl of physics." This theory breaks new ground by revealing that the vacuum dielectric properties triggering "displacement current" essentially result from the synergistic action of PUs and its evolutionary products (EPs, MPs, EMPs). This discovery not only completes the micro-mechanism of classical electromagnetic theory, but also provides a new perspective for exploring the nature of vacuum, demonstrating inheritance and innovation of classical theories.

6.1.2 PUs and the Ground State of Electromagnetic Fields

In quantum electrodynamics and quantum field theory, the "True Vacuum" is defined as the "**Ground State**" when the electromagnetic field is unexcited. PUs in this theory perfectly correspond to this "Ground State," as they precisely reside in an unexcited state. This correspondence offers new ideas for unifying classical electromagnetism with modern quantum theory, showcasing the theory's potential to integrate diverse theoretical frameworks.

6.1.3 The Energy Code of the Quantum Vacuum State

Within this cosmic theoretical framework, EPs and MPs, as fundamental energy carriers, have their numerical values precisely defined as 0.5 times the Planck constant. This groundbreaking discovery aligns closely with the key coefficient "0.5" in **Dirac's electromagnetic field** quantization equation, thereby elucidating the physical essence of vacuum zero-point energy at the quantum level. This achievement not only deepens our understanding of the energetic characteristics of EPs and MPs but also provides a critical theoretical foundation for exploring their energy interaction mechanisms with the quantum vacuum state. It holds significant scientific significance and research value in unraveling the laws governing energy dynamics within the microcosm.

6.2 Explanations of Cosmological Phenomena

6.2.1 Resolution of the Dark Matter and Dark Energy Problem

Modern cosmology, through advanced detection technologies and methods such as cosmic microwave background radiation, Type Ia supernova observations, and large-scale structure measurements, has accurately determined the proportional composition of cosmic matter. Results show that baryonic matter, the ordinary matter constituting stars, galaxies, and atoms (composed of protons, neutrons, etc.), accounts for approximately 4.9% of the universe's total mass-energy; dark matter accounts for 26.8%; and dark energy comprises 68.3%. These data form the core parameters^[20-22] of the **Lambda-CDM standard model** in modern cosmology, widely validated by numerous astronomical observations and serving as a cornerstone of current understanding of cosmic matter composition.

This Cosmic Theory offers an alternative approach. Based on an in-depth study of the interactions and distributions of cosmic primitives (EPs, MPs, EMPs), it deduces the material composition proportions at cosmic equilibrium: baryonic matter (5%), leptonic matter + electromagnetic waves + dark matter (25%), and dark energy (70%). Comparing theoretical derivations with modern cosmological measurements reveals a high degree of consistency in overall trends:

- The error in baryonic matter proportion is only 0.1%.
- The combined proportion of leptonic matter, electromagnetic waves, and dark matter differs from the measured dark matter-only proportion by 1.8%.
- The error in dark energy proportion is 1.7%.

Within the permissible error range of scientific research, the theory's material proportion deductions closely match actual observations. This not only validates the theory's rationality in explaining cosmic matter composition and highlights its scientific value but also demonstrates its compatibility with modern cosmology in fundamental cognition.

6.2.2 An Innovative Solution to the Big Bang Singularity Problem

In the 1920s, Lemaitre proposed the "Big Bang" hypothesis, Gamow introduced nucleosynthesis, Hubble discovered galaxy recession, and the detection of cosmic microwave background radiation collectively established the **Big Bang theory** as the core of modern cosmology. However, the theory's predicted cosmic birth singularity-characterized by infinite density, space-time curvature, heat, and infinitesimal volume-renders all known physical laws inapplicable. Both general relativity and quantum mechanics fall into self-contradiction when explaining the singularity problem.

This theory constructs the Eight-Level Cosmic Systems based on the essential properties of EPs and MPs. The two

Top-Level Cosmic Systems are particularly critical: the 8th-Level Cosmic System exhibits holographic properties, serving as the "master blueprint" of the universe's ultimate order; the 7th-Level Cosmic System, grounded in bidirectional time and two-dimensional space, establishes a unique information storage and retrieval mechanism, giving rise to an exclusive cosmic information processing paradigm.

In these two holographic universes where dark energy defines their existential form, PUs, EPs, MPs and EMPs do not exist in isolation. Instead, they operate like precisely coordinated quantum gears through a "quantum primitive self-organization" mechanism featuring coordinated symbiosis, symmetric balance, and unity of opposites. This mechanism not only acts as the "engine" driving the quantitative and qualitative changes of the universe but also directly triggers two generative big bangs. These two cosmic events, akin to fires of creation, directly gave rise to the material universe, with their specific generative processes as follows:

(1) The PUs Phase Transitions Big Bang (Birth of Time and Two-Dimensional Space): In the 8th-Level Cosmic System, time exists in an unchanging constant state, with energy remaining in a highly condensed and unmanifested Primordial Unity state, where all maintains its original order within absolute symmetry. The PUs singularity with a diameter of 10^{-k} meters continuously accumulated energy in this extremely stable environment, eventually triggering the PUs Phase Transitions and causing a violent explosion. This process essentially represents the symmetry-breaking transition from the 8th to the 7th -Level Cosmic System-when the absolutely symmetric structure of the Primordial Unity state disintegrated, it not only shattered the inherent unchanging nature of time in the 8th-Level Cosmic System, but also gave rise to a False Vacuum state, EPs, MPs, and EMPs. Concurrently, spatial dimensions evolved from the zero-dimensional PUs to one-dimensional EPs/MPs and finally to two-dimensional EMPs.

The PUs phase transitions break the old equilibrium and trigger symmetry breaking, giving rise to a brand-new temporal symmetry structure-forward and backward time interdependently balance each other dynamically, jointly forming a bidirectional time system. Within this system, forward time drives energy dispersion, promoting the generation of low-dimensional spaces and cosmic primitives; backward time, together with the two-dimensional spatial structure, plays a dual core role: on the one hand, maintaining energy conservation to ensure system stability, and on the other hand, jointly constituting a "cosmic information collection and storage system" that captures and encodes dynamic evolution information such as energy fluctuations and dimensional transitions in real time, storing them in the fabric of space-time as quantum states. This process not only lays the temporal framework for the 7th-Level Cosmic System but also paves the way for the evolution of subsequent cosmic levels and the formation of new orders.

(2) The EMP Phase Transitions Big Bang (Birth of Three-Dimensional Space and Matter): After the formation of the 7th-Level Cosmic System, a singularity with a diameter of 10^{-35} meters suddenly underwent a massive explosion, triggering a critical symmetry breaking event. This violent explosion gave rise to Physical Space and Phase-Transformed EMP Domains, elevating the spatial dimension from two to three. Simultaneously, as the two-way temporal symmetry established in the 7th level disintegrated, a new Orthogonal Octet-State Spatial Symmetry emerged, thereby constructing the Eight Directions Worlds of the 6th-Level Cosmic System. The Primordial State World and the Elementary State World located in the central region, together with the Eight Directions Worlds, mutually echo to form the Ten Directions Worlds of the 6th-level cosmos.

Within the Ten Directions Worlds, the eight fundamental structures exhibit not only vertical and horizontal mirror symmetry in space but also form a radial symmetric distribution around a central point. This multi-dimensional symmetry reveals the process by which cosmic structures evolve from an initial highly unified state through a series of phase transitions and developments into a more intricate and ordered new system. Subsequently, the Ten Directions Worlds underwent five coupled phase transitions in Physical Space, continuously merging and evolving, ultimately forming the world we observe today.

This theory not only ingeniously resolves the singularity dilemma in traditional Big Bang theory but also provides a more reasonable explanation for the universe's early evolution.

6.2.3 The Dirac Sea and the Theoretical Paradigm Shift of "Cosmic Seas"

In the early 20th century, the pursuit of unifying special relativity and quantum mechanics reached a pivotal milestone with Paul Dirac's groundbreaking formulation of the Dirac equation. This relativistic wave equation, designed to describe the dynamics of high-speed electrons, accomplished two revolutionary feats: it inherently incorporated the property of electron spin, a quantum mechanical feature crucial for understanding atomic structure, and it predicted the existence of antimatter through its solutions encompassing both positive and negative energy states. The subsequent "Dirac Sea" hypothesis, which conceptualized the vacuum as a plenum of negative-energy electrons, not only resolved theoretical inconsistencies but also laid the cornerstone for quantum field theory. For decades, it has served as a cornerstone model for elucidating the microscopic fabric of matter.

However, as the frontiers of physics advanced into the exploration of phenomena beyond electromagnetic interactions-such as the enigma of dark matter, the cosmic acceleration driven by dark energy, and the complex dynamics of high-energy particle collisions-the limitations of the Dirac Sea theory became increasingly apparent. These unsolved

puzzles underscore the necessity for a more comprehensive theoretical framework.

This research constructs a groundbreaking cosmological theory system, proposing the concept of the Eight-Layered Cosmic Seas of Primitives—including the Cosmic Sea of Holographic Primitives, Cosmic Sea of Time Primitives, Cosmic Sea of Spatial Primitives, Cosmic Sea of Physical Forces Primitives, Cosmic Sea of Galaxy Primitives, Cosmic Sea of Stellar Primitives, Cosmic Sea of Planetary Primitives, and Cosmic Sea of Independent Life Primitives.

This system deeply integrates the fundamental laws of the universe, spatiotemporal topological structures, basic physical forces, and the evolutionary processes of matter and life, surpassing traditional cognitive boundaries in both theoretical depth and coverage. It constructs a new underlying logical framework for the universe that goes beyond the classical "Dirac Sea"—the traditional "Dirac Sea" is essentially a subset of electron primitives within the Cosmic Sea of Stellar Primitives, providing a more inclusive theoretical paradigm for understanding the hierarchical evolution of the universe.

Rigorous comparative analyses and model-based validations demonstrate that the "Cosmic Seas" theory offers significant advancements. It provides more coherent explanations for the distribution patterns of dark matter and dark energy, reveals new insights into the high-order interaction mechanisms of subatomic particles, and paves the way for resolving long-standing bottlenecks in cosmology. This theoretical innovation not only fills critical gaps in existing models but also holds the potential to reshape our fundamental understanding of the universe, marking a significant step forward in the quest to unveil the mysteries of cosmic structure and evolution.

6.3 Interpretations of Electric Fields, Magnetic Fields, and Wave-Particle Duality

This theory innovatively proposes that electric fields are the superposition effect of numerous EPs in motion, and magnetic fields are the superposition effect of numerous MPs in motion. The existence of electric fields itself serves as strong validation of EPs. In classical electromagnetism, electric fields are manifested through forces on charged particles; according to this theory, these forces originate from the gravitational superposition generated by the motion of EPs. For example, the electric field observed around a charged object is essentially the result of gravitational forces transmitted outward by the motion of EPs within the object. The rationality of EPs as the microfoundation of electric fields is indirectly proven through research and measurement of properties such as electric field strength and electric field line distribution.

Similarly, the existence of magnetic fields validates the presence of MPs. In traditional electromagnetism, magnetic fields are closely linked to electric currents and magnets. This theory posits that magnetic fields arise from the superposition of repulsive effects of moving MPs. For instance, the magnetic field around a permanent magnet reflects the superposition of repulsive forces caused by the ordered motion of MPs within the magnet. Measurements of magnetic fields (e.g., magnetic induction intensity, magnetic field line distribution) and deepened understanding of electromagnetic induction further support the view of MPs as the microorigin of magnetic fields.

This theory also innovatively identifies the "wave-particle duality" in material phenomena as a universal natural process of state transformation among the Positive Evident State World, Negative Evident State World, and Evident Light State World. By analyzing this from a new perspective, it reveals the essence of **Wave-Particle Duality**, enriches our understanding of subatomic particle behavior, and provides new directions for the development of quantum mechanics.

6.4 Explanations of Quantum Fluctuations and Unification of the Four Fundamental Forces

Based on the first principles of cosmology, this theory takes EPs and MPs as the most fundamental cosmic units, systematically revealing the nature of virtual particles in modern physics—PUs and EMPs. Studies confirm that phase transitions of PUs and EMPs are the core mechanisms driving quantum fluctuations, providing a deterministic physical origin for the random fluctuations of energy and particles in the quantum world. This fundamental mechanism indicates that seemingly irregular quantum phenomena actually follow deep-seated phase transition logic.

During EMP Phase Transitions, the resulting Phase-Transformed EMPs adhere to the Orthogonal Eight-state Spatial Symmetry Principle, constructing a panoramic view of the 6th Level cosmic evolution based on mutual rotation and centrality.

In the critical process of the 6th Level universe giving birth to the 5th Level universe, the first coupling phase transition triggers a crucial symmetry-breaking event. This break is not a chaotic deconstruction but a birthplace of new order—the four fundamental forces emerge therefrom. Each force precisely corresponds to one of the four axes in the eight-state space, thus establishing a new symmetrical framework. This new symmetry paradigm not only redefines the interaction patterns between substances but also lays a solid physical foundation for matter condensation, spatial construction, and subsequent evolution in the 5th Level universe. It weaves micro-quantum states and macro-cosmic structures closely together, bridging the transformation of the universe from abstract concepts to concrete existence.

Further exploration reveals a precise correspondence between the four positive directions and the four fundamental

forces:

The Positive Charge State World(PCSW) corresponds to the strong nuclear force. At the nuclear scale, through collaboration with the Negative Charge State World, it generates gluons carrying color charge, which-based on quantum chromodynamics-tightly bind quarks into protons and neutrons.

The Negative Charge State World(NCSW) corresponds to the weak nuclear force. By uniting with the Positive Charge State World, it produces W and Z bosons, governing particle decay processes and neutrino interactions.

The Evident Light State World(ELSW) corresponds to electromagnetic force. Using photons as mediators, it constructs atomic structures and governs electromagnetic phenomena through charge attraction and repulsion.

The Hidden Light State World(HLSW) corresponds to gravity (the superposition of EPs gravitation and MPs repulsion). Using hidden photons as mediators, its mechanism is rooted in baryonic matter's distortion of space-time, directly linked to the energy-momentum tensor of matter. Although weak, it shapes the large-scale structure of galaxies and the universe.

This theory breakthroughly unifies the four fundamental forces as natural products of cosmic matter and dark matter generation, transcending the traditional isolated descriptions of fundamental forces. By establishing a connection between micro-quantum phase transitions and macro-physical laws, it not only offers an innovative solution to the "grand unified theory" problem but also builds a theoretical bridge between the quantum world and the macro-cosmos, opening new pathways for exploring the essence of matter and cosmic evolution.

6.5 The Cross-Scale Information Transfer Mechanism of Quantum Entanglement

In exploring the laws governing the material world, the connection between micro-quantum phenomena and macro-material evolution has always been a core proposition in physics research. As the most representative **non-local phenomenon** in quantum mechanics, the physical mechanism behind quantum entanglement has long sparked in-depth discussions in academia. Based on the innovative theoretical framework of the Converged Kernel Zone and the Diffused Core Region, this section reveals how the interaction between these two domains establishes a cross-scale information transfer pathway for quantum entanglement, providing a new perspective for understanding the unity of the micro and macro worlds.

6.5.1 The Interaction Framework Between the Converged Kernel Zone and the Diffused Core Region and Cross-Scale Information Transfer

Based on the Principle of Inversion Symmetry of Cosmic Primitive Motions, Figure 12 illustrates four corresponding modes between the Converged Kernel Zone and the Diffused Core Region of Phase-Transformed EMPs: horizontally presenting a mirror-symmetric structure, and vertically constructing a symmetric mapping between the Electric Core Domain and the Magnetic Core Domain. In these correspondences, there are significant interactive overlapping regions of Phase-Transformed EMPs between the Converged Kernel Zone and the Diffused Core Region, forming bidirectional information transmission channels-changes in the Converged Kernel Zone can instantly affect the Diffused Core Region, and vice versa, the dynamics of the Diffused Core Region can reversely influence the Converged Kernel Zone, enabling real-time information interaction.

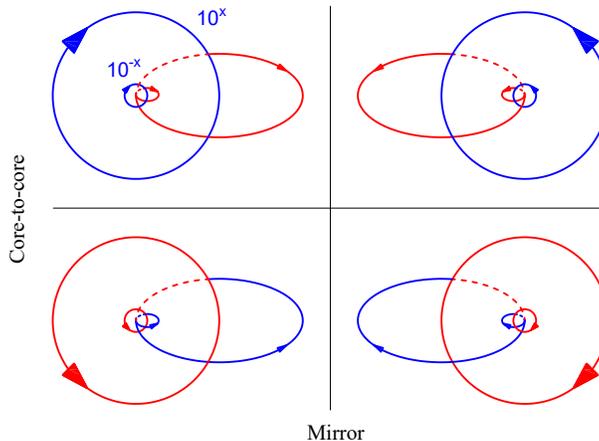


Figure 12. Converged Kernel Zone - Diffused Core Region Relationship Diagram (EMPs). The area enclosed by the blue line: motion region of the MP, The area enclosed by the red line: motion region of the EP.

From a systematic perspective, the physical reality system in the universe is essentially a complex network formed by numerous Phase-Transformed EMPs through quantum entanglement and coupling mechanisms. This underlying structure determines that each system must inherit the Converged Kernel Zone and the Diffused Core Region correspondence property of Phase-Transformed EMPs, evolving into a composite system with internal and external correlations. The system exhibits a double-layer concentric spherical shell topological structure: the Diffused Core Region (as the outer cladding layer) and the Converged Kernel Zone are nested with each other, continuously coordinating the dynamic balance between the internal and external regions of the system through bidirectional information flow, and driving the evolution process of the physical system.

Take Earth, a typical 2nd Level Cosmic System, as an example. The logarithmic average scale of the planetary core is approximately 10^{-7} meters, the logarithmic average scale of the planetary diffused core is approximately 10^7 meters. This scale law wonderfully echoes Earth's ecosystem: 10^{-7} meters corresponds to the logarithmic average scale of microorganisms, 10^7 meters is close to Earth's diameter. Notably, for the microorganisms of the same species on Earth, even when dispersed in different regions separated by 10^7 meters and never in direct contact, their DNA similarity still exceeds 90%.

This phenomenon originates from a dual cross-scale information interaction mechanism:

(1) Macro scale: Continuous information exchange between Earth's Converged Kernel Zone and Diffused Core Region drives the synergistic evolution of matter and energy;

(2) Micro scale: The Converged Kernel Zone and the Diffused Core Region system of individual microorganisms possesses non-local correlation capabilities, enabling it to break through spatial limitations and establish information-sharing networks with other microbial individuals.

Such multi-level interactions are not only the core driving force behind the synergistic evolution of cosmic matter but also reveal the universal law of cross-scale information transfer.

From a quantum perspective, each quantum can similarly be regarded as a complete system containing a Converged Kernel Zone and a Diffused Core Region. The Diffused Core Region of a quantum wraps the Converged Kernel Zone in the form of a concentric spherical shell. The two exhibit scale symmetry through logarithmic transformation and achieve information interaction through non-local correlations.

This implies that quantum information transfer is essentially the quantized expression of the universe's cross-scale interaction mechanism, providing a unified theoretical framework for explaining non-local phenomena such as quantum entanglement.

6.5.2 Dynamic mechanism of quantum entanglement based on dual-domain interaction

Take entangled quanta A and B as an example (both with a scale of 10^{-15} meters). Each forms a Converged Kernel Zone of 10^{-15} meters in size, and establishes a Diffused Core Region centered on its own Converged Kernel Zone with a radius of 10^{15} meters.

Assume quantum A is placed in a laboratory on Earth, and quantum B is emitted into cosmic space 10^{10} meters away from Earth.

(1) State change: When an external operation alters the state of quantum A's Converged Kernel Zone, its Diffused Core Region immediately generates fluctuations;

(2) Cross-domain transmission: Due to the spatial overlap between the Diffused Core Regions of quanta A and B, the fluctuation information from A's Diffused Core Region is rapidly transmitted to B's Diffused Core Region through this overlapping region, completing superluminal transmission across 10^{10} meters in a special manner within the Diffused Core Region.

(3) State synchronization: The fluctuations in quantum B's Diffused Core Region further influence its Converged Kernel Zone state based on the close coupling relationship between the Converged Kernel Zone and Diffused Core Region, ultimately achieving state synchronization with quantum A and completing superluminal information transfer.

Thus, the phenomenon of quantum entanglement is essentially a specific manifestation of the Converged Kernel Zone and the Diffused Core Region interaction mechanism at the micro-quantum level, and the synergistic effect of the dual domains constitutes the core physical process of information transfer in quantum entanglement.

7. CONCLUSION

This study establishes EPs and MPs as the fundamental building blocks of the universe based on the first principles of the universe, constructing a logically rigorous and universally applicable new cosmological theory system. Breaking through the constraints of traditional scientific research paradigms, this theory not only reconstructs the underlying logic of human cognition of the universe but also builds a unified bridge between macroscopic astrophysics and microscopic

quantum domains, providing a revolutionary theoretical framework for the development of modern physics.

7.1 Breakthrough in Dark Matter and Dark Energy Research

The theoretical framework based on the interaction mechanism of EPs and MPs has achieved a paradigm-level breakthrough in the field of dark matter and dark energy research. By systematically revealing the dynamic evolution laws and deep coupling mechanisms of EPs and MPs on a cosmic scale, this study innovatively proposes a structural model and classification system for dark matter and dark energy. This achievement not only fills the gap in the explanation of unknown matter-energy forms in existing theories but also holds the promise of triggering a fundamental revolution in cosmological models. It propels humanity's understanding of the universe's matter-energy distribution from phenomenological description to essential comprehension, providing a subversive path to solve core problems such as the universe's material composition and the nature of space-time.

7.2 Milestone in the Unification of Four Fundamental Forces

This theoretical system has accomplished a landmark breakthrough in the century-long quest to unify the four fundamental forces. Starting from the fundamental level of the universe, by deconstructing the evolutionary logic of EPs and MPs, it successfully integrates electromagnetic force, gravitational force, strong nuclear force, and weak nuclear force into a unified theoretical framework, realizing the scientific vision pursued by physicists such as Einstein throughout their lives. This grand unified theory spanning macroscopic celestial bodies and the microscopic quantum world not only breaks the cognitive barriers in traditional theories of fundamental force unification but also lays a solid foundation for theoretical physics to advance toward the "Theory of Everything," marking a new height in humanity's understanding of the universe's basic laws.

7.3 Revolution in Explaining Ultimate Cosmic and Quantum Phenomena

Regarding the ultimate mystery of the cosmic big bang singularity, this study proposes a "quantum primitive self-organization" mechanism based on the essential properties of EPs and MPs, thoroughly subverting the traditional understanding of the universe's initial state and opening up a brand-new physical landscape for space-time origin research. In explaining the phenomenon of quantum entanglement, the theory breaks through the philosophical boundaries of local realism, reinterpreting the laws of the quantum world through non-local correlation properties. This could trigger a paradigmatic revolution in the foundational theory of quantum mechanics, driving humanity's cognition of the microscopic world to achieve a qualitative leap.

These series of breakthroughs not only innovate the research paradigm of basic sciences but also herald a new round of theoretical reconstruction and technological innovation in the fields of physics and cosmology. This work is poised to become a major theoretical breakthrough that rewrites the history of human science, providing an epoch-making theoretical cornerstone for exploring the ultimate mysteries of the universe.

Abbreviation

Abbr.	Full Term	Abbr.	Full Term	Abbr.	Full Term
AES	Aggregated Elementary State	AHLS	Aggregated Hidden Light State	AELS	Aggregated Evident Light State
APES	Aggregated Positive Evident State	APHS	Aggregated Positive Hidden State	ANCS	Aggregated Negative Charge State
ANES	Aggregated Negative Evident State	ANHS	Aggregated Negative Hidden State	APS	Aggregated Primordial State
APCS	Aggregated Positive Charge State	DES	Diffused Elementary State	DHLS	Diffused Hidden Light State
DELS	Diffused Evident	DPES	Diffused Positive	DPHS	Diffused Positive

	Light State		Evident State		Hidden State
DNCS	Diffused Negative Charge State	DNES	Diffused Negative Evident State	DNHS	Diffused Negative Hidden State
DPS	Diffused Primordial State	DPCS	Diffused Positive Charge State	ELS	Evident Light State
ELSW	Evident Light State World	ES	Elementary State	ESW	Elementary State World
EMPs	Electromagnetic Primitives	EPs	Electric Primitives	HLS	Hidden Light State
HLSW	Hidden Light State World	MPs	Magnetic Primitives	NHS	Negative Hidden State
NHS W	Negative Hidden State World	NCS	Negative Charge State	NCSW	Negative Charge State World
NES	Negative Evident State	NESW	Negative Evident State World	PCS	Positive Charge State
PCSW	Positive Charge State World	PES	Positive Evident State	PESW	Positive Evident State World
PHS	Positive Hidden State	PHSW	Positive Hidden State World	PS	Primordial State
PSW	Primordial State World	PU _s	Primordial Unities	PTEMP _s	Phase-Transformed EMP _s

References

- [1] Anonymous. Supermassive black hole puts Einstein's theory to the test: Decades of data from the Milky Way's black hole bear out predictions of general relativity [J]. *Nature*, 2019, 572(7767).
- [2] Bajardi, Francesco, Blixt, Daniel, & Capozziello, Salvatore. Hamilton equations in $f(T)$ teleparallel gravity and new general relativity [J]. *Physical Review D*, 2025, 111(8): 1–24.
- [3] Zhai, Xiaobo, Huang, Changyu, Ren, Gang, et al. Extended harmonic mapping connects equations in classical, statistical, fluid, quantum physics, and general relativity [J]. *Scientific Reports*, 2021, 10(1): 1–13.
- [4] Xu, Ping, Ma, Yiqiu, Ren, Ji-Gang, et al. Satellite testing of a gravitationally induced quantum decoherence model [J]. *Science*, 2019, 366(6461): 132–135.
- [5] Selim, M. A., Ehrhardt, M., Ding, Y. Q., et al. Selective filtering of photonic quantum entanglement via anti-parity-time symmetry [J]. *Science*, 2025, 387(6741): 1424–1428.
- [6] Tian, X. L., Li, X. H., & Sun, H. Universe hypothesis of quantum eleven- dimensional spacetime [C]. *Journal of Physics: Conference Series*, 2021: 99–104.
- [7] Kragh, Helge. Quantum mechanics: A historical-linguistic perspective [J]. *American Journal of Physics*, 2025, 93(1): 7–13.
- [8] Raizen, Mark G. New tests of quantum mechanics with unstable nuclei [J]. *Physical Letters B*, 2025, 865:

139480.

- [9] Clery, D. Infrared space telescope will probe 'inflation' after Big Bang [J]. *Science*, 2025, 387(6737): 913–914.
- [10] Backes, K. M., Palken, D. A., Al Kenany, S. A., et al. A quantum-enhanced search for dark matter axions [J]. *Nature*, 2021, 590(7845): 1–8.
- [11] Boyarsky, A., Drewes, M., & Lasserre, T. Sterile neutrino dark matter [Working Paper]. Cornell University Library, 2019.
- [12] Li, Xiang. Recent status and results of the Dark Matter Particle Explorer [C]. 37th International Cosmic Ray Conference, 2022.
- [13] Castelvechi, D. New dark energy could solve universe expansion mystery [J]. *Nature*, 2021, 597(7877): 460–461.
- [14] Castelvechi, D. Dark energy is tearing the Universe apart: What if the force is weakening? [J]. *Nature*, 2024, 629(8011): 274–275.
- [15] Castelvechi, D. Hints of twisted light offer clues to dark energy's nature [J]. *Nature*, 2020, 588(7836): 21–21.
- [16] Hutere, Dragan, & Shafer, Daniel L. Dark energy two decades after: Observables, probes, consistency tests [Working Paper]. Cornell University Library, 2018.
- [17] RGough, M. P. Evidence for dark energy driven by star formation: Information dark energy? [J]. *Entropy*, 2025, 27(2): 1–15.
- [18] Yousaf, Z., Khan, S., Shrahili Mansour, et al. Modeling anisotropic dark energy self-gravitating stars satisfying the Karmarkar condition [J]. *Annals of Physics*, 2025, 474: 169921.
- [19] Tian, Xiaoliang, Li, Xiaohua, & Sun, Hui. A method for cosmic architecture analysis based on Electric Primitives and Magnetic Primitives theory [P]. Chinese Patent: 202310152282.6, 2023-07-28.
- [20] Di Haoran, Shi Haihao, Peng, Yanli, et al. The influence of dark matter on the motion of asteroids [J]. *Modern Physics Letters A*, 2023, 38(7): 2350043.
- [21] Hazra Dhiraj Kumar, Majumdar Subhabrata, Pal Supratik, et al. Post-Planck dark energy constraints[J]. *Physical Review D*, 2015, 91(8): 083005.
- [22] Yang Weiqiang, Pan Supriya, Barrow John D, et al. Large-scale stability and astronomical constraints for coupled dark-energy models [J]. *Physical Review D*, 2018, 97(4): 043529.