## A Unified Quantum Cosmology Theory: The Origin of Matter, Dark Matter, and Dark Energy Based on the ABC Vortex Field and Its Asymmetry Mechanism

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**Abstract:**  
This paper presents a complete quantum cosmological model that unifies the explanation of fundamental problems such as the quantum origin of the universe, the generation mechanisms of matter and dark matter, the nature of dark energy, and the matter-antimatter asymmetry. The core of the theory is based on the quantum dynamics of three fundamental vortex fields: the electromagnetic vortex field A, the color charge vortex field B, and the Higgs vortex field C. We demonstrate that the universe originated from a Planck-scale ABC vortex field wrapped state; through quantum tunneling, released cosmic energy quanta couple with the ABC fields to generate positive-mass matter and negative-mass dark matter, respectively. The geometric asymmetry of the color charge field B () leads to asymmetric quark production rates, and through hadron combination dynamics, strictly ensures a net baryon number . The reverse stress generated during particle production causes dynamic rupture of the vortex fields, and the released energy manifests as dark energy. For the first time, this paper derives the observed values of the cosmic energy components (, , ) from first principles, providing a complete theoretical framework for modern cosmology.  
**Keywords:** quantum cosmology; ABC vortex field; origin of matter; dark matter; dark energy; matter-antimatter asymmetry  
 1. Introduction  
Modern cosmology faces four fundamental questions: What were the initial conditions of the universe? How were matter and dark matter produced? What is the nature of dark energy? Why is there much more matter than antimatter? Based on Professor Li Zhijun’s ABC theory, this paper establishes a unified quantum cosmological model that provides complete answers to these fundamental questions.  
 2. Theoretical Framework: Quantum Origin and Field Theory Foundations  
 2.1 Quantum State of the ABC Vortex Field  
The initial state of the universe is a singularity wrapped by a twisted closed ABC composite field, with the potential given by:

2.2 Quantum Tunneling and Energy Release  
Through the instanton effect, the system decays from the false vacuum to the true vacuum:

The energy release is described by the source term:

3. Generation Mechanism of Matter and Dark Matter  
 3.1 Coupling and Mass Generation  
Cosmic energy quanta nonlinearly couple with the ABC fields:

Mass is generated via Yukawa coupling:  
- Coupling to vacuum: (matter particles)  
- Coupling to vacuum: (dark matter particles)  
 3.2 Geometric Asymmetry of the Color Charge Field  
The distribution functions of the color charge field are:

where .  
 4. Rigorous Proof of Matter-Antimatter Asymmetry  
 4.1 Quark Production Rate Equations  
The production asymmetry is given by:

4.2 Net Baryon Number Calculation  
The net baryon number is:

Substituting the production relations:

Using (when ):

This strictly proves .  
 5. Origin of Dark Energy: Dynamic Field Rupture Mechanism  
 5.1 Reverse Stress and Field Equations  
The particle stress-energy tensor modifies the field equations:

5.2 Field Rupture and Energy Release  
When , the field undergoes dynamic rupture, releasing energy:

6. First-Principles Calculation of Cosmological Parameters  
 6.1 Derivation of Energy Components  
From energy conservation:

6.2 Matter Component Ratio  
The matter ratio is determined by the coupling coefficients:

7. Conclusions and Outlook  
This paper establishes a complete unified quantum cosmological theory. The main conclusions are as follows:  
7.1. **Unified Theoretical Framework:** Provides a complete theoretical description from quantum origin to matter formation.  
7.2. **Rigorous Mathematical Derivation:** Proves , explaining the dominance of matter.  
7.3. **First-Principles Parameter Calculation:** Derives cosmological parameters from fundamental principles.  
7.4. **Testable Predictions:** Predicts special features in the primordial gravitational wave spectrum.  
Future work will focus on:  
7.4.1. More precise quantum field theory calculations;  
7.4.2. Detailed comparison with observational data;  
7.4.3. Studies of early universe phase transition dynamics.  
 References  
[1] Li, Z. J. (2023). The ABC Mechanism in the Universe.  
[2] Vilenkin, A. (1983). The Birth of Inflationary Universes. *Nuclear Physics B*.  
[3] Kolb, E. W., & Turner, M. S. (1990). *The Early Universe*. Addison-Wesley.  
[4] Peskin, M. E., & Schroeder, D. V. (1995). *An Introduction to Quantum Field Theory*. Westview Press.  
[5] Planck Collaboration. (2018). Planck 2018 results. *Astronomy & Astrophysics*.  
This paper establishes a complete theoretical framework from quantum origin to matter formation, rigorously explaining the origin of fundamental cosmic parameters and providing a solid theoretical foundation for modern cosmology.