**The Field Combination Origin of Wave-Particle Duality: A Unified Interpretation Based on the Synergistic Action of ABC Vortex Fields**

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**Abstract:**  
Based on Li Zhijun’s Field Combination Theory, this paper explicitly proposes for the first time that the “wave-particle duality” of particles is not a fundamental postulate of quantum mechanics, but rather an inevitable result of the synergistic action of three fundamental cosmic vortex fields within the particle (electromagnetic field A, color charge field B, and Higgs field C). Wave properties originate from the excitation of the A-field, manifesting as de Broglie waves; particle properties originate from the excitation of the C-field, manifesting as localized mass and energy quanta; the B-field unifies these two aspects into an indivisible field combination quantum through its coupling action. We demonstrate that the quantum state of a particle can be completely described by the field combination wave function , where the A-field component directly corresponds to the matter wave function, explaining wave phenomena such as interference and diffraction; the C-field component provides rest mass and locality, explaining particle phenomena such as collisions and trajectories. This theory provides a new physical picture for understanding the core mysteries of quantum mechanics.

**Keywords:** Field Combination Theory; Wave-Particle Duality; ABC Vortex Fields; Quantum Mechanics Interpretation; Matter Waves; Field Combination Quantum

1. **Introduction: From the “Duality” Paradox to Deconstructing the “Combinatorial Origin”**

The fundamental puzzle of quantum mechanics—“how can an object be both a wave and a particle simultaneously?”—essentially stems from the traditional view that treats waves and particles as two contradictory aspects of the same entity. This paper proposes a revolutionary viewpoint: the attributes of wave and particle originate from different physical fields within the particle, which are unified into a single quantum entity through the field combination mechanism.

1. **Theoretical Framework: Field-Theoretic Separation and Unification of Wave and Particle**

**2.1 The Sole Source of Wave Properties: A-Field (Electromagnetic Vortex Field)**

Core Argument: All wave phenomena—including the de Broglie wavelength , frequency , coherence, and the superposition principle—are entirely determined by the excitation mode of the A-field.

Mathematical Realization:  
\* The matter wave function is essentially the spatiotemporal representation of the A-field component:

* The Schrödinger equation describes the temporal evolution of the A-field:

Physical Picture: In the double-slit experiment, it is the A-field wave function of the electron that passes through both slits simultaneously and produces an interference pattern.

**2.2 The Sole Source of Particle Properties: C-Field (Higgs Vortex Field)**

Core Argument: All particle characteristics—including rest mass , locality, indivisibility, and quantized energy levels—are entirely determined by the excitation mode of the C-field.

Physical Connotation:  
\* Source of Rest Mass: is the excitation energy of the C-field, determining inertial mass and gravitational interaction.

* Guarantee of Locality: The C-field ensures the particle is detected as a whole, as seen in the “all-or-nothing” phenomenon of the photoelectric effect.
* Essence of Quantization: The energy levels of bound states result from the joint action of A-field fluctuations and C-field constraints.

**2.3 The Coupling Role of the B-Field and the Unity of the Field Combination Quantum**

Key Mechanisms:  
\* Coupling Action: The B-field (color/charge) couples the A-field and C-field into a unified field combination quantum through gauge interactions:

* Indivisibility: What is experimentally observed is always the complete field combination quantum, not an isolated A-field or C-field.
* Interaction Channel: The B-field determines how the field combination quantum interacts with other particles via electromagnetic force, strong force, etc.

1. **Reinterpretation of Key Quantum Phenomena**

**3.1 Field Combination Interpretation of the Double-Slit Experiment**

Traditional Perplexity: How can a single electron pass through two slits at once?

Field Combination Elucidation:  
1. Wave Phase: The A-field component of the electron passes through both slits in the form of a wave function, producing an interference pattern.  
2. Detection Phase: The entire field combination quantum is received by the detector as a whole.  
3. Revealed Essence: Interference is an attribute of the A-field, while point-like detection is a manifestation of the locality conferred by the C-field.

**3.2 The Essence of Wave Function Collapse from a Field Combination Perspective**

Traditional Perplexity: How does measurement cause an extended wave function to collapse instantaneously?

Field Combination Elucidation:  
\* “Collapse” is essentially the process where, after an irreversible interaction occurs via the B-field between the field combination quantum and the measuring instrument, the A-field component decoheres from a superposition state to a specific eigenstate .

* The C-field ensures the detection result is always a complete quantum unit, with no intermediate state of a “partial particle” existing.

**3.3 Quantum Entanglement from a Field Combination Perspective**

Novel Explanation: An entangled state, such as , is essentially a non-local correlation between the A-field components of two field combination quanta, while their C-field components remain spatially separated.

1. **Theoretical Verification and Experimental Predictions**

**4.1 Reinterpretation of Existing Experiments**

* Electron Diffraction: The diffraction pattern reflects the wave特性 of the A-field, while each detection point corresponds to the absorption of a complete field combination quantum.
* Quantum Tunneling: A-field fluctuations enable the particle to traverse the potential barrier, while the C-field ensures that what is detected remains a complete particle.

**4.2 Novel Theoretical Predictions**

1. Mass-Dependent Wave Nature: For the same momentum, particles with a larger C-field mass should exhibit a relatively weaker A-field wave nature.
2. Interaction Modulation: By regulating the coupling strength of the B-field, it may be possible to influence the degree to which wave-particle duality is manifested.

**5.Conclusion and Outlook**

Li Zhijun’s Field Combination Theory provides the clearest and most self-consistent ontological explanation for wave-particle duality to date:  
1. Separation of Origin: Wave nature originates from the A-field, particle nature originates from the C-field, resolving the conceptual binary paradox.  
2. Unification Mechanism: The B-field coupling integrates the two into an indivisible field combination quantum.  
3. Enhanced Explanatory Power: Provides a new framework for understanding难题 such as quantum measurement and entanglement.

This theory not only deepens our understanding of the quantum world but, more importantly, elevates the foundation of quantum mechanics from “phenomenological description” to the level of “mechanistic explanation.” Future precise experimental verification of the specific predictions of the Field Combination Theory holds the potential to pioneer a new paradigm in fundamental quantum research.

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