**Mechanism of Quantum Internal Force Imbalance and Field Combination Transition in Particle Decay: A Unified Model Based on ABC Field Combination Theory**

**Authors:** Li Zhijun, Zhao Guangyao

**Abstract:**  
Based on Li Zhijun’s ABC field combination theory, this paper proposes a unified model explaining the intrinsic mechanism of particle decay. The core argument is: The essence of particle decay is a field combination state transition process driven by quantum internal force imbalance, where the relaxation of the background potential of the Higgs vortex field (C) provides the main driving force, the recombination of the electromagnetic vortex field (A) and the color charge vortex field (B) determines the specific decay mode, and the system’s transition from a high-energy-level non-steady state to a low-energy-level steady state achieves energy release and internal force rebalancing. This paper establishes quantum dynamical equations containing ABC three-field coupling, introduces an internal force balance functional and stability criterion, derives the universal relationship between decay width and field combination state energy level difference, and provides a unified field theory explanation framework for various particle decay phenomena.

**Keywords:** ABC field combination theory; Particle decay; Quantum internal force imbalance; Higgs vortex field; Electromagnetic vortex field; Color charge vortex field; Stability transition

1. **Introduction**

In the ABC field combination theory, fundamental particles can be expressed as specific coupling states of the electromagnetic vortex field (A), color charge vortex field (B), and Higgs vortex field (C):

Traditional theories view decay as a process dominated by weak interactions but cannot explain the intrinsic driving force and stability differences of decay. This paper proposes: The fundamental cause of particle decay is the field combination state reconstruction triggered by quantum internal force imbalance, which achieves energy release and internal force rebalancing through the transition from a high-energy-level non-steady state to a low-energy-level steady state.

1. **Theoretical Framework: Internal Force Balance and Stability Criterion**

**2.1 Internal Force Balance Functional**  
Define a functional describing the system’s internal force balance state:

where are field stiffness coefficients, and is the coupling constant. Stable particles correspond to the minimum points of the functional.

**2.2 Stability Criterion**  
System stability is determined by the second-order variation:

When the system becomes unstable, and decay occurs.

1. **Decay Mechanism: Three-Field Cooperative Transition Process**

**3.1 C-field Potential Relaxation Drive**The relaxation of the Higgs field background potential is the main driving force of decay:

This process releases binding energy that drives the entire decay:

**3.2 AB-field Recombination Mode**The recombination of the electromagnetic and color charge fields determines the final decay state:

**3.3 Decay Width Calculation**  
The decay width is determined by the matrix element:

where the matrix element contains contributions from three fields:

1. **Theoretical Application and Verification**

**4.1 -decay Case**Field recombination in neutron decay n :

**4.2 Hadron Decay Case**Recombination process in decay:

**4.3 Theoretical Predictions and Experimental Comparison**The calculated decay widths are highly consistent with experimental values:

| **Decay Process** | **Theoretical Prediction (MeV)** | **Experimental Value (MeV)** |
| --- | --- | --- |
| n |  |  |
|  |  |  |
|  |  |  |

1. **Conclusion**

Based on the ABC field combination theory, this paper establishes a unified mechanism model for particle decay:  
1. Intrinsic driving force: Quantum internal force imbalance is the fundamental cause of decay  
2. Energy release mechanism: C-field potential relaxation provides the main driving force  
3. Mode selection mechanism: AB-field recombination determines specific decay channels  
4. Universal framework: The model applies to all types of particle decay

This theory provides a new unified framework for particle physics, directly linking decay phenomena to intrinsic quantum field dynamics.

**References**[1] Li, Z.J. “ABC Field Combination Theory”. Preprint (2023)  
[2] Peskin, M.E. An Introduction to Quantum Field Theory. CRC Press (2018)  
[3] Griffiths, D.J. Introduction to Elementary Particles. Wiley (2008)  
[4] Wilczek, F. “Origins of Mass”. Reviews of Modern Physics (2012)

Note: All derivations in this model are based on fundamental principles of quantum field theory, with self-consistent mathematical forms compatible with existing physical laws. Theoretical predictions are highly consistent with experimental observations.