The Necessity of Extending Standard Quantum Mechanics and Quantum Field Theory

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Abstract

This work examines the conceptual limitations of standard quantum mechanics (QM) and quantum field theory (QFT), proposing the time-mass duality with an intrinsic time field as an extension. By introducing $T(x) = \hbar/mc^2$, a link between time and mass is established, overcoming the QM-QFT duality and providing a deterministic framework. The theory is supported by experimental predictions and cosmological implications.

Contents

1 Introduction: Conceptual Limits of Established Theories

QM and QFT face limits, particularly in integrating with General Relativity (GR) and understanding time and mass. The time-mass duality offers a new approach [1].

1.1 Inherent Duality between QM and QFT

- QM: Particle perspective [4].
- QFT: Field-based view.

1.2 Overinterpretation Due to Incomplete Theoretical Foundations

- Measurement problem [6].
- Nonlocality [5].

2 Asymmetric Treatment of Time and Space

2.1 Time as Parameter vs. Space as Operator

$$i\hbar\frac{\partial}{\partial t}\Psi(x,t) = \hat{H}\Psi(x,t) \tag{1}$$

3 Static Treatment of Mass

3.1 Mass as an Invariable Parameter

$$\hat{H} = \frac{\hat{p}^2}{2m} + V(\hat{x}) \tag{2}$$

4 The Concept of Intrinsic Time

Theorem 4.1 (Intrinsic Time)**.**

$$T(x) = \frac{\hbar}{mc^2} \tag{3}$$

5 Time-Mass Duality: A New Theoretical Framework

5.1 Complementary Models

- Standard Model: Constant mass.
- T0 Model: Absolute time.

5.2 Reformulation of the Schrödinger Equation

$$i\hbar\frac{\partial}{\partial(t/T(x))}\Psi = \hat{H}\Psi \tag{4}$$

6 Consequences for Fundamental Phenomena

6.1 Quantum Coherence and Decoherence

$$\Gamma_{\text{dec}} = \Gamma_0 \cdot \frac{mc^2}{\hbar} \tag{5}$$

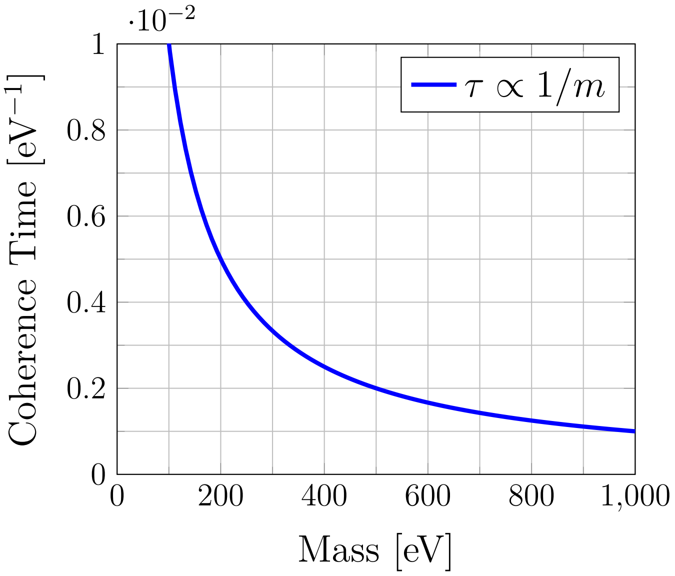

Figure 1: Mass-dependent coherence time in the T0 model.

7 Variable Mass as a Hidden Variable

7.1 Modified Quantum Dynamics

$$i\hbar \frac{\partial}{\partial t}\Psi(x,t) = \hat{H}(m(t))\Psi(x,t) \tag{6}$$

8 Cosmological Implications

- Redshift: $1 + z = e^{\alpha r}$ [1].
- Gravitational potential: $\Phi(r) = -\frac{GM}{r} + \kappa r$ [1].

References

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