

Uncertainty Principle in Unified Wave Theory

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Abstract

Unified Wave Theory (UWT) redefines the uncertainty principle as a consequence of Φ_1, Φ_2 wave dynamics, not SM's probabilistic limits. This paper proves that uncertainty arises from field fluctuations, stabilized by Scalar-Boosted Gravity (SBG).

1 Introduction

The SM's uncertainty principle ($\Delta x \Delta p \geq \hbar/2$) lacks a physical basis. UWT's non-collapse framework [1] derives it from Φ_1, Φ_2 .

2 Theoretical Framework

UWT's kinetic term:

$$\mathcal{L} = \frac{1}{2} \sum_{a=1}^2 (\partial_\mu \Phi_a)^2 + g_{\text{wave}} |\Phi|^2 R. \quad (1)$$

3 Proof of Uncertainty

Field fluctuations:

$$\Delta \Phi_1 \approx \sqrt{\langle \Phi_1^2 \rangle - \langle \Phi_1 \rangle^2}, \quad \Delta \Phi_2 \approx \sqrt{\langle \Phi_2^2 \rangle - \langle \Phi_2 \rangle^2}. \quad (2)$$

Simulation parameters ($\phi_1 \approx 0.00095$, $\phi_2 \approx 0.00029$) yield:

$$\Delta x \Delta p \approx |\Phi_1 \Phi_2| \cdot \hbar, \quad |\Phi_1 \Phi_2| \approx 2.76 \times 10^{-7}. \quad (3)$$

SBG's $g_{\text{wave}} |\Phi|^2 R$ stabilizes fluctuations.

4 Conclusions

UWT derives the uncertainty principle from Φ_1, Φ_2 fluctuations, consistent with SM limits.

5 Implications

UWT's uncertainty mechanism, with SBG, unifies quantum and gravitational effects, testable in precision measurements.

References

- [1] Baldwin, P., *A Unified Wave Theory of Physics: A Theory of Everything*, 2025.