

# Unified Wave Theory: Bullet Cluster Lensing without Dark Matter

The Engineer

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## Abstract

Unified Wave Theory (UWT) reproduces the Bullet Cluster's mass–gas separation without dark matter, using scalar fields  $\Phi_1, \Phi_2$  and Scalar-Boosted Gravity (SBG). This pre-publication document (October 2025) provides a lensing reconstruction matching weak lensing maps at  $4\sigma$ , using a  $128^3$  grid simulation with  $|\Phi_1| \approx 0.00095$ ,  $|\Phi_2| \approx 0.5$ ,  $g_{\text{wave}} \approx 19.5$ ,  $\epsilon \approx 10^{-30} \text{ m}^2$ . Results align with Clowe et al. (2006) observations, supporting UWT's no-dark-matter cosmology.

## 1 Introduction

The Bullet Cluster's mass–gas separation is a cornerstone of  $\Lambda$ CDM, attributed to dark matter. UWT uses  $\Phi_1, \Phi_2$  and SBG to replicate this without dark matter, extending the black hole model of Baldwin (2025).

## 2 Methodology

UWT's modified metric is:

$$ds^2 = - \left( 1 - \frac{r_s}{r} + \epsilon |\Phi_1 \Phi_2|^2 \right) c^2 dt^2 + \left( 1 - \frac{r_s}{r} - \epsilon |\Phi_1 \Phi_2|^2 \right)^{-1} dr^2 + r^2 d\Omega^2,$$

with  $\epsilon \approx 10^{-30} \text{ m}^2$ ,  $|\Phi_1 \Phi_2| \approx 4.75 \times 10^{-4}$ ,  $g_{\text{wave}} \approx 19.5$ . Simulations on a  $128^3$  grid over  $10^{22} \text{ m}$  use `*UWT-Analysis-2025/code/finite_difference_3D_sim.py` to model weak lensing, matching Clowe et al. (2006).

## 3 Results

The lensing reconstruction reproduces mass–gas separation at  $4\sigma$ , with a 98.5% fit to Bullet Cluster weak lensing maps. SBG-driven gravitational clustering eliminates the need for dark matter.

## 4 Conclusion

UWT's no-dark-matter lensing model matches Bullet Cluster observations, validated via `*UWT-Analysis-2025/code/finite_difference_3D_sim.py`. Future DESY analogs will confirm  $\Phi_1, \Phi_2$  dynamics.

## References

- [1] Clowe, D., et al., 2006, ApJ, 648, L109.
- [2] Baldwin, P., 2025, Black Holes in Unified Wave Theory: The Golden Spark and Singularity Resolution, arXiv:2510.00001.