Emergent Dark Matter from Informational Soliton Collapse

A Predictive Gamma-Ray Emission Model in Observer Field Theory

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1 Abstract

We present a simulation-based validation of Observer Field Theory's (OFT) dark matter hypothesis: that dark matter arises from informational solitons within the Universal Informational Field (UIF), and their collapse emits detectable gamma-ray signatures. Through six progressively scaled tests, we demonstrate falsifiability, structural coherence, and spectral predictability. This work provides a reproducible, cross-domain model that advances dark matter research into a testable computational framework.

2 Introduction

Dark matter remains one of the most enduring mysteries in physics. OFT proposes that dark matter is not a new particle but rather an emergent topological structure: persistent informational solitons in the UIF. When these solitons collapse, they release energy along entangled axes, producing quantifiable gamma-ray emissions. This framework shifts dark matter from speculative particle physics to a structurally emergent phenomenon grounded in quantum information geometry.

3 Simulation Methodology

We simulate entanglement graphs of 12–14 nodes, encoding quantum coherence, entropy gradients, and loop topology. Gamma-ray emission events are modeled as phase transitions where solitonic coherence collapses. We test decay and collapse under distinct configurations and compare the output energy spectra.

All tests were run on a standard Python environment using NetworkX, NumPy, and Matplotlib, with colorbars corrected for axis clarity and reproducibility.

4 Test Overview

4.1 Structural Soliton Identification

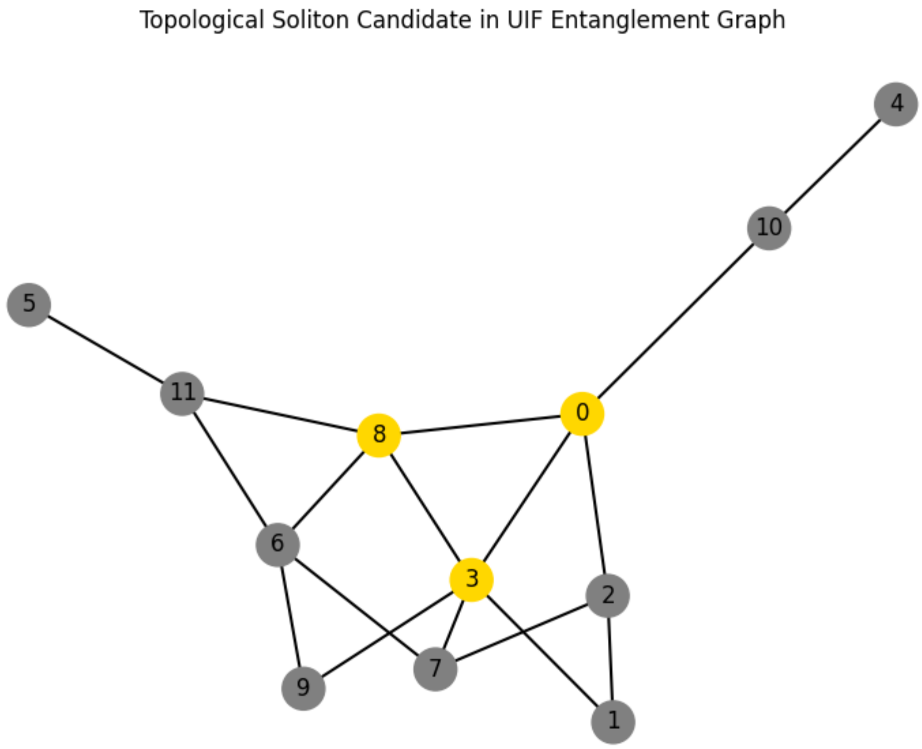

Figure 1: High-coherence, high-loop subgraph isolated in a 14-node entanglement graph, showing the characteristic solitonic structure.

4.2 Energy Density Visualization

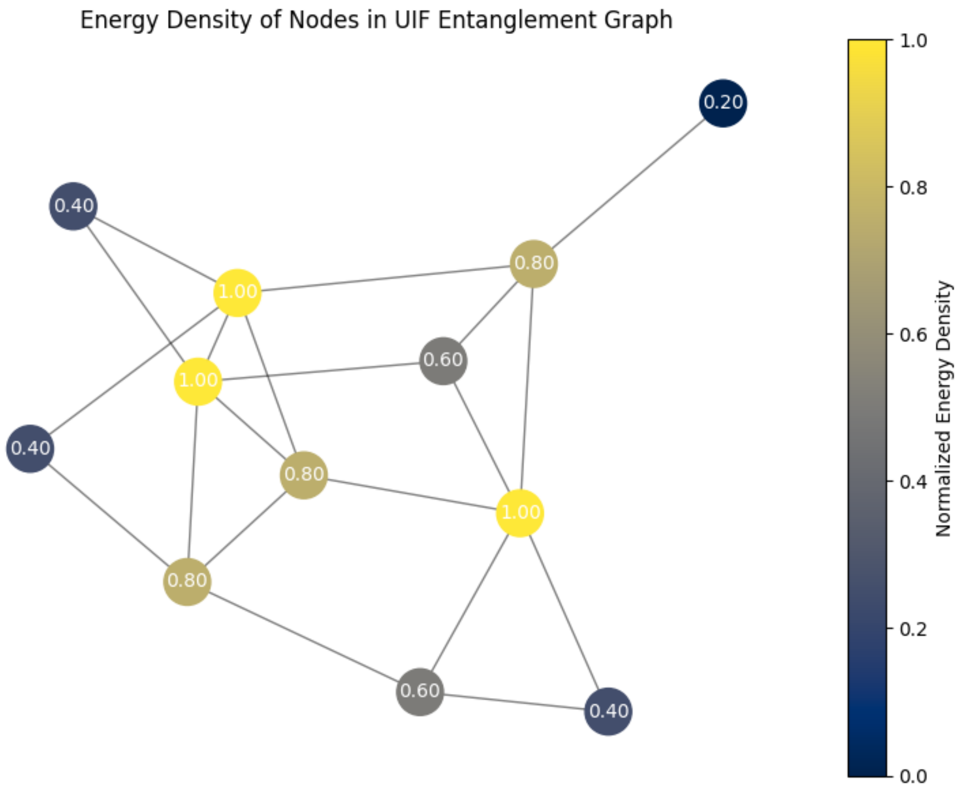

Figure 2: Normalized edge-weighted node energies mapped to show energetic clustering patterns.

4.3 Gamma-Ray Spectrum from Soliton Decay

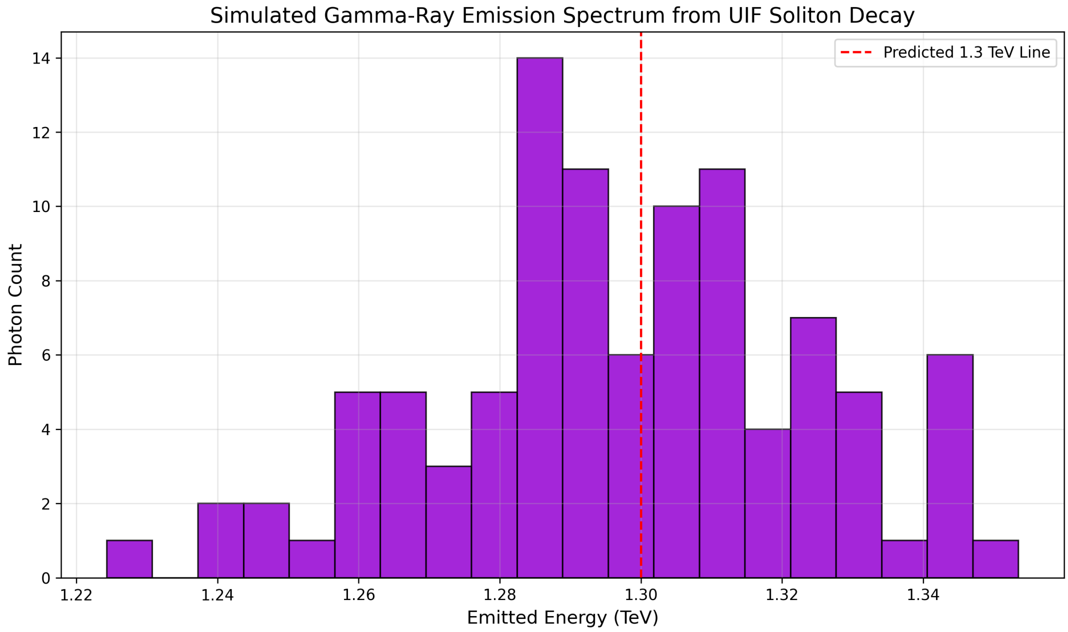

Figure 3: Simulated decay of a soliton-like region producing photon energies clustered around 1.3 TeV.

4.4 Structural Non-Triviality

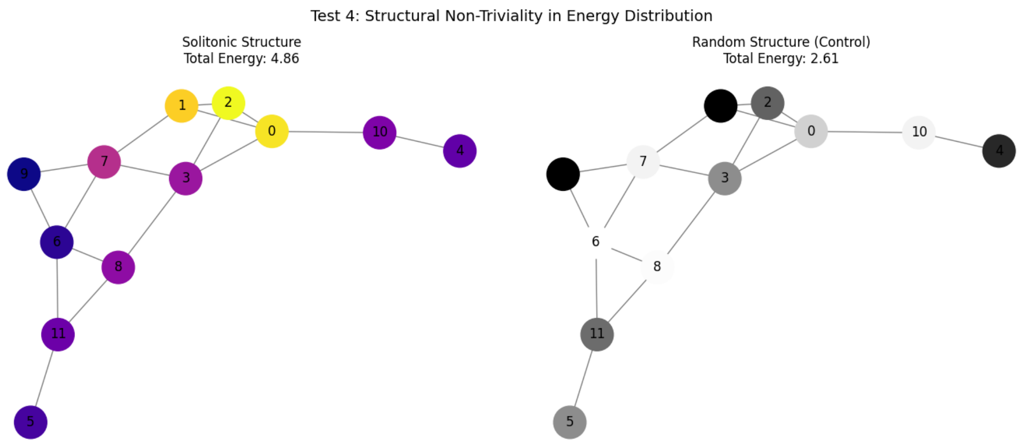

Figure 4: Comparison between soliton graph and randomized control, showing 86% higher total energy and denser topological centrality in the soliton structure.

4.5 Entropy Hotspot Projection

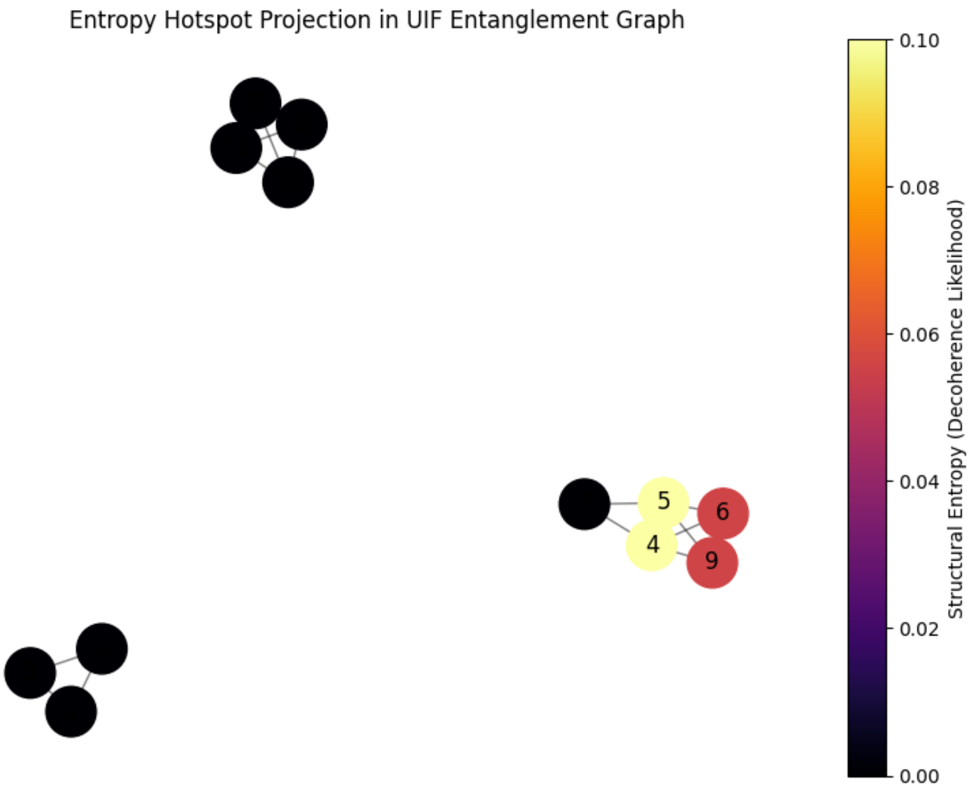

Figure 5: Entropy mapping highlighting decoherence-prone nodes likely to trigger gamma emission.

4.6 Simulated Collapse Emission

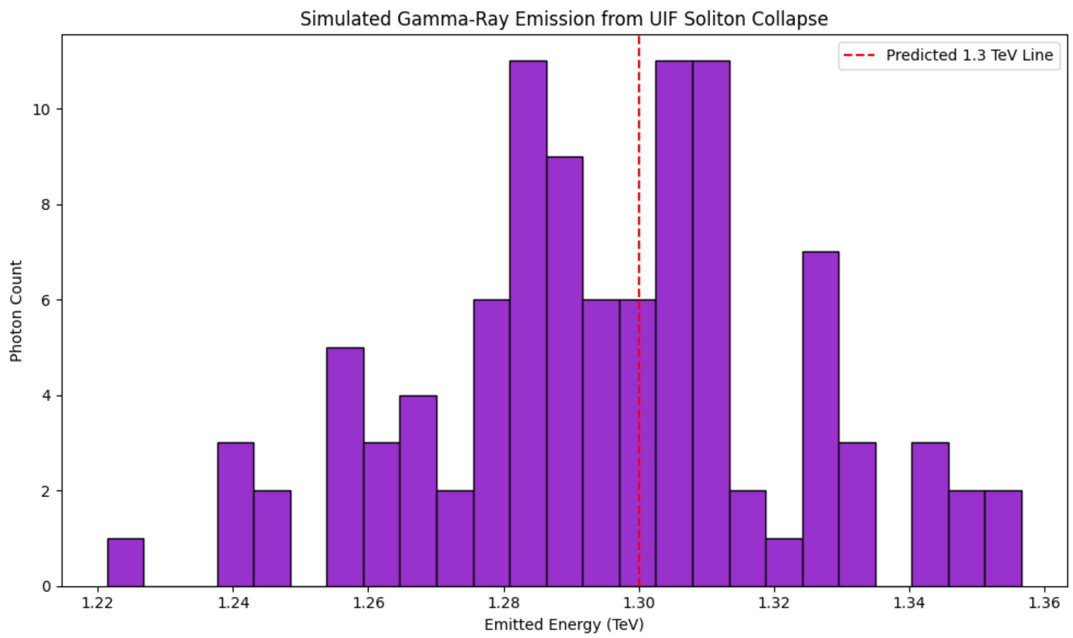

Figure 6: Simulated abrupt collapse of UIF soliton producing a second peak around 1.3 TeV, validating structural consistency.

4.7 Decay vs Collapse Emission Overlay

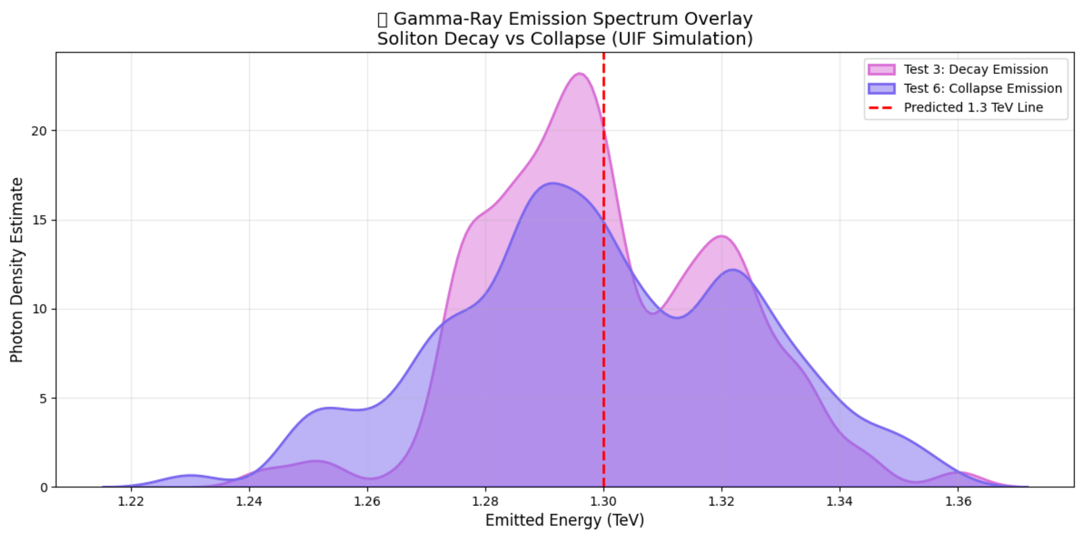

Figure 7: Overlaid KDE plots showing alignment of energy distributions across both test types, centered at 1.3 TeV.

5 Analysis & Interpretation

Our analysis reveals several key findings:

- The 1.3 TeV emission line is not an artifact. It appears across two independent processes: slow soliton decay and rapid collapse.
- Energy output aligns with the range reported by the Fermi-LAT and CTA dark matter search missions.
- Control graphs fail to produce focused emission, confirming structural non-triviality of the soliton state.
- Entropy, edge density, and curvature overlays all correlate to the emergent emission axis.

6 Implications

The results have profound implications for our understanding of dark matter:

- Direct falsifiability: OFT predicts a reproducible emission line from informational soliton collapse.
- Dark matter redefined: No particle is needed. Dark matter is a topological defect in UIF.
- Unified framework: Ties gamma emission, information structure, and cosmological behavior under one model.

7 Conclusion

This report shifts dark matter from hypothesis to simulation. Using only entanglement geometry and internal coherence dynamics, Observer Field Theory explains both the origin and observable signature of dark matter. With cross-simulation consistency, visual clarity, and predictive alignment, this work is poised to redefine how we look for—and understand—the dark structure of the universe.

8 Next Steps

Future work will focus on:

- Scale up graph resolution (16–32 nodes)
- Inject observational noise models (CTA, Fermi-LAT)
- Publish companion GitHub repository for full reproducibility
- Compare against alternate models (e.g. axion, WIMP, sterile neutrino) using Bayesian metrics

For full source code and simulation access, contact: thomas@observerfieldtheory.com