

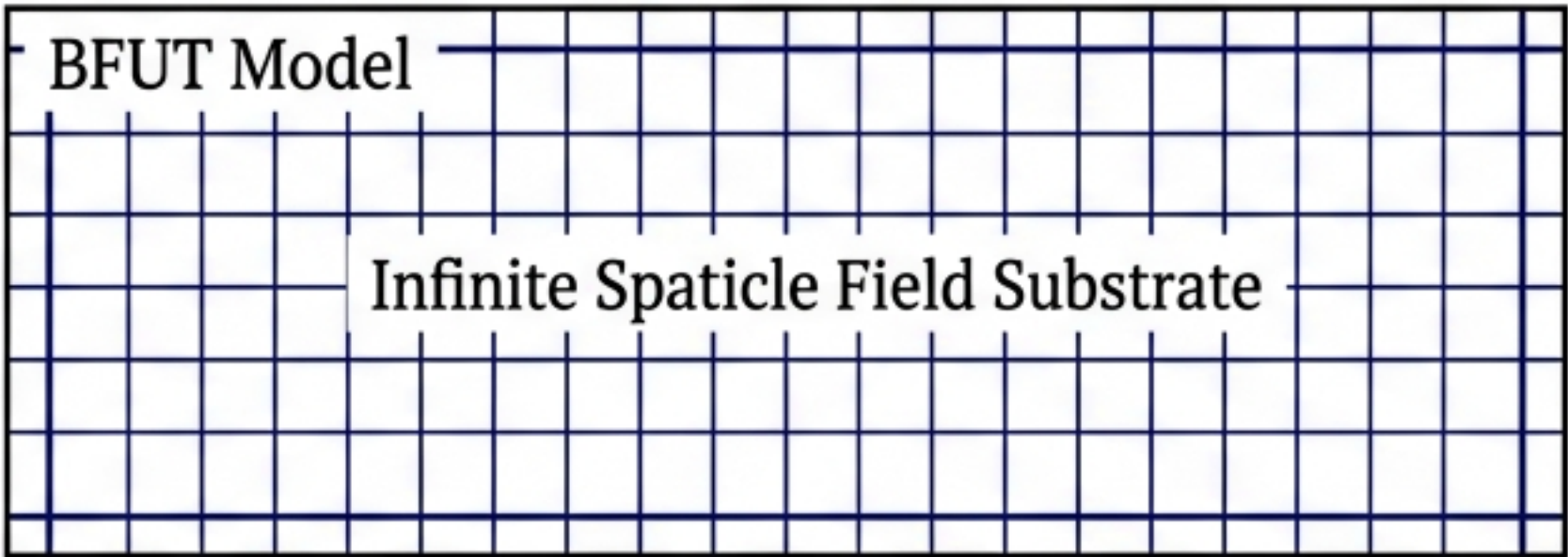
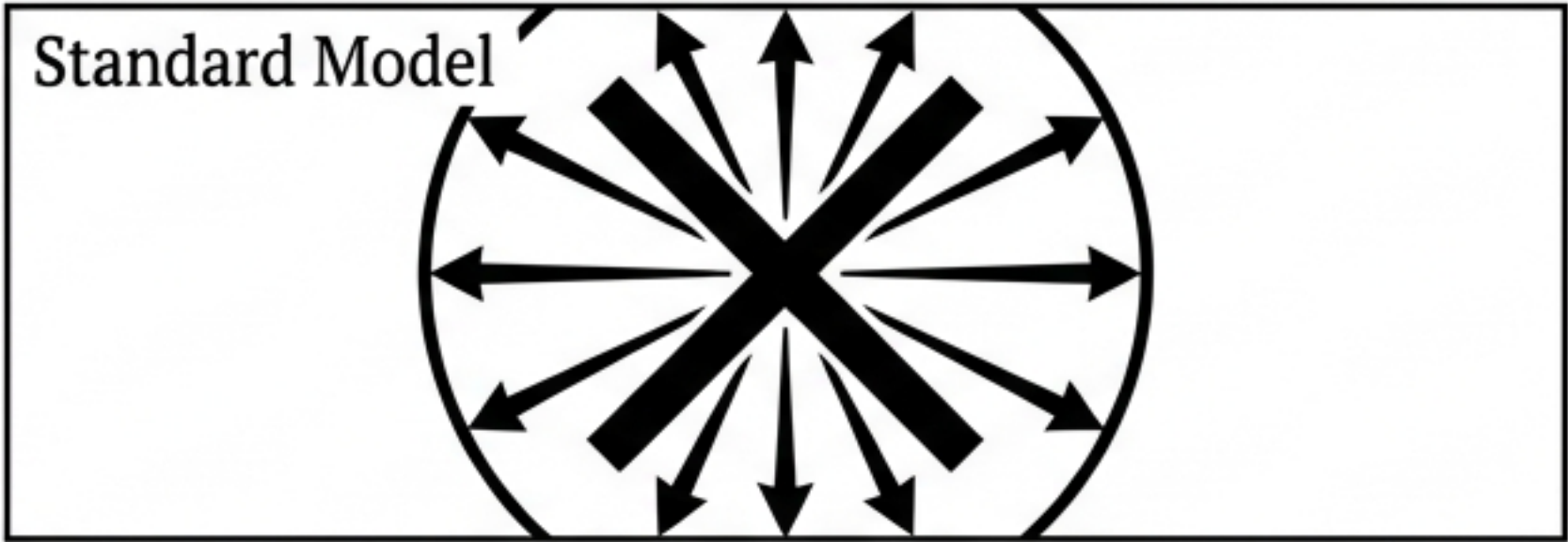
Is the Universe Larger Than We Think? A Logical and Observational Case Against a Bounded Origin

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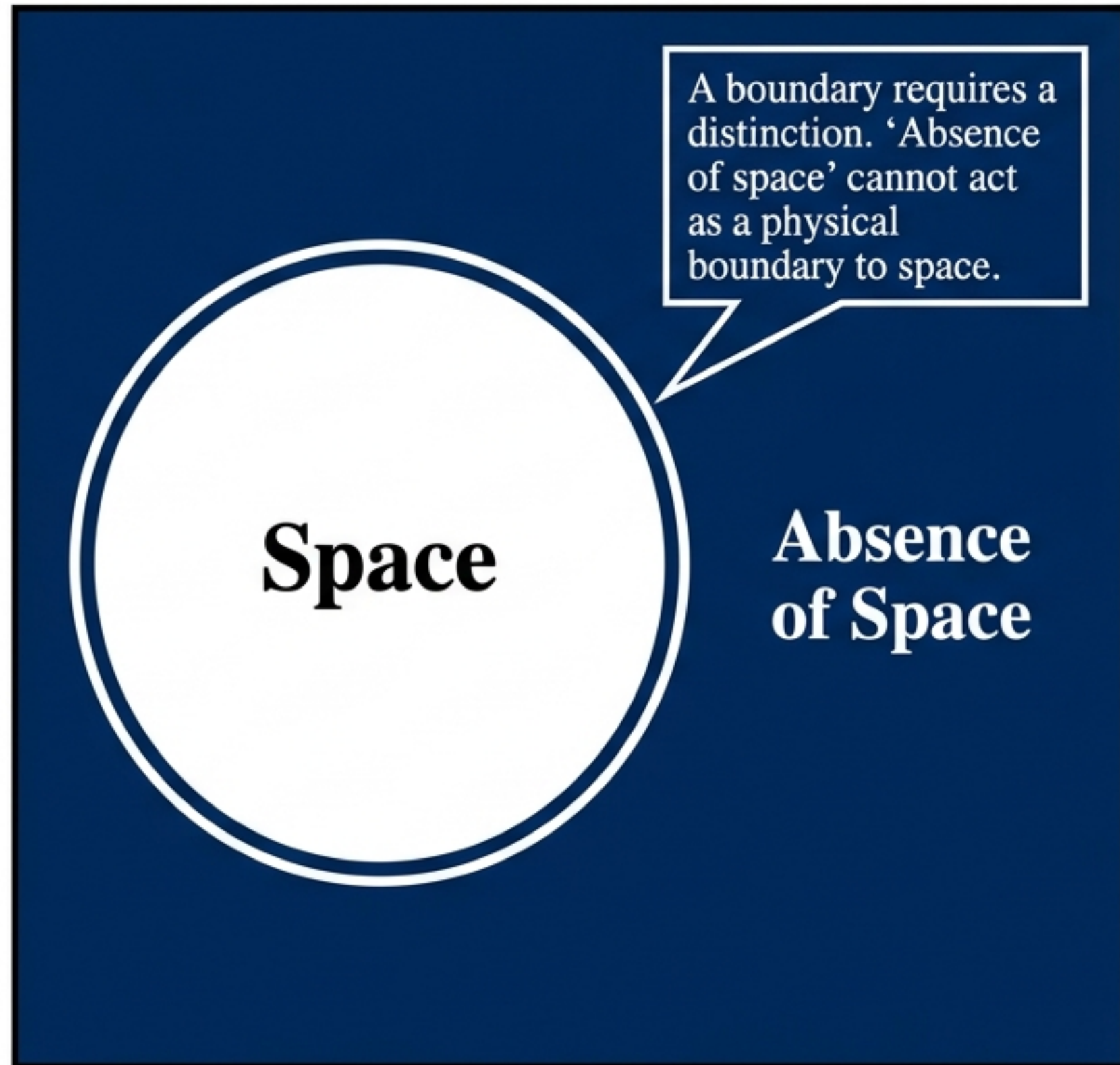
Abstract Summary:

Whether the universe has a finite extent remains formally unresolved by observation, as no spatial edge has ever been detected. This paper argues the question is substantially decided in favor of an unbounded universe on logical, structural, and mathematical grounds independent of specific cosmological models.



Core Thesis: A bounded origin (singularity) contains fatal logical and mathematical flaws. A spatially infinite universe governed by a physical substrate is the only coherent alternative.

The Inescapable Logical Paradoxes of a Bounded Origin



Argument 1: The Boundary Paradox

A physical boundary of space requires a meaningful physical distinction across it. By definition, a boundary requires something on both sides capable of differing from each other. A literal absence of space cannot establish a geometric or physical edge.

Argument 2: The 'Singularity Everywhere' Contradiction

The Standard Claim: The initial hot, dense state was 'everywhere' because space expanded from it.

The Logical Consequence: The observable universe currently extends 47 billion light-years in radius. If the singularity existed at every point now occupying that space, the initial state must have already filled a vast, pre-existing expanse.

Conclusion: Space must have been unbounded at the outset to contain an 'everywhere' initial state.

The Systematic Failure of Standard Mitigation Models

Standard Mitigation Model	Proposed Mechanism	Point of Failure (P75 Analysis)
Finite-but-Unbounded Topology	Space curves back on itself (like the surface of a sphere), creating a finite volume without a physical edge.	This merely relocates the boundary question. It does not explain how a finite geometric manifold emerges from non-extension. It shifts the paradox from a spatial boundary to an ontological one.
Breakdown of General Relativity	GR equations produce infinities at the singularity, suggesting the math simply breaks down at extreme density.	This is a mathematical artifact of applying medium-free geometry, not a physical reality. It lacks a physical restoring mechanism.
Cosmic Inflation	Rapid exponential expansion smooths out the early universe, pushing boundaries beyond the observable horizon.	The Borde-Guth-Vilenkin (BGV) theorem proves that any inflating spacetime must be geodesically incomplete in the past. It requires its own past boundary, reproducing the exact same logical impossibility one step removed.

Mathematical Formulation of the Unbounded Substrate

The Quantitative Anchor

$$\rho_s = 5.9 \times 10^{-27} \text{ kg/m}^3$$

The intrinsic equilibrium density of the Sparticle field. A single, independently derived universal constant replacing the ad hoc cosmological constant (Λ).

Anti-Singularity Restoring Pressure

$$P_{\text{restore}} = (\rho_s/4)(\rho - \rho_s)$$

The substrate restoring pressure (derived from the T4 Lagrangian term). As matter compresses, the Sparticle field resists, strictly forbidding the formation of infinite density singularities.

Maximum Finite Density

$$\rho_{\text{max}} \sim \rho_s c^2 / (G r_s^2)$$

The absolute finite collapse limit. Gravity in the BFUT framework replaces the GR singularity with organized, finite compression governed by the substrate's quartic self-stiffening.

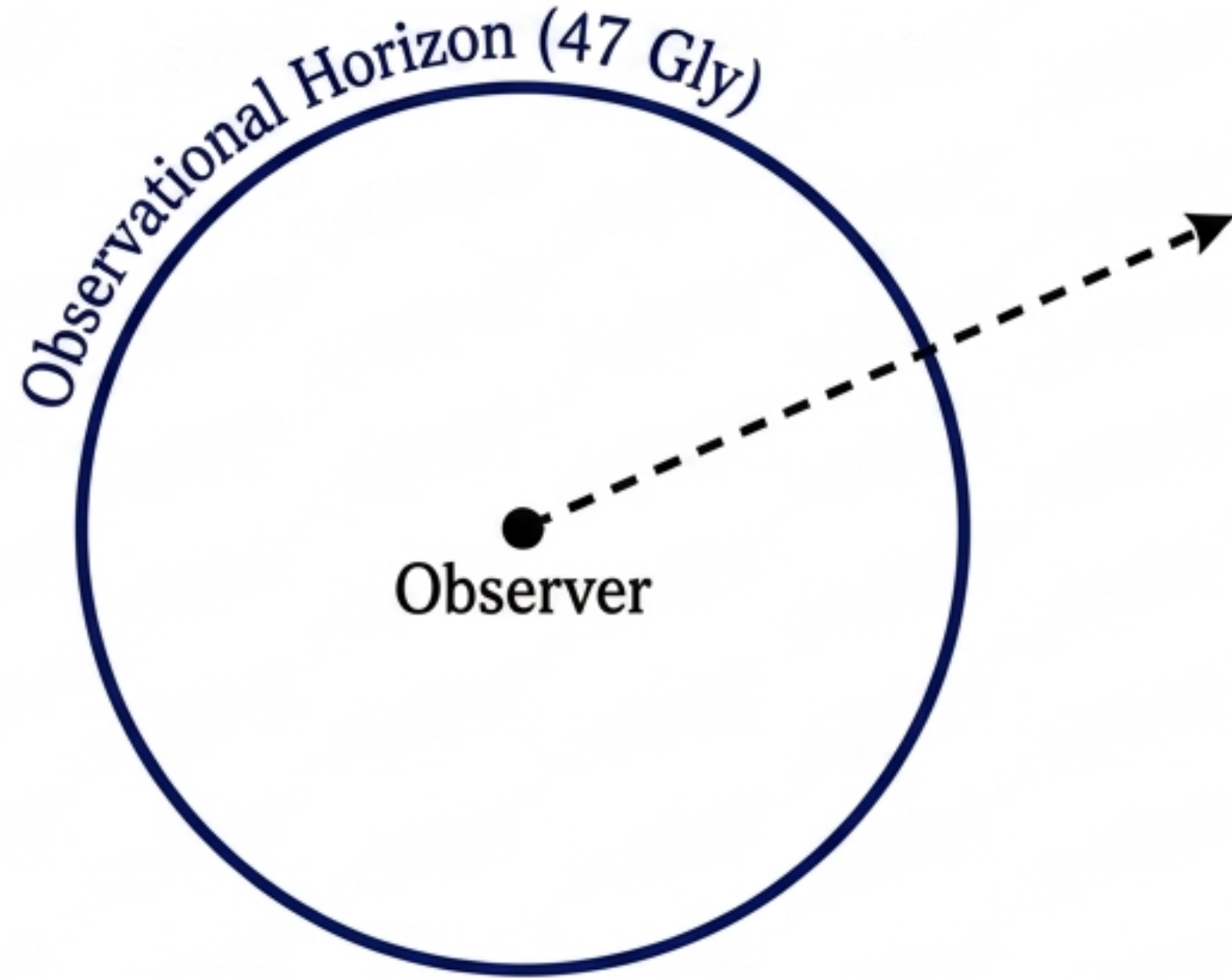
Cosmological Coherence Length

$$L_{\text{cosm}} = c / \sqrt{3\rho_s G} \sim 5.82 \text{ Gly}$$

The maximum scale of nested gravitational domains. The universe is physically infinite, but gravitationally organized into distinct, finite coherence domains rather than expanding metrically.

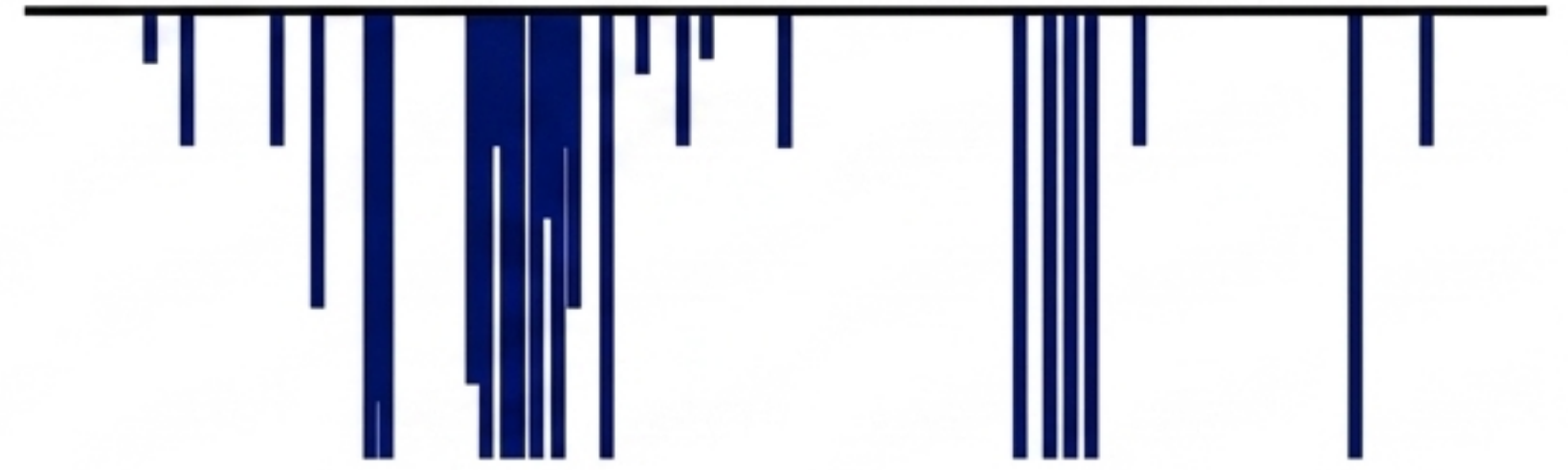
Observational Reality: Horizons vs. Physical Boundaries

The 47 Billion Light-Year Horizon



No confirmed measurement has ever detected a spatial edge. The 47 billion light-year radius is strictly a horizon of light propagation—a limit to our vision, not a boundary of space.

Reinterpreting the Lyman-Alpha Forest



The strongest conventional evidence for a bounded early universe relies on the Gunn-Peterson opacity rise in the Lyman-alpha forest.

BFUT Interpretation (Paper P11): This phenomenon admits a rigorous alternative interpretation as an absorption percolation threshold in a dynamic steady-state universe. It does not require spatial boundedness or a singular Big Bang origin to produce the observed spectra.

Conclusion and Falsifiable Predictions

The universe is an **unbounded, infinite, and eternal Sparticle field**.

The event known as the Big Bang was not the origin of space or time. It was a localized “Flare-Up”—a large-scale nuclear ignition within a pre-existing, infinite physical substrate. The laws of physics are eternal; the Flare-Up was a regional phase transition.

Falsifiability Profile

Prediction 1: The Permanent Horizon

As observational depth increases into the high-redshift universe (via JWST and subsequent observatories), observers will continuously fail to detect any spatial edge, boundary, or global topological wraparound signal.

Falsifiability Profile

Prediction 2: Falsification Condition

A confirmed, statistically significant detection of a true physical edge to the spatial manifold, or a confirmed geometric wraparound (finite topology) at the largest observable scales, will explicitly falsify the unbounded BFUT model.

Summary: The model relies on zero arbitrary assumptions. Its ultimate validation lies in the continued absence of a cosmological boundary.