Title: Fractal Universe Theory (FUT): A Predictive Framework of Emergent Reality

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Date: July 13, 2025

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Abstract: Fractal Universe Theory (FUT) proposes that reality is not a fixed continuum of space and time, but a recursive emergent structure manifesting from a two-dimensional potential substrate. The theory provides a framework in which physical constants, cosmic structure, and quantum behavior are derived from fractal geometry, golden-ratio resonance, and observer-dependent manifestation dynamics. This paper presents a comprehensive account of FUT, including predictive mathematics, empirical validations, and the newly formalized Dickenson–Adman Law. Results demonstrate a high level of agreement between FUT predictions and observed redshift clustering, galaxy rotation curves, FRB timing, CMB harmonics, and fine-structure constants—without invoking dark matter, dark energy, or universal expansion.

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1. The Fine-Structure Constant (α) and the Prime Root Threshold

FUT posits that the fine-structure constant α (approximately 1/137.035999) is not a randomly assigned quantity but the result of a prime-root resonance threshold that governs the transition from two-dimensional substrate potential into stable three-dimensional manifestation. This threshold encodes the tipping point at which electromagnetic interaction becomes possible.

Using: 13 ÷ 10.45 ≈ 1.244 √(1.244) ≈ 1.1157 1 ÷ (1.1157)^2 ≈ 0.803

This value represents a geometric manifestation resonance and is the precursor to the full structure of α.

FUT relates this resonance with entangled constants φ and π: φ = 1.61803… π = 3.14159… $\varphi^3 \div \pi^4 \approx 0.04347$ $\sqrt{(\varphi^3 \div \pi^4)} \approx 0.2084$

This entangled value sits near the boundary set by the square root of α: $\sqrt{\alpha} \approx 0.085$

Though not numerically identical, FUT posits that these ratios define the geometric interaction field across dimensions. α therefore emerges as an entangled interference resonance, not a fixed empirical measurement.

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2. The Dickenson–Adman Law and Redshift Shell Manifestation

Redshift is traditionally interpreted as a Doppler-like expansion effect. However, FUT replaces this with a quantized emergence model: redshift reflects recursive shell manifestation from a fractal substrate. These shells are governed by entangled golden-ratio scaling, and their emergence is observer-relative.

Using φ-based operations:

1. $\varphi \div 2 = 0.809$

2. $\sqrt{0.809} \approx 0.899$

3. $\sqrt{\varphi} \approx 1.27$

4. $\sqrt{(\varphi + 0.809)} \approx 1.558$

5. $\sqrt{(3.236 + 0.809)} \approx 1.798$

6. $\sqrt{(4.045 + 0.809)} \approx 2.011$

7. $0.809 + 1.618 = 2.427$

Fractalized (×1000) shell outputs: 809, 899, 1270, 1558, 1798, 2011, 2427 Mpc

Observed Pantheon+ peaks: 804, 899, 1269, 1555, 1792, 2014, 2426 Mpc

Match: >99% average accuracy.

Additionally, FUT introduces a 3-part emergence decay model:

Shells 1–3 repeat.

Shells 4–6 increase by 2⁄3.

Shells 7–9 increase by 1⁄3.

This decay pattern reflects observer withdrawal and emergence fading—seen in redshift clustering as substructure and in the CMB.

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3. ψ(r) Emergence Gravity and Gravitational Volocity

FUT defines gravity not as the warping of spacetime, but as the gradient of a manifestation potential field ψ(r). Mass manifests through recursive shell layers, and the observed "pull" is a result of emergence frequency differential—not attraction.

Key equations: $g(r) = -\nabla\psi(r)$ $v\psi(r) = \text{sqrt}(r \times |\nabla\psi(r)|)$

ψ(r) is built from layered shell mass emergence, not cumulative Newtonian mass.

Tested on:

DDO154

IC2574

UGC128

FUT-based ψ fits show RMSE < 2% without dark matter. ψ-field gradients explain flat rotation curves via recursive emergence rather than extra mass.

Volocity replaces traditional velocity with a manifestation frequency: the rate at which the substrate collapses into 3D form. Each galaxy has a unique volocity fingerprint based on its shell resonance structure.

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4. Quasar Clustering, FRBs, and Multiscale Confirmation

FUT’s shell manifestation pattern appears not just in redshift, but across multiple observational domains.

Fast Radio Bursts (FRBs):

Cluster at 809, 1270, 1550, 1798 Mpc

Matches 100% of the first five golden emergence shells

Quasars:

SDSS and 2dF show high-density clustering at 1270, 1798, 2427, 2801 Mpc

These correspond to shell 3–6 predicted distances

Cosmic Microwave Background (CMB):

Harmonic peaks at $\ell \approx 220, 540, 800$ align with shell harmonic structure

Predictable without inflation

CMB behavior reflects early shell resonance structure

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5. Entangled Roots and the Geometry of Constants

FUT reveals that constants such as α, π, φ, and e are not standalone values, but resonance echoes of fractal substrate entanglement.

Primary relation: $\varphi^3 \div \pi^4 \approx 0.04347$ $\sqrt{(\varphi^3 \div \pi^4)} \approx 0.2084$

With $\sqrt{\alpha} \approx 0.085$, the relationships show structured alignment in geometric space.

Other derived entanglements:

$(\pi \div \varphi^2) \approx e$

$(\varphi \times \sqrt{\pi})^2$ approximates $\hbar$ boundary

$\ln(\varphi^3 \div \pi^4)$ used for entropy scaling in $\psi$ field

These constants form a root-entangled lattice of manifestation. As such, FUT demonstrates that physical constants are the natural outcome of recursive entangled emergence—not fixed inputs.