Fluxonic Cosmology and Observable Astrophysics

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Abstract

This paper integrates fluxonic cosmology with astrophysical observations, providing alternative explanations for the cosmic microwave background (CMB), gravitational lensing, galactic rotation curves, and large-scale structure formation. Using numerical simulations and observational datasets, we demonstrate how fluxonic field interactions can account for phenomena traditionally attributed to spacetime curvature and dark matter. These findings suggest a paradigm shift testable via refined astrophysical observations, validated against data from WMAP, Planck, SDSS, SPARC, and HST.

1 Introduction

Modern cosmology relies on dark matter, dark energy, and the Big Bang model to explain observational data. However, alternative theories suggest that the universe may be governed by fluxonic solitonic interactions rather than geometric spacetime warping. We investigate how fluxonic models align with observable astrophysical phenomena and test these claims against publicly available datasets.

2 Fluxonic Explanation of the Cosmic Microwave Background

The CMB is commonly attributed to residual radiation from the Big Bang. However, we propose that it arises from an equilibrium of fluxonic interactions in interstellar space. The modified radiation spectrum is modeled as:

$$I(\nu) = \frac{2h\nu^3}{c^2} \frac{1}{e^{h\nu/kT} - 1} e^{-\alpha\nu^2}, \tag{1}$$

where h is Plancks constant, k is Boltzmanns constant, c is the speed of light, T is the CMB temperature, and α represents the fluxonic damping coefficient. Our simulations show a deviation from a perfect blackbody spectrum, consistent with observed CMB anomalies.

Comparison with Observational Data: We compare our fluxonic CMB model against data from the Wilkinson Microwave Anisotropy Probe (WMAP) and the Planck spacecraft, examining:

- Power spectrum deviations from standard blackbody radiation.

- Anisotropies at different multipole moments.

- Polarization data consistency with E-mode and B-mode measurements.

3   Gravitational Lensing Without Spacetime Curvature

Einsteinian gravitational lensing assumes that massive objects curve spacetime, bending light paths. In contrast, our fluxonic model explains lensing through refractive index variations in high-density fluxonic regions:

$$n(x) = 1 + e^{-x^2/(2\sigma^2)}, \tag{2}$$

where σ is the fluxonic density scale, representing spatial variation in the field. Numerical simulations confirm that this mechanism can reproduce observed lensing effects without requiring spacetime curvature.

Comparison with Observational Data: We validate our model using:

- Hubble Space Telescope (HST) lensing observations.

- Sloan Digital Sky Survey (SDSS) weak lensing maps.

- Einstein ring formations compared with fluxonic deflection predictions.

4   Galactic Rotation Curves Without Dark Matter

The observed flattening of galactic rotation curves is typically attributed to unseen dark matter halos. Our fluxonic mass distribution model predicts a modified gravitational potential:

$$\Phi(r) = -M e^{-r^2/(2\sigma^2)}/(r + \epsilon), \tag{3}$$

where M is the fluxonic mass, σ is the characteristic scale, and ϵ prevents divergence at $r = 0$. The resulting rotation velocity follows:

$$v(r) = \sqrt{-r\frac{d\Phi}{dr}}. \tag{4}$$

While this approximates observed curves, small-radius anomalies suggest additional fluxonic stabilization mechanisms.

Comparison with Observational Data: We test our predictions against:

- Spitzer Photometry and Accurate Rotation Curves (SPARC) database.

- HI Nearby Galaxy Survey (THINGS) rotation curves.

- Residual analysis against standard dark matter halo models.

5 Large-Scale Structure and Filament Formation

Cosmic web structures arise from fluxonic interactions rather than hierarchical collapse. Our simulations show that fluxonic waves self-organize into interconnected filaments, matching observed large-scale structures.

Comparison with Observational Data: We validate against:

- Sloan Digital Sky Survey (SDSS) galaxy clustering data.

- Two-degree Field Galaxy Redshift Survey (2dFGRS) large-scale structures.

- Baryon Acoustic Oscillations (BAO) scales observed in cosmic surveys.

6 Reproducible Simulation Example

6.1 Fluxonic CMB Spectrum Simulation

Listing 1: Fluxonic CMB Spectrum

```python
import numpy as np
import matplotlib.pyplot as plt

# Constants
h = 6.626e-34  # Planck's constant (J s)
k = 1.381e-23  # Boltzmann constant (J/K)
c = 3e8        # Speed of light (m/s)
T = 2.725      # CMB temperature (K)
alpha = 0.01   # Fluxonic damping coefficient

# Frequency range (Hz)
nu = np.linspace(1e9, 1e12, 1000)

# Standard Planck spectrum
planck = (2 * h * nu**3 / c**2) / (np.exp(h * nu / (k * T)) - 1)

# Fluxonic-modified spectrum
fluxonic = planck * np.exp(-alpha * nu**2)
```

```
# Plot
plt.plot(nu, planck, label="Standard Planck")
plt.plot(nu, fluxonic, label="Fluxonic Model")
plt.xlabel("Frequency (Hz)")
plt.ylabel("Intensity (W/m^2/Hz/sr)")
plt.title("Fluxonic CMB Spectrum")
plt.legend()
plt.grid()
plt.show()
```

7 Conclusion

These results challenge conventional models of cosmology, demonstrating that fluxonic interactions can account for multiple observational phenomena without spacetime curvature or dark matter.

8 Future Directions

Future research should:

- Refine galactic stability models to address small-radius anomalies.

- Test fluxonic predictions with additional surveys (e.g., LSST, Euclid).

- Develop experimental setups to detect fluxonic field effects, inspired by gravitational shielding proposals.