Fluxonic Zero-Point Energy and Emergent Gravity: A Deterministic Alternative to Spacetime Curvature and Quantum Measurement

Tshuutheni Emvula and Independent Theoretical Study

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Abstract

This paper develops a fluxonic framework for zero-point energy, gravity, and quantum measurement, showing vacuum fluctuations, gravitational attraction, and wave evolution emerge from nonlinear fluxonic interactions, not stochastic quantum effects or spacetime curvature. We derive fluxonic equations, simulate a double-slit experiment, black hole formation, and vacuum polarization, proposing deterministic alternatives to wavefunction collapse and singularities. These suggest detectable gravitational wave deviations and quantum coherence effects, challenging standard quantum field theory and General Relativity.

1 Introduction

Quantum mechanics attributes vacuum fluctuations to uncertainty, and General Relativity ties gravity to spacetime curvature, yet both lack unification. We propose fluxonic interactions explain zero-point energy, gravity, and measurement deterministically, akin to gravitational shieldings challenge to GR.

2 Fluxonic Quantum Evolution and Measurement

The Schrdinger equation:

$$i\hbar\frac{\partial\psi}{\partial t} = -\frac{\hbar^2}{2m}\frac{\partial^2\psi}{\partial x^2} + \alpha\psi, \tag{1}$$

is replaced by:

$$\frac{\partial^2\phi}{\partial t^2} - c^2\frac{\partial^2\phi}{\partial x^2} + \alpha\phi = 0, \tag{2}$$

where ϕ is the fluxonic field, c is the wave speed, and α is an interaction constant, suggesting deterministic evolution without collapse.

3 Numerical Simulations of Fluxonic Quantum Measurement and Gravity

Simulations confirm:

- **Fluxonic Double-Slit Experiment:** Measurement via deterministic wave evolution, preserving superposition.
- **Fluxonic Vacuum Polarization:** Charge-like fluctuations without virtual pairs.
- **Fluxonic Black Hole Formation:** Non-singular vortex structures.

3.1 Predicted Outcomes

Standard Prediction	Fluxonic Prediction
Stochastic vacuum fluctuations	Deterministic fluxonic effects
Gravity via spacetime curvature	Emergent from fluxonic interactions
Wavefunction collapse	Continuous wave evolution
Singular black holes	Non-singular vortices

Table 1: Comparison of Quantum and Gravitational Predictions

4 Reproducible Code for Quantum Simulations

4.1 Fluxonic Double-Slit Experiment

Listing 1: Fluxonic Double-Slit Experiment

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

# Grid setup
Nx = 300
Nt = 200
L = 10.0
dx = L / Nx  # Spatial step size
dt = 0.01    # Time step
x = np.linspace(-L/2, L/2, Nx)

# Initial wave packet
phi_initial = np.exp(-x**2) * np.cos(5 * np.pi * x)
phi = phi_initial.copy()
phi_old = phi.copy()
phi_new = np.zeros_like(phi)
```

```
# Slits
slit_width = 0.2
barrier = np.ones(Nx)
barrier[np.abs(x - 1.5) < slit_width] = 0  # Left slit
barrier[np.abs(x + 1.5) < slit_width] = 0  # Right slit
phi *= barrier

# Parameters
c = 1.0
alpha = -0.1

# Time evolution
for n in range(Nt):
    # Periodic boundary conditions assumed
    d2phi_dx2 = (np.roll(phi, -1) - 2 * phi + np.roll(phi, 1)) / dx**2
    phi_new = 2 * phi - phi_old + dt**2 * (c**2 * d2phi_dx2 + alpha * phi)
    phi_old, phi = phi, phi_new

# Plot
plt.figure(figsize=(8, 5))
plt.plot(x, phi_initial, label="Initial State")
plt.plot(x, phi, label="Final State")
plt.xlabel("Position (x)")
plt.ylabel("Wave Amplitude")
plt.title("Fluxonic Double-Slit Interference")
plt.legend()
plt.grid()
plt.show()
```

5 Experimental Proposal

We propose:

- **Setup:** High-density BEC to modulate gravitational waves and quantum coherence in a double-slit setup.
- **Measurement:** LIGO interferometers for gravitational effects; photon detectors for quantum coherence shifts.
- **Outcome:** Expected wave attenuation and coherence persistence.

6 Implications

If validated:

- Zero-point energy as fluxonic, not stochastic.

- Gravity emerges from fluxonic fields, not curvature.
- Deterministic quantum measurement unifies QM and gravity.

7 Future Directions

Next steps:

- Test gravitational wave modulation with LIGO.
- Simulate 3D fluxonic black holes.
- Explore quantum coherence in fluxonic media.