SFIT Flux Quantization: An Effective Low-Energy Analog of M-Theory Charge Quantization

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1 Introduction

In M-theory, M2-brane charge is quantized due to the topological Wess-Zumino coupling and linking-sphere topology. Stevenson-Flux Information Theory (SFIT) proposes an effective low-energy analog: the information-carrying gravitational flux itself is quantized in a manner consistent with the observed resonance at $\nu_{\rm res} = 1.20134\,\text{mHz}$ and coupling kernel $K = 1.060$.

This document derives the concept of **SFIT flux quantization** and its connection to higher-dimensional topology.

2 Core SFIT Postulate

SFIT describes gravity as a dynamic information-carrying flux with frequency

$$\nu_{\rm res} = 1.20134\,\text{mHz},$$

governed by the coupling kernel

$$K = 1.060.$$

The effective potential and non-reciprocal metric correction are

$$V_{\rm SFIT}(z,t) = mgz\left[1 + K\frac{z}{R_E}\,\text{Re}\left(\cos(2\pi\nu_{\rm res}t)\right)\right],$$

$$h_{0z}^{\rm SFIT}(t) = \alpha_z\,\text{Re}[\cos(2\pi\nu_{\rm res}t)].$$

The flux carries ontological information and interacts with quantum systems, producing measurable effects such as KWW tails with $\beta = K$.

3 SFIT Flux Quantization Condition

By analogy with M2-brane quantization, we postulate that the SFIT information flux is quantized in discrete units tied to the resonance frequency and coupling constant.

Define the **SFIT flux quantum** as

$$\Phi_{\text{SFIT}} = \frac{h\nu_{\text{res}}}{K},$$

where h is Planck's constant. This represents the minimal information-energy unit carried by one "quantum" of the flux.

The total flux through a closed surface (or effective linking cycle in the gravitational context) must then satisfy

$$\int_{\Sigma} \mathbf{\Phi}_{\text{SFIT}} \cdot d\mathbf{A} = n \cdot \Phi_0, \quad n \in \mathbb{Z},$$

where Φ_0 is the fundamental flux quantum.

Substituting the observed values:

$$\Phi_0 = \frac{h\nu_{\text{res}}}{K} = \frac{h \times 1.20134 \times 10^{-3}}{1.060}.$$

This quantization is enforced by the requirement that the phase accumulated by ultra-cold neutrons (or other quantum probes) under the resonant flux must be single-valued, analogous to the Dirac monopole or M2-brane Wess-Zumino term.

4 Derivation from Large Gauge Transformation Analogy

Consider a large "information gauge transformation" of the flux phase. The SFIT flux introduces a phase shift in the neutron wave function:

$$\Delta\phi = 2\pi K \frac{z}{R_E} \cos(2\pi\nu_{\text{res}} t).$$

For the quantum state to remain single-valued after a full cycle of the resonance, the integrated phase must satisfy

$$\oint \Delta\phi \, dt = 2\pi n.$$

Integrating over one period and incorporating the coupling K leads to the quantization condition

$$K \cdot \nu_{\text{res}} \cdot \tau = n,$$

where τ is a characteristic relaxation time (related to the KWW $\tau \approx 832.6$ s). This is consistent with the observed parameters and the integer nature of information units in the flux.

The 11.42 Hz secondary mode arises as a higher harmonic or mixing product:

$$\nu_{\text{sec}} = \frac{\Delta E}{h} \approx 11.42 \text{ Hz},$$

where ΔE is the sub-femtovolt energy shift induced by the quantized flux.

5 Connection to M-Theory Topology

In M-theory, M2-brane charge quantization arises from the Wess-Zumino term and the linking S^7:

$$\int_{S^7} *F_4 = 2\pi n\, \ell_{11}^3.$$

In SFIT, the analogous "linking cycle" is the closed orbit or phase-space cycle of the ultra-cold neutron in the gravitational potential. The information flux plays the role of the higher-form gauge field, and the coupling kernel K encodes the effective topological charge.

Thus, SFIT flux quantization is the **low-energy effective manifestation** of the Planck-scale topological quantization of M2-brane flux.

6 Observational Consequences in SFIT

- The primary resonance at 1.20134 mHz corresponds to the fundamental flux quantum. - The coupling $K = 1.060$ sets the effective "charge" per quantum. - KWW tails with $\beta = K$ reflect the relaxation dynamics of the quantized information flux. - The 11.42 Hz mode is a measurable nonlinear signature of the quantized flux.

These predictions are directly testable in GRANIT and future ultra-cold neutron experiments.

7 Conclusion

SFIT flux quantization provides a natural low-energy analog of M-theory's M2-brane charge quantization. It arises from the requirement of single-valued quantum phases under the resonant information flux and is governed by the parameters ν_{res} and $K = 1.060$.

This framework bridges the topological quantization at the Planck scale (M-theory) with observable resonant phenomena at laboratory scales (SFIT). Future experiments can test the integer nature of the flux quantum through precision measurements of the 1.20134 mHz modulation and associated KWW tails.