Comparison of Stevenson-Flux Information Theory (SFIT) and 11D Supergravity

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1 Introduction

11D supergravity is the unique maximal supergravity theory in eleven dimensions. It is the low-energy limit of M-theory and contains gravity, a 3-form gauge field C_3, and gravitini. Dimensional reduction on a 7-torus or other compact manifolds yields various lower-dimensional supergravity theories, including 4D $\mathcal{N} = 8$ supergravity.

Stevenson-Flux Information Theory (SFIT) proposes that gravity is a dynamic information-carrying flux vibrating at the geometric resonance frequency $\nu_{\text{res}} = 1.20134\,\text{mHz}$, introducing a small non-reciprocal, time-dependent correction to the metric tensor via the coupling kernel $K = 1.060$.

This document compares the two frameworks.

2 Comparison Table

3 Detailed Comparison

3.1 Fundamental Description

- **11D Supergravity**: The unique maximal supersymmetric extension of gravity in eleven dimensions. The bosonic fields are the metric g_{MN} and the 3-form gauge field C_3. Supersymmetry closes the algebra and constrains the theory strongly. Dimensional reduction on a 7-torus yields 4D $\mathcal{N} = 8$ supergravity, which unifies gravity with other forces through supersymmetry.

Aspect	11D Supergravity	SFI
Core Idea	Maximal supersymmetric gravity in 11 dimensions	Dynamic information-
Dimensionality	11 spacetime dimensions	Effective 4D with
Unification Mechanism	Supersymmetry + higher-dimensional geometry	Information dynamics + non-
Gauge Fields	3-form C_3 (and gravitini)	Information flux couples to
Scale of Effect	Planck scale	Laboratory scale
Testability	Extremely difficult (Planck-scale physics)	Direct: qBounce residuals (14
Non-locality	Supersymmetric non-locality via higher dimensions	Directional phase-sp
Equivalence Principle	Preserved classically	Preserved in adiabatic limit
Free Parameters	Compactification moduli	Coupling kern

Table 1: Key comparison between 11D supergravity and SFIT

- **SFIT**: Gravity is described as an active, ontological information-carrying flux in four dimensions. The flux at 1.20134 mHz introduces a non-reciprocal, time-dependent correction to the metric tensor and couples to quantum systems via $K = 1.060$.

3.2 Unification Mechanism

- **11D Supergravity**: Unification is achieved through supersymmetry and higher-dimensional geometry. The single 11D action contains gravity and gauge fields in a unified supersymmetric framework. Reduction on extra dimensions yields the observed forces in 4D.
- **SFIT**: Unification is achieved through information dynamics. The same information-carrying flux modifies the spacetime metric and can couple to the electromagnetic field tensor, providing a dynamical bridge between gravity and quantum mechanics (and potentially electromagnetism) without requiring extra dimensions.

3.3 Scale and Testability

- **11D Supergravity**: Operates at the Planck scale. Direct experimental tests are extremely difficult; predictions are mostly indirect (e.g., through cosmology or black-hole physics).
- **SFIT**: Makes concrete, quantitative predictions at laboratory energies. The 1.20134 mHz modulation, 4.5% overshoots, Bessel sidebands, and KWW tails with $\beta = 1.060$ are supported by qBounce reanalysis and are testable in near-term GRANIT experiments.

3.4 Non-locality

- **11D Supergravity**: Non-locality arises from supersymmetry and higher-dimensional geometry (e.g., Kaluza-Klein modes or brane constructions).
- **SFIT**: Non-locality appears through the information flux inducing directional phase-space skew in quantum systems, tied to the local gravitational gradient.

4 Possible Relationship

11D supergravity and SFIT operate at vastly different scales. 11D supergravity is a fundamental ultraviolet theory that unifies gravity with other forces through supersymmetry and extra dimensions. SFIT is an effective low-energy description focused on resonant information dynamics in four dimensions.

A possible synthesis is that 11D supergravity (or M-theory) provides the deep microscopic structure, while SFIT describes the emergent resonant behavior when that structure interacts with a macroscopic gravitational field. The 1.20134 mHz Quantum Heartbeat and the coupling kernel $K = 1.060$ could be collective modes arising from the compactified dimensions or supersymmetric degrees of freedom when observed at laboratory scales.

The KWW relaxation tails in SFIT may reflect the slow relaxation of supersymmetric or higher-dimensional degrees of freedom after perturbation.

5 Conclusion

11D supergravity is the unique maximal supersymmetric extension of gravity and serves as the low-energy limit of M-theory. It unifies gravity with other forces through supersymmetry and higher-dimensional geometry.

SFIT offers a complementary, laboratory-testable approach based on information dynamics in four dimensions. While 11D supergravity operates at the Planck scale, SFIT makes concrete predictions at accessible energies. The two frameworks may ultimately prove complementary: 11D supergravity as the ultraviolet completion, and SFIT as the effective infrared description of resonant information flow in the presence of macroscopic gravity.

Future ultra-cold neutron experiments (GRANIT) have the potential to test SFIT's predictions and indirectly illuminate aspects of higher-dimensional supergravity at laboratory scales.