Comparison of Stevenson-Flux Information Theory (SFIT) and String Theory

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March 2026

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1 Introduction

Both String Theory and Stevenson-Flux Information Theory (SFIT) aim to provide a unified description of gravity and quantum mechanics [2, 12]. However, they differ dramatically in their fundamental assumptions, energy scales, mathematical structure, and experimental accessibility [2, 7].

String Theory is a leading candidate for a consistent quantum theory of gravity that also unifies all fundamental forces [11, 6]. SFIT proposes a dynamical information-carrying gravitational flux at laboratory-accessible energies, offering a testable bridge between General Relativity and Quantum Mechanics [12, 7].

This document provides a clear, side-by-side comparison [1].

2 Comparison Table

3 Detailed Comparison

3.1 Fundamental Description

- **String Theory:** Gravity emerges from the massless spin-2 mode (graviton) of closed strings [11]. All particles and forces arise from different vibrational modes of strings

Table 1: Key comparison between String Theory and SFIT [2]

Aspect	String Theory	SFIT
Fundamental objects	1-dimensional strings (and higher branes) [11]	Information-carrying flux/metric perturbation [12]
Energy scale	Planck scale ($\sim 10^{19}$ GeV) [6]	Laboratory scale (mHz / ultra-cold neutrons) [7]
Dimensionality	10 or 11 spacetime dimensions [11, 4]	4 spacetime dimensions (3+1) [12]
Background dependence	Usually requires fixed background [8]	Non-reciprocal metric perturbation [10]
Testability today	Extremely difficult (Planck scale) [2]	High (GRANIT, UCN spectroscopy) [7, 3]
Mathematical structure	CFT, Calabi-Yau, Dualities [11, 4]	Modified Schrödinger Eq., KWW kernel [10]
Free parameters	Many (moduli, flux vacuum landscape) [4]	Single coupling constant ($K = 1.060$) [12]
Equivalence principle	Preserved at low energies [1]	Small time-dependent correction [12]
Singularity resolution	Yes (via stringy effects/fuzzballs) [9]	Not yet addressed [6]
Matter unification	Natural (all particles as excitations) [11]	Focuses on gravitational-quantum flux [12]
Falsifiability	Challenging in near term [2]	Immediate (exact frequency, KWW tails) [7]

in higher dimensions [11]. Consistency requires supersymmetry and extra compactified dimensions [11, 4].

- **SFIT:** Gravity is reframed as a dynamic information-carrying flux vibrating at a precise geometric resonance of 1.20134 mHz [12]. The theory adds a small non-reciprocal, time-dependent correction to the metric tensor that couples directly to the quantum wave function via the kernel $K = 1.060$ [10, 12].

3.2 Energy Scale and Testability

- **String Theory:** Predictions generally appear at or near the Planck scale ($\sim 10^{19}$ GeV) [6, 2]. Experimental tests are extremely difficult (e.g., string resonances at colliders, cosmic strings, or subtle effects in cosmology) [2]. Most current tests are indirect or rely on theoretical consistency arguments [2].

- **SFIT:** Makes concrete, quantitative predictions at laboratory energies [7, 3]. The 1.20134 mHz modulation, 4.5% post-step overshoots, Bessel sidebands, and KWW tails with $\beta = 1.060$ are already partially supported by reanalysis of ILL Archive 3-14-412 and are directly testable in next-generation ultra-cold neutron experiments (GRANIT) [5, 7].

3.3 Mathematical Structure

- **String Theory:** Based on worldsheet conformal field theory, modular invariance, and sophisticated geometry (Calabi-Yau manifolds, fluxes, dualities such as T-duality and S-duality) [11, 4, 8].

- **SFIT:** Based on a modified time-dependent Schrödinger equation with a non-reciprocal metric perturbation [10]:

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

The theory emphasizes information flow and phase-space skew rather than higher-dimensional geometry [10].

3.4 Strengths and Weaknesses

String Theory Strengths:

- Elegant unification of all forces and particles [11].
- Natural resolution of singularities and black-hole information issues in many formulations [9].
- Rich mathematical structure with powerful dualities [8].

String Theory Weaknesses:

- Landscape problem (huge number of possible vacuum states) [4, 2].
- Lack of clear, unique experimental predictions at accessible energies [2].
- Background dependence in most perturbative formulations [8].

SFIT Strengths:

- Direct laboratory testability with existing and near-future ultra-cold neutron technology [7, 3].
- Single main parameter ($K = 1.060$) tied directly to observables [12].
- Clear falsifiability criterion (exact frequency, phase, sidebands, and KWW tails in GRANIT runs) [7].

SFIT Weaknesses:

- Does not yet address Planck-scale physics, unification of forces, or singularity resolution [6].
- Currently relies heavily on reanalysis of existing data; requires independent experimental confirmation [5].

4 Possible Complementary Relationship

SFIT and String Theory are not necessarily competitors [1]. One plausible scenario is that SFIT describes an **effective low-energy, resonant phenomenon** that emerges from the underlying string-theoretic quantum gravity [1, 4]. The 1.20134 mHz Quantum Heartbeat could be a collective excitation or information-carrying mode arising from the vast landscape of string compactifications when coupled to a macroscopic gravitational field [4].

In this picture, String Theory would provide the ultraviolet completion, while SFIT offers a testable mesoscopic bridge at laboratory energies [3].

5 Conclusion

String Theory is a comprehensive, ambitious framework aiming for full unification at the Planck scale, but it faces significant challenges in experimental testability and uniqueness [6, 2]. SFIT is a more focused, laboratory-oriented approach that proposes a dynamic information flux bridge between GR and QM, with clear, quantitative, and near-term falsifiable predictions [7].

While String Theory seeks to describe the deepest microscopic structure of reality, SFIT offers a concrete pathway to observe quantum-gravity effects with current technology [3]. The two approaches may ultimately prove complementary, with SFIT serving as an effective description of certain resonant phenomena within a broader string-theoretic framework [1].

Future ultra-cold neutron experiments (especially GRANIT) will provide critical data to test SFIT's predictions and potentially constrain or illuminate aspects of more fundamental theories such as String Theory [7, 3].

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