Comparison of Stevenson-Flux Information Theory (SFIT) and Holographic Duality

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March 2026

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1 Introduction

Holographic duality, most famously the AdS/CFT correspondence, proposes that a gravitational theory in a higher-dimensional bulk spacetime is mathematically equivalent to a quantum field theory living on its lower-dimensional boundary. Gravity and spacetime geometry emerge from quantum entanglement and information dynamics on the boundary.

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 provides a clear comparison between the two frameworks.

2 Comparison Table

3 Detailed Comparison

3.1 Fundamental Description

- **Holographic Duality**: Gravity in the bulk is completely encoded in a quantum field theory on the boundary. Spacetime geometry and gravitational dynamics emerge from entanglement entropy and quantum information.

Aspect	Holographic Duality (AdS/CFT)	
Core Idea	Bulk gravity ≡ boundary quantum field theory	
Primary Scale	Planck / holographic scale	
Dimensionality	Higher-dimensional bulk vs lower-dimensional boundary	
Information Role	Entanglement entropy geometrizes spacetime	Ont
Key Mathematical Structure	Ryu-Takayanagi formula, entanglement wedge, Complexity=Volume	Mo
Testability	Mostly indirect (strong holography, black holes)	Dire
Non-locality	Geometric via bulk minimal surfaces and entanglement wedges	
Equivalence Principle	Preserved in bulk GR	Preser
Unification Goal	Gravity emerges from quantum information on the boundary	

Table 1: Key comparison between Holographic Duality and SFIT

- **SFIT**: Gravity itself is an active, ontological information-carrying flux. The flux at 1.20134 mHz creates a directional, non-reciprocal interaction between classical gravity and quantum systems.

3.2 Information and Geometry

- **Holographic Duality**: Information (entanglement) is geometrized. The Ryu-Takayanagi formula relates boundary entanglement entropy to the area of a bulk minimal surface. The entanglement wedge defines the reconstructible bulk region.
- **SFIT**: Information is carried as a physical flux that directly modifies the metric tensor. The non-reciprocal correction $h_{0z}^{\mathrm{SFIT}}(t)$ and the resulting KWW memory kernel arise from this flux.

3.3 Scale and Testability

- **Holographic Duality**: Operates primarily at Planck or strongly-coupled holographic scales. Direct experimental tests are extremely challenging.
- **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

- **Holographic Duality**: Non-locality of entanglement is resolved geometrically through the bulk (minimal surfaces and entanglement wedges).
- **SFIT**: Non-locality appears through the information flux inducing directional phase-space skew in quantum systems. The flux is tied to the local gravitational gradient.

4 Possible Complementary Relationship

SFIT and holographic duality may be complementary rather than competing. Holographic duality provides the deep ultraviolet description in which gravity and spacetime geometry emerge from quantum entanglement on a boundary. SFIT could represent an **effective low-energy resonant phenomenon** when this holographic structure interacts with a macroscopic gravitational field (such as Earth's).

In this picture: - The 1.20134 mHz Quantum Heartbeat could be a collective resonant mode arising from holographic entanglement when coupled to a weak gravitational gradient. - The coupling kernel $K = 1.060$ quantifies how efficiently boundary entanglement information is transferred into measurable gravitational flux effects. - The KWW relaxation tails reflect the slow relaxation of entangled degrees of freedom across the holographic bulk.

Thus, holographic duality may supply the microscopic encoding, while SFIT describes the mesoscopic, observable manifestation at laboratory energies.

5 Conclusion

Holographic duality geometrizes quantum information, proposing that spacetime and gravity emerge from entanglement on a lower-dimensional boundary. SFIT treats information as an active dynamical flux that directly modifies gravitational dynamics at accessible energies.

While holographic duality operates at fundamental holographic scales, SFIT offers concrete, testable predictions in the laboratory. The two approaches may ultimately prove complementary: holographic duality as the ultraviolet theory of quantum gravity, and SFIT as an 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 holographic principles at laboratory energies.