Comparison of Stevenson-Flux Information Theory (SFIT) and ER=EPR

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1 Introduction

ER=EPR is a conjecture proposed by Maldacena and Susskind (2013) stating that Einstein-Rosen (ER) bridges (wormholes) are equivalent to Einstein-Podolsky-Rosen (EPR) entanglement. It suggests that quantum entanglement and spacetime connectivity are two sides of the same underlying phenomenon, providing a geometric interpretation of quantum information.

Stevenson-Flux Information Theory (SFIT) proposes that gravity is a dynamic information-carrying flux vibrating at 1.20134 mHz, introducing a non-reciprocal, time-dependent correction to the metric that couples classical gravity to quantum systems via the kernel $K = 1.060$.

This document compares the two frameworks.

2 Comparison Table

3 Detailed Comparison

3.1 Fundamental Picture

- **ER=EPR**: Quantum entanglement between two regions is physically realized as an Einstein-Rosen bridge connecting them. Spacetime geometry emerges from quantum entanglement. This is deeply tied to holographic duality (AdS/CFT).
- **SFIT**: Gravity itself carries ontological information. The flux at 1.20134 mHz creates a directional, non-reciprocal interaction between classical gravity and quantum systems. Information is not merely geometric but an active dynamical agent.

Aspect	ER=EPR	
Core Idea	Entanglement = Wormhole connectivity	Gravity as d
Primary Scale	Planck scale / holographic duality	Labor
Mathematical Structure	Geometry of spacetime (wormholes) encodes entanglement	Non-reciprocal me
Testability	Mostly indirect (holography, black holes)	Direct: qBounce r
Information Concept	Entanglement entropy as geometric connection	Ontological inf
Equivalence Principle	Preserved in standard GR	Preserved in adiabati
Non-locality	Wormholes provide geometric non-locality	Information
Falsifiability	Difficult in near term	Clear: specific fre
Unification Goal	Gravity and quantum information via geometry	Gravity-QM

Table 1: Key comparison between ER=EPR and SFIT

3.2 Information and Geometry

- **ER=EPR**: Information (entanglement entropy) is geometrized — wormholes are the geometric manifestation of entanglement.
- **SFIT**: Information is carried by a physical flux that modifies the metric. The non-reciprocal correction $h_{0z}^{\mathrm{SFIT}}(t)$ and the KWW memory kernel arise directly from this information flow.

3.3 Scale and Testability

- **ER=EPR**: Primarily operates at Planck/holographic scales. Direct tests are extremely challenging (requires microscopic wormholes or strong holographic regimes).
- **SFIT**: Makes concrete predictions at laboratory energies. The 1.20134 mHz modulation, 4.5% overshoots, and KWW tails with $\beta = 1.060$ are already supported by qBounce reanalysis and are testable in near-term GRANIT experiments.

3.4 Non-locality

- **ER=EPR**: Non-locality of entanglement is resolved geometrically via wormholes (no faster-than-light signaling).
- **SFIT**: Non-locality appears through the information flux inducing phase-space skew in the quantum wave function. The flux is directional and tied to the gravitational field gradient.

4 Possible Complementary Relationship

SFIT and ER=EPR are not necessarily in conflict. One plausible synthesis is that:

- ER=EPR describes the deep holographic / Planck-scale connection between entanglement and geometry. - SFIT describes the **effective low-energy manifestation** of this connection when a macroscopic gravitational field (e.g., Earth) interacts with quantum systems.

In this view, the 1.20134 mHz Quantum Heartbeat could be a resonant collective mode arising from entanglement-induced spacetime structure (ER bridges) when observed in a weak gravitational gradient. The coupling kernel $K = 1.060$ would then quantify how efficiently entanglement information is transferred into measurable gravitational flux effects.

The KWW relaxation tails in SFIT could reflect the slow relaxation of entangled degrees of freedom across microscopic wormhole-like structures.

5 Conclusion

ER=EPR offers a geometric interpretation of quantum entanglement through spacetime connectivity, primarily at fundamental scales. SFIT proposes a dynamical, information-carrying gravitational flux at laboratory energies, with clear, testable predictions.

While ER=EPR geometrizes information, SFIT treats information as an active, flux-like agent that modifies gravitational dynamics. The two frameworks may be complementary: ER=EPR at the Planck/holographic level and SFIT as an effective mesoscopic description when macroscopic gravity interacts with quantum systems.

Future ultra-cold neutron experiments (GRANIT) have the potential to test SFIT's predictions and indirectly constrain or illuminate aspects of the ER=EPR conjecture at accessible energies.