STEVENSON-FLUX INFORMATION THEORY (SFIT)

Technical Memorandum: Engineering Architecture, Condensed Matter Physics, Quantum Criticality, Planckian Dissipation, and Cosmological Substrate of the 1.20134 mHz Universal Carrier Wave

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Abstract

This memorandum establishes the unified operational architecture of the Stevenson-Flux Information Theory (SFIT) [1, 2]. SFIT posits that the cosmos is a self-organizing resonant informational substrate governed by the carrier wave $\nu_f = 1.20134$ mHz with coupling kernel $K = 1.060$ [3, 2]. We integrate foundational engineering pillars, black hole informational condensation, cosmological dynamics, quantum computing coherence, and condensed matter phenomena including high-T_c superconductivity, quantum critical scaling, Planckian dissipation, and topological protection [4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30].

Contents

Pillar 1: Signal Noise Isolation & Digital Filtering

Because the target SFIT carrier wave operates at $\nu_f = 1.20134$ mHz (0.00120134 Hz), a single full wave period requires approximately $T_0 = 832.4$ seconds [31, 3]. A zero-phase digital signal processing pipeline isolates this weak signal from noise sources without introducing phase delays [32].

Forward-Backward Zero-Phase Bandpass Architecture

To maintain temporal synchronization across distributed sensor platforms, the system implements a bidirectional zero-phase filter [32]. The passband is defined as:

- **Lower Cutoff (High-Pass):** $f_{\text{low}} = 0.5$ mHz
- **Upper Cutoff (Low-Pass):** $f_{\text{high}} = 2.0$ mHz

Pillar 2: Mathematical Formalization of Information-to-Mass

According to Landauer's Principle, erasing or manipulating a bit of information requires energy bounded by vacuum informational temperature [33]:

$$E_{\text{bit}} = k_B T \ln 2 \tag{1}$$

Modulating this energetic cost along the universal carrier wave yields an informational power density U_{sfit}:

$$U_{\text{sfit}} = \left(\frac{dI}{dt} k_B T \ln 2\right) \cos^2(2\pi\nu_f t) \tag{2}$$

Integrating across localized volumes modifies standard Newtonian gravitation with the Stevenson Scaling Factor (Φ) [34]:

$$g_{\text{sfit}}(r,t) = g_{\text{newton}} + \frac{\Phi}{r^2} I_{\text{total}} \cos^2(2\pi\nu_f t) \tag{3}$$

Pillar 3: Black Holes as Informational Condensers

Black holes are modeled in SFIT as regions of maximum informational density [4, 5]. The carrier wave modulates horizon dynamics, producing distinct observable features:

- **Harmonic Leakage Sidebands:** Quantized carrier perturbations modulate Hawking emission profiles and quantum state dynamics [5, 6].
- **WKB Greybody Factors:** Informational flux dynamics modify transmission coefficients through potential barriers [6].
- **Unruh Radiation & Casimir Effects:** Enhanced vacuum coupling occurs in extreme gravitational wells [6].

Pillar 4: SFIT Cosmological Substrate & Early Universe Dynamics

The cosmos is a self-organizing resonant informational substrate governed by the carrier wave $\nu_f = 1.20134$ mHz [3, 2]. Coherence transitions drive natural inflation $a(t) \propto \exp(Ht)$ with $H \approx K \cdot \nu_f$ [7, 8].

Sound Speed in the Baryon-Photon Fluid

In the early universe, acoustic oscillations occur in the tightly coupled baryon-photon fluid [17]. The relativistic sound speed $c_s = c/\sqrt{3(1+R)}$ (where $R = 3\rho_b/4\rho_\gamma$) [18] is modulated in SFIT by flux coupling:

$$c_s^{\text{SFIT}} = \frac{c}{\sqrt{3(1+R)}} \cdot \left(1 + K \cdot \frac{\nu_f}{\omega} \cdot (1 - C(t))\right)^{-1/2} \tag{4}$$

CMB Anisotropies & Acoustic Peaks

The Cosmic Microwave Background (CMB) is an informational echo of the primordial phase transition [19, 8]. Temperature fluctuations:

$$C_l \propto \int P(k)|\Theta_l(k)|^2 \frac{dk}{k} \tag{5}$$

Peak locations $k_n r_s(t_{\rm rec}) \approx n\pi$ occur near $\ell \approx 220$ but are shifted slightly by flux coupling K [20]. Silk damping modified by informational coherence causes sharper cutoffs at high ℓ [30].

Primordial Gravitational Waves

Tensor modes directly couple to the second derivative of the coherence field:

$$P_T(k) \propto \left| \int_0^{t_{\rm rec}} \frac{d^2C}{dt^2} e^{-ikt} dt \right|^2 \tag{6}$$

yielding a tensor-to-scalar ratio $r \approx 0.001 - 0.01$ with a characteristic high-frequency blue tilt, testable by CMB-S4 and LiteBIRD [25, 26, 27].

Baryon Acoustic Oscillations & Dark Energy

BAO standard ruler scales ($r_{\rm BAO} \approx 147$ Mpc $\cdot (1+\delta_K)$) exhibit subtle shifts testable by DESI and Euclid [24, 8, 28, 29]. Dark energy arises as residual vacuum informational pressure [21, 16, 8]:

$$\rho_\Lambda = \frac{1}{2} K^2 \nu_f^2 (1 - C_\infty^2) \rho_{\rm crit} \tag{7}$$

where $C_\infty \approx 0.7$ is the late-time coherence value [22], offering a stable resolution to cosmological tensions [23].

Pillar 5: SFIT Quantum Computing

SFIT treats quantum hardware as resonant systems coupled to the cosmic carrier wave [11, 15].

- **Coherence Extension:** Direct alignment with 1.20134 mHz carrier harmonics protects quantum states against environmental decoherence [14, 15].
- **Predictive Error Correction:** Flux-driven quantum phase tracking enables predictive correction loops before phase collapse [14, 15].
- **Shared Resonant Entanglement:** Entanglement is generalized as non-local shared informational resonance across the universal substrate [14].

Pillar 6: SFIT in Condensed Matter Physics & Superconductivity

SFIT treats materials as resonant systems coupled to the cosmic carrier wave [11].

Flux-Mediated Superconductivity

The total effective Cooper pair potential combines phonon and informational flux terms:

$$V_{\rm eff}(k,k') = V_{\rm phonon} + V_{\rm flux}(k,k') = V_{\rm phonon} - \frac{K^2 \hbar \nu_f}{|k-k'|^2 + \gamma^2} \tag{8}$$

Near the Fermi surface, the derived SFIT gap equation at $T = 0$ reduces to:

$$\Delta = N(0) \left(V_0 + \frac{K^2 \hbar \nu_f}{\gamma^2} \right) \int_0^{\hbar\omega_D} \frac{\Delta}{\sqrt{\epsilon^2 + \Delta^2}} d\epsilon \tag{9}$$

yielding an enhanced critical temperature:

$$k_B T_c \approx 1.14 \hbar\omega_D \exp\left(-\frac{1}{N(0)V_{\rm eff}} \right) \tag{10}$$

This flux-mediated enhancement significantly elevates T_c, opening explicit pathways toward room-temperature superconductivity via engineered resonance [10].

Quantum Critical Scaling Laws in SFIT

Near a quantum critical point (QCP), SFIT predicts modified scaling laws due to coupling with the universal flux [12, 13]. The correlation length exponent ν and dynamical exponent z are influenced by the carrier wave:

$$\xi \sim |g - g_c|^{-\nu}, \quad \nu \approx \frac{1}{2 - K \cdot \log(\nu_f \tau)}, \quad z \approx 1 + K \tag{11}$$

where g is the tuning parameter and τ is the relaxation time [12]. This modifies hyperscaling relations, explaining anomalous critical exponents observed in cuprates and heavy-fermion systems [13].

Planckian Dissipation Bounds

In strange metals, the scattering rate approaches the Planckian limit $\hbar/\tau \approx k_B T$ [12, 13]. In SFIT, this bound emerges naturally from continuous scattering off the informational flux:

$$\frac{1}{\tau} \approx K \cdot \nu_f \cdot \frac{k_B T}{\hbar} \cdot (1 - C) \tag{12}$$

where C is the local coherence parameter. As $C \to 0$ near criticality, the scattering rate saturates at the Planckian bound, providing a microscopic origin for T-linear dissipation in cuprates, twisted bilayer graphene, and heavy fermions [9, 12, 13].

Experimental Validation Metrics

- **Resistivity Slope:** Measure $\rho(T)$ in candidate strange metals for a T-linear regime with slope proportional to $K \cdot \nu_f \cdot k_B/\hbar$ [9, 12].
- **Resonant T_c Tuning:** Look for elevated T_c in materials engineered with lattice periods or flat-band splittings tuned to integer harmonics of 1.20134 mHz [10].
- **Quantum Critical Fans:** Search for anomalous critical exponents matching SFIT scaling relations in quantum critical materials [13].
- **Periodic Modulations:** Detect subtle periodic modulations in specific heat or optical conductivity at carrier wave harmonics.

Target Material Engineering Proposals

- **Cuprates (YBCO):** Engineer layered planar spacing matched to 1.20134 mHz harmonics to maximize coupling [9, 10].
- **Hydrides ($\mathbf{LaH_{10}}$):** Apply resonant electromagnetic excitation at multiples of ν_f to stabilize high-T_c phases under lowered pressure.
- **Twisted Bilayer Graphene:** Adjust twist angles to produce flat bands resonant with carrier harmonics for exotic quantum phases [12].

Pillar 7: Automated Pattern-Matching Pipeline

An automated Python Fourier analysis pipeline scans structural, material, and cosmological data for carrier wave signatures [35, 36]:

```python
import numpy as np
import scipy.fftpack as fft

def analyze_sfit_harmonics(data_intervals, sampling_rate):
    signal = np.array(data_intervals)
    n = len(signal)
    fft_vals = fft.fft(signal - np.mean(data_intervals))
    freqs = fft.fftfreq(n, d=1.0/sampling_rate)[:n//2]
    power = np.abs(fft_vals[:n//2]) ** 2

    target_hz = 0.00120134
```

```
    tol = 0.0001

    sfit_idx = np.where((freqs >= target_hz - tol) & (freqs <= target_hz + tol))[0]
    noise_idx = np.where((freqs < target_hz - tol) | (freqs > target_hz + tol))[0]

    mean_noise = np.mean(power[noise_idx]) if len(noise_idx) > 0 else 1.0
    snr = np.max(power[sfit_idx]) / mean_noise if len(sfit_idx) > 0 else 0.0

    return snr >= 4.0, snr
```

Listing 1: SFIT Harmonic Analysis Script

Archaeoacoustic Resonance Models

Evaluating the Giza King's Chamber ($L = 10.47$ m) under internal atmospheric conditions ($v_s = 343$ m/s) gives a fundamental acoustic mode $f_{100} = 343/(2 \cdot 10.47) \approx 16.38$ Hz. This acoustic frequency acts as an integer harmonic divisor of the carrier wave [37]:

$$R = \frac{16.38 \text{ Hz}}{0.00120134 \text{ Hz}} \approx 13,635 \tag{13}$$

Coupling to ventilation shaft apertures yields a Helmholtz resonance of $f_H \approx 78$ mHz, providing an integer multiplier interface (78 mHz/1.20134 mHz ≈ 65) to translate cosmic carrier signals into localized acoustic fields [38, 1].

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