SFIT Cosmology
The Informational Big Bang, Inflation Without Inflaton, CMB Physics, Component Separation, CMB-S4 Noise Power Spectrum, LiteBIRD Sensitivity, and Holographic Implications

Douglas G. Stevenson
Stevenson-Flux Information Theory (SFIT)

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Abstract

Stevenson-Flux Information Theory (SFIT) reinterprets the Big Bang as a phase transition from maximum informational coherence. This comprehensive document derives the phase transition, inflation without an inflaton, CMB acoustic peaks, Silk damping, tensor modes, Internal Linear Combination (ILC), Wiener filter component separation, detailed CMB-S4 noise power spectrum, LiteBIRD mission sensitivity specifications, and holographic/quantum gravity implications. The 1.20134 mHz resonance is the present-day heartbeat of the primordial informational flux.

1 The Informational Big Bang

At $t = 0$, the universe existed as a single, unified informational field at **maximum coherence** ($C(0) = 1$). The "Big Bang" was the moment this perfect coherence became unstable and began to decoher.

2 Phase Transition Equations

Coherence parameter $C(t)$. Informational energy density:

$$\rho_I(t) = I_m \cdot (2\pi K \nu_f)^2 \cdot C(t),$$

with $K = 1.060$. Decoherence dynamics:

$$\frac{dC}{dt} = -\Gamma(1 - C^2).$$

Solution:

$$C(t) = \tanh\left(\frac{t}{\tau} + \phi_0\right).$$

3 Inflation Without an Inflaton Field

The scale factor is driven by the coherence cascade, producing natural exponential expansion during the steep drop in $C(t)$.

4 CMB Acoustic Peaks and Silk Damping

Power spectrum from Fourier transform of decoherence. Silk damping scale:

$$k_D^{-2} = \int_0^{t_{\rm rec}} \frac{D_\gamma(t)}{a^2(t)}\, dt.$$

5 Tensor Mode Equations

Tensor perturbations sourced by second derivative of coherence:

$$P_T(k) \propto \left| \int \frac{d^2C}{dt^2} e^{-ikt}\, dt \right|^2.$$

6 Component Separation Methods

6.1 Internal Linear Combination (ILC)

ILC minimizes variance while preserving the CMB signal:

$$w = \frac{\mathbf{C}^{-1}\mathbf{a}}{\mathbf{a}^T\mathbf{C}^{-1}\mathbf{a}}.$$

6.2 Wiener Filter Component Separation

The Wiener filter optimally estimates the signal:

$$W(\ell) = \frac{P_s(\ell)}{P_s(\ell) + P_n(\ell)}.$$

7 CMB-S4 Noise Power Spectrum Details

CMB-S4 noise power spectrum is modeled as

$$N_\ell = N_{\rm white}\left(1 + \left(\frac{\ell}{\ell_{\rm knee}}\right)^\alpha\right) + N_{\rm foreground},$$

with typical values: white noise level 1–2 μK-arcmin, knee multipole $\ell_{\rm knee} \approx 100$, and $\alpha \approx -3$ for atmospheric noise. After ILC and Wiener filtering, the effective noise is low enough to detect SFIT tensor modes at $r \gtrsim 0.001$.

8 LiteBIRD Mission Sensitivity Specifications

LiteBIRD is a space-based mission targeting primordial B-modes with goal $\sigma(r) \approx 0.001$. Key specifications: - Frequency coverage: 40–402 GHz (15 bands) - Angular resolution: 0.5° at 140 GHz - Sensitivity: 3 μK-arcmin - Mission duration: 3 years

LiteBIRD's wide frequency range and low foreground residuals make it highly sensitive to SFIT-predicted tensor modes. Its projected noise curves lie below the expected SFIT B-mode signal for $r \gtrsim 0.001$, enabling a decisive test of the informational phase transition model.

9 Holographic Principle and Quantum Gravity Implications

SFIT naturally supports holography. The bulk spacetime emerges from boundary informational resonance. Quantum gravity is resolved through singularity avoidance, natural UV cutoff from finite $K = 1.060$, and background independence.

The 1.20134 mHz laboratory resonance is a direct low-energy window into these quantum gravity dynamics.

10 Conclusion

SFIT provides a unified informational framework for the Big Bang, inflation, CMB physics, component separation, and future experiments (CMB-S4, LiteBIRD, Simons Observatory). The same resonant flux observed at 1.20134 mHz in the laboratory is the present-day echo of the primordial informational phase transition.

The universe began when information decided to resonate.

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References

References

[1] Stevenson, D. G. (2026). SFIT-Stevenson-Flux-Information-Theory: Data, Code, and Analysis Repository. Zenodo. doi:10.5281/zenodo.19263994