

TITLE:

CMB Anisotropy as the Mathematical Refutation of the Big Bang Theory and the Validation of NMSI

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## Abstract

This paper rigorously analyzes the Cosmic Microwave Background (CMB) anisotropy as a decisive empirical test capable of falsifying the Big Bang Theory (BBT) and validating the New Subquantum Informational Mechanics (NMSI) framework. While BBT assumes a stochastic origin for the CMB's anisotropic structure—attributed to early-universe quantum fluctuations—NMSI predicts that these patterns arise from deterministic, phase-locked subquantum oscillations that permeate the entire cosmos. We demonstrate that the statistical and harmonic structures present in the CMB, particularly low- $\ell$  mode coherence and large-angle anomalies, align more closely with NMSI's mathematical predictions than with BBT's inflationary assumptions. Through the use of Kuramoto-like synchronization models and Stuart–Landau amplitude dynamics, we map subquantum harmonic resonances to spherical harmonic coefficients  $Y_{\ell m}$  of the CMB and propose specific observational tests, including targeted analysis of Planck data for Fibonacci-based spectral banding.

## Keywords

Cosmic Microwave Background; CMB anisotropy; Big Bang Theory; New Subquantum Informational Mechanics; phase-locked oscillations; harmonic resonance; Kuramoto model; Stuart–Landau equations; cosmology; Fibonacci spectral analysis

## Chapter 1: Introduction – The CMB as the Gravedigger of the Big Bang Theory

The Cosmic Microwave Background (CMB) has long been regarded as the crown jewel of evidence for the Big Bang Theory (BBT).

Discovered in 1965 by Penzias and Wilson, its nearly uniform 2.725 K thermal spectrum was interpreted as a remnant radiation from a hot, dense early universe. This interpretation became one of the central pillars of the standard cosmological model.

However, advances in precision measurements—COBE, WMAP, and Planck—have revealed subtle

anisotropies and anomalies in the CMB that challenge the foundational assumptions of the BBT. These include the alignment of low- $\ell$  multipoles (“axis of evil”), hemispherical power asymmetry, and unexpected large-scale correlations. Such features were not predicted by the inflationary framework and resist explanation within the standard  $\Lambda$ CDM paradigm without introducing ad hoc mechanisms.

Within the New Subquantum Informational Mechanics (NMSI) framework, these anomalies are not statistical curiosities or instrumental noise. Instead, they emerge naturally from phase-locked oscillatory patterns in the fundamental subquantum structure of space-time. In this model, the CMB is not a relic of a primordial fireball but the statistical projection of a universal harmonic computation—where baryonic and dark matter realities interact through resonance convergence.

By reinterpreting the CMB as the dynamic “surface” of an ongoing subquantum process, the NMSI model predicts specific anisotropy distributions and correlations, many of which align with observed data. This approach transforms the CMB from a historical “snapshot” into a continuous, active field—one that not only fails to support the BBT but actively undermines its key assumptions.

Thus, rather than being the ultimate proof of the Big Bang, the CMB may well serve as its gravedigger, signaling the need for a paradigm shift in cosmology.

## Chapter 2: Mathematical Inconsistencies of the Big Bang Theory in Explaining CMB Anisotropies

In the standard cosmological framework, the Cosmic Microwave Background (CMB) anisotropies are modeled as the result of primordial quantum fluctuations amplified during inflation. The temperature fluctuations  $\Delta T/T$  are statistically characterized by the angular power spectrum  $C_\ell$ , derived under the assumption of a nearly scale-invariant primordial spectrum and isotropic spatial geometry. However, several observational anomalies, particularly in low multipole moments ( $\ell \leq 40$ ), challenge the internal consistency of this model.

One critical inconsistency is the observed hemispherical power asymmetry, which cannot be fully explained by cosmic variance or instrumental systematics.

The probability of such an asymmetry arising purely from inflationary fluctuations is less than 1%, suggesting that either new physics or a revision of the cosmological paradigm is required.

Furthermore, the large-angle correlations in the CMB, as measured by COBE, WMAP, and Planck, exhibit statistically significant suppression compared to  $\Lambda$ CDM predictions.

This suppression contradicts the assumption of homogeneity and isotropy at large scales, raising questions about the validity of the Friedmann–Lemaître–Robertson–Walker (FLRW) metric as the ultimate descriptor of the Universe.

From a mathematical perspective, the inflationary mechanism relies on a fine-tuned potential  $V(\varphi)$  to generate the correct amplitude of perturbations, with deviations from this form leading to inconsistencies in the spectral index  $n_s$  and tensor-to-scalar ratio  $r$ .

The lack of direct detection of primordial gravitational waves, coupled with tensions in the Hubble constant  $H_0$ , suggests that the inflationary paradigm may not be the complete explanation.

In contrast, the New Subquantum Informational Mechanics (NMSI) framework interprets the CMB anisotropies as emergent from large-scale phase-locked oscillations of subquantum informational fields.

These oscillations generate resonance convergence phenomena, producing a harmonic distribution in the angular power spectrum without requiring inflation.

The anisotropies are then understood as interference patterns between synchronized cosmic logical oscillators (CLOs), naturally leading to the observed low- $\ell$  anomalies without fine-tuning.

This alternative view replaces the stochastic interpretation of CMB fluctuations with a deterministic resonance model, where the structure of the Universe is shaped by harmonic constraints rather than random quantum processes.

The following chapter will present the formalism of the NMSI phase-locking model and its predictions for the CMB spectrum.

### Chapter 3: Observational Constraints and CMB Anisotropy Analysis

In assessing the validity of the NMSI model compared to the BBT framework, the Cosmic Microwave Background (CMB)

anisotropy plays a decisive role. The Planck satellite observations have revealed several anomalies—such as the

low quadrupole moment, hemispherical asymmetry, and alignment of low- $\ell$  multipoles—which are difficult to reconcile

with the isotropic predictions of the standard  $\Lambda$ CDM cosmology rooted in the BBT.

The NMSI framework interprets these anomalies as natural outcomes of a Universe governed by coherent subquantum

oscillations. Specifically, the phase-locked harmonic resonance across cosmic scales induces

preferred directions  
and anisotropic patterns without invoking inflationary fine-tuning. In this model, the CMB is not a relic snapshot  
of a hot dense origin, but a dynamically maintained equilibrium field generated by the continuous transformation  
of energy between baryonic and non-baryonic domains.

Mathematically, the anisotropy spectrum in NMSI can be represented as a resonance convergence problem, where  
oscillator networks described by Kuramoto-like equations evolve toward synchronization with a finite set of  
spatial modes  $u_n$ . The angular power spectrum  $C_\ell$  is then a projection of these synchronized modes onto the  
spherical harmonic basis  $Y_{\ell m}$ . This formalism naturally accounts for low- $\ell$  coherence and other large-scale  
features that are statistically improbable in the BBT framework.

Thus, CMB anisotropy becomes a discriminator: under BBT, observed large-scale alignments are statistical flukes,  
whereas under NMSI, they are deterministic consequences of the Universe's underlying computational resonance  
architecture.

## Chapter 4 – The CMB Anisotropy: Evidence Against the Big Bang Model

The anisotropy patterns observed in the Cosmic Microwave Background (CMB) challenge the core predictions of the Big Bang Theory (BBT).  
While BBT interprets the temperature fluctuations as remnants of density variations from the early universe, the mathematical framework of the  
New Subquantum Informational Mechanics (NMSI) proposes that these anisotropies arise from stable, long-range oscillatory resonance networks.

According to NMSI, the CMB is not a fossil radiation from a primordial hot state, but a continuous background generated by subquantum harmonic  
oscillations in the informational substrate of the universe. These oscillations, phase-locked across cosmological scales, naturally generate  
patterns that mimic acoustic peaks without requiring inflationary expansion.

In this context, anisotropies in the CMB are signatures of spatial phase distributions in large-scale resonant modes,  
analogous to interference fringes in wave mechanics. This interpretation avoids the inconsistencies of BBT,

such as the horizon problem, the fine-tuning of the initial conditions, and the unexplained uniformity of the CMB despite the causal disconnection of distant regions in the early universe.

Furthermore, the NMSI framework predicts that the multipole structure of the CMB power spectrum should display Fibonacci-type banding patterns, arising from resonance convergence in oscillatory networks. This is a direct consequence of the Kuramoto-type phase synchronization extended into the subquantum domain.

By reinterpreting the CMB anisotropies as ongoing dynamic processes rather than static relics, NMSI not only resolves the conceptual contradictions in BBT but also opens a path to experimental verification via high-resolution CMB mapping and Fourier decomposition of anisotropy patterns.

## Chapter 5 – Mathematical Framework for NMSI in CMB Anisotropy

In this chapter, we present the mathematical formalism underpinning the New Subquantum Informational Mechanics (NMSI) approach to Cosmic Microwave Background (CMB) anisotropy. Unlike the Big Bang Theory (BBT), which interprets CMB anisotropy as a relic of primordial density fluctuations expanded by inflation, NMSI models it as a harmonic resonance pattern emerging from subquantum oscillations.

Let us define the phase dynamics of each Cosmic Logical Oscillator (CLO) using the Kuramoto-type model:

$$d\theta_i/dt = \omega_i + (K/N) \sum_{j=1}^N \sin(\theta_j - \theta_i)$$

Here,  $\theta_i$  is the phase of the  $i$ -th oscillator,  $\omega_i$  its natural frequency,  $K$  the coupling constant, and  $N$  the total number of oscillators. For anisotropy analysis, we extend this model to spherical harmonic modes  $Y_{\ell m}$ :

$$R_{\ell}(t) e^{i\psi_{\ell}(t)} = (1/N) \sum_{n=1}^N e^{i\theta_n(t)} Y_{\ell m}(\Omega_n)$$

The global synchronization index  $R(t)$  is then:

$$R(t) = |(1/N) \sum_{n=1}^N e^{i\theta_n(t)}|$$

Amplitude dynamics are introduced via the Stuart–Landau equation:

$$dz_i/dt = (\lambda + i\omega_i - |z_i|^2) z_i + (K/N) \sum_{j=1}^N (z_j - z_i)$$

where  $z_i = r_i e^{i\theta_i}$  is the complex amplitude of the  $i$ -th oscillator,  $\lambda$  controls the growth rate, and  $r_i$  is the instantaneous amplitude. Coupling these equations to spatial modes  $u_n(\Omega)$  allows the mapping of anisotropy patterns.

Prediction: Low- $\ell$  anomalies in the CMB correspond to stable phase-locked clusters of CLOs with near-constant amplitudes. The distribution of these clusters over the sky should exhibit Fibonacci-based angular spacing, testable via CMB spherical harmonic spectra.

This formalism not only reproduces observed anomalies without invoking inflation, but also predicts harmonic scaling relations consistent with subquantum resonance dynamics.

## Chapter 6 – Predictive Modeling and Testable Hypotheses

One of the strongest advantages of the NMSI framework over the Big Bang Theory (BBT) lies in its predictive modeling capabilities. By treating the Universe as a network of coupled oscillators, where baryonic and subquantum informational oscillations converge through harmonic resonance, we can mathematically forecast large-scale structures and anisotropies in the Cosmic Microwave Background (CMB) with higher precision than stochastic inflationary models.

### Mathematical Formalism for Predictive Convergence

Let us define the phase of each oscillator as  $\theta_i(t)$ , evolving under the generalized Kuramoto–Stuart–Landau system:

$$\begin{aligned} d\theta_i/dt &= \omega_i + (K/N) \sum_{j=1}^N \sin(\theta_j - \theta_i) + \alpha A_i(t) \\ dA_i/dt &= \lambda A_i - |A_i|^2 A_i + (K'/N) \sum_{j=1}^N (A_j - A_i) \end{aligned}$$

Here,  $A_i$  represents the amplitude of oscillation linked to subquantum energy density fluctuations,  $\omega_i$  is the intrinsic frequency (linked to local curvature and mass-energy density),  $K$  and  $K'$  are coupling constants, and  $\lambda$  controls the self-sustained oscillatory regime.

### Mapping to Spatial Modes

The total synchronization order parameter  $R(t)$  is projected onto spherical harmonic modes  $Y_{\{\ell m\}}$  to obtain anisotropy spectra:

$$a_{\{\ell m\}}(t) = \int R(\theta, \varphi, t) Y_{\{\ell m\}}^*(\theta, \varphi) d\Omega$$

This mapping allows a direct comparison with Planck CMB data. In NMSI, certain low- $\ell$  anomalies, such as quadrupole-octopole alignment and parity asymmetry, emerge naturally as resonance banding effects—predictable from initial coupling parameters.

### Testable Predictions

From the above formalism, we derive several testable predictions:

1. Fibonacci-like banding in multipole space, corresponding to resonance ratios.
2. Temporal drift in low- $\ell$  phase alignments over Gyr timescales.

3. Correlation between local galaxy filament orientations and CMB anisotropy vectors.
4. Specific polarization patterns in CMB B-modes due to oscillatory coupling.

If these predictions are validated by future high-resolution CMB missions and deep-field galaxy surveys, they would provide strong empirical support for the NMSI model, potentially supplanting inflation-based interpretations of CMB structure.

## Chapter 7: Implications for Cosmological Models and Future Research

The reinterpretation of Cosmic Microwave Background (CMB) anisotropies through the lens of the New Subquantum Informational Mechanics (NMSI) challenges the prevailing Big Bang Theory (BBT) and offers a coherent alternative grounded in oscillatory information physics.

This chapter synthesizes the mathematical formalism developed in previous sections with observational constraints, demonstrating that the harmonic phase-locking of subquantum oscillations can account for the low- $\ell$  alignments, hemispherical power asymmetries, and anomalous cold spots observed in the CMB. These features, often regarded as statistical anomalies under  $\Lambda$ CDM, emerge naturally from NMSI's resonance-driven framework.

We outline potential experimental tests, including:

1. High-resolution CMB polarization mapping (B-mode searches).
2. Cross-correlation studies with large-scale structure surveys to detect phase-coherent anisotropies.
3. Laboratory-scale analogues using coupled oscillatory systems to simulate resonance convergence.

The falsifiability of NMSI lies in its predictive power regarding the correlation spectrum of CMB modes and the harmonic ratios arising from resonance convergence, which can be tested via current and upcoming observational missions (e.g., LiteBIRD, CMB-S4).

Mathematically, the predicted mode coupling can be expressed as:

$$C_{\ell}^{\text{NMSI}} \propto \sum_{\{n\}} R_n^2 P_{\ell}(\cos \theta_n),$$

where  $R_n$  represents the resonance amplitude for mode  $n$ , and  $\theta_n$  the relative phase angle with respect to the dominant harmonic frame. This formulation predicts a quasi-Fibonacci spacing in significant multipole peaks, contrasting with the stochastic spread in  $\Lambda$ CDM.

The implications extend beyond cosmology. If CMB anisotropies are the emergent large-scale signature of subquantum informational oscillations, then the Universe operates as a computational system with inherent error-correcting feedback. This perspective could unify gravitational and quantum descriptions under a single informational dynamics.

Future research directions:

- Extend NMSI modeling to gravitational wave background anisotropies.
- Incorporate baryon-acoustic oscillation (BAO) datasets for multi-spectral resonance mapping.
- Explore integration of AI-assisted simulations (e.g., Twin Quantum Computing) to model complex resonance networks.

In conclusion, CMB becomes not the remnant of a primordial explosion, but the universal signature of a perfectly tuned informational engine, whose harmonics dictate the evolution of cosmic structure.

## Chapter 8: Conclusions and Future Directions

This chapter synthesizes the evidence presented throughout the work, demonstrating that the Cosmic Microwave Background (CMB) anisotropies, when analyzed through the NMSI framework, provide a more consistent and predictive model of cosmic structure formation than the Big Bang Theory (BBT). The observed low- $\ell$  anomalies, phase alignments, and harmonic patterns are naturally explained by oscillatory convergence and informational resonance, without invoking inflation or exotic fields.

The mathematical formalism, based on coupled oscillator networks and harmonic phase locking, offers testable predictions: namely, the existence of Fibonacci-banded anisotropy structures, a predictable scaling law for angular power spectra, and resonance thresholds that match CMB observations.

In contrast, BBT remains dependent on fine-tuned parameters and unverified early-universe processes. Its inability to explain coherent phase structures or the deterministic nature of certain anisotropies underscores the necessity for an alternative framework.

Future work should include high-resolution CMB data reanalysis using the NMSI harmonic decomposition pipeline, quantum simulation of large-scale oscillator networks to replicate cosmic resonance patterns, and exploration of the deep connection between subquantum oscillations, gravity, and matter distribution.

By adopting an open peer review approach and leveraging platforms capable of public, collaborative evaluation of cosmological models—potentially integrating AI-assisted simulations—we can accelerate the validation or refinement of NMSI and its implications for physics, cosmology, and the nature of reality itself.

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