The Yukawa–NMSI + HDQG Framework: Dismantling the Big Bang Model and Reinterpreting Cosmological Observations without Dark Energy and Expansion

Prof. Dr. Sergiu Vasili Lazarev

ORCID: https://orcid.org/0009-0005-3749-9735

Email: cycletermo@gmail.com

Abstract

This article introduces an alternative cosmological framework that combines the Yukawa–NMSI formalism with holographic dissipative quantum gravity (HDQG). We demonstrate that the standard Big Bang model (BBT) relies on misinterpretations of observational data. Specifically:
1. Baryon Acoustic Oscillations (BAO) do not reflect cosmic expansion but instead subquantum oscillatory interference.
2. The Hubble tension vanishes once gravitational fluxes are correctly reinterpreted, eliminating the need for a 'Hubble constant.'
3. The Cosmic Microwave Background (CMB) is not a relic of an initial singularity but a signal of a phase transition.
4. Gravitational Waves (GW) confirm the stability of oscillatory phases and offer a direct test of the new framework.

The central result: Dark Energy does not exist, and Dark Matter is not exotic particles but the antiphase component of baryonic matter. The Yukawa–NMSI + HDQG framework provides testable equations, falsifiable predictions, and a coherent view of the Universe as an oscillatory logical system without singularities or expansion.

Keywords

Yukawa–NMSI; HDQG; Oscillatory Subquantum Physics; BAO; CMB; Gravity; Dark Energy; Dark Matter; Hubble Tension; Oscillatory Universe

Chapter 1 – Introduction

The accelerated development of modern cosmology has exposed cracks in the ΛCDM paradigm. Discrepancies such as the Hubble tension, unexplained anomalies in Baryon Acoustic Oscillations (BAO), and low-ℓ anomalies in the Cosmic Microwave Background (CMB) all point toward the insufficiency of a static interpretation of Einstein's equations patched with unobservable parameters: dark energy and cold dark matter.

The Yukawa–NMSI framework has already demonstrated, through oscillatory interference formalism, that gravitational interactions can be reformulated without invoking exotic dark matter particles or a cosmological constant. Instead, mass emerges as a coupling between baryonic matter and its oscillatory antiphase, sustained by a subquantum informational vacuum.

The Holographic Dissipation Quantum Gravity (HDQG) approach, by contrast, interprets spacetime curvature as an emergent dissipative geometry, where information flux and entropy balance determine large-scale dynamics. Combining these two models offers a powerful predictive framework: Yukawa–NMSI explains galactic and cluster-scale dynamics, while HDQG provides consistency at cosmological scales.

The aim of this work is to integrate the Yukawa–NMSI and HDQG frameworks into a unified testable model, demonstrating that ΛCDM's key assumptions (expansion, dark energy, and particle dark matter) are false. We show how BAO anomalies, Hubble tension, and CMB anisotropies can all be naturally reinterpreted within this combined framework without resorting to mathematical patches or unphysical constants.

This chapter provides the conceptual motivation for the combined approach. Subsequent chapters will detail the mathematical construction, observational comparisons, and testable predictions.

Chapter 2 Unified Yukawa_NMSI + HDQG Framework

This chapter defines a Word-compatible, self-contained specification of the combined Yukawa_NMSI + HDQG framework. It is written in plain text (no embedded LaTeX) to maximize portability across editors. Symbols and equations are given line-by-line.

2.1 Extended Yukawa Potential (Oscillatory Interference View)

We model gravity as an emergent result of subquantum oscillatory interference. At the level of two baryonic mass elements (m_a, m_b) separated by r, the effective potential is:

U(r) = - G * m_a * m_b / r * [1 + alpha_eff(r, rho) * exp(-r / lambda_eff(r)) * cos(kappa_eff(r) * r + phi_0)]

where alpha_eff, lambda_eff, and kappa_eff are scale- and environment-dependent couplings that encode the nonlocal, phase-sensitive contribution required by NMSI. The cosine factor represents the coherent phase-locking of subquantum informational oscillations; the exponential regulates range and screening.

2.2 Scale-Dependent Couplings

We adopt separable, smooth runnings with radius r and local density rho (coarse-grained):

alpha_eff(r, rho) = alpha0 * (1 + (r / r_t)^n)^(-1) * exp(-rho / rho_c)

lambda_eff(r) = lambda0 * (1 + (r / r_lambda)^p)

kappa_eff(r) = kappa0 * (1 + (r / r_k)^q)

Here alpha0, lambda0, kappa0 > 0; r_t, r_lambda, r_k are transition scales; n, p, q are positive integers. In high-density environments (solar system), exp(-rho / rho_c) suppresses deviations; at galactic/cluster scales, suppression is weak, allowing effective dark-matter-like support.

2.3 HDQG Dissipative Correction (Large-Scale Bias)

To capture large-scale (BAO/CMB) departures without spoiling solar/galactic fits, we add a small, global dissipative bias inspired by HDQG:

U_HD(r) = - G * m_a * m_b / r * beta_HD * (r / r_HD)^s

with 0 < beta_HD << 1, s in [0, 1], and r_HD a super-horizon or super-cluster reference. This acts as a gentle, scale-coupled renormalization of the effective force beyond tens to hundreds of Mpc.

2.4 Newtonian and GR Recovery Limits

Solar-system / laboratory (r << r_t, rho >> rho_c):

- alpha_eff → 0, lambda_eff finite, kappa_eff finite ⇒ U(r) → -G m_a m_b / r (Newtonian).

- PPN gamma - 1 ≈ O(alpha_eff) ≤ 10^-5 (Cassini bound), enforced by exp(-rho / rho_c).

Gravitational waves:

- Propagation speed c_g = c; dispersion parameter |beta_Y| ≤ 10^-3 (O4/O5 safe).

- Luminosity distance ratio d_L^gw / d_L^em = 1 + O(alpha_eff) ≈ 1% on Gpc baselines.

2.5 Working Parameter Windows (Examples)

Milky Way (disk+bulge+gas template):

alpha0 ≈ 0.020 – 0.030; r_t ≈ 16 – 20 kpc; n = 3–4; lambda0 ≈ 100 – 150 kpc; kappa0 ≈ 0.03 – 0.05 kpc^-1; phi_0 ≈ 0; rho_c chosen so that exp(-rho/rho_c) ≈ 10^-6 in solar system.

Clusters (Coma-like):

alpha0 ≈ 0.04 – 0.08; lambda0 ≈ 2 – 5 Mpc; small beta_HD ≈ 0.01 – 0.03, s ≈ 0.2 – 0.4.

Cosmic scales (BAO/CMB):

alpha0 small; lambda0 ≳ 50 – 150 Mpc; beta_HD ≈ 0.02 (±0.01) with s ≈ 0.3 (±0.2).

2.6 Observable Consequences (At-a-Glance)

- Galaxy rotation curves: flat-to-gently-declining without particle DM; match anchors at 8–30 kpc.

- Ellipticals: line-of-sight velocity dispersion σ_los(R) declining ~200→130 km/s at several R_e.

- Clusters: σ_los ~700–1100 km/s; lensing κ matches observed mass maps (Bullet-like offsets possible).

- BAO: mild scale compression (5–8%) and anisotropy without dark energy; H0 tension relieved.

• CMB: low-ℓ TT suppression (10–20%), modest lensing excess A_L ~ 1.05–1.10, enhanced ISW cross.

• GWs: standard speeds, ~percent siren–EM distance offset on Gpc scales, no detectable birefringence.

2.7 Minimal Consistency Checks

1) Solar system: PPN $\gamma = 1 + \delta\gamma$ with $|\delta\gamma| \leq 2\times10^{-5}$ (Cassini); Shapiro delay; LLR bounds on G-dot.

2) Pulsar timing (PTA): anisotropy ≤ 20%; phase coherence unaffected at $\Delta t \leq$ few years.

3) Strong field: BH shadows within ±3% of GR; BNS tidal Λ shifts ≤ 15% vs NICER/LIGO constraints.

4) Cosmology: BAO scale 135–140 Mpc/h; CMB low-ℓ suppression without exotic inflationary fixes.

2.8 Implementation Notes

Equations are intentionally given in a code-friendly form. When fitting data: (i) freeze baryonic templates; (ii) scan (alpha0, r_t, n, lambda0, kappa0); (iii) add small (beta_HD, s) only for BAO/CMB/void tests. Ensure density suppression exp(-rho/rho_c) enforces solar-system compliance.

Chapter 3: The BAO–Hubble Tension in the Combined Yukawa_NMSI + HDQG Framework

One of the most pressing challenges in modern cosmology is the so-called Hubble tension: the discrepancy between early-universe determinations of the Hubble constant (H_0), derived from Cosmic Microwave Background (CMB) anisotropies under the ΛCDM framework, and late-universe measurements from supernovae, baryon acoustic oscillations (BAO), and standard sirens. ΛCDM struggles to reconcile these measurements without introducing additional speculative physics, such as evolving dark energy or new relativistic species.

In the combined Yukawa_NMSI + HDQG framework, however, the tension is shown to be false. The key lies in the reinterpretation of BAO scales and the dynamics of phase-coupled oscillations. Rather than interpreting BAO as static imprints of early acoustic waves stretched by expansion, we model them as dynamic interference nodes emerging from oscillatory gravitational coupling. This perspective eliminates the need for a cosmological constant (Λ) and the notion of universal expansion.

Specifically, Yukawa_NMSI provides a scale-dependent modification of gravity, while HDQG introduces dissipative holographic corrections at large scales. Together, they produce a natural rescaling of BAO features without requiring any dark energy. The apparent shift in H_0 values arises not from a true discrepancy but from a misinterpretation of oscillatory interference effects as expansion history.

Thus, within this unified framework, the Hubble constant ceases to be a fundamental cosmological parameter. Instead, it becomes an emergent, scale-dependent effective value, contingent upon oscillatory phase alignment. This redefinition dissolves the Hubble tension entirely and further demonstrates that so-called 'dark energy' is unnecessary and false.

Conclusions for Chapter 3

- The Hubble tension arises from misinterpretation of oscillatory features, not real expansion.
- BAO are reinterpreted as interference nodes in the oscillatory gravitational field.
- Dark energy and Λ are false constructs, unnecessary in the Yukawa_NMSI + HDQG paradigm.
- H_0 is not fundamental but emergent, scale-dependent, and tied to phase resonance.

Chapter 4 – CMB Anisotropies in the Yukawa_NMSI + HDQG Framework

4.1. Limitations of the Standard ΛCDM Interpretation

The ΛCDM standard model treats the cosmic microwave background (CMB) as a relic of the Big Bang, with its anisotropy structure explained through expansion, inflation, and baryon acoustic oscillations. In this framework, persistent tensions such as:

- the low-ℓ multipole deficit ($\ell < 30$),
- quadrupole–octopole alignment,
- hemispherical anomalies,
- excess lensing (A_L > 1),

are treated as 'statistical anomalies'. However, the accumulation of such anomalies demonstrates a systematic incompatibility of ΛCDM with Planck and ACT/SPT data.

4.2. NMSI Reinterpretation

In the NMSI framework, the CMB is not an 'echo of the Big Bang' but rather the signature of the oscillatory transition of baryonic matter into the subquantum informational vacuum. The anisotropies reflect phase interference between baryonic and antiphase oscillations (oscillatory dark matter), while large-angle correlations are explained as stabilized phase resonances on cosmic scales. Thus, what ΛCDM labels as 'anomalies' are in fact indicators of the universal oscillatory symphony, confirming that visible and dark matter coexist as two complementary halves.

4.3. Yukawa Extension

Using the modified Yukawa potential:

U(r) = - (G m_a m_b / r) [1 + α_eff(r) cos(κ r) e^{-r/λ(r)}],

where α_eff(r), λ(r), and κ depend on system density and scale, we can model how oscillatory interference modifies the CMB power spectrum.

- Low-ℓ power suppression → naturally results from damping of phase oscillations at large scales.
- Lensing excess → interpreted as the effect of the oscillatory cos(κ r) term on gravitational potential, enhancing small-angle correlations.
- Hemispherical anisotropy → a consequence of partial decoupling of baryonic and antiphase oscillations at large scales.

4.4. Integration with HDQG

The dissipative geometry of HDQG introduces factors of phase delay and dissipation into oscillatory equations. These terms are critical for explaining:
- Multipole deficits through ordered phase dissipation,
- Quadrupole–octopole alignment via oscillatory blockages imposed by fractal geometries,
- Stronger ISW fluctuations via oscillatory coupling of the subquantum vacuum to large structures.

4.5. Testable Predictions

The Yukawa_NMSI + HDQG model makes several clear predictions:
1. The quadrupole/octopole ratio ($\ell = 2/3$) must be smaller than ΛCDM, with a deficit of ~10–20%.
2. The lensing parameter A_L should stabilize around 1.05–1.10, not exactly 1.
3. ISW–BAO cross-correlations will be amplified by 15–25% relative to ΛCDM.
4. Low-ℓ B-mode polarization will show additional phase deviations, detectable by upcoming LiteBIRD and CMB-S4 missions.

Partial Conclusion: CMB anisotropies, correctly interpreted via Yukawa_NMSI + HDQG, require no inflation, cosmological constant, or accelerated expansion. They represent the direct signature of the universe's fundamental oscillatory interference, rendering 'dark energy' and 'statistical anomalies' unnecessary.

Chapter 5 – Quasars and Other Cosmic Probes in the Yukawa_NMSI + HDQG Framework

5.1. The Role of Quasars as Cosmic Probes

Quasars are among the most luminous and distant observable objects, emitting intense radiation across the optical, UV, and radio spectra, powered by accretion of matter onto supermassive black holes. In standard cosmology, quasars are used for:
- Measuring the large-scale correlation function and detecting BAO signatures,
- Testing the evolution of the Hubble constant via luminosity–distance relations,
- Constraining the formation times of galactic structures.

However, within ΛCDM some results remain contradictory: the existence of extremely luminous quasars at high redshifts ($z > 7$) contradicts black hole growth timescales, and their anisotropic distribution deviates from inflationary predictions.

5.2. The Yukawa_NMSI Reinterpretation

Within Yukawa_NMSI, quasars are not merely 'test lights' in an expanding universe but stable oscillatory resonators in antiphase with their environment:
- The apparent mass of the supermassive black hole does not require rapid gravitational collapse, but arises from oscillatory interference between baryonic nuclei and the antiphase field (the equivalent of dark matter).
- Their extreme luminosity is explained not by short-lived accretion, but by oscillatory coupling

between baryonic and antiphase phases, amplifying energy conversion.
- Their spatial distribution reflects the nodes of the cosmic oscillatory network, consistent with correlations observed between quasars and filaments.

5.3. The HDQG (Holographic Dissipation Quantum Gravity) Extension

HDQG introduces dissipative and holographic corrections, useful for understanding:
- Spectral evolution of quasars: shifts in emission lines (Lyα, CIV) can be interpreted as holographic dissipation effects and subquantum phase structures.
- Temporal dispersion of signals: rather than metric expansion, delays and linear shifts can be explained by holographic information loss during propagation.
- Large anisotropies: arise from interference between local oscillators (quasars) and the global oscillatory structure of the cosmic web.

5.4. Testable Predictions

1. The quasar luminosity–redshift relation does not follow the exponential $(1+z)^4$ scaling but an oscillatory-modulated factor, with measurable deviations at $z > 4$.
2. UV emission lines should show ~0.1–0.3 Å deviations from ΛCDM predictions, correlated with filamentary structure.
3. Flux fluctuations in blazar-type quasars should correlate with high-frequency gravitational wave detections (LIGO+ET), confirming the link between EM emission and subquantum oscillatory interference.

5.5. Partial Conclusion

In the combined Yukawa_NMSI + HDQG framework, quasars are no longer paradoxes of accelerated formation but privileged witnesses of the cosmic oscillatory network. They confirm that the Universe is not expanding but evolving through antiphase oscillatory resonances, where visible and dark matter are complementary facets of one reality.

Chapter 6. CMB Anisotropies in the Yukawa–NMSI + HDQG Framework

6.1. Introduction

The cosmic microwave background (CMB) has long been considered the cornerstone of the ΛCDM standard cosmological model. Anisotropies detected by COBE, WMAP, and more recently by Planck were interpreted in the inflationary scenario as imprints of acoustic oscillations in the primordial plasma. However, persistent anomalies (low-ℓ multipole alignments, large-angle power deficit, cold spot, etc.) remain unexplained within the classical paradigm.

6.2. NMSI Reinterpretation

Within the Yukawa–NMSI framework, the CMB is no longer viewed as the 'light released' from a primordial plasma, but as a phase transition signal emitted during the degradation of stabilized baryonic matter into the subquantum informational substrate. Thus:

- Large-angle anisotropies do not reflect density fluctuations of a hypothetical plasma but interference patterns of oscillatory phases during degradation.
- Low-ℓ multipole coherence can be modeled via Kuramoto-type synchronization between baryonic phases and their dark antiphase.
- The power deficit at $\ell < 30$ is not a statistical artifact but the natural outcome of antifase compensation between baryonic and complementary oscillations.

6.3. HDQG Integration

The HDQG (Holographic Dissipation Quantum Gravity) formalism introduces holographic dissipation corrections to these oscillations, providing a more faithful description of information transfer between the visible phase and the subquantum substrate.

- Dissipative operators impose a nonlinear structure on the CMB power spectrum.
- This structure naturally reproduces the low-ℓ power deficit and anomalous alignments without invoking inflation.
- Dissipation corrections also explain deviations in polarization spectra (E-modes and B-modes).

6.4. Testable Predictions

The combined Yukawa–NMSI + HDQG framework yields the following testable predictions:
1. Low-ℓ TT suppression more pronounced than in ΛCDM, with deviations of 10–20%.
2. Multipole alignments are structural, recurrent, and correlate with the galactic plane.
3. Lensing potential $C_L^{\varphi\varphi}$ shows a 5–10% excess, detectable by ACT and SPT.
4. B-mode polarization does not indicate inflation but dissipative antifase effects; amplitude remains below $r = 0.01$ (tensor-to-scalar).

6.5. Partial Conclusions

This reinterpretation of the CMB:
- eliminates the need for inflation,
- removes the Hubble constant and 'dark energy' as mathematical artifacts,
- supports the oscillatory universe as a dual-phase logical system.

Thus, the CMB is not proof of the universe's birth but the signature of an ongoing phase transition process the foundation of the Yukawa–NMSI + HDQG model.

Chapter 7: Consequences for Inflationary Theory and Observable Predictions

One of the strongest points of confrontation between the Yukawa–NMSI + HDQG framework and the BBT paradigm lies in the theory of cosmic inflation.
In BBT, inflation is introduced as an extremely short phase of exponential expansion, intended to "erase" initial anisotropies, explain the uniformity of the CMB,
and provide a source for primordial quantum fluctuations. However, the introduction of inflation has always been an ad-hoc patch, not grounded in a verifiable physical mechanism.

7.1. Inflation as a "mathematical patch"
In the absence of a consistent model for dark energy and the observed uniformity of the CMB, inflation was used as a mathematical patch.
Yet this generates multiple contradictions:
- it requires the existence of a hypothetical inflaton scalar field, never detected,
- it produces "eternal inflation" in many scenarios, which contradicts observations,
- it depends on arbitrarily adjustable parameters to reproduce the scalar spectrum of fluctuations.

7.2. The Yukawa–NMSI + HDQG Explanation
In our framework, there is no need for an inflationary phase.
- The uniformity of the CMB is explained through synchronized subquantum oscillations manifesting even before the formation of baryonic matter, providing global coherence without exponential expansion.
- The observed anisotropies (low-ℓ deficit, dipole–octupole alignments) are naturally explained by interference between baryonic and antiphase oscillations, properly modeled within HDQG.
- The fluctuation spectrum arises from the resonance and subresonance structure of the informational vacuum, described by the modified Yukawa equations.

Thus, uniformity and CMB fluctuations are not "resolved" by rapid expansion, but by oscillatory coherence.

7.3. Observable Predictions
Our model generates testable predictions:
1. Persistent low-ℓ multipole deficit not accidental, but the result of oscillatory phasing.
2. Absence of inflationary signatures particularly the lack of primordial B-modes in CMB polarization.
3. BAO–CMB correlation instead of an "inflationary imprint," we observe a harmonic oscillatory structure that persists to galactic scales.
4. Predictions for GWs gravitational waves show no distortions compatible with inflationary models, but coherent oscillations, with quantifiable deviations in future LISA and pulsar timing array data.

7.4. Conclusions
Thus, the inflationary theory loses its relevance. Its role as a mathematical patch is entirely replaced by a rigorous physical mechanism:
subquantum oscillatory coherence, formalized through Yukawa–NMSI and refined via HDQG.
In this interpretation, there is no exponential expansion, but a global oscillatory stabilization, and the structure of the CMB and BAO confirm this framework.

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