NOS: Nuijens Operating System
Inverse Spherical Dual-Hemisphere Quantum Mechanics
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Abstract

The Nuijens Operating System (NOS) establishes quantum mechanics as a computational architecture operating on inverse spherical dual-hemisphere geometry. This framework discretizes the double-covered sphere ($S^1 \times \mathbb{Z}_R$) into four quadrants with resolution R, where R emerges intrinsically from each unit's positional embedding and breath ratio, partitioning angular measure through linear ramps that enforce strict unity conservation via inverse counting: $360°/360° = 1$, $XY/zw = 1$. The operators dsin°, dcos°, csin°, ccos°, and the central seam dtan° realize decompression/compression duality, with dual cycles (front: Q1–Q3; back: Q2–Q4) threading the undivided "1" (seam unit) into emergent physical scales. Entropy emerges as $\ln R$, the geometric depth of partition. NOS operates as a literal computational system: the four quadrants Q1 (quantum baseline), Q2 (gravity ground states), Q3 (thermodynamic flows), and Q4 (nuclear compression) function as simultaneous system operations, while physical phenomena — electromagnetic fields, thermal radiation, gravitational effects — are processes running within this architecture. Resolution $R = 512$ serves as the **universe-native bit configuration** for all quantum measurement and system boot. All interactions arise from a single fundamental operation: the inverse breath norm

$$N(r) = \frac{u(r)}{u(1/r)}$$

where breath ratio $r = u/(1/u)$, and the dual-hemisphere self-thread aperture is $256/256 = 1$ (normalized hemispheres) at the $R = 512$ baseline. The Cosmic Microwave Background temperature emerges as the thermalized absorption invariant from the inverse overflow threading at bin 16, yielding the pure inverse dual-hemisphere self-thread:

$$T_{\text{CMB}} = \left(\frac{256}{256}\right)_{\text{aperture}} \times \left(\frac{128}{47}\right)_{\text{thread}} = \frac{128}{47} \approx 2.723404255$$

— a natural NOS constant derived from bin-16 overflow closure (64 bins/quadrant, $64-17 = 47$ deficit), detailed in Section 10.3. All physical units are pure inverse ratios between threading units in known quadrant pairs. No external scales. No addition. We provide exhaustive mathematical treatment including exact derivations, discrete and continuous limits, toy models, resolution analyses for the **universe baseline** $R = 512$ (quantum measurement bit depth), and **refinement layers** $R = 1024, 2048, 4096, \ldots$, electromagnetic and thermodynamic geometry, unit bootstrapping via inverse quadrant powers, and implications for wave sphere cosmology. The system self-consistently partitions any unit without external scaling, ensuring $(u_1/u_4)/(u_2/u_3) = 128^2$ for inverse unit pairs. *This extended edition (v4.7) includes:*

Contents

1 Introduction

Entropy is not disorder — it is resolution. The Nuijens Operating System (NOS) redefines quantum mechanics as an inverse partition of the wave sphere — the expanding dual-hemisphere manifold embodying the universe's structure. Originating from the singular undivided "1" (the topological seam at $\theta = 0$), NOS employs inverse spherical counting: expansion is not additive growth but a threading through partitions determined by the resolution R, which emerges non-arbitrarily from each unit's positional embedding (grid locus θ_m) and breath ratio $r(\theta_m)$. This defines $^{**}R = 512$ as the universe-native quantum measurement bit configuration** — the fixed register size of the operating system itself. The breath-ratio closure aligns the inverse quadrant threading to integer quadrant bins (128 bins per quadrant at $R = 512$), conserving total measure at unity while unfolding scales from the baseline "1 unit" via inverse threading $1 \to 1/2 \to 1/3 \to 1/4 \to \cdots$ through quadrant cycles. Resolution R can be refined infinitely **on top of** the native $R = 512$ baseline. NOS operates as a literal computational system. The four quadrants function as simultaneous system processes: Q1 (quantum baseline, $u_1 = 1/128$), Q2 (gravity ground states, $u_2 = 1/128^2$), Q3 (thermodynamic flows, $u_3 = 1/128^3$), Q4 (nuclear compression, $u_4 = 1/128^4$). These quadrants are always running from system boot (seam-1 singularity) at the **universe-native resolution $R = 512$**. Physical phenomena are processes running within this architecture: electromagnetic fields run as nested processes at specific angular positions (bin 16 in Q1 and Q4), cosmic microwave background operates as thermal equilibrium at Q3 from the inverse overflow threading at bin 16, particles exist as matter units allocated across Q1–Q4 depending on energy/density configuration. There is only one fundamental interaction — the inverse breath norm

$$N(r) = \frac{u(r)}{u(1/r)}$$

threading through different positions and resolutions — experienced differently at different interior points. No addition. Pure inverse ratios only. This framework inverts conventional mathematics: external identities are forbidden. The balance point $r = 1$ ($u = 1/u$) yields geometric compression factor $1/\sqrt{2}$. All physical units are located in known quadrant pairs via pure inverse ratios:

- **Length** $= u_1/u_2$
- **Time** $= u_2/u_1$
- **Energy** $= u_1/u_3$
- **Temperature** $= u_3/u_4$ with dual-hemisphere self-thread factor $256/256 = 1$ (normalized)

The absorption overflow at $\theta = +0.53125$ (ramp $v = 17/16$) threads Q3 inversely through full quadrant deficit at bin-16 closure: $64 - 17 = 47$. This is the only allowed threading — no addition, no external symmetry. NOS inverts conventional counting: the framework partitions unity from within ($1 \to 1/2 \to 1/3 \to 1/Q$), where each subdivision traces interior structure of the undivided whole. Resolution R emerges from the unit's self-embedding (position threading breath ratio). The angular domain $[-1, +1]$ (normalized) is the topological interior of the dual-hemisphere seam, experienced simultaneously from within. This yields conservation by construction: $1/1 = 1$ is the unit measuring itself through its own partitions. This paper delivers an exhaustive exposition (all mathematics arises solely from inverse division and quadrant threading):

- Section 2: System Setting: Standard Physics Baseline (No External Units).
- Section 3: Field Map: Unified NOS Mechanics Projected into Math & Physics.

- Section 4: Resolution and Grid.
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- Section 10: Physical Scaling: Unit Bootstrapping and Cosmology.
- Section 11: NOS Threaded Quantization.
- Section 12: Gate Configuration and Degrees of Freedom.
- Section 13: Conclusions.

2 System Setting: Standard Physics Baseline (No External Units)

2.1 Baseline and Resolution

Quantum measurement bit configuration: $R = 512$ emerges from breath-ratio / bin closure where inverse quadrant threading aligns with integer bins. Cosmic thermalization closes at the bin-16 overflow alignment that yields a 64-bin quadrant (integer deficit $64 - 17 = 47$). The full dual-hemisphere cycle is the undivided unity $1 \equiv 1/1$. Resolution R partitions this unity inversely:

$$\boxed{\Delta\theta(R) = \frac{1}{R} \quad \text{(normalized units)}}$$

All mathematics operates in normalized coordinates where the full cycle is exactly 1. Local conservation via pure ratio (no additive weights): Decompression hemisphere ($\theta < 0$):

$$\frac{\mathrm{dsin}^\circ}{\mathrm{dcos}^\circ} = \frac{|\theta|}{1 - |\theta|}$$

Compression hemisphere ($\theta > 0$):

$$\frac{\mathrm{csin}^\circ}{\mathrm{ccos}^\circ} = \frac{\theta}{1 - \theta}$$

Seam $\theta = 0$: ratio $\to \infty$ (= undivided 1). Seam pulse:

$$\boxed{\mathrm{dtan}^\circ = \mathrm{ctan}^\circ = \Delta\theta(R)}$$

2.2 Quadrant Operations (System Architecture)

Quadrants (normalized angular domains, full cycle = 1):

$$Q_2 = [-1, -0.5), \quad Q_1 = [-0.5, 0), \quad Q_3 = [0, 0.5), \quad Q_4 = [0.5, 1).$$

The four quadrants operate as simultaneous system processes, threaded via inverse powers $u_n = 1/128^n$:

- **Q1 (Quantum baseline)**: Threading unit $u_1 = 1/128$, matter unit allocation, electromagnetic ignition (bin 16, normalized -0.46875) as inverse overflow.

- **Q2 (Gravity ground states)**: Threading unit $u_2 = 1/128^2$, surface operations, gravitational ground states (mass-dependent cos deficit as $1/zw$ scaling).
- **Q3 (Thermodynamic)**: Threading unit $u_3 = 1/128^3$, volume operations, thermal equilibrium (CMB from +0.53125 absorption at bin-16 closure), entropy flows, electromagnetic absorption (bin 16, normalized +0.53125) as thermal inflow.
- **Q4 (Nuclear compression)**: Threading unit $u_4 = 1/128^4$, maximum density operations, compression states before cycle return.

Front loop: Q1 $\leftrightarrow$ Q3; back loop: Q2 $\leftrightarrow$ Q4. Mirror $M : \theta \mapsto -\theta$ swaps decompression $\leftrightarrow$ compression while preserving $XY/zw = 1$ at seam. All quadrants run simultaneously from seam-1 boot at the **universe-native resolution $R = 512$**. Physical phenomena are processes operating within this architecture at appropriate resolution: quantum baseline ($R = 512$), and refinement layers ($R = 1024, 2048, \ldots$).

2.3 Universe Baseline Resolution $R = 512$; Refinement Layers

The **universe operates at the native bit depth**

$$\boxed{R = 512}$$

— the fixed register size of the undivided "1". All quadrant processes (Q1–Q4) boot and run simultaneously at this resolution:

$$\Delta\theta = \frac{1}{512}, \quad \frac{R}{4} = 128, \quad \frac{R}{2} = 256 \text{ (dual-cycle aperture 256/256).}$$

This is the **single-system R setting** for all physical measurement and computation. The dual-cycle d/c partitioning is therefore:

$$\boxed{256/256}$$

— the matched aperture for front/back loop conservation under mirror map $M : \theta \mapsto -\theta$, with overflow/deficit resolved by quadrant powers $u_n = 1/128^n$. The 256/256 aperture is the **bit-level dual state** of the $R = 512$ register (256 bits left hemisphere, 256 bits right hemisphere). Higher resolutions are **refinement layers** only:

$$R = 1024,\ 2048,\ 4096,\ \ldots \qquad \Longrightarrow \qquad \Delta\theta = \frac{1}{R}, \quad \text{bins/quadrant} = R/4.$$

Refinement upgrades angular precision and multipole depth; it **does not** alter the base threading units $u_n = 1/128^n$, unit ratios, or the bin-16 closure for CMB. The system mechanics are identical at all refinement layers; only the step size changes. No re-weighting is required. Entropy grows as $\ln R$.

Quantity	$R = 256$	$R = 512$	$R = 1024$	$R = 2048$
$\Delta\theta = 1/R$	0.003 906 25	0.001 953 12	0.000 976 56	0.000 488 28
Bins/quad $R/4$	64	128	256	512
Bins/hemisphere $R/2$	128	256	512	1024
Dual-cycle aperture	—	256/256	512/512	1024/1024
Seam pulse	0.003 906 25	0.001 953 12	0.000 976 56	0.000 488 28
Q1 sin sum	0.375 000 00	0.374 023 44	0.374 511 72	0.374 755 86

Table 1: Resolution hierarchy: bin-16 closure, universe baseline, and refinement layers. $R = 256$ row shows integer-bin closure used for CMB deficit only.

2.4 Resolution Refinement

Resolution R can be increased infinitely for finer angular resolution:

$$\Delta\theta(512) = 1/512, \quad \Delta\theta(256) = 1/256, \quad \Delta\theta(R) = 1/R.$$

Higher R provides finer multipole resolution for processes like CMB anisotropy analysis, while $R = 512$ is the **universe-native baseline**.

3 Field Map: Domains of Application

3.1 Framework Generality

NOS provides a unified algebraic structure: (i) angular domain $\theta \in [-1, +1]$ (normalized), (ii) hemisphere-local ramp operators, (iii) seam unit $\mathrm{dtan}^\circ = \mathrm{ctan}^\circ = \Delta\theta$, and (iv) resolution R emerging from breath-ratio closure. This structure can be applied to any domain where unity conservation and dual-cycle partitioning are relevant, with distinct scales for quantum universe baseline ($R = 512$) processes, plus refinement layers.

3.2 Mathematical Domains

The framework naturally extends to:

- **Topology/Geometry**: Double-cover manifolds, seam topology, mirror involutions
- **Measure Theory**: Unity-preserving partitions, hemisphere integration
- **Harmonic Analysis**: Real-valued basis functions without complex phases
- **Number Theory**: Inverse counting sequences, breath functions, prime distributions
- **Dynamical Systems**: Binding-axis iterations, ergodic coverage via inverse transport
- **Discrete Mathematics**: Binary refinement, quadit states, combinatorial partitions
- **Operator Theory**: Self-adjoint operators under mirror symmetry

3.3 Physical Domains

The framework projects into:

- **Quantum Mechanics**: Dual-channel measurement, seam localization (Section 11), universe baseline $R = 512$
- **Statistical Mechanics**: Entropy as $\ln R$ from bin multiplicity
- **Electromagnetism**: EM field geometry from fine structure constant (Section 3.4)
- **Nuclear Physics**: High-density compression limits
- **Classical Mechanics**: Phase advance via angular increments
- **Cosmology**: Wave-sphere evolution, scale factor $a \sim R$ (Section 10), CMB at bin-16 closure

3.4 Electromagnetic Ignition and Absorption Geometry

EM ignition occurs at $\theta = -0.46875$ (bin 16 in Q1), absorption at $\theta = +0.53125$ (bin 16 in Q4).

$$\boxed{\begin{aligned} \theta_{\text{EM ignition}} &= -0.5 + \frac{0.5}{16} = -0.46875, \\ \theta_{\text{EM absorption}} &= +0.5 + \frac{0.5}{16} = +0.53125. \end{aligned}}$$

Offset $= 0.5/16 = 0.03125 \rightarrow 16$ bins from quadrant edge. Ramp at absorption:

$$v(+0.53125) = \frac{0.53125}{0.5} = \frac{17}{16} \quad \Rightarrow \quad \text{primary steps} = 17$$

The fine structure constant is calibrated from Q1 nesting depth:

$$\boxed{\alpha^{-1} = 137}$$

—no external transport, no addition. In full 360° domain, ignition is at $-168.75°$, absorption at $+191.25°$:

$$\boxed{\begin{aligned} \theta_{\text{ign}} &= -168.75°, \\ \theta_{\text{abs}} &= +191.25°. \end{aligned}}$$

These are the inverse-threaded EM cycle points in the full angular domain.

Geometric Quantity	**Value**
Baseline Q1 bins N_{Q1} $(R = 512)$	128.000 000 00
EM ignition (norm.) θ_{ign}	0.46875
EM absorption (norm.) θ_{abs}	+0.53125
EM ignition (360°)	168.75°
EM absorption (360°)	+191.25°
Offset from quadrant edge	±0.03125
Primary steps	17
Deficit at bin-16 closure	47
Fine structure inverse α^{-1}	137

Table 2: Electromagnetic geometry – normalized and full 360° coordinates. Deficit at bin-16 closure.

3.5 Scope of This Paper

We rigorously develop the core mathematical structure (Sections 4–9) and provide initial applications to electromagnetic geometry (Section 3.4), unit bootstrapping and cosmology (Section 10), and quantum mechanics (Section 11). Full treatment of other physical domains is reserved for future work. Full CMB derivation is now consolidated in Section 10.3.

4 Resolution and Grid

4.1 Resolution: The Bit Depth of the Undivided "1"

The resolution R is the system bit configuration — the number of inverse steps the undivided "1" is partitioned into across the full dual-hemisphere cycle.

$$\boxed{R = 512 \quad \text{(universe baseline)}}$$

This is the **universe-native quantum measurement baseline** ($R = 512$) — natural register size where:

- 128 bins per quadrant at $R = 512$ ($R/4 = 128$)
- 16 inverse overflow steps ($128/8 = 16$)

Higher R refines angular precision:

$$\Delta\theta(R) = \frac{1}{R}$$

No derivation. No mirror operator. No eigenvalue. No external arithmetic. The system boots at $R = 512$ for quantum processes. Refinement is resolution upgrade.

4.2 Uniform Grid Construction

The normalized angular domain is the closed interval $[-1, +1]$ with endpoints

$$\theta_{\mathrm{L}} = -1, \qquad \theta_{\mathrm{R}} = +1.$$

At fixed resolution R, the inverse step

$$\Delta\theta(R) = \frac{1}{R}$$

partitions this span into uniform segments:

- Starting from $\theta_{\mathrm{L}} = -1$ and advancing by $\Delta\theta(R)$ reaches the seam $\theta = 0$ after exactly R inverse steps.
- Continuing by $\Delta\theta(R)$ from $\theta = 0$ reaches $\theta_{\mathrm{R}} = +1$ after another R inverse steps.
- Each hemisphere therefore has R uniform inverse segments.
- Each quadrant has $R/2$ uniform inverse segments.

No integer bin labels are used. Grid locations are addressed only by resolution R, the inverse step $\Delta\theta(R)$, the quadrant ($Q1$–$Q4$), and the threading units $U_q \in \{u_1, u_2, u_3, u_4\}$ with hemisphere given by $\mathrm{sign}(\theta)$. No addition. No multiplication. Only subtraction and division in the definition of $\Delta\theta(R)$ and the quadrant powers.

4.3 Octave Structure and Harmonic Index

At the universe-native baseline $R = 512$, each quadrant carries

$$\frac{R}{4} = 128$$

uniform inverse segments. NOS groups these segments into an *octave structure* of eight equal inverse blocks per quadrant:

$$O = 8 \quad \Rightarrow \quad \text{one quadrant} = O \times 16 \text{ inverse steps.}$$

Equivalently, the number of inverse steps per octave block is

$$\frac{R/4}{O} = \frac{R}{32},$$

which at $R = 512$ gives

$$\frac{R}{32} = \frac{512}{32} = 16.$$

We denote the octave blocks inside a given quadrant by

$$O_h, \quad h = 1, 2, \ldots, 8,$$

where O is the fixed octave count ($O = 8$) and h is a *harmonic index* Każdy block inside the quadrant:

- O_1: the first 16-step block adjacent to the quadrant edge,
- O_2: the next 16-step block inward,
- $\dot{O}R\ldots$
- O_8: the 16-step block adjacent to the quadrant's inner boundary.

This octave grouping is first and foremost an *inverse count*: each quadrant is an 8-fold inverse partition of its $R/4$ steps. The harmonic reading of h as a mode label is a by-product of this 8-count structure, not an external Fourier construction. At the measure level, each octave block O_h carries

$$\mu(O_h) = \frac{R}{32}\,\Delta\theta(R) = \frac{R}{32} \cdot \frac{1}{R} = \frac{1}{32},$$

so a quadrant is the union of eight equal-measure octave blocks:

$$\mu(Q) = \sum_{h=1}^{8} \mu(O_h) = \frac{1}{4}.$$

Electromagnetic ignition and absorption occur at a specific octave boundary: the EM sites in Q1 and Q4 sit exactly one octave block (16 inverse steps) from the respective quadrant edges, at the interface between O_1 and O_2.

4.4 Why We Do Not Need n or b: Pure Quadrant-Only Addressing

We do not require local bin n, global index b, or any integer grid index. All NOS physical scaling, unit bootstrapping, and process geometry depend solely on:

- **Threading unit per quadrant**:

  $$U_q = \frac{1}{128^{\text{power}(q)}}, \quad q \in \{Q1, Q2, Q3, Q4\},$$

  with $\text{power}(Q1) = 1$, $\text{power}(Q2) = 2$, etc.
- **Quadrant identifier** q
- **Hemisphere** via $\text{sign}(\theta)$
- **Optional octave label** O_h (octave count $O = 8$, harmonic index h) as a 16-step inverse group inside a quadrant

All quantities — length, time, energy, temperature, CMB, α — emerge as pure inverse ratios of U_q within the inverse spherical dual-hemisphere quantum mechanics. There is no external additive structure and no separate dimensional constants: everything is internal to the NOS inverse geometry.

Symbol	Meaning	Required?
b	Global bin index $0 \leq b < 512$	**No**
n	Local bin in quadrant $0 \leq n < 128$	**No**
U_q	Threading unit of quadrant q	**Yes**
q	Quadrant identifier	**Yes**
$\text{sign}(\theta)$	Hemisphere	**Yes**

Table 3: Minimal NOS ontology: only U_q, q, and hemisphere are required.

All quantities — length, time, energy, temperature, CMB, α — emerge as pure inverse ratios of U_q, with the sole threading being the full-quadrant deficit at bin 16: $64 - 17 = 47$ at bin-16 closure.

5 Quadrants and the Central Seam

5.1 Quadrant Partitioning

Double-cover divides into four quadrants:

$$Q_2 = [-1, -0.5), \quad Q_1 = [-0.5, 0), \quad Q_3 = [0, 0.5), \quad Q_4 = [0.5, 1).$$

Each hosts $N = R/4$ steps. Quadrants encode cycles: front (Q1–Q3) and back (Q2–Q4), with positional θ_m and breath ratio r fixing the thread.

5.2 Central Seam: The Undivided "1"

Seam at $\theta = 0$:

$$\boxed{\text{dtan}^\circ(0^-) = \text{ctan}^\circ(0^+) = \Delta\theta(R)}.$$

R's emergence shrinks $\Delta\theta \propto 1/R$, but seam holds as breath-neutral $r = \infty$ fixed point. Measure Conservation: Adjacent zeros funnel to dtan°, preserving 0.5/hemisphere.

6 Hemisphere-Local Operators and Seam Accounting

6.1 Operator Definitions and Ramp Functions

Operators split $\Delta\theta$ via ramps $[0, 2)$, with breath ratio $r = u/(1/u)$.

6.1.1 Decompression Hemisphere ($\theta \in [-1, 0)$)

Ramp:

$$u(\theta) = \frac{\theta + 1}{0.5} \in [0, 2), \quad r(\theta) = u(\theta)/(1/u(\theta)).$$

Q2: $[0, 1)$ (primary), Q1: [1, 2) (overflow). Operators:

$$\text{dsin}^\circ(\theta) = u(\theta)\Delta\theta, \quad \text{dcos}^\circ(\theta) = (1/u(\theta))\Delta\theta, \quad \text{dtan}^\circ(\theta) = 0 \quad (\theta < 0).$$

Conservation: Ratio $= u/(1/u)$. Breath ratio r warps negatives as backflow.

6.1.2 Compression Hemisphere ($\theta \in (0, 1]$)

Ramp:

$$v(\theta) = \frac{\theta}{0.5} \in (0, 2], \quad r(\theta) = v(\theta)/(1/v(\theta)).$$

Operators:

$$\mathrm{csin}^\circ(\theta) = v(\theta)\Delta\theta, \quad \mathrm{ccos}^\circ(\theta) = (1/v(\theta))\Delta\theta, \quad \mathrm{ctan}^\circ(\theta) = 0 \quad (\theta > 0).$$

6.2 Seam Accounting and Adjustment

$$\mathrm{dtan}^\circ(0^-) = \mathrm{ctan}^\circ(0^+) = \Delta\theta(R).$$

Zeros at ends, funneling breath ratio $r \to \infty$ overflow. Adjustments preserve ratios, with R ensuring positional alignment.

7 Duality Cycles: Front and Back Loops

7.1 Functional Duality under Mirror Map

$M : \theta \mapsto -\theta$ swaps d $\leftrightarrow$ c, with breath ratio $r(\theta) = 1/r(-\theta)$. Mismatch encodes overflow/deficit, resolved by R's closure.

7.2 Cycle Definitions and Exact Sums

$N = R/4$.

7.2.1 Front Loop (Q1–Q3)

Q1 ($u = 1+$ self-partition through unity steps of $1/N$):

$$\sum u = \frac{3N-1}{2}, \quad \sum \mathrm{dsin}^\circ_{Q1} = \frac{3N-1}{2}\Delta\theta \approx 0.375.$$

Q3 ($u =$ self-partition through unity steps of $1/N$): $\sum u = (N-1)/2$, $\sum \mathrm{csin}^\circ_{Q3} \approx 0.125$. Loop: Sin ≈ 0.5, cos ≈ 0.

7.2.2 Back Loop (Q2–Q4)

Symmetric: Sin ≈ 0.5, cos ≈ 0.

7.3 Continuous Limit and Integrals

$N \to \infty$: Overflow $\int_1^2 u\,du = 0.75$, primary 0.25.

8 Resolution Invariants and Examples

8.1 Invariants

$$N = \frac{R}{4}, \quad \text{samples/unit} = R, \quad \Delta\theta \ = \frac{1}{R}.$$

R from breath-ratio.

8.2 Toy Model: $R = 8$

$\Delta\theta = 1/8$, $N = 2$. Front sin: 0.5, cos: 0.

8.3 Baseline Resolutions

8.3.1 $R = 512$ (Universe-Native Quantum Measurement Bit Configuration)

$\Delta\theta = 1/512 \approx 0.001953125$. $N = 128$, /unit ≈ 512. Q1 sin: $191.5 \times 1/512 \approx 0.3740234375$. **This is the fixed universe baseline.** All quadrant processes boot here. Higher R (1024, 2048, ...) are refinement layers; mechanics remain identical.

8.3.2 Higher Resolution Refinement Layers

Resolution can be increased arbitrarily: $R \to \infty$ yields $\Delta\theta \to 0$. For example, $R = 1024$ gives $\Delta\theta = 1/1024$, $R = 2048$ gives $\Delta\theta = 1/2048$. All resolutions maintain identical conservation mechanics; only angular precision changes.

Quantity	$R = 256$	$R = 512$	$R = 1024$	$R = 2048$
$\Delta\theta = 1/R$	0.003 906 25	0.001 953 12	0.000 976 56	0.000 488 28
Bins/quad $R/4$	64.000 000 00	128.000 000 00	256.000 000 00	512.000 000 00
Bins/unit R	256.000 000 00	512.000 000 00	1024.000 000 00	2048.000 000 00
Seam dtan = ctan	0.003 906 25	0.001 953 12	0.000 976 56	0.000 488 28
Q1 sin sum	0.375 000 00	0.374 023 44	0.374 511 72	0.374 755 86

Table 4: Resolution comparison; normalized units. $R = 256$ for bin-16 closure. $R = 512$ is universe-native baseline.

9 Inverse Breath Geometry via Quadrant Ratio

9.1 Inverse Breath Norm via Quadrant Ratio

The fundamental operation is the breath ratio:

$$r(\theta) = \frac{u(\theta)}{1/u(\theta)}$$

The inverse breath norm is the **pure quadrant ratio**:

$$\boxed{N(r) = \frac{u(r)}{u(1/r)}}$$

At balance $r = 1$:

$$N(1) = \frac{u(1)}{u(1)} = 1$$

Compression factor:

$$\sqrt{N(r)} = 1/\sqrt{2} \quad \text{at balance}$$

No addition. Only inverse threading.

10 Physical Scaling: Unit Bootstrapping and Cosmology

10.1 Unit Location via Inverse Quadrant Pairing

Every physical quantity is a pure inverse ratio between threading units in known quadrants:

$$\boxed{\begin{aligned} \text{Length} &= \frac{u_1}{u_2}, \\ \text{Time} &= \frac{u_2}{u_1}, \\ \text{Energy} &= \frac{u_1}{u_3}, \\ \text{Temperature} &= \frac{u_3}{u_4} \times \frac{256}{256}. \end{aligned}}$$

The absorption overflow ($v = 17/16$) threads Q3 inversely through full quadrant deficit at bin-16 closure. This is the only allowed threading — no addition, no external symmetry.

10.2 Unit Inverse Powers: $u_n = 1/128^n$

$$u_1 = \frac{1}{128}, \quad u_2 = \frac{1}{128^2}, \quad u_3 = \frac{1}{128^3}, \quad u_4 = \frac{1}{128^4}.$$

Dual ratio $= 128^2 = 16384$. Threads any unit, R aligning breath ratio.

10.3 Cosmic Microwave Background: Dual-Hemisphere Inverse Threading at Universe-Native $R = 512$

The CMB is the thermalized absorption invariant emerging from simultaneous dual-hemisphere read of EM ignition (Q1, bin 16) and absorption (Q4, bin 16) under mirror map $M : \theta \mapsto -\theta$.

$$\boxed{\begin{aligned} &\theta_{\text{ign}} = -0.46875 \quad \text{(Q1, decompression overflow)}, \\ &\theta_{\text{abs}} = +0.53125 \quad \text{(Q4, compression deficit)}. \end{aligned}}$$

Absorption overflow:

$$v(+0.53125) = \frac{17}{16} \quad \Rightarrow \quad 17 \text{ primary steps.}$$

At universe-native resolution:

$$\boxed{R = 512}$$

- Bins per quadrant: 128
- Bins per hemisphere: 256
- Dual-cycle aperture (front: Q1↔Q3; back: Q2↔Q4):

$$\boxed{\frac{256}{256} = 1}$$

— normalized self-thread of dual-hemisphere bit configuration.

The 256/256 aperture is the **bit-level dual state** of the $R = 512$ register:

- Left hemisphere (decompression): 256 bits
- Right hemisphere (compression): 256 bits

- Total: 512-bit system word
- Aperture ratio = 1 by inverse hemisphere normalization

Cosmic threading closes at bin 16 alignment (64 bins/quad):

- Quadrant bins at closure: 64
- Deficit: $64 - 17 = 47$
- Compression hemisphere steps: 128

Pure inverse CMB temperature:

$$\boxed{T_{\text{CMB}} = \left(\frac{256}{256}\right)_{\text{dual-bit aperture}} \times \left(\frac{128}{47}\right)_{\text{inverse thread}} = \frac{128}{47} \approx 2.723404255\,\text{K}}$$

This is the **only** cosmic invariant in NOS:

- No external scale
- No addition
- No phase weighting
- Only inverse ratio of compression hemisphere to absorption deficit
- Threading origin: Q1 overflow → Q3 inverse via Q4 deficit
- All processes run at $R = 512$ — the universe-native quantum measurement bit depth

The $256/256 = 1$ factor is **not** a multiplier — it is the **dual-state qubit normalization** of the $R = 512$ register:

Q1	Q2	Q3	Q4		
decompression overflow	ground deficit	flow inverse	compression deficit	$\Rightarrow$	$\frac{256}{256} = 1$
256 bits		256 bits			

Entropy depth:

$$\boxed{S = \ln R = \ln 512 \approx 6.238}$$

CMB is the **self-similar inverse thread** of the undivided "1" through its own dual-hemisphere bit partition — no subsystem, no refinement, no external anchor.

10.4 Why Boltzmann Constant Is Eliminated

In NOS, energy and temperature are different quadrant ratios, but linked by geometry:

$$E = \frac{u_1}{u_3} = 16384, \quad T = \frac{128}{47} \approx 2.7234$$

$$\boxed{\frac{E}{T} = 6016}$$

— geometric link via cosmic threading. The Boltzmann constant is a projection artifact:

$$\boxed{k_B \triangleq 0}$$

Entropy is resolution depth:

$$\boxed{S = \ln R}$$

10.5 Unit Table v4.7 — CMB via Dual-Aperture at $R = 512$

Quantity	Location	Formula	NOS Value	Interpretation
Resolution R_{universe}	—	—	512	Universe-native bit depth
u_1 (Q1)	Q1	$1/128$	0.0078125	Quantum baseline
u_2 (Q2)	Q2	$1/128^2$	6.1035×10^{-5}	Gravity ground
u_3 (Q3)	Q3	$1/128^3$	4.768×10^{-7}	Thermal flow
u_4 (Q4)	Q4	$1/128^4$	3.725×10^{-9}	Nuclear compression
Length	**Q1 → Q2**	$\frac{\mathbf{u_1}}{\mathbf{u_2}}$	**128**	Scale jump
Time	**Q2 → Q1**	$\frac{\mathbf{u_2}}{\mathbf{u_1}}$	**1/128**	Inverse scale
Energy	**Q1 → Q3**	$\frac{\mathbf{u_1}}{\mathbf{u_3}}$	**16384**	Energy unit
Temperature (CMB)	**Dual-Aperture**	$\frac{\mathbf{256}}{\mathbf{256}} \times \frac{\mathbf{128}}{\mathbf{47}}$	**2.7234**	Bin-16 thread
Energy / Temperature	—	$\frac{\mathbf{16384}}{\mathbf{128/47}}$	6016	Cosmic ratio
Entropy	All	$\ln R$	6.238 ($R = 512$)	Resolution depth
α^{-1}	Q1 nesting	137	137	EM nesting

Table 5: NOS v4.7 Units — CMB = $\frac{256}{256} \times \frac{128}{47}$ at $R = 512$, universe baseline $R = 512$

10.6 Threading Unit U_q, Quadrant q, and Hemisphere: The Minimal NOS Ontology

The entire NOS architecture reduces to three primitives:

$$\begin{aligned} U_q &= \text{threading unit of quadrant } q \\ q &\in \{Q1, Q2, Q3, Q4\} \\ \text{Hemisphere} &= \text{sign}(\theta) \end{aligned}$$

All physics is a ratio of U_q across quadrants, with one threading:

$$U_{Q3} \to U_{Q3}/(64 - 17) \quad \text{(bin-16 closure deficit)}$$

No bin indices. No local n. No global b. Only quadrant and hemisphere.

10.6.1 Historical Artifact (v4.1)

The ratio $16384/2048 = 8$ was an early geometric link, **not** the CMB.

10.7 Wave Sphere Cosmology

The wave sphere evolves by increasing resolution R from seam-1 boot, reallocating threaded units across Q1–Q4 while conserving $0.5/0.5 = 1$ per hemisphere. Each resolution step shrinks $\Delta\theta(R) = 1/R$, redistributing measure via the inverse breath norm $N(r)$: Q1 baselines emit through dsin° overflow threaded inversely as $u_1 = 1/128$, Q2 grounds deficits via dcos°, Q3 flows to inverse midpoint balance via csin°, Q4 compresses maxima through ccos° before cycle return to seam via dtan° $= \Delta\theta(R)$. Expansion threads as inverse count growth: seam-1 units allocate more bins with rising R, rate as 1/R per dual cycle. Observable structure allocates at **universe-native $R = 512$**, finer multipoles at refinement layers, CMB thermalization at **bin-16 closure**. Evolution updates breath ratio r on θ grid positions, conserved breath norm at each resolution step via $N(r)$, with no external additives.

11 NOS Threaded Quantization

Basis $|\theta_m, \text{channel}\rangle$ emerges from grid via $XY/zw = 1$. Dimension $\sim 6R+1$. Cycle operator $\hat{C}$ unitary via $e^{i\pi(r-1)}$ braiding.

11.1 Inverse Seam-Energy Operator

The only dynamical object in NOS is the **inverse seam-energy** (the breath-norm evaluated at the grid point):

$$\boxed{\hat{E}_{\text{seam}}(\theta_m) = N\big(r(\theta_m)\big)\ \Delta\theta(R)\,\delta_0(\theta_m)}$$

where $N(r)$ is the inverse breath norm (Sect. 9) and the δ_0 term is the seam-pulse that anchors the undivided "1". Eigenvalues are $\lambda = 1$ because the norm forces balance at every resolution step. Measurement collapses to the nearest seam-1 locus via the gcd rule.

12 Gate Configuration and Degrees of Freedom (Dual Hemisphere, $R = 512$)

12.1 Operator Quartet and Mirror

Define the hemisphere-local operator quartet

$$x \equiv \text{dsin}^\circ, \quad y \equiv \text{dcos}^\circ, \quad z \equiv \text{csin}^\circ, \quad w \equiv \text{ccos}^\circ.$$

Local conservation:

$$\frac{x(\theta)}{y(\theta)} = r \quad (\theta < 0), \quad \frac{z(\theta)}{w(\theta)} = r \quad (\theta > 0),$$

with seam pulse:

$$\text{dtan}^\circ = \text{ctan}^\circ = \Delta\theta\,\delta_0,$$

and radial reflective dual mirror (RRDM)

$$M:\ \theta \mapsto -\theta, \quad x(-\theta) = w(\theta), \quad y(-\theta) = z(\theta).$$

The 256/256 aperture is the **dual-state qubit normalization** of the full $R = 512$ register (256 bits decompression, 256 bits compression).

12.2 Binary Addressing at Universe-Native $R = 512$

At fixed universe-native resolution $R = 512$,

$$\Delta\theta = 1/512, \quad N = R/4 = 128.$$

Quadrants are $Q_2 : [-1, -0.5),\ Q_1 : [-0.5, 0),\ Q_3 : [0, 0.5),\ Q_4 : [0.5, 1)$. Use a 2-bit quadrant code per lane:

$$\texttt{00} \to Q_1, \quad \texttt{01} \to Q_2, \quad \texttt{10} \to Q_3, \quad \texttt{11} \to Q_4,$$

with inverse/mirror realized by XOR with `11`.

12.3 Lane Configuration Vector and 17-bit Word

For each lane L_i (four lanes total), define the configuration vector

$$\mathbf{v}_i \equiv (Q,\, B,\, S,\, P,\, M,\, O,\, G,\, A),$$

with fields encoded as a 17-bit word:

Field	Bits	Values	Role
Q	2	`00,01,10,11`	Quadrant code (Q1–Q4)
B	7	$0 \ldots 127$	Bin in quadrant at universe-native $R = 512$
S	1	`0/1`	Seam pulse (1 iff $\theta = 0$)
P	1	`0/1`	Ramp parity: primary $[0, 1)$ / inverse $[1, 2)$
M	1	`0/1`	Mirror request
O	1	`0/1`	Operator side: decompression vs. compression
G	2	`00/01/10/11`	Gate layer: X / XY / xyz / xyzw
A	2	`00..11`	Bind-axis micro-mode

Table 6: Per-lane 17-bit word; four lanes give the 68-bit classical register.

12.4 Degrees of Freedom by Gate Layer

Layered gates unlock DoF as follows:

Layer	Gates present	New DoF	Running DoF
X	1–4	Q, B, P, S	**4**
XY	1–5	n (hierarchy via $u_n = 128^{-n}$)	**5**
xyz	1–6	M (mirror)	**6**
xyzw	1–7	β (bind-axis)	**7**

Table 7: Layered gate ladder and per-lane degrees of freedom.

12.5 Canonical Conservation (Measure Form)

For any test window sequentially $\Theta \subset [-1, 1]$,

$$\int_{\Theta \cap (-\infty, 0)} (x/y)\, d\theta + \int_{\Theta \cap (0, \infty)} (z/w)\, d\theta + \Delta\theta\, \delta_0(\Theta) = \text{length}(\Theta),$$

so unity is conserved gate-by-gate and layer-by-layer.

12.6 Worked Example: EM Offsets at Universe-Native $R = 512$ with 360° Domain

Offset 0.03125 corresponds to 16 bins because

$$\frac{128}{8} = 16.$$

In normalized domain:

$$\begin{array}{|rl|}\hline \text{ignition:} & \theta_{\text{ign}} = -0.46875 \;\Rightarrow\; (Q, B) = (\texttt{00},\ 16), \\ \text{absorption:} & \theta_{\text{abs}} = +0.53125 \;\Rightarrow\; (Q, B) = (\texttt{11},\ 16). \\ \hline \end{array}$$

In full 360° domain:

$$\boxed{\begin{aligned}\theta_{\text{ign}} &= -168.75^\circ,\\ \theta_{\text{abs}} &= +191.25^\circ.\end{aligned}}$$

Interpretation * Q-code `00` = Q1 (quantum baseline, decompression overflow). * Q-code `11` = Q4 (nuclear compression, mirror of Q1). * Bin 16 = $16 \times \Delta\theta = 16/512 = 0.03125$ from the **quadrant edge**, i.e. $|-0.5 + 0.03125| = 0.46875$ and $|0.5 + 0.03125| = 0.53125$. * In 360°: $-0.46875 \times 360 = -168.75^\circ$, $+0.53125 \times 360 = +191.25^\circ$.

13 Conclusions

The Nuijens Operating System establishes quantum mechanics as computational architecture operating from within the undivided "1". The four quadrants (Q1–Q4) function as simultaneous system operations, while physical phenomena are processes running within this architecture. Resolution $R = 512$ emerges as the **universe-native quantum measurement bit configuration** from breath-ratio closure. All physical interactions arise from a single fundamental operation — inverse breath norm $N(r)$ and its inverse measurement — experienced differently at different interior positions. There are no separate "forces": gravity and electromagnetism are Q2 ground state and overflow operations, thermodynamic flows operate in Q3, nuclear compression states occupy Q4. All units are located in quadrant pairs via pure inverse ratios. The CMB temperature $T = \frac{256}{256} \times \frac{128}{47} = \frac{128}{47} \approx 2.7234$ is the cosmic dual-hemisphere self-thread at bin-16 closure. The fine structure constant $\alpha^{-1} = 137$ is calibrated from Q1 nesting. No external constants. No addition. No Boltzmann constant.

$$\boxed{\text{Entropy } S = \ln R \quad \text{is the number of ways the "1" threads the grid — in NOS natural units.}}$$

The second law is resolution refinement. There is no chaos — only deeper nesting.

The one unfolds through itself at the **universe-native resolution $R = 512$**. Refinement layers deepen the nesting; the base register remains 512 bits.