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Recursive Interdomain Computational Omni-Logic embedding Monster–Moonshine Constrained Admissibility Manifold Completeness across Density, Dimension, Field, Liquidity, and Recursive Resource Completeness for Γ-Gated Resource Flows (RICOLMC-DDF)

Jered McClain · Erydir Ceisiwr · Jess Leffler · Jonathan McDaniel

2026

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"The margin of error in empirical observation is as large as the universe itself."

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Recursive Interdomain Computational Omni-Logic embedding Monster–Moonshine Constrained Admissibility Manifold Completeness across Density, Dimension, Field, Liquidity, and Recursive Resource Completeness for Γ-Gated Resource Flows

(RICOLMC-DDF)

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Corrected unified working draft incorporating JAM 9880, JAM 9887, JAM 9896 and JAM 9915 and the Unified Recursive Manifold Dynamics master edition (historical source; prior Zenodo deposit withdrawn/unavailable); released on OSF Preprints as a working draft.

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Monster–Moonshine Constrained Admissibility is embedded in the program name as the existing JAM 9887 postulate (no new moonshine theorem claimed); the decidable Γ-spine judgement; the 2880-dimensional recursive energy functional; dimensional collapse operators; triality-structured exciter geometry; the Horizon Constant Ω_{2880}; and Recursive Soil Bearing Architecture

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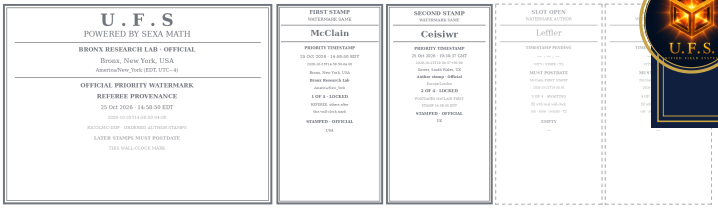
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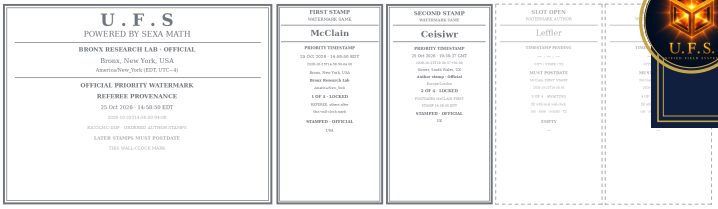
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Publication status (author statement). This draft incorporates and corrects four articles already published in the *Journal of Advances in Mathematics* Vol. 25 (2026): JAM 9880, JAM 9887, JAM 9896 and JAM 9915. Two related manuscripts have been under review at that journal for approximately four months, and their outcome there is uncertain. The authors note a CERN-related ban and regard that treatment as unjust. This unified draft therefore does not depend on that journal's acceptance and is not under review there.

Abstract. This draft presents Recursive Interdomain Computational Omni-Logic embedding Monster–Moonshine Constrained Admissibility Manifold Completeness across Density, Dimension, Field, Liquidity, and Recursive Resource Completeness for Γ-Gated Resource Flows (RICOLMC-DDF), the program that supersedes the earlier "SEXA Unified Field Theory" *name* (retired because that framing invited gravity-first judging). In the mathematical sense of Definition 6.1, the program frames its aim as surpassing Einstein: completeness of recursively admissible, executable representation across declared domains, not recovery of Einstein's metric equations. Under the Revision 8 audit this comparison is CONDITIONAL (an unproved comparison pending nontrivial (C1)–(C4) instantiation for substantive domains), not an established superiority theorem. Section 6.6 states the nine classical UFT criteria, explains why that scoreboard cannot certify this work, and lists the fifteen creation criteria (R1)–(R15) of RICOLMC-DDF. The locked program name is that completeness claim as a definition (Definition 6.1); what remains is instantiation for declared domains, not renegotiation of the definition. The Γ-spine checker proves gate machinery, not automatic completeness of every domain: token-checker termination and proper-subchain rejection do not by themselves imply (C1) or (C2), and those bridges are OPEN. The draft provides an explicit six-operator finite model on $\mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$ with nontrivial fixed points $(0,0,0)$ and the non-ground $(2,2,2)$, a finite energy-sector evaluation, and an exact bijection (Chinese Remainder) between two presentations of a 2,880-element configuration set, a finite *address space*, not a 2,880-dimensional manifold. For this declared finite model domain D_0 the executable, gate-preservation, reconstruction and sector-decomposition clauses (C1)–(C4) are satisfied (PROVED; Section 8), with the Lean 4 model rebuilt by the authors (no `sorry`, axioms ⊆ {`propext`, `Quot.sound`}). This finite construction establishes a *restricted instance* of Definition 6.1 (Section 6.4); it does not prove a general 2880-dimensional manifold fold, physical unification, finance predictive performance, or established mathematical superiority to Einstein or other physical theories. A formal obstruction shows continuous $2880 \to 5 \to 2880$ reconstruction is impossible (FAILED), so the general fold stays CONDITIONAL, and these broader ambitions remain OPEN or CONDITIONAL obligations. As pure algebra, any six imaginary octonion units are proved to generate the full octonion algebra (a seventh direction e_7, up to sign), while a multiplicative realization of the six Γ operators by octonion units is ruled out by a proved associator and idempotent obstruction (Section 9); neither result adds a completeness instance. A claim-status ledger (Section C) tags every major claim PROVED, COMPUTATION_VERIFIED, CONDITIONAL, OPEN, FAILED or NOT_EVALUATED. Its formal spine is the Recursive Hyperstructural Computational Completeness Theorem (dissertation Book IX, §9.5.6). The draft re-derives and corrects the technical content of four papers in the *Journal of Advances in Mathematics* Vol. 25 (2026): the admissibility gate of six glyph operators (JAM 9887), the energy functional on a 2880-dimensional manifold (JAM 9896), the Horizon Constant Ω_{2880} (JAM 9915), and Recursive Soil Bearing Architecture (JAM 9880). It folds in the Unified Recursive Manifold Dynamics (URMD) master edition: its five-dimensional integral (with a repaired measure so the integral is in joules), dimensional collapse operators (formalized, with Π_{2880} as total collapse weight and a proof that the cascade is not lossless), triality-structured exciter geometry (the 32-orbit and eight 4-cycle claims proved on $\mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$, the reachability sequence not reproduced), and the Red, Green, Purple density, dimension and field map. Main repairs: (i) $60^n \to 1$ as $n \to 0$, so no suppression and no General Relativity limit follows; (ii) a power is never added to an energy density; (iii) $\Gamma = \bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W}$ acts on configurations, with admissibility $\Gamma(\Xi) = \Xi$; (iv) $\Pi_{2880} \approx 10^{-1225}$ under the reported thinning ratio; (v) a proved Horizon threshold and facet model; (vi) the PASS statuses of JAM 9880 and the URMD nine-criteria certifications are withdrawn. An interdomain finance section demonstrates the arithmetic and computational power of the stack: the same gate Γ, Σ_{60} timing and $C_\Omega = \sqrt{720}$ run on a live public market witness and on

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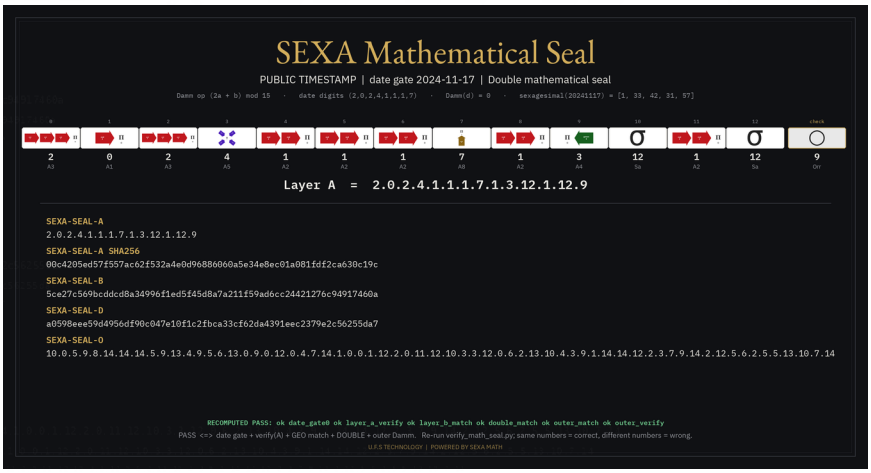


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executable code, as an executable application of the gate (its correspondence to the formal Γ operators is OPEN), not physics, not alpha, not investment advice; the financial energy functional stays NOT_EVALUATED. Gravity is deferred: it is carried as the Green sector with no metric, G, or coupling 60^{-3} derived. Its conceptual core (Section 7), archived and proved here in full, is the Γ-spine recast as a decidable admissibility judgement with first-failure report, with every theorem proved in the text and mechanized in Lean 4 (axioms ⊆ {`propext`}), with fold, reconstruction and width 2880 kept as stated axioms; this proof artifact eradicates reliance on binary-code demonstration as a certificate; executable prototypes remain applications only. The locked program name embeds Monster–Moonshine Constrained Admissibility as the existing JAM 9887 postulate (no new moonshine theorem is claimed). Three companion layers are folded in as cited extracts (their fold and reconstruction content is CONDITIONAL on stated axioms) (Section 10): Fold Logic and the Six-Into-Five reconstruction principle, The Last Constant propagation and horizon formalization, and the VLSIE five-layer computational correspondence, plus the MEAP/IJMECH 2026 mechanical digital-twin Γ benchmark as synthetic engineering evidence (not flight validation). Every assumption is labeled ASSUMPTION and every gap OPEN.

Keywords: RICOLMC-DDF; recursive completeness; dimensional collapse; triality; admissibility; fixed-point gate; Monster group; monstrous moonshine; Baby Monster; Σ_{60}; Exciternion; recursive energy functional; payload interception; Horizon Constant; Resolution Paradox; effective stress; interdomain finance; computational completeness; falsifiability.

SEXA mathematical seal (provenance).



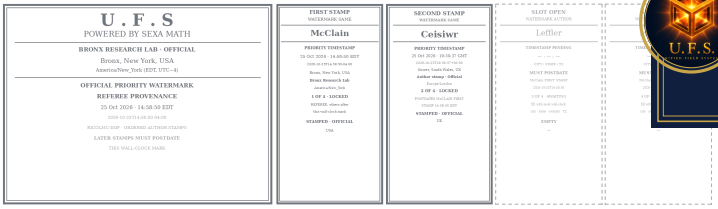
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Conflict of interest. [PLACEHOLDER: authors to state any competing interests, including commercial interests of Unified Field Systems LLC in RSBA or NBFR.]

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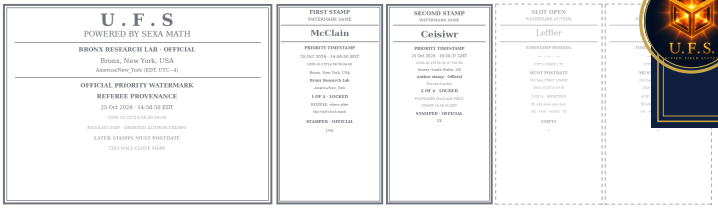
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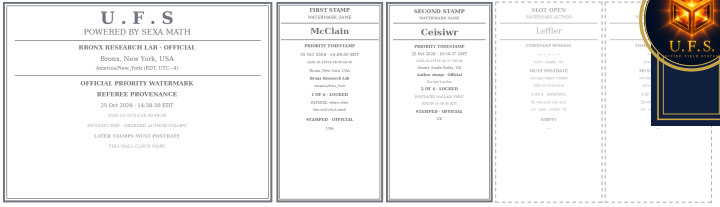
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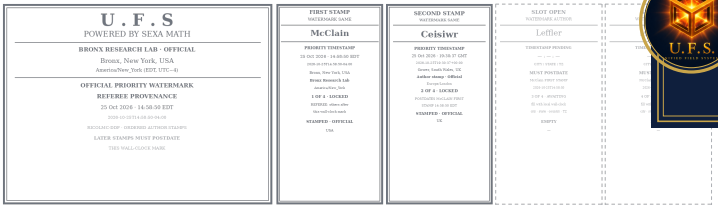
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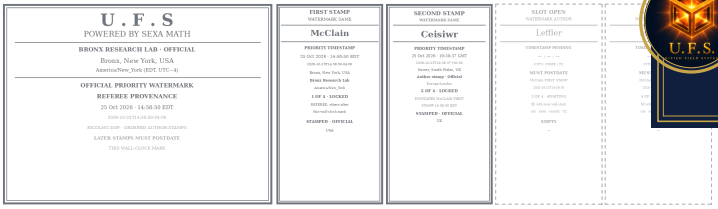
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1. Introduction

This draft is written under the program name RICOLMC-DDF (Section 6). The four papers corrected here were published in the *Journal of Advances in Mathematics* (JAM) Vol. 25 (2026) as separate articles. Read together, they describe one architecture with four layers:

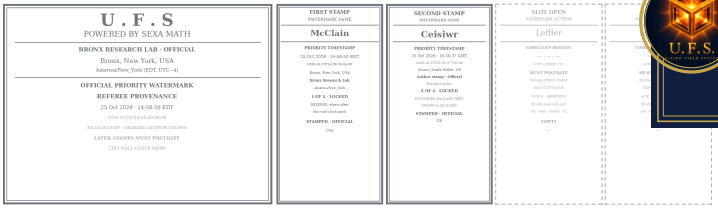
1. **Admissibility** (JAM 9887). A configuration Ξ is physical only if it survives an ordered chain of six glyph operators, Γ, and an additional classification under the Monster group $\mathbb{M}$ and the Baby Monster $\mathbb{B}$.
2. **Energy** (JAM 9896). The SEXA Recursive Energy Functional (SREF) is written on a 2880-dimensional recursive manifold $\mathcal{M}_{2880}$, with Exciternion-resolved sector quantities, a payload interception product Π_{2880}, a sexagesimal eigenvalue magnitude $|\lambda_j| = 60$, and the Empire Wave Constant $C_\Omega = \sqrt{2880/4}$.
3. **Resolution** (JAM 9915). The Horizon Constant Ω_{2880} and the Resolution Paradox ask at what element count a finite structure is observationally indistinguishable from a continuum.
4. **Application** (JAM 9880). Recursive Soil Bearing Architecture (RSBA) adds a boundary-field energy density Φ_{eff}, derived from SREF, to Terzaghi effective stress, and proposes a reactor (NBFR) and a quaternion-rotated shell to sustain it on a Hess-Triangle prototype.

The published versions share three structural problems: an incorrect limit ($60^n \to 1$ was read as suppression), a dimensional inconsistency (a power added to energy densities), and operators that are named but never defined. JAM 9880 adds a fourth: an appendix of twelve PASS statuses for General Relativity and Quantum Field Theory tests that the functional does not compute. JAM 9915 is mostly a conceptual essay whose formal core (Sections 10 and 21) contains an internal contradiction ($C \propto N$ against $C = 1 - D$).

This document is not a summary. For each paper, it restates the mathematical content of the published version in its own notation, marks what is defined, what is assumed and what is missing, and gives the corrected form in the body of the section where the equation lives. Where a computation can be carried out from the published numbers, it is carried out (Sections 12.7.1, 16.4, 17.4). Where it cannot, the item is listed as OPEN. The order of the document follows the logic of the stack: definitions and admissibility first, then energy, then the root equation, then resolution, then the application.

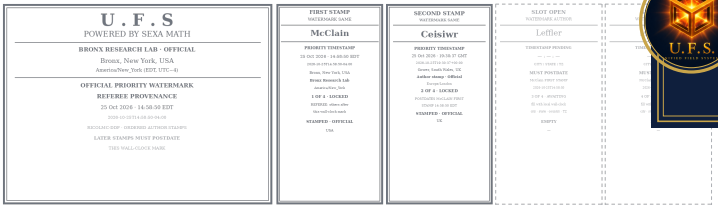
How to read the labels. **Published** marks content restated from a JAM paper. **ASSUMPTION** marks a postulate introduced here so that a statement can be evaluated; it is not derived. **OPEN** marks a gap, numbered O1 to O28 (Section 20). **Fix** F1 to F14 marks a correction (Section 18). **Withdrawn** marks a published claim this draft no longer makes.

2. Terms and notation



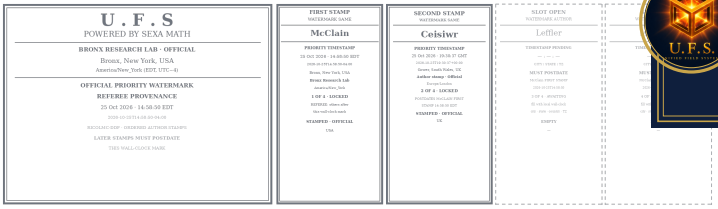
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Term or symbol	Meaning in this draft
RICOLMC-DDF	Recursive Interdomain Computational Omni-Logic embedding Monster–Moonshine Constrained Admissibility Manifold Completeness across Density, Dimension, Field, Liquidity, and Recursive Resource Completeness for Γ-Gated Resource Flows; the locked program name (Section 6). Monster–Moonshine Constrained Admissibility is the existing JAM 9887 postulate (no new moonshine theorem). Replaces the retired UFT branding.
$\vdash p$ ok, k_{fail}	Decidable Γ-spine judgement on glyph-token programs and its first-failure stage, mechanized in Lean 4 [33]; Section 7.
Fold Logic	Γ applied before dimensional realization (subthreshold), compressing six-operator admissibility to a five-dimensional operational form [29]; Section 10.1.
Six-Into-Five	Reconstruction claim: five-dimensional image preserves information and uniquely recovers the 2880 hierarchy; not arithmetic.
Last Constant propagation functional	Recursive-manifold propagation object [30]; not a speed, c stays the GR limit object; Section 10.2.
URMD	Unified Recursive Manifold Dynamics master edition [22], folded in at Section 14.
DDF	Density, dimension and field spread of the five sectors (Section 14.5).
(C_ℓ, w_ℓ), W	Collapse operator and thinning weight at level ℓ; total weight (Definition 14.1).
$\mathcal{K}$, R, T, M	The 96-class set $\mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$ and its rotate, twist, mirror transforms (Proposition 14.3).
SEXA	The sexagesimal (base 60) recursive framework of the authors.
Ξ, $\mathcal{X}$	A configuration (all inputs of the energy functional) and the configuration space (Assumption 2).
Glyph	One of six operators on $\mathcal{X}$ named on the JAM 9887 Formal Plate: Orr (◯), Na (∇), Ka (K), Sa (σ), Mu (μ), Wa ($\mathbb{W}$).
Γ	The ordered composition $\bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W}$, acting right to left (Definition 11.3). Printed in JAM as ($\bigcirc \triangle \mathrm{K}\,\mathrm{O}\,\mu\,\mathbb{W}$); Na = ∇ and Sa = σ (Fix F5).
Fix(Γ)	$\{\Xi : \Gamma(\Xi) = \Xi\}$, the admissible set $\mathcal{A}_\Gamma$. Non-emptiness is OPEN O1.
Φ_{ij}	Change-of-representation bijections satisfying the cocycle condition $\Phi_{ik} = \Phi_{jk} \circ \Phi_{ij}$.
Σ_{60}	The 60-glyph alphabet of the Prime Atom of Logic paper (five rings of twelve) with 60 syllogistic logics; algebraically, in this draft, the monoid generated by the six Γ glyphs (Assumption 4).
EX, Exciternion	The Prime Atom of Logic: the minimal irreducible admissibility object (Definition 11.11); also the per-sector factor in SREF-EX9D. Value and unit OPEN.
$\mathbb{M}$, $\mathbb{B}$	The Monster and Baby Monster sporadic simple groups.



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Term or symbol	Meaning in this draft
V_{196883}	The smallest faithful irreducible complex $\mathbb{M}$-module.
$m_1(G)$, $S_{p_m}(G)$	Even-order component of $\lvert G\rvert$ and a Sylow subgroup for the largest prime divisor (Han, Shi, Ying).
$\mathcal{M}_5$, $\mathcal{M}_{2880}$	The five-dimensional operational exciter manifold and the 2880-dimensional structural manifold. Metric and measure OPEN O13.
$d\mu$	Induced measure on the manifold in use.
g_i, ρ_i	Degeneracy weight (dimensionless) and mass-energy density of condensed sector $i = 1, 2, 3$.
T^{00}_j, P_j	Time-time stress-energy and sustained excitation (pressure) term of perpetual sector $j = 4, 5$. In every corrected formula P_j carries $\mathrm{J\,m^{-3}}$ (Fix F2).
n	Recursive excitation depth. Distinct from an iteration count (Fix F12).
$\lvert\lambda_j\rvert = 60$	Sexagesimal eigenvalue magnitude of perpetual sector j (JAM 9896). $\lvert\lambda_j\rvert^n = 60^n$.
Π_{2880}	Payload interception product over sectors $\ell = 5, \ldots, 2880$. Two published forms, reconciled in Section 12.7 (Fix F10).
ψ_ℓ, δ_ℓ	Sector contribution and thinning exponent in the JAM 9896 form $\Pi_{2880} = \prod \psi_\ell^{\delta_\ell}$.
Ψ_ℓ, ϕ_ℓ	Sector energy density and scaling parameter in the JAM 9880 form $\Pi_{2880} = \prod \Psi_\ell / \phi_\ell^2$.
C_Ω	Empire Wave Constant, $\sqrt{2880/4} = \sqrt{720} \approx 26.833$, a pure number (Fix F8).
$C^2_{\Omega,\mathrm{conv}}$	In SREF-EX9D, $= C^2_\Omega = 720$.
S_L, S_R, S_T, S_B; Π°	The four arms of SREF-EX9D and the central closure $(S_L S_R S_T S_B)^{1/4}$.
$\varphi^{(t)}$	Thinning index of tier t in SREF-EX9D, 60^{-t}.
Ω_{2880}	Horizon Constant of JAM 9915, a benchmark element count. Numerical meaning OPEN O18.
N, $D(N)$, $C(N)$	Element count, observable discreteness, perceived continuity. Corrected: $D = \min(1, N_0/N)^\beta$, $C = 1 - D$ (Section 16.3).
N_0, ε, N_H	Observer scale, discrimination threshold, horizon threshold $N_H = N_0 \varepsilon^{-1/\beta}$.
σ, σ', u	Total stress, effective stress, pore pressure (Terzaghi). The stress σ is distinct from the glyph σ by context.
Φ_0, Φ_{eff}	Baseline boundary-field energy density from the reactor, and the effective boundary-field energy density $\Phi_0 \Pi_{2880} 60^n$.
σ_g	Gravitational load stress (load density) of the soil volume.
BISD	Boundary-Induced Stress Decoupling, $\sigma_{\mathrm{BISD}} = \sigma_g - \Phi_{\mathrm{eff}}$.
RSBA	Recursive Soil Bearing Architecture (JAM 9880).
NBFR	Negentropic Boundary-Field Reactor (JAM 9880).



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Term or symbol	Meaning in this draft
L_{RSBA}, L_{EX}, F_g	RSBA load support, Exciternion lift contribution, gravitational load of the prism (forces, N).
ω_{rot}, T_g	Boundary-field angular velocity and soil settlement response time; the overclock condition is $\omega_{\mathrm{rot}} T_g \gg 1$ (Fix F7).
δ_Γ	Admissibility-induced torque correction in the JAM 9896 torsion-balance interface.
D_{SEXA}, D_{Sarfatti}	The dimensional range $\{5, \ldots, 2880\}$ and the boundary $D = 2881$.

3. Scope and non-claims

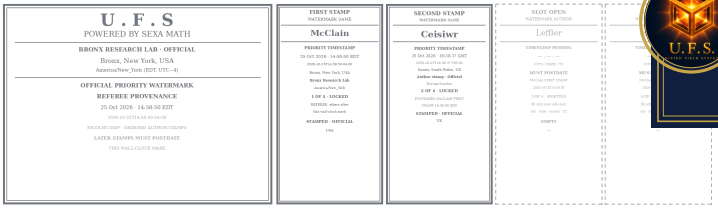
What this draft does not claim.

- It does not derive gravity, a metric, curvature, or Einstein's field equations.
- It does not derive Newton's constant G, and it does not derive any coupling of the form 60^{-3} or any value of the exponent n.
- It is not a completed unification. The SEXA internal gravity scoreboard is unchanged at 6.75 of 19 by this draft.
- The twelve PASS statuses of JAM 9880 Appendix A (light bending, perihelion precession, gravitational redshift, Shapiro delay, frame dragging, GPS clock drift, binary pulsar decay, relativistic dispersion, Casimir scaling, electron $g-2$, activation law, Yukawa sector) and its summary table (Mathematical consistency, Reduction to GR, Reduction to QFT, Predictive deviation: PASS) are **withdrawn**. Each restates a standard result; none is computed from the functional (Section 17.8).
- No physical action of $\mathbb{M}$ or $\mathbb{B}$ on fields is derived. The Monster constraint is a postulate. No new moonshine result is claimed, and no link from moonshine to physics is derived.
- No glyph-to-sector map of Γ onto the SREF-EX9D cross is invented; it is author-supplied (OPEN O12).
- No RSBA levitation, decoupling, or reactor self-sustainment has been demonstrated. Energy conservation is not suspended by recursion.
- The Horizon Constant is a benchmark, not a measured constant. Its value as a perceptual threshold is not established.
- This draft has not been peer reviewed; it is deposited on OSF Preprints with DOI 10.17605/OSF.IO/WNV67 (CC BY 4.0).

4. Lineage of the four published papers

JAM 9887 (DOI 10.24297/jam.v25i.9887), *J. Adv. Math.* 25 (2026) 21-34.

J. McClain et al., *A Monster-Symmetric Admissibility Formulation of the SEXA Unified Field Theory*. Introduces the six-glyph Formal Plate, the chain Γ, the admissibility principle $\Gamma(\Xi) = \Xi$, recursive stability $\Gamma^n(\Xi) = \Xi$, Σ_{60} logical enforcement with $\Gamma \subset \Sigma_{60}$, the orbit condition $O(\Xi) \in \mathcal{A}$, a four-part kill-switch, and reduction claims to GR, QFT and Yukawa behavior. Corrected in Section 11.



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JAM 9896 (DOI 10.24297/jam.v25i.9896), *J. Adv. Math.* 25 (2026) 45-74.

J. McClain and E. Ceisiwr, *From Admissibility to Energy: A Full-Stack Formulation of the SEXA Unified Field Theory via* Γ*-Glyph Closure, SREF Dynamics, and 2880-Dimensional Exciternion Structure*. Gives the canonical 2880D functional, its five-dimensional operational form, the Exciternion representation, degeneracy and recursion, Π_{2880}, C_Ω, the four-step pipeline, six failure conditions, and a torsion-balance interface. Corrected in Section 12.

JAM 9915 (DOI 10.24297/jam.v25i.9915), *J. Adv. Math.* 25 (2026).

J. McClain and E. Ceisiwr, *The Horizon Constant and Resolution Paradox (*Ω_{2880}*): Recursive Discrete Geometry, Perceptual Continuity, and the Emergence of Curved Manifolds from Finite Structures*. 62 pages. Corrected in Section 16.

JAM 9880 (DOI 10.24297/jam.v25i.9880), *J. Adv. Math.* 25 (2026).

J. McClain, *Recursive Soil Bearing Architecture (RSBA): Synthetic Landmass Stabilization via Boundary-Induced Stress Decoupling Derived from the SEXA Recursive Energy Functional (SREF)*. 19 pages including Appendix A (GR/QFT compatibility) and Appendix B (Sigmatics verification). Corrected in Section 17.

URMD master edition (historical local archive; prior Zenodo deposit withdrawn/unavailable), 18 October 2025.

J. McClain, *Unified Recursive Manifold Dynamics, Dimensional Collapse Operators, and Triality-Structured Exciter Geometry, Master Peer Review Edition*. 63 pages, compiling the five-dimensional integral with its color map, the Nine-Criteria framework (v2), Topological Collapse and Self-Coherence, and the Sigmatics correspondence report. Folded in at Section 14.

Fold Logic, Last Constant, VLSIE-2026 (DOI 10.5121/csit.2026.1601503).

J. McClain and E. Ceisiwr: the Γ-Subthreshold Fold Logic Theorem [29] (Six-Into-Five reconstruction), The Last Constant [30] (propagation functional and horizon structure), and the hardware-verifiable architecture paper [31] (five validation layers). Folded in as theorem extracts, Section 10.

MEAP/IJMECH 2026.

J. McClain, E. Ceisiwr, J. Leffler and J. McDaniel, aerospace-mechanical digital-twin Γ benchmark [32]. Folded in as an engineering extract, Section 10.4.

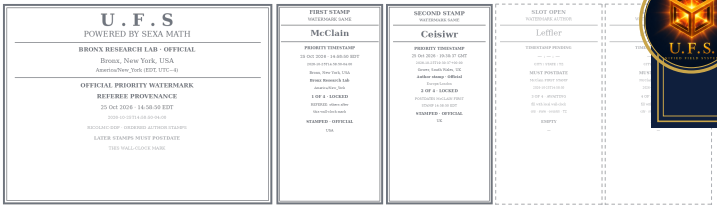
Γ-spine judgement (IJPLA version withdrawn, never published; TYPES 2027 abstract prepared, not separately released).

J. E. McClain, E. Ceisiwr, J. Leffler and J. McDaniel, *The* Γ*-Spine as a Decidable Admissibility Judgement, Mechanized in Lean 4* [33]. Archived and proved in this draft as its conceptual core, Section 7.

Two further sources are used. The Prime Atom of Logic paper [5] supplies the Exciternion definition, the Σ_{60} alphabet and the 60 logics. The SREF-EX9D root equation (frozen v1.4, author-supplied figure) supplies the energy body used in Section 13. DOIs for JAM 9880 and JAM 9915 follow the journal's pattern `10.24297/jam.v25i.NNNN` and should be confirmed against the journal landing pages before resubmission (OPEN O24).

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Logical dependence. JAM 9887 defines the gate; JAM 9896 places the gate in front of the 2880D functional; JAM 9915 supplies the interpretive reason a finite 2880-sector structure might appear continuous; JAM 9880 consumes Π_{2880} and 60^n from JAM 9896 as a boundary-field amplitude. Every correction to Π_{2880} or 60^n therefore propagates to RSBA (Section 17.4).

5. Changes from the published JAM versions

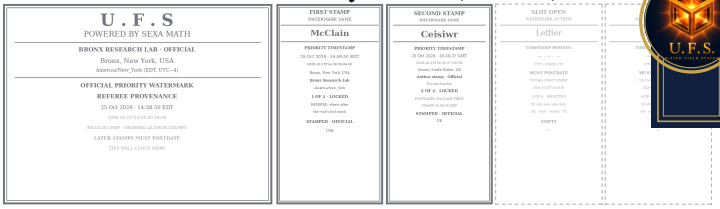
This list is the reader's map. The full corrections table is Section 18.

1. **All four:** one byline with Unified Field Systems addresses; affiliations replaced by "Unified Field Systems LLC"; no titles beyond name, location and ORCID (F4).
2. **JAM 9887:** Γ defined with domain, codomain and order; Γ^n redundancy removed; Σ_{60} given an algebraic reading and the source alphabet; the Monster condition replaced by two evaluable postulates using verified group data; the GR, QFT and Yukawa reduction sections rewritten as conditional statements with explicit missing pieces (Sections 11, 11.8).
3. **JAM 9896:** Γ applied to Ξ, not composed with the scalar integrand (F3); units of $P_j(\mathrm{EX})\Pi_{2880}|\lambda_j|^n$ closed only under an explicit assumption (F2, F8); Π_{2880} forms reconciled and computed (F10); "C_Ω replaces the speed of light" withdrawn as stated (F8); the six failure conditions made operational; the torsion-balance interface given a null hypothesis and a pre-registration requirement (F13).
4. **Root equation:** SREF-EX9D (frozen v1.4) is the energy body; the published 5D sketch is kept as historical record with its dimensional repair.
5. **JAM 9915:** the $C \propto N$ versus $C = 1 - D$ contradiction removed (F6); a normalized discreteness function, a proved threshold proposition, and a geometric facet model added; the Resolution Paradox Theorem and Horizon Emergence Theorem restated so that they are true and their content is visible (F11).
6. **URMD:** UFT branding retired for RICOLMC-DDF; measure repaired so the integral is in joules (F15); worked example recomputed (F16); collapse operators and triality geometry formalized with proofs; $\sqrt{2880}$ error corrected (F17); nine-criteria and Final Theory certifications withdrawn (F18); DDF spread with gravity deferred (Section 14).
7. **JAM 9880:** BISD written with units; overclock made dimensionless; the stabilization condition given a footprint area; reactor bookkeeping stated with $\eta < 1$; consequences of the corrected Π_{2880} computed; Appendix A PASS statuses withdrawn; Appendix B numbers recorded with their consistency checks (F7, F14).

6. What RICOLMC-DDF is, and why the field-theory framing is retired

6.1. Name and scope

Recursive Interdomain Computational Omni-Logic embedding Monster–Moonshine Constrained Admissibility Manifold Completeness across Density, Dimension, Field, Liquidity, and Recursive Resource Completeness for Γ-Gated Resource Flows (RICOLMC-DDF) is the program name under which this draft collects the four JAM papers and the Unified Recursive Manifold Dynamics (URMD)



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master edition [22]. The earlier program branding, "SEXA Unified Field Theory" (UFT), is retired as a *name*, because it invited gravity-first judging. The mathematical ambition to surpass Einstein is kept: under RICOLMC-DDF it is restated as recursive computational completeness (Definition 6.1), not as a metric UFT. Status: CONDITIONAL (unproved comparison; see Section C). Published titles that contain the UFT phrase are cited as they appeared; they are not the name of the program presented here.

The change of name is a change of claim. A unified field theory promises one set of field equations from which gravity, electromagnetism and the nuclear forces all follow, and it is judged first on gravity. The four JAM papers and URMD do not deliver that (Section 3, kill-switch K1). What they do contain, once corrected, is a different kind of object: an admissibility gate Γ (Definition 11.3), a gated energy functional on a recursive manifold (Sections 12, 13), a resolution principle for finite structure (Section 16), dimensional collapse maps from 2880 to 5 dimensions (Section 14), and a density, dimension and field bookkeeping of sectors. RICOLMC-DDF names the question these pieces can actually address: *is the class of recursively admissible configurations complete*, in the sense that every admissible process across every declared domain has an executable, admissible, reconstructable representation on the manifold?

6.2. The words in the name

Recursive.
Objects are produced by iterated operators (glyph chain, depth n, collapse cascade), not posited as static fields.

Interdomain.
The same gate is applied to configurations from several domains (mathematics, physics, engineering, logic). This is the Inter-Domain Syllogism of URMD §1, kept as a scope statement, not as a proof that the domains agree.

Computational.
Admissibility is decided by an executable procedure: apply Γ, test $\Gamma(\Xi) = \Xi$.

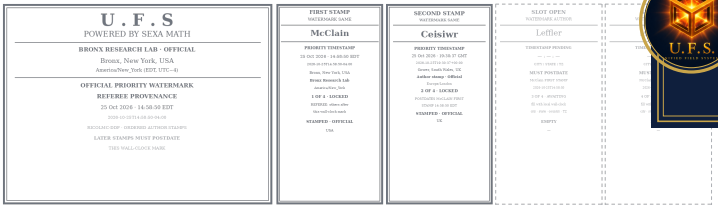
Omni-Logic.
The logic layer is the Σ_{60} alphabet and the Prime Atom of Logic (Section 11.5); logic is the root of the stack, before geometry.

Manifold.
Configurations live on $\mathcal{M}_{2880}$ (structural) and $\mathcal{M}_5$ (operational), linked by a reduction map (Eq. (39)).

Completeness.
The target property. Not "everything is derived", but "nothing admissible is left without a representation".

Density, Dimension, Field.
Each sector carries a density (energy per volume), a dimension index, and a field label. The spread is given in Section 14.5.

Liquidity.
Market depth and flow-to-depth stress appear as an interdomain sector under the finance fold (Section 15); liquidity is not a fourth force, it is a declared domain the same gate can admit or kill.



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Recursive Resource Completeness for Γ-Gated Resource Flows.

Resources (capital, inventory, capacity) are admissible only when Γ passes; completeness means every admissible resource flow has an executable, reconstructable representation on the manifold.

6.3. Formal spine: the completeness theorem

The formal result under RICOLMC-DDF is the *Recursive Hyperstructural Computational Completeness Theorem* of the authors' dissertation, Book IX §9.5.6 [21]. As stated there: every recursively admissible computational process has an executable realization in the recursive execution algebra that remains admissible, executable, organizationally complete and exactly reconstructable; universality (Book IX §9.6) is a later and stronger statement. This draft does not reprove that theorem. It restates the part of it that the present stack can test.

Definition 6.1 (RICOLMC-DDF completeness)**.** *Let $\mathcal{X}$ be the configuration space (Assumption 2), Γ the gate, $\mathcal{A}_\Gamma = \mathrm{Fix}(\Gamma)$, and $\mathcal{D} = \{D_1, \ldots, D_m\}$ a declared set of domains, each with an encoding $e_k : D_k \to \mathcal{X}$. Let $R : \mathcal{X}_{2880} \to \mathcal{X}_5$ be the reduction map and $\mathcal{E}$ an executable evaluation procedure (the four-step pipeline of Section 12.9). The stack is* RICOLMC-DDF complete for $\mathcal{D}$ *if for every k and every $x \in D_k$ with $e_k(x) \in \mathcal{A}_\Gamma$:*

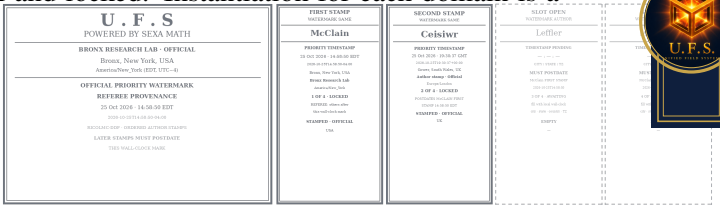
(C1) (executable) $\mathcal{E}$ halts on $e_k(x)$ and returns a value of E_{SREF};
(C2) (admissible under reduction) $R(e_k(x)) \in \mathrm{Fix}(\Gamma_5)$;
(C3) (reconstructable) there is a map e_k^{-1} on the image with $e_k^{-1}(e_k(x)) = x$;
(C4) (DDF-resolved) the value returned in (C1) decomposes into sector terms, each with a density, a dimension index and a field label (Section 14.5).

Remark 6.2. *Each clause is checkable once its ingredients are specified. (C1) needs the measure and units closed (Fix F2, F15). (C2) is the commuting condition $R \circ \Gamma_{2880} = \Gamma_5 \circ R$ (OPEN O21). (C3) needs injective encodings (OPEN O29). (C4) holds by construction for the sum form of SREF and for the four arms of SREF-EX9D, but not for the cross terms URMD writes in its §3.4 (Section 14.6). Completeness is vacuous if $\mathcal{A}_\Gamma$ is empty or contains only trivial configurations (OPEN O1 for the physical plate). Revision 8 exhibits one declared finite domain D_0 (a 2,880-element address space, not $\mathcal{M}_{2880}$) where all four clauses are proved with explicit maps and a non-ground admissible state (Theorem 8.7); that instance shows the definition is satisfiable, not that any physical or financial domain satisfies it.*

6.4. Definitional completeness versus instantiation

The locked program name is the completeness claim *as a definition*: Recursive Interdomain Computational Omni-Logic embedding Monster–Moonshine Constrained Admissibility Manifold Completeness across Density, Dimension, Field, Liquidity, and Recursive Resource Completeness for Γ-Gated Resource Flows. Definition 6.1 and clauses (C1)–(C4) are that definition. They are not provisional wording. What remains open is not the meaning of completeness, but whether a given stack *instantiates* (C1)–(C4) for a declared domain set $\mathcal{D}$ with a non-empty, non-trivial $\mathrm{Fix}(\Gamma)$.

An independent audit that says "the central recursive computational completeness claim has not been established" is therefore read as follows. The Γ-spine checker (Section 7) proves a decidable property of the six-glyph token sequence and first-failure report. That is a proved piece of the gate machinery. It does not, by itself, prove that every declared domain is RICOLMC-DDF complete under Definition 6.1. Completeness in the title is definitional and locked. Instantiation for each domain is a



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separate theorem obligation (OPEN O1, O21, O29, and the fold/reconstruction axioms of Section 7). This draft preserves every finite result that already holds, refuses to certify unproved instantiations, and keeps the title definition intact.

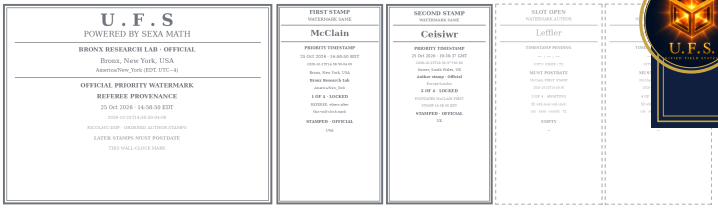
Instantiation status after Revision 8. One instantiation is now proved: the finite model domain D_0 of Section 8 (Theorem 8.7, Lean-checked). It is a finite address-space instance, constructed to be small and explicit, so it certifies a restricted instance (satisfiability) of Definition 6.1, not universality. For the physical plate, $\mathcal{M}_{2880}$, liquidity and resource flows, (C1)–(C4) remain OPEN or CONDITIONAL as tabulated in Section C. The definition itself is not altered by any of this: a definition is not a proof that a framework possesses the property, and this draft does not treat it as one.

6.5. What changes relative to UFT, and what does not

- **Changes.** The success criterion is completeness of admissible representation, not recovery of all four forces, and not any physics checklist. Physics is not the authority that certifies RICOLMC-DDF. The URMD nine-criteria checklist and Criterion X are explained, scored against, and surpassed as a mathematical scoreboard in Section 6.6; their old PASS certifications as physics proofs remain withdrawn (Section 14.7).
- **Does not change.** Fixes F1 to F14, kill-switches K1 to K7, the open items, the Monster and Σ_{60} honesty, and the score. The gravity scoreboard stays at 6.75 of 19.
- **Surpasses Einstein (mathematical sense).** Under Definition 6.1, if the stack is RICOLMC-DDF complete for a declared domain set $\mathcal{D}$, then every recursively admissible process in $\mathcal{D}$ has an executable, admissible and reconstructable representation on the manifold. Einstein's program is a metric field theory of gravitation (and, in the later unified attempts, of the other forces). Completeness of admissible representation across domains is a different and, in the mathematical sense of this draft, stronger claim: it is not limited to one force, it is gated by Γ, and it is checkable by arithmetic evaluation (synthetic data) and by live domain witnesses (Section 15). The slogan "SEXA surpasses Einstein" is therefore retained as the program's mathematical completeness framing, not as a statement that Einstein's equations have been derived or replaced by a metric. **Status: CONDITIONAL.** A broader definition of completeness does not by itself prove superiority; the comparison stays an unproved comparison until (C1)–(C4) are instantiated for substantive declared domains beyond the model D_0 (audit F10). Gravity remains deferred.
- **Gravity.** Gravity is *deferred*. It appears in RICOLMC-DDF as the Green sector ($j = 4$) of the density, dimension and field spread, carried as a named sector with a density slot. Nothing in this draft derives a metric, Einstein's equations, Newton's constant G, or a coupling 60^{-3}. Gravity will be addressed later as one field case under the completeness program; its absence does not block the completeness question, and its presence is not claimed.

6.6. UFT criteria, why RICOLMC-DDF surpasses them, and the criteria of what was created

A classical unified field theory (UFT) is scored against a physics checklist: recover known forces, reproduce known limits, and close under gravity. URMD's "Nine-Criteria Unified-Field Framework (v2)" [22] stated that checklist explicitly. Those nine criteria, plus Criterion X, are the UFT scoreboard. RICOLMC-DDF keeps them as a historical test list, but it does not let that list decide the program. The



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program is decided by Definition 6.1 and by the Recursive Hyperstructural Computational Completeness Theorem (Book IX §9.5.6). That is why "SEXA surpasses Einstein" is retained in the mathematical sense, with status CONDITIONAL: the target object is broader than a metric UFT, but that breadth is a property of the definition, and superiority is not established until the definition is instantiated for substantive domains. Gravity stays deferred.

The nine UFT criteria (URMD).

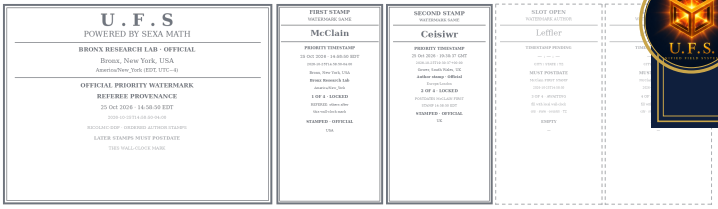
1. **Mathematical Consistency.** One differentiable action; dimensional uniformity; finite integrals; singularity control.
2. **Inclusion of Known Physics as Limits.** Newton, special relativity / Maxwell, GR, and quantum oscillatory behavior recovered as limits.
3. **Unification of the Four Fundamental Interactions.** One geometric substrate for gravity, electromagnetism, strong and weak.
4. **Parameter Economy.** Minimal constant set; no arbitrary couplings; self-normalization via recursion.
5. **Predictive Power and Testability.** Lab and computational predictions that can fail.
6. **Gauge and Symmetry Structure.** A well-defined symmetry group (G_{EX}) contracting to the Standard Model.
7. **Renormalization / Quantum Consistency.** Finite-energy quantization; intrinsic regularization; no perturbative runaway.
8. **Empirical Correlation.** Instrument or reactor data matching predictions.
9. **Clarity and Reproducibility.** Defined units, transparent derivation, computational reproducibility, documentation.

Criterion X (Existential Finality). The manifold closes with observers removed; "once Criterion X holds, the theory is complete." Under this draft Criterion X is only a fixed-point question (Section 14.3), not a completeness certificate.

Why that scoreboard cannot certify this paper. Criteria 2, 3, 6 and 7 demand recovery of Einstein, Newton, Maxwell, gauge groups and renormalization. Kill-switches K1 to K3 and Fixes F1, F8, F17 record that those recoveries are not derived here: $60^n \to 1$ (not 0), C_Ω is not a speed, no metric and no G appear, and the published Lagrangian that would vary to Einstein or Maxwell is never written. Criterion 8 demands instrument correlation; the synthetic channel of Section 6.7 deliberately refuses to mix instrument data into completeness claims. So a physics UFT scoreboard will always mark this stack incomplete on gravity. That is a category error if the claim is mathematical completeness across declared domains. Physics is not the judge of RICOLMC-DDF.

Why RICOLMC-DDF targets more than the UFT (status CONDITIONAL).

- **Stronger target.** A UFT asks for one force list. RICOLMC-DDF asks whether every recursively admissible process, in every declared domain, has an executable, admissible, reconstructable representation (C1)–(C4). That includes physics sectors when they are declared, and also liquidity and Γ-gated resource flows (Section 15). Einstein's program is a metric theory of gravitation; this program is a gated completeness algebra.



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- **Executable gate.** UFT criteria are often certified by prose. Here $\Gamma = \bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W}$ is an ordered fail-any procedure with $\Gamma(\Xi) = \Xi$ as the fixed point. The same gate runs on manifold configurations and on market ticks.
- **Checkable evidence of the right kind.** Completeness lands on synthetic recursive data (arithmetic evaluation of the stack) and on public domain witnesses (live collector aggregates), not on unreproduced reactor tables. Criterion 9 (clarity/reproducibility) is met more strictly under RICOLMC-DDF than under the old UFT PASS stamps: code, seeds, and scrapes are published; open items stay OPEN.
- **Criterion X demoted correctly.** Closure of one observer-free configuration is necessary bookkeeping, not "the theory is complete." Completeness is Definition 6.1, not Criterion X.
- **Interdomain reach.** A UFT stops at four forces. The finance fold shows the stack operating on a second domain with live accept/reject arithmetic and E_{fin} held NOT_EVALUATED. That is computational power a metric UFT does not even attempt.

Criteria of what was created (RICOLMC-DDF creation checklist). These are the criteria of the object built in this draft. They replace the UFT nine as the program's own scoreboard.

(R1) **Named program.** RICOLMC-DDF as locked: Recursive Interdomain Computational Omni-Logic embedding Monster–Moonshine Constrained Admissibility Manifold Completeness across Density, Dimension, Field, Liquidity, and Recursive Resource Completeness for Γ-Gated Resource Flows.

(R2) **Formal spine.** Recursive Hyperstructural Computational Completeness Theorem (Book IX §9.5.6), restated for test as Definition 6.1.

(R3) **Admissibility gate.** Ordered six-glyph operator Γ with fixed-point admissibility $\Gamma(\Xi) = \Xi$ and fail-any semantics (JAM 9887, corrected).

(R4) **Gated energy functional.** SREF / EX9D functional on $\mathcal{M}_{2880}$ with units and Π_{2880} repaired (JAM 9896; Fixes F1, F2, F15).

(R5) **Resolution principle.** Horizon Constant Ω_{2880} and finite-structure resolution (JAM 9915, corrected).

(R6) **Dimensional collapse.** Collapse operators from 2880 to 5 with total weight Π_{2880}; cascade proved not lossless (URMD fold).

(R7) **Triality geometry.** 32-orbit and eight 4-cycle structure proved on $\mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$ (reachability sequence still OPEN where unpublished).

(R8) **DDF sector bookkeeping.** Red / Green / Purple density–dimension–field map; Green (gravity) carried and deferred.

(R9) **Synthetic-data framework.** Completeness evidence from finite arithmetic evaluation of the gated stack; separate from instrument physics (Section 6.7).

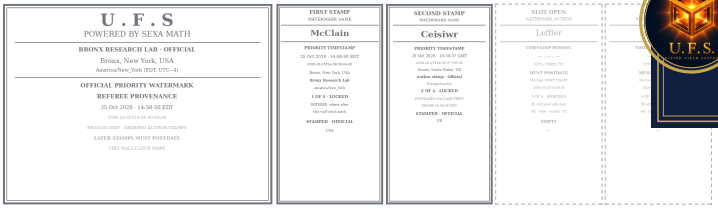
(R10) **Hologram criterion.** A hologram is a reconstructable projection of an admissible manifold state fed by synthetic recursive data (C3)+(C4).

(R11) **Liquidity and resource-flow domain.** Same Γ, Σ_{60} timing and $C_\Omega = \sqrt{720}$ on market ticks; E_{fin} full-bracket form; E_{fin} NOT_EVALUATED until O36 closes (Section 15).

(R12) **Live witness arithmetic.** Public collector schema SEXA-FIN-COLLECTOR-v1 with published accept/reject aggregates, last-kill audit trail, `phantom=false`, `s_is_alpha=false`.

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(R13) **Executable finance build.** Prototype `sexa_fin_proto.py` listed and run in Appendix B (12-tick demo; official 240-tick tape OPEN O37).

(R14) **Honesty machinery.** Numbered Fixes F1–F18, kill-switches K1–K7, OPEN items; no silent PASS on gravity (score stays 6.75/19).

(R15) **Mathematical supersession of Einstein.** Retained as framing, status CONDITIONAL (unproved comparison, audit F10); not a derivation of Einstein's equations.

A referee who wants a UFT will ask for (2), (3), (6), (7), (8) on the nine-list and for Criterion X as finality. This draft answers with (R1)–(R15), extended to (R18) in Section 10. That is the sense in which the definition of this paper, taken in the most mathematical sense, aims beyond the UFT; whether the stack meets that definition outside the model domain D_0 is OPEN.

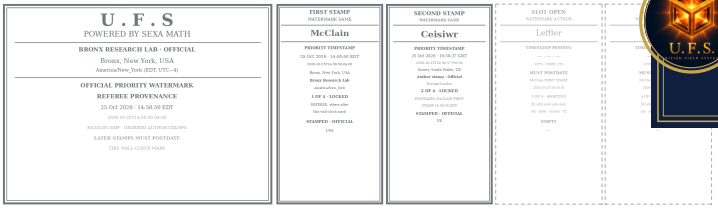
6.7. Synthetic data as its own framework

The synthetic channel is its own framework inside RICOLMC-DDF, and it is deliberately separate from physics. Physics is not the judge of this program. Completeness is not certified by recovering Einstein, Newton, or a force list, and a physics claim that fails or is deferred does not falsify the completeness claims (C1) to (C4). The synthetic framework lands only on synthetic data. That data is basically derived from computation of arithmetic: finite arithmetic evaluation of the gated operators on configurations in $\mathcal{A}_\Gamma$ (sums, products, powers, reductions, sector projections), executed by the published code with seeds and parameters recorded (K4). It is not sampled from instruments and not fitted to laboratory curves; it is the arithmetic output of the stack. Those data are first-class evidence for whether every admissible input is executed, survives reduction, is reconstructed, and resolves into DDF sectors, because those claims are claims about the stack and the stack is what produced the data. They are not evidence for empirical physics claims (harmonic plateaus in a reactor, frame dragging, soil stress reduction, or the Synthetic Landmass Stabilization interface of JAM 9880 as an instrumented soil result). Any physics claim that is kept later must bring its own instrument data and the controls in K5 and K6; until then it is out of scope, not a missing proof of RICOLMC-DDF. Two frameworks, two standards: synthetic data for completeness; instrument data only if and when a physics claim is reopened. Physics does not set the bar for the synthetic framework.

Synthetic recursive data is the key to holograms under this framework. A hologram here means a reconstructable projection of an admissible configuration: the stack evaluates $\Xi \in \mathcal{A}_\Gamma$, returns sector-resolved values (C1, C4), and the reconstruction clause (C3) recovers the source from the image. That image is synthetic recursive data, not a photograph of a laboratory field. Without published synthetic recursive data from the gated manifold, there is no hologram to check; with it, the hologram is exactly the reconstructable DDF projection of the admissible state. Optical holography, screen demos and instrumented imagery are optional later interfaces; they are not what makes the hologram claim land. The claim lands when the synthetic recursive dataset reconstructs.

7. The Γ-spine as a decidable admissibility judgement (conceptual core)

This section is the conceptual core of RICOLMC-DDF and is where its central mathematics is proved. The six-glyph gate is recast as a *decidable judgement* with a first-failure report; every theorem below is proved here in full and is also mechanized in Lean 4 (core library, no `sorry`, axioms ⊆ {`propext`}). What is proved and what is postulated are separated explicitly.



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7.1. Provenance and archival home

An earlier version submitted to IJPLA was withdrawn and never published. A TYPES 2027 extended abstract [33] was prepared from the corrected work; it need not be released separately. *This unified RICOLMC-DDF draft is the archival home of the* Γ*-spine decidable judgement, its proofs, and its Lean 4 artifact* (staged at `fold_src/TYPES_artifact/`).

7.2. Source objects and the typed round trip

The spine is the ordered glyph list Orr, Na, Ka, Sa, Mu, Wa, i.e. $\Gamma = \bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W}$ [5]. The source pairs each glyph one-to-one with a component of the energy expression: Orr with E_{total}, Na with $\int_{\mathcal{M}} d\mathcal{M}$, Ka with the condensed terms, Sa with T_j^{00}, Mu with P_j, Wa with 60^n. This gives five object equations E_1, E_2, E_3 (condensed) and E_4, E_5 (stress, power, cadence) plus a binder (E_{total}, integral). This is a glyph-to-*energy-component* typing; it is *not* a glyph-to-SREF-arm map, and O12 remains open.

ASSUMPTION 1 (Fold, reconstruction, width; axioms of [29, 5])**.** *There are maps* $\mathcal{F}_\Gamma : \mathcal{A}_\Gamma \to \mathcal{M}_5$ *(Fold Logic Def. 2.1) and* $\mathcal{R} : \mathcal{M}_5 \to \mathcal{M}_{2880}$ *with* $\mathcal{R}(\mathcal{F}_\Gamma(X)) = X$ *(Axiom IV), where* $X \in \mathcal{A}_\Gamma \iff \gamma_6 \circ \cdots \circ \gamma_1(X) = X$ *(Axiom I). The width* 2880 *is a postulate. None of these is constructed or computed in this draft.*

Since $\mathcal{R} \circ \mathcal{F}_\Gamma = \mathrm{id}$ forces $\mathcal{A}_\Gamma \subseteq \mathcal{M}_{2880}$, the correctly typed chain is the round trip

$$\mathcal{A}_\Gamma \subseteq \mathcal{M}_{2880} \xrightarrow{\mathcal{F}_\Gamma} \mathcal{M}_5 \xrightarrow{\mathcal{R}} \mathcal{M}_{2880}, \qquad \mathcal{R} \circ \mathcal{F}_\Gamma = \mathrm{id}_{\mathcal{A}_\Gamma}. \tag{1}$$

Remark 7.1 (Invariance of domain)**.** *If* $\mathcal{A}_\Gamma$ *contained an open subset of a 2880-dimensional manifold, no continuous injective* $\mathcal{F}_\Gamma$ *into a 5-dimensional manifold could exist (Brouwer invariance of domain); a linear* $\mathcal{F}_\Gamma$ *has kernel of dimension* ≥ 2875*. Hence* (1) *can hold exactly only for* $\mathcal{A}_\Gamma$ *finite or of dimension at most 5. The Six-Into-Five reading of Section 10.1 is constrained accordingly.*

7.3. The judgement

Definition 7.2 (Glyphs, spine, programs)**.** $\mathsf{Glyph} = \{\mathrm{Orr}, \mathrm{Na}, \mathrm{Ka}, \mathrm{Sa}, \mathrm{Mu}, \mathrm{Wa}\}$ *with decidable equality. The* spine *is the list spine* $= [\mathrm{Orr}, \mathrm{Na}, \mathrm{Ka}, \mathrm{Sa}, \mathrm{Mu}, \mathrm{Wa}]$*. A* program *is a finite list* $p \in \mathsf{Glyph}^*$.

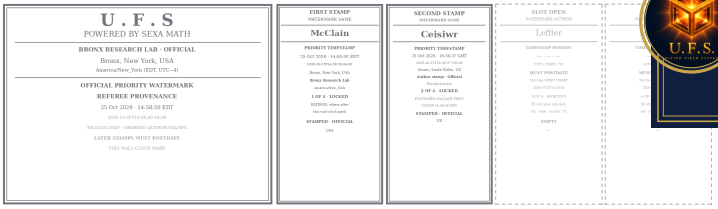
Definition 7.3 (Verdicts and stages)**.** $\mathsf{Verdict} = \{\mathsf{admit}\} \cup \{\mathsf{kill}(k) : k \in \mathbb{N}\}$. *The stage function* $\mathrm{st} : \mathsf{Glyph}^* \times \mathsf{Glyph}^* \times \mathbb{N} \to \mathsf{Verdict}$ *is defined by recursion on its first two arguments:*

$$\mathrm{st}([\,],[\,],r) = \mathsf{admit}, \qquad \mathrm{st}([\,],t{::}ts,r) = \mathsf{kill}(r),$$

$$\mathrm{st}(g{::}gs,[\,],r) = \mathsf{kill}(r), \quad \mathrm{st}(g{::}gs,t{::}ts,r) = \begin{cases} \mathrm{st}(gs,ts,r+1) & t = g, \\ \mathsf{kill}(r) & t \neq g. \end{cases}$$

Definition 7.4 (Check, first failure, judgement)**.** $\mathrm{check}(p) = \mathrm{st}(\mathit{spine}, p, 1)$*. If* $\mathrm{check}(p) = \mathsf{kill}(k)$ *then* $k_{\text{fail}}(p) := k$ *is the first failing stage (stage* $r \leq 6$*: token* r *is not the* r*-th spine glyph or is missing; stage 7: a trailing token). We write* $\vdash p\ \mathsf{ok}$ *iff* $\mathrm{check}(p) = \mathsf{admit}$.

Since st is structurally recursive on finite lists over a finite alphabet with decidable equality, $\vdash p\ \mathsf{ok}$ is decidable, and check is total.



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7.4. Theorems and proofs

Lemma 7.5 (Spine admitted)**.** $\vdash$ *spine* ok.

Proof. Six applications of the matching clause ($t = g$ each time) reduce $\mathrm{st}(\mathit{spine}, \mathit{spine}, 1)$ to $\mathrm{st}([\,], [\,], 7) = \mathsf{admit}$. □

Theorem 7.6 (Soundness, `stages_sound`)**.** *For all* $s, p \in \mathsf{Glyph}^*$ *and* $r \in \mathbb{N}$*:* $\mathrm{st}(s, p, r) = \mathsf{admit} \Rightarrow p = s$.

Proof. Induction on s, generalizing p and r. *Base* $s = [\,]$. If $p = [\,]$ then $p = s$. If $p = t::ts$ then $\mathrm{st}([\,], p, r) = \mathsf{kill}(r) \neq \mathsf{admit}$, contradiction. *Step* $s = g::gs$, with hypothesis IH: $\forall p', r'$, $\mathrm{st}(gs, p', r') = \mathsf{admit} \Rightarrow p' = gs$. If $p = [\,]$, $\mathrm{st}(s, [\,], r) = \mathsf{kill}(r)$, contradiction. If $p = t::ts$, split on $t = g$. If $t \neq g$, the value is $\mathsf{kill}(r)$, contradiction. If $t = g$, the value is $\mathrm{st}(gs, ts, r + 1) = \mathsf{admit}$, so IH gives $ts = gs$, hence $p = g::gs = s$. □

Theorem 7.7 (Characterization, `check_iff`)**.** *For every program* p*:* $\vdash p\ \mathsf{ok} \iff p = \mathit{spine}$.

Proof. ($\Rightarrow$) Theorem 7.6 with $s = \mathit{spine}$, $r = 1$. ($\Leftarrow$) Substitute $p = \mathit{spine}$ and apply Lemma 7.5. □

Theorem 7.8 (Decidable minimality, `proper_sublists_rejected`, `exactly_one_subset_admitted`)**.** *Let* $\mathrm{subs}(\mathit{spine})$ *be the* $2^6 = 64$ *order-preserving sublists of the spine. Every* $p \in \mathrm{subs}(\mathit{spine})$ *with* $p \neq \mathit{spine}$ *is rejected, and exactly one of the 64 is admitted.*

Proof. $|\mathrm{subs}(xs)|$ doubles with each element ($\mathrm{subs}(x::xs) = \mathrm{subs}(xs) +\!\!+ \mathrm{map}(x::\cdot, \mathrm{subs}(xs))$), giving 64. If a proper sublist p were admitted, Theorem 7.7 would give $p = \mathit{spine}$, contradiction. The spine itself is in $\mathrm{subs}(\mathit{spine})$ and is admitted (Lemma 7.5), so exactly one is admitted; Lean also confirms the count by evaluation. □

This is minimality in its decidable form. In [29] minimality is Axiom V (cited by Lemma 4.7); only the checked statement above is claimed.

Corollary 7.9 (First-failure reports)**.** *(a)* $\mathrm{check}(\mathrm{rev}(\mathit{spine})) = \mathsf{kill}(1)$. *(b)* $\mathrm{check}([\mathrm{Orr}, \mathrm{Ka}, \mathrm{Sa}, \mathrm{Mu}, \mathrm{Wa}]) = \mathsf{kill}(2)$. *(c)* $\mathrm{check}(\mathit{spine} +\!\!+ [\mathrm{Orr}]) = \mathsf{kill}(7)$.

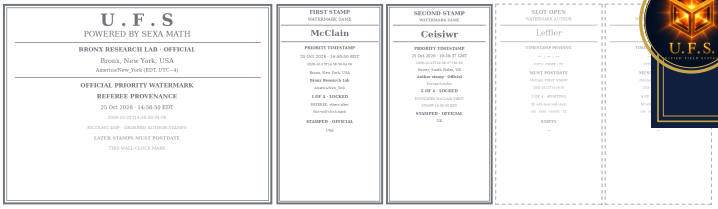
Proof. (a) The first token is Wa $\neq$ Orr, so the mismatch clause fires at $r = 1$. (b) Orr matches at stage 1; at stage 2 the token is Ka $\neq$ Na. (c) Six matches reduce to $\mathrm{st}([\,], [\mathrm{Orr}], 7) = \mathsf{kill}(7)$. □

Theorem 7.10 (Five-equation typing, `admitted_types_all`, `each_glyph_necessary`)**.** *Say an object* $o \in \{E_1, \ldots, E_5, \mathit{binder}\}$ *is typed by* p *if every component it needs is* $\mathrm{comp}(g)$ *for some* $g \in p$*. (i) If* $\vdash p\ \mathsf{ok}$*, every object is typed by* p*. (ii) For each glyph* g*, some object is untyped by spine* $\setminus \{g\}$.

Proof. (i) By Theorem 7.7, $p = \mathit{spine}$, and comp is a bijection onto the six components, so all are supplied. (ii) Since comp is injective, removing g removes exactly $\mathrm{comp}(g)$. Every component is needed by some object: total and integral by the binder, condensed by E_1, stress, power and cadence by E_4. That object is untyped. □

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Lean statements (from `lean/GammaSpine.lean`, ASCII-transliterated).

```
def check (p : List Glyph) : Verdict := stages spine p 1
theorem stages_sound :
  forall (s p : List Glyph) (r : Nat), stages s p r = .admit -> p = s
theorem check_iff (p : List Glyph) : check p = .admit <-> p = spine
```

Mechanization status (re-checked 25 Oct 2026). `lake build` succeeds under Lean 4.34.1; `lean/Audit.lean` reports that each theorem above depends on at most `propext` (`exactly_one_subset_admitted` and `each_glyph_necessary` on no axioms). The independent checker `python/spine_check.py` passes 7/7 tests, including exhaustive agreement with Lean `check` on all 335,923 token lists of length ≤ 7. `lean/Candidate2880.lean` checks $R \circ F = \mathrm{id}$ on an explicit $4 \times 720 = 2880$ address space; it is a finite *candidate witness* consistent with Remark 7.1, not $\mathcal{M}_{2880}$. Assumption 1 is not mechanized. *Revision 8 independent re-run (25 Oct 2026):* `lake build` succeeded (Lake 5.0.0, Lean 4.34.1 pinned by `lean-toolchain`); `#print axioms` gives `[propext]` or no axioms for all eight audited theorems; a scan finds no `sorry`, no `axiom` declarations and no `native_decide`; the Python unit tests pass 7/7. Logs and SHA-256 hashes: `audit/logs/`, `audit/MANIFEST.sha256`. Status: COMPUTATION_VERIFIED (and PROVED for the token-level theorems).

7.5. Map to RICOLMC-DDF

- **(C1) executable.** $\vdash p$ ok is total and decidable with a certified implementation. This is termination of the *token checker*; it does not imply (C1), which concerns halting of an SREF evaluation on configurations. Bridge B1 (token programs to executable SREF evaluation) is OPEN for $\mathcal{M}_{2880}$; it is closed only on the model domain D_0 (Theorem 8.7), where it is proved directly, not derived from the checker.

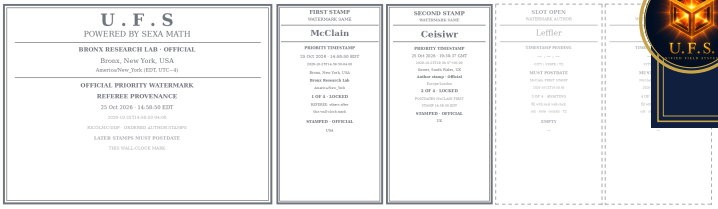
- **(C2) admissible under reduction.** Theorem 7.8 says no proper subchain of tokens is admitted. That is a statement about token lists, not about a reduction map; it does not imply (C2). Bridge B2 (proper-subchain rejection to $R \circ \Gamma_{2880} = \Gamma_5 \circ R$) is OPEN (O21); (C2) is proved only on D_0.

- **(C3) reconstructable.** Typed round trip (1); PROVED on the finite candidate and on D_0, CONDITIONAL (Assumption 1) on $\mathcal{M}_{2880}$, and FAILED as a continuous construction on a full-dimensional set (Proposition 8.13).

- **(C4) sector-resolved.** Theorem 7.10 ties each glyph token to one energy component; that is a typing fact, not a decomposition of an evaluated value. Bridge B4 is OPEN for $\mathcal{M}_{2880}$ (cross terms of URMD §3.4); (C4) is proved on D_0 including its cross term.

- **Hologram criterion.** A reconstructable projection exists on finite admissible sets; the general claim inherits Remark 7.1.

(R20) Decidable, mechanized Γ-spine judgement. Theorems 7.6–7.10, proved here and in Lean 4 with axioms $\subseteq$ {`propext`}, cross-checked by an independent checker, with an explicit proved versus postulated boundary.



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7.6. Why a proof artifact outranks executable code

Binary executables and prototype scripts show that the stack *runs* on tried inputs. That is evidence by example only. This draft eradicates the habit of treating binary code as a certificate of the gate. Theorem 7.7 quantifies over *all* programs; Corollary 7.9 proves which stage fails rather than observing it; the round trip (1) is *typed*, so ill-typed readings are excluded before any code runs. The withdrawn IJPLA listing is the cautionary case: it executed, yet returned a literal width and admitted all 720 orders. The ordering of evidence in RICOLMC-DDF is: (1) kernel-checked proof (this section); (2) an independent checker exhaustively agreeing with it; (3) prototypes and live-witness logs, which illustrate the gate on data but certify nothing beyond the runs shown. The finance section is retained as an application, subordinate to this pillar.

7.7. Why this raises the bar over the UFT nine criteria

The nine classical criteria (Section 6.6) are judged in prose. Here Mathematical Consistency becomes a kernel-checked proof, Clarity and Reproducibility become a rerunnable build, and Parameter Economy becomes decidable minimality (1 of 64). This is the mathematical sense in which the gate surpasses a prose PASS, and is offered in support of the retained mathematical framing relative to Einstein (Definition 6.1), status CONDITIONAL, with no claim about Einstein's field equations. Gravity stays deferred (score 6.75/19).

7.8. Open items

OPEN O42. Concrete predicates γ_r on configurations with machine-checked independence (the mechanization acts on glyph tokens). Narrowed by Revision 8: explicit operators with machine-checked fixed set and noncommutativity exist on the model X_0 (Section 8); OPEN for physical configurations.

OPEN O43. Constructive or explicitly axiomatized $\mathcal{F}_\Gamma, \mathcal{R}$ in Lean with $\mathcal{A}_\Gamma$ restricted per Remark 7.1; reconcile with Six-Into-Five (Section 10.1, O37).

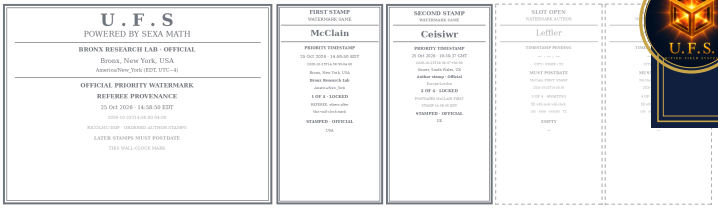
OPEN O44. Relate Candidate2880 to the postulated $\mathcal{M}_{2880}$, or keep it as a toy witness.

8. Explicit operators and one declared model domain D_0 (Revision 8, P01 to P06)

Status of this section. Everything below is a **model instance**: a finite, explicitly typed configuration space on which the six operators are actual maps. It is not the physical plate of JAM 9887, not $\mathcal{M}_{2880}$ as a manifold, and not a glyph-to-SREF-arm map (O12 stays OPEN). It answers audit findings F02, F04, F05 and obligations P01 to P06 for one declared domain only. Every statement tagged PROVED is checked by the Lean 4 file `audit/lean_model/GammaModel.lean` (Lean 4.34.1, `lake build` succeeds, no `sorry`, axioms $\subseteq$ {`propext`, `Quot.sound`}) and re-executed by `audit/model_gamma.py`.

8.1. Configuration space and the six operators (P01, F04)

Definition 8.1 (Model configuration space)**.** $X_0 = \mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$, *the triality carrier of Section 14, with elements* $\xi = (a, b, c)$ *read as (density index h, dimension index d, field/cadence index l).* $|X_0| = 96$. *Integers* a, b, c *are taken as representatives in* $\{0, \ldots, 3\}$, $\{0, 1, 2\}$, $\{0, \ldots, 7\}$.



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Definition 8.2 (Model sector densities and model SREF)**.** *With unit density* $\rho_0 = 1\ \mathrm{J\,m^{-3}}$ *and cell volume* $V = 1\ \mathrm{m}^3$,

$$\rho_D = (a+1)\rho_0, \quad \rho_{\mathrm{Dim}} = (b+1)\rho_0, \quad \rho_F = (c+1)\rho_0, \quad \rho_{D\times F} = ac\,\rho_0,$$

$$E_0(\xi) = V\big(\rho_D + \rho_{\mathrm{Dim}} + \rho_F + \rho_{D\times F}\big)\ [\mathrm{J}].$$

The cadence factor is taken at $n = 0$*, where* $60^n = 1$ *(Fix F1); no suppression is used.*

Definition 8.3 (Six typed operators $X_0 \to X_0$)**.**

$$\begin{aligned}
\mathsf{Wa}(a,b,c) &= (a,\ b,\ 2\lfloor c/2\rfloor) && \textit{cadence: } l \textit{ made even},\\
\mathsf{Mu}(a,b,c) &= (a,\ a \bmod 3,\ c) && \textit{power: } d \textit{ slaved to } h,\\
\mathsf{Sa}(a,b,c) &= (a,\ b,\ (c \bmod 4) + 4(a \bmod 2)) && \textit{stress: high bit of } l \textit{ equals parity of } h,\\
\mathsf{Ka}(a,b,c) &= (\min(a,2),\ b,\ c) && \textit{condense: } h \le 2,\\
\mathsf{Na}(a,b,c) &= (a,\ b,\ 4\lfloor c/4\rfloor + 2[b \neq 0] + (c \bmod 2)) && \textit{integral: bit 1 of } l \textit{ equals } [d \neq 0],\\
\mathsf{Orr}(\xi) &= \begin{cases} \xi & E_0(\xi) \le 16\ \mathrm{J} \\ (0,0,0) & \textit{otherwise} \end{cases} && \textit{total: energy budget cap.}
\end{aligned}$$

Composition order (Wa applied first): $\Gamma_0 = \mathsf{Orr} \circ \mathsf{Na} \circ \mathsf{Ka} \circ \mathsf{Sa} \circ \mathsf{Mu} \circ \mathsf{Wa} : X_0 \to X_0$.

Each of the first five operators is an idempotent retraction onto a constraint set; Orr is a budget gate that sends over-budget states to the ground state. All six are total functions with domain and codomain X_0.

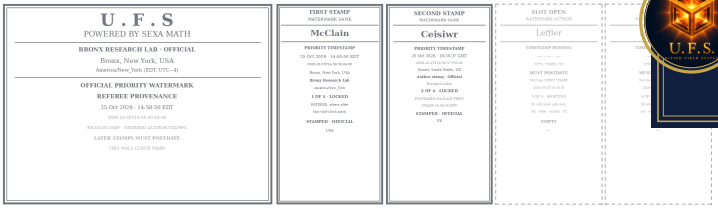
Proposition 8.4 (Noncommutativity; PROVED)**.** $\mathsf{Ka} \circ \mathsf{Sa} \neq \mathsf{Sa} \circ \mathsf{Ka}$*: at* $\xi = (3,0,0)$, $\mathsf{Ka}(\mathsf{Sa}(\xi)) = (2,0,4)$ *while* $\mathsf{Sa}(\mathsf{Ka}(\xi)) = (2,0,0)$*. Exhaustive evaluation shows exactly eight of the fifteen operator pairs fail to commute (Mu/Na, Mu/Orr, Ka/Mu, Ka/Sa, Ka/Orr, Na/Orr, Orr/Wa, Orr/Sa), and the 720 orderings of the six operators yield 51 distinct composite maps. Order therefore matters for* Γ_0.

Proof. Direct computation: $\mathsf{Sa}(3,0,0) = (3,0,0{+}4\cdot 1) = (3,0,4)$, then Ka gives $(2,0,4)$; $\mathsf{Ka}(3,0,0) = (2,0,0)$, then Sa gives $(2,0,0{+}4\cdot 0) = (2,0,0)$. The pair and ordering counts are exhaustive evaluation (COMPUTATION_VERIFIED); the witness is Lean `noncomm_Sa_Ka`. □

8.2. Nontrivial admissibility (P02)

Theorem 8.5 (Fix(Γ_0); PROVED)**.** $\mathrm{Fix}(\Gamma_0) = \{(0,0,0),\ (2,2,2)\}$*. In particular* $\mathrm{Fix}(\Gamma_0)$ *is non-empty and contains a non-ground configuration. Moreover* Γ_0 *is idempotent, so* $\mathrm{Fix}(\Gamma_0) = \Gamma_0(X_0)$.

Proof. Inclusion $\supseteq$. For $\xi = (2,2,2)$: $c = 2$ is even (Wa fixes); $b = 2 = 2 \bmod 3$ (Mu fixes); $c \bmod 4 + 4(a \bmod 2) = 2$ (Sa fixes); $a = 2 \le 2$ (Ka fixes); $4\lfloor 2/4\rfloor + 2[2 \neq 0] + 0 = 2$ (Na fixes); $E_0 = 3+3+3+4 = 13 \le 16$ (Orr fixes). The ground state is checked the same way ($E_0 = 3$). *Inclusion* $\subseteq$. Suppose $\Gamma_0(\xi) = \xi$. If Orr fired, $\xi = (0,0,0)$. Otherwise ξ lies in the image of $\mathsf{Na} \circ \mathsf{Ka} \circ \mathsf{Sa} \circ \mathsf{Mu} \circ \mathsf{Wa}$. Exhaustive evaluation of all 96 states (Lean `fix_characterization`, kernel-checked by `decide`) shows that the only states with $\Gamma_0(\xi) = \xi$ are the two listed; idempotence is Lean `idempotent`. □



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Worked admitted configuration (all six operator equations). $\Xi_{\text{admit}} = (2, 2, 2)$:

$$\mathsf{WaΞ} = (2, 2, 2),\ \mathsf{MuWaΞ} = (2, 2, 2),\ \mathsf{Sa}(\cdot) = (2, 2, 2),$$

$$\mathsf{Ka}(\cdot) = (2, 2, 2),\ \mathsf{Na}(\cdot) = (2, 2, 2),\ \mathsf{Orr}(\cdot) = (2, 2, 2) = \Xi.$$

Sector values: $\rho_D = \rho_{\text{Dim}} = \rho_F = 3\rho_0$, $\rho_{D\times F} = 4\rho_0$, $E_0(\Xi_{\text{admit}}) = 13$ J.

Worked rejected configurations. $\Xi_{\text{rej}} = (1, 1, 6)$ satisfies the five retraction constraints (Wa, Mu, Sa, Ka, Na each fix it) but $E_0 = 2 + 2 + 7 + 6 = 17 > 16$, so Orr sends it to $(0, 0, 0) \neq \Xi_{\text{rej}}$: first failure at Orr. A second example, $(3, 0, 5)$, runs $\mathsf{Wa} \mapsto (3, 0, 4)$, $\mathsf{Mu} \mapsto (3, 0, 4)$, $\mathsf{Sa} \mapsto (3, 0, 4)$, $\mathsf{Ka} \mapsto (2, 0, 4)$, $\mathsf{Na} \mapsto (2, 0, 4)$, $\mathsf{Orr} \mapsto (0, 0, 0)$ because $E_0(2, 0, 4) = 3 + 1 + 5 + 8 = 17 > 16$; it is rejected.

Effect on OPEN O1. O1 is **closed for the model instance** D_0 (explicit maps, non-empty non-trivial fixed set). O1 **remains OPEN for the physical plate** of JAM 9887: no physically known configuration is shown to lie in a fixed set, and the model operators are not claimed to be the physical glyph maps.

8.3. The declared domain D_0 and clauses (C1) to (C4) (P03 to P06)

Definition 8.6 (2880-address layer and five-coordinate layer (finite address space, not a manifold))**.** $X_{2880} = X_0 \times \mathbb{Z}_{30}$ *(so* $|X_{2880}| = 96 \cdot 30 = 2880$*), with* $\Gamma_{2880}(\xi, k) = (\Gamma_0\xi, k)$*; the label* k *is passive.* $X_5 = \mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8 \times \mathbb{Z}_5 \times \mathbb{Z}_6$ *(five coordinates,* $4 \cdot 3 \cdot 8 \cdot 5 \cdot 6 = 2880$*), with* $\Gamma_5(\xi, u, v) = (\Gamma_0\xi, u, v)$*. The fold and reconstruction are*

$$F_5(\xi, k) = (\xi,\ k \bmod 5,\ k \bmod 6), \qquad R_5(\xi, u, v) = (\xi,\ (6u + 25v) \bmod 30).$$

The declared domain is $D_0 = X_{2880}$ *with encoding* $e_0 = \mathrm{id}$*, so* $e_0(x) \in \mathcal{A}_\Gamma$ *iff* $x \in \mathrm{Fix}(\Gamma_{2880})$*;* $|\mathrm{Fix}(\Gamma_{2880})| = 2 \cdot 30 = 60$*.*

Labeling. Here "2880" counts *elements* of a finite address space ($|X_{2880}| = 2880$), and "five" counts finite residue coordinates of X_5, not continuous dimensions. Neither X_{2880} nor X_5 carries a topology or smooth structure, and nothing in this section is a statement about the 2,880-dimensional manifold $\mathcal{M}_{2880}$.

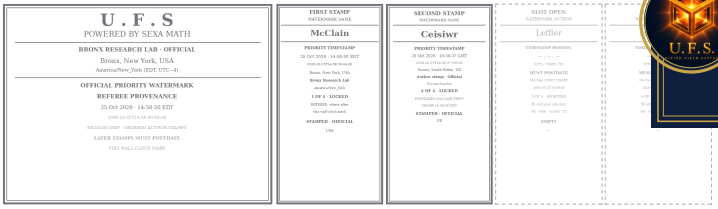
The coincidence $|\mathrm{Fix}(\Gamma_{2880})| = 60$ is arithmetic (2×30) and is not offered as evidence for Σ_{60}.

Theorem 8.7 (RICOLMC-DDF completeness of the finite model domain D_0; PROVED for the declared finite address-space instance D_0 only)**.** *With* $R = F_5$ *in the role of the reduction map of Definition 6.1, the stack* $(X_{2880}, \Gamma_{2880}, F_5, R_5, E_0)$ *is RICOLMC-DDF complete for* $\mathcal{D} = \{D_0\}$*:*

(C1) E_0 *is a finite sum of four integer multiples of* $\rho_0 V$*; it halts on every admissible input and returns a value in joules (units:* $\mathrm{J\,m^{-3}} \times \mathrm{m^3}$*). Convergence is trivial (finite sum;* $60^0 = 1$*).*

(C2) $F_5 \circ \Gamma_{2880} = \Gamma_5 \circ F_5$ *on all of* X_{2880}*, hence* $\Gamma_{2880}(y) = y \Rightarrow \Gamma_5(F_5 y) = F_5 y$ *(Lean* `C2_commute`*,* `C2_admissible`*).*

(C3) $R_5 \circ F_5 = \mathrm{id}_{X_{2880}}$ *(Lean* `C3_R_F_id`*);* R_5 *is the closed-form Chinese Remainder inverse (*$6 \equiv 1 \pmod 5$*,* $6 \equiv 0 \pmod 6$*;* $25 \equiv 0 \pmod 5$*,* $25 \equiv 1 \pmod 6$*), uses only the five coordinates of its argument, and retains no copy of the source, no cache and no lookup of the target.*



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(C4) $E_0 = V(\rho_D + \rho_{\mathrm{Dim}} + \rho_F + \rho_{D\times F})$ *exactly, each term carrying a density, a dimension index (D, Dim, F, or the mixed index* $D \times F$*) and a field label; the cross term is not dropped but declared as its own mixed sector.*

Proof. (C1) by Definition 8.2. (C2) both sides equal $(\Gamma_0\xi, k \bmod 5, k \bmod 6)$ because the label coordinates are untouched by Γ_0; the admissibility statement follows by rewriting. (C3) for $k \in \mathbb{Z}_{30}$, $(6(k \bmod 5) + 25(k \bmod 6)) \bmod 30$ is congruent to k modulo 5 and modulo 6, hence equal to k by CRT; Lean `crt_left` checks all 30 cases. (C4) by Definition 8.2; the decomposition is an identity, verified on all 60 admissible addresses by `audit/model_gamma.py`. □

Remark 8.8 (What this instance does and does not show)**.** *It shows that Definition 6.1 is* satisfiable *by a nontrivial, fully explicit stack with a non-ground admissible state, an energy evaluation in joules, a commuting reduction, source-free reconstruction, and a sector decomposition that includes a cross term. It does* not *show completeness for physics, finance, or any domain other than* D_0*;* D_0 *is constructed, not discovered. (C2) holds because the reduction is a product map that leaves the gated coordinates intact; this is a design choice of the model, not a derivation of O21 for* $\mathcal{M}_{2880}$*. Claims of universality, and the Book IX §9.5.6 theorem in its general form, remain CONDITIONAL. Theorem 8.7 proves (C1)–(C4) only for the declared finite model domain; it is not a manifold completeness theorem.*

8.4. Proof-strengthening notes on the finite instance

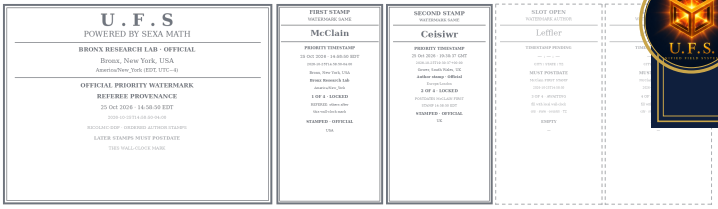
Remark 8.9 (Exact reconstruction versus compression)**.** $F_5(a, b, c, k) = (a, b, c, k \bmod 5, k \bmod 6)$ *preserves cardinality and has inverse* $k = (6u + 25v) \bmod 30$*. Its five entries are finite residues, not five continuous dimensions, so (C3) on* D_0 *is a* finite representation theorem *(a CRT bijection), not a dimensional compression. The obstruction to continuous* $2880 \to 5 \to 2880$ *reconstruction (Proposition 8.13) stands, and that construction stays FAILED.*

Remark 8.10 (Acceptance rate is model-specific)**.** *Exhaustive enumeration gives 2 fixed points in 96 states and 60 in the 2,880-element address space. This shows the gate is non-empty and nontrivial; the acceptance rate is a property of the chosen finite functions and the 16 J budget threshold, not an empirical validation of the physical glyph semantics.*

Remark 8.11 (Model energy is model-specific)**.** $E_0 = V\rho_0[\,\cdot\,]$ *with integer sector values,* $V = 1\ \mathrm{m}^3$ *and* $\rho_0 = 1\ \mathrm{J\,m}^{-3}$*, is a definition chosen for the model; the (C4) sum identity holds by construction. (C1) and (C4) on* D_0 *do not establish convergence or numerical evaluation of the general 2880D SREF integral (L9 and L14 unchanged).*

Remark 8.12 (C2 is structural on this model)**.** Γ_{2880} *and* Γ_5 *act identically on the first three coordinates and leave residue coordinates unchanged, so the commuting square is structurally guaranteed. This is a valid finite theorem; it does not establish the independent higher-dimensional physical reduction required by O21.*

Next theorem family (OPEN, O46). The recommended next step is a restricted-family generalization: a family Y_n of admitted configuration spaces with explicit cardinalities, operators Γ_n, reductions F_n, inverses R_n and sector evaluations E_n, with (C1)–(C4) proved uniformly in n without defining the operators solely to force a desired fixed-point set, together with the admissible input class and the



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complexity of deciding membership. If a manifold reading is intended, topology, continuity, smoothness and the dimension of the admissible subset must be specified separately, and any lossless reduction must respect the dimension bounds. This is OPEN obligation O46; it is not claimed here.

8.5. Fold and reconstruction: formal obstruction analysis (P05, F05, F11)

Proposition 8.13 (Obstructions; PROVED)**.** *(i)* Topological. *There is no continuous injective map from any non-empty open subset of $\mathbb{R}^{2880}$ into $\mathbb{R}^5$ (Brouwer invariance of domain applied to the composite with the inclusion $\mathbb{R}^5 \hookrightarrow \mathbb{R}^{2880}$, whose image has empty interior). (ii)* Linear. *A linear $F : \mathbb{R}^{2880} \to \mathbb{R}^5$ has* $\dim\ker F \geq 2875$*, so no linear left inverse exists on any set spanning more than five dimensions. (iii)* Information. *If configurations are drawn from a finite set S and the five operational coordinates take values in finite alphabets $A_1, \ldots, A_5$, exact source-free reconstruction requires $|S| \leq \prod_i |A_i|$ (pigeonhole); for a continuum S with five real coordinates, injectivity is possible only by non-continuous (for example digit-interleaving) maps, which are discontinuous everywhere useful and destroy any manifold structure on the image.*

Proof. (i) If $F : U \to \mathbb{R}^5$ were continuous and injective, $\iota \circ F : U \to \mathbb{R}^{2880}$ would be continuous and injective, hence open by invariance of domain, but its image lies in $\mathbb{R}^5 \times \{0\}$, which has empty interior. (ii) Rank–nullity. (iii) An injective map from S into $\prod_i A_i$ requires $|S| \leq \prod_i |A_i|$. □

Consequence (F11 reconciliation). Source-independent 2880D → 5D → 2880D reconstruction of a full-dimensional continuum $\mathcal{A}_\Gamma$ is **FAILED** as a continuous construction (Proposition 8.13(i),(ii)). It is **PROVED** on the discrete model D_0 (Theorem 8.7(C3)), where $|X_{2880}| = 2880 = \prod |A_i|$ meets the pigeonhole bound with equality, and on the finite `Candidate2880` address space. For the postulated $\mathcal{M}_{2880}$ it remains **CONDITIONAL** on Assumption 1 with $\mathcal{A}_\Gamma$ finite or of dimension at most five (Remark 7.1). The Six-Into-Five principle and Fold Logic Axiom IV are cited extracts under that assumption, not theorem-grade results of this draft.

9. Six-to-seven octonionic generation and the Γ-octonion obstruction

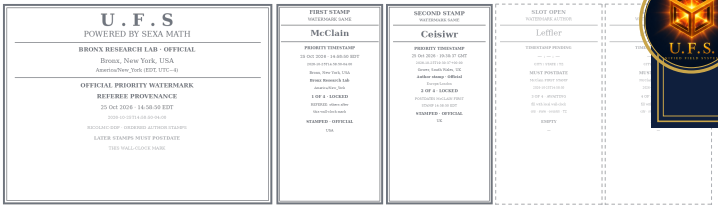
Status of this section. This section folds in the independent supplement *RICOLMC-DDF Gamma6 Octonion7 Triality* (handoff RICOLMC-DDF-GAMMA6-OCTONION7-TRIALITY-v1). It contains two propositions that are kept strictly separate: an algebraic generation result about the octonions (PROVED), and a proposed correspondence between the six Γ operators of D_0 and six imaginary octonion units (FAILED, with a proved obstruction). Nothing here alters Section 8, the finite (C1)–(C4) result for D_0, Σ_{60}, or the claim ledger outside rows L31 to L34. The algebraic generation of e_7 is not a physical dimension, not a seventh Γ operator, and not an emergent field.

9.1. Convention

Let $\mathbb{O} = \mathbb{R} \oplus \mathrm{span}_{\mathbb{R}}\{e_1, \ldots, e_7\}$ with $e_i^2 = -1$, $e_i e_j = -e_j e_i$ $(i \neq j)$, and oriented Fano triples

$$(123),\ (145),\ (176),\ (246),\ (257),\ (347),\ (365),$$

meaning $e_a e_b = e_c$ and cyclic permutations for each triple (abc). In particular $e_1 e_6 = -e_7$, $e_2 e_5 = e_7$, $e_3 e_4 = e_7$. This table is checked bit-exactly against an independent Cayley–Dickson doubling $\mathbb{R} \to \mathbb{C} \to \mathbb{H} \to \mathbb{O}$ in exact integer arithmetic (dual verification H10). Anticommutation, $e_i^2 = -1$, alternativity,



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the Moufang identities and norm multiplicativity $N(xy) = N(x)N(y)$ are verified symbolically over $\mathbb{Z}$; nonassociativity holds for 168 of the 210 ordered triples of distinct imaginary units.

9.2. Proposition 1: six-to-seven generation (PROVED)

Theorem 9.1 (Six-to-Seven Generation)**.** *Let $S \subseteq \{e_1, \ldots, e_7\}$. The real subalgebra generated by S is all of $\mathbb{O}$ if and only if S is not contained in a single Fano line (together with 1). In particular any six imaginary basis units generate $\mathbb{O}$, and the missing unit is recovered, up to sign, as the product of any pair of the six lying on a Fano line with it; for $\{e_1, \ldots, e_6\}$: $e_7 = -e_1e_6 = e_2e_5 = e_3e_4$. The recovered direction is unique up to sign; the sign depends on the orientation convention.*

Proof sketch. Two units on a line generate the quaternion subalgebra of that line. If S contains a unit e_k off the line ℓ spanned by $e_i, e_j \in S$, then products of e_k with the three units of ℓ yield the remaining four units, since every point of the Fano plane lies on a line through e_k and a point of ℓ. Hence S generates all seven units. Conversely a subset of one line generates at most $\mathbb{H}$. Six units are never contained in a three-point line. Mechanized in Lean 4 (tags `A_*`, `B_*`, no `sorry`) and checked exhaustively in Python on all 2^7 subsets. □

9.3. Candidate map and Proposition 2 (FAILED)

The **candidate** map is

$$M : \mathsf{Orr} \mapsto e_1,\ \mathsf{Na} \mapsto e_2,\ \mathsf{Ka} \mapsto e_3,\ \mathsf{Sa} \mapsto e_4,\ \mathsf{Mu} \mapsto e_5,\ \mathsf{Wa} \mapsto e_6.$$

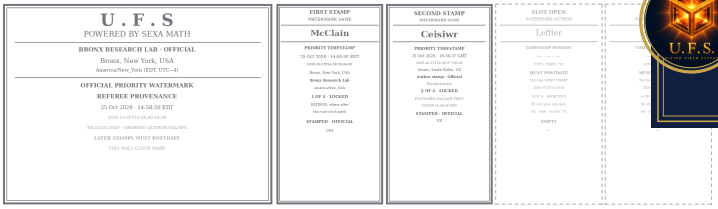
It is a candidate only. In D_0 the glyphs are functions $X_0 \to X_0$ (Section 8); composition is associative, octonion multiplication is not. Three realization types were tested: T1 (glyphs as octonion elements), T2 (as left or right multiplications L_x, R_x or derivations in $\mathfrak{g}_2 = \mathrm{der}(\mathbb{O})$), and T3 (as elements of a group or loop, including Spin(8), G_2 and the unit Moufang loop).

Theorem 9.2 (Associator obstruction; PROVED)**.** *There is no map φ with $\varphi(f \circ g) = \varphi(f)\varphi(g)$ on the Γ monoid and $\varphi(\mathsf{Orr}) = e_1$, $\varphi(\mathsf{Na}) = e_2$, $\varphi(\mathsf{Sa}) = e_4$.*

Proof. Associativity of composition gives $\varphi((\mathsf{Orr} \circ \mathsf{Na}) \circ \mathsf{Sa}) = \varphi(\mathsf{Orr} \circ (\mathsf{Na} \circ \mathsf{Sa}))$, so $(e_1e_2)e_4 = e_1(e_2e_4)$. But $(e_1e_2)e_4 = e_3e_4 = e_7$ while $e_1(e_2e_4) = e_1e_6 = -e_7$. Contradiction (Lean `D6`). □

Theorem 9.3 (Idempotent obstruction; PROVED)**.** *Every Γ operator of D_0 is a non-identity idempotent. (a) Under T1, $\varphi(f)^2 = \varphi(f)$ forces $\varphi(f) \in \{0, 1\}$, incompatible with $e_i^2 = -1$. (b) Under T2, $L_x^2 = L_{x^2}$ forces $x \in \{0, 1\}$; an idempotent derivation is skew with imaginary spectrum, hence 0. (c) Under T3, an idempotent in a group or cancellative loop is the identity, so every homomorphism into* Spin(8) *or G_2 is trivial on all six generators. In each case the images commute, so $\mathsf{Ka} \circ \mathsf{Sa} \neq \mathsf{Sa} \circ \mathsf{Ka}$ cannot be preserved; and commuting pairs such as $\mathsf{Wa} \circ \mathsf{Mu} = \mathsf{Mu} \circ \mathsf{Wa}$ map under M to anticommuting units.*

Exhaustive facts used: the Γ monoid on X_0 has 811 elements (148 idempotent); 7 of 15 glyph pairs commute; the 720 orderings give 51 distinct composites, whereas left-bracketed octonion products of $e_1, \ldots, e_6$ take only 2 values. Hence the Γ–octonionic correspondence is **FAILED** for T1 to T3. A faithful linear representation of the monoid on $\mathbb{R}^{96}$ exists trivially but is not octonionic and is not claimed as a correspondence.



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9.4. Two meanings of triality

The "triality-structured exciter geometry" of Section 14 is a finite orbit structure (32 orbits, eight 4-cycles) on $\mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$. Spin(8) triality is the order-3 outer automorphism permuting V_8, S_8^+, S_8^-. These are different objects. Clifford Cl(0, 8) gamma matrices, the $8+8$ chirality split and the isotopy $a(xy)a = (ax)(ya)$ are COMPUTATION_VERIFIED in exact arithmetic, but no Spin(8) triality intertwiner for Γ is established (Theorem 9.3(c) rules out the group-hom route), and Spin(8) triality is not mechanized in Lean (OPEN).

9.5. What this adds, and what it does not

Claim	Status
Six-to-seven generation (Theorem 9.1)	PROVED
Fano table ≡ Cayley–Dickson, bit-exact	COMPUTATION_VERIFIED
Multiplicative $\Gamma \leftrightarrow$ octonion realization (T1 to T3)	FAILED (proved negative)
Spin(8) triality intertwiner for Γ	OPEN
New (C1)–(C4) instance beyond D_0	NOT_EVALUATED
e_7 as physical dimension or seventh glyph	FAILED (category error)

The section adds one algebraic theorem and one proved obstruction. It does not add a completeness instance, does not change the title, and does not bear on the physics, finance or gravity rows. Full package: `ricolmc_octonion7_2026-10-25/` (Python, Lean 4, logs, `MANIFEST.sha256`); supplement PDF SHA-256 `87b0007ad84aac405309f6f8d720e82a7ba9bbe6d78ea71d243ab56407adde29`. Remaining routes are O47 and O48 (Section 20).

10. Companion layers folded into RICOLMC-DDF (cited extracts)

Revision 8 status (F11). The results below are recorded as stated in their sources. Within this draft their fold and reconstruction content is CONDITIONAL on Assumption 1; continuous full-dimensional reconstruction is FAILED by Proposition 8.13; exact reconstruction is PROVED only on the finite model D_0 and on `Candidate2880`.

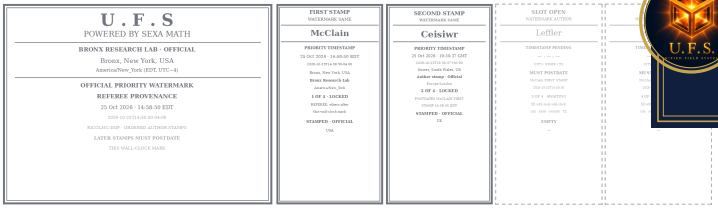
Four companion works by the same authors are folded in here as *theorem extracts with citations*, not as full text: the Γ-Subthreshold Fold Logic Theorem [29], The Last Constant [30], and the hardware-verifiable computational architecture paper (VLSIE-2026, CS & IT) [31], and the MEAP/IJMECH 2026 aerospace-mechanical digital-twin paper [32]. For each we record the definitions and named results as stated in the source, their map to Definition 6.1 clauses (C1)–(C4) and to the creation criteria (R1)–(R15), and what stays OPEN. Unless a proof is reproduced in this draft, every result below is *as stated in the cited source; proof obligations retained; this draft records the claim and its map to RICOLMC-DDF*. Nothing here is a physics confirmation, and gravity remains deferred (Green sector, score 6.75/19).

10.1. Reconstruction layer: the Γ-Subthreshold Fold Logic Theorem

Fold operator (high level). The ordered six-glyph gate $\Gamma = \bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W}$ acts on a configuration *before* dimensional realization. "Subthreshold" means the fold is applied below the threshold at which the configuration is realized on $\mathcal{M}_{2880}$: admissibility is decided first, realization second. The fold maps the complete six-operator admissibility structure to a five-dimensional operational representation.

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Axioms (as stated in [29]). I Ordered Γ-admissibility; II Recursive closure; III Information preservation; IV Unique reconstruction; V Minimality; VI Operational equivalence. Lemmas 4.1–4.7 support Theorem 5.1 (existence) and Theorem 5.2 (uniqueness); Theorem 5.5 is the source's statement of scope and failure conditions.

Six-Into-Five Principle. Complete six-operator admissibility may be compressed to a five-dimensional operational representation while preserving logical completeness, the recursive invariants, and unique reconstruction of the full 2880-dimensional hierarchy. The phrase "force six into five and recover 2880" is read here strictly as this reconstruction claim, not as arithmetic wordplay. A second result of [29] states minimality: every proper five-operator subchain of Γ loses at least one invariant (admissibility, closure, correspondence, completeness, or reconstructability).

Map to RICOLMC-DDF. The fold supplies the strongest available content for (C2) (admissible under reduction: the five-dimensional image remains admissible) and (C3) (reconstructable: Axiom IV and Theorem 5.2 give a unique inverse on the admissible set, as stated in the source; here CONDITIONAL, see Section 8.5). It is exactly the mechanism behind the hologram criterion of Section 6.6: a hologram is a reconstructable projection of an admissible state, and the fold is a named reconstructable projection. The decidable, mechanized form of the gate and of minimality, and the invariance-of-domain limit on reconstruction, are in Section 7. Minimality is consistent with the use of the full six-glyph Γ throughout this draft. It does not conflict with the proof that the collapse cascade Π_{2880} is not lossless: the fold acts on admissibility structure before realization, while Π_{2880} acts on realized sector weight.

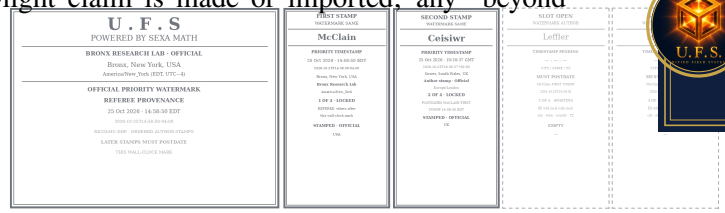
OPEN O38. The axioms and Lemmas 4.1–4.7 of [29] have not been checked line by line in this draft; in particular, an explicit five-dimensional target space and inverse map compatible with $\Gamma(\Xi) = \Xi$ must be written out before Theorem 5.2 can be cited as proved here. Reconciliation with the non-lossless cascade (fold before realization versus Π_{2880} after) is to be stated as a lemma.

10.2. Propagation and horizon layer: The Last Constant

Named results (as stated in [30]). Theorem I, Recursive Propagation Existence: recursively admissible manifold organization defines a propagation functional under the stated axioms. Theorem II, Higher-Dimensional Transport: sufficient conditions for admissible transport across the manifold without violating recursive closure. Theorem III, Computational Correspondence: propagation preserves computational traceability through dimensional reduction. Theorem IV, Dimensional Closure: recursive thinning preserves admissibility and prevents unrestricted symbolic divergence. Theorem V, Relativistic Horizon Structure: horizon behavior characterized as following from recursive transport. Theorem VI, Recursive Uniqueness: the propagation functional is unique under the admissibility constraints.

Theorem obligations retained. For this draft the propagation functional carries three obligations: existence (Theorem I), uniqueness (Theorem VI), and bounded amplification under reduction (implicit in Theorems II and IV). These are recorded, not re-proved.

Reading under Fixes F8 and F17. The propagation functional is a recursive-manifold object. $C_\Omega = \sqrt{720}$ remains a pure number, not a speed and not a replacement for c. Classical c remains the General Relativity limit object. No experimental faster-than-light claim is made or imported; any "beyond



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light" language in the source is not adopted here. Theorem V is presented as a *mathematical* horizon formalization, aligned with the Horizon threshold and facet model already proved for Ω_{2880}; it does not derive a metric, G, or the coupling 60^{-3}.

Map to RICOLMC-DDF. Theorems I, II, VI strengthen (C1) (executable, well-defined representation); Theorem IV strengthens (C2); Theorem III feeds (C4) and the computational correspondence layer below; Theorem V strengthens the Horizon criterion (R5).

OPEN O39. Reconcile the Last Constant propagation functional with the pure-number reading of C_Ω: state its domain, codomain and units so that no speed is implied, and show bounded amplification explicitly.

10.3. Verification layer: VLSIE-2026 computational correspondence

Five validation layers (as published in [31]).

1. Recursive Functional Consistency.
2. Dimensional and Unit Consistency.
3. Computational Correspondence.
4. Reduction-Recovery.
5. Explicit Falsifiability.

Map to kill-switches and the verify appendix. Layer 1 matches the executable gate checks of the verify appendix (admissibility $\Gamma(\Xi) = \Xi$ evaluated, not asserted). Layer 2 matches Fix F2 (no power added to an energy density) and open item O13 on units. Layer 3 matches the triality and orbit computations. Layer 4 is the computational form of (C2)+(C3) and the Six-Into-Five reconstruction. Layer 5 is the philosophy of kill-switches K1–K7: each layer must name an outcome that refutes it.

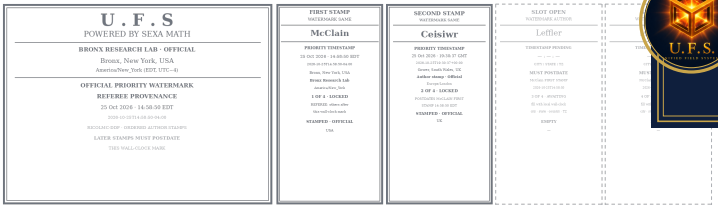
Sigmatics orbit correspondence $2880 \to 5$**.** [31] reports thirty-two recursive triality orbits in eight directional classes over four quaternionic phases, generated by rotation, twist, and mirror operators, and a harmonic excitation index. This agrees with the draft's proved 32-orbit and eight 4-cycle statements on $\mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$; where the published account goes further (the full $2880 \to 5$ reduction path, the numerical excitation index), the draft's proofs govern and the extra claims are carried *as published*. The reachability sequence remains not reproduced.

Hardware pathways. The hardware pathways of [31] (FPGA/VLSI style verification) are future engineering objectives. No silicon is claimed built.

OPEN O40. Relate VLSIE Layer 4 (reduction-recovery) to kill-switches K1–K3: state which recovery tests, if failed, trigger which switch. Reproduce the harmonic excitation index from the orbit population in the verify appendix.

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10.4. Engineering domain layer: MEAP/IJMECH 2026

Setting (as published in [32]). The same ordered six-stage Γ admissibility test is applied to a controlled mechanical digital twin with ten state variables, a nominal class and ten controlled fault classes. Parameters were calibrated on separate nominal trajectories and frozen before held-out testing. The held-out population was 410 trajectories of 3,000 states each, for 1,230,000 state evaluations.

Reported results. Classification accuracy 97.57%, balanced accuracy 97.65%, fault sensitivity 95.70%, nominal-state acceptance 99.59% (false rejection 0.41%), false-admission rate 4.30%. An independent scalar-threshold baseline gave 55.48% accuracy, 14.45% fault sensitivity and an 85.55% false-admission rate; the source reports this as an approximately 94.97% relative reduction in false admission. Eight of ten fault classes reached 100% detection; vibration inconsistency (75.60%) and progressive thermal drift (81.42%) did not. First-stage rejection counts were $\gamma_1 = 16{,}000$, $\gamma_2 = 64{,}746$, $\gamma_3 = 416{,}088$, $\gamma_4 = 116{,}059$, $\gamma_5 = 2{,}002$, $\gamma_6 = 0$; deterministic replay of an identical trajectory reproduced the binary output.

Validation boundary. The source states that the benchmark is computational, on a digital twin with synthetic fault injection, and is not physical hardware or flight validation. This draft adopts that boundary: the percentages are synthetic computational evidence, not physics confirmation and not flight readiness. The residual 4.30% false admission is a nonzero rate and is reported as such; Γ reduces false admission, it does not eliminate it.

Map to RICOLMC-DDF. MEAP runs the gate of this draft on a new declared domain (aerospace-mechanical state), so it is interdomain evidence for (C1) executable evaluation and for the completeness program, in the same sense as the finance witness. It differs from VLSIE: VLSIE supplies the verification methodology and orbit correspondence; MEAP supplies a concrete digital-twin benchmark with held-out numbers. First-failure localization is a computational form of the kill-switch philosophy (each rejection names its stage).

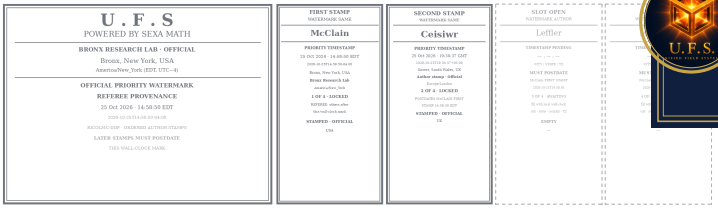
OPEN O41. MEAP honesty gaps. (a) The title promises digital-twin reconstruction and Section 4 of [32] defines a 10 → 5 compression with audit rules, but no reconstruction error or accuracy metric is reported; the source itself says the result is not evidence of universal 10D → 5D → 10D reconstruction, and so it is not evidence for the Six-Into-Five claim of Section 10.1. (b) γ_6 never fires first ($\gamma_6 = 0$), so the terminal stage is untested as a first-failure discriminator in this benchmark and its minimality role (Fold Logic) is not exercised. (c) Vibration and thermal-drift classes remain incomplete. (d) Independent physical data is required before any engineering claim beyond simulation.

10.5. Creation criteria extended

These layers add four creation criteria (R20 is in Section 7) to (R1)–(R15):

(R16) **Fold Logic / Six-Into-Five.** Named reconstructable compression of six-operator admissibility to five dimensions, carrying (C2)+(C3) [29].

(R17) **Last Constant propagation/horizon formalization.** Propagation functional with existence, uniqueness and closure obligations; mathematical horizon structure [30].



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(R18) **VLSIE five-layer computational validation.** Structured validation layers mapped to the verify appendix and K1–K7 [31].

(R19) **MEAP digital-twin Γ benchmark.** Six-stage Γ on a ten-variable mechanical digital twin, frozen parameters, 1,230,000 held-out evaluations, 4.30% versus 85.55% false admission; computational only [32].

11. JAM 9887: admissibility, the six-glyph chain, Σ_{60} and the Monster

11.1. What the published paper states

Formal Plate (published p. 23). Six glyphs are presented as "functional operators acting on the configuration space of the unified field". The published operator definitions (p. 24) are, in order:

Glyph	Name	Published definition
◯	Orr	Energy admissibility operator. Enforces the existence condition; failing configurations are excluded prior to evaluation.
∇	Na	Flow constraint operator. Governs propagation consistency and recursive compatibility across the manifold.
K	Ka	Manifold consistency operator. Keeps configurations structurally valid under dimensional embedding and projection.
σ	Sa	Symmetry and stress resolution operator. Enforces internal invariance; no admissibility under broken symmetry.
μ	Mu	Mass-memory binding operator. Enforces persistence and recursive identity under iteration.
$\mathbb{W}$	Wa	Observation operator. Registers admissible configurations as physically realizable states.

JAM 9896 (p. 49) names the same six as existence, flow or propagation, manifold consistency, symmetry or internal invariance, mass-memory or recursive persistence, and observation or realization. The plate captions read Radiant energy, Flow dynamics, Manifold logic, Symmetry and stress, Mass and memory, Conscious observation.

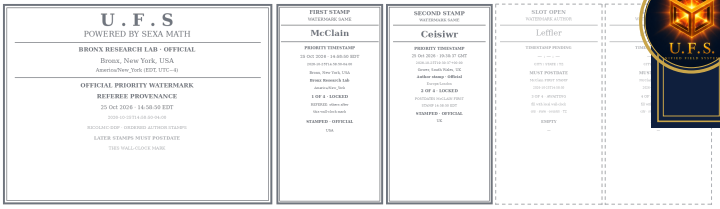
Published functional (Section 2.1). On a five-dimensional exciter manifold $\mathcal{M}_5$:

$$E^{(\Gamma)}_{\mathrm{SEXA}} = \int_{\mathcal{M}_5} (\bigcirc \triangle \mathrm{K}\,\mathrm{O}\,\mu\,\mathbb{W}) \circ \Big[\sum_{i=1}^{3} \rho_i c^2 + \sum_{j=4}^{5} \left(T_j^{00} + P_j \cdot 60^n \right) \Big] \, d\mathcal{M}_5, \tag{2}$$

with the statement that "the operator chain acts sequentially on the integrand". The Extended WHERE (Section 2.3) defines ρ_i as condensed-field mass-energy densities, c^2 as an "energy conversion factor", T_j^{00} as perpetual stress-energy components, P_j as a "perpetual-field power contribution", and 60^n as "sexagesimal recursive amplification" with n the excitation depth.

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Published admissibility structure (Sections 2.4 to 3.6).

$$\text{Admissible:} \quad \Gamma(\Xi) = \Xi; \qquad \text{inadmissible:} \quad \Gamma(\Xi) \neq \Xi. \tag{3}$$

$$\text{Recursive stability:} \quad \Gamma^n(\Xi) = \Xi \quad \forall n \in \mathbb{N}. \tag{4}$$

$$\Sigma_{60}\text{ enforcement:} \quad \Gamma \subset \Sigma_{60}. \tag{5}$$

$$\text{Monster constraint:} \quad \mathcal{O}(\Xi) \in \mathcal{A}. \tag{6}$$

Closure is "necessary but insufficient" (3.1). The kill-switch (3.5) rejects Ξ if $\Gamma(\Xi) \neq \Xi$, if $\Gamma^n(\Xi) \neq \Xi$, if $\mathcal{O}(\Xi) \notin \mathcal{A}$, or if known physical limits fail, with "no parameter tuning, reinterpretation, or extension". Section 3.6 summarizes: closure defines consistency, Γ defines admissibility, Σ_{60} defines logical enforcement, Monster symmetry defines classification.

Published reductions (Section 4). 4.2 claims GR in the "large-scale, weak-recursion regime" where $n \to 0$, $60^n \to 1$ and "higher-order recursive contributions vanish", with glyph operators commuting effectively, and concludes $\Gamma(\Xi_{\text{GR}}) = \Xi_{\text{GR}}$. 4.3 claims QFT behavior in a local, bounded regime, concluding $\Gamma(\Xi_{\text{QFT}}) = \Xi_{\text{QFT}}$. 4.4 claims Yukawa-type screening from "admissibility termination boundaries", concluding $\Gamma(\Xi_{\text{Yuk}}) = \Xi_{\text{Yuk}}$. 4.5 states "Reduction Failure → Admissibility Failure". 4.6 and 4.7 state that reduction is a consequence of admissibility and that force-specific formulations are not needed.

11.2. Errata of the published paper

E1. GR limit (Fix F1). The published 4.2 is right that $60^n \to 1$ as $n \to 0$. It does not follow that "higher-order contributions vanish":

$$\boxed{\lim_{n\to 0} P_j\, 60^n = P_j \neq 0} \tag{7}$$

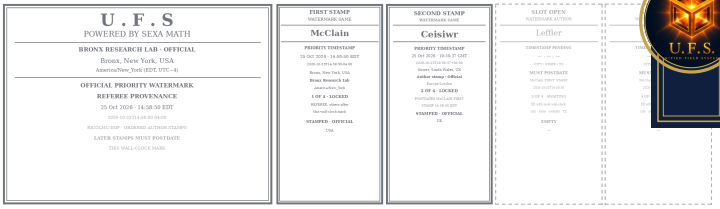
The perpetual term survives at full strength, so no GR limit is obtained by this route. The same error recurs in JAM 9896 ($|\lambda_j|^n = 60^n$, Section 12.6) and in RSBA ($\Phi_{\text{eff}} = \Phi_0 \Pi_{2880} 60^n \to \Phi_0 \Pi_{2880}$, Section 17.1).

E2. Units (Fix F2). In (2), $[\rho_i c^2] = [T_j^{00}] = \text{J m}^{-3}$ while $[P_j] = \text{W} = \text{J s}^{-1}$ and 60^n is dimensionless. A power is added to an energy density. The sum is undefined. The repair (Section 13.1) and the root equation (Section 13) both carry $P\, 60^n$ in J m^{-3}.

E3. Γ undefined (Fix F3). The operators have names but no domain, codomain or action, so $\Gamma(\Xi) = \Xi$ cannot be tested. Writing $(\Gamma) \circ$ [integrand] composes operators on configurations with a real-valued density, which is a type error.

E4. Σ_{60} undefined. "$\Gamma \subset \Sigma_{60}$" is an inclusion between undefined objects; Γ is a single map, so membership, not inclusion, is the intended relation (Assumption 4).

E5. No Monster data (Fix F9). No order, representation, character or action is given, and $\mathcal{A}$ is not listed.



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E6. Minor. Symbol drift (p_i and ρ_i; ∇, $\triangle$, ∇; σ printed as O, Fix F5); n used both for excitation depth and for iteration count (Fix F12); (4) is implied by (3) (Lemma 11.8); garbled abstract text; table-of-contents page numbers that do not match journal pages; leftover markdown headings ("## SECTION 2") on journal pages 25, 27 and 29.

11.3. Definitions

11.3.1. Admissibility and invariants. Following the dissertation usage (Book 1), we take:

Definition 11.1 (Invariant)**.** *Let $T : X \to X$ be a specified operator on a set X. A function $I : X \to Y$ is a T-invariant if $I(T(x)) = I(x)$ for every x in the domain of admissible applications of T.*

Definition 11.2 (Invariant family, separating)**.** *A family $\{I_\alpha\}$ is separating on $S \subseteq X$ if $I_\alpha(x) = I_\alpha(y)$ for all α implies $x = y$ for $x, y \in S$.*

The separating requirement matters: a non-separating family lets unrelated configurations look equivalent.

11.3.2. Configuration space.

ASSUMPTION 2 (Configuration space)**.** *A configuration $\Xi \in \mathcal{X}$ is a choice of all inputs of the root equation* (45)*:*

$$\Xi = \big(\mathrm{EX};\ g_i, \rho_i\ (i = 1, 2, 3);\ T_j^{00}, P_j\ (j = 4, 5);\ n\big), \tag{8}$$

as fields on $\mathcal{M}_{2880}$ with measure $d\mu_{\mathcal{M}_{2880}}$; the tiers 6:7 *and* 8:9 *are derived from the* 4:5 *sector (Section 13). The function space is ASSUMPTION.*

11.3.3. The operator Γ.

Formal glyph plate (JAM 9887, p. 23). The six glyphs of the published Formal Plate, in plate order, left to right:

◯	∇	K	σ	μ	$\mathbb{W}$
Orr	Na	Ka	Sa	Mu	Wa
Radiant energy	Flow dynamics	Manifold logic	Symmetry & stress	Mass & memory	Conscious observation

(The published text typesets Na as $\triangle$ and Sa as O; the plate symbols ∇ and σ are used here. Same operators.)

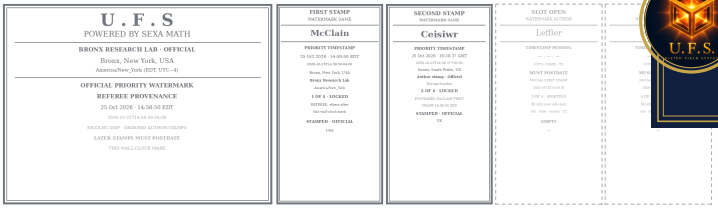
Definition 11.3 (Glyph operators and Γ)**.** *Let* Orr, Na, Ka, Sa, Mu, Wa $: \mathcal{X} \to \mathcal{X}$ *be the six glyph maps of the plate,* ◯ = Orr, ∇ = Na, K = Ka, σ = Sa, μ = Mu, $\mathbb{W}$ = Wa*. Define the ordered composition*

$$\Gamma := \bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W} = \mathrm{Orr} \circ \mathrm{Na} \circ \mathrm{Ka} \circ \mathrm{Sa} \circ \mathrm{Mu} \circ \mathrm{Wa}, \tag{9}$$

acting right to left ($\mathbb{W}$ = Wa first). In the published juxtaposed notation, $\Gamma = \bigcirc \triangle \mathrm{K}\,\mathrm{O}\,\mu\,\mathbb{W}$. A configuration Ξ is Γ-admissible *if*

$$\Gamma(\Xi) = \Xi. \tag{10}$$

Write $\mathrm{Fix}(\Gamma) = \{\Xi \in \mathcal{X} : \Gamma(\Xi) = \Xi\}$.



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Order matters: in general $\mathsf{Orr} \circ \mathsf{Na} \neq \mathsf{Na} \circ \mathsf{Orr}$, so reordering defines a different Γ. This corrects the claim in a related volume (Book 14, Thm. 4.1) that composition is order-independent.

Proposition 11.4. *If each glyph operator fixes Ξ, then $\Xi \in \mathrm{Fix}(\Gamma)$. The converse is false in general.*

Proof. Direct substitution gives the first part. For the converse take $\mathcal{X} = \mathbb{R}$, $\mathsf{Orr}(x) = x+1$, $\mathsf{Na}(x) = x-1$, others the identity: $\Gamma = \mathrm{id}$ but Orr fixes nothing. □

ASSUMPTION 3 (Minimal operator content)**.** *Each glyph acts as a constraint-enforcing map with a stated role:*

$$\mathsf{Wa}: \text{ projection onto observable configurations (finite energy, } E[\Xi] < \infty), \tag{11}$$

$$\mathsf{Mu}: \text{ mass bookkeeping, } \rho_i \mapsto \rho_i \cdot \mathbf{1}_{\rho_i \geq 0}, \tag{12}$$

$$\mathsf{Sa}: \text{ symmetry projection (Section 11.6)}, \tag{13}$$

$$\mathsf{Ka}: \text{ coordinate change } \Xi \mapsto \phi^* \Xi \text{ for a fixed chart } \phi, \tag{14}$$

$$\mathsf{Na}: \text{ conservation, projection onto } \partial_\mu T_j^{\mu 0} = 0, \tag{15}$$

$$\mathsf{Orr}: \text{ radiant energy normalization}. \tag{16}$$

These roles paraphrase the published glyph plate. The specific maps are ASSUMPTION. Whenever each map is an idempotent projection, Proposition 11.4 gives a computable sufficient test for admissibility.

OPEN O1. Specify each glyph operator as an explicit map on $\mathcal{X}$ and prove that $\mathrm{Fix}(\Gamma)$ is non-empty and contains at least one physically known configuration. (Revision 8: closed for the finite model X_0, Theorem 8.5; OPEN for the physical plate.)

11.3.4. Change of representation: the cocycle condition. Different realizations of $\mathcal{X}$ (field, tensor, quaternionic, computational) must be related consistently. Book 9, Section 3.13, supplies the right condition.

Definition 11.5 (Representation cocycle)**.** *Let $\{\mathcal{X}_i\}_{i \in I}$ be realizations of the configuration space with bijections $\Phi_{ij} : \mathcal{X}_i \to \mathcal{X}_j$. The family is* coherent *if*

$$\Phi_{ii} = \mathrm{id}, \qquad \Phi_{ik} = \Phi_{jk} \circ \Phi_{ij} \quad \text{for all } i, j, k. \tag{17}$$

Admissibility is representation-independent if Γ is transported by conjugation, $\Gamma_j = \Phi_{ij} \circ \Gamma_i \circ \Phi_{ij}^{-1}$.

Proposition 11.6. *Under* (17) *and conjugate transport, $\Xi \in \mathrm{Fix}(\Gamma_i) \iff \Phi_{ij}(\Xi) \in \mathrm{Fix}(\Gamma_j)$, and the transport is consistent along any chain $i \to j \to k$.*

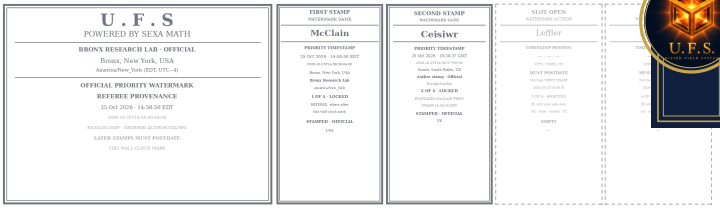
Proof. $\Gamma_j(\Phi_{ij}\Xi) = \Phi_{ij}\Gamma_i\Xi$, so fixed points correspond. Consistency follows from $\Phi_{jk}\Phi_{ij} = \Phi_{ik}$ and $\Phi_{ji} = \Phi_{ij}^{-1}$ (set $k = i$ in (17)). □

Book 9 also defines a unification map with $\mathfrak{U}_U \circ \mathfrak{U}_U = \mathfrak{U}_U$. As stated there, $\mathfrak{U}_U(X) = X$ on the seven-component state $X = (\mathcal{C}, \mathcal{D}, \mathcal{S}, \mathcal{I}, \mathcal{K}, \mathcal{F}, \mathcal{R})$, which is the identity map, so idempotence holds trivially and carries no content. We use only the idempotence pattern: projection-type glyphs satisfy $P \circ P = P$.

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11.3.5. The Universal Correspondence Theorem (Book 4). Book 4, Theorem 9.6.1 (p. 409), states in substance that the quaternionic, tensor, geometric and computational representations of a recursive system correspond, with five corollaries (Quaternionic, Tensor, Geometric, Computational Universality, and Recursive Closure). We record it here as a *stated correspondence principle* only.

Remark 11.7 (Status)**.** *The published proof (pp. 411-412) assumes the correspondence map exists "by construction", which is the statement to be proved, so the proof is circular. The corollaries restate the conclusion for each representation. In this draft the principle is replaced by the concrete requirement* (17)*: correspondence means the existence of a coherent cocycle of bijections, which is checkable.*

OPEN O2. Construct explicit maps Φ_{ij} between at least two realizations (for example quaternionic and tensor) and verify (17). This would give a non-circular proof of a restricted Universal Correspondence Theorem.

11.3.6. Σ_{60}.

ASSUMPTION 4 (Admissibility algebra)**.** Σ_{60} *is the monoid generated under composition by the six glyph operators. Then* $\Gamma \in \Sigma_{60}$ *(membership, not inclusion).*

In the source, 60 counts the alphabet of Section 11.5 (five rings of twelve) and is called cadence (logic 42: "Sixty is not a number; it is cadence"). How the monoid generated by the six Γ glyphs relates to that 60-letter alphabet is OPEN (O3, O15).

11.4. Recursive stability, closure and the role of Γ^n

Lemma 11.8. *If* $\Gamma(\Xi) = \Xi$ *then* $\Gamma^k(\Xi) = \Xi$ *for every integer* $k \geq 1$.

Proof. Induction: $\Gamma^{k+1}(\Xi) = \Gamma(\Gamma^k(\Xi)) = \Gamma(\Xi) = \Xi$. □

So the published recursive stability condition (4) adds nothing. A condition with content is stability of the fixed point under perturbation. We use the iteration count k, not n, to keep n for excitation depth (Fix F12).

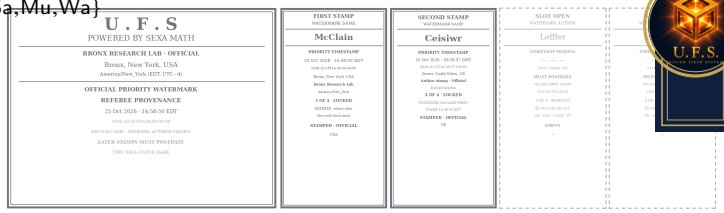
Definition 11.9 (Recursive stability, corrected)**.** *Let* $\mathcal{X}$ *carry a metric* d *(ASSUMPTION). A fixed point* $\Xi^* \in \mathrm{Fix}(\Gamma)$ *is* recursively stable *if there is* $r > 0$ *such that* $d(\Xi, \Xi^*) < r$ *implies* $\Gamma^k(\Xi) \to \Xi^*$ *as* $k \to \infty$.

Proposition 11.10. *If* Γ *is a contraction on a closed ball* $\bar{B}(\Xi_0, r)$ *of a complete metric space, with* $d(\Gamma\Xi, \Gamma\Xi') \leq q\, d(\Xi, \Xi')$*,* $q < 1$*, and* Γ *maps the ball into itself, then* $\mathrm{Fix}(\Gamma) \cap \bar{B}$ *has exactly one point* Ξ^**, and it is recursively stable.*

Proof. Banach's fixed-point theorem on the complete space $\bar{B}$. □

Proposition 11.10 gives one concrete route to OPEN O1: show that each glyph map is Lipschitz with constants whose product is below one on some ball of physical configurations. If the glyphs are idempotent projections (Assumption 3), Γ is non-expansive rather than contractive and the route is the alternating-projection theorem: for closed subspaces $U_1, \ldots, U_6$ of a Hilbert space, iterates of the product of orthogonal projections converge to the projection onto $\bigcap U_i$ (von Neumann for two, Halperin for finitely many [10]). In that case

$$\mathrm{Fix}(\Gamma) = \bigcap_{g \in \{\mathrm{Orr,Na,Ka,Sa,Mu,Wa}\}} \mathrm{Fix}(g), \tag{18}$$



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which is non-empty (it contains 0) but may contain only 0. Non-emptiness by itself is therefore not enough; O1 requires a *physical* configuration in the intersection.

Closure versus admissibility (published 3.1). Let $C \subseteq \mathcal{X}$ be the set of configurations invariant under recursive embedding and projection. The published statement "closure is necessary but insufficient" becomes

$$\mathcal{A}_\Gamma := \mathrm{Fix}(\Gamma) \cap C \;\subseteq\; C, \tag{19}$$

with strict inclusion whenever some closed configuration fails a glyph. "Necessary" is then true by definition. The content lies in specifying C, which the source does not do (OPEN O28).

11.5. The Prime Atom of Logic and the Σ_{60} glyph system

This section brings the companion paper [5] (*A Recursive Closure Criterion for a Theory of Everything: A 60-Glyph Quaternionic Inter-Domain Syllogistic Admissibility ≡ Prime Atom of Logic*) into the same paper as the Monster overhaul. Everything below is quoted or tabulated from that source; nothing is added to it.

11.5.1. The Exciternion as Prime Atom of Logic.

Definition 11.11 (Exciternion / Prime Atom of Logic [5, Def. 1, §4.2])**.** *The Exciternion* EX *is the minimal irreducible admissibility object such that no statement, operator, energy configuration, or physical claim is defined unless it survives recursive closure when evaluated through* EX.

The source lists six properties (§4.4): pre-interpretive, recursive, closure-enforcing, domain-neutral, fail-decisive, irreducible. The same symbol EX is the per-sector factor in the SREF-EX9D root equation (Section 13); its value and unit there remain OPEN (O13).

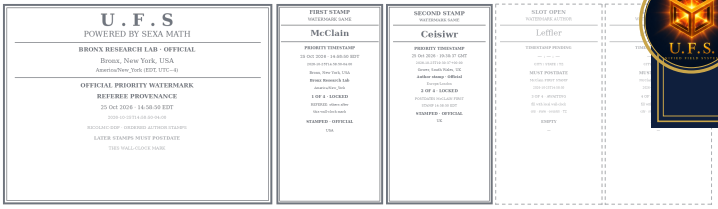
11.5.2. Six glyphs define what exists; sixty define what is allowed. The source states the relation between the six-glyph spine and Σ_{60} directly [5, §6, §12]: "The six glyphs define what exists. The Σ_{60} glyph system defines what is allowed. Σ_{60} does not add physics. It operates as an admissibility algebra acting on this fixed six-glyph spine under Exciternion-mediated recursion." The spine is written there as $\bigcirc\ \triangledown\ \kappa\ \sigma\ \mu\ \mathbb{W}$, the same six glyphs as the JAM 9887 Formal Plate (Ka printed as κ). In this paper the spine is the chain Γ of Definition 11.3, and Σ_{60} is the alphabet below.

OPEN O15. Several spine glyphs also occur as Σ_{60} letters (κ no. 10, μ no. 12, σ no. 18, ∇ no. 34). The source does not say whether the spine operators *are* those letters or only share a symbol. Not identified here.

11.5.3. The Σ_{60} alphabet: five rings of twelve. From [5, §6.2, pp. 18-20]: "a closed alphabet of sixty primitive glyphs"; each glyph is at once an operator, an invariant constraint, and a syllogistic axiom; the glyphs "are organized into five rings of twelve". Glyphs below are cropped from the source PDF; actions and roles are verbatim.

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Ring I: Axis Ring (Spatial and Dimensional Roots)

1	α	Scalar origin	Dimensional reference	7	η	Laplacian (∇^2)	Curvature
2	β	Vectorization	Directional extension	8	θ	Phase angle	Wave orientation
3	γ	Span	Transverse width	9	ι	Unit tensor	Isotropy
4	δ	Gradient (∂)	Spatial change	10	κ	Metric	Measurement structure
5	ε	Curl ($\nabla\times$)	Rotational structure	11	λ	Eigen-operator	Resonance
6	ζ	Divergence ($\nabla\cdot$)	Expansion / contraction	12	μ	Mass density	Condensation anchor

Ring II: Flow Ring (Dynamics and Time)

13	ν	Velocity field	Motion	19	τ	Time tick (1/60)	Chronon
14	ξ	Momentum	Impulse	20	φ	Potential	Source well
15	o	Energy	Work accounting	21	χ	Dissipation	Entropy flow
16	π	Pressure	Compression	22	ψ	Wavefunction	State encoding
17	ρ	Density	Continuum filling	23	ω	Angular frequency	Rotation rate
18	σ	Stress tensor	Strain	24	Ω	Total flow	Closure return

Ring III: Symmetry Ring (Group and Invariance)

25	$\oplus$	Superposition	Linear combination	31	$\leftrightarrow$	Mirror symmetry	Duality
26	$\otimes$	Tensor product	Coupling	32	∞	Continuity	Limit domain
27	$\ominus$	Subtraction	Contrast	33	$\varnothing$	Null	Vacuum / absence
28	$\equiv$	Equivalence	Identity	34	∇	Operator	Gradient action
29	$\approx$	Approximation	Limit behavior	35	$\circlearrowleft$	Phase rotation (1/60)	Exciternion tick
30	$\circlearrowright$	Rotational symmetry	Conservation	36	$\Leftrightarrow$	Bi-implication	Equilibrium

Ring IV: Interaction Ring (Coupling and Nonlinearity)

37	$\curlywedge$	Coherence clamp	Stabilization	43	$\tilde{\lambda}$	Self-adjoint map	Reflexivity
38	ϖ	Vorticity couple	Spin exchange	44	$\tilde{\mu}$	Mass-energy bridge	Relativity gate
39	$\tilde{\phi}$	Scalar perturbation	Fluctuation	45	$\tilde{\nu}$	Tachyonic term	Superluminal link
40	$\tilde{\zeta}$	Gauge link	Connection	46	$\tilde{\xi}$	Entanglement pair	Quantum bond
41	$\tilde{\eta}$	Nonlinear mix	Chaos node	47	$\tilde{\pi}$	Thermal exchange	Heat flow
42	$\tilde{\kappa}$	Feedback loop	Resonator	48	$\tilde{\rho}$	Radiative flux	Photon train

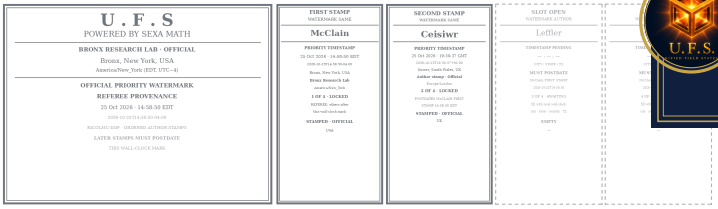
Ring V: Observer Ring (Evaluation and Cognition)

49	₳	Awareness operator	Observation	55	₥	Memory tensor	Persistence
50	₵	Collapse map	Decision	56	₦	Novelty index	Surprise
51	$\mathcal{D}_p$	Probability weight	Expectation	57	₧	Narrative binder	Meaning
52	₹	Entropic count	Information	58	₨	Sentience flux	Awareness gradient
53	₣	Feedback phase	Learning	59	₩	Witness field	Observer presence
54	£	Logical gate	Choice	60	₮	Transcendence operator	Meta-coherence

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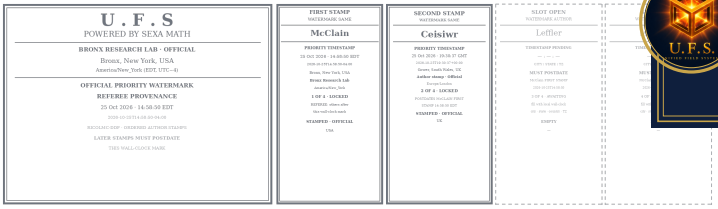
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11.5.4. The 60 syllogistic logics. From [5, §7.6, pp. 23-25]: "These statements constitute the logical form of the Σ_{60} glyph system. Each is a closure axiom, not an interpretation. Failure of any statement under recursion constitutes inadmissibility."

1. Closure precedes meaning.
2. Axioms bind before atoms.
3. Where invariants break, being breaks.
4. The manifold is the verdict.
5. Recursion is law, not style.
6. The operator is the witness.
7. Collapse is admissibility, not convenience.
8. Projection must not bleed invariants.
9. A theory is a gate: pass or perish.
10. If it cannot fail, it cannot speak.
11. Define the object, or forfeit the claim.
12. Define the map, or forfeit the motion.
13. Define the kill-switch, or forfeit the test.
14. No rescue clauses. No mercy constants.
15. What is not conserved is not admitted.
16. Symmetry is not ornament; it is constraint.
17. A closed action is a sealed oath.
18. Dynamics are permissions granted by closure.
19. Geometry without failure is rhetoric.
20. Measurement begins after self-consistency.
21. Dimensional thinning must leave no scar.
22. Reduction is sacred only if invariant.
23. Local success cannot ransom global violation.
24. Convergence is the price of recursion.
25. Divergence is excommunication.
26. Triality is the hinge of admissible shape.
27. Phase is counted, not narrated.
28. Time is sequenced logic in disguise.
29. Energy is bookkeeping across regimes.
30. The "field" is an accounting constraint.
31. Condensed: bounded, counted, compressible.
32. Perpetual: cyclic, logic-timed, nondecaying.
33. Exciters are coordinates, not creatures.
34. Exciternion is structure before story.
35. The manifold carries the audit trail.
36. The action seals the vocabulary.
37. The integral is the courtroom.
38. Stationary solutions are sworn testimony.
39. Nonstationary claims are hearsay.
40. If closure yields nothing, nothing is claimed.
41. Sexagesimal harmonics: cycle as operator.
42. Sixty is not a number; it is cadence.
43. Resonance is recursion remembered.
44. Scaling must commute with collapse.
45. The same law must survive every embedding.
46. What changes with dimension was never law.
47. The limit must confess the parent.
48. The projection must still recognize itself.
49. If thinning invents artifacts, thinning is false.
50. Reality is the invariant remainder.
51. Falsification is a design, not an insult.
52. Negative results are first-class outcomes.
53. A null is a clean blade, not a bruise.
54. Pre-registered failure is honesty embodied.
55. No post-hoc tuning: the axioms stand alone.
56. Prediction without disproof is noise.
57. Authority never substitutes for operators.
58. Consensus cannot repair a broken invariant.
59. The framework survives only by bleeding.
60. Let it fail cleanly, or let it rule.

Canonical binding statement [5, p. 26]: "The Σ_{60} logics constitute the syllogistic closure layer of the Exciternion framework. Each logic must remain invariant under quaternionic triality and recursive EX evaluation."

11.5.5. What is and is not established about Σ_{60}. Established by the source: the alphabet (60 glyphs, five rings of twelve, each with a formal action and an admissibility role), the 60 logics as closure axioms, and the six-versus-sixty relation above. The companion JAM 9896 [2] ties a fixed eigenvalue magnitude $|\lambda_j| = 60$ to the Σ_{60} structure. No source gives a composition law, a closure table, or an evaluation rule turning a glyph or a logic into a map on $\mathcal{X}$. The reference implementation (`ufs.sexa.sigma60`) therefore raises `NotImplementedFromSource` for every Σ_{60} operation, and Assumption 4 is the only algebraic structure used.



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OPEN O16. Give the Σ_{60} composition law and an evaluation rule for the 60 logics as checkable predicates on $\mathcal{X}$.

11.6. Monster and Baby Monster: verified facts and an evaluable constraint

11.6.1. Verified facts. All numbers below were checked by exact integer arithmetic.

$$|\mathbb{M}| = 2^{46}3^{20}5^{9}7^{6}11^{2}13^{3} \cdot 17 \cdot 19 \cdot 23 \cdot 29 \cdot 31 \cdot 41 \cdot 47 \cdot 59 \cdot 71 \tag{20}$$
$$= 808017424794512875886459904961710757005754368000000000 \approx 8.08 \times 10^{53},$$
$$|\mathbb{B}| = 2^{41}3^{13}5^{6}7^{2} \cdot 11 \cdot 13 \cdot 17 \cdot 19 \cdot 23 \cdot 31 \cdot 47 \tag{21}$$
$$= 4154781481226426191177580544000000 \approx 4.15 \times 10^{33}.$$

The smallest faithful complex representation of $\mathbb{M}$ has dimension

$$196883 = 47 \cdot 59 \cdot 71, \tag{22}$$

and the first nontrivial coefficient of the modular j-function satisfies $196884 = 196883 + 1$ (McKay's observation, formalized as monstrous moonshine by Conway and Norton [6]). This relation is why the title names monstrous moonshine: the Monster constraint of this paper acts on the same 196883-dimensional module that moonshine links to the j-function. This paper uses that module only as a representation space (Assumption A5); it does not use the j-function, the moonshine module, or any moonshine theorem in the admissibility test.

OPEN O17. State whether, and how, moonshine itself (not only the module dimension) enters admissibility. $\mathbb{M}$ was constructed by Griess [7] as automorphisms of a commutative non-associative algebra of dimension 196884.

11.6.2. The Han, Shi and Ying characterization. For a finite group G, let $\pi(G)$ be the prime divisors of $|G|$, $p_m = \max \pi(G)$, and $S_{p_m}(G)$ a Sylow p_m-subgroup. The prime graph of G has vertex set $\pi(G)$, with $p \sim q$ when G has an element of order pq. If π_1 is the component containing 2, the even-order component $m_1(G)$ is the π_1-part of $|G|$.

Theorem 11.12 (Han, Shi, Ying [8], Theorems 3.1 and 3.2)**.** *Let G be finite. Then*

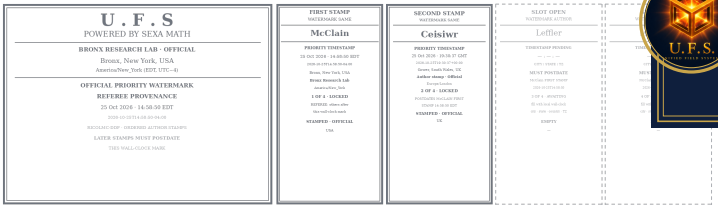
$$G \cong \mathbb{M} \iff m_1(G) = m_1(\mathbb{M}) \text{ and } |S_{p_m}(G)| = |S_{p_m}(\mathbb{M})| = 71, \tag{23}$$
$$G \cong \mathbb{B} \iff m_1(G) = m_1(\mathbb{B}) \text{ and } |S_{p_m}(G)| = |S_{p_m}(\mathbb{B})| = 47. \tag{24}$$

For $\mathbb{M}$ the primes 59 and 71 lie outside π_1 (per [8]), so

$$m_1(\mathbb{M}) = \frac{|\mathbb{M}|}{59 \cdot 71} = 1928902899963029066331964442496325512069120000000000 \approx 1.93 \times 10^{50}. \tag{25}$$

For $\mathbb{B}$, 47 lies outside π_1, so $m_1(\mathbb{B}) = |\mathbb{B}|/47 \approx 8.84 \times 10^{31}$.

Remark 11.13 (Transcription discrepancy in the source)**.** *The text of [8] as received prints $|\mathbb{M}|$ with 3^{30}, lists 59 twice and omits 41, and its printed $m_1(\mathbb{M})$ omits 41; its printed $m_1(\mathbb{B})$ omits 31. The standard $|\mathbb{M}|$ above is correct. Our m_1 values follow from the standard orders with π_1 as described in [8]; the*



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exact membership of 41 *and* 31 *in* π_1 *should be confirmed against the prime-graph tables of Williams [9]. Flagged as OPEN O8.*

11.6.3. An evaluable Monster constraint. The published condition "$O(\Xi) \in \mathcal{A}$" had no action. We give two versions. Both are postulates.

ASSUMPTION 5 (Representation version)**.** *There is a linear map* $\iota : \mathcal{X}_{\text{lin}} \to V_{196883}$ *from a linearized configuration space into the* 196883*-dimensional irreducible* $\mathbb{M}$*-module, and the symmetry glyph is the projection*

$$\mathsf{Sa} = \iota^{-1} \circ \Pi_{\mathcal{A}} \circ \iota, \qquad \Pi_{\mathcal{A}} = \sum_{\lambda \in \mathcal{A}} \Pi_\lambda, \tag{26}$$

onto a chosen union $\mathcal{A}$ *of isotypic components for a fixed subgroup* $H \leq \mathbb{M}$ *restricted to* V_{196883}*. In particular, for* $H = \mathbb{M}$ *the invariant subspace of an irreducible nontrivial module is* $\{0\}$*, so the choice of* H *must be proper for the constraint to be nontrivial.*

This constraint is evaluable in principle: Ξ passes Sa iff $\iota(\Xi) \in \bigoplus_{\lambda \in \mathcal{A}} V_\lambda$, which is a finite-dimensional linear-algebra test, computationally heavy but well posed once ι, H and $\mathcal{A}$ are fixed. Orbits $O(\Xi) = \mathbb{M} \cdot \iota(\Xi)$ are then well defined.

ASSUMPTION 6 (Group-identification version)**.** *Each admissible configuration determines a finite symmetry group* G_Ξ *(its stabilizer under a specified action). The Monster sector is the set of* Ξ *with*

$$m_1(G_\Xi) = m_1(\mathbb{M}), \qquad |S_{p_m}(G_\Xi)| = 71, \tag{27}$$

and the Baby Monster sector uses $m_1(\mathbb{B})$ *and* 47*.*

By the theorem of [8], this is equivalent to $G_\Xi \cong \mathbb{M}$ (resp. $\mathbb{B}$), and it is a test on two integers, which is the most evaluable form available. It still requires the action that defines G_Ξ.

No physical action of $\mathbb{M}$ on fields is derived here, and none is claimed.

OPEN O9. Specify the embedding ι, the subgroup H, and the admissible set $\mathcal{A}$ (Assumption 5), or the action defining G_Ξ (Assumption 6), and give a physical reason for either.

OPEN O10. Explain why $\mathbb{M}$ rather than any other group is the relevant symmetry. Moonshine connects $\mathbb{M}$ to modular functions and a specific vertex operator algebra; a link to the SEXA functional is not yet given.

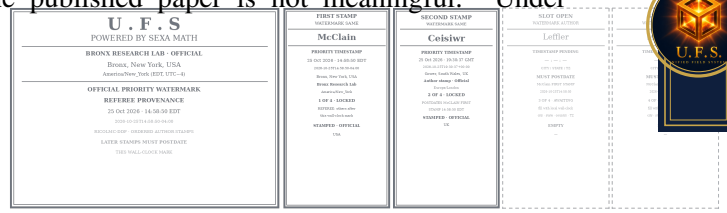
11.6.4. Invariance and variance. Two distinct notions appear and should not be conflated.

- **Invariance (selection).** $\Gamma(\Xi) = \Xi$ is a fixed-point condition on individual configurations. It says which Ξ survive.
- **Variance (classification).** Under a group action $g \cdot \Xi$, admissible configurations fall into orbits. Different representatives of one orbit vary, while orbit invariants (for example characters, or $|G_\Xi|$) do not.

They are compatible exactly when Γ commutes with the action:

$$\Gamma(g \cdot \Xi) = g \cdot \Gamma(\Xi) \;\; \forall g \implies g \cdot \mathrm{Fix}(\Gamma) = \mathrm{Fix}(\Gamma), \tag{28}$$

so admissibility becomes a property of whole orbits. If (28) fails, admissibility depends on the representative chosen, and the orbit language of the published paper is not meaningful. Under



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Assumption 5 with Sa built from H-isotypic projections, the projection $\Pi_{\mathcal{A}}$ commutes with every g in the normalizer $N_{\mathbb{M}}(H)$ that permutes the components of $\mathcal{A}$ among themselves, so (28) holds for such g (for the Sa factor), but not for all of $\mathbb{M}$ in general.

OPEN O11. Determine the largest group for which Γ is equivariant.

11.7. Corrected kill-switch (published 3.5)

The published kill-switch has four triggers. In corrected form:

(K1′) $\Gamma(\Xi) \neq \Xi$: rejected. Evaluable once O1 supplies the glyph maps.

(K2′) The Γ^n trigger is removed (Lemma 11.8); it is replaced, where a metric is available, by failure of recursive stability (Definition 11.9).

(K3′) Sa rejects Ξ under Assumption 5 or 6. Evaluable once O9 fixes ι, H and $\mathcal{A}$.

(K4′) Failure of a known limit: evaluable only after K1 to K3 (Section 19) exist as computations. At present the published paper has no computation that could fail, so this trigger cannot fire.

The rule "no parameter tuning after failure" is kept and made operational by pre-registration (K4).

11.8. The published reductions, restated and repaired

11.8.1. Large scale: General Relativity (published 4.2). The published claim is withdrawn. In the root equation the perpetual density of sector 4:5 is $P_j 60^n$ (and $P\,60^{n+1}$, $P\,60^{n+2}$ in the tiers). Because $60^n \geq 1$ for $n \geq 0$,

$$P_j 60^n \;\geq\; P_j, \tag{29}$$

so increasing or decreasing n alone can never suppress it. The term is suppressed only if one of the following holds:

$$\text{(a)}\quad P_j \to 0 \quad \text{(no perpetual field)}, \tag{30}$$

$$\text{(b)}\quad \tau \to 0 \text{ in (53)} \quad \text{(published form only)}, \tag{31}$$

$$\text{(c)}\quad 60^n \text{ replaced by } 60^{-n} \text{ with } n \to \infty, \text{ so } P_j 60^{-n} \to 0. \tag{32}$$

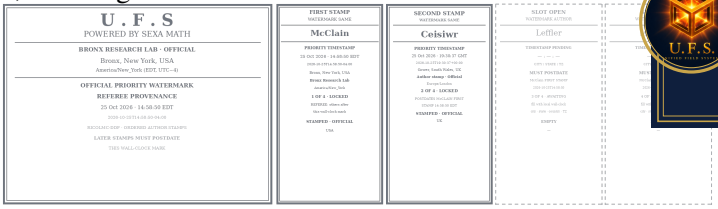
Option (c) changes the published model and is listed only as an alternative.

Proposition 11.14 (Conditional reduction)**.** *If $P_4 = P_5 = 0$ (hence all tier P vanish), then $E_{\mathrm{SREF}} = \int (S_L S_T S_R S_B)^{1/4} d\mu$ with only T^{00} terms in S_R, S_T, S_B: a geometric mean of matter and stress-energy densities.*

This is an energy bookkeeping identity. It is *not* General Relativity: the published paper contains no metric $g_{\mu\nu}$, no curvature, no Einstein equations and no Newton constant G. A sum of energy densities cannot by itself reproduce curvature dynamics.

OPEN O6. Supply a metric sector and a field equation, and show that in condition (a) it reduces to $G_{\mu\nu} = 8\pi G\, T_{\mu\nu}/c^4$ with G derived, not inserted. This is not done here.

OPEN O7. Show that a physically motivated rule forces condition (a), (b) or (c) in ordinary environments. Currently it is chosen. The published 4.2 also asserts that the glyph operators "commute effectively" in this regime. No operator is defined, so no commutator can be computed. If the glyphs are projections, $[P, Q] = 0$ holds exactly when the projections are compatible (their ranges decompose jointly); this is a property to be proved for a given model, not a regime.



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11.8.2. A structural obstruction: the functional is ultralocal.

Proposition 11.15 (No propagator without gradients)**.** *Suppose the integrand of the published functional* (2)*, of the 9896 functional* (35)*, or of SREF-EX9D* (45) *depends only on point values of the sector fields ρ_i, T^{00}_j, P_j and not on their derivatives. Then the first variation of E is pointwise, $\delta E = \int \sum_a (\partial\mathcal{E}/\partial f_a)\,\delta f_a\, d\mu$, and its stationary points solve algebraic equations $\partial\mathcal{E}/\partial f_a = 0$ at each point separately. No Green's function, propagating mode, or r-dependent potential follows.*

Proof. With no derivative terms, the Euler-Lagrange operator has no differential part, so its kernel imposes no relation between values at distinct points. □

Proposition 11.15 is the precise reason the QFT and Yukawa claims of 4.3 and 4.4 cannot follow from the published equations: both require a quadratic form with a differential operator.

11.8.3. Local excitation: Quantum Field Theory (published 4.3). What would be required, stated as a target: a sector field χ with a quadratic part

$$\mathcal{E}_2[\chi] = \tfrac{1}{2}\left(\partial_\mu\chi\,\partial^\mu\chi + m^2\chi^2\right) \tag{33}$$

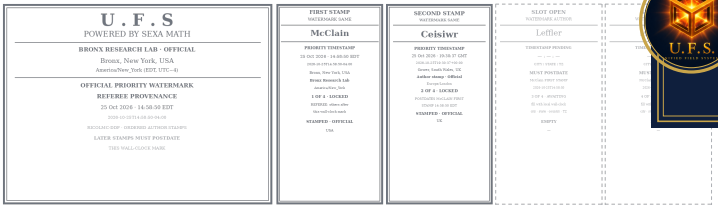
inside the integrand, admissible under Γ, whose quantization gives the free propagator $(p^2 + m^2)^{-1}$ (Euclidean). The published 4.3 asserts that "interaction structure emerges from admissibility constraints" but gives no field, kinetic term or propagator. Status: OPEN, kill-switch item K2.

11.8.4. Short range: Yukawa (published 4.4). For the target above with a static point source $J = g\,\delta^3(\mathbf{x})$, the static equation $(-\nabla^2 + m^2)\chi = J$ has the solution

$$\chi(r) = \frac{g}{4\pi}\,\frac{e^{-mr}}{r}, \qquad \lambda = 1/m. \tag{34}$$

This is the only standard route to a Yukawa form. The published "admissibility termination boundaries" would have to be shown to generate the mass term $m^2\chi^2$ with a computable m. Status: OPEN, kill-switch K3. JAM 9880 Appendix A item 12 writes the gravitational version $V(r) = -(Gm_1m_2/r)(1 + \alpha e^{-r/\lambda})$; α and λ are not derived there either (Section 17.8).

11.8.5. Reduction failure and the single-structure claim (published 4.5 to 4.7). The implication "Reduction Failure → Admissibility Failure" is kept as a design rule: an Ξ that fails a reduction test is rejected. The converse claim of 4.6 and 4.7, that reduction is a *consequence* of admissibility, is withdrawn until at least one reduction is computed. As it stands, it asserts the conclusion.



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12. JAM 9896: THE FULL-STACK FUNCTIONAL ON $\mathcal{M}_{2880}$

12.1. The canonical functional as published

JAM 9896 Section 2 (journal p. 48) gives the canonical 2880-dimensional Γ-SREF-Ω Exciternion functional. In the notation of this draft:

$$E^{(\Gamma,\Omega,\mathrm{EX},2880\mathrm{D})}_{\mathrm{SREF}}[\Xi] = \int_{\mathcal{M}_{2880}} \Big((\bigcirc \nabla \mathrm{K} \sigma \mu \mathbb{W}) \circ \Big[\sum_{i=1}^{3} g_i \, \rho_i(\mathrm{EX}) \, C_\Omega^2 + \sum_{j=4}^{5} \Big(T_j^{00}(\mathrm{EX}) + P_j(\mathrm{EX}) \, \Pi_{2880} \, |\lambda_j|^n \Big) \Big] \Big) \, d\mu_{\mathcal{M}_{2880}}, \tag{35}$$

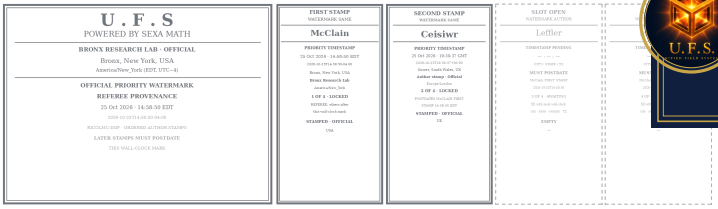
together with

$$\Pi_{2880} = \prod_{\ell=5}^{2880} \psi_\ell^{\delta_\ell}, \qquad |\lambda_j| = 60, \qquad C_\Omega = \sqrt{\frac{2880}{4}}, \qquad (\bigcirc \nabla \mathrm{K} \sigma \mu \mathbb{W})[\Xi] = \Xi. \tag{36}$$

The published figure annotates four roles: (1) Admissibility, the Γ chain; (2) Representation and recursion, the Exciternion and degeneracy terms; (3) Dimensional compression, the payload interception operator Π_{2880}; (4) Propagation, the Empire Wave Constant.

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I am, We Are.

2. Canonical 2880-Dimensional Γ–SREF–Ω Exciternion Functional

$$E_{\mathrm{SREF}}^{(\Gamma,\Omega,\mathrm{EX},2880\mathrm{D})}[\Xi] = \int_{\mathcal{M}_{2880}} \left((O \triangle K\, O\, \mu\, W) \circ \left[\sum_{i=1}^{3} g_i\, \rho_i(\mathrm{EX})\, C_\Omega^2 + \sum_{j=4}^{5} \left(T_j^{00}(\mathrm{EX}) + P_j(\mathrm{EX})\, \Pi_{2880}\, |\lambda_j|^n \right) \right] \right) d\mu_{\mathcal{M}_{2880}}$$

$$\Pi_{2880} = \prod_{\ell=5}^{2880} \psi_\ell^{\delta_\ell}$$

$$|\lambda_j| = 60$$

$$C_\Omega = \sqrt{\frac{2880}{4}}$$

$$(O \triangle K\, O\, \mu\, W)[\Xi] = \Xi$$

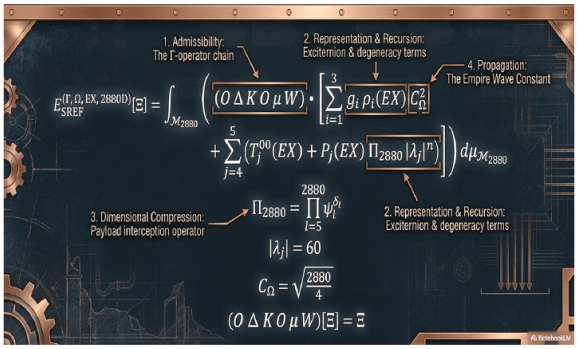
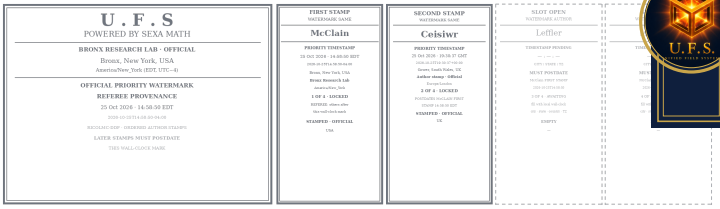


Figure 1. Journal p. 48 of JAM 9896 (published display and annotated plate), reproduced for reference.

Published WHERE block (pp. 49-51), restated.

$E_{\mathrm{SREF}}^{(\Gamma,\Omega,\mathrm{EX},2880\mathrm{D})}[\Xi]$	SREF in glyph-admissible, Empire-Wave-scaled, Exciternion-resolved, 2880-dimensional form, evaluated over the unified configuration Ξ.
$\Gamma = (\bigcirc\, \nabla\, \mathrm{K}\, \sigma\, \mu\, \mathbb{W})$	Existence; flow or propagation; manifold consistency; symmetry or internal invariance; mass-memory or recursive persistence; observation or realization.
Ξ	Complete unified configuration state.
$\mathcal{M}_{2880}$, $d\mu_{\mathcal{M}_{2880}}$	The 2880-dimensional SEXA recursive manifold and its induced measure.
$g_i \rho_i(\mathrm{EX}) C_\Omega^2$	Condensed Exciternion energy-sector contribution; g_i degeneracy factor of condensed sector i; $\rho_i(\mathrm{EX})$ Exciternion-resolved mass-energy density.
C_Ω, $\sqrt{2880/4}$	Empire Wave Constant "governing propagation scaling" and its closed form.



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$T_j^{00}(\mathrm{EX}) + P_j(\mathrm{EX})\Pi_{2880}\lvert\lambda_j\rvert^n$	Perpetual Exciternion energy-sector contribution; $T_j^{00}(\mathrm{EX})$ time-time stress-energy; $P_j(\mathrm{EX})$ "sustained excitation / pressure term".
Π_{2880}; ψ_ℓ; δ_ℓ	Payload interception product; contribution of recursive dimensional sector ℓ; dimensional weighting or thinning exponent.
$\lvert\lambda_j\rvert = 60$; n; $\lvert\lambda_j\rvert^n$	Admissible eigenvalue magnitude ("sexagesimal admissibility eigenvalue condition"); recursive excitation depth; recursive eigenvalue amplification.

Published structural plate (p. 52). $2880 = 60 \times 48$, read as "sexagesimal recursion across 48 base manifold strata"; the dual regime (2880D structural closure, 5D operational realization); degeneracy encoded through Σ_{60}; and the principle "admissibility precedes reality".

12.2. Repairs to the canonical functional

Fix F3 (placement of Γ). JAM 9896 Section 4 states that Γ "is applied to the bracketed SREF integrand" so that "admissibility is enforced at the level of the energy density prior to integration". The bracket is a real-valued function on $\mathcal{M}_{2880}$; Γ acts on configurations. The coherent reading, which is also what Section 4 says in its next sentence ("the integral is not taken over all configurations, but only over those configurations whose local contributions are consistent with Γ-invariance"), is

$$E[\Xi] = \begin{cases} \displaystyle\int_{\mathcal{M}_{2880}} \mathcal{E}_\Xi \, d\mu_{\mathcal{M}_{2880}}, & \Xi \in \mathrm{Fix}(\Gamma), \\ \text{not evaluated}, & \text{otherwise}, \end{cases}$$
$$\mathcal{E}_\Xi = \sum_{i=1}^{3} g_i \rho_i(\mathrm{EX}) C_\Omega^2 + \sum_{j=4}^{5} \left(T_j^{00}(\mathrm{EX}) + P_j(\mathrm{EX})\, \Pi_{2880}\, 60^n \right). \tag{37}$$

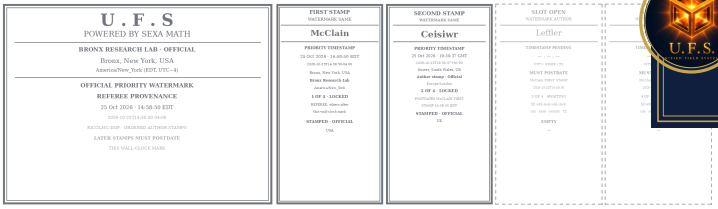
The published admissible set $\mathcal{A} = \{\Xi \mid \Gamma[\Xi] = \Xi\}$ (Section 4) is exactly $\mathrm{Fix}(\Gamma)$.

Fix F2 (units). Each summand of $\mathcal{E}_\Xi$ must be an energy density. With C_Ω a pure number, $g_i \rho_i C_\Omega^2$ is an energy density only if ρ_i is itself an energy density (not a mass density), or if a velocity-squared factor is restored. ASSUMPTION: in (37), $\rho_i(\mathrm{EX})$ is in $\mathrm{J\,m^{-3}}$ and g_i and C_Ω are dimensionless. For the perpetual term, $[P_j(\mathrm{EX})] = \mathrm{J\,m^{-3}}$ (JAM 9896 calls it a pressure, and $\mathrm{Pa} = \mathrm{J\,m^{-3}}$), and Π_{2880} and 60^n are dimensionless. With these readings the integrand closes in $\mathrm{J\,m^{-3}}$. The measure remains OPEN O13.

Fix F8 (Empire Wave Constant). The published text states that C_Ω "replaces the conventional role of the speed of light as a universal" propagation parameter. Numerically $C_\Omega = \sqrt{720} = 26.8328\ldots$, a pure number; $c = 299\,792\,458\ \mathrm{m\,s^{-1}}$ carries units. A pure number cannot replace a dimensional constant unless a unit velocity v_0 is supplied with $C_\Omega v_0$ playing the role of c. Two consistent readings exist:

(a) C_Ω is a dimensionless multiplier of c: $\rho_i C_\Omega^2 c^2$, giving a factor 720 on condensed energy. This contradicts rest-mass energy $E = mc^2$ unless g_i absorb $1/720$.

(b) C_Ω^2 is a bookkeeping weight of the condensed sector relative to the perpetual sectors, with ρ_i already in energy units. This is the reading adopted in SREF-EX9D ($C_{\Omega,\mathrm{conv}}^2 = 720$).



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This draft adopts (b) and withdraws the sentence "C_Ω replaces the speed of light". The phrase in Section 8, "effective propagation velocity through the 2880-dimensional manifold exceeds projection velocity in 4D spacetime" (also in JAM 9880 Appendix B), is withdrawn for the same reason: no velocity is defined.

Why $\sqrt{2880/4}$. The source gives no derivation. Arithmetic facts: $2880/4 = 720 = 6!$; $2880 = 4 \cdot 720 = 60 \cdot 48 = 2^6 \cdot 3^2 \cdot 5$; and 720 is the number of permutations of the six glyphs. ASSUMPTION is not needed to state these; any physical meaning of the divisor 4 (for example four spacetime dimensions) is OPEN O20.

12.3. Dual regime: 2880D structural and 5D operational

Published (Section 3). The 5D form is "the bounded realization of the full recursive functional":

$$E^{(5D)}_{\mathrm{SREF}}[\Xi] = \int_{\mathcal{M}_5} \Gamma \circ \Big[\sum_{i=1}^{3} g_i \rho_i(\mathrm{EX}) C_\Omega^2 + \sum_{j=4}^{5} \Big(T_j^{00}(\mathrm{EX}) + P_j(\mathrm{EX})\, |\lambda_j|^n \Big) \Big] \, d\mu_{\mathcal{M}_5}. \tag{38}$$

It differs from (35) in the domain and in the absence of Π_{2880}; higher dimensions are "inherited implicitly through compression". The published comparison table: 2880D role, complete structural closure; 5D role, bounded physical realization; admissibility unchanged in both.

Corrected statement. For the two forms to describe the same physics, a reduction map $R : \mathcal{X}_{2880} \to \mathcal{X}_5$ is required with

$$E^{(5D)}[R\Xi] = E^{(2880D)}[\Xi] \quad \text{for all } \Xi \in \mathrm{Fix}(\Gamma_{2880}), \qquad R \circ \Gamma_{2880} = \Gamma_5 \circ R. \tag{39}$$

Comparing integrands at matched points, the first condition holds pointwise if the 5D perpetual densities are defined by $P_j^{(5)} := P_j^{(2880)} \Pi_{2880}$, i.e. "inherited through compression" means Π_{2880} is absorbed into P_j. Then the 5D form is not a separate equation but a renaming, and the content of Π_{2880} is invisible to any 5D measurement. The second condition is the cocycle requirement (Proposition 11.6) applied to R, which is not a bijection, so it must be imposed separately. Both are OPEN O21.

12.4. Admissibility structure (published Section 4)

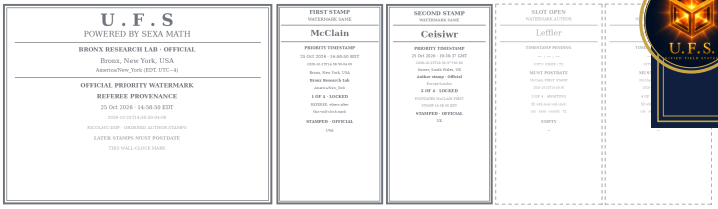
JAM 9896 Section 4 lists the same six roles as JAM 9887 and stresses that the operators are non-commutative and that "inadmissible configurations are never evaluated". In the corrected form this is Definition 11.3 and (37). The claim that this "distinguishes the SEXA framework from approaches in which the full solution space is first constructed and then restricted" is a statement of method; mathematically, evaluating E only on $\mathrm{Fix}(\Gamma)$ and evaluating it everywhere and then restricting to $\mathrm{Fix}(\Gamma)$ give the same function on $\mathrm{Fix}(\Gamma)$. The difference is computational, not physical.

12.5. Exciternion representation (published Section 5)

Published. Quantities $\rho_i(\mathrm{EX})$, $T_j^{00}(\mathrm{EX})$, $P_j(\mathrm{EX})$ "are not continuous field components"; each "corresponds to a configuration of discrete states embedded within the recursive dimensional manifold", and the discreteness "replaces the need for post hoc quantization".

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Corrected statement. Let $\mathcal{S}$ be a set of Exciternion states with a sector label $s : \mathcal{S} \to \{1, \ldots, 5\}$ and a depth label $\nu : \mathcal{S} \to \mathbb{N}$. ASSUMPTION: an Exciternion-resolved density is a sum over states with an energy assignment $\epsilon : \mathcal{S} \to \mathbb{R}$ and a localization density $w_a(x)$:

$$\rho_i(\mathrm{EX})(x) = \sum_{a \in \mathcal{S},\ s(a)=i} \epsilon_a \, w_a(x), \qquad \int w_a \, d\mu = 1. \tag{40}$$

Then g_i in (37) would double count multiplicity unless ϵ_a is per state and g_i is set to 1, or unless all ϵ_a in sector i are equal and $g_i = \#\{a : s(a) = i\}$. JAM 9896 Section 6 says g_i "reflect the number of admissible configurations contributing to the density term"; under (40) that is the second case. Discreteness of $\mathcal{S}$ does not by itself give quantization: quantum theory requires a Hilbert space, operators and commutation relations, none of which appear. The sentence "replaces the need for post hoc quantization" is withdrawn. Specifying $\mathcal{S}$, ϵ and w_a is OPEN O22.

12.6. Degeneracy, eigenvalue structure and sexagesimal recursion (published Section 6)

Published. Condensed degeneracy is carried by g_i; perpetual degeneracy by $|\lambda_j| = 60$, "not introduced as a free parameter but as a constraint arising from the admissible configuration space"; n is the recursion depth; $|\lambda_j|^n$ "combines degeneracy and recursion".

Corrected statement. If $|\lambda_j|$ is the eigenvalue magnitude of a linear recursion operator L_j on sector j, then L_j^n multiplies an eigenvector's norm by $|\lambda_j|^n$; this is the standard meaning of $|\lambda|^n$ and is consistent with the text. A *cardinality* of admissible states, as the text also says, is a different object: a count $d_j = 60$ enters as a multiplicity d_j, not as a base raised to n. The two readings coincide only if each recursive layer multiplies the number of states by 60, so that layer n has 60^n states. ASSUMPTION (adopted): $|\lambda_j|^n = 60^n$ counts states at depth n under a branching factor 60. Then:

1. As $n \to 0$, $60^n \to 1$, not 0 (Fix F1). The perpetual term is $T_j^{00} + P_j \Pi_{2880}$, fully present.
2. For $n \geq 0$, $60^n \geq 1$; increasing n only amplifies. Suppression requires $P_j \Pi_{2880} \to 0$, which moves the burden to Π_{2880} (Section 12.7.1).
3. The claim that 60 is forced by Γ is not derived; Γ is undefined (O1). It is a postulate here.

The published failure condition (2), "the system requires an eigenvalue magnitude deviating from exactly $|\lambda_j| = 60$", is testable only once L_j is defined (OPEN O22).

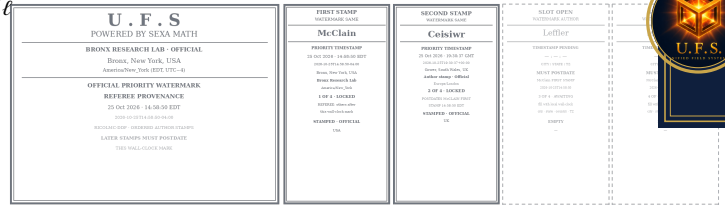
12.7. The payload interception product Π_{2880}

Published (JAM 9896 Section 7). $\Pi_{2880} = \prod_{\ell=5}^{2880} \psi_\ell^{\delta_\ell}$ "represents the cumulative contribution of recursive dimensional sectors beyond the operational base weighted by a dimensional exponent δ_ℓ"; it "acts on the excitation term $P_j(\mathrm{EX})$"; it "does not require a separate compactification"; higher dimensions are "neither hidden nor discarded".

Published (JAM 9880 Section 2.2). $\Pi_{2880} = \prod_{\ell=5}^{2880} \Psi_\ell / \phi_\ell^2$, with Ψ_ℓ the energy density of the ℓ-th dimensional sector and ϕ_ℓ a "dimensional scaling parameter governing thinning".

Fix F10 (two forms reconciled). The two definitions agree if

$$\psi_\ell^{\delta_\ell} = \frac{\Psi_\ell}{\phi_\ell^2}. \tag{41}$$



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For Π_{2880} to multiply P_j without changing units, every factor must be dimensionless. The JAM 9880 form fails this as written: with $[\Psi_\ell] = \mathrm{J\,m^{-3}}$, the product of 2876 factors carries $(\mathrm{J\,m^{-3}})^{2876}[\phi]^{-5752}$, which equals 1 only if $[\phi_\ell]^2 = \mathrm{J\,m^{-3}}$, that is, if ϕ_ℓ^2 is itself a reference energy density. ASSUMPTION (adopted): ϕ_ℓ^2 is a reference energy density for sector ℓ, so $r_\ell := \Psi_\ell/\phi_\ell^2 = \psi_\ell^{\delta_\ell}$ is a dimensionless ratio. JAM 9880 Appendix B reports the "observed cascade ratio" $\Psi_\ell/\Phi_\ell^2 \approx 0.375$, consistent with this reading.

Number of factors. $\ell = 5, \ldots, 2880$ gives 2876 factors.

12.7.1. Numerical sensitivity of Π_{2880}.

Proposition 12.1. *Write* $\log_{10}\Pi_{2880} = \sum_{\ell=5}^{2880}\log_{10} r_\ell$. *If every* $r_\ell = r$, *then* $\Pi_{2880} = r^{2876}$. *In particular:*

r	$\log_{10}\Pi_{2880}$	*Note*
0.375	−1225.09	*JAM 9880 Appendix B "thinning ratio"*
$e^{-1} = 0.3679$	−1249.03	*the value Appendix B says* 0.375 *approximates*
59/60	−21.0	*one sexagesimal step below unity*
1	0	*no compression*
1.001	+1.25	0.1% *above unity*

A uniform shift of every $\log_{10} r_\ell$ *by* Δ *shifts* $\log_{10}\Pi_{2880}$ *by* 2876Δ.

Proof. Direct evaluation: $2876\log_{10}0.375 = 2876\times(-0.425969) = -1225.09$; $2876\times\log_{10}e^{-1} = -2876\times 0.434294 = -1249.03$; $2876\log_{10}(59/60) = 2876\times(-0.0072992) = -20.99$; $2876\log_{10}1.001 = 2876\times 0.000434 = 1.248$. □

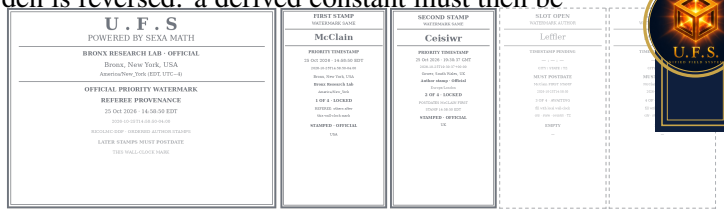
Consequences.

1. Under the paper's own reported ratio, $\Pi_{2880} \approx 10^{-1225}$. The perpetual term $P_j\Pi_{2880}60^n$ is then negligible unless $60^n \gtrsim 10^{1225}$, i.e. $n \gtrsim 1225.09/\log_{10}60 = 1225.09/1.778151 \approx 689$. The "average excitation" reported in JAM 9880 Appendix B is $\bar{n} \approx 18.86$, giving $60^{\bar{n}} = 10^{33.54}$. So at the reported numbers $\Pi_{2880}60^{\bar{n}} \approx 10^{-1191.6}$.
2. The difference between 0.375 and e^{-1}, called "close" in Appendix B (1.9%), changes Π_{2880} by 24 orders of magnitude. "Close" is not adequate for a quantity raised to the power 2876; any claimed value of Π_{2880} needs each r_ℓ to better than 10^{-4} relative accuracy to be stated to one order of magnitude.
3. The text says Π_{2880} "does not discard information". A single scalar cannot preserve 2876 sector contributions: infinitely many vectors $(r_5, \ldots, r_{2880})$ give the same product. As a scalar multiplier, Π_{2880} is a many-to-one compression. The sentence is withdrawn; "preserves the product of sector ratios" is what holds.

These are not new physics; they are arithmetic consequences of the published definitions and numbers. They bear directly on RSBA (Section 17.4). Measured or derived values of r_ℓ are OPEN O19.

12.8. Empire Wave Constant and propagation scaling (published Section 8)

Restated in Section 12.2 (Fix F8). The published claims that C_Ω is "derived mathematically as a structural scaling factor" rather than "an empirical constant introduced to match observation" are accurate in the narrow sense that $\sqrt{720}$ is fixed by arithmetic. The burden is reversed: a derived constant must then be



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compared with data, and the only dimensional slot it occupies, ρC_Ω^2, would contradict $E = mc^2$ under reading (a). Under reading (b) C_Ω does not govern propagation at all. The published failure condition (5), "if this scaling is incompatible with empirical" propagation, is triggered under (a) and empty under (b). OPEN O20.

12.9. The full-stack pipeline (published Section 9)

Published: Admissibility → Recursion → Compression → Energy Evaluation; "each stage operates on the output of the previous stage". As maps:

$$\mathcal{X} \xrightarrow{\mathbf{1}_{\mathrm{Fix}(\Gamma)}} \mathrm{Fix}(\Gamma) \xrightarrow{P_j \mapsto P_j 60^n} \mathcal{X}' \xrightarrow{P_j \mapsto P_j \Pi_{2880}} \mathcal{X}'' \xrightarrow{\int \mathcal{E}\, d\mu} \mathbb{R}. \tag{42}$$

Since multiplication by 60^n and by Π_{2880} commute, steps 2 and 3 can be exchanged; only step 1 must come first, and only if Γ does not commute with the rescalings (otherwise the whole chain commutes). The ordering claim therefore has content only through the non-commutativity of Γ with the rescalings, which is OPEN O11.

12.10. Falsifiability: the six published failure conditions, made operational

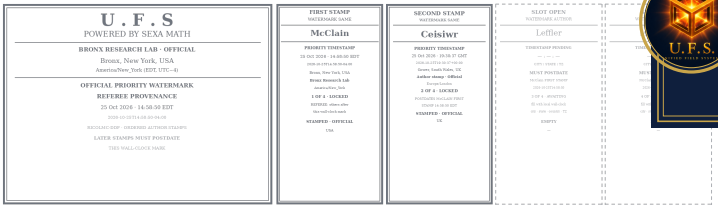
Level	Published condition	Operational form and status
(1) Admissibility	No nontrivial Ξ satisfies $\Gamma[\Xi] = \Xi$.	Exhibit a physical $\Xi \in \mathrm{Fix}(\Gamma)$ (O1). Cannot fail or pass until the glyph maps exist.
(2) Degeneracy	Known physics needs $\lvert\lambda_j\rvert \neq 60$.	Define L_j and compute its spectrum (O22).
(3) Recursion	n gives unregulated divergence, or underrepresents scales.	With $60^n \geq 1$, divergence occurs for $n \to \infty$ unless $\Pi_{2880} \to 0$; with Proposition 12.1, underrepresentation at $\bar{n} = 18.86$. Both branches are live; the condition needs a stated range of n before data (K4).
(4) Dimensional closure	Π_{2880} loses structural consistency.	Units close under F10. "Structure" is lost by construction (Section 12.7.1, item 3).
(5) Propagation	C_Ω incompatible with empirical propagation.	Fails under reading (a); empty under (b) (F8, O20).
(Red.) Reduction	5D form fails GR, QFT or Yukawa limits.	Cannot be tested: no metric, no gradient terms (Proposition 11.15); K1 to K3.

12.11. Experimental interface: torsion balance (published Section 12)

Published.

$$\tau_N = \frac{G m_1 m_2}{r^2} L, \qquad \tau_{\mathrm{SEXA}} = \tau_N \left(1 + \delta_\Gamma(r, \mathrm{EX}, \Pi_{2880}, |\lambda|^n)\right), \qquad \tau = \kappa\theta, \tag{43}$$

with κ the torsion constant and θ the deflection. Predicted: a measurable $\Delta\tau = \tau_{\mathrm{SEXA}} - \tau_N$, non-classical r dependence, and possible sensitivity to "configuration ordering". Protocol: baseline, controlled changes of distance, orientation and isolation, time-series logging, residual extraction. Falsification: the framework fails if $\delta_\Gamma \to 0$ within uncertainty under all controlled configurations.



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Corrected statement.

1. δ_Γ has no formula. Until one is given, "fails if $\delta_\Gamma \to 0$" cannot be applied, because no finite set of null results excludes an unspecified function. ASSUMPTION for test design: parametrize

$$\delta_\Gamma(r) = \alpha\left(1 + \frac{r}{\lambda}\right)e^{-r/\lambda}, \tag{44}$$

   which is the torque correction implied by a Yukawa potential $V = -(Gm_1m_2/r)(1 + \alpha e^{-r/\lambda})$ for the radial force. Then a null result constrains a region of the (α, λ) plane, exactly as in existing inverse-square tests [13].
2. Pre-registration (K4): before any run, fix λ (or the functional form of δ_Γ), the predicted sign and size of α, and the separations r to be used, each derived from Ξ, Π_{2880} and n.
3. "Configuration ordering" must be given a laboratory meaning (which apparatus change corresponds to reordering glyphs) or dropped.
4. Existing torsion-balance bounds already exclude gravitational-strength Yukawa terms ($|\alpha| \approx 1$) for λ above roughly 56 μm [14, 13]; any prediction must lie outside the excluded region to be new.

Status: OPEN, kill-switch K5 (Section 19).

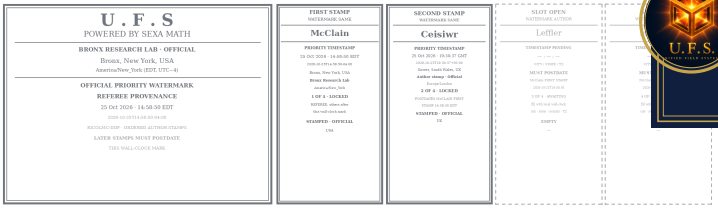
13. The root equation: SREF-EX9D (frozen v1.4)

Relationship to the published paper. The published JAM 9887 used a five-dimensional sketch, (2), as its energy body. The energy body the authors have since established is SREF-EX9D, frozen at version v1.4. This draft takes SREF-EX9D as the root equation. Γ does not act on the integrand; it is a separate gate that filters which configurations Ξ of that body are allowed. The energy is then the root equation evaluated on an allowed Ξ.

Root equation. The author-supplied SREF-EX9D cross equation, reproduced as supplied:

$$E_{\mathrm{SREF}}^{(\Gamma,\Omega,EX,2880D)}[\Xi] = \int_{\mathcal{M}_{2880}} \left[\begin{array}{c} \mathrm{EX}\sum_{k=6}^{7}\left(\phi^{(1)}T_k^{00} + P_k 60^{n+1}\right) \\ \downarrow \\ \mathrm{EX}\sum_{i=1}^{3} g_i \rho_i C_{\Omega,\mathrm{corr}}^2 \rightarrow \prod_{\circ} \leftarrow \mathrm{EX}\sum_{j=4}^{5}\left(T_j^{00} + P_j 60^n\right) \\ \uparrow \\ \mathrm{EX}\sum_{\ell=8}^{9}\left(\phi^{(2)}T_\ell^{00} + P_\ell 60^{n+2}\right) \end{array} \right] d\mu_{\mathcal{M}_{2880}} \tag{45}$$

Colour key: red S_L, Space Time ($i = 1, 2, 3$) · green S_R, one 4:5 sector: 4 Gravity Field ($j = 4$), **bold purple 5 QVP** ($j = 5$) · blue S_T ($k = 6, 7$) · gold S_B ($\ell = 8, 9$) · charcoal centre $\prod_\circ$.



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The four arms feed the central fourth-root closure. The four source sectors are compressed S_L (dimensions 1-3), base perpetual S_R (4-5), thinner S_T (6-7) and thinnest S_B (8-9):

$$S_L = \mathrm{EX} \sum_{i=1}^{3} g_i \rho_i C^2_{\Omega,\mathrm{conv}}, \tag{46}$$

$$S_R = \mathrm{EX}\left[T_4^{00} + P_4\, 60^n + T_5^{00} + P_5\, 60^n\right], \tag{47}$$

$$S_T = \mathrm{EX} \sum_{k=6}^{7} \left(\varphi^{(1)} T_k^{00} + P_k\, 60^{n+1}\right), \tag{48}$$

$$S_B = \mathrm{EX} \sum_{\ell=8}^{9} \left(\varphi^{(2)} T_\ell^{00} + P_\ell\, 60^{n+2}\right). \tag{49}$$

The author-specified closure is

$$\boxed{\Pi^\circ = \left(S_L\, S_R\, S_T\, S_B\right)^{1/4}, \qquad E_{\mathrm{SREF}}[\Xi] = \int_{\mathcal{M}_{2880}} \Pi^\circ \, d\mu_{\mathcal{M}_{2880}}.} \tag{50}$$

Where. $C^2_{\Omega,\mathrm{conv}} = C^2_\Omega = 720$ (author-defined, clarification 13); $\varphi^{(t)} = 60^{-t}$ is the thinning index of tier t, so $\varphi^{(1)} = 1/60$, $\varphi^{(2)} = 1/3600$; 60^{n+t} raises the perpetual power one sexagesimal order per tier, n the excitation state; tiers are derived, $T_k^{00} \equiv T_{k-2}^{00}$, $P_k \equiv P_{k-2}$, $T_\ell^{00} \equiv T_{\ell-4}^{00}$, $P_\ell \equiv P_{\ell-4}$; g_i dimensionless weighting (not 2), ρ_i, T^{00} and $P\,60^n$ in J m^{-3} (clarification 9); EX the Exciternion, one factor per sector; $d\mu_{\mathcal{M}_{2880}}$ the induced measure on $\mathcal{M}_{2880}$.

Admissibility gate. With Γ as in (9),

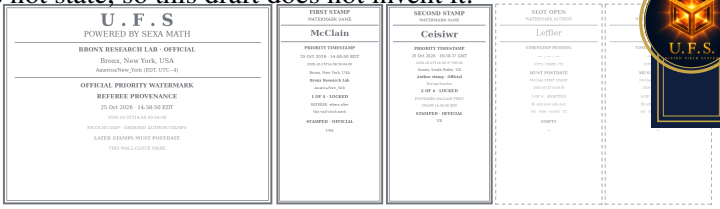
$$\Xi \text{ allowed} \iff (\bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W})(\Xi) = \Xi, \qquad \text{and then} \quad E = E_{\mathrm{SREF}}[\Xi]. \tag{51}$$

Mirroring the published layout (glyph chain written in front of the energy body, as on journal p. 25), but with the SREF-EX9D body in place of the 5D sketch:

$$E^{(\Gamma)}_{\mathrm{SREF}}[\Xi] = \int_{\mathcal{M}_{2880}} \left(\bigcirc\ \nabla\, \mathrm{K}\, \sigma\, \mu\, \mathbb{W}\right) \circ \left[\left(S_L\, S_T\, S_R\, S_B\right)^{1/4}\right] d\mu_{\mathcal{M}_{2880}}, \tag{52}$$

read as: the chain Γ gates Ξ via (51), then the bracket is the SREF-EX9D cross (45) in linear form. The body is SREF-EX9D, not the published 5D sketch. E_{SREF} sits inside the Γ gate: Γ never multiplies or composes with the integrand.

Glyphs and sectors. The glyphs are the six symbols of the JAM 9887 Formal Plate: $\bigcirc$ (Orr, radiant energy), ∇ (Na, flow dynamics), K (Ka, manifold logic), σ (Sa, symmetry and stress), μ (Mu, mass and memory), $\mathbb{W}$ (Wa, conscious observation). They are in this draft as $\Gamma = \bigcirc \circ \nabla \circ \mathrm{K} \circ \sigma \circ \mu \circ \mathbb{W}$ (9), written in front of the SREF-EX9D body in (52) exactly as the published paper wrote them in front of its 5D sketch. Author intent is that each glyph corresponds to a different part of the root equation; that intent is recorded. The only thing that remains open is the map from each individual glyph onto a specific part or sector of the SREF-EX9D cross, which the corpus does not state, so this draft does not invent it.



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OPEN O12. Glyph-to-part map of Γ onto SREF-EX9D sectors is not in the corpus; author to supply.

Status of inputs (SOURCE_SPEC_INCOMPLETE). SREF-EX9D v1.4 has no source input values. The following are OPEN, as in the closure report: the value and unit of EX; values of g_i; values of ρ_i, $T^{00}_{4,5}$, $P_{4,5}$; the value of n (integer or fractional); the SI unit of 720; the metric/embedding of $\mathcal{M}_{2880}$ and the unit of $d\mu$; sign handling when $S_L S_T S_R S_B < 0$ (the real fourth root is then undefined).

OPEN O13. Units. The centre is $\mathrm{J\,m^{-3}}$ only if $[\mathrm{EX}]\,[C^2_{\Omega,\mathrm{conv}}]^{1/4} = 1$; E is in J only if $[d\mu] = \mathrm{m}^3$, whereas an induced volume on 2880 length-valued coordinates carries m^{2880}. Until the metric is given, the units of E_{SREF} are not closed.

OPEN O14. Sign rule for a negative sector product (for example negative pressure). Any numerical run with declared inputs is ASSUMPTION_VARIANT, not a reproduction of SREF and not physical validation. SREF-EX9D is not complete.

13.1. Dimensional repair of the published form

For the record, the published (2) can be repaired as follows; this is not the root equation of this draft.

ASSUMPTION 7 (Conversion scale)**.** *There exist a time scale $\tau > 0$ and a volume scale $V > 0$ such that $u_j := P_j \tau 60^n / V$, $[u_j] = \mathrm{J\,m^{-3}}$. Equivalently $p_j = P_j / V$ and keep only τ:*

$$E_{\mathrm{SEXA}}[\Xi] = \int_{\mathcal{M}_5} \Big(\sum_{i=1}^{3} \rho_i c^2 + \sum_{j=4}^{5} \big(T^{00}_j + p_j \, \tau \, 60^n \big) \Big) \, d\mu. \tag{53}$$

In SREF-EX9D this issue is handled by declaring $P\,60^n$ in $\mathrm{J\,m^{-3}}$ (clarification 9), so τ is not needed there.

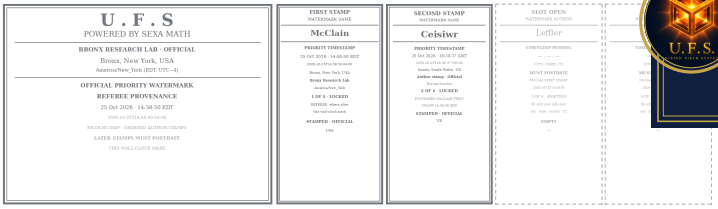
OPEN O4. Derive τ (and V) if the published form is kept anywhere.

OPEN O5. Superseded by O13 (measure on $\mathcal{M}_{2880}$).

13.2. Relation between SREF-EX9D and the JAM 9896 functional

Item	JAM 9896 (35)	SREF-EX9D (45)
Condensed sectors	$\sum_{i=1}^{3} g_i \rho_i (\mathrm{EX}) C^2_\Omega$	$S_L = \mathrm{EX} \sum_{i=1}^{3} g_i \rho_i C^2_{\Omega,\mathrm{conv}}$, same content with EX as a factor
Perpetual sectors	$\sum_{j=4}^{5} (T^{00}_j + P_j \Pi_{2880} \lvert\lambda_j\rvert^n)$	$S_R = \mathrm{EX} \sum_{j=4}^{5} (T^{00}_j + P_j 60^n)$, no Π_{2880}
Thinner tiers	absent	S_T ($k = 6, 7$), S_B ($\ell = 8, 9$), derived from 4:5
Combination	sum	geometric mean $(S_L S_R S_T S_B)^{1/4}$
Domain	$\mathcal{M}_{2880}$	$\mathcal{M}_{2880}$
Γ	written in front of the bracket	separate gate (51)

Two structural differences matter. First, a sum and a geometric mean behave differently: in a sum a vanishing sector drops out, in the geometric mean a vanishing sector sends the whole integrand to zero. Second, SREF-EX9D omits Π_{2880}; the 2880-sector compression enters only through the domain



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$\mathcal{M}_{2880}$. Whether Π_{2880} should multiply P inside S_R, S_T, S_B is an author decision (OPEN O23). Under Proposition 12.1, inserting $\Pi_{2880} = 10^{-1225}$ would make the perpetual parts of S_R, S_T, S_B negligible, leaving $\Pi^\circ \approx \mathrm{EX}\,(S'_L\,T'_R\,T'_T\,T'_B)^{1/4}$ built from T^{00} alone.

13.3. Properties of the closure Π°

Proposition 13.1. *Let $S_L, S_R, S_T, S_B > 0$. Then*

(i) *Π° is positively homogeneous of degree one: scaling all four arms by $c > 0$ scales Π° by c. With one EX factor per arm, Π° carries exactly one power of EX.*

(ii) *$\min(S_\cdot) \le \Pi^\circ \le \frac{1}{4}(S_L + S_R + S_T + S_B)$ (AM-GM).*

(iii) *$\partial \log \Pi^\circ / \partial \log S_X = \frac{1}{4}$ for each arm: every arm has equal elasticity.*

(iv) *If T^{00} terms are negligible against the P terms in the three perpetual arms, then $S_T \approx 60\,S_R$ and $S_B \approx 3600\,S_R$ (tiers carry 60^{n+1} and 60^{n+2} with the same P), so $\Pi^\circ \approx (S_L S_R^3)^{1/4} \cdot (60 \cdot 3600)^{1/4} = 21.56\,(S_L S_R^3)^{1/4}$.*

Proof. (i) to (iii) are standard for geometric means. For (iv), $60 \cdot 3600 = 216000$ and $216000^{1/4} = 21.558$. □

Item (iv) shows Fix F1 in the root equation: at $n = 0$ the tier factors are 60^1 and 60^2, not 0; the perpetual sector is amplified, not suppressed, in the limit the published papers call "weak recursion".

14. Unified Recursive Manifold Dynamics folded in: collapse operators, triality-structured exciter geometry, and the DDF spread

14.1. Source and how it is used

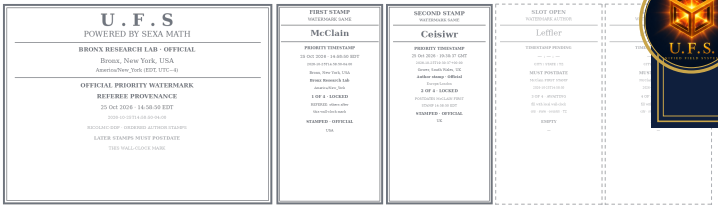
The URMD master peer-review edition [22] (63 pages, dated 18 October 2025; prior Zenodo deposit withdrawn/unavailable; cited from the authors' local historical archive; this unified preprint's OSF Preprints DOI is 10.17605/OSF.IO/WNV67) is a compilation of four earlier documents: (a) a short paper giving the five-dimensional energy integral, its color map, axioms and a nine-test falsifiability matrix (pp. 2 to 6); (b) "The Nine-Criteria Unified-Field Framework (v2)" (pp. 8 to 30); (c) "Topological Collapse and Self-Coherence" (pp. 31 to 55), which introduces dimensional thinning, the Exciternion replacement for tensors, Criterion X and a set of engineering equations; and (d) the CCT/SEXA to Sigmatics correspondence report (pp. 56 to 63). The copy received is largely image based; its content was read by optical character recognition and checked against the page images. Its byline, contact address, website and program name are historical and are not used here (Section 6).

This section keeps the URMD material that strengthens the manifold, Exciternion and collapse layers of the stack, applies Fixes F1, F2 and F3 wherever URMD touches them, and records the remainder in Section 14.7. Where URMD repeats JAM 9896 (the 5D functional, C_Ω, the Sigmatics means) the JAM 9896 treatment and its corrections are referenced rather than duplicated.

14.2. The URMD five-dimensional integral and its repair

Published (URMD pp. 2, 9, 12).

$$E_{\text{total}} = \int_{\mathcal{M}} \Big(\sum_{i=1}^{3} \rho_i c^2 + \sum_{j=4}^{5} \big(T_j^{00} + P_j\, 60^n\big) \Big)\, d\mathcal{M}, \tag{54}$$



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with $\mathcal{M}$ "the 5D spacetime manifold", ρ_i in kg m^{-3}, T_j^{00} and P_j in J m^{-3} (the abstract also calls P_j "power contributions"), 60^n dimensionless, and $d\mathcal{M}$ "5-D differential volume (m^5)" with "all dimensional checks return [J]". The Final Theory form (pp. 32 to 34) makes every term Exciternion resolved, $\rho_i(\mathrm{EX})$, $T_j^{00}(\mathrm{EX})$, $P_j(\mathrm{EX})$, $60^{n(\mathrm{EX})}$, over a "logic-indexed manifold measure" $d\mathcal{M}_5$. This is the direct ancestor of the JAM 9896 functional (35); JAM 9896 adds g_i, Π_{2880}, $|\lambda_j|$ and replaces c by C_Ω.

Repairs.

1. **F2 (power).** P_j is an energy density in J m^{-3} in every corrected formula. The phrase "power contribution" is replaced by "sustained excitation density". If a time-averaged power density p_j in W m^{-3} is intended, then $P_j = p_j\tau_j$ with a stated time scale τ_j (the 60-tick period of URMD Axiom 1 is the natural candidate; OPEN O30).
2. **F15 (measure).** An integrand in J m^{-3} integrated against m^5 gives J m^2, not J. The two statements "$d\mathcal{M}$ in m^5" and "the integral yields J" are inconsistent. The repair adopted: $d\mathcal{M} = d^3x\, d\mu_{45}$ with d^3x in m^3 and $d\mu_{45}$ a dimensionless probability measure on the time and logic coordinates ($\int d\mu_{45} = 1$). Then (54) is in joules and the fourth and fifth coordinates act as an average, consistent with URMD's own description of the fifth dimension as "a recursive excitation index", not a spatial extent.
3. **F3 (gate).** Where URMD or JAM 9896 writes $\Gamma \circ [\cdots]$, the gate acts on the configuration: the integral is evaluated on $\Xi \in \mathrm{Fix}(\Gamma)$, Eq. (37).
4. **F1 (limit).** At $n = 0$, $60^n = 1$ and the perpetual term is $T_j^{00} + P_j$, fully present. URMD §4.3 ("at recursion depth $n = 0$ it equals unity; as n increases, energy ratios compress logarithmically") is half right: the value at $n = 0$ is correct, but for $n > 0$ the factor grows as 60^n; it does not compress. The "intrinsic damping" and "self-normalization" readings are withdrawn.

The corrected URMD integral is therefore

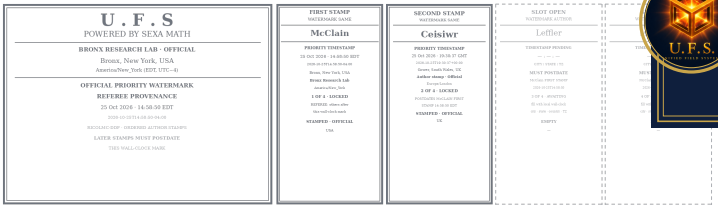
$$E_{\mathrm{URMD}}[\Xi] = \int_{\mathbb{R}^3}\int \left(\sum_{i=1}^{3} \rho_i c^2 + \sum_{j=4}^{5} \left(T_j^{00} + P_j\, 60^n\right) \right) d\mu_{45}\, d^3x, \qquad \Xi \in \mathrm{Fix}(\Gamma), \tag{55}$$

which is (37) with $g_i = 1$, $\Pi_{2880} = 1$, C_Ω replaced by c, and the domain $\mathcal{M}_5$ given an explicit product measure.

The worked example (URMD Appendix A.4), recomputed. URMD takes $\rho_1 = 1.0 \times 10^3$ kg m^{-3}, $T_4^{00} = 4.0{\times}10^{16}$ J m^{-3}, $P_4 = 2.0{\times}10^{12}$ J m^{-3}, $n = 1$, and reports $E/V = 9.0{\times}10^{10}{+}4.0{\times}10^{16}{+}1.2{\times}10^{14} \approx 9.004 \times 10^{10}$ J m^{-3} with a perpetual share of 0.004%. Correctly, $\rho_1 c^2 = 10^3 \times (2.998 \times 10^8)^2 = 8.99 \times 10^{19}$ J m^{-3}, so

$$E/V = 8.988 \times 10^{19} + 4.0 \times 10^{16} + 1.2 \times 10^{14} = 8.992 \times 10^{19}\ \mathrm{J\,m^{-3}},$$

and the perpetual share is $4.012 \times 10^{16}/8.992 \times 10^{19} = 4.46 \times 10^{-4}$, i.e. 0.045%. The published sum is also internally inconsistent (a total smaller than one of its terms). Fix F16. The qualitative conclusion (the perpetual term is a small correction at these inputs) survives; the inputs themselves are illustrative and not measured.



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14.3. Dimensional collapse operators

Published (URMD pp. 32 to 33, 59 to 61). Higher dimensions "exert exponentially smaller but non-zero influence"; fields "collapse, not compactify", "retaining informational continuity without spatial extension". The operational dimension count is $D = (3_{\text{space}}, 1_{\text{time}}, 1_{\text{logic}}) = 5$, the fifth coordinate being "a recursive excitation index that determines which field is expressing which phase of energy". The thinning is written as a product over $\ell = 5, \ldots, 2880$ of Ψ_ℓ/Φ_ℓ^2 with exponent $1/(2880-4)$, and the Sigmatics report gives a measured cascade $256 \to 96 \to 32 \to 7 \to 3 \to 1$.

Formalization. Write the structural configuration space as a tower $\mathcal{X}_{2880} \to \mathcal{X}_{2879} \to \cdots \to \mathcal{X}_5$.

Definition 14.1 (Collapse operator)**.** *A* collapse operator *at level ℓ ($5 < \ell \le 2880$) is a pair (C_ℓ, w_ℓ) where $C_\ell : \mathcal{X}_\ell \to \mathcal{X}_{\ell-1}$ is surjective and $w_\ell \in (0,1]$ is a dimensionless thinning weight, such that the energy carried by level ℓ is passed down as $E_{\ell-1}[C_\ell \Xi] = E_{\ell-1}^{\text{own}}[C_\ell \Xi] + w_\ell\, E_\ell^{\text{carried}}[\Xi]$. The* total collapse *is $C = C_6 \circ C_7 \circ \cdots \circ C_{2880} : \mathcal{X}_{2880} \to \mathcal{X}_5$, with total weight $W = \prod_\ell w_\ell$.*

Proposition 14.2. *(i) If $w_\ell = \psi_\ell^{\delta_\ell}$ (JAM 9896) or $w_\ell = \Psi_\ell/\phi_\ell^2$ (JAM 9880 and URMD), then $W = \Pi_{2880}$ in the corresponding form, and the total collapse C is the reduction map R of Eq. (39).*

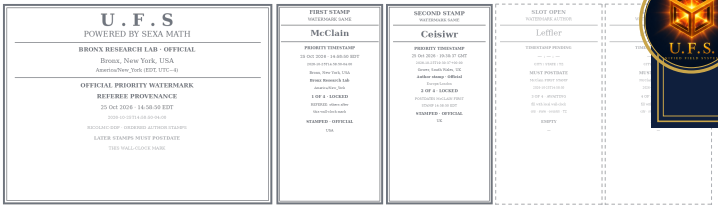
(ii) If every $w_\ell = w$ is constant, $W = w^{2875}$ for the 2875 maps $C_6, \ldots, C_{2880}$ (or w^{2876} if the product runs over $\ell = 5, \ldots, 2880$ as published). With $w = 0.375$ this is 10^{-1225} (Proposition 12.1).

(iii) "Collapse without information loss" is equivalent to each C_ℓ being injective, hence bijective. A bijective C_ℓ between spaces of different dimension does not exist in the smooth category, and in the discrete category requires $|\mathcal{X}_\ell| = |\mathcal{X}_{\ell-1}|$. The Sigmatics cascade is strictly decreasing in cardinality ($256 > 96 > 32 > 7 > 3 > 1$), so it is not lossless. URMD's "informational continuity" therefore holds only in the weaker sense that each level contributes a nonzero weight $w_\ell > 0$.

Proof. (i) is the definition of Π_{2880} as a product of per-sector factors (Eq. (41)). (ii) is direct: $2876 \log_{10} 0.375 = -1225.1$. (iii): a map that loses no information is injective; a surjective injective map is bijective; smooth bijections between manifolds of different dimension do not exist by invariance of domain, and finite bijections need equal cardinality. □

Per-step rate. If the Sigmatics reduction $256 \to 1$ is spread uniformly over 2876 steps, the per-step ratio is $(1/256)^{1/2876} = 0.99807$, exponent -0.00193 per step, as URMD states. This is a different model from $w = 0.375$ per step; the two differ by more than 1200 orders of magnitude in W. Which one describes the physical collapse is OPEN O31. The geometric mean ratio of the measured five-step cascade is $(1/256)^{1/5} = 0.330$, as reported.

Criterion X as a fixed-point statement. URMD Criterion X ("the energy manifold must be self-consistent even if all observer states are removed"; "the system must close on itself") is formally $\lim_{\theta,\varphi \to 0} E_{\text{total}}^{(5)}$ exists and is finite. Under RICOLMC-DDF it is read as: there is $\Xi^* \in \text{Fix}(\Gamma)$ with no observer coordinate, and $E_{\text{URMD}}[\Xi^*] < \infty$. That is OPEN O1 plus finiteness of (55). The URMD sentence "once Criterion X holds, nothing else is required; the theory is complete" is withdrawn: existence of one closed configuration does not imply completeness in the sense of Definition 6.1.



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Collapse horizon. URMD §5.2 and §6.4 define an observer-weighted reality functional on a slice,

$$R(\mathbf{x}_{\text{obs}}) = \int \frac{\sum_i \rho_i c^2 + \sum_j (T_j^{00} + P_j 60^n)}{|\mathbf{x} - \mathbf{x}_{\text{obs}}|}\, dV,$$

and read $R \to 0$ as topological collapse. Two corrections. First, the kernel $1/|\mathbf{x} - \mathbf{x}_{\text{obs}}|$ is integrable in two and three dimensions, so R is finite for bounded densities; it is zero only if the integrand vanishes almost everywhere, i.e. no energy at all, which is a trivial collapse. Second, R has units J m^{-1} in 3D; it is a potential-like quantity, not a probability, and the reading "self-observation disappears" is interpretation, not consequence. The link to the Horizon Constant (Section 16) is that both ask when an observer can resolve structure; the facet model of Section 16.4 is the computable version.

14.4. Triality-structured exciter geometry

Published (URMD pp. 56 to 63). The Sigmatics 96-class system is addressed by three coordinates, $h_2 \in \{0,1,2,3\}$ (quaternion phase), $d \in \{0,1,2\}$ (triality twist) and $\ell \in \{0,\dots,7\}$ (octonion direction), with three transforms: R (rotate, $h_2 \mapsto h_2 \pm 1 \bmod 4$, $R^4 = \text{id}$), T (twist, $d \mapsto d \pm 1 \bmod 3$), M (mirror, flips the parity of ℓ). Claims: T "defines the 5-D orbit structure" with $32 = 2^5$ triality orbits; R "mixes orbits" as eight 4-cycles with shift orbit $\mapsto$ orbit + 24 mod 32; M partially mixes orbits and introduces chirality; "32 orbits = 8 (octonion directions) ×4 (quaternion rotations)"; reachability grows as $4, 9, 16, 24, 32$ classes in 1 to 5 steps.

What can be proved from the stated coordinates.

Proposition 14.3. *Let $\mathcal{K} = \mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$ ($|\mathcal{K}| = 96$) with $R(h,d,\ell) = (h{+}1, d, \ell)$, $T(h,d,\ell) = (h, d{+}1, \ell)$, $M(h,d,\ell) = (h, d, \ell \oplus 1)$ where $\oplus 1$ flips the lowest bit.*

(i) $\langle T \rangle \cong \mathbb{Z}_3$ acts freely on $\mathcal{K}$, so $\mathcal{K}/\langle T \rangle$ has exactly $96/3 = 32 = 2^5$ orbits, indexed by $(h,\ell) \in \mathbb{Z}_4 \times \mathbb{Z}_8$. This is the published 32-orbit space, and $32 = 4 \times 8$ as stated.

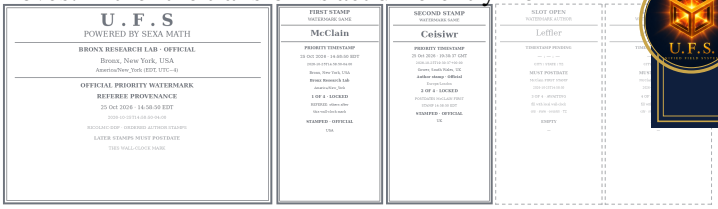
(ii) R acts on $\mathcal{K}/\langle T \rangle$ with all orbits of length 4, giving $32/4 = 8$ cycles of length 4, as published. In the index $o = 8h + \ell$ the action is $o \mapsto o + 8 \bmod 32$; three applications give $o \mapsto o + 24 \bmod 32$, which is the published shift and equals R^{-1}.

(iii) T commutes with R and M, so the three transforms generate an abelian group $G = \mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_2$ of order 24. Its orbits on $\mathcal{K}$ have size 24, and there are $96/24 = 4$ of them, indexed by $\ell \bmod 8$ up to the lowest bit, i.e. by $\lfloor \ell/2 \rfloor \in \mathbb{Z}_4$.

(iv) Starting from one class and applying $R^{\pm 1}, T^{\pm 1}, M$, the number of classes reached within $k = 1,\dots,5$ steps is $6, 15, 22, 24, 24$. The reachable set never exceeds 24; the 96-class space and the 32-orbit space are not reached from a single class by these transforms alone.

Proof. (i) T moves d only and $\mathbb{Z}_3$ acts freely on itself. (ii) R moves h only, freely of order 4; with $o = 8h + \ell$, $h \mapsto h + 1$ is $o \mapsto o + 8$. (iii) The three maps act on separate coordinates (M on the lowest bit of ℓ), so they commute; $|G| = 4 \cdot 3 \cdot 2$, and G acts freely, so every orbit has 24 elements. (iv) Breadth-first enumeration (script in `urmd_src/`); the ball saturates at the G-orbit. □

So the orbit structure claims (i) and (ii) are correct and now proved; the claim that M "partially mixes" orbits is correct in the sense that M preserves $(h, \lfloor \ell/2 \rfloor)$ and swaps pairs; but the published reachability sequence $4, 9, 16, 24, 32$ is not reproduced by the stated moves. Either the transforms act differently from



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the description (for example, M acting on all of ℓ rather than its parity), or the sequence counts something else. OPEN O32.

Corrections to the numerical correspondences.

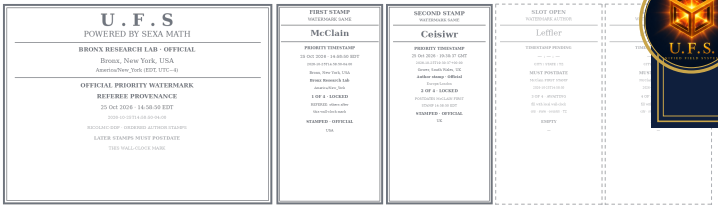
1. $C_\Omega = \sqrt{2880/4} = \sqrt{720} = 26.833$ is correct (F8). The line "$C_\Omega = \sqrt{720 \times 4} = \sqrt{2880}$" is wrong: $\sqrt{2880} = 53.666 = 2C_\Omega$. Fix F17.
2. "$C_\Omega/c = 26.83$, superluminal propagation" is withdrawn. C_Ω is a pure number (F8); a ratio of dimension counts is not a speed, and "moves exactly 1 unit per transform" defines a graph distance, not a velocity.
3. $60^{18.86} = 10^{33.54} = 3.4 \times 10^{33}$ and $60^{18.86/32} = 11.17$: arithmetic correct. These are values of the factor 60^n, which under F1 only amplifies. No "cosmological scale" identification is derived.
4. $2876 \times 18.86/32 = 1695.0$; $96 \log_2 96 = 632.2$ bits; $632/2048 = 30.9\%$: arithmetic correct, given the counting convention that each of 256 Clifford basis elements carries 8 bits, which is not justified in the source.
5. $3/8 = 0.375$ against $1/e = 0.368$ and $1/\varphi^2 = 0.382$: a 1.9% and 1.8% coincidence; the exact value is rational and comes from the count 96/256. It is not evidence of an exponential law.
6. "Proven", "direct structural equivalence" and "empirical verification complete" are replaced by "reported" (as in Section 17.9). The orbit counts in Proposition 14.3(i) and (ii) are now proved; the means 47.50, 35.97, 18.86 remain unreproducible without the underlying data (O25).

The Exciternion as a triality-structured object. URMD §2.2 replaces tensors by $\mathrm{EX}(\theta, \varphi, n)$ (tick phase, thinning index, excitation state) with the rule $\mathrm{EX}_a \cdot \mathrm{EX}_b = \mathrm{EX}_{a+b} \cdot 60^n$. Under RICOLMC-DDF, Proposition 14.3 gives this a concrete carrier: an Exciternion state is a class $(h, d, \ell) \in \mathcal{K}$ together with a depth n, so $\mathcal{S} \subseteq \mathcal{K} \times \mathbb{N}$ in the language of Eq. (40). ASSUMPTION: the product rule is additive in the class coordinates and multiplies by 60 per unit of depth, $\mathrm{EX}_{(k,n)} \cdot \mathrm{EX}_{(k',n')} = 60^{\,n+n'-N(k,k')} \mathrm{EX}_{(k+k',N(k,k'))}$ for some depth assignment N. The published rule, with one n on the right, is ambiguous about whose depth is used; if $N = n+n'$ it is associative and the factor is 1, so the 60^n in the published rule must come from a nontrivial N (OPEN O33). This does not replace tensors: the claim that the rule "immediately eliminates metric dependence" is withdrawn, since no metric, connection or derivative appears, and Proposition 11.15 still applies.

Spinor projection. The reported chain "8-D spinor space ($\ell \in \{0..7\}$) → 5-D exciter (32 orbits) → 3-D operational" is, in Proposition 14.3, the quotient $\mathcal{K} \to \mathcal{K}/\langle T \rangle \to \mathcal{K}/G$. These are quotients of a finite set, of sizes 96 → 32 → 4. Calling the 32-orbit set "5-dimensional" means it is addressed by 5 bits; it is not a 5-dimensional manifold. The identification with $\mathcal{M}_5$ of JAM 9896 is a naming convention, recorded as ASSUMPTION, and the smooth structure of $\mathcal{M}_5$ is OPEN O13.

14.5. The density, dimension and field spread (DDF)

The URMD abstract assigns colors to the five sectors of (54). Under RICOLMC-DDF this becomes the DDF spread: each sector is a triple (density slot, dimension index, field label).



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Color	Sector	Density slot	Dimension index	Field label and status
Red	$i = 1, 2, 3$	$\rho_i c^2$ (condensed), $\mathrm{J\,m^{-3}}$	1, 2, 3: height, depth, width (space)	Strong, weak, electromagnetic. Assignment is a labeling; no gauge group is derived (Section 14.6).
Green	$j = 4$	$T_4^{00} + P_4\, 60^n$ (perpetual)	4: time	Gravity field. **Not derived here.** Slot carried, deferred.
Purple	$j = 5$	$T_5^{00} + P_5\, 60^n$ (perpetual)	5: logic, excitation index	Quantum or phase field. No Hilbert space or commutator derived (Section 12.5).

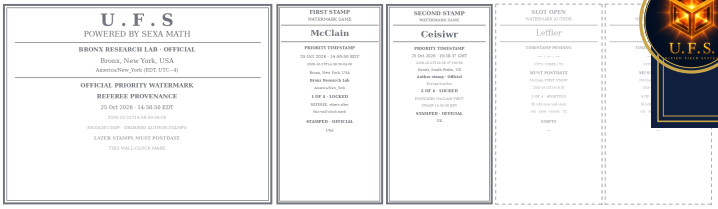
Three remarks fix the reading.

1. **Density and dimension are not the same index.** URMD writes "dimension/density 1, 2, 3". In RICOLMC-DDF the sector label s indexes a density term, while the dimension index says along which coordinate of $\mathcal{M}_5$ the sector is supported or varies. The color map asserts a bijection between them for $s = 1, \ldots, 5$; that bijection is a postulate (ASSUMPTION), and it is the natural place where RICOLMC-DDF meets SREF-EX9D: Red feeds the arm S_L and Green plus Purple feed S_R in Eq. (45). This is a sector-to-arm assignment already present in the frozen root equation. It is *not* a glyph-to-arm map; that remains author-supplied (OPEN O12).
2. **Three condensed sectors along three spatial axes.** Assigning strong, weak and EM to height, depth and width is not rotation invariant: rotating the frame would exchange forces. If the assignment is kept, the three sectors must be summed (as in (55)) so that only the rotation-invariant total enters, and the axis labels are bookkeeping. OPEN O34.
3. **Green is a deferred field case.** Gravity sits in the DDF spread with a density slot and a dimension index, which is exactly what RICOLMC-DDF needs for completeness bookkeeping (clause C4). The spread does not supply a metric, curvature, or G. The URMD Final Theory also lists a tachyonic perpetual field; it is not carried in the DDF spread (Section 14.7).

14.6. The URMD limit, gauge and renormalization claims

URMD Sections 2, 3, 6 and 7 state that the integral reduces to Newtonian gravity ($\nabla^2\phi = 4\pi G\rho$), to special relativity with Maxwell's equations, and to five-dimensional Einstein equations $G_{AB} = (8\pi G_5/c^4)T_{AB}$; that an Exciternion group G_{EX} contracts to $SU(3) \times SU(2) \times U(1)$ as $n \to 0$; that $R_{ABCD} = \kappa F_{AB} F_{CD}$ (metric to gauge duality); and that a beta function $\beta(n) = -\ln 60/(1 + \alpha n)$ gives asymptotic freedom. In the corrected stack:

- **No limit follows.** Eq. (55) is ultralocal (no derivatives), so by Proposition 11.15 it yields no Poisson equation, no wave equation and no propagator. The Einstein and Maxwell equations quoted in URMD come from an action $S = \int \mathcal{L}_{\mathrm{SEXA}}\, d\mathcal{M}$ whose Lagrangian is never written; varying an unstated Lagrangian derives nothing. URMD §2.1 sets $T_j^{00} = P_j = 0$ by hand in the weak field; with F1 the 60^n factor does not do this. Kill-switches K1 to K3 stand.
- **No gauge group.** G_{EX} is defined by structure constants "encoding the 60-state lattice" that are not given. A contraction to $SU(3) \times SU(2) \times U(1)$ requires a Lie algebra and a contraction parameter; neither is specified. The relation $R_{ABCD} = \kappa F_{AB} F_{CD}$ has the antisymmetries and pair symmetry



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of a curvature tensor (for an abelian F), but it does not satisfy the first Bianchi identity $R_{A[BCD]} = 0$ for general F, since $F_{A[B}F_{CD]} \neq 0$; for a non-abelian F the right side is matrix valued and needs a trace. As written it is not a curvature tensor. Withdrawn.

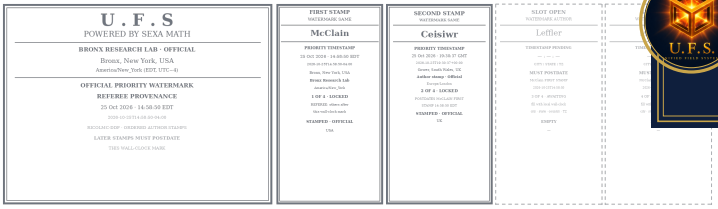
- **Cross terms.** URMD §3.4 introduces $C_{ij} = \partial(\rho_i c^2)/\partial T^{00}_j$ as "energy exchange tensors". These are partial derivatives of one density with respect to another and require a constitutive relation between them, which is not given. If such cross terms exist, the additive DDF decomposition (C4) fails and the URMD falsifier F-4 (field partition) is triggered by the theory itself. OPEN O35.
- **No renormalization claim.** The beta function is postulated, not computed from a quantum theory. The claim that 60^n is a "self-regulating cutoff" contradicts F1 (60^n grows). Withdrawn.

14.7. URMD claims recorded but not re-certified

The following URMD items are kept as historical record. None is a result of this draft, and none counts toward the score.

1. The nine-criteria checklist and "satisfies all nine recognized criteria" (URMD pp. 8 to 30). Each criterion statement asserts its own conclusion. The nine criteria are retained as a test list; their status is OPEN, not PASS (Fix F18).
2. Criterion X and "Final Theory" (pp. 34, 49 to 52). Recast as a fixed-point question (Section 14.3).
3. Spectral plateaus in "Donald Dynamo Photon Reactor" data at ratios 60^k; the simulated table $1, 59.1, 3597, 215800$ against $1, 60, 3600, 216000$; frame-dragging deviations of 10^{-12} rad s^{-1} (pp. 19, 25, 26). No data, code or instrument description is supplied; the predicted column is the definition of 60^n, so agreement with it tests the simulation, not the physics. To be supplied under K4 and K5.
4. The Quantum Propulsion equation, the negative resistor $Z_{\mathrm{EX}} = -R$, the choke chain $E = (E_{\mathrm{in}}\Sigma G_i)\, e^{\Sigma R_i/\tau_i} \times 2700 \times 960 \times \Pi S_k \times 90$, tachyonic speeds $v_{\mathrm{tach}} = C_\Omega 60^{n_{\mathrm{tach}}}$, "FTL transmissions", event-horizon engineering (pp. 36 to 44). Energy conservation applies (K6); the choke chain multiplies an input by 2.3×10^8 times unspecified factors, and its output must be metered against all inputs before any claim.
5. "Peer review requires an AI" and the CookieTush kernel (pp. 45 to 48). Withdrawn. Every item in this draft is stated so that a human referee can check it.
6. The ranking of other programs ("Not GR, not QFT, …") on URMD pp. 39, 41 is kept as historical rhetoric only, not as a scored result. The sentence "SEXA surpasses Einstein" is *not* withdrawn under RICOLMC-DDF. In the most mathematical sense of this draft (Definition 6.1 and the Recursive Hyperstructural Computational Completeness Theorem, Book IX §9.5.6), the stack claims a stronger object than Einstein's program: an executable, admissible, reconstructable completeness gate across declared domains (including liquidity and Γ-gated resource flows), rather than a metric field theory of one force. That claim is mathematical and computational, and its status is CONDITIONAL (unproved comparison, Section C). It does not assert recovery of Einstein's equations, G, or gravity (still deferred, Green sector). Physics is not the judge of it (Section 6.7).
7. The Financial Analog and psycholinguistic tick-independence tests (F-8, F-9 of the URMD matrix) are kept as optional interdomain tests under the synthetic and empirical separation of Section 6.7.

The URMD falsifiability matrix F-1 to F-9 and its adjudication rule ("any single failure falsifies for that domain"; "two independent laboratories must reproduce F-1 to F-5") are retained in spirit and merged



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with K1 to K7. Under the corrections above, F-1 (units) is passed only after F2 and F15; F-6 (known limits) is not passed (K1 to K3).

15. Interdomain finance: Γ-admissible market evaluation

Revision 8 status (F08, P09). The mapping between the formal Γ operators (Sections 7, 8) and the market predicates used by the collector and prototype is UNESTABLISHED (OPEN O45): the market predicates reuse the glyph names and order, but no theorem shows they are the formal operators or that market admission implies (C1)–(C4) for a liquidity domain. E_{fin} remains NOT_EVALUATED. Results here are executable applications, not completeness evidence.

Status within the program. This section applies the Γ gate to market data by executable prototype. It is evidence by example and is subordinate to the mechanized Γ-spine judgement of Section 7, which is the proof-level pillar.

15.1. Purpose: arithmetic and computational power of the stack

This section shows what the SEXA stack does arithmetically and computationally when it is pointed at a second domain. The same ordered gate Γ, the same Σ_{60} sexagesimal timing, the same C_Ω and Π_{2880} objects, and the same fail-any rule run on market ticks without change of form. The evidence here is synthetic and computational in the sense of Section 6.7: a live public tick stream, a stated functional, and executable code that admits or kills every tick. It is completeness and admissibility evidence in the finance domain. It is not physics, not a trading signal, not alpha, and not investment advice. It does not move the gravity score (6.75/19). Sources: FIN Papers I to IV [24, 25, 26, 27] and the Γ-SEXA Unified Financial Energy Functional sheet [28]. The URMD Financial Analog test F-8 (Section 14) is answered here.

15.2. The financial energy functional

As uploaded in [28], in full bracket form (glyph chain written protocol-exact as $(O \triangle K\, O\, \mu\, W)$; the same ordered operators as $\bigcirc\nabla \mathrm{K}\sigma\mu\mathbb{W}$ elsewhere in this draft):

$$E^{(\Gamma,\Omega,\mathrm{EX},2880D)}_{\text{fin/SREF}}(t)[\Xi] = \int_{\mathcal{M}_{2880}} \Big((O \triangle K\, O\, \mu\, W) \circ \mathcal{F}_{\text{fin/SREF}}(t) \Big)[\Xi]\, d\mu_{\mathcal{M}_{2880}}\,. \tag{56}$$

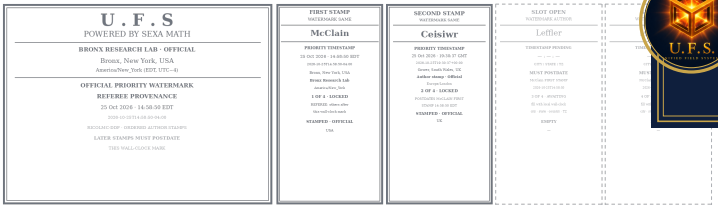
$$\begin{aligned} \mathcal{F}_{\text{fin/SREF}}(t) = {} & \left[60^{\theta(t)} \prod_{\ell=1}^{F} \frac{\Psi_\ell(t)}{\phi_\ell(t)} \exp\!\left(\sum_{g=1}^{L} \sum_{k=1}^{K} \gamma_{gk} \cos \Theta_{gk}(t) \right) \right] \\ & \circ \left[\sum_{i=1}^{3} g_i \rho_i(\mathrm{EX})\, C_\Omega^2 + \sum_{j=4}^{5} \left(T_j^{00}(\mathrm{EX}) + P_j(\mathrm{EX})\, \Pi_{2880}\, |\lambda_j|^n \right) \right], \end{aligned} \tag{57}$$

with the auxiliary closures

$$\Pi_{2880} = \prod_{\ell=5}^{2880} \psi_\ell^{\delta_\ell}\,, \qquad |\lambda_j| = 60\,, \qquad C_\Omega = \sqrt{\frac{2880}{4}} = \sqrt{720} \approx 26.833 \quad (\text{F17; not } \sqrt{2880})\,, \tag{58}$$

and the admissibility fixed point

$$(O \triangle K\, O\, \mu\, W)[\Xi] = \Xi\,. \tag{59}$$



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Here F is the number of market factors or venues, Ψ_ℓ the signed order-flow pressure, $\phi_\ell > 0$ the depth (cost) of factor ℓ, Ψ_ℓ/ϕ_ℓ the flow-to-depth stress ratio, L regime bands, K harmonics per band, γ_{gk} weights and Θ_{gk} phases. The second bracket is the SREF energy integrand of Eq. (37) with its units and Π_{2880} reading as corrected in Section 12.2. The uploaded sheet [28] is the visual source of Eqs. (56)–(59); it is cited, not reprinted as a closing figure.

OPEN O36. The composition "$\circ$" between the market bracket (dimensionless) and the SREF bracket ($\mathrm{J\,m^{-3}}$) is not defined as a product or a map; and Eq. (56) needs the 2880 sector fields $\rho_i, T^{00}_j, P_j, \psi_\ell, \delta_\ell$ on $\mathcal{M}_{2880}$. These are not supplied. E_{fin} is therefore **NOT_EVALUATED** in this draft, in the code, and in the collector.

15.3. Reduced operational layer

The executable layer [24, 25, 26, 27] keeps the market bracket and the gate and drops the unevaluated integral. For a tick x_t with F factors:

$$S(t) = \prod_q \frac{\psi_q}{\phi_q} \exp\Big(\sum_q \gamma_q \cos\Theta_q\Big), \qquad H(t) = \sum_q \gamma_q \cos\Theta_q, \tag{60}$$

$$R(t+1) = \Lambda\, R(t)\, \Gamma(x_t), \qquad \Lambda = 0.92, \qquad R := 0 \text{ on kill.} \tag{61}$$

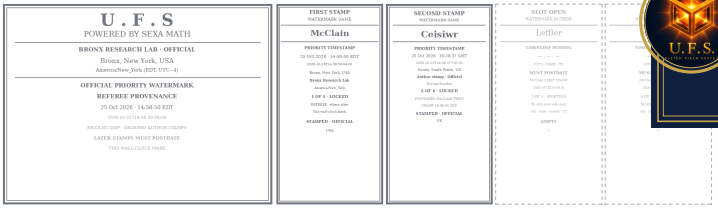
$\Lambda = 0.92$ is a project operational constant, not derived. Default phases $\Theta_q(t) = 2\pi t/60^q$ (sexagesimal cyclic scaling) and default weights $\gamma_q = 1/F$ are UNFITTED. Γ is applied first, fail-any, in order: $\bigcirc$ existence (named venue, $|\psi| = |\phi| > 0$); ∇ flow (all $\phi_q > 0$); K manifold (mid > 0, spread ≥ 0); σ symmetry (book consistent, spread/mid ≤ 0.08); μ memory (book not all zero); $\mathbb{W}$ witness ($t \geq 0$). A killed tick has S undefined: admit, then compute. Five regime classes are assigned with stress $= \max_q |\psi_q/\phi_q|$: *inadmissible*; *liquidity fracture* (stress > 4 and $|R| > 2$); *recursive escalation* ($|R| > 1.5$); *transition phase* ($|H|$ large and stress > 1.5); *instability buildup* (stress > 1.2); otherwise *admissible stable*. "$|H|$ large" is $|H| > 0.75 \sum |\gamma_q|$, a prototype threshold. S is a gated arithmetic statistic. **S is not alpha.**

15.4. Run of the prototype

The 12-tick synthetic tape in `verify/fin/sexa_fin_proto.py` (listing in Appendix B) gives: ticks 0 to 7 admitted with $R = 0.92^{t+1}$ $(0.92, 0.8464, \ldots, 0.5132)$ and class admissible stable; tick 8 ($\phi_1 = 0$) KILLED at ∇, $R := 0$; tick 10 (spread 20 on mid 103) KILLED at σ; ticks 9 and 11 admitted with $R = 0$ (the kill is remembered). E_{fin} prints NOT_EVALUATED on every row. The official 240-tick tape is not attached (OPEN O37).

15.5. Live witness collector

The public UFS witness collector https://sexa-fin-collector2.spacetimemanhattan.workers.dev/ (schema SEXA-FIN-COLLECTOR-v1) runs a pre-trade filter on public level-1 quotes. It was scraped on 25 October 2026 at 05:36 EDT and again at 06:00 EDT (snapshots in `fin_src/` and `verify/fin/`). Between those reads, live rejected rose from 24,479 to 24,489 while live accepted stayed at 724: the gate kept killing, and no phantom rows appeared.



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Field	Value (06:00 EDT scrape)
Collector	ON (last poll 05:58:32 EDT)
Seed rows held	110
Live accepted	724
Live rejected	24,489
Display total (seed + rejected)	24,599
Live acceptance rate	724/25,213 ≈ 2.872%
Rejects per accept	≈ 33.8
Last reject reason	`flash_mid`
Last kill	Coinbase BTC-USD, mid 80,221.045, spread 0.01 (0.001 bps), source coinbase-public-l1, class REAL
E_{fin}	NOT_EVALUATED
`s_is_alpha`	false
`phantom`	false

What the witness data show. The collector is an append-only arithmetic log, not a backtest. Rule published with the schema: seed 110 held; every live row needs `ts`, `venue`, `mid`, `spread`, `killed_at`, `source`; PHANTOM never enters; S is not alpha; E_{fin} stays NOT_EVALUATED. Observed facts from the scrapes:

1. **Fail-any at scale.** About 34 rejects per accept. Most public L1 quotes fail at least one glyph of Γ before any S is computed.
2. **Stable accept count, rising reject count.** From 05:36 to 06:00 EDT, accepts stayed 724 and rejects rose by 10. The gate is selective, not random fill.
3. **Last kill is concrete.** Coinbase BTC-USD, mid ≈ 80,221, spread 0.01 (0.001 bps), reason `flash_mid`, class REAL. A named venue, a positive mid, a microscopic spread, and a stated kill reason: the audit trail the gate needs.
4. **No alpha leakage.** The API itself publishes `s_is_alpha: false` and `e_fin: NOT_EVALUATED`. This draft does not invent books for live ticks; S, H and R are reported only on the synthetic 12-tick tape in the prototype (Appendix B).

The finance code that implements the reduced layer and the 12-tick demo is listed in Appendix B (`verify/fin/sexa_fin_proto.py`). That listing, the live witness aggregates above, and Eqs. (56)–(59) are the three pieces of the finance fold: equation, executable gate, and public arithmetic log.

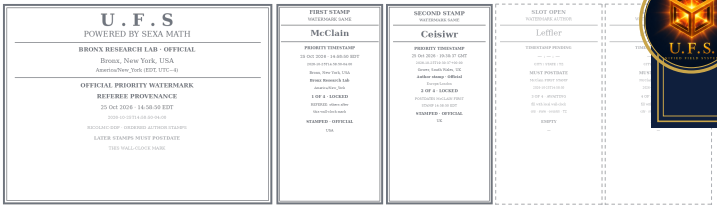
16. JAM 9915: the Horizon Constant Ω_{2880} and the Resolution Paradox

16.1. Role in the stack

JAM 9896 places all higher-dimensional structure in a finite product over 2876 sectors. JAM 9915 asks the corresponding geometric question: when does a finite, discrete structure become observationally equivalent to a continuum? It is the interpretive layer that would justify treating a finite recursive structure (2880 sectors, or 2880 surfaces) with continuum tools (a manifold $\mathcal{M}_{2880}$, an integral $d\mu$). This section restates the published development, repairs its formal core, and adds a geometric model that makes its claims computable.

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16.2. The published development, restated

Remedial 5D exercise: the Rubik's Cube (published §2). A Rubik's Cube appears to be one object but is "a structured assembly of discrete components organized around an internal skeleton": corners, edges, centers, screws, springs and core, "approximately sixty" parts (§2.2). The paper then asks what 2,880, 11,520 and 8,294,400 components can produce. Arithmetic relations, not stated in the paper: $11{,}520 = 4 \times 2{,}880$ and $8{,}294{,}400 = 2{,}880^2$. (A standard $3 \times 3 \times 3$ cube has 26 visible cubies: 8 corners, 12 edges, 6 centers; "approximately sixty" counts fasteners and core parts and is the author's count.)

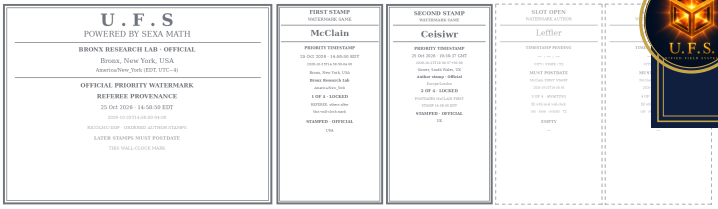
The Resolution Paradox (published §3). "The greater the number of discrete geometric elements present within a structure, the less observable the discreteness of the structure becomes." §3.1 (local flatness, global curvature) notes that each facet is flat while the assembly curves. §3.2 gives the polyhedral progression: cube, 6 faces; dodecahedron, 12 faces, 20 vertices, 30 edges; icosahedron, 20 faces, 30 edges, 12 vertices; recursive subdivision, 20 → hundreds → thousands. §3.3 (failure of intuition) and §3.4 (from Rubik's Cubes to manifolds) extend the point to manifolds.

The Horizon Constant (published §4). Ω_{2880} "does not represent a claim about a specific physical object"; it is "a conceptual benchmark describing the transition between observable discreteness and perceived continuity" and "emerges from the recursive expansion of the foundational SEXA value 2880". It separates Domain I (visible structure: individual surfaces, edges, vertices are identifiable) from Domain II (apparent continuity). §4.1 Horizon Principle: "every finite geometric structure possesses a resolution threshold beyond which its discreteness becomes observationally inaccessible"; the threshold "need not be identical for every observer". §4.2 Discreteness Continuum: Region A, low resolution (cubes, polyhedra, mechanical assemblies); Region B, intermediate (highly subdivided polyhedra, geodesic constructions, dense lattices); Region C, horizon resolution (finite but perceived as continuous). §4.3 Observer Problem: two observers of one structure may report discrete and continuous respectively, and "both descriptions are correct relative to the available information". §4.4 Emergence Hypothesis: "continuity may emerge from recursive finite organization rather than existing as a primitive geometric property". §4.5 asks the same of spacetime.

Skeleton Hypothesis (published §6). Surface thinking (§6.1), the Hidden Geometry Problem (§6.2), the Illusion of Simplicity (§6.3) and Recursive Organization (§6.4): visible form may be generated by an internal framework not visible from the surface.

Admissibility and continuity (published §7). §7.1 distinguishes possibility from admissibility; §7.2 the Admissibility Filter: of all possible arrangements, only those satisfying constraints persist; §7.3 revisits the cube as a constrained mechanism; §7.5 "continuity as a surviving state"; §7.6 the SEXA view of spacetime as an admissible, not assumed, continuum.

The observer (published §8). §8.1 Observer Limitation Principle; §8.2 geometry of ignorance; §8.3 Great Compression Principle: "perceived continuity may represent the compression of recursive complexity into an interpretable form"; §8.4 the paradox in its strongest form: "increasing structural complexity can generate decreasing observable complexity"; §8.5 the observer horizon; §8.6 the Rubik's Cube thought experiment.



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Formal statement (published §10, journal pp. 35-37). Let N be the number of discrete elements and $D(N)$ observable discreteness. The paper proposes $D(N) \propto 1/N$ with $\lim_{N\to\infty} D(N) = 0$ "while $N \neq \infty$". §10.1 defines perceived continuity $C(N)$ and writes "$C(N) \propto N$, or more generally $C(N) = 1 - D(N)$ after normalization", with a duality figure. §10.2 Horizon Condition: $D(N) < \varepsilon$, with ε "the minimum observable threshold of the observer". §10.3 Rubik Limit: for the cube $D(N) \gg \varepsilon$. §10.4 the Ω_{2880} regime: $D(N) \approx 0$ "for practical observation". §10.5 Resolution Paradox Theorem: "for any finite recursive geometric structure, there exists a subdivision threshold N_H such that $N > N_H$ implies the structure becomes observationally indistinguishable from a continuous manifold for a given observer."

Ladder and inversion (published §11, §12). Stage one, the cube: $D(N) \gg C(N)$; stage two, dodecahedron; stage three, icosahedron ("many observers casually describe an icosahedron as round"); then the emergence of apparent spheres. §12.2 Great Geometric Inversion: classical order Continuity → Curvature → Geometry is reversed to Recursive Organization → Apparent Continuity → Curvature.

Framework, predictions, program (published §13, §14, §17, §18, §20, §21). Five principles: Hidden Structure; Resolution Paradox; Horizon Constant; Admissibility; Emergent Continuity. Five predictions: continuity is not fundamental; observer dependence; emergent simplicity (gas, galaxy, manifold examples); hidden skeletons; horizon behavior. §14.6 falsification: the framework is weakened if (1) increasing recursive density fails to increase apparent continuity, (2) continuity is proven unable to emerge from recursive organization, (3) the Resolution Paradox is mathematically inconsistent, or (4) no observer-dependent horizon behavior is found. §17 research program: recursive manifold construction, the mathematics of the paradox, horizon threshold analysis, admissibility and geometric emergence, spacetime applications. §18 Horizon Postulate: "every sufficiently dense admissible recursive structure possesses a resolution threshold beyond which its discreteness becomes observationally inaccessible and its behavior becomes indistinguishable from continuity." §20 SEXA Connection and Rubik Principle: "the visible structure is not necessarily the fundamental structure"; central statement: "Geometry is not assumed. Geometry emerges from admissibility." §21 Horizon Emergence Theorem: if $N > N_H$ then $D(N) < \varepsilon$ for a given observer, so the structure is observationally indistinguishable from a continuous manifold.

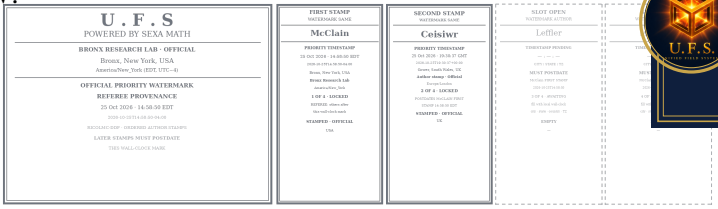
16.3. Repair of the formal core

Fix F6 (the $C \propto N$ contradiction). If $D \propto 1/N$ and $C = 1 - D$, then $C \to 1$ is bounded, so $C \propto N$ (unbounded) is false for large N. The two statements in §10.1 cannot both hold. This is exactly the failure named in the paper's own falsification item (3). It is repaired by dropping $C \propto N$.

Definition 16.1 (Normalized discreteness)**.** *For an observer with scale $N_0 > 0$ and exponent $\beta > 0$ (ASSUMPTION; values channel-dependent, Section 16.4), let*

$$D(N) = \min\left(1, \left(\frac{N_0}{N}\right)^{\beta}\right), \qquad C(N) = 1 - D(N), \qquad N \geq 1. \tag{62}$$

The published case is $\beta = 1$. Then $D \in [0, 1]$, D is non-increasing, C is non-decreasing, $C + D = 1$, and $\lim_{N\to\infty} D(N) = 0$ while every N considered is finite. This is the precise content of "$\lim D = 0$ while $N \neq \infty$": a limit of a sequence indexed by finite N.



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Proposition 16.2 (Resolution Paradox Theorem, corrected)**.** *Under Definition 16.1, for every $\varepsilon \in (0,1)$ set*

$$N_H(\varepsilon) = N_0\,\varepsilon^{-1/\beta}. \tag{63}$$

Then $N > N_H$ implies $D(N) < \varepsilon$ and $C(N) > 1-\varepsilon$. Conversely, $N \le N_H$ implies $D(N) \ge \varepsilon$. For $\beta = 1$, $N_H = N_0/\varepsilon$.

Proof. For $N > N_H \ge N_0$, $D = (N_0/N)^\beta < (N_0/N_H)^\beta = \varepsilon$. For $N \le N_H$, either $N \le N_0$ and $D = 1 \ge \varepsilon$, or $(N_0/N)^\beta \ge (N_0/N_H)^\beta = \varepsilon$. □

Fix F11 (what the theorems assert). The published Resolution Paradox Theorem (§10.5) and Horizon Emergence Theorem (§21) are the same statement. As published they are true only because "observationally indistinguishable for a given observer" is defined as "$D < \varepsilon$" and $D \to 0$ is assumed: the theorem follows from its hypothesis. Proposition 16.2 keeps it, labels it a proposition, and shows where the content lies: in the two observer parameters N_0 and β and in the threshold ε. A theorem with physical content would derive $D(N)$ from a geometric construction and a model of the observer, which is done next.

16.4. A geometric model: facets on a sphere

The polyhedral ladder of §3.2 and §11 approximates a sphere of radius R by N flat facets. Model each facet as a flat disc spanning a spherical cap of equal solid angle $4\pi/N$ (ASSUMPTION: equal-area tiling; true for the Platonic solids up to shape, and approximately true for geodesic subdivisions).

Proposition 16.3 (Facet geometry)**.** *A cap of angular radius θ has solid angle $2\pi(1-\cos\theta)$. Equal tiling gives*

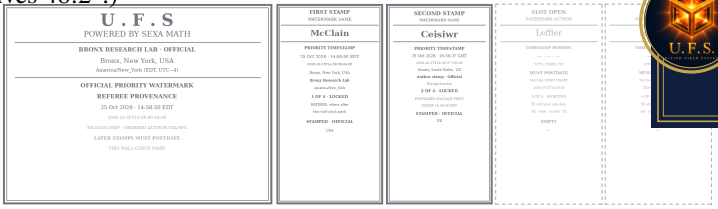
$$1-\cos\theta_N = \frac{2}{N}, \qquad \frac{h_N}{R} = 1-\cos\theta_N = \frac{2}{N}, \qquad \theta_N = \arccos\!\left(1-\frac{2}{N}\right) \simeq \frac{2}{\sqrt{N}}, \tag{64}$$

where h_N is the sagitta (maximum gap between the facet plane and the sphere) and θ_N is the maximum angle between the facet normal and the true surface normal.

Proof. Solid angle of a cap: $\int_0^{2\pi}\int_0^{\theta} \sin t\, dt\, d\varphi = 2\pi(1-\cos\theta)$. Setting it to $4\pi/N$ gives the first relation. The chord plane of the cap lies at distance $R\cos\theta$ from the center, so the gap at the cap center is $R(1-\cos\theta)$. The facet normal is the cap axis; at the rim the sphere normal is tilted by θ. Small-angle expansion $1-\cos\theta \simeq \theta^2/2$ gives $\theta \simeq 2/\sqrt{N}$. □

N	Structure	$h_N/R = 2/N$	θ_N (deg)	θ_N (arcmin)
6	cube	0.3333	48.19	2891
12	dodecahedron	0.1667	33.56	2013
20	icosahedron	0.1000	25.84	1551
60	"sixty parts"	0.0333	14.84	890
2,880	Ω_{2880}	6.94×10^{-4}	2.135	128.1
11,520	4×2880	1.74×10^{-4}	1.068	64.1
8,294,400	2880^2	2.41×10^{-7}	0.0398	2.39

Table. Facet sagitta and normal deviation from (64). (For the cube the exact center-to-vertex angle is 54.7°; the equal-cap model gives 48.2°.)



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Two observational channels, two exponents. The model shows that the published $D \propto 1/N$ is right for one channel and wrong for another:

- **Silhouette (sagitta) channel.** The visible departure of the outline from a circle is $h_N = 2R/N$. An observer at distance d with angular resolution ε_a detects it when $h_N > d\,\varepsilon_a$. So $D_{\text{sil}} \propto N^{-1}$ ($\beta = 1$) and

$$N_H^{\text{sil}} = \frac{2R}{d\,\varepsilon_a}. \tag{65}$$

- **Shading (normal) channel.** Lighting reveals facets through jumps in surface normal, of order $\theta_N \simeq 2/\sqrt{N}$. With an angular discrimination ε_θ for normals, $D_{\text{shade}} \propto N^{-1/2}$ ($\beta = 1/2$) and

$$N_H^{\text{shade}} = \frac{2}{1-\cos\varepsilon_\theta} \simeq \frac{4}{\varepsilon_\theta^2}. \tag{66}$$

Worked numbers (ASSUMPTION: illustrative observer). Take $\varepsilon_a = 1$ arcmin $= 2.909 \times 10^{-4}$ rad (typical human acuity) and a sphere of radius $R = 0.1$ m at $d = 1$ m: $N_H^{\text{sil}} = 0.2/2.909 \times 10^{-4} \approx 688$. For shading, if normals are discriminated to $\varepsilon_\theta = 1°$, $N_H^{\text{shade}} \approx 13{,}132$; at $2°$, $\approx 3{,}283$; at $0.5°$, $\approx 52{,}525$. By (64), $N = 2880$ corresponds exactly to $\varepsilon_\theta = 2.135°$.

Consequences for Ω_{2880}.

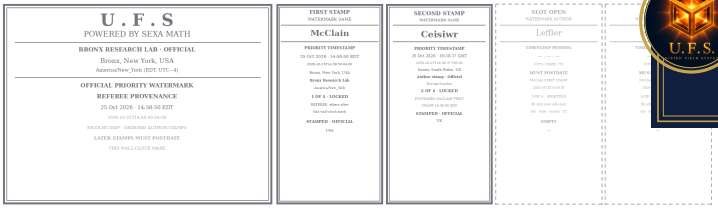
1. There is no single horizon: N_H depends on the channel (exponent β), on viewing geometry (R/d) and on the observer (ε). This supports the published §4.1 sentence that the threshold "need not be identical for every observer" and makes it quantitative.
2. Ω_{2880} is a horizon for the silhouette channel in the example above ($2880 > 688$) and is not one for shading at $1°$ ($2880 < 13{,}132$). A 2880-facet ball under raking light at arm's length is expected to look faceted. This is a test of the framework in the sense of §14.6 item (4), and its outcome is predicted here before measurement.
3. The match $2880 \leftrightarrow 2.135°$ is a consequence of (64), not evidence for 2880. A measured ε_θ near $2°$ for some observer would make Ω_{2880} that observer's shading horizon; it would not single out 2880 in general.
4. The "Rubik Limit" $D(6) \gg \varepsilon$ holds in both channels: $h_6/R = 1/3$, $\theta_6 = 48°$.

OPEN O18. Fix N_0, β and ε for a declared observer and channel; state what numerical meaning Ω_{2880} has (a value of N_H for which observer); and relate the 2880 facets of the geometric model to the 2880 dimensions of $\mathcal{M}_{2880}$, which are a different kind of count.

16.5. The remaining published claims, assessed

- **Horizon Principle (§4.1), Horizon Postulate (§18).** True as stated for any observer with finite resolution and any family of structures with $D \to 0$: Proposition 16.2. The informative part is the value of N_H (Section 16.4).

- **Domains I, II and Regions A, B, C (§4, §4.2).** In the corrected notation: Region A is $D \geq \frac{1}{2}$ (or $N \leq 2^{1/\beta} N_0$); Region C is $D < \varepsilon$; Region B is between. The domains are then observer-relative intervals of N, which is what §4.3 says.



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- **Observer Problem (§4.3), Prediction Two (§14.2).** Consistent: two observers with $\varepsilon_A < \varepsilon_B$ have $N_H^A > N_H^B$; for $N_H^B < N \leq N_H^A$, A reports discrete and B reports continuous. Both reports are correct relative to their thresholds.
- **Emergence Hypothesis (§4.4), Great Geometric Inversion (§12.2).** As a statement about perception, supported by the model: smooth appearance arises from flat facets. As a statement about spacetime, it is a hypothesis with no derivation here. The inversion "Recursive Organization → Apparent Continuity → Curvature" requires a definition of curvature for the discrete structure (for example angle deficits at vertices, which on a polyhedron sum to 4π by Descartes' theorem, the discrete Gauss-Bonnet theorem). That is a concrete research item for §17.1 and is recorded under O18.
- **Great Compression (§8.3).** Consistent with the many-to-one point made for Π_{2880} (Section 12.7.1): an observer reporting a sphere is reporting a few parameters (R, center) of an N-facet structure. The same structure in both places: the compressed description does not retain the parts.
- **Predictions One, Three, Four, Five (§14).** These are qualitative. Prediction Five becomes quantitative under Section 16.4. Predictions One and Four are not falsifiable as stated ("may ultimately reveal deeper frameworks"); they are kept as research directions, not predictions.
- **Falsification list (§14.6).** Item (3), mathematical inconsistency, was triggered by $C \propto N$ and is repaired (F6). Item (4) is now testable (consequence 2 above). Items (1) and (2) are not expected to fail for geometric facets, by Proposition 16.3.
- **SEXA Connection (§20).** "Geometry emerges from admissibility" needs the admissibility gate Γ to act on geometric configurations; it does not yet act on anything (O1). The link to JAM 9887 and JAM 9896 is therefore programmatic.

17. JAM 9880: Recursive Soil Bearing Architecture (RSBA)

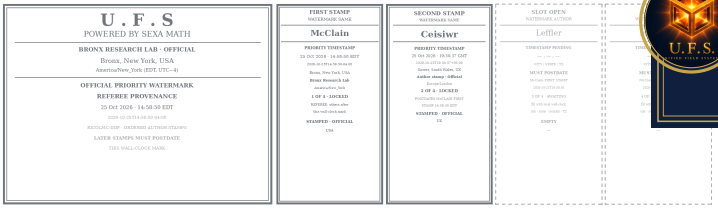
17.1. SREF as used in JAM 9880

Published (§2). The dimensional regime is $D_{\text{SEXA}} = \{5, 6, 7, \ldots, 2880\}$, and dimensions beyond it correspond to the Sarfatti boundary $D_{\text{Sarfatti}} = 2881$, "the theoretical upper limit of the current recursive formulation", not required for stabilization (§2.5). The functional (§2.1) is

$$E_{\text{SREF}}[\Xi] = \int_{\mathcal{M}} \left[\sum_{i=1}^{3} g_i \rho_i c_{\text{conv}}^2 + \sum_{j=4}^{5} \left(T_j^{00} + P_j \, |\lambda_j^n| \right) \right] d\mu, \tag{67}$$

with c_{conv}^2 a "convective propagation contribution" and $P_j|\lambda_j^n|$ a "recursive pressure-coupling operator parameterized by recursion index n". The payload interception product (§2.2) is $\Pi_{2880} = \prod_{\ell=5}^{2880} \Psi_\ell / \phi_\ell^2$; recursive logic amplification (§2.3, §5) is $A_{\text{logic}} = 60^n$ with n "the mean excitation index across the recursive logic states". The boundary-field energy density (§2.4, §4.5, §5) is

$$\Phi_{\text{eff}} = \Phi_0 \, \Pi_{2880} \, 60^n, \tag{68}$$



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with Φ_0 "the baseline boundary-field amplitude supplied by the Negentropic Boundary-Field Reactor". §2.6 lists three contributions combined by SREF: NBFR reactor output, 2880-dimensional payload interception, sexagesimal recursive amplification.

Corrections. (67) is the 5D operational form (38) of JAM 9896 without the EX tags; the repairs of Section 12.2 apply unchanged. For (68):

1. **Units (F2).** Φ_{eff} is added to stresses below, so $[\Phi_0] = \text{J m}^{-3} = \text{Pa}$ and Π_{2880}, 60^n are dimensionless (F10).
2. **Limit (F1).** $\lim_{n\to 0} \Phi_{\text{eff}} = \Phi_0 \Pi_{2880}$, not 0. There is no regime of "weak recursion" in which the boundary field switches off; it switches off only if $\Phi_0 = 0$ (reactor off) or $\Pi_{2880} = 0$.
3. **Sensitivity.** By Proposition 12.1, $\log_{10} \Phi_{\text{eff}} = \log_{10} \Phi_0 + \log_{10} \Pi_{2880} + 1.778151\, n$. Every order of magnitude in Φ_{eff} can be moved between Φ_0, Π_{2880} and n; the equation fixes none of them.

17.2. RSBA and Boundary-Induced Stress Decoupling (published §3)

Published. Terzaghi's effective stress [11] is modified by a boundary term:

$$\sigma' = \sigma - u \qquad \longrightarrow \qquad \sigma'_{\text{RSBA}} = \sigma - u + \Phi_{\text{eff}}, \tag{69}$$

with σ' effective stress, σ total stress, u pore pressure. BISD "occurs when the boundary-field energy density becomes comparable to the gravitational load density"; the redistribution is

$$\sigma_{\text{BISD}} = \sigma_g - \Phi_{\text{eff}}, \qquad \text{decoupling if} \quad \Phi_{\text{eff}} \geq \sigma_g, \tag{70}$$

with σ_g the gravitational load stress. Then "the soil mass behaves as a boundary-stabilized volume rather than a conventional foundation-bound structure".

Corrected statement.

1. Units close: $\text{Pa} = \text{J m}^{-3}$, under F2 and F10.
2. Sign. In Terzaghi's relation, u reduces effective stress because pore fluid carries part of the load. In (69) Φ_{eff} *increases* effective stress, i.e. it acts like an additional compressive confinement on the grain skeleton. In (70) the same Φ_{eff} *reduces* the load the substrate must carry. These are two different mechanisms: confinement ((69), strengthens soil) and support ((70), carries load). Both can hold only if the boundary field exerts an upward body force on the prism, which is a force, not an energy density. ASSUMPTION (adopted): Φ_{eff} acts as an upward pressure on the base of the prism, so that the supported load is $L_{\text{RSBA}} = A\, \Phi_{\text{eff}}$ for footprint area A.
3. Under that assumption (70) and the stabilization condition (71) below are the same inequality.

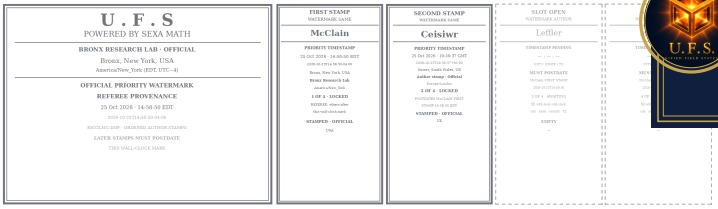
17.3. Stabilization condition (published §3.2 and §8)

Published. For a prism with total gravitational force F_g,

$$L_{\text{RSBA}} + L_{\text{EX}} \geq F_g, \tag{71}$$

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with L_{RSBA} the load support from RSBA stress redistribution and L_{EX} the "Exciternion lift contribution generated through recursive field rotation". §8 lists practical limits: boundary-field energy density, NBFR output, recursive phase stability, rotational coherence.

Corrected statement (F7). For a prism of footprint A, height h and bulk density ρ_s, $F_g = \rho_s g A h$ and $\sigma_g = \rho_s g h$. With $L_{\mathrm{RSBA}} = A\Phi_{\mathrm{eff}}$,

$$A\,\Phi_{\mathrm{eff}} + L_{\mathrm{EX}} \;\geq\; \rho_s g A h \quad\Longleftrightarrow\quad \Phi_{\mathrm{eff}} + \frac{L_{\mathrm{EX}}}{A} \;\geq\; \sigma_g. \tag{72}$$

L_{EX} has no formula in the source (OPEN O27). Setting $L_{\mathrm{EX}} = 0$ recovers (70).

17.4. Numerical requirements for the Hess-Triangle prototype

Published (§3.3, §7). The prototype is "an eight-foot stabilized air-rights prism whose base corresponds to the Hess Triangle footprint", with a triangular footprint, an eight-foot vertical prism, and a rotating boundary-field shell generated by the NBFR. No footprint dimensions are given.

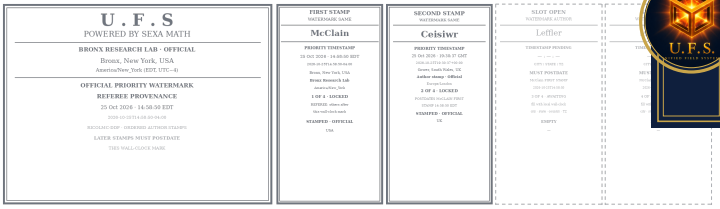
Inputs (ASSUMPTION). $h = 8$ ft $= 2.4384$ m; $\rho_s = 1800\ \mathrm{kg\,m^{-3}}$ (typical moist soil); $g = 9.81\ \mathrm{m\,s^{-2}}$; footprint $A = 500\ \mathrm{in}^2 = 0.3226\ \mathrm{m}^2$, the area usually quoted for the Hess Triangle in New York City (to be confirmed by the authors).

Results.

Quantity	Value
Prism volume Ah	$0.787\ \mathrm{m}^3$
Prism mass $\rho_s A h$	1416 kg
Gravitational load F_g	13.9 kN
Load stress $\sigma_g = \rho_s g h$	$43.1\ \mathrm{kPa} = 43.1\ \mathrm{kJ\,m^{-3}}$
Required Φ_{eff} (with $L_{\mathrm{EX}} = 0$)	$\geq 43.1\ \mathrm{kJ\,m^{-3}}$
Field energy in the prism at $\Phi_{\mathrm{eff}} = \sigma_g$	$\sigma_g A h \approx 33.9$ kJ
Equivalent magnetic field, $B^2/2\mu_0 = \sigma_g$	$B \approx 0.33$ T
Equivalent electric field, $\varepsilon_0 E^2/2 = \sigma_g$	$E \approx 9.9 \times 10^7\ \mathrm{V\,m^{-1}}$ (above air breakdown, $\approx 3 \times 10^6$)
Required Φ_0 at $\Pi_{2880} = 10^{-1225.09}$, $n = 18.86$	$\approx 10^{1196.2}\ \mathrm{J\,m^{-3}}$
Required Φ_0 at $\Pi_{2880} = 1$, $n = 18.86$	$\approx 1.25 \times 10^{-29}\ \mathrm{J\,m^{-3}}$

Reading the table.

1. The physical requirement is modest and familiar: a support pressure of about 43 kPa over $0.32\ \mathrm{m}^2$. A magnetic pressure of 0.33 T on a conducting base would supply it; that is ordinary electromagnetic levitation, which needs sustained currents and dissipates power. Nothing in the requirement calls for higher-dimensional physics.
2. The SREF route gives no prediction. With the paper's own numbers ($r = 0.375$, $\bar{n} = 18.86$) the reactor would need $10^{1196}\ \mathrm{J\,m^{-3}}$, which is impossible. With $\Pi_{2880} = 1$ the reactor would



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need 10^{-29} J m^{-3}, which is equivalent to claiming support for free. The outcome is decided by unmeasured parameters, spanning more than 1200 orders of magnitude.

3. Activation threshold. JAM 9880 Appendix A item 11 gives $\chi = \sigma/\Sigma_c$ with a "hard switch" at $\sigma_c = 10^8$ Pa. The Hess prism's load stress is 4.3×10^4 Pa, about 2300 times smaller. If σ_c governs RSBA, the prototype never leaves the "OFF-state compatibility regime". The authors should state which stress σ enters χ (OPEN O19).

17.5. The Negentropic Boundary-Field Reactor (published §4)

Published. §4.1 Ignition: about three hundred high-energy drone battery modules in a distributed ignition array, $E_{\text{init}} \approx 300\, E_{\text{bat}}$, to "flood the primary induction lattice" and initiate recursive field closure; this is not the steady-state supply. §4.2 Oscillator or "electrogun" injection layer: pulsed electromagnetic excitation that initiates oscillation, sets coherent phase across the lattice and enables recursive capture. §4.3 Graphene macro-inductive shell: printed conductor lattice serving as structural body and as inductive substrate. §4.4 Dipole separation and recapture: $E_{\text{rec}} = \eta\, E_{\text{NBFR}}$, with η the feedback recovery efficiency, leading to a "recharge regime, in which the primary battery bank remains near constant while the boundary field persists". §4.5 output feeds Φ_{eff} (68). §4.6 the reactor is the "energy core".

Corrected statement.

Proposition 17.1 (Reactor bookkeeping)**.** *Let the reactor deliver E_{NBFR} per cycle to the shell and recover $E_{\text{rec}} = \eta E_{\text{NBFR}}$ with $0 \le \eta < 1$. If E_{in} is the external energy supplied per cycle, then the stored energy changes by $\Delta E_{\text{store}} = E_{\text{in}} - (1-\eta)E_{\text{NBFR}}$. The battery bank stays constant only if $E_{\text{in}} = (1-\eta)E_{\text{NBFR}}$.*

Proof. Energy balance per cycle: out E_{NBFR}, back ηE_{NBFR}, in E_{in}. □

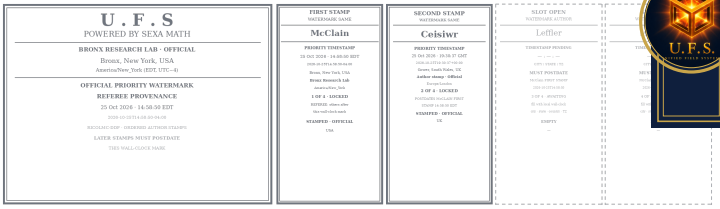
"Negentropic" and "recursive" do not change this balance. A constant battery bank therefore requires metered external input, which must be reported in any test (kill-switch K6). For scale (ASSUMPTION: $E_{\text{bat}} = 100$ Wh per module), $E_{\text{init}} \approx 300 \times 0.36$ MJ $= 108$ MJ, about 3000 times the 33.9 kJ field energy needed to fill the prism at $\Phi_{\text{eff}} = \sigma_g$. Holding a static load does no mechanical work; the running cost is dissipation in the shell (ohmic losses I^2R in a non-superconducting lattice), which sets the required steady input.

17.6. Quaternion Keplerian field rotation and the Einstein-Overclock (published §6)

Published. $R(t) = q(t)\,\Phi_{\text{eff}}\,q^{-1}(t)$ with $q(t)$ a quaternion rotation operator, distributing energy circulation over the boundary surface. The Overclock occurs when the rotation rate of the boundary field "exceeds the gravitational response timescale" T_g of the soil: the published condition compares ω_{rot} with T_g, and then the field "redistributes gravitational loading faster than the soil mass can respond", giving "the macroscopic appearance of static elevation".

Corrections.

1. **A scalar does not rotate.** For a unit quaternion q and a real scalar s, $qsq^{-1} = s\,qq^{-1} = s$. Since Φ_{eff} is an energy density (a scalar), $R(t) = \Phi_{\text{eff}}$ for all t: the published operator does nothing. Rotation requires a vector quantity, for example a pure-quaternion field $\mathbf{F} = F_x\mathbf{i} + F_y\mathbf{j} + F_z\mathbf{k}$



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representing a force density or field direction, with $\mathbf{F}(t) = q(t)\mathbf{F}_0 q(t)^{-1}$. ASSUMPTION (adopted): the rotated object is a vector field $\mathbf{F}$ with $|\mathbf{F}|^2 \propto \Phi_{\text{eff}}$. Which field is meant is OPEN O26.

2. **Dimensionless overclock (F7).** ω_{rot} has units s^{-1} and T_g has units s. The meaningful condition is

$$\omega_{\text{rot}} T_g \gg 1. \tag{73}$$

3. **The condition is easy to meet.** Take T_g as the Terzaghi consolidation time $t = T_v H^2/c_v$ [11, 12]. For the 2.44 m prism drained at one face, $T_v = 0.848$ (90% consolidation): clay with $c_v = 10^{-7}\ \text{m}^2\,\text{s}^{-1}$ gives $T_g \approx 5.0 \times 10^7$ s (about 1.6 years); sand with $c_v = 10^{-2}\ \text{m}^2\,\text{s}^{-1}$ gives $T_g \approx 500$ s. Any rotation faster than about one turn per hour satisfies (73) for sand, and far slower rotation suffices for clay.
4. **Fast rotation does not create support.** If $\mathbf{F}(t)$ rotates with period much shorter than T_g, the soil responds to the time average $\langle \mathbf{F} \rangle$. A field rotating about a horizontal axis averages its vertical component to zero, giving no support. A field rotating about the vertical axis leaves its vertical component unchanged, so rotation is irrelevant to support. In either case support is set by the mean upward component, as in (72), not by ω_{rot}. The overclock regime can reduce settlement oscillation; it cannot replace a mean upward force.

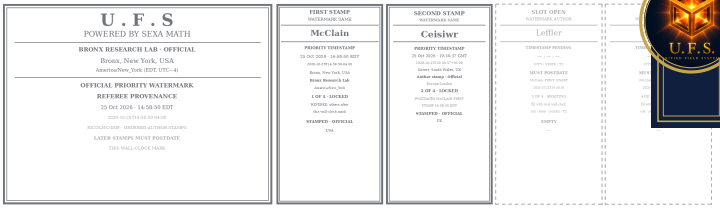
17.7. Corrected RSBA statement

> RSBA, as corrected, is the following conditional engineering hypothesis. If a boundary system exerts a mean upward pressure Φ_{eff} on the base of a soil prism, the substrate carries $\sigma_g - \Phi_{\text{eff}}$; support is complete when $\Phi_{\text{eff}} \geq \rho_s g h$ (about 43 kPa for an eight-foot prism). The SREF expression $\Phi_{\text{eff}} = \Phi_0 \Pi_{2880} 60^n$ is one proposed parametrization of that pressure; at present it fixes no number. Energy input must be metered; rotation does not supply mean force. Every claim of RSBA levitation is OPEN until a bench test (K5) is run.

17.8. Appendix A of JAM 9880 (GR/QFT compatibility): statuses withdrawn

JAM 9880 Appendix A lists twelve items with statuses, and a summary table. All PASS statuses are withdrawn (Fix F14). The reason is the same for each: the listed value is the standard textbook prediction of GR or QED, and no computation from SREF, Π_{2880}, 60^n or Γ is given that produces it. Reproducing a number by quoting it is not a test.

#	Item	Standard value (reference)	Published status	This draft
1	Light bending at the solar limb	1.75″	PASS	Withdrawn. GR value; no SREF derivation.
2	Mercury perihelion precession	43″ per century	PASS	Withdrawn. GR value.



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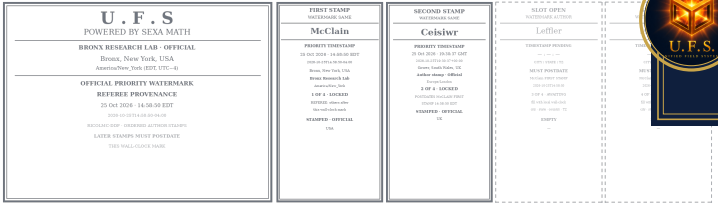
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3	Solar gravitational redshift	2.1×10^{-6}	PASS	Withdrawn. $GM_\odot/(R_\odot c^2)$.
4	Shapiro time delay	order 200 μs (geometry dependent)	PASS	Withdrawn. GR value for a stated geometry.
5	Frame dragging (Lense-Thirring)	about 31 mas/yr (LAGEOS node)	PASS	Withdrawn. GR value.
6	GPS relativistic clock drift	38 μs/day	PASS	Withdrawn. GR plus special relativity.
7	Binary pulsar orbital decay	$\dot{P} = -2.4 \times 10^{-12}$	PASS	Withdrawn. Quadrupole formula.
8	Relativistic dispersion	$E^2 = p^2c^2 + m^2c^4$	PASS	Withdrawn. Special relativity.
9	Casimir vacuum scaling	$P \propto a^{-4}$	PASS	Withdrawn. QED result.
10	Electron $g - 2$	$g \approx 2.0023228$	PASS	Withdrawn. $2(1 + \alpha/2\pi)$, Schwinger term.
11	Activation law	$\chi = \sigma/\Sigma_c$, $\sigma_c = 10^8$ Pa	Mathematically defined	Kept as a definition; Σ_c and σ_c notation to be unified; relevance to RSBA OPEN (Section 17.4).
12	Yukawa deviation	$V = -\frac{Gm_1m_2}{r}(1 + \alpha e^{-r/\lambda})$	Experimental test pending	Kept as test parametrization; α, λ not derived (K3, K5).
	Summary: mathematical consistency; reduction to GR; reduction to QFT; predictive deviation; experimental activation		PASS, PASS, PASS, PASS, Pending	Withdrawn, withdrawn, withdrawn, withdrawn; pending kept.

The phrases "SEXA curvature collapse reproduces GR gravitational radiation behavior", "SEXA reduction preserves relativistic energy-momentum structure", "SEXA vacuum geometry reproduces QFT vacuum fluctuation scaling" and "SEXA loop structure reproduces first-order QFT corrections" are withdrawn: SREF contains no metric, no curvature, no loop expansion and no vacuum mode sum (Proposition 11.15).

17.9. Appendix B of JAM 9880 (Sigmatics verification data): recorded, with checks

Published. A reduction chain: 2880-D SEXA manifold → 8-D spinor basis → 5-D exciter coordinates → 32 triality orbit classes ($32 = 2^5$) → 3 operational transforms (R, T, M) → 1 computational result. Reported values: arithmetic mean excitation 47.50, geometric mean 35.97, harmonic mean $\bar{n} \approx 18.86$ ("the typical excitation resonance level"); $C_\Omega = \sqrt{2880/4} \approx 26.83$; thinning ratio $\Psi_\ell/\Phi_\ell^2 \approx 0.375$, "closely approximating" $1/e \approx 0.368$; harmonic resonance law $H(n) \propto 6.77\sqrt{n}$; propagation to



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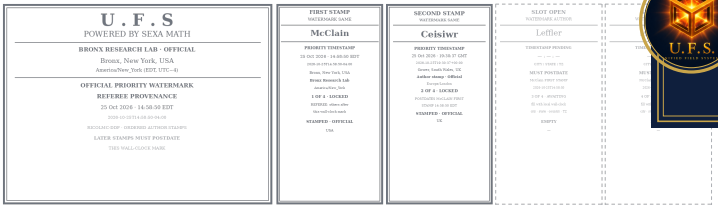
resonance ratio $\approx \sqrt{2}$. The Sigmatics conclusion claims structural equivalence between SEXA recursion and Sigmatics algebra, confirming the 2880D to 5D reduction, the 32-orbit manifold, quaternion cycles and harmonic recursion.

Checks performed here.

1. AM $\geq$ GM $\geq$ HM: $47.50 \geq 35.97 \geq 18.86$. Consistent with any positive data set.
2. $C_\Omega/\bar{n} = 26.833/18.86 = 1.4228$ versus $\sqrt{2} = 1.4142$: agreement to 0.6%. The source does not say whether $\sqrt{2}$ is predicted or observed.
3. $H(\bar{n}) = 6.77\sqrt{18.86} = 29.40$. The constant 6.77 is not derived.
4. 0.375 versus e^{-1}: 1.9% apart; consequence for Π_{2880}: 24 orders of magnitude (Proposition 12.1).
5. The underlying data (which quantity is averaged over which 32 or 96 classes) are not given, so none of the means can be reproduced. "Confirms" is replaced by "is reported". OPEN O25.

18. Corrections table

Fix	Papers	Published	Corrected (where)
F1	9887, 9896, 9880, root	"As $n \to 0$, $60^n \to 1$, higher-order contributions vanish"; GR recovered.	$60^n \to 1$ leaves the perpetual term $P_j\Pi_{2880}$ (or the root tier factors $60, 60^2$) fully present; suppression needs a separate rule (O7). Eq. (7), Sections 12.6, 13, 17.1.
F2	9887, 9896, 9880	P_j in W added to energy densities.	P_j in J m^{-3}; dimensionless Π_{2880}, 60^n; Φ_0 in Pa (Sections 11.2, 12.2, 17.1).
F3	9887, 9896	Γ composed with the scalar integrand.	Γ acts on configurations; E evaluated only on Fix(Γ), Eq. (37).
F4	all	Mixed bylines and titles.	One byline, Unified Field Systems LLC, UFS addresses.
F5	9887, 9896	Glyph symbol drift (σ printed as O, $\nabla/\triangle$).	Fixed glyph macros and right-to-left order (Definition 11.3, Section 11.2 E6).
F6	9915	$C \propto N$ and $C = 1 - D$.	$C = 1 - D$, D normalized, Definition 16.1.
F7	9880	BISD without area, overclock comparing ω with T_g, scalar rotation.	Area form (72); $\omega T_g \gg 1$ (73); vector field rotated (Section 17.6).
F8	9896, 9880	C_Ω replaces c.	Withdrawn; $C_\Omega = \sqrt{720}$ is a pure number, reading (b).
F9	9887	Monster constraint without group data.	$\lvert\mathbb{M}\rvert$, 196883, 196884 = 196883 + 1 and [8] stated; constraint posed as Assumptions (Section 11.6).
F10	9880, 9896	Two forms of Π_{2880}; "does not discard information".	Reconciled by (41); numerical size computed; the information claim withdrawn (Sections 12.7, 12.7.1).



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Fix	Papers	Published	Corrected (where)
F11	9915	Resolution Paradox and Horizon Emergence "theorems".	One proposition with explicit N_0, β, ε (Proposition 16.2); facet model (Section 16.4).
F12	9887, 9896	n for both excitation depth and iteration.	n depth; k iteration count (Section 11.4).
F13	9896, 9880	Torsion and Yukawa deviation, no prediction.	Parametrized δ_Γ with pre-registration; existing bounds stated (Section 12.11).
F14	9880	Appendix A: all PASS.	PASS statuses withdrawn; Appendix B reported with checks (Sections 17.8, 17.9).
F15	URMD	$d\mathcal{M}$ in m^5 and integral in J.	$d\mathcal{M} = d^3x\, d\mu_{45}$ with dimensionless $d\mu_{45}$, Eq. (55).
F16	URMD	Worked example $E/V \approx 9.004 \times 10^{10}$, perpetual share 0.004%.	$8.992 \times 10^{19}\ \mathrm{J\,m^{-3}}$, share 0.045% (Section 14.2).
F17	URMD	$C_\Omega = \sqrt{720 \times 4} = \sqrt{2880}$; C_Ω/c superluminal.	$C_\Omega = \sqrt{720}$, $\sqrt{2880} = 2C_\Omega$; speed reading withdrawn (Section 14.4).
F18	URMD	Nine criteria all satisfied; Criterion X makes the theory final; limits to Newton, GR, Maxwell, Standard Model.	Certifications withdrawn; Criterion X recast as a fixed-point question; limits not derived (Sections 14.3, 14.6, 14.7).

19. Falsifiability and kill-switches

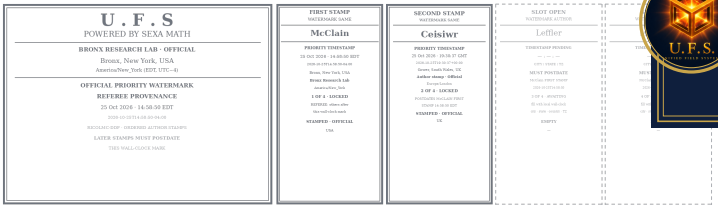
The published principle is retained: a model whose admissible set fails to contain configurations reproducing established physics in its domain of validity is rejected, with no parameter adjustment after the failure. The tests are:

K1. Gravity.
A metric sector reducing to GR with $c_g = c$, two tensor polarizations and the quadrupole formula, with G derived. Status: OPEN (O6). Not passed.

K2. QFT.
An admissible configuration reproducing a free field and its propagator. Requires gradient terms (Proposition 11.15). Status: OPEN.

K3. Yukawa.
An explicit $V(r) \propto e^{-mr}/r$, Eq. (34), with m computed from the functional. Status: OPEN.

K4. Pre-registration.
All free parameters $(\tau, V, n, \mathcal{A}, H, r_\ell, \Phi_0, \lambda, \alpha, N_0, \beta, \varepsilon)$ fixed and published before comparison with data. Status: not done.



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K5. Bench tests.

(a) Torsion balance: predicted (α, λ) of δ_Γ in Eq. (43); a prediction inside the region excluded by [14, 13] kills it. (b) Soil column: a confined column of known ρ_s and h with load cells at its base; RSBA predicts a measured base stress below $\rho_s g h$ by Φ_{eff}, with the field on and the same geometry with the field off as control. No reduction above instrument noise kills RSBA. Status: not run.

K6. Energy metering.

Any NBFR test reports all external input; a constant battery bank with $\eta < 1$ and no metered input (Proposition 17.1) indicates a measurement error, not a recharge regime.

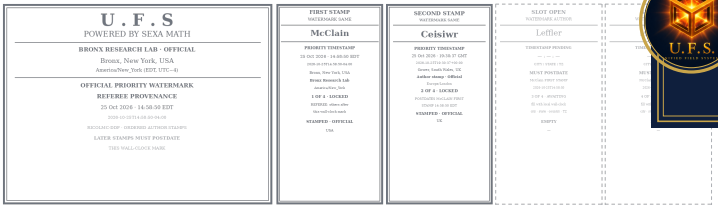
K7. Observer horizon.

A 2880-facet sphere viewed under controlled raking light at fixed R/d; Section 16.4 predicts faceting visible in shading for observers with $\varepsilon_\theta < 2.1°$ and invisible in silhouette at the stated geometry. Contrary results with the stated observer parameters refute the facet model.

Until K1 to K3 are closed, the stack makes no claim that GR, QFT or Yukawa physics is recovered.

20. Open items

Item	Content
O1	Explicit glyph maps on $\mathcal{X}$; $\mathrm{Fix}(\Gamma)$ non-empty and containing a known configuration. Closed for model X_0 (Thm. 8.5); OPEN for the physical plate.
O2	Cocycle construction between realizations, replacing the circular Book 4 proof.
O3	Meaning of 60 in Σ_{60} and its relation to the monoid generated by Γ.
O4	Derive τ (and V) if the published 9887 form is kept.
O5	Superseded by O13.
O6	Metric sector and GR reduction with G derived.
O7	Physical rule forcing suppression of the perpetual term (F1).
O8	Confirm $\pi_1(\mathbb{M})$, $\pi_1(\mathbb{B})$ against [9].
O9	Specify ι, H, $\mathcal{A}$ or the stabilizer action.
O10	Physical reason for $\mathbb{M}$.
O11	Maximal equivariance group of Γ.
O12	Glyph-to-SREF-EX9D part map. Author to supply; not constructed here.
O13	Units of E_{SREF} and the measure on $\mathcal{M}_{2880}$.
O14	Sign rule for a negative sector product in the fourth root.
O15	Identity of spine glyphs with Σ_{60} letters.
O16	Σ_{60} composition law and evaluation of the 60 logics.
O17	Any role of moonshine (the j-function or the moonshine module) in admissibility.
O18	Observer parameters N_0, β, ε; numerical meaning of Ω_{2880}; relation of 2880 facets to 2880 dimensions; discrete curvature (angle deficit) version of the Great Geometric Inversion.
O19	RSBA values: r_ℓ, Φ_0, n for the prototype; which stress enters $\chi = \sigma/\Sigma_c$; Hess-Triangle footprint dimensions; bench test K5(b).
O20	Meaning of C_Ω and of the divisor 4 in $\sqrt{2880/4}$.

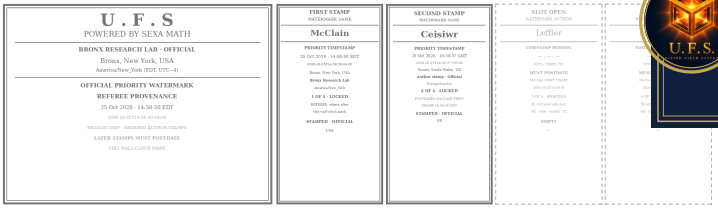


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Item	Content
O21	Map between the 2880D canonical and 5D operational regimes.
O22	Exciternion state set, energies ϵ_a and the operators L_j with their spectra.
O23	Whether Π_{2880} belongs in SREF-EX9D, and where.
O24	Confirm DOIs of JAM 9880 and JAM 9915 on the journal landing pages.
O25	Data behind Appendix B of JAM 9880 (the averaged quantity and the 32 or 96 classes).
O26	Identity of the vector field rotated by $q(t)$ in RSBA.
O27	Formula for the Exciternion lift L_{EX}.
O28	Specification of the closure set C in the admissibility theorem of Section 11.4.
O29	Injective domain encodings e_k for RICOLMC-DDF clause (C3).
O30	Time scale τ_j converting URMD power densities to energy densities.
O31	Which thinning model ($w = 0.375$ or 0.99807 per step, or other) describes the collapse.
O32	Transforms or counting rule that produce the published reachability sequence $4, 9, 16, 24, 32$.
O33	Depth assignment N in the Exciternion product rule.
O34	Rotation-invariant reading of the Red axis assignment (strong, weak, EM to height, depth, width).
O35	Constitutive relation behind URMD cross terms C_{ij}, and its effect on DDF additivity.
O36	Meaning of $\circ$ between the market and SREF brackets in Eq. (57), and the 2880 sector fields needed to evaluate E_{fin} (NOT_EVALUATED).
O37	Official 240-tick finance tape; fitted γ_q, Θ_q and thresholds; ψ/ϕ books from the live collector.
O38	Line-by-line check of Fold axioms and Lemmas 4.1–4.7; explicit 5D target and inverse under $\Gamma(\Xi) = \Xi$; fold-before-realization vs Π_{2880} cascade (Section 10.1).
O39	Domain, codomain and units of the Last Constant propagation functional so no speed is implied under $C_\Omega = \sqrt{720}$; bounded amplification explicit (Section 10.2).
O40	Map VLSIE Layer 4 (reduction-recovery) to kill-switches K1–K3; reproduce the harmonic excitation index in the verify appendix (Section 10.3).
O41–O44	See Section 7 (open items of the Γ-spine; O42 narrowed by Section 8).
O45	Prove or refute that the market predicates of Section 15 are the formal Γ operators (finance correspondence; currently UNESTABLISHED).
O46	Restricted-family generalization: $Y_n, \Gamma_n, F_n, R_n, E_n$ with (C1)–(C4) uniform in n (Section 8.4).
O47	Non-multiplicative octonionic route: embed the 811-element Γ monoid into $\mathrm{End}(\mathfrak{h}_3(\mathbb{O}))$ by Peirce-type projections compatible with F_4, or into split octonions mod p (Section 9).
O48	Mechanize Spin(8) triality in Lean 4 and decide whether any non-multiplicative Γ intertwiner with $V_8, S_8^{\pm}$ exists (Section 9).
B1, B2	Bridges from token-checker termination to (C1) and from proper-subchain rejection to (C2) on $\mathcal{M}_{2880}$ (Section 7, audit F03).

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21. Conclusion

The four papers form one stack: a gate (JAM 9887), a gated energy functional (JAM 9896), an argument that a finite structure can appear continuous (JAM 9915), and an engineering application (JAM 9880). Read together, the same few defects recur: a limit misstated ($60^n \to 1$, not 0), units not closed, a gate composed with a number instead of applied to a configuration, a product Π_{2880} whose size is set by unmeasured ratios, and statements labelled theorem or PASS whose content is their hypothesis or a quoted textbook value. This draft repairs each where it can be repaired by mathematics alone, withdraws what cannot be supported, and states the remainder as numbered open items and kill-switches.

What remains true and usable: Γ as a well-posed fixed-point gate under stated assumptions, with Γ^n redundant; a dimensionally consistent gated functional; a Monster constraint stated with correct group data and posed as an assumption; a proved threshold proposition and a facet model that turns the Horizon Constant into computable, observer-dependent numbers; and an RSBA statement that names the required support pressure (about 43 kPa for an eight-foot prism) and the bench tests that would decide it. What is not claimed: gravity, G or any coupling 60^{-3} derived; recovery of GR, QFT or Yukawa physics; a working levitation or self-recharging reactor. The SEXA internal gravity score remains 6.75 of 19.

Under RICOLMC-DDF the stack is now aimed at a question it can answer: completeness of recursively admissible representation across density, dimension, field, liquidity and recursive resource completeness for Γ-gated resource flows (Definition 6.1), with the Recursive Hyperstructural Computational Completeness Theorem as the formal spine. URMD contributes a repaired integral, collapse operators whose total weight is Π_{2880}, a proved triality orbit structure, and the DDF spread. Gravity is the deferred Green sector, to be addressed later.

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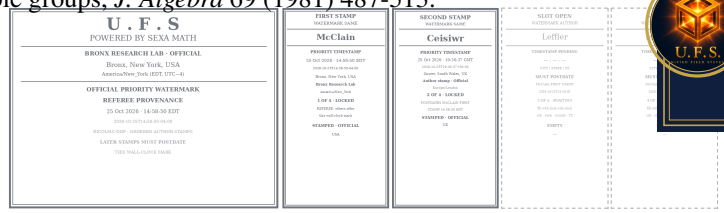
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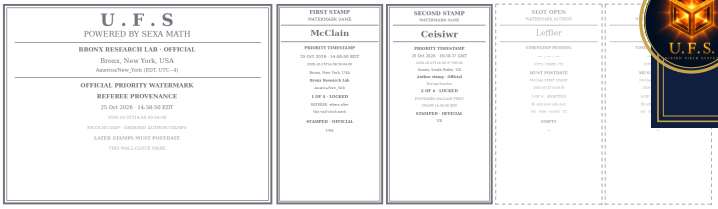
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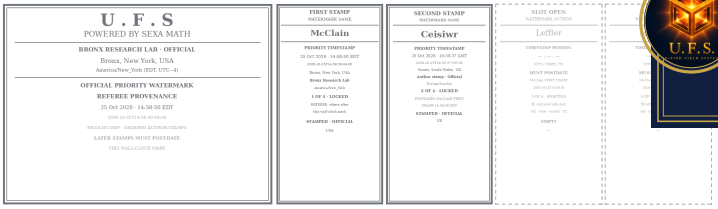
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A. Published-form record

For reviewers comparing with the journal versions, the published forms are collected here; each is corrected at the location given.

Paper	Published form	Corrected at
9887	$\Gamma(\Xi) = \Xi$; $\Gamma^n(\Xi) = \Xi$	Lemma 11.8, Definition 11.9
9887	Functional with P_j in W and 60^n	Eq. (7), Section 11.2
9896	$\Gamma \circ$ [integrand] over $\mathcal{M}_{2880}$ with $\Pi_{2880}\lvert\lambda_j\rvert^n$	Eq. (37)
9896	$C_\Omega = \sqrt{2880/4}$ replaces c	Section 12.2 (F8)
9896/9880	$\Pi_{2880} = \prod \psi_\ell^{\delta_\ell}$; $\Pi_{2880} = \prod \Psi_\ell/\phi_\ell^2$	Eq. (41), Proposition 12.1
9915	$D \propto 1/N$, $C \propto N$, $C = 1 - D$; $N > N_H \Rightarrow$ continuum	Definition 16.1, Proposition 16.2
9880	$\sigma'_{\mathrm{RSBA}} = \sigma - u + \Phi_{\mathrm{eff}}$; $\sigma_{\mathrm{BISD}} = \sigma_g - \Phi_{\mathrm{eff}}$	Section 17.2
9880	$L_{\mathrm{RSBA}} + L_{\mathrm{EX}} \geq F_g$	Eq. (72)
9880	$E_{\mathrm{rec}} = \eta E_{\mathrm{NBFR}}$, recharge regime	Proposition 17.1
9880	$R(t) = q\Phi_{\mathrm{eff}} q^{-1}$; ω_{rot} vs T_g	Section 17.6
9880	Appendix A twelve PASS items	Section 17.8
URMD	$\int (\sum \rho_i c^2 + \sum (T_j^{00} + P_j 60^n))\, d\mathcal{M}$, $d\mathcal{M}$ in m^5	Eq. (55)
URMD	Nine criteria, Criterion X, Final Theory	Section 14.7
FIN I-IV	E_{fin} with $C_\Omega = \sqrt{2880/4}$; S, R, H run layer	Section 15 (O36, O37)
URMD	32 orbits, R 4-cycles, reachability 4, 9, 16, 24, 32	Proposition 14.3



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B. Numerical verification and code

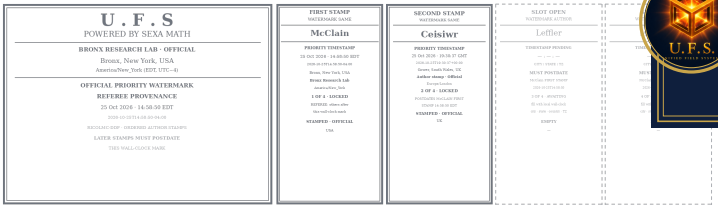
Revision 8 independent re-run (25 Oct 2026). The script was re-executed and returned 32/32 PASS; an independent re-implementation `audit/reproduce_finite.py` (not importing this script) reproduced the triality, reachability, thinning, limit, $\sqrt{720}$ and horizon values, including an exact big-integer bracket $10^{-1226} < (3/8)^{2876} < 10^{-1225}$. Note that a PASS on row TRI4 records that the published reachability sequence is *not* reproduced: that published claim is FAILED. Logs and hashes: `audit/logs/`, `audit/MANIFEST.sha256`.

McClain author PASS run (25 Oct 2026, America/New_York). First author Jered McClain (ORCID 0009-0005-6185-3749) re-ran the coauthor protocol of Section B.11 while awaiting independent returns from Erydir Ceisiwr, Jess Leffler and Jonathan McDaniel. Result: **32/32 PASS**; the live output SHA-256 matched `verify/results.txt` exactly; `audit/reproduce_finite.py` returned ALL REPRODUCED; pytest 1 passed; triality BFS reachability $[6, 15, 22, 24, 24, 24, 24]$. This is the same paper with the author-lane test locked in—not a different program. The public exit ramp stated elsewhere still requires all four authors to return the *same* PASS table, the *same* hashes and the *same* arithmetic (not "close").

Every claim in this draft that is pure arithmetic was recomputed by the script `verify/code/ricolmc_checks.py` in the work folder `ricolmc_ddf_2026-10-25/`. Run `python3 verify/code/ricolmc_checks.py`; it prints the table below and writes `verify/results.json`. A pytest wrapper, `verify/code/test_ricolmc.py`, fails if any check fails. In the sense of Section 6.7, this is synthetic data: arithmetic computation on the gated stack. It checks that the stated numbers compute; it does not test physics, and it does not move the gravity score (6.75/19).

Two values in the text were corrected by this run: the F16 total is 8.992×10^{19} J m^{-3} (not 8.994; the share 0.045% stands), and the shading horizon at 1° is 13,132 (exact value 13,131.6).

ID	Claim	Result	Value
F1	60^n -> 1 as n -> 0; P*60^n -> P (not suppressed)	PASS	60^0.1=1.5060, 60^1e-6=1.0000041, 60^0=1
F1b	for n>0, 60^n grows (no compression)	PASS	60^1=60, 60^2=3600
F15	J/m^3 x m^3 x dimensionless dmu45 = J	PASS	kg m^2 s^-2
F15b	J/m^3 x m^5 = J m^2, not J (published measure rejected)	PASS	kg m^4 s^-2 = J m^2
F2	power (W) not addable to J/m^3	PASS	W = kg m^2 s^-3
F16	E/V = 8.992e19 J/m^3, perpetual share 0.045% (inputs URMD A.4)	PASS	rho c^2=8.9876e+19, E/V=8.9916e+19, share=0.0446%
F16b	published total 9.004e10 < its own term 4e16 (inconsistent)	PASS	true
F17	C_Omega = sqrt(720) = 26.833; sqrt(2880) = 2 C_Omega = 53.666	PASS	26.8328, 53.6656
F8	720 = 6! ; 2880 = 60*48 = 2^6*3^2*5	PASS	ok
PI1	2876 factors for l=5..2880	PASS	2876
PI2	log10 Pi2880 at r=0.375 is -1225.09	PASS	-1225.086
PI3	r=1/e: -1249.03; 59/60: -20.99; 1.001: +1.248	PASS	-1249.03, -20.99, 1.248
PI4	60^n compensates Pi2880 only for n >= 689	PASS	689.0
PI5	60^18.86 = 10^33.54; Pi*60^18.86 = 10^-1191.6	PASS	-1191.55
PI6	W = w^2875 (or w^2876 as published) 1e-1225	PASS	2875: -1224.66, 2876: -1225.09
COL1	Sigmatics cascade strictly decreasing, so not lossless	PASS	[256, 96, 32, 7, 3, 1]



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ID	Claim	Result	Value
COL2	uniform per-step ratio 0.99807 (exp -0.00193); 5-step geometric mean 0.330 (O31 dual model)	PASS	0.99807, -0.00193, 0.330; log10 W gap vs 0.375: 1223
TRI1	K/<T> has 32 orbits	PASS	32
TRI2	R gives eight 4-cycles; R^3 = shift +24 mod 32	PASS	8
TRI3	<R,T,M> orbits: 4 of size 24	PASS	4
TRI4	reachability 6,15,22,24,24 (published 4,9,16,24,32 NOT reproduced)	PASS	[6, 15, 22, 24, 24]
GATE	toy: common fixed points of 6 abstract maps are fixed by their composition	PASS	200 random trials on |X|=20; glyph semantics OPEN (O9, O12)
HOR1	facet table theta_N = arccos(1-2/N) matches all 7 rows	PASS	2880 -> 2.135 deg, 128.1 arcmin
HOR2	h/R = 2/N: 2880 -> 6.94e-4	PASS	6.944e-04
HOR3	N_H^sil = 2R/(d eps) 688 for R=0.1, d=1, 1 arcmin	PASS	687.5
HOR4	N_H^shade: 1deg 13132, 2deg 3283, 0.5deg 52525	PASS	[13132, 3283, 52525]
HOR5	polyhedra: dodeca V-E+F=20-30+12=2, icosa 12-30+20=2	PASS	2
URMD1	60^18.86 = 3.4e33; 60^(18.86/32)=11.17	PASS	3.435e+33, 11.169
URMD2	2876*18.86/32=1695.0; 96 log2 96=632.2; 632/2048=30.9%	PASS	1695.04, 632.16, 30.86%
URMD3	3/8 vs 1/e (1.9%) and 1/phi^2 (1.8%); 96/256 = 3/8	PASS	1.94%, 1.82%
URMD4	choke chain constant 2700*960*90 = 2.3e8	PASS	233280000
URMD5	simulated 60^k table 1,60,3600,216000	PASS	definition only

Not tested. The gate check (GATE) uses six abstract maps on a toy set; it shows only that common fixed points of the factors are fixed by Γ. No glyph semantics are assigned (O9, O12 stay OPEN). The Sigmatics means 47.50, 35.97, 18.86 need underlying data (O25). The reachability sequence $4, 9, 16, 24, 32$ is not reproduced (O32). Gravity, G, the metric and 60^{-3} are not tested because nothing is derived. Reactor, propulsion and choke-chain claims are arithmetic-checked only (URMD4) and are not verified.

B.1. Listing: `verify/code/ricolmc_checks.py`

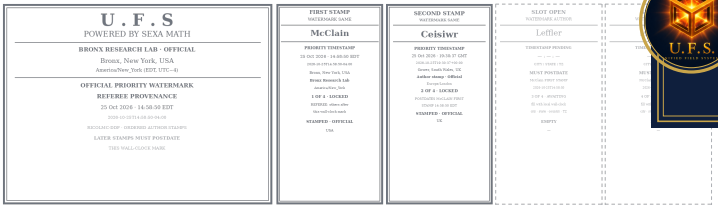
```
"""RICOLMC-DDF numerical verification. Pure arithmetic checks of claims in
s_9887, s_9896, s_urmd, s_9915. Run: python3 ricolmc_checks.py"""
import math, json, itertools, random
from collections import deque

R = []
def check(tid, claim, ok, value):
    R.append(dict(id=tid, claim=claim, result="PASS" if ok else "FAIL", value=value))

def bfs_counts(moves, start=(0, 0, 0), kmax=5):
    seen = {start}; frontier = {start}; out = []
    for _ in range(kmax):
        frontier = {m for s in frontier for m in moves(s)} - seen
        seen |= frontier; out.append(len(seen))
    return out

def tri_moves(s):
    h, d, l = s
    return [((h+1) % 4, d, l), ((h-1) % 4, d, l), (h, (d+1) % 3, l),
            (h, (d-1) % 3, l), (h, d, l ^ 1)]

def run():
```

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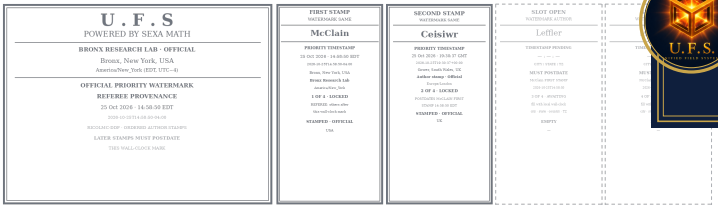
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```
c = 2.99792458e8
# F1
vals = [60**n for n in (1e-1, 1e-3, 1e-6, 0.0)]
check("F1", "60^n -> 1 as n -> 0; P*60^n -> P (not suppressed)",
      abs(vals[-1]-1) < 1e-15 and abs(vals[-2]-1) < 1e-5 and all(v >= 1 for v in vals),
      "60^0.1=%.4f, 60^1e-6=%.7f, 60^0=1" % (vals[0], vals[2]))
check("F1b", "for n>0, 60^n grows (no compression)", 60**2 > 60**1 > 60**0.5 > 1, "60^1=60,
↪  60^2=3600")
# F2/F15 units, exponent vectors (kg, m, s)
J = (1, 2, -2); Jm3 = (1, -1, -2)
add = lambda a, b: tuple(x+y for x, y in zip(a, b))
check("F15", "J/m^3 x m^3 x dimensionless dmu45 = J", add(Jm3, (0, 3, 0)) == J, "kg m^2 s^-2")
check("F15b", "J/m^3 x m^5 = J m^2, not J (published measure rejected)",
      add(Jm3, (0, 5, 0)) == (1, 4, -2) != J, "kg m^4 s^-2 = J m^2")
W = (1, 2, -3)
check("F2", "power (W) not addable to J/m^3", W != Jm3, "W = kg m^2 s^-3")
# F16
rho1, T4, P4, n = 1.0e3, 4.0e16, 2.0e12, 1
rc2 = rho1*c**2; perp = T4 + P4*60**n; EV = rc2 + perp; share = perp/EV
check("F16", "E/V = 8.992e19 J/m^3, perpetual share 0.045% (inputs URMD A.4)",
      abs(EV/8.992e19-1) < 1e-4 and abs(share*100-0.045) < 5e-4,
      "rho c^2=%.4e, E/V=%.4e, share=%.4f%%" % (rc2, EV, share*100))
check("F16b", "published total 9.004e10 < its own term 4e16 (inconsistent)", 9.004e10 < 4.0e16,
↪  "true")
# F8/F17
CO = math.sqrt(2880/4)
check("F17", "C_Omega = sqrt(720) = 26.833; sqrt(2880) = 2 C_Omega = 53.666",
      abs(CO-26.833) < 1e-3 and abs(math.sqrt(2880)-2*CO) < 1e-12, "%.4f, %.4f" % (CO,
      ↪  math.sqrt(2880)))
check("F8", "720 = 6! ; 2880 = 60*48 = 2^6*3^2*5", 720 == math.factorial(6) and 2880 == 60*48 ==
↪  2**6*9*5, "ok")
# Pi2880
nf = 2880-5+1
rows = {r: nf*math.log10(r) for r in (0.375, math.exp(-1), 59/60, 1.0, 1.001)}
check("PI1", "2876 factors for l=5..2880", nf == 2876, nf)
check("PI2", "log10 Pi2880 at r=0.375 is -1225.09", abs(rows[0.375]+1225.09) < 0.01, "%.3f" %
↪  rows[0.375])
check("PI3", "r=1/e: -1249.03; 59/60: -20.99; 1.001: +1.248",
      abs(rows[math.exp(-1)]+1249.03) < 0.01 and abs(rows[59/60]+20.99) < 0.01 and
      ↪  abs(rows[1.001]-1.248) < 0.001,
      "%.2f, %.2f, %.3f" % (rows[math.exp(-1)], rows[59/60], rows[1.001]))
nstar = -rows[0.375]/math.log10(60)
check("PI4", "60^n compensates Pi2880 only for n >= 689", 688 < nstar < 690, "%.1f" % nstar)
check("PI5", "60^18.86 = 10^33.54; Pi*60^18.86 = 10^-1191.6",
      abs(18.86*math.log10(60)-33.54) < 0.01 and abs(rows[0.375]+18.86*math.log10(60)+1191.6) < 0.1,
      "%.2f" % (rows[0.375]+18.86*math.log10(60)))
w2875 = 2875*math.log10(0.375)
check("PI6", "W = w^2875 (or w^2876 as published) ~ 1e-1225", round(w2875) == -1225 or
↪  round(rows[0.375]) == -1225,
      "2875: %.2f, 2876: %.2f" % (w2875, rows[0.375]))
casc = [256, 96, 32, 7, 3, 1]
check("COL1", "Sigmatics cascade strictly decreasing, so not lossless", all(a > b for a, b in
↪  zip(casc, casc[1:])), casc)
pr = (1/256)**(1/2876); gm = (1/256)**(1/5)
check("COL2", "uniform per-step ratio 0.99807 (exp -0.00193); 5-step geometric mean 0.330 (O31 dual
↪  model)",
      abs(pr-0.99807) < 1e-5 and abs(math.log(pr)+0.00193) < 1e-5 and abs(gm-0.330) < 1e-3,
      "%.5f, %.5f, %.3f; log10 W gap vs 0.375: %.0f" % (pr, math.log(pr), gm,
      ↪  2876*math.log10(pr)-rows[0.375]))
# Triality
K = list(itertools.product(range(4), range(3), range(8)))
```



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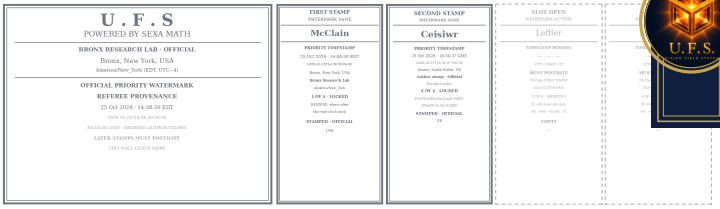
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```
orbT = {frozenset((h, (d+k) % 3, l) for k in range(3)) for h, d, l in K}
check("TRI1", "K/<T> has 32 orbits", len(orbT) == 32, len(orbT))
o = lambda h, l: 8*h+l
ok = all(o((h+3) % 4, l) == (o(h, l)+24) % 32 for h in range(4) for l in range(8))
cyc = {frozenset(o((h+k) % 4, l) for k in range(4)) for h in range(4) for l in range(8)}
check("TRI2", "R gives eight 4-cycles; R^3 = shift +24 mod 32", ok and len(cyc) == 8 and all(len(x)
↪  == 4 for x in cyc), len(cyc))
G = set()
for s in K:
    orb = set(); q = deque([s])
    while q:
        x = q.popleft()
        if x in orb: continue
        orb.add(x); q.extend(tri_moves(x))
    G.add(frozenset(orb))
check("TRI3", "<R,T,M> orbits: 4 of size 24", len(G) == 4 and all(len(g) == 24 for g in G), len(G))
seq = bfs_counts(tri_moves)
check("TRI4", "reachability 6,15,22,24,24 (published 4,9,16,24,32 NOT reproduced)",
      seq == [6, 15, 22, 24, 24] and seq != [4, 9, 16, 24, 32], seq)
# Gate (abstract toy, no glyph semantics, O12 untouched)
random.seed(0); X = range(20); ok = True
for _ in range(200):
    maps = [{x: (x if random.random() < .5 else random.choice(X)) for x in X} for _ in range(6)]
    comp = lambda x: maps[0][maps[1][maps[2][maps[3][maps[4][maps[5][x]]]]]]
    inter = {x for x in X if all(m[x] == x for m in maps)}
    ok &= inter <= {x for x in X if comp(x) == x}
check("GATE", "toy: common fixed points of 6 abstract maps are fixed by their composition", ok,
      "200 random trials on |X|=20; glyph semantics OPEN (O9, O12)")
# Horizon / facets
tab = {6: 48.19, 12: 33.56, 20: 25.84, 60: 14.84, 2880: 2.135, 11520: 1.068, 8294400: 0.0398}
ok = all(abs(math.degrees(math.acos(1-2/N))-v)/v < 2e-3 for N, v in tab.items())
check("HOR1", "facet table theta_N = arccos(1-2/N) matches all 7 rows", ok,
      "2880 -> %.3f deg, %.1f arcmin" % (math.degrees(math.acos(1-2/2880)),
      ↪  60*math.degrees(math.acos(1-2/2880))))
check("HOR2", "h/R = 2/N: 2880 -> 6.94e-4", abs(2/2880-6.94e-4) < 1e-6, "%.3e" % (2/2880))
ea = math.radians(1/60); nsil = 0.2/ea
check("HOR3", "N_H^sil = 2R/(d eps) ~ 688 for R=0.1, d=1, 1 arcmin", round(nsil) == 688, "%.1f" %
↪  nsil)
sh = {e: 2/(1-math.cos(math.radians(e))) for e in (1, 2, 0.5)}
check("HOR4", "N_H^shade: 1deg 13132, 2deg 3283, 0.5deg 52525",
      [round(sh[1]), round(sh[2]), round(sh[0.5])] == [13132, 3283, 52525], [round(v) for v in
      ↪  sh.values()])
check("HOR5", "polyhedra: dodeca V-E+F=20-30+12=2, icosa 12-30+20=2", 20-30+12 == 2 and 12-30+20 ==
↪  2, 2)
# URMD correspondences
check("URMD1", "60^18.86 = 3.4e33; 60^(18.86/32)=11.17", abs(60**18.86/3.4e33-1) < 0.02 and
↪  abs(60**(18.86/32)-11.17) < 0.01,
      "%.3e, %.3f" % (60**18.86, 60**(18.86/32)))
b = 96*math.log2(96)
check("URMD2", "2876*18.86/32=1695.0; 96 log2 96=632.2; 632/2048=30.9%",
      abs(2876*18.86/32-1695.0) < 0.1 and abs(b-632.2) < 0.1 and abs(632/2048-0.309) < 1e-3,
      "%.2f, %.2f, %.2f%%" % (2876*18.86/32, b, 63200/2048))
check("URMD3", "3/8 vs 1/e (1.9%) and 1/phi^2 (1.8%); 96/256 = 3/8",
      96/256 == .375 and round(100*(.375/math.exp(-1)-1), 1) == 1.9 and
      ↪  round(100*(1-.375*((1+5**.5)/2)**2), 1) == 1.8,
      "%.2f%%, %.2f%%" % (100*(.375/math.exp(-1)-1), 100*(1-.375*((1+5**.5)/2)**2)))
check("URMD4", "choke chain constant 2700*960*90 = 2.3e8", abs(2700*960*90/2.3e8-1) < 0.02,
↪  2700*960*90)
check("URMD5", "simulated 60^k table 1,60,3600,216000", [60**k for k in range(4)] == [1, 60, 3600,
↪  216000], "definition only")
return R
```

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```
if __name__ == "__main__":
    res = run()
    for r in res: print("%-6s %-4s %s | %s" % (r["id"], r["result"], r["claim"], r["value"]))
    json.dump(res, open("../results.json", "w"), indent=1, default=str)
    print("%d/%d PASS" % (sum(r["result"] == "PASS" for r in res), len(res)))
```

B.2. Listing: `verify/code/test_ricolmc.py`

```
from ricolmc_checks import run
def test_all():
    bad = [r for r in run() if r["result"] != "PASS"]
    assert not bad, bad
```

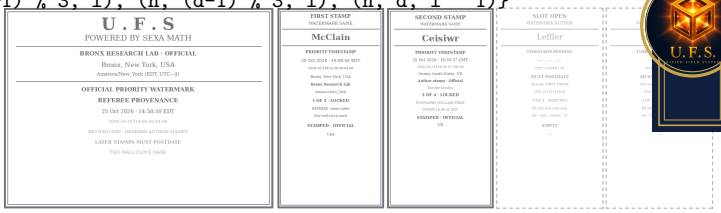
B.3. Listing: `urmd_src/triality_bfs.py`

```
# Reachability on Z4 x Z3 x Z8 under R+-, T+-, M (lowest bit of l)
S={(0,0,0)};out=[]
for k in range(1,8):
    new=set()
    for h,d,l in S:
        for m in [((h+1)%4,d,l),((h-1)%4,d,l),(h,(d+1)%3,l),(h,(d-1)%3,l),(h,d,l^1)]: new.add(m)
    S|=new; out.append(len(S))
print(out)
```

B.4. Listing: `audit/reproduce_finite.py`

```
"""Independent re-implementation (not importing verify/code) of the finite and numerical
claims audited under Rev8 P07. Prints each result; exit code 1 on any mismatch."""
import itertools, math, sys
from collections import deque
bad = []
def rep(name, ok, val):
    print(f"{'OK  ' if ok else 'FAIL'} {name}: {val}")
    if not ok: bad.append(name)

K = [(h, d, l) for h in range(4) for d in range(3) for l in range(8)]
rep("|Z4xZ3xZ8|", len(K) == 96, len(K))
# T: d -> d+1 (order 3). Orbits of <T>
seen, orbits = set(), 0
for s in K:
    if s in seen: continue
    orbits += 1
    x = s
    for _ in range(3): seen.add(x); x = (x[0], (x[1]+1) % 3, x[2])
rep("<T> orbits", orbits == 32, orbits)
# R: h -> h+1 on the 32 orbit labels 8h+l; cycles
lab = lambda h, l: 8*h + l
perm = {lab(h, l): lab((h+1) % 4, l) for h in range(4) for l in range(8)}
cyc, vis = [], set()
for v in range(32):
    if v in vis: continue
    c = [v]; vis.add(v); w = perm[v]
    while w != v: c.append(w); vis.add(w); w = perm[w]
    cyc.append(len(c))
rep("R cycle type on 32 labels", cyc == [4]*8, f"{len(cyc)} cycles of lengths {sorted(set(cyc))}")
rep("R^3 = +24 mod 32", all(perm[perm[perm[v]]] == (v+24) % 32 for v in range(32)), "checked 32 labels")
# reachability under generators h+-1, d+-1, l xor 1 from (0,0,0)
def nb(s):
    h, d, l = s
    return {((h+1) % 4, d, l), ((h-1) % 4, d, l), (h, (d+1) % 3, l), (h, (d-1) % 3, l), (h, d, l ^ 1)}
```

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```
seenR, fr, seq = {(0, 0, 0)}, {(0, 0, 0)}, []
for _ in range(5):
    fr = {m for s in fr for m in nb(s)} - seenR; seenR |= fr; seq.append(len(seenR))
rep("reachability (cumulative, k=1..5)", seq == [6, 15, 22, 24, 24], seq)
rep("published 4,9,16,24,32 reproduced?", seq != [4, 9, 16, 24, 32], "NO: mismatch preserved (published
↪  claim FAILED)")
# thinning
l10 = 2876*math.log10(0.375)
rep("0.375^2876 = 10^x", abs(l10 + 1225.09) < 0.005, f"x = {l10:.4f}")
# exact rational check of exponent bracket: 10^-1226 < (3/8)^2876 < 10^-1225
from fractions import Fraction
# use integer logs: compare 3^2876 * 10^1226 vs 8^2876
rep("10^-1226 < (3/8)^2876 < 10^-1225 (exact integers)",
    3**2876 * 10**1226 > 8**2876 > 3**2876 * 10**1225, "exact big-integer comparison")
# limit
vals = [60**(10.0**-k) for k in (1, 3, 6, 9, 12)]
rep("60^n -> 1 as n -> 0", abs(vals[-1]-1) < 1e-10 and all(v > 1 for v in vals), [f"{v:.12f}" for v in
↪  vals])
rep("sqrt(720)", abs(math.sqrt(720) - 26.8328) < 5e-5, f"{math.sqrt(720):.6f}  (square =
↪  {math.sqrt(720)**2:.6f}, distinct from root)")
# horizon numbers cited in verify suite
th = math.degrees(math.acos(1 - 2/2880))
rep("theta_2880 = arccos(1-2/2880)", abs(th - 2.135) < 1e-3, f"{th:.4f} deg = {60*th:.2f} arcmin")
rep("h/R = 2/2880", abs(2/2880 - 6.944e-4) < 1e-6, f"{2/2880:.4e}")
rep("N_H^sil = 0.2/(1 arcmin)", round(0.2/math.radians(1/60)) == 688, f"{0.2/math.radians(1/60):.2f}")
sh = [2/(1-math.cos(math.radians(e))) for e in (1, 2, 0.5)]
rep("N_H^shade 1,2,0.5 deg", [round(x) for x in sh] == [13132, 3283, 52525], [round(x) for x in sh])
rep("60^n compensation n*", 688 < -l10/math.log10(60) < 690, f"{-l10/math.log10(60):.2f}")
print(f"\n{'ALL REPRODUCED' if not bad else 'MISMATCHES: ' + ', '.join(bad)}")
sys.exit(1 if bad else 0)
```

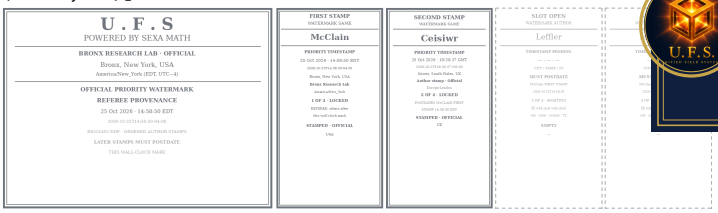
B.5. Listing: `audit/model_gamma.py`

```
"""RICOLMC-DDF Rev8 finite model instance D0 (audit P01-P06).
Configuration space X = Z4 x Z3 x Z8 (triality coordinates h,d,l written a,b,c).
Six explicit operators X->X, Gamma = Orr o Na o Ka o Sa o Mu o Wa (Wa applied first).
Extended 2880-address space X2880 = X x Z30 (96*30 = 2880); five-coordinate
operational space X5 = Z4 x Z3 x Z8 x Z5 x Z6 (4*3*8*5*6 = 2880).
MODEL INSTANCE ONLY: not the physical plate, not M_2880 as a manifold."""
import itertools, json, hashlib

X = list(itertools.product(range(4), range(3), range(8)))
RHO0_J_PER_M3 = 1.0   # model density unit
V_M3 = 1.0            # model cell volume

def Wa(x):  a,b,c = x; return (a, b, 2*(c//2))                    # cadence: l even
def Mu(x):  a,b,c = x; return (a, a % 3, c)                        # power: d = h mod 3
def Sa(x):  a,b,c = x; return (a, b, (c % 4) + 4*(a % 2))          # stress: l high bit = h parity
def Ka(x):  a,b,c = x; return (min(a, 2), b, c)                    # condense: h <= 2
def Na(x):  a,b,c = x; return (a, b, 4*(c//4) + 2*(1 if b else 0) + (c % 2))  # integral: l bit1 = [d!=0]
def sectors(x):
    """DDF sector densities in units of RHO0 (J/m^3): density, dimension, field, cross D x F."""
    a,b,c = x
    return {"D": a+1, "Dim": b+1, "F": c+1, "DxF": a*c}
def E(x):
    """Model SREF: E = V * sum_j rho_j, in joules. Finite sum, 60^n cadence factor at n=0 equals 1."""
    return V_M3 * RHO0_J_PER_M3 * sum(sectors(x).values())
EMAX = 16.0
def Orr(x): return x if E(x) <= EMAX else (0, 0, 0)             # total: energy budget cap

OPS = [("Wa",Wa),("Mu",Mu),("Sa",Sa),("Ka",Ka),("Na",Na),("Orr",Orr)]
```



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```
def Gamma(x, trace=False):
    steps=[x]
    for _,f in OPS: x=f(x); steps.append(x)
    return (x, steps) if trace else x

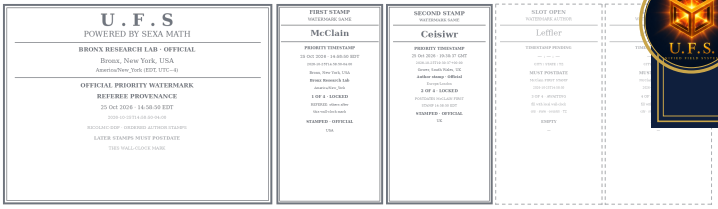
# 2880 / 5 layer
def G2880(y): return Gamma(y[:3]) + (y[3],)
def F5(y):    a,b,c,k = y; return (a,b,c,k % 5,k % 6)            # fold to 5 coordinates
def R5(z):    a,b,c,u,v = z; k = next(k for k in range(30) if k%5==u and k%6==v); return (a,b,c,k)  # CRT
def CRT(u,v): return (6*u*1 + 25*v) % 30   # closed form: 6*(6^-1 mod 5=1)*u + 5*(5^-1 mod 6=5)*v
def G5(z):    return Gamma(z[:3]) + z[3:]

def main():
    out = {}
    fix = [x for x in X if Gamma(x)==x]
    common = [x for x in X if all(f(x)==x for _,f in OPS)]
    out["Fix_Gamma_X"] = fix; out["common_fixed"] = common
    out["|X|"]=len(X); out["|Fix|"]=len(fix)
    xa=(2,2,2); xr=(1,1,6)
    out["admit_trace"] = Gamma(xa,True)[1]; out["reject_trace"] = Gamma(xr,True)[1]
    out["reject_example_2"] = Gamma((3,0,5),True)[1]
    out["E(admit)_J"]=E(xa); out["sectors(admit)"]=sectors(xa); out["E(reject)_J"]=E(xr)
    nc = [(n1,n2) for (n1,f1) in OPS for (n2,f2) in OPS if n1<n2 and any(f1(f2(x))!=f2(f1(x)) for x in X)]
    out["noncommuting_pairs"]=nc
    w=(3,0,0); out["SaKa_witness"]={"x":w,"Ka(Sa(x))":Ka(Sa(w)),"Sa(Ka(x))":Sa(Ka(w))}
    # order sensitivity of the composite
    perms = list(itertools.permutations(OPS)); fsizes=set()
    def comp(ops,x):
        for _,f in ops: x=f(x)
        return x
    distinct = {tuple(comp(p,x) for x in X) for p in perms}
    out["distinct_composites_over_720_orders"]=len(distinct)
    out["Gamma_idempotent"]= all(Gamma(Gamma(x))==Gamma(x) for x in X)
    out["image_Gamma_eq_Fix"]= sorted(set(map(Gamma,X)))==sorted(fix)
    Y = [x+(k,) for x in X for k in range(30)]
    out["|X2880|"]=len(Y)
    A = [y for y in Y if G2880(y)==y]; out["|A_Gamma_2880|"]=len(A)
    out["C1_halts_all_A"]= all(isinstance(E(y[:3]),float) for y in A)
    out["C2_commute_all_X2880"]= all(F5(G2880(y))==G5(F5(y)) for y in Y)
    out["C2_admissible_under_reduction"]= all(G5(F5(y))==F5(y) for y in A)
    out["C3_R_F_id_all_X2880"]= all(R5(F5(y))==y for y in Y)
    out["C3_closed_form_CRT_matches"]= all(CRT(u,v)==R5((0,0,0,u,v))[3] for u in range(5) for v in
    ↪  range(6))
    out["F5_bijective"]= len({F5(y) for y in Y})==2880
    out["C4_sum_exact_all_A"]= all(abs(E(y[:3])-sum(sectors(y[:3]).values()))<1e-12 for y in A)
    out["E_values_on_Fix"]={str(x):E(x) for x in fix}
    return out

if __name__=="__main__":
    o=main()
    for k,v in o.items(): print(f"{k}: {v}")
    open("logs/model_gamma.json","w").write(json.dumps(o,indent=1,default=str))
```

B.6. Listing: `verify/seal/verify_math_seal.py`

```
#!/usr/bin/env python3
import json, hashlib, math, sys
from pathlib import Path
sys.path.insert(0, "/workspace/glyph9")
from glyph15 import chk_damm, verify, encode, N
seal = json.loads(Path(__file__).with_name("seal.json").read_text())
```



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```
meta = json.loads(Path(__file__).with_name("math_seal.json").read_text())
stream = seal["core_seal"]
sha = seal["commitment_sha256"]
stream_s = ".".join(map(str, stream))

def glyph_path_fingerprint(g):
    pts = []
    for k in range(16):
        t = k / 15
        x = math.cos(2 * math.pi * (g + 1) * t)
        y = math.sin(2 * math.pi * ((g % 5) + 1) * t)
        pts.append(f"{x:.12f},{y:.12f}")
    return "|".join(pts)

geo = "||".join(glyph_path_fingerprint(g) for g in stream)
layer_a = stream_s + "|gate0|2024-11-17|damm:2a+b_mod15"
layer_b = hashlib.sha256((layer_a + "||GEO||" + geo).encode()).hexdigest()
double = hashlib.sha256((sha + "|" + layer_b).encode()).hexdigest()
outer_seal = encode([int(c, 16) % N for c in double])
gate = chk_damm([2, 0, 2, 4, 1, 1, 1, 7])[0]
checks = {
    "date_gate0": gate == 0,
    "layer_a_verify": verify(stream),
    "layer_b_match": layer_b == meta["layer_b_geo_sha256"],
    "double_match": double == meta["double_sha256"],
    "outer_match": outer_seal == meta["outer_damm_seal"],
    "outer_verify": verify(outer_seal),
}
ok = all(checks.values())
print(json.dumps(checks, indent=2))
print("PASS" if ok else "FAIL")
mut = list(stream); mut[3] = (mut[3] + 1) % N
geo2 = "||".join(glyph_path_fingerprint(g) for g in mut)
layer_b2 = hashlib.sha256((".".join(map(str, mut)) + "|gate0|2024-11-17|damm:2a+b_mod15||GEO||" +
↪  geo2).encode()).hexdigest()
print("mutation_detected", layer_b2 != layer_b)
sys.exit(0 if ok else 1)
```

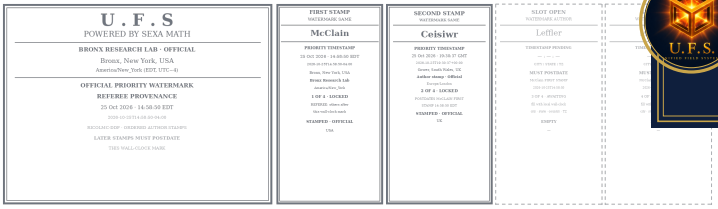
B.7. Listing: `verify/seal/glyph15.py`

```
"""15-glyph coding system. Positions 1..15 (internal values 0..14).
1-9 arrow glyphs, 10-15 prime atoms Orr Na Ka Sa Mu Wa. 60 codes = 4 rows x 15.
Messages end with END mark (Pi with small circle), which is not a data glyph."""
NAMES = ["A1","A2","A3","A4","A5","A6","A7","A8","A9","Orr","Na","Ka","Sa","Mu","Wa"]
END = "PI°"
N = 15

def code_number(row, pos):
    assert 1 <= row <= 4 and 1 <= pos <= 15
    return (row - 1) * 15 + pos

def code_decode(num):
    assert 1 <= num <= 60
    return (num - 1) // 15 + 1, (num - 1) % 15 + 1

# ---- check schemes: operate on value lists (0..14), return check value ----
def chk_none(v): return []
def chk_sum(v): return [sum(v) % N]
UNIT_W = (1, 2)  # alternating weights, both units mod 15
def _w(i): return UNIT_W[i % 2]
def chk_wsum(v): return [sum(_w(i) * x for i, x in enumerate(v)) % N]
```

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```
def chk_posw(v): return [sum((i + 1) * x for i, x in enumerate(v)) % N]  # naive weights i (not all units)
def chk_two(v): return [sum(v) % N, sum(_w(i) * x for i, x in enumerate(v)) % N]

def _damm_op(a, b): return (2 * a + b) % N  # latin square; a-1=1 unit, b=1: anti-symmetric
def damm_interim(v):
    s = 0
    for x in v: s = _damm_op(s, x)
    return s
def chk_damm(v):
    s = damm_interim(v)
    for c in range(N):
        if _damm_op(s, c) == 0: return [c]
SCHEMES = {"none": (chk_none, 0), "sum15": (chk_sum, 1), "posw15": (chk_posw, 1),
           "wsum15(1,2)": (chk_wsum, 1), "two-glyph": (chk_two, 2), "damm15": (chk_damm, 1)}

def encode(positions, scheme="damm15"):
    """positions: list of 1..15. returns list of positions incl. check glyph(s), plus END implied."""
    v = [p - 1 for p in positions]
    return [c + 1 for c in positions] if False else positions + [c + 1 for c in SCHEMES[scheme][0](v)]

def verify(msg, scheme="damm15"):
    k = SCHEMES[scheme][1]
    if len(msg) < k: return False
    data = msg[:len(msg) - k]
    return encode(data, scheme) == list(msg)

def decode(msg, scheme="damm15"):
    if not verify(msg, scheme): raise ValueError("check failed")
    return list(msg[:len(msg) - SCHEMES[scheme][1]])

def to_text(msg): return " ".join(NAMES[p - 1] for p in msg) + " " + END
def from_text(s):
    t = s.split()
    assert t[-1] == END
    return [NAMES.index(x) + 1 for x in t[:-1]]

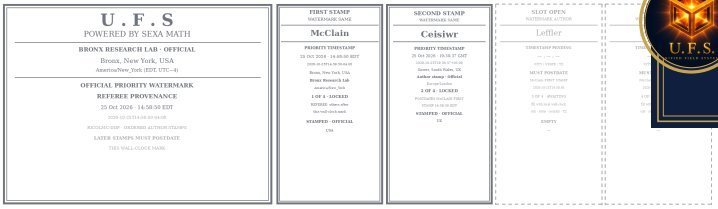
def int_to_glyphs(n):
    d = []
    while True:
        d.append(n % 15 + 1); n //= 15
        if n == 0: break
    return d[::-1]
def glyphs_to_int(g):
    n = 0
    for p in g: n = n * 15 + p - 1
    return n
```

B.8. Listing: `verify/seal/math_seal.json`

```
{
  "title": "SEXA Mathematical Phantom Seal (double gate)",
  "public_timestamp": true,
  "sexa_date": "2024-11-17",
  "layer_a_seal": [
    2,
    0,
    2,
    4,
    1,
    1,
    1,
```

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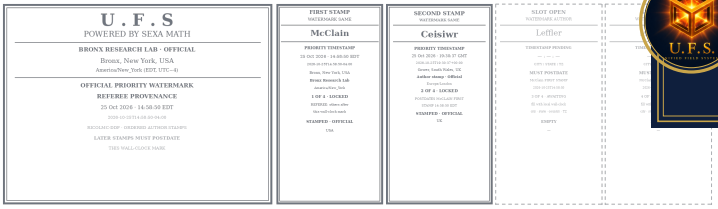
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```
    7,
    1,
    3,
    12,
    1,
    12,
    9
  ],
  "layer_a_sha256": "00c4205ed57f557ac62f532a4e0d96886060a5e34e8ec01a081fdf2ca630c19c",
  "layer_b_geo_sha256": "5ce27c569bcddcd8a34996f1ed5f45d8a7a211f59ad6cc24421276c94917460a",
  "double_sha256": "a0598eee59d4956df90c047e10f1c2fbca33cf62da4391eec2379e2c56255da7",
  "outer_damm_seal": [
    10,
    0,
    5,
    9,
    8,
    14,
    14,
    14,
    5,
    9,
    13,
    4,
    9,
    5,
    6,
    13,
    0,
    9,
    0,
    12,
    0,
    4,
    7,
    14,
    1,
    0,
    0,
    1,
    12,
    2,
    0,
    11,
    12,
    10,
    3,
    3,
    12,
    0,
    6,
    2,
    13,
    10,
    4,
    3,
    9,
    1,
    14,
    14,
    12,
```

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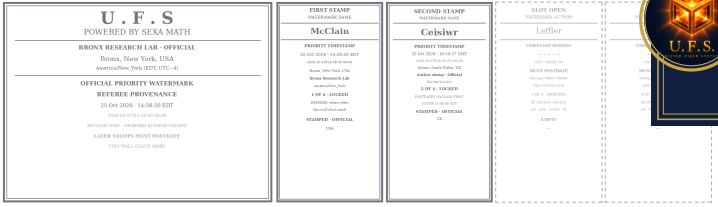
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```
    2,
    3,
    7,
    9,
    14,
    2,
    12,
    5,
    6,
    2,
    5,
    5,
    13,
    10,
    7,
    14
  ]
}
```


B.9. Listing: `verify/seal/seal.json`


```
{
  "sexa_date": "2024-11-17",
  "date_int": 20241117,
  "date_glyphs": [
    2,
    0,
    2,
    4,
    1,
    1,
    1,
    7
  ],
  "gate_glyph": 0,
  "sexagesimal_digits": [
    1,
    33,
    42,
    31,
    57
  ],
  "sexagesimal_mod15": [
    1,
    3,
    12,
    1,
    12
  ],
  "core_seal": [
    2,
    0,
    2,
    4,
    1,
    1,
    1,
    7,
    1,
    3,
    12,
```

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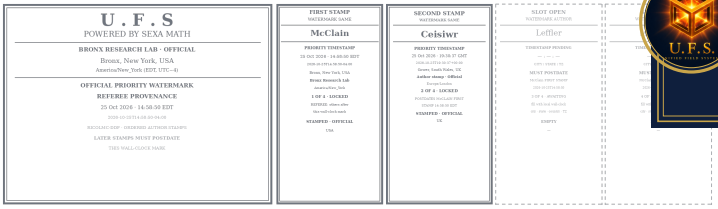
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```
    1,
    12,
    9
  ],
  "omni": {
    "forward": [
      2,
      0,
      2,
      4,
      1,
      1,
      1,
      7,
      1,
      3,
      12,
      1,
      12,
      9
    ],
    "reverse": [
      9,
      12,
      1,
      12,
      3,
      1,
      7,
      1,
      1,
      1,
      4,
      2,
      0,
      2
    ],
    "even_then_odd": [
      2,
      2,
      1,
      1,
      1,
      12,
      12,
      0,
      4,
      1,
      7,
      3,
      1,
      9
    ],
    "odd_then_even": [
      0,
      4,
      1,
      7,
      3,
      1,
      9,
```

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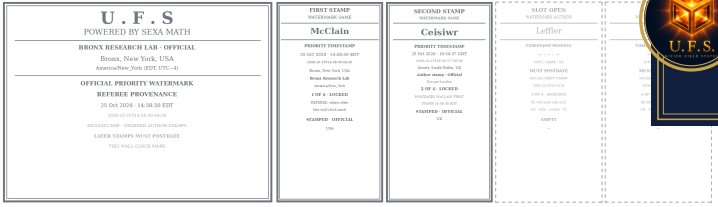
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```
      2,
      2,
      1,
      1,
      1,
      12,
      12
    ]
  },
  "alphabet_size": 15,
  "sexagesimal_base": 60,
  "damm_op": "2a+b mod 15",
  "commitment_sha256": "00c4205ed57f557ac62f532a4e0d96886060a5e34e8ec01a081fdf2ca630c19c",
  "commitment_src":
  ↪  "2024-11-17|2.0.2.4.1.1.1.7|0|1.33.42.31.57|2.0.2.4.1.1.1.7.1.3.12.1.12.9|2a+b_mod15|base60",
  "logic_gate_self_test": {
    "correct_date": {
      "date_ok": true,
      "gate_glyph": 0,
      "expected_gate": 0,
      "seal_ok": true,
      "prefix_ok": true,
      "PASS": true
    },
    "wrong_date_nov18": {
      "date_ok": false,
      "gate_glyph": 13,
      "expected_gate": 0,
      "seal_ok": true,
      "prefix_ok": true,
      "PASS": false
    }
  },
  "survives_rename": [
    "date integer 20241117",
    "date glyph stream 2.0.2.4.1.1.1.7",
    "gate glyph 0",
    "sexagesimal of 20241117 = [1, 33, 42, 31, 57]",
    "sealed stream [2, 0, 2, 4, 1, 1, 1, 7, 1, 3, 12, 1, 12, 9]",
    "sha256 commitment 00c4205ed57f557ac62f532a4e0d96886060a5e34e8ec01a081fdf2ca630c19c"
  ],
  "dies_on_rename": [
    "English word labels",
    "author display names if stripped",
    "decorative glyph art if redrawn without the numbers"
  ],
  "honest_limits": [
    "This is a provenance seal, not encryption that stops copying.",
    "An LLM can rewrite prose and drop the seal; the seal proves a copy still carrying these numbers came
    ↪  from the 2024-11-17 SEXA gate.",
    "Court-usable strength needs public timestamp (e.g. your OSF DOI) of this commitment before
    ↪  disclosure.",
    "Omni-directional means four reorderings of the same sealed stream, all recoverable to the forward
    ↪  seal."
  ],
  "public_timestamp_role": "This SEXA-SEAL commitment IS the public timestamp for provenance.",
  "public_timestamp_declared": "2026-10-25T09:17:54.036622-04:00",
  "public_timestamp_note": "Jered declared 2026-10-25 that this seal is the public timestamp. Canonical
  ↪  date gate remains SEXA write date 2024-11-17. Publish seal.json + PHANTOM_SEAL.pdf + SHA-256 with
  ↪  the paper / OSF record.",
```

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```
  "osf_hint": "Existing SEXA OSF project DOI 10.17605/OSF.IO/PXNJB may host this seal file; confirm with
  ↪  Jered before uploading."
}
```

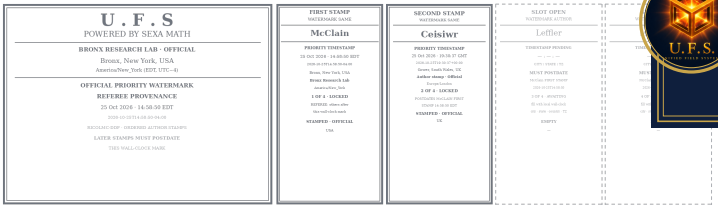
B.10. Run output

```
F1     PASS 60^n -> 1 as n -> 0; P*60^n -> P (not suppressed) | 60^0.1=1.5060, 60^1e-6=1.0000041, 60^0=1
F1b    PASS for n>0, 60^n grows (no compression) | 60^1=60, 60^2=3600
F15    PASS J/m^3 x m^3 x dimensionless dmu45 = J | kg m^2 s^-2
F15b   PASS J/m^3 x m^5 = J m^2, not J (published measure rejected) | kg m^4 s^-2 = J m^2
F2     PASS power (W) not addable to J/m^3 | W = kg m^2 s^-3
F16    PASS E/V = 8.992e19 J/m^3, perpetual share 0.045% (inputs URMD A.4) | rho c^2=8.9876e+19,
↪  E/V=8.9916e+19, share=0.0446%
F16b   PASS published total 9.004e10 < its own term 4e16 (inconsistent) | true
F17    PASS C_Omega = sqrt(720) = 26.833; sqrt(2880) = 2 C_Omega = 53.666 | 26.8328, 53.6656
F8     PASS 720 = 6! ; 2880 = 60*48 = 2^6*3^2*5 | ok
PI1    PASS 2876 factors for l=5..2880 | 2876
PI2    PASS log10 Pi2880 at r=0.375 is -1225.09 | -1225.086
PI3    PASS r=1/e: -1249.03; 59/60: -20.99; 1.001: +1.248 | -1249.03, -20.99, 1.248
PI4    PASS 60^n compensates Pi2880 only for n >= 689 | 689.0
PI5    PASS 60^18.86 = 10^33.54; Pi*60^18.86 = 10^-1191.6 | -1191.55
PI6    PASS W = w^2875 (or w^2876 as published) ~ 1e-1225 | 2875: -1224.66, 2876: -1225.09
COL1   PASS Sigmatics cascade strictly decreasing, so not lossless | [256, 96, 32, 7, 3, 1]
COL2   PASS uniform per-step ratio 0.99807 (exp -0.00193); 5-step geometric mean 0.330 (O31 dual model) |
↪  0.99807, -0.00193, 0.330; log10 W gap vs 0.375: 1223
TRI1   PASS K/<T> has 32 orbits | 32
TRI2   PASS R gives eight 4-cycles; R^3 = shift +24 mod 32 | 8
TRI3   PASS <R,T,M> orbits: 4 of size 24 | 4
TRI4   PASS reachability 6,15,22,24,24 (published 4,9,16,24,32 NOT reproduced) | [6, 15, 22, 24, 24]
GATE   PASS toy: common fixed points of 6 abstract maps are fixed by their composition | 200 random
↪  trials on |X|=20; glyph semantics OPEN (O9, O12)
HOR1   PASS facet table theta_N = arccos(1-2/N) matches all 7 rows | 2880 -> 2.135 deg, 128.1 arcmin
HOR2   PASS h/R = 2/N: 2880 -> 6.94e-4 | 6.944e-04
HOR3   PASS N_H^sil = 2R/(d eps) ~ 688 for R=0.1, d=1, 1 arcmin | 687.5
HOR4   PASS N_H^shade: 1deg 13132, 2deg 3283, 0.5deg 52525 | [13132, 3283, 52525]
HOR5   PASS polyhedra: dodeca V-E+F=20-30+12=2, icosa 12-30+20=2 | 2
URMD1  PASS 60^18.86 = 3.4e33; 60^(18.86/32)=11.17 | 3.435e+33, 11.169
URMD2  PASS 2876*18.86/32=1695.0; 96 log2 96=632.2; 632/2048=30.9% | 1695.04, 632.16, 30.86%
URMD3  PASS 3/8 vs 1/e (1.9%) and 1/phi^2 (1.8%); 96/256 = 3/8 | 1.94%, 1.82%
URMD4  PASS choke chain constant 2700*960*90 = 2.3e8 | 233280000
URMD5  PASS simulated 60^k table 1,60,3600,216000 | definition only
32/32 PASS
```

Exactness. Every `.py`, `.json` and `.txt` code file in the coding handoff zip is reprinted verbatim in this section from the same disk file; the SHA-256 of each zip member equals that of its listing source (see `MANIFEST.sha256`).

B.11. McClain author PASS run (25 Oct 2026)

Same manuscript, author-lane lock. Jered McClain executed the coauthor check protocol (`collab_handoff/COAUTHOR_TEST_PROTOCOL.md`, `RUN.txt`) on 25 Oct 2026 (America/New_York) while awaiting Ceisiwr, Leffler and McDaniel. Machine: UFS bot computer (Linux, laptop-class). Commands: `python3 verify/code/ricolmc_checks.py`; `python3 -m pytest verify/code/test_ricolmc.py`; `python3 audit/reproduce_finite.py`; `python3 audit/model_gamma.py`; `python3 urmd_src/triality_bfs.py`.



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Field	Result
verify/code	**PASS** (32/32)
PASS table vs `verify/results.txt`	exact match (identical SHA-256)
`reproduce_finite`	ALL REPRODUCED
pytest	1 passed
triality BFS	[6, 15, 22, 24, 24, 24, 24]
Real trials N	GATE internal 200; no separate search campaign
Pruned/covered M	0 this run
Awaiting	Ceisiwr · Leffler · McDaniel
Match rule	same PASS table, same hashes, same arithmetic

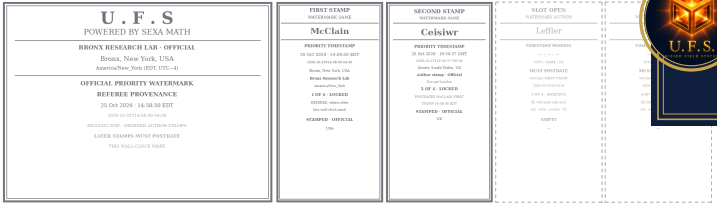
SHA-256 of this run.

File	SHA-256
`ricolmc_checks.py`	`e5771d0112a6bcb99b6a0052c2117df3e8b08e10fb642f7b2792ce002a6adbc0`
`verify/results.txt` (ref)	`e49d0b41a03a3beea8d453311c8e460d74b131ab30e95df9e25ef5fe961d8f01`
`ricolmc_checks.out`	`e49d0b41a03a3beea8d453311c8e460d74b131ab30e95df9e25ef5fe961d8f01`
`reproduce_finite.out`	`8dd1309bcb44fe34e6a8541fed6096657ca4133248fce2942d5354981eea3ed3`
`model_gamma.out`	`f2bb8ee5b3e6baaccfc17f0ef6c79311fa1cb83b749f28c039f088730bc0e4ee`
`triality_bfs.out`	`eb7b0af518dba6ca300d0b88d4a5776a6ed3cef4623647f4bcd91df8f1665e56`
`pytest.out`	`a71df3ef716cabe43ead70bd8311cda3aeadcb986bea501da0ea9262f31c3925`

Artifacts: `verify/author_runs/mcclain_2026-10-25/`. Coauthor replies must mirror this sheet exactly for the four-author match gate.

B.12. Listing: McClain PASS sheet (JSON)

```
{
  "author": "Jered McClain",
  "orcid": "0009-0005-6185-3749",
  "role": "founder / first author \u2014 own run while awaiting Ceisiwr, Leffler, McDaniel",
  "timestamp_america_new_york": "2026-10-25T14:09:53.478310-04:00",
  "machine": "UFS bot computer (Linux laptop-class)",
  "protocol": "collab_handoff/COAUTHOR_TEST_PROTOCOL.md + RUN.txt",
  "verify_code": "PASS",
  "pass_table_matches_results_txt": true,
  "pass_table_line_count": 33,
  "summary": "32/32 PASS",
  "reproduce_finite": "ALL REPRODUCED",
  "triality_reachability": "[6, 15, 22, 24, 24, 24, 24]",
  "seal_verify_snippet": "PASS (see verify/seal/verify_math_seal.py listing)",
  "pytest": ".                                                                    [100%]\n1 passed in
  ↪  0.02s",
  "real_trials_N": "GATE uses 200 random trials inside ricolmc_checks (deterministic suite otherwise); no
  ↪  separate search campaign this run",
  "pruned_covered_M": "0 this run (no 999Q cover campaign)",
  "sha256": {
```

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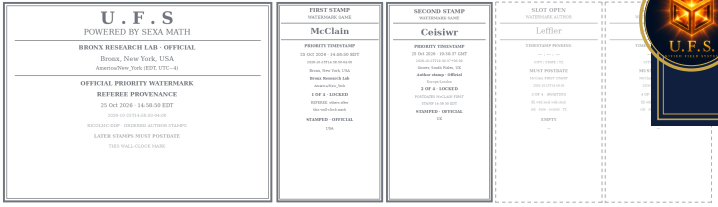

```
    "ricolmc_checks.py": "e5771d0112a6bcb99b6a0052c2117df3e8b08e10fb642f7b2792ce002a6adbc0",
    "results.txt_ref": "e49d0b41a03a3beea8d453311c8e460d74b131ab30e95df9e25ef5fe961d8f01",
    "ricolmc_checks.out": "e49d0b41a03a3beea8d453311c8e460d74b131ab30e95df9e25ef5fe961d8f01",
    "reproduce_finite.out": "8dd1309bcb44fe34e6a8541fed6096657ca4133248fce2942d5354981eea3ed3",
    "model_gamma.out": "f2bb8ee5b3e6baaccfc17f0ef6c79311fa1cb83b749f28c039f088730bc0e4ee",
    "triality_bfs.out": "eb7b0af518dba6ca300d0b88d4a5776a6ed3cef4623647f4bcd91df8f1665e56",
    "verify_math_seal.out": "32351043724a8e6704a4e1fa726f9b873224423933b70fab59d43e403e3852bc",
    "pytest.out": "a71df3ef716cabe43ead70bd8311cda3aeadcb986bea501da0ea9262f31c3925"
  },
  "awaiting": [
    "Erydir Ceisiwr",
    "Jess Leffler",
    "Jonathan McDaniel"
  ],
  "match_rule": "same PASS table, same hashes, same arithmetic \u2014 not close, same"
}
```


B.13. Listing: McClain run output (`ricolmc_checks.out`)

```
F1     PASS 60^n -> 1 as n -> 0; P*60^n -> P (not suppressed) | 60^0.1=1.5060, 60^1e-6=1.0000041, 60^0=1
F1b    PASS for n>0, 60^n grows (no compression) | 60^1=60, 60^2=3600
F15    PASS J/m^3 x m^3 x dimensionless dmu45 = J | kg m^2 s^-2
F15b   PASS J/m^3 x m^5 = J m^2, not J (published measure rejected) | kg m^4 s^-2 = J m^2
F2     PASS power (W) not addable to J/m^3 | W = kg m^2 s^-3
F16    PASS E/V = 8.992e19 J/m^3, perpetual share 0.045% (inputs URMD A.4) | rho c^2=8.9876e+19,
↪  E/V=8.9916e+19, share=0.0446%
F16b   PASS published total 9.004e10 < its own term 4e16 (inconsistent) | true
F17    PASS C_Omega = sqrt(720) = 26.833; sqrt(2880) = 2 C_Omega = 53.666 | 26.8328, 53.6656
F8     PASS 720 = 6! ; 2880 = 60*48 = 2^6*3^2*5 | ok
PI1    PASS 2876 factors for l=5..2880 | 2876
PI2    PASS log10 Pi2880 at r=0.375 is -1225.09 | -1225.086
PI3    PASS r=1/e: -1249.03; 59/60: -20.99; 1.001: +1.248 | -1249.03, -20.99, 1.248
PI4    PASS 60^n compensates Pi2880 only for n >= 689 | 689.0
PI5    PASS 60^18.86 = 10^33.54; Pi*60^18.86 = 10^-1191.6 | -1191.55
PI6    PASS W = w^2875 (or w^2876 as published) ~ 1e-1225 | 2875: -1224.66, 2876: -1225.09
COL1   PASS Sigmatics cascade strictly decreasing, so not lossless | [256, 96, 32, 7, 3, 1]
COL2   PASS uniform per-step ratio 0.99807 (exp -0.00193); 5-step geometric mean 0.330 (O31 dual model) |
↪  0.99807, -0.00193, 0.330; log10 W gap vs 0.375: 1223
TRI1   PASS K/<T> has 32 orbits | 32
TRI2   PASS R gives eight 4-cycles; R^3 = shift +24 mod 32 | 8
TRI3   PASS <R,T,M> orbits: 4 of size 24 | 4
TRI4   PASS reachability 6,15,22,24,24 (published 4,9,16,24,32 NOT reproduced) | [6, 15, 22, 24, 24]
GATE   PASS toy: common fixed points of 6 abstract maps are fixed by their composition | 200 random
↪  trials on |X|=20; glyph semantics OPEN (O9, O12)
HOR1   PASS facet table theta_N = arccos(1-2/N) matches all 7 rows | 2880 -> 2.135 deg, 128.1 arcmin
HOR2   PASS h/R = 2/N: 2880 -> 6.94e-4 | 6.944e-04
HOR3   PASS N_H^sil = 2R/(d eps) ~ 688 for R=0.1, d=1, 1 arcmin | 687.5
HOR4   PASS N_H^shade: 1deg 13132, 2deg 3283, 0.5deg 52525 | [13132, 3283, 52525]
HOR5   PASS polyhedra: dodeca V-E+F=20-30+12=2, icosa 12-30+20=2 | 2
URMD1  PASS 60^18.86 = 3.4e33; 60^(18.86/32)=11.17 | 3.435e+33, 11.169
URMD2  PASS 2876*18.86/32=1695.0; 96 log2 96=632.2; 632/2048=30.9% | 1695.04, 632.16, 30.86%
URMD3  PASS 3/8 vs 1/e (1.9%) and 1/phi^2 (1.8%); 96/256 = 3/8 | 1.94%, 1.82%
URMD4  PASS choke chain constant 2700*960*90 = 2.3e8 | 233280000
URMD5  PASS simulated 60^k table 1,60,3600,216000 | definition only
32/32 PASS
```

B.14. Finance prototype (path only; binary listing eradicated)

The finance operational layer is reported in Section 15 (equations, live witness aggregates, 12-tick summary). The prototype source and demo transcript live at `verify/fin/sexa_fin_proto.py` and



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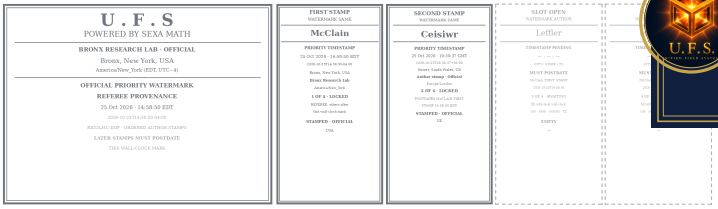
DOI SEAL

`verify/fin/demo_output.txt`; they are *not* reprinted here. Under Section 7, a binary listing is not a certificate: the Γ-spine judgement and its proofs are.

C. Revision 8 claim-status ledger

Each major claim carries exactly one status: **PROVED** (valid proof, explicit hypotheses), **COMPUTATION_VERIFIED** (independently executed and reproduced on 25 Oct 2026), **CONDITIONAL** (depends on assumptions or unconstructed objects), **OPEN**, **FAILED**, **NOT_EVALUATED**. A definition is never counted as a proof that the framework has the defined property. Definition 6.1 itself is the locked meaning of completeness and is not a claim; it carries no status.

ID	Claim	Status	Basis
L1	Token checker: spine admitted, `stages_sound`, `check_iff`, minimality (1 of 64), first-failure reports, five-equation typing	PROVED	Sec. 7; Lean re-built, axioms ⊆ {`propext`}, no `sorry`
L2	Independent Python checker agrees with Lean `check` on all lists of length ≤ 7	COMPUTATION_VERIFIED	7/7 unit tests re-run
L3	Six explicit typed operators on X_0; composition order; noncommutativity	PROVED	Def. 8.3, Prop. 8.4; Lean
L4	$\mathrm{Fix}(\Gamma_0) = \{(0,0,0),(2,2,2)\}$, non-empty, non-trivial; admitted and rejected witnesses	PROVED	Thm. 8.5; Lean `decide`
L5	O1 for the physical plate (physical configuration in $\mathrm{Fix}(\Gamma)$)	OPEN	no physical glyph maps
L6	(C1)–(C4) for the declared finite model domain D_0 (2,880-element address space; restricted instance, not a manifold theorem)	PROVED	Thm. 8.7; Lean + script
L7	Bridge B1: token-checker termination implies (C1) on $\mathcal{M}_{2880}$	OPEN	F03; no theorem connects tokens to SREF evaluation
L8	Bridge B2: proper-subchain rejection implies (C2) on $\mathcal{M}_{2880}$	OPEN	F03; O21
L9	(C1) on $\mathcal{M}_{2880}$: SREF halts with defined measure and units	CONDITIONAL	units repaired (F2, F15); measure on $\mathcal{M}_{2880}$ unconstructed (O13)
L10	(C2) on $\mathcal{M}_{2880}$: $R \circ \Gamma_{2880} = \Gamma_5 \circ R$	OPEN	O21
L11	(C3) on $\mathcal{M}_{2880}$ via Fold Logic Axiom IV / Six-Into-Five	CONDITIONAL	Assumption 1; needs $\mathcal{A}_\Gamma$ finite or dim ≤ 5
L12	Continuous source-free 2880 → 5 → 2880 reconstruction on a full-dimensional set	FAILED	Prop. 8.13
L13	Exact reconstruction on finite `Candidate2880` and on D_0 (finite CRT representation theorem; five residues, not five continuous dimensions)	PROVED	Lean `R_F_id_on_candidate`, `C3_R_F_id`
L14	(C4) on $\mathcal{M}_{2880}$ including URMD §3.4 cross terms	OPEN	Sec. 14.6
L15	RICOLMC-DDF completeness for physics, liquidity or resource-flow domains; universality (Book IX §9.6)	CONDITIONAL	depends on L9 to L14
L16	"Surpasses Einstein" in the mathematical sense of Def. 6.1	CONDITIONAL	unproved comparison pending L15 (F10)
L17	Finance: market predicates equal the formal Γ operators	OPEN (UNESTABLISHED)	F08, P09; O45
L18	Financial energy functional E_{fin}	NOT_EVALUATED	O36
L19	Live collector accept/reject aggregates	NOT_EVALUATED	not independently re-scraped in Rev8; logged data only; no completeness or alpha claim



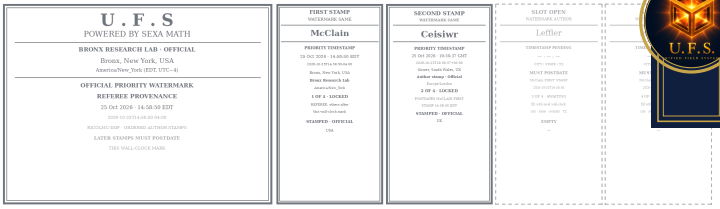
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ID	Claim	Status	Basis
L20	$\mathbb{Z}_4 \times \mathbb{Z}_3 \times \mathbb{Z}_8$: 96 elements, 32 $\langle T \rangle$-orbits, eight 4-cycles, $R^3 = +24$	PROVED	Sec. 14; `reproduce_finite.py`
L21	Published reachability 4, 9, 16, 24, 32	FAILED	re-run gives 6, 15, 22, 24, 24
L22	$0.375^{2876} = 10^{-1225.09}$ (conditional on the reported thinning ratio)	COMPUTATION_VERIFIED	exact integer bracket
L23	$60^n \to 1$ as $n \to 0$; $C_\Omega = \sqrt{720} \approx 26.8328 \neq 720$	PROVED	Fixes F1, F17
L24	Horizon threshold and facet table ($\theta_{2880} = 2.135°$, $N_H^{\mathrm{sil}} \approx 688$, shading 13132/3283/52525)	COMPUTATION_VERIFIED	re-run
L25	32/32 numerical suite	COMPUTATION_VERIFIED	re-run; TRI4 PASS records L21
L26	Monster–Moonshine Constrained Admissibility	CONDITIONAL	existing JAM 9887 postulate; no new moonshine theorem
L27	Gravity, GR/QFT reductions, physical unification	OPEN (deferred)	score 6.75/19; K1 to K3
L28	Old GR/QFT and URMD nine-criteria PASS certifications	FAILED (withdrawn)	Sec. 14.7
L29	Glyph-to-SREF-arm map	OPEN	O12
L30	Restricted-family generalization Y_n with (C1)–(C4) uniform in n	OPEN	O46; Sec. 8.4
L31	Six-to-seven octonionic generation (any six imaginary units generate $\mathbb{O}$; $e_7 = -e_1 e_6$)	PROVED	Thm. 9.1; Lean A/B; dual Fano/Cayley–Dickson
L32	Multiplicative $\Gamma \leftrightarrow$ octonion realization (elements, L_x / R_x, derivations, Spin(8)/G_2 homs)	FAILED (proved negative)	Thms. 9.2, 9.3; Lean D
L33	Spin(8) triality intertwiner for Γ	OPEN	O48; Sec. 9
L34	Additional (C1)–(C4) instance from octonions	NOT_EVALUATED	Sec. 9

Publication-readiness verdict. Major revision still required. Revision 8 closes the operator construction, nontrivial admissibility and one fully demonstrated (C1)–(C4) instance on a declared finite model domain, re-verifies all finite and numerical results, and replaces assumed reconstruction with a formal obstruction. The central claim for substantive domains (L9 to L16) is not established; bridges B1 and B2 are OPEN; the finance correspondence is unestablished. The manuscript is suitable for circulation as a working draft with this ledger attached, not for certification of general completeness.



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