MASTER FRAMEWORK • RESEARCH SPECIFICATION

Unified Informational Physics Research Ontology and Specification

Version 2.0 — Release Candidate 3

Kevin L. Brown

Independent Researcher • August 2026

Supersedes Master Framework V1.2 (December 2025)

Contents

The publication PDF contains a fully materialized table of contents. In Word, select all and press F9 if page numbers do not refresh automatically.

Document control

Field	V2.0 status
Document	Unified Informational Physics Research Ontology and Specification (UIPO)
Version	2.0 Release Candidate 3 — author review copy
Supersedes	Master Framework V1.2 (December 2025)
Author	Kevin L. Brown
Peer review	Not peer reviewed at publication of this draft
Validation companion	Deferred until this ontology is approved: *UIPO Scientific Validation, Evidence, and Falsification Standard*
Funding	Pending author statement before public release
Competing interests	Pending author statement before public release
Data and code	No empirical dataset is analyzed. Appendices H and I are CS2 protocol specifications; no versioned reference implementation or result dataset is supplied, so neither is CS3. Author repository statement pending.
AI assistance	AI tools assisted with structural editing, consistency checking, mathematical review, reference checking, and document production. Scientific responsibility, definitions, claims, and approval remain with the author.

Authorial intent and non-claim statement

UIPO is intended to coordinate mathematical proposals, hypotheses, protocols, and applications that use information, coherence, recursion, geometry, and triadic structure as organizing concepts. V2.0 preserves the nine-part architecture, section numbering, named constructs, formulas, protocols, models, and appendices of V1.2 while separating normative definitions from testable physical claims and downstream implementations.

The ontology does not treat conceptual unity as empirical confirmation. A definition may be precise without being true of nature; a simulation may be internally correct without validating the represented system; a retrospective fit may be informative without prospective predictive value; and a protocol may be reproducible without its outputs being physically meaningful. These distinctions are normative in V2.0.

Reading and classification conventions

Every numbered section identifies its status layer, canonical statement, operational meaning, claim class, specification status, scope, required next work, and V1.2 disposition.

Status layers. N — Normative Core: primitive definitions, types, notation, and mathematical schemas. **H — Hypothesis Layer:** claims that a construct describes or predicts nature. **P — Protocol Registry:** procedures that consume frozen definitions and produce auditable outputs. **A — Application Registry:** downstream computational, organizational, ledger, or physical implementations. **L — Legacy and Extension Registry:** historical constructs preserved for traceability but not sufficiently specified for normative use. A section may span layers, but each claim inherits only the status of its own layer and specification.

Claim classes. B established external scientific background; **D** definition or convention; **M** mathematical proposal; **H** empirical hypothesis; **P** protocol; **A** application or implementation. A section may contain more than one class.

Claim specification status. CS0 — Named or conceptual: the claim or construct is identifiable but lacks a complete formal specification. **CS1 — Formally defined:** a mathematical, logical, or procedural schema is stated with enough structure to inspect for consistency. **CS2 — Operationally instantiated:** a concrete instance supplies observables, estimators, units or a dimensionless rule, uncertainty, and a frozen decision rule. **CS3 — Implemented and internally verified:** a CS2 instance has a versioned implementation that passes reproducibility or conformance checks. CS status does not indicate empirical support. **EB** identifies external scientific background supported independently of UIPO. Prospective evidence, falsification, replication, and evidentiary scoring are intentionally deferred to the companion standard.

Disposition labels. Retained preserves V1.2 content; **corrected** repairs an internal error without changing the construct's identity; **operationalized** adds observables or decision rules; **reclassified** changes scientific status rather than meaning; **unresolved** preserves a construct while identifying missing author-approved specification.

Revision principles

1. Preserve the identity of UIPO constructs unless the author explicitly retires them.
2. Separate normative definitions, mathematical schemas, empirical hypotheses, protocols, applications, and legacy extensions.
3. Declare primitive versus derived quantities, domains, codomains, units, observation maps, reference distributions, uncertainty, and decision rules before numerical interpretation.
4. Treat universal physical language as a hypothesis unless derived from stated axioms or independently established.
5. Keep historical V1.2 equations visible when V2.0 introduces a corrected operational form.
6. Use explicit causal alternatives, null models, controls, uncertainty intervals, out-of-sample tests, and prospective registration where applicable [7,8,10–12].

7. Preserve unresolved acronyms and symbols in the legacy registry rather than inventing meanings.
8. Treat every model as an approximation whose usefulness depends on declared scope and comparison with alternatives [11].

V2.0 revision summary

9. Information is operationally plural: state distinguishability, Shannon information, Fisher information, algorithmic description length, language-relative semantic content, and goal-relative pragmatic or functional information are separated rather than conflated.
10. The historical substrate I=(M,F,O) is retained, while canonical notation I_sub=(M,F_set,O_set) prevents collisions and requires an observation map.
11. UIPO now separates the Normative Core, Hypothesis Layer, Protocol Registry, Application Registry, and Legacy and Extension Registry.
12. Claim specification uses CS0–CS3; none of these statuses implies empirical confirmation.
13. The THD vector is written T_THD(n). The historical weighted phase statistic is reclassified as concentration, and a wrapped 1:2:3 harmonic-lock statistic is supplied.
14. CEP is a testable claim template under an explicit probability model, not a theorem unless separate axioms and proof are supplied.
15. Local coherence phi_c(x) is distinguished from the aggregate functional C[F] and the scalar aggregate bar_phi_c(W) used by ITI.
16. Undefined V1.2 constructs are preserved in a non-normative legacy registry.
17. A formalization profile, governance postulates, publication profiles, and five-hypothesis core register define the scientific center of the framework.
18. Appendix H supplies a fully frozen CS2 change-detection protocol specification, and Appendix I supplies a fully frozen CS2 synthetic THD phase-lock mapping; neither is an implementation, a result, or evidence for UIPO.
19. Appendix G preserves V1.2-to-V2.0 traceability.

Part I — Foundational Preamble

0. What an Ontology Is

Status layer. N — Normative Core.

Canonical V2.0 statement. An ontology is an explicit inventory of entities, relations, properties, operators, admissible transformations, measurement links, and revision rules. In UIPO, the ontology is an informational architecture: it says what kinds of objects the framework permits, how symbols are typed, and what must be observed before a proposed quantity is treated as empirical.

Operational meaning. A UIPO model is ontology-compliant only when every entity has a domain, every operator has an input and output type, every measured term has a reproducible estimator and unit or declared dimensionless normalization, and every empirical claim has a comparison condition. Terms that lack these items may remain in the ontology as research placeholders but cannot support numerical conclusions.

Formalization profile

UIPO V2.0 is a **human-readable normative specification ontology** in the sense of an explicit, reusable conceptual specification [28]. Its current authoritative form is this versioned text and its canonical dictionary. It does not claim the machine-enforced semantics of OWL, RDF, first-order logic, or a proof assistant. A later machine-readable export may encode the specification, but such an export must identify this release, preserve every constraint, and pass a bidirectional conformance audit before it can be treated as equivalent.

The principal entity classes are StateSpace, FieldFamily, OperatorSet, ObservationModel, Metric, Measure, Hypothesis, Protocol, Application, and LegacyExtension. Principal typed relations are hasDomain, hasCodomain, isObservedBy, derivesFrom, requires, instantiates, tests, comparedWith, and supersedes.

The following consistency rules are normative:

20. no unresolved legacy term may enter a normative numerical calculation;
21. every empirical hypothesis must depend on a declared observation model and at least one conventional comparator;
22. a protocol or application cannot validate a premise solely by reusing that premise in its success criterion;
23. a symbol has one meaning within a namespace, with historical aliases explicitly marked;
24. changes to definitions, mappings, or thresholds require a new version and a disposition record.

Governance postulate register

These postulates govern the specification; they are not asserted as laws of nature.

ID	Postulate	Operational consequence
P0	Representational neutrality	A UIPO schema may represent informational structure without asserting that information is ontologically primary.

ID	Postulate	Operational consequence
P1	Typed observation linkage	Every empirical term is connected to an observation model, estimator, and uncertainty statement.
P2	Claim separability	Definitions, mathematical proposals, empirical hypotheses, protocols, applications, and legacy constructs retain separate status.
P3	Non-circular validation	Downstream outputs and definition-built scores cannot independently validate their own premises.
P4	Versioned revision	Material changes to mappings, thresholds, or meanings create a traceable new version rather than a silent reinterpretation.

Classification / specification / disposition. D; CS1 as a governance definition and formalization profile. Scope: framework-level only; compliance does not establish physical truth. Required next work: a machine-readable export only if it can preserve these semantics, plus independent reproduction of any claimed measurement. **V1.2 disposition: retained and operationalized.**

1. Why a Unified Informational Physics Ontology Is Needed

Status layer. N — Normative Core.

Canonical V2.0 statement. UIPO coordinates symbols and dependencies across informational physics, Triune Harmonic Dynamics (THD), scalar-time proposals, awareness and identity models, protocols, and system applications. The practical problems addressed are symbol drift, implicit assumptions, category mixing, protocol opacity, and models that cannot be connected to observations.

Operational meaning. Version-controlled definitions, formula identifiers, provenance records, and dependency tests shall be used across all UIPO papers and implementations. A downstream document may extend a construct, but it must name the parent definition, state any changed assumptions, and distinguish a new version from the canonical form.

Classification / specification / disposition. D/P; CS1. Scope: coordination and research governance. Required next work: cross-document symbol audit and reproducibility audit. The existence of an ontology solves consistency problems, not scientific validity. **V1.2 disposition: retained and expanded.**

2. Informational Substrate

Status layer. N for the schema; H for ontological primacy.

Canonical V2.0 statement. UIPO uses the typed representational schema

$$I\_sub = (M, F\_set, O\_set), \qquad (1)$$

where M is a state space or manifold, F_set is a family of fields or state variables on M, and O_set is a set of admissible operators. The V1.2 notation I=(M,F,O) remains a historical alias. Equation (1) organizes a model; it does not by itself establish that information is the fundamental substance of nature.

Information semantics. V2.0 permits several non-interchangeable meanings, each of which must be named in a concrete claim:

25. **Physical-state distinguishability:** the ability of an observation procedure to distinguish admissible states.
26. **Shannon information:** quantities defined from probability distributions, such as entropy and mutual information [1,5].
27. **Fisher information:** local sensitivity of a likelihood to parameters, with a declared statistical model [3,4].
28. **Algorithmic description length:** a theoretical measure relative to a description language; exact Kolmogorov complexity is not generally computable [18].
29. **Semantic information:** the content of an expression relative to an explicit language, codebook, and interpretation model [19].
30. **Pragmatic or functional information:** the contribution of a signal or state to a specified goal, action, viability criterion, or task performance, evaluated against a declared counterfactual or ablation.

These meanings may be related in a specific model but may not be substituted for one another by terminology alone. The physical-substrate proposition—roughly, that informational structure is ontologically primary—is a separate empirical or metaphysical hypothesis in Layer H.

Observation and derivation. A concrete model must identify latent or physical state $x \in X$, observation $y \in Y$, observation map $h\_obs:X \to Y$, and measurement model $y=h\_obs(x)+nu$ or a declared non-additive alternative. It must distinguish primitive quantities from derived statistics and state topology, dimension, regularity, codomains, units, invariances, equivalence relations, and uncertainty.

Operational meaning. Without the observation map and declarations above, Equation (1) is a CS1 schema rather than a physical model. An empirical instance reaches CS2 only when the variables and decision rules are supplied.

Classification / specification / disposition. D/M in Layer N: CS1. Fundamental informational-substrate claim in Layer H: CS0 until made discriminating and testable. Required next work: compare an instantiated model with non-UIPO alternatives on independently governed observations. **V1.2**

disposition: retained, notation-corrected, and operationally separated from the physical-primacy hypothesis.

3. Triadic Form

Status layer. N for notation; H for physical applicability.

Canonical V2.0 statement. THD uses the scaling vector

$$\mathrm{T\_THD(n)} = (3n, 6n\hat{}2, 9n\hat{}3), \qquad (2)$$

and separately specifies the reference triad

$$\mathrm{F0} = 1{:}2{:}3. \ (3)$$

Equation (2) has component ratio 1:2n:3n^2 after division by 3n for nonzero n; it equals 1:2:3 only at n = 1. V2.0 therefore does not derive Equation (3) from Equation (2) without an additional mapping or assumption.

Operational meaning. Every THD test must specify what n represents, how the three components map to observables, whether scale and offset are fitted, what comparison families are allowed, and whether n was fixed before seeing the data. A test of the triadic form requires preregistered tolerances and correction for searches over mappings, windows, variables, and harmonics.

Classification / specification / disposition. D/M/H; CS1 as a mathematical definition, CS0 for cross-domain physical applicability unless a claim-specific study advances it. Required next work: benchmark against null ratios, alternative power laws, and held-out data. **V1.2 disposition: retained and corrected by separating the two stipulations.**

4. Structure of the Full Ontology

Status layer. N — Normative Core.

Canonical V2.0 statement. UIPO retains nine document parts while applying five status layers across them. Parts are organizational; layers determine normative force.

Layer	Contents	Normative force
N — Normative Core	Primitives, types, notation, schemas, dictionary, dependencies	Binding for UIPO conformance, not evidence of nature
H — Hypothesis Layer	CEP, THD applicability, physical UIM, informational time, IQD, cosmology, awareness hypotheses	Testable proposals only

Layer	Contents	Normative force
P — Protocol Registry	Archion, Luminarch, PROFILE, GLYPH/GID/GRD, SMEP/ECHOLOCK, TRIFECTA	Procedures; validity depends on inputs and tests
A — Application Registry	Computational implementations and downstream uses	Cannot validate their own premises
L — Legacy and Extension Registry	Unresolved historical names, equations, and proposed extensions	Traceability only; non-normative until promoted

Publication profiles

The master document is an umbrella specification. A public extract must declare one of the following profiles and may not imply the status of material outside that profile.

Profile	Included material	Appropriate use
Core Specification	Only clauses explicitly labeled Layer N: Sections 0–4; the N-labeled schemas within Sections 8–16 and 18; Sections 39–40; Appendices E–F; and the classification/governance conventions. H, P, A, and L clauses are excluded even when they appear in the same Part.	Definitions, typing, notation, conformance, and dependency control
Hypothesis Registry	All and only Layer H propositions, including the five central hypotheses and claim-specific mathematical models	Preregistered tests and hypothesis-specific research programs
Protocol and Application Registry	All and only Layer P and A clauses and their declared dependencies	Reproducible procedures and implementations whose outputs do not validate upstream premises
Legacy and Extension Registry	All and only Layer L material	Traceability and development; never a normative numerical dependency

Operational meaning. Layer labels, not Part numbers, determine publication-profile membership. Dependency direction proceeds from the Normative Core to hypotheses, protocols, and applications. A later application cannot be cited as independent validation of the assumptions that generated it. Promotion from L to another layer requires an author-approved definition and a disposition entry.

Classification / specification / disposition. D; CS1. Required next work: completeness, layer-assignment, dependency, and profile-conformance audits. **V1.2 disposition: retained and structurally separated.**

5. Empirical Foundations

Status layer. H with external EB background and L candidate domains.

Canonical V2.0 statement. UIPO draws on established work in information theory, statistics, information geometry, thermodynamics, dynamical systems, and cybernetics [1–6,15,16]. These bodies of work provide mathematical tools and comparison models; they do not independently validate UIPO-specific physical claims.

Landauer's principle predicts a thermodynamic cost for logically irreversible bit erasure under specified physical conditions [2], and controlled experiments have tested that constrained result [17]. It does not establish a general information–energy identity. Information geometry supplies established metrics on statistical model families [3–5], but it does not establish that spacetime is a UIPO informational manifold. Critical-transition research supplies conventional comparators for early-warning or pressure-transition claims [6].

V1.2 also named the Casimir effect, interferometry, astrophysical constraints, random-number-generator studies, and biophysical coherence. V2.0 preserves these as legacy candidate test domains, not current evidence anchors. “EIE” is not expanded or sourced in V1.2 and remains in the legacy registry.

Operational meaning. Any claimed external anchor requires a claim-specific evidence map: citation, measured variable, estimator, uncertainty, UIPO equation, and relationship type—derivation, compatibility, analogy, or direct test. Analogy and compatibility are not confirmation.

Classification / specification / disposition. B plus H; EB for the cited external findings only. UIPO-specific evidentiary relevance remains CS0 until a direct, discriminating claim is operationalized. **V1.2 disposition: retained, corrected, and moved from generic anchoring to claim-specific mapping.**

6. Information–Energy–Awareness Relations

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. UIPO keeps three proposed relations: information–energy through physically embodied information processing; information–awareness through recursion stability; and energy–awareness through viable informational structures. These relations occupy different epistemic levels.

Landauer’s principle concerns physical implementation of logically irreversible operations; it does not establish that information and energy are identical [2]. Recursion stability may be measured as a property of a representation or dynamical process, but its connection to awareness is a UIPO hypothesis. Energetic viability can be necessary for biological or computational persistence without being sufficient for awareness.

Operational meaning. A test must define separate observables for information, energy, recursion, viability, and any awareness report or behavioral criterion; specify causal alternatives; and prohibit substituting one variable for another by definition.

Classification / specification / disposition. B/H; EB for limited information-thermodynamic background, CS0 for awareness relations. Required next work: discriminating experiments in which recursion and energy are varied independently while awareness-related outcomes are assessed under blinded criteria. **V1.2 disposition: retained and reclassified.**

6A. Core Hypothesis Register

Status layer. H — Hypothesis Layer.

This register identifies the smallest set of central empirical propositions needed to test whether UIPO contributes more than terminology or flexible redescription. Each record is a claim schema, not evidence. A CS2 study must freeze the model version, observation mapping, UIPO restriction set, comparator, effect threshold, exclusion rules, and analysis code before outcome evaluation.

ID	Central proposition	Current status
H-UIPO-1	A model with a frozen, finite set of UIPO-specific restrictions provides held-out predictive value beyond a physically equivalent model from which those restrictions are absent.	CS1 claim schema; untested here
H-CEP-1	In a population selected by external maintenance criteria before coherence is measured, expected coherence change satisfies the registered bound without conditioning on later survival.	CS1 claim schema; universal form unestablished
H-THD-1	A mapping frozen across at least three nonzero n levels, including one $n \neq 1$, predicts held-out triadic observables better than allowed alternative scaling families.	CS1 claim schema; cross-domain applicability unestablished
H-SPC-1	Independently predicted modes, bands, timing, and coupling mechanism exhibit excess 1:2:3 phase locking beyond structure-preserving surrogate and conventional baselines.	CS1 statistic family; physical claim untested here
H-CTL-1	A frozen UIPO-specific source/loss restriction improves held-out local trajectory prediction beyond an equally flexible conventional balance model.	CS1 model form; generality unestablished

H-UIPO-1 — Representational adequacy and physical-content discriminator

Formal proposition. Before analysis, define a finite UIPO restriction set R_U containing at least one risky constraint not forced by the observations alone—for example a fixed dependency relation, cross-domain mapping, THD coefficient relation, coherence source/loss restriction, or informational-clock relation. For preregistered proper score S, equalized parameter budget, and held-out dataset D_{test}, model $M_U(R_U)$ must improve on comparator M_0 by at least δ_{min}. M_0 uses the same observations, target, training data, and parameter budget but omits R_U. **Physical interpretation.** UIPO has added scientific content only when its specific restrictions exclude otherwise admissible predictions. **Observable.** Out-of-sample likelihood, calibration, prediction error, or another proper domain score. **Comparator.** The strongest feasible conventional model and a restriction-matched ablation. **Unique discriminator.** The advantage survives equalized tuning, independent data governance, individual ablation of every element of R_U, and ablation of the full set. **Falsification.** The registered domain claim fails if improvement is below δ_{min}, reverses on held-out data, disappears after flexibility matching, or cannot be attributed to any frozen UIPO-specific restriction. **Status.** CS1; no empirical support assigned by this document.

H-CEP-1 — Conditional coherence tendency

Formal proposition. Equation (5) holds for one frozen CEP-RID record in a population whose system-entry and self-maintenance criteria are defined using variables independent of the tested coherence outcome. Eligibility is fixed at the start of W; every eligible system remains in analysis, including failure, dissolution, and boundary-exit outcomes. Conditioning on survival through W is prohibited. **Physical interpretation.** Systems classified as self-maintaining by external criteria tend not to lose the selected coherence quantity under the allowed dynamics. **Observable.** Registered change in C with uncertainty over W, plus all failure and boundary-exit states. **Comparator.** Null dynamics and at least one alternative objective or transition model. **Unique discriminator.** Prospective performance without changing the coherence definition, eligibility rule, boundary, or window after observing outcomes. **Falsification.** The lower uncertainty bound for expected change falls below $-\epsilon_C$, the result appears only after excluding failures, or an allowed alternative explains the data at least as well without the CEP restriction. **Status.** CS1 claim template; the universal language of V1.2 remains CS0.

H-THD-1 — Triadic scaling

Formal proposition. One preregistered mapping from three observable families to $T_{THD}(n)=(3n,6n^2,9n^3)$ is held fixed across at least three preregistered, nonzero n levels with repeated observations at each level; at least one level must satisfy $n\neq1$. It must improve held-out score by at least δ_{THD} over unrestricted and alternative power-law families. A single $n=1$ triad cannot test the scaling law. **Physical interpretation.** The constrained triadic scaling captures reproducible cross-level structure rather than a fitted numerical resemblance. **Observable.** The mapped measurements with declared units, normalization, uncertainty, and independent replication units. **Comparator.** Null ratios, fitted power laws, permutation mappings, and the best allowed non-THD model. **Unique discriminator.** Constraint-driven predictive advantage across levels after accounting for all searched variables, windows, lags, mappings, and candidate n values. **Falsification.** No registered advantage on held-out levels, instability under allowed preprocessing sensitivity checks, or equivalent performance from a simpler alternative. **Status.** CS1 mathematical claim schema; no cross-domain confirmation assigned.

H-SPC-1 — 1:2:3 harmonic phase locking

Formal proposition. A mechanism or independently governed training set must predict the modes, bands, direction of coupling, lag range, evaluation interval, and minimum duration before test data are inspected. The registered R_1:2:3 must then exceed both its multiplicity-corrected, structure-preserving surrogate threshold and its minimum effect size in independent evaluation records. **Physical interpretation.** Preidentified modes maintain the specified wrapped phase relations for a predicted reason, not merely because harmonic bands were searched. **Observable.** Instantaneous phase estimates and the component statistics in Equation (28). **Comparator.** Nulls that preserve appropriate univariate temporal structure while disrupting cross-mode alignment, plus conventional n:m phase-locking analysis [20,21,27]. **Unique discriminator.** Prospective mode, band, timing, and mechanism prediction; the statistic itself is not claimed as novel. **Falsification.** The preregistered modes do not exceed the corrected threshold and effect size, fail independent-record replication, or vanish under the allowed estimator and window sensitivity set. **Status.** CS1 statistic family; claim-specific tests may reach CS2–CS3 without implying empirical support.

H-CTL-1 — Coherence transport

Formal proposition. A CS2 test must predeclare a UIPO-specific restriction on Equation (25), such as the special relation ell_c-sigma_c=eta_CTL Q_RC1 with fixed sign, functional form, and identifiable coefficient range. The restricted model must reduce held-out trajectory error by at least delta_CTL relative to an equally flexible conventional balance or advection–diffusion–reaction model using the same observations and boundary data. **Physical interpretation.** A locally measurable coherence density follows a risky UIPO-specific balance relation rather than a generic continuity equation alone. **Observable.** Repeated measurements of density, flux, sources, losses, and boundary exchange. **Comparator.** Conventional balance models, an unrestricted source/loss model, and an ablation with the UIPO-specific term removed. **Unique discriminator.** Stable held-out improvement attributable to the frozen restriction, not parameter count or leakage. **Falsification.** The advantage is absent, disappears under ablation or flexibility matching, residuals violate the declared balance beyond tolerance, or the UIPO-specific coefficient is non-identifiable. **Status.** CS1 model form; no general physical-law status.

7. The Coherence Expansion Principle (CEP)

Status layer. H — Hypothesis Layer.

Historical V1.2 form. “Any self-maintaining informational system evolves under allowable operators toward configurations of non-decreasing informational coherence,” represented as

$$C[F_{(t+\Delta t)}] \ \geq \ C[F_t]. \ (4)$$

Canonical V2.0 statement. CEP is a testable claim template. For probability model P_theta, declared system boundary B_IBC, operators O_set, observation window W, and tolerance epsilon_C, the proposed claim is

$$E_{(P_\theta)}[\Delta C \mid B_{IBC}, O_{set}, W] \ \geq \ -\varepsilon_C. \ (5)$$

It becomes a theorem only if separate axioms, regularity conditions, and a proof are supplied. Equation (4) is recovered only when noise, uncertainty, and transient decreases are excluded by assumption. Open, fluctuating, metastable, or failing systems may decrease a selected coherence statistic; conventional transition models provide essential alternatives [6].

Operational meaning. Every CEP test must freeze a registered model identifier CEP-RID containing the measure family and version, probability model, admissible operator family, boundary rule, window, tolerance, null, allowed alternatives, preprocessing, and decision rule before outcome data are evaluated. Selecting a coherence measure after observing a trajectory does not test CEP.

Anti-flexibility rule. A study shall select its measure, operator, boundary, normalization, window, and comparator from registered families before outcomes are inspected. Any new family requires a versioned justification. All searches over mappings, variables, lags, windows, thresholds, and exclusions must be logged and included in error control. A post hoc addition is exploratory and cannot confirm the preregistered CEP claim.

Classification / specification / disposition. M/H in Layer H; CS1 as a claim template, CS0 as a universal law. Required next work: CS2 instantiations tested against null dynamics and alternative objectives. **V1.2 disposition: retained, corrected, operationalized, and reclassified.**

8. Informational Boundary Conditions (IBC)

Status layer. N for the schema; H when physically interpreted.

Canonical V2.0 statement. Let S_sys ⊂ M be a system with boundary ∂S_sys. Preserve the V1.2 structure in collision-free notation:

$$B_{IBC} \ = \ (S_{sys}, \partial S_{sys}, C_{min}, \Delta_{max}), \qquad (6)$$

with historical admissibility conditions

$$C[F] \ \geq \ C_{min}, \ \ |Q_{RC1}| \ \leq \ \Delta_{max}, \ \ \delta C[F] \ \geq \ 0. \ (7)$$

The historical V1.2 line used R_info; Equation (7) uses its canonical V2.0 alias Q_RC1. For empirical use, augment B_IBC with window W, uncertainty model U, tolerance vector epsilon, and boundary exchange terms J_boundary. The final condition is interpreted through Equation (5), not as an unconditional pointwise law.

Operational meaning. S_sys and ∂S_sys must be observable or inferable by a declared segmentation rule. C_min and Δ_max must be frozen from theory, training data, or a reference distribution before evaluation. Report sensitivity to alternative boundaries.

Classification / specification / disposition. D/M in Layer N and H; CS1 as a schema and CS2 only when instantiated. Scope: model-specific viability, not an automatic physical edge. **V1.2 disposition: retained, notation-corrected, and operationalized.**

Part II — Mathematical Foundations

9. Triadic Mathematics

Status layer. N for the operator; H for physical applicability.

Canonical V2.0 statement. The triadic operator remains

$$\mathrm{H\_n}(\mathrm{X1}, \mathrm{X2}, \mathrm{X3}) \ = \ (3\mathrm{n}\ \mathrm{X1}, 6\mathrm{n}\text{^}2\ \mathrm{X2}, 9\mathrm{n}\text{^}3\ \mathrm{X3}). \ (8)$$

Its use requires the three components to belong to compatible vector spaces or to be mapped into a common comparison space. Dimensional quantities must be nondimensionalized before component ratios, norms, or geometric means are computed.

Operational meaning. A study must specify n, component semantics, units, normalization, error propagation, and permitted transformations. The operator is linear in each Xk for fixed n but not linear in n; this distinction matters when fitting.

Classification / specification / disposition. M; CS1 as a defined operator. Physical relevance remains claim-specific. Required next work: identifiability, sensitivity, and comparison with simpler two-component and unrestricted three-component models. **V1.2 disposition: retained and operationalized.**

10. Core Indices

Status layer. N for typed schemas; H/L for interpretation and unresolved factors.

Canonical V2.0 statement. V1.2 defines four indices. Collision-free V2.0 notation is

$$\mathrm{TEI} \ = \ (\mathrm{T\_TEI} \ \cdot \ \mathrm{Cu\_TEI} \ \cdot \ \mathrm{Cr\_TEI} \ \cdot \ \mathrm{B\_TEI} \ \cdot \ \mathrm{H\_TEI})\text{^}(1/5), \qquad (9)$$

$$\mathrm{ITI}(\mathrm{W}) \ = \ (\mathrm{dT\_S/dt})/\mathrm{omega\_ref}, \ \ \mathrm{omega\_ref} \ > \ 0, \qquad (10)$$

$$\mathrm{EET}(\mathrm{S\_ent}) \ \equiv \ \mathrm{ZPCI} \ = \ \exp(-\alpha\ \mathrm{S\_ent}), \qquad (11)$$

$$\mathrm{HTCS}(\mathrm{h}, \mathrm{h\_ref}) \ \equiv \ \mathrm{RSI} \ = < \mathrm{h}, \mathrm{h\_ref} > / \ (||\mathrm{h}|| \ ||\mathrm{h\_ref}||). \ (12)$$

The subscripts disambiguate symbols without inventing missing meanings. V1.2 does not define the five TEI components, their units, or estimators; TEI therefore remains CS0. omega_ref is a frozen positive reference clock rate with the same units as dT_S/dt, making ITI dimensionless. The historical form

(1/bar_phi_c)(dT_S/dt) is preserved as ITI_hist for traceability but is not canonical because multiplying it by bar_phi_c in the State Evolution Equation cancels the proposed coherence dependence. The neutral names **Exponential Entropy Transform (EET; historical ZPCI)** and **Harmonic Target Cosine Similarity (HTCS; historical RSI)** describe what the formulas compute without asserting physical meaning. Equation (11) requires dimensionless alpha S_ent. Equation (12) is cosine similarity between declared harmonic-comparison vector h and reference vector h_ref, with nonzero vectors in a declared inner-product space; ordinary time remains t.

Operational meaning. Each factor must have a domain, unit or dimensionless normalization, sign constraint, missing-data rule, estimator, and uncertainty. Composite scores must be accompanied by component values and sensitivity to aggregation. A study using ITI_hist must label it historical, analyze the cancellation explicitly, and may not substitute it silently for Equation (10).

Classification / specification / disposition. D/M; TEI CS0; ITI CS1 as a dimensionless clock-rate schema; ZPCI CS1 as a transform and CS0 as a physical claim; RSI CS1 mathematically. **V1.2 disposition: retained, symbol-corrected, and unresolved where author definitions are absent.**

11. Informational Tensor Geometry

Status layer. N for geometric vocabulary; H for UIM physical interpretation.

Canonical V2.0 statement. The Unified Informational Manifold (UIM) is a candidate differentiable state space with metric g_ij, connection ∇, curvature tensor R_ijkl, and informational Laplacian

$$\Delta\_I\, f \;=\; g\hat{}ij\ \nabla\_i\, \nabla\_j\, f. \quad (13)$$

The metric is not fixed by naming the manifold. A model must state whether g is Euclidean, pseudo-Riemannian, Fisher-information based, learned, or otherwise constructed. Information geometry provides established mathematical tools for statistical manifolds [4,5], but UIM’s physical interpretation is a separate hypothesis.

Operational meaning. Declare coordinates, chart transitions, metric signature, differentiability, connection, measure dμ_g, and invariance requirements. If the metric is estimated from data, provide identifiability and uncertainty.

Classification / specification / disposition. B/M/H; EB for differential and information geometry, CS0–CS1 for a specific UIM. Required next work: coordinate-invariance checks, recovery on known manifolds, and predictive comparison with non-geometric representations. **V1.2 disposition: retained and operationalized.**

12. Coherence Functional and Informational Curvature

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. V1.2's forms are retained in Layer H as candidate family members, not universal definitions. Candidate coherence functional CF-1, neutrally described as the **Gradient–Laplacian Score Functional**, is

$$C[F] = (1/Z) \int_M \varphi_c(x; F)\, d\mu_g, \qquad (14)$$

with dimensionless candidate local term

$$\varphi_c(x; F) = (\|\nabla S_{ent}\|/\kappa_g) / (1 + |\Delta_I S_{ent}|/\kappa_\Delta). \ (15)$$

Here kappa_grad>0 has the units of ||grad S_ent|| and kappa_lap>0 has the units of |Delta_I S_ent|. Candidate scalar functional RC-1, neutrally named the **Composite State Functional**, is

$$Q_{RC1} = a_R(\|\nabla S_{ent}\|/\kappa_g)^2 + b_R(\Delta_I S_{ent}/\kappa_\Delta) + c_R(\psi/\psi_0)^2. \ (16)$$

The coefficients a_R, b_R, and c_R are dimensionless; psi is an explicitly declared auxiliary scalar field and psi_0>0 is its reference scale. Q_RC1 is the canonical neutral symbol; R_info remains a historical alias. Equation (15) rewards normalized gradient magnitude and penalizes normalized Laplacian magnitude; whether that represents coherence is a construct-validity question. Equation (16) is not a geometric curvature scalar derived from g_ij unless a derivation is supplied. The scalar aggregate used in ITI may be defined, for example, as bar_phi_c(W)=mean_W[phi_c], but the aggregation must be fixed by the concrete model.

Operational meaning. Define S_ent, Z, norm, reference scales, coefficients, psi, boundary behavior, measure, aggregation, and units. If no defensible auxiliary field exists, set c_R=0 before evaluation rather than fitting psi post hoc. Compare CF-1 and RC-1 with conventional entropy, mutual information, spectral coherence, autocorrelation, and domain-specific measures.

Classification / specification / disposition. M/H in Layer H; CS1 as candidate schemas, CS0 as physical interpretations. **V1.2 disposition: retained, notation-corrected, and reclassified as candidate forms.**

13. Informational Gradient (IG)

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. Preserve

$$G_I = \nabla S_{obj} \ (17)$$

and close the units of the V1.2 candidate flow with an explicit mobility:

$$dX^i/dT_S = -\mu_G\, g^{ij}\, \nabla_j S_{obj}. \ (18)$$

S_obj denotes the declared objective or potential. mu_G is a nonnegative mobility coefficient with the units needed to map the metric gradient to state change per unit T_S; it must be fixed or estimated only on training data. Equation (18) is gradient descent on S_obj under metric g. It does not imply movement toward higher coherence unless the model demonstrates the relation between S_obj and C. If S_obj is instantiated from entropy, loss, action, or another potential, the sign and interpretation can differ.

Operational meaning. State the objective function, sign convention, mu_G, constraints, time parameter, and units. Estimate gradients without using future data and report stability under coordinate changes.

Classification / specification / disposition. M/H; CS1 as a dimensionally typed flow, CS0 as a general law. Required next work: trajectory prediction against alternative vector fields. **V1.2 disposition: retained, dimensionally closed, and corrected.**

14. Informational Identity Metric (IIM)

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. Let $E\_rep:X \to V$ be a declared representation into an inner-product space V, let $z = E\_rep(X)$, and let R_V be the represented recursion operator. The metric is

$$RDS(z) \;\equiv\; IIM(z) \;= <z, R\_V(z)> \_V \,/\, (\|z\|\_V \, \|R\_V(z)\|\_V). \quad (19)$$

The historical notation $RDS(X)$ is permitted only when X is already a vector in the declared common space. For points on a manifold, an implementation must specify a common tangent-space comparison—such as log maps to a fixed base point followed by required parallel transport—or a coordinate-invariant embedding. Inner products of untransported points or tangent vectors at different locations are undefined. The neutral name **Recursion Direction Similarity (RDS; historical IIM)** states what the formula measures. $IIM \approx 1$ means approximate collinearity, not complete preservation of magnitude, component structure, causal function, semantic identity, or physical continuity.

Operational meaning. Define E_rep, R_V, inner product, base point or transport rule where applicable, nonzero-domain rule, equivalence class, noise baseline, and threshold. When “identity” is the target construct, Equation (19) should be reported alongside magnitude retention, structural distance, functional performance, and continuity tests.

Classification / specification / disposition. M/H; CS1 as cosine similarity in a declared common representation space, CS0 for identity sufficiency. Required next work: known-preserved and known-changed controls, perturbation curves, reliability, and discriminant validity. **V1.2 disposition: retained, geometrically typed, operationalized, and scope-corrected.**

15. Informational Divergence Threshold (IDT)

Status layer. N/P — Schema and protocol dependency.

Historical V1.2 form. IDT was defined as the supremum δ for which $|\Delta\_I\, S\_ent| < \delta$ for all IBC-admissible configurations. Because IBC itself references an allowed deviation, this can become circular.

Canonical V2.0 statement. Preserve divergence statistic

$$D\_I(X) \;=\; |\Delta\_I\, S\_ent(X)|, \qquad (20)$$

and define a claim-specific threshold from an external reference or null distribution:

$$\mathrm{IDT\_(q, W)} = \mathrm{Q\_q[D\_I(X) \mid H0, W]}, \qquad (21)$$

where Q_q is a preregistered quantile and W is the observation window. A state exceeds the threshold when D_I > IDT_(q,W) after uncertainty and multiple-testing correction.

Operational meaning. The null, quantile, sampling process, window, estimator, and error-control method must be fixed without using the test labels.

Classification / specification / disposition. M/P; CS1 when a reference distribution is specified. Required next work: false-positive calibration, power analysis, and transport to independent data. **V1.2 disposition: retained and corrected to remove circularity.**

16. Domain Interaction Rules (DIR)

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. Preserve canonical domains

$$\mathrm{D} = \{\mathrm{D\_id, D\_pr, D\_har, D\_awr}\}, \qquad (22)$$

representing the historical identity, process, harmonic, and awareness domains, and the interaction form

$$\Phi\mathrm{\_XY} = \lambda\mathrm{\_XY} < \mathrm{F\_X, F\_Y} >. \ (23)$$

Equation (23) is meaningful only if F_X and F_Y are mapped to compatible spaces. λ_XY carries any units needed for dimensional consistency and may be asymmetric when directional coupling is intended.

Operational meaning. Each domain needs inclusion/exclusion rules, observation variables, mapping functions, coupling direction, lag structure, and null of no interaction. Awareness-domain variables must not be inferred solely from identity or harmonic scores.

Classification / specification / disposition. D/M/H; CS0–CS1 by instantiation. Required next work: inter-rater domain coding, identifiability, intervention or temporal tests, and comparison with uncoupled models. **V1.2 disposition: retained and operationalized.**

17. Coherence Transport Law (CTL)

Status layer. H — Hypothesis Layer.

Historical V1.2 form.

$$\partial \mathrm{C} / \partial \mathrm{T\_S} + \nabla \cdot (\mathrm{C\, v\_I}) = -\eta\, \mathrm{R\_info}. \ (24)$$

Canonical V2.0 statement. A local balance law should use coherence density c(x,T_S):

$$\partial \mathrm{c} / \partial \mathrm{T\_S} + \nabla \cdot \mathrm{J\_c} = \sigma\mathrm{\_c} - \ell\mathrm{\_c}, \ \ \mathrm{J\_c} = \mathrm{c\, v\_I} + \mathrm{J\_diff}. \ (25)$$

The historical sink is retained as the special hypothesis ell_c - sigma_c = eta_CTL Q_RC1 when units match and the sign of Q_RC1 is defined. eta_CTL is the CTL coupling coefficient and is distinct from the metric coefficient eta_T. Global C[F] follows by integration with boundary fluxes.

Operational meaning. Specify local density, flux, sources, losses, boundary conditions, conservation residual, and measurement interval. The equation must be dimensionally closed.

Classification / specification / disposition. M/H; CS1 as a model form, CS0 as a general law. Required next work: residual analysis, held-out trajectory prediction, conservation checks, and comparison with diffusion/advection-reaction models. **V1.2 disposition: retained as a special case and corrected through a general balance form.**

18. Scalar Phase Coupling (SPC)

Status layer. H — Hypothesis Layer.

Historical V1.2 form.

$$\varphi\_I = 3\varphi\_3 + 6\varphi\_6 + 9\varphi\_9, \text{with coupling when } \varphi\_I \approx \varphi\_H. \ (26)$$

Corrected V2.0 interpretation. Phases are circular variables modulo 2pi. The historical weighted phasor

$$z\_w = 3e\hat{}(i\,\varphi\_3) + 6e\hat{}(i\,\varphi\_6) + 9e\hat{}(i\,\varphi\_9),\ \ \rho\_w = |z\_w|/18 \ (27)$$

is retained as a **weighted phase-concentration diagnostic**. It does not test a 1:2:3 harmonic lock: concentration is high when the three phases point in similar directions.

If the 3, 6, and 9 modes are hypothesized to have frequency ratio 1:2:3, define windowed wrapped-phase statistics

$$R\_6{:}3 = |< e\hat{}(i(\varphi\_6 - 2\varphi\_3)) > \_W|,\ \ R\_9{:}3 = |< e\hat{}(i(\varphi\_9 - 3\varphi\_3)) > \_W|,\ \ R\_1{:}2{:}3 = \sqrt{}(R\_6{:}3\ R\_9{:}3).\ (28)$$

Equation (28), not Equation (27), operationalizes the proposed harmonic lock. The square-root product is a symmetric aggregation choice, not a uniquely derived law. A study must freeze and justify its primary aggregation before evaluation, report R_6:3 and R_9:3 separately, and include sensitivity to alternatives such as the minimum and product without switching the primary result post hoc. Values near one indicate stable phase combinations over W; significance requires a surrogate null that preserves the temporal properties relevant to the domain while disrupting the hypothesized cross-mode alignment, with correction for every searched band, lag, window, and aggregation [20,21,27]. The statistic is a conventional generalized phase-locking form; UIPO-specific content must come from a preregistered prediction of modes, timing, or mechanism, not from renaming the statistic.

Operational meaning. Define signal extraction, mode bands, phase estimator, window, minimum duration, weighting, lags, search space, surrogate null, and frozen threshold.

Classification / specification / disposition. M/H in Layer H; CS1 as a corrected statistic family and CS2 only in a fully instantiated test. **V1.2 disposition: historical form retained; concentration and harmonic locking are separated and corrected.**

Part III — Informational Physics

19. Informational Action

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. Preserve the candidate action using collision-free notation:

$$S_{act} = \int_M L_I \, d\mu_g, \qquad (29)$$

where L_I is an informational Lagrangian density. S_{ent} is reserved for entropy-like quantities. A document using the historical S_I must declare whether it means action, entropy, or another scalar and map it to the corresponding V2.0 symbol.

Operational meaning. Define fields, units, symmetries, boundary terms, variational variables, and Euler–Lagrange equations. A physical action must have dimensions of action or explicitly declare a dimensionless convention.

Classification / specification / disposition. M/H in Layer H; CS0 until L_I is specified. **V1.2 disposition: retained, notation-corrected, and unresolved.**

20. Informational Cosmology

Status layer. H/L — Hypothesis program with unresolved extensions.

Canonical V2.0 statement. UIPO retains Unified Informational Cosmology (UIC), the ANC construct, and scalar-field quantum-gravity proposals as named research programs. V1.2 does not supply sufficient equations, parameter definitions, or observables to treat them as complete cosmological models.

Operational meaning. A UIC model must state the action or field equations, background spacetime, stress-energy content, initial conditions, parameter priors, and predicted observables such as expansion history, structure growth, lensing, or spectrum features. “ANC” remains unresolved pending its author-approved expansion and definition.

Classification / specification / disposition. H/research program; CS0. Required next work: reproduce standard cosmological benchmarks, identify a discriminating prediction, and test against public data without post hoc parameter expansion. **V1.2 disposition: retained and explicitly unresolved where underspecified.**

21. Zero-Point & Informational-Time Physics

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. This Layer H program retains ZPCI, entropy-coupled fields, and informational-time geodesics. Informational time T_S is not assumed identical to coordinate time, proper time, thermodynamic time, or algorithmic step count.

The proposed augmented metric is

$$ds_I^2 = g_{ij}\, dX^i\, dX^j + \eta_T\, dT_S^2. \quad (30)$$

With the displayed plus sign and positive-definite g, Equation (30) is a Riemannian augmented-coordinate metric; it does not create a causal time dimension. A Lorentzian interpretation would require a stated signature change, dimensional conversion, causal structure, and physical justification. ZPCI remains a mathematical transform until S_ent, alpha, and an observable consequence are defined.

Operational meaning. Provide an ordering or clock procedure for T_S, comparison with physical time, metric signature and units, geodesic equations, and a measurement signature not absorbed by ordinary reparameterization.

Classification / specification / disposition. M/H in Layer H; CS0 as a physical model. **V1.2 disposition: retained, signature-qualified, and operational requirements added.**

22. Informational Quantum Dynamics

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. Informational Quantum Dynamics (IQD) proposes that selected quantum behavior may be modeled using informational curvature and constraints. V2.0 does not claim that this interpretation replaces quantum theory or that a re-description constitutes a new physical prediction.

Operational meaning. An IQD model must define its state space, observables, probability rule, dynamics, composition rule for joint systems, and relation to unitary evolution or explicitly modified evolution. It must reproduce relevant quantum benchmarks before testing deviations.

Classification / specification / disposition. M/H; CS0 unless a specific model is derived and tested. Required next work: normalization, no-signaling or declared alternative, benchmark recovery, and an experimentally discriminating prediction. **V1.2 disposition: retained and reclassified as a research program.**

Part IV — Triune Harmonic Dynamics

23. R/D/N Decomposition

Status layer. L — Legacy and Extension Registry.

Canonical V2.0 statement. Preserve

$$X = X\_R \oplus X\_D \oplus X\_N, \qquad (31)$$

where the components are the V1.2 R/D/N decomposition. V1.2 did not provide canonical expansions, projection operators, orthogonality conditions, or a universal physical interpretation for R, D, and N. Those items remain unresolved rather than being inferred.

Operational meaning. Each application must define the three labels, projection maps P_R,P_D,P_N, reconstruction rule, residual, and whether $\oplus$ denotes a direct sum, orthogonal decomposition, or conceptual partition.

Classification / specification / disposition. D/M; CS0–CS1 by instantiation. Required next work: reconstruction accuracy, component identifiability, stability, and advantage over unrestricted decompositions. **V1.2 disposition: retained and unresolved pending canonical definitions.**

24. TEI & 3–6–9 Phase Lock

Status layer. H/L — Hypothesis with unresolved TEI.

Canonical V2.0 statement. TEI remains Equation (9) and cannot be calculated canonically until its five components are author-defined. The V1.2 shorthand

$$\varphi\_3 : \varphi\_6 : \varphi\_9 \approx 1 : 2 : 3 \quad (32)$$

is retained as a historical statement of intent, not a valid ratio of wrapped phase angles. A 1:2:3 frequency hypothesis must identify the modes and use the wrapped combinations in Equation (28), or an explicitly justified alternative.

Operational meaning. Define signals, harmonic bands, frequency estimator, phase reference, lock window and duration, tolerance, null distribution, and entire search space. Labels 3, 6, and 9 carry no physical significance without a measurement mapping.

Classification / specification / disposition. M/H; TEI CS0, harmonic-lock statistic CS1. **V1.2 disposition: retained, mathematically corrected, and partially unresolved.**

25. Resonance & HCS

Status layer. L — Legacy and Extension Registry.

Canonical V2.0 statement. UIPO retains Brown–Drake resonance and high-coherence structures (HCS) as named THD constructs. Resonance shall mean a reproducible response maximum, phase relationship, mode coupling, or energy/information transfer under a defined forcing or natural-mode model—not merely a numerical resemblance.

Operational meaning. Define the Brown–Drake equation or algorithm, system modes, forcing, damping, bandwidth, quality factor or substitute, coherence estimator, and HCS classification threshold. These were not supplied in sufficient detail by V1.2 and remain unresolved.

Classification / specification / disposition. M/H; CS0. Required next work: controlled excitation or observational mode analysis, null spectra, robustness to preprocessing, and independent replication. **V1.2 disposition: retained and unresolved pending specification.**

Part V — Protocol Layer

26. Archion

Status layer. P/L — Protocol Registry with unresolved stages.

Canonical V2.0 statement. Archion remains UIPO's six-stage verification framework:

$$\mathrm{FORM} \rightarrow \mathrm{DIG} \rightarrow \mathrm{DLA} \rightarrow \mathrm{CIG} \rightarrow \mathrm{COH} \rightarrow \mathrm{CFV}. \quad (33)$$

V1.2 does not provide author-approved expansions, inputs, outputs, or decision rules for all six stage abbreviations. V2.0 preserves the pipeline and identifies those missing specifications; it does not rename the stages.

Operational meaning. Each stage requires a purpose, admissible input schema, transformation, output schema, failure state, audit artifact, and handoff condition. Re-running the same deterministic implementation on the same data should reproduce the same stage outputs, subject to version and random-seed controls.

Classification / specification / disposition. P; CS0 as a complete protocol, potentially CS1 stage by stage. Required next work: stage specification, conformance tests, inter-operator agreement, benchmark cases, and independent implementation. **V1.2 disposition: retained and unresolved pending stage definitions.**

27. Luminarch Prime

Status layer. P/L — Protocol Registry with unresolved inputs.

Canonical V2.0 statement. Luminarch Prime remains the metric-analysis framework using Ω, Γ_c, RIV, TEI, ZPCI, and ITI. The symbols are not treated as empirical merely because they are assembled into a protocol.

Operational meaning. The protocol must define Ω (Awareness Metric), Γ_c (Causal Integrity), Recursive Identity Verification (RIV), metric order, required inputs, normalization, error propagation, abstention rules, and output interpretation. TEI, ZPCI, and ITI inherit all unresolved dependencies from Section 10.

Classification / specification / disposition. P/H; CS0. Required next work: complete specification, test–retest reliability, blinded benchmark cases, ablation of each metric, and comparison with simpler scoring systems. **V1.2 disposition: retained and operational requirements added without redefining the metrics.**

28. PROFILE & Resonant Identity

Status layer. P/H — Protocol Registry and hypothesis.

Canonical V2.0 statement. PROFILE remains UIPO's resonant-identity protocol. It uses IIM and IG within IBC and IDT constraints to evaluate stability of a declared representation under recursion and change.

Operational meaning. PROFILE must specify the population or system, state encoding, recursion operator, observation interval, threshold calibration, missing-data rules, and what outcome "resonant identity" denotes. The protocol may support a statement about representational stability; claims about personal, conscious, legal, or metaphysical identity require separate criteria.

Classification / specification / disposition. P/H; CS0–CS1 after specification. Required next work: positive/negative controls, inter-rater reliability where coding is used, longitudinal stability, and comparison with standard similarity measures. **V1.2 disposition: retained, operationalized, and scope-limited.**

29. GLYPH, GID, GRD

Status layer. P/L — Protocol Registry with unresolved specifications.

Canonical V2.0 statement. GLYPH, Geometric Informational Dynamics (GID), and Geometric Resonance Dynamics (GRD) remain the geometric informational-processing family. V2.0 preserves the names and sequence while requiring each to be distinguished by inputs, transformations, and outputs.

Operational meaning. A glyph must have an encoding grammar and invariance rules. GID must define its geometry and dynamics. GRD must define resonance observables and controls. A visual or geometric pattern is not evidence of a causal mechanism unless the relevant alternative encodings and selection procedures are tested.

Classification / specification / disposition. P/M/H; CS0. Required next work: encoding reproducibility, invariance testing, adversarial controls, held-out prediction, and comparison with generic geometric or embedding methods. **V1.2 disposition: retained and unresolved pending complete specifications.**

30. SMEP & ECHOLOCK

Status layer. P/L — Protocol Registry and legacy term.

Canonical V2.0 statement. SMEP and ECHOLOCK remain the integrity-preserving ledger layer. Their intended function is to preserve provenance, timestamps, transformations, checks, and result states across a research or forecasting workflow.

Operational meaning. A conforming ledger records immutable identifiers, content hashes, timestamps, actor or process identity, code and model versions, source provenance, parameter settings, data-access constraints, corrections, and failed or null outcomes. Cryptographic integrity establishes record consistency, not truth of the recorded claim.

Classification / specification / disposition. P/A; CS1 as a ledger schema. A frozen concrete ledger instance is CS2; a versioned implementation that passes conformance and reproducibility tests is CS3. External audit is evidence and governance, not a CS advancement. Required next work: tamper tests, collision-resistant hashing, independent record reconstruction, access-control review, and public correction policy. **V1.2 disposition: retained and operationalized.**

31. TRIFECTA

Status layer. P — Protocol Registry.

Canonical V2.0 statement. TRIFECTA remains the three-part sequence

$$\text{Theory} \;\rightarrow\; \text{Prediction} \;\rightarrow\; \text{Independent Verification.} \quad (34)$$

"Independent" means that the verifier did not design the prediction, control the outcome data, or change the success criteria after seeing results. An AI-generated check using the same assumptions and data lineage is not independent verification.

Operational meaning. Theory specifies a model and assumptions; Prediction supplies a time-stamped, measurable, risky forecast with uncertainty and falsification criteria; Independent Verification applies the frozen criteria to independently governed evidence. All misses and protocol deviations remain in the record.

Classification / specification / disposition. P; CS1 as a protocol schema. Required next work: successful end-to-end prospective demonstrations and independent audit. **V1.2 disposition: retained and operationalized.**

Part VI — Awareness & Phenomenology

32. ACM

Status layer. H — Hypothesis Layer.

Canonical V2.0 statement. The Awareness Coordinate Model (ACM) retains order, recursion, and stability as proposed coordinates. These may characterize informational organization; their identification with awareness is a Layer H hypothesis, not a result guaranteed by definition. Integrated-information and free-energy research are relevant comparison programs, not evidence for ACM [13,14].

Operational meaning. Each coordinate requires an estimator, scale, temporal window, uncertainty, and external criterion. Human or animal studies require claim-appropriate behavioral, report, neurophysiological, or clinical comparators. Non-biological studies must avoid anthropomorphic labels unless discriminating criteria are supplied.

Classification / specification / disposition. D/M/H; CS0. **V1.2 disposition: retained and reclassified.**

33. Coupled Identity–Phase State Model

Status layer. H — Hypothesis Layer.

Historical name. Coupled Field of Being (CFB).

Canonical V2.0 statement. The neutral scientific alias **Coupled Identity–Phase State Model (CIPSM)** denotes the preserved phenomenological construct linking IIM, IG, and SPC under viability conditions. The historical name remains searchable but is not a claim that a physical field or metaphysical “being” exists.

The historical viability conditions are

$$\mathrm{IIM(X)} \ \geq \ \mathrm{I\_min}, \quad |\Delta\_\mathrm{I\,S\_ent}| \ < \ \mathrm{IDT}. \quad (35)$$

These conditions identify recursion-direction similarity and bounded divergence only.

Operational meaning. Define the coupled state, interaction terms, I_min, IDT calibration, and outcome to be explained. Separate first-person phenomenology, third-person behavior, computational organization, and physical-field claims.

Classification / specification / disposition. M/H; CS0. **V1.2 disposition: retained under a neutral alias, duplicate corrected, and scope-limited.**

34. State Evolution Equation

Status layer. H — Hypothesis Layer.

Historical name. Manifestation Equation.

Historical V1.2 form.

$$\mathrm{dX/dT\_S} \ = \ \mathrm{bar\_\varphi\_c} \ \cdot \ \mathrm{RSI} \ \cdot \ \mathrm{ITI\_hist}, \qquad (36)$$

As written historically, substituting the old ITI definition cancels bar_phi_c; the scalar right-hand side also cannot equal a vector derivative without a direction rule.

Canonical V2.0 candidate. For vector-valued state, use

$$dX^i/dT\_S \;=\; \mu\_X\, \text{bar\_}\varphi\text{\_c}(W) \;\cdot\; \text{HTCS}(h, h\_ref) \;\cdot\; \text{ITI}(W) \;\cdot\; u^i(X, T\_S), \qquad (37)$$

where u^i is a declared dimensionless unit direction field, bar_phi_c and HTCS are dimensionless, ITI is the dimensionless clock-rate ratio in Equation (10), and mu_X carries the units of state per unit T_S. A scalar state is the special case u=1. This typing prevents the historical cancellation and closes the dimensions without claiming the equation is physically correct.

Operational meaning. Define every factor, units, zeros, singularities, mu_X, direction field, initial conditions, and observation model. Normalize u with the declared metric, state how a zero or undefined HTCS is handled, and estimate any free coefficient only on training data.

Classification / specification / disposition. M/H; CS1 as a typed candidate schema and CS0 as a physical law because its factors and mechanism remain unvalidated. **V1.2 disposition: retained under a neutral alias, cancellation-corrected, dimensionally closed, and vector-typed with a scalar special case.**

Part VII — System Models

35. Physical-Model Extension Registry

Status layer. L — Legacy and Extension Registry.

Canonical V2.0 statement. PHS, PCIM, ECHFD, Scalar Generators, and bounded-antigravity proposals are preserved in Layer L as historical physical-model extensions. V1.2 does not provide sufficient canonical expansions or equations for PHS, PCIM, or ECHFD. They are not part of the Normative Core.

Operational meaning. Promotion to Layer H requires variables, equations, dimensions, parameter bounds, known-limit recovery, apparatus or dataset, predicted effect size, uncertainty, safety controls, conventional alternative explanations, and a falsification rule. A bounded-antigravity proposal must specify a measurable force, acceleration, energy, or metric effect while controlling electromagnetic, thermal, vibrational, aerodynamic, and instrumental effects.

Classification / specification / disposition. H in Layer L; CS0. **V1.2 disposition: retained and demoted to the non-normative extension registry.**

36. Computational Models

Status layer. A/P — Application and protocol implementation.

Canonical V2.0 statement. Scalar-time forecasting, harmonic game theory, and IQD solvers remain computational model families in Layer A. A family name is CS0–CS1; a concrete model may reach CS2; a versioned implementation that passes reproducibility and conformance checks may reach CS3. None of those statuses constitutes empirical validation.

Operational meaning. Every model card states data provenance, target, feature timing, leakage controls, objective, parameter estimation, uncertainty, calibration, baselines, ablations, evaluation split, compute environment, random seeds, and versioned code. Forecast windows and scoring rules must be frozen before outcomes; probabilistic forecasts should use proper scoring rules such as the Brier score where applicable [9].

Classification / specification / disposition. M/P/A; CS0–CS3 only at the appropriate level of instantiation. External performance and physical validity are separate questions. **V1.2 disposition: retained and specification-corrected.**

37. Archion Token

Status layer. A/L — Application and Legacy Registry.

Canonical V2.0 statement. Archion Token is preserved in Layers A/L as a downstream trust or value-transfer proposal using IIM, CTL, and IBC. It is not a foundational physical entity and cannot serve as evidence for the ontology that defines it.

Operational meaning. Promotion from a concept requires governance, issuance and retirement rules, ledger architecture, rights and obligations, attack model, custody, privacy, jurisdictional review, market-risk disclosure, and a clear statement of what the token represents.

Classification / specification / disposition. A; CS0 as the preserved concept. **V1.2 disposition: retained and demoted to a downstream application/legacy registry.**

Part VIII — Meta-Integration

38. UCP/HCP

Status layer. H/P/L — Hypothesis, protocol, and unresolved naming.

Canonical V2.0 statement. Universal Convergence Protocol/Point (UCP) and Harmonic Convergence Protocol/Point (HCP) remain global-attractor constructs using SPC, IG, IBC, IDT, CTL, and DIR. V1.2 uses “UCP/HCP” without fixing whether each final letter denotes protocol, point, or both; V2.0 preserves the acronym and marks the distinction unresolved.

Appendix B retains compatibility conditions

$$|f_I - f_H| < \varepsilon_f, \quad |\varphi_I - \varphi_H| < \varepsilon_\varphi. \quad (38)$$

These are proximity criteria, not proof of a universal attractor.

Operational meaning. Define the state space, attractor, basin, convergence metric, frequency and phase estimators, tolerances, and finite-time decision rule. Demonstrate robustness to initial conditions and model misspecification.

Classification / specification / disposition. M/H/P; CS0. Required next work: dynamical derivation, numerical basin analysis, and prospective observation. **V1.2 disposition: retained and unresolved where naming and dynamics are incomplete.**

39. Canonical Dictionary

Status layer. N — Normative Core.

Canonical V2.0 statement. The canonical dictionary and symbol table are normative for names, types, domains, and versioned meanings. Undefined historical terms reside in the legacy registry and may not be used in numerical conclusions. Appendix E records both sets without erasing V1.2 traceability.

Operational meaning. New documents cite the UIPO version, use the canonical name and symbol on first use, identify local extensions, and record collisions. A meaning change requires a version increment and disposition entry.

Classification / specification / disposition. D/P in Layer N; CS1. **V1.2 disposition: retained, collision-audited, and separated from the legacy registry.**

40. Dependency Graph

Status layer. N — Normative Core.

Canonical V2.0 statement. UIPO dependencies are directed and typed. “Uses” means a downstream construct requires an output or assumption; it does not mean downstream performance validates the upstream construct. Cycles must identify calibration versus evaluation data.

The historical V1.2 chain is preserved for traceability:

$$\mathrm{CEP} \rightarrow \{\mathrm{IBC}, \mathrm{IG}, \mathrm{IIM}, \mathrm{IDT}, \mathrm{DIR}, \mathrm{CTL}, \mathrm{SPC}\} \rightarrow \mathrm{UIM} \rightarrow \mathrm{UIF} \rightarrow \mathrm{ITI}. \quad (39)$$

UIF is undefined and therefore terminates the normative chain. The corrected construction order in Appendix F starts with observation definitions, $\mathrm{I\_sub}$, metric/measure choices, and estimators before any derived score.

Operational meaning. Each edge is labeled definition, mathematical dependency, parameter dependency, test dependency, protocol dependency, or application dependency. A release may contain unresolved legacy nodes, but it may not route a normative calculation through them.

Classification / specification / disposition. D/P in Layer N; CS1. **V1.2 disposition: historical graph retained, construction graph corrected, and UIF demoted to Layer L.**

Part IX — Appendices

Appendix A — Fifteen-Step Ladder of Informational Coherence

Status layer. L/P — Legacy assessment architecture.

The ladder is retained as an ordered assessment architecture. It is not assumed to be a unidimensional psychometric scale. Each step C_k requires its own estimator, uncertainty, and missing-data rule.

31. Baseline Order
32. Directional Coherence
33. Boundary Stability (IBC)
34. Temporal Stability
35. Phase Coherence (SPC)
36. Triadic Conformity
37. Cross-Layer Compatibility (DIR)
38. Recursion Stability (IIM)
39. Predictive Integrity
40. Scalar-Time Regularity
41. Zero-Point Coherence (ZPCI)
42. Harmonic Integration (THD)
43. Awareness Stability (ACM)
44. Identity Cohesion (PROFILE)
45. UCP Proximity

The historical Ladder Composite Index is

$$\mathrm{LCI} = \left(\prod_{k=1}^{15} C_k\right)^{1/15}. \quad (40)$$

Before use, all C_k must be dimensionless and nonnegative, with declared handling of zeros. A geometric mean makes any zero component decisive and can hide compensating profiles. Therefore report the 15-component vector, LCI, uncertainty, and sensitivity to aggregation choices. **Classification / specification: D/M/P; CS0–CS1 by implementation. V1.2 disposition: retained and operationalized.**

Appendix B — Six Foundational Items (Updated to Seven)

Status layer. N/L — Normative schemas and unresolved terms.

B1. Canonical domain separation

D = {D_id, D_pr, D_har, D_awr} for identity, process, harmonic, and awareness. V1.2's {I,P,H,A} remains a historical alias. Membership rules are model-specific.

B2. Recursion-operator spectrum

$$R(X) = R_1 X + R_2 X^2 + R_3 X^3, \quad R_1 : R_2 : R_3 = 1 : 2 : 3. \quad (41)$$

The meanings of powers of X, operator action, coefficient scale, and convergence domain must be specified.

B3. Informational-time metric

$$ds_I^2 = g_{ij}\, dX^i\, dX^j + \eta_T\, dT_S^2. \quad (42)$$

See Section 21 for typing and physical-time requirements.

B4. UCP compatibility

$$|f_I - f_H| < \varepsilon_f, \quad |\varphi_I - \varphi_H| < \varepsilon_\varphi. \quad (43)$$

Frequencies, phases, estimators, and tolerances must be preregistered.

B5. Composite-index normalization

Composite indices default to geometric means only when factors are commensurate, nonnegative, and normalized. Otherwise the aggregation rule must be justified and sensitivity reported.

B6. Protocol types

{Validation, Awareness, Identity, Geometric, Ledger, Experimental} is the retained protocol taxonomy. A protocol may have multiple tags but one primary purpose.

B7. IBC tuple

The canonical tuple is Equation (6), augmented operationally as described in Section 8.

Classification / specification / disposition. D/M/P; primarily CS0–CS1. **V1.2 disposition: all seven items retained and operationalized.**

Appendix C — Archion Verification Framework

Status layer. P/L — Protocol Registry with unresolved stages.

V1.2 defines a six-check vector

$$AV : X \to \{0,1\}^6, \qquad (44)$$

and composite pass

$$AV\_all = \prod\_(i = 1)\^6\ A\_V\^(i). \quad (45)$$

The product is a strict all-or-none gate. V2.0 preserves it and requires each binary check to correspond to one Archion stage in Equation (33), with explicit pass, fail, indeterminate, and not-applicable rules. Because $\{0,1\}$ cannot represent indeterminate cases, an implementation should preserve the historical binary result while maintaining a separate status vector $\{\text{pass, fail, indeterminate, not applicable}\}$.

Archion checks IIM and IDT where those measures are applicable and fully defined. It must record inputs, versions, operator identity, timestamps, and stage-level records. **Classification / specification: P; CS0 until the six stages are author-specified. V1.2 disposition: retained and operationalized without inventing stage meanings.**

Appendix D — Experimental Templates

Status layer. P — Protocol Registry.

D1. Scalar-time forecasting

Historical form:

$$dT\_S/dt = F(bar\_\varphi\_c, C\_k, TEI) \text{ under CTL and IBC.} \quad (46)$$

Required record: target and horizon; clock definitions; input timing; frozen functional form; parameter-estimation set; baseline forecasts; probabilistic scoring rule; calibration; missing-data policy; and public result ledger.

D2. Glyph resonance

Historical contrast:

$$\Delta H = H\_control - H\_glyph, \text{ requiring DIR and SPC.} \quad (47)$$

Required record: glyph generation and encoding; control generation; randomization; blinding; resonance measure; sample size; exclusion criteria; multiple-testing correction; effect estimate and uncertainty; and replication plan.

D3. Awareness stability

Historical change:

$$\Delta\Omega = \Omega\_(t + \Delta t) - \Omega\_t, \text{ constrained by IIM and IBC.} \quad (48)$$

Required record: operational definition of Ω; participant or system eligibility; temporal resolution; behavioral/report/physiological comparators; blinding; safety and ethics; attrition; and falsification criterion.

Template-wide specification status. A generic template is CS1. A concrete template with observables, uncertainty, and a frozen decision rule may be CS2; a versioned implementation may be CS3. Empirical support is assessed only under the companion standard. **V1.2 disposition: all templates retained and operationalized.**

Appendix E — Normative Symbol Table and Canonical Dictionary

Status layer. N/L — Normative dictionary plus legacy registry.

E1. Normative symbol table

Symbol	Meaning and type	Units, constraints, or status
I_sub	Substrate representation tuple (M,F_set,O_set)	Dimensionless schema; historical I
M, X, Y	State space and latent/observation spaces	Topology, dimension, and units are instance-specific
F_set, O_set	Field family and set of typed operators	Member/operator-specific
h_obs	Observation map $X \to Y$	Measurement-specific; uncertainty required
T_THD(n), F0, H_n	THD vector, reference triad, and triadic operator	Normalization, mapping, and units declared
B_IBC	Boundary tuple (S_sys,∂S_sys,C_min,Delta_max)	Mixed fields; each declared
S_sys, ∂S_sys	System and boundary	Segmentation rule required
C[F], Delta C, C_min	Global coherence functional, change, and threshold	Model-specific; frozen rule required
P_theta, W, epsilon_C, CEP-RID	Probability model, window, tolerance, and registered CEP model ID	Fixed before outcome evaluation
T_S, t, omega_ref	Informational time, ordinary comparison time, and positive reference clock rate	Clock/order procedures and units declared; ITI dimensionless
T_TEI, Cu_TEI, Cr_TEI, B_TEI, H_TEI	Unresolved TEI factors	Meanings, estimators, and units unresolved
EET, ZPCI, alpha	Exponential Entropy Transform, historical alias, and scale	alpha S_ent dimensionless
HTCS, RSI, h,	Harmonic Target Cosine Similarity, historical alias, comparison vector, and reference vector	Common inner-product space; nonzero; dimensionless after normalization

Symbol	Meaning and type	Units, constraints, or status
h_ref		
g_ij, nabla, Delta_I, dmu_g	Metric, connection/gradient, Laplacian, and measure	Geometry and signature declared
S_ent, S_obj, S_act, L_I	Entropy-like scalar, objective, action, and Lagrangian density	Meanings and units cannot be interchanged
phi_c, bar_phi_c, Z	Local normalized score, aggregate, and normalizer	Aggregation and nonzero-domain rules required
kappa_grad, kappa_lap	Positive gradient and Laplacian reference scales	Match the corresponding numerator units
Q_RC1, a_R, b_R, c_R	Dimensionless Composite State Functional and coefficients	Historical alias R_info; not geometric curvature
psi, psi_0	Auxiliary scalar field and positive reference scale	Instance definition required; psi/psi_0 dimensionless
G_I, mu_G	Gradient of declared objective and mobility coefficient	mu_G closes state-per-informational-time units
RDS, IIM, E_rep, R_V, z	Recursion Direction Similarity, historical alias, representation map, represented recursion, and vector state	Common inner-product or transported tangent space; nonzero domain
D_I, IDT_(q,W), Q_q	Divergence statistic, threshold, and reference quantile	Null/reference distribution required
D_id, D_pr, D_har, D_awr	Identity, process, harmonic, and awareness domains	Historical domain set {I,P,H,A}
Phi_XY, lambda_XY, F_X, F_Y	Coupling, coupling coefficient, and mapped domain fields	Compatible spaces and dimensional closure required
c, J_c, v_I, J_diff	Coherence density, total flux, velocity, and diffusive flux	Local balance-law units
sigma_c, ell_c, eta_CTL	Source, loss, and historical CTL coupling	Source/loss per informational time; eta_CTL closes units
z_w, rho_w, phi_3, phi_6, phi_9	Weighted phasor, concentration, and circular phases	Phases modulo 2pi; rho_w∈[0,1]

Symbol	Meaning and type	Units, constraints, or status
R_6:3, R_9:3, R_1:2:3	Wrapped phase-lock statistics	Dimensionless in [0,1]; surrogate calibration required
eta_T	Informational-time metric coefficient	Distinct from eta_CTL; closes metric units
u^i, mu_X	Unit direction field and state-evolution mobility/rate coefficient	u dimensionless and metric-normalized; mu_X has state per T_S units
R_1, R_2, R_3, X_R, X_D, X_N	Legacy recursion/decomposition quantities	Meanings or projections unresolved where noted

Unresolved variables may be preserved symbolically but may not be numerically evaluated or used to infer physical effects.

E2. Canonical construct dictionary

Term	Canonical V2.0 meaning	Layer / class	Specification note
UIPO	Unified Informational Physics Ontology	N / D	This document
THD	Triune Harmonic Dynamics	H / M-H	Cross-domain applicability is hypothetical
TEI	Triune Equilibrium Index	L-H / M	Five components unresolved; CS0
ITI	Informational Time Index	H / M	Dimensionless clock-rate ratio; historical coherence-normalized form is noncanonical
EET / ZPCI	Exponential Entropy Transform; historical Zero-Point Coherence Index	H / M-H	Transform defined; physical meaning provisional
HTCS / RSI	Harmonic Target Cosine Similarity; historical Resonant Self-Integration	H / M	Cosine similarity between h and h_ref
CEP	Coherence Expansion Principle	H / M-H	Conditional claim template
IBC	Informational Boundary Conditions	N-H / D-M	Equation (6) plus declared operational augmentation
IG / G_I	Informational Gradient	H / M	Gradient of declared objective
RDS / IIM	Recursion Direction Similarity; historical	H / M-H	Directional similarity only;

Term	Canonical V2.0 meaning	Layer / class	Specification note
	Informational Identity Metric		not full identity
IDT	Informational Divergence Threshold	N-P / M-P	Quantile of declared reference distribution
DIR	Domain Interaction Rules	H / D-M-H	Uses disambiguated domain labels
CTL	Coherence Transport Law	H / M-H	Candidate local balance law
SPC	Scalar Phase Coupling	H / M-H	Equation (28) tests harmonic lock
UIM	Unified Informational Manifold	H / M-H	Metric/state-space specification required
LCI	Ladder Composite Index	L / M-P	Assessment architecture; component definitions incomplete
ACM	Awareness Coordinate Model	H / M-H	Awareness mapping remains hypothetical
CIPSM / CFB	Coupled Identity–Phase State Model; historical Coupled Field of Being	H / M-H	Neutral alias canonical in V2.0
State Evolution Equation	Historical Manifestation Equation	H / M-H	Vector-typed candidate with scalar special case; physical claim unvalidated
Archion	Six-stage verification framework	P / P	Complete stage meanings unresolved
Luminarch Prime	Multi-metric analysis framework	P / P-H	Inherits unresolved indices
PROFILE	Resonant-identity protocol	P / P-H	Representation stability only unless separately validated
GLYPH/GID/GRD	Geometric protocol family	P / P-M-H	Grammar and equations required
SMEP/ECHOLOCK	Integrity-ledger family	P-L / P-A	SMEP expansion unresolved
TRIFECTA	Theory→Prediction→Independent Verification	P / P	Protocol schema; independence rules apply
UCP/HCP	Universal/Harmonic convergence construct	H-P-L / M-H-P	Protocol/point distinction unresolved

E3. Legacy terms awaiting specification

Historical term	Preserved context	Missing before promotion
EIE	Empirical-foundations anchor	Expansion, source, measured relation
UIF	Dependency-graph node	Expansion, definition, type, equations
ANC	Cosmology program	Expansion, equations, observables
PHS, PCIM, ECHFD	Physical-model names	Expansions, variables, equations, tests
SMEP	Ledger construct	Expansion and technical specification
R/D/N	Three-part decomposition	Meanings, projections, reconstruction rule
FORM/DIG/DLA/CIG/COH/CFV	Archion stages	Author-approved expansions, inputs, outputs, gates
TEI factors	T_TEI,Cu_TEI,Cr_TEI,B_TEI,H_TEI	Meanings, units, estimators, aggregation rationale
Brown–Drake resonance / HCS	THD extensions	Equation, observables, thresholds
Scalar Generators / bounded antigravity	Physical extensions	Dimensional model, apparatus, controls, safety

These entries are searchable, versioned, and non-normative. Preservation is not endorsement.

Appendix F — Dependency Graph

Status layer. N — Normative Core.

F1. Historical V1.2 chains retained for traceability

46. Foundational: CEP → {IBC,IG,IIM,IDT,DIR,CTL,SPC} → UIM → UIF → ITI.
47. Harmonic: THD → TEI → RSI → HCS.
48. Identity: PROFILE → Resonant Identity → ACM.
49. Geometric: GID → GRD → Scalar Generators.
50. Ledger: SMEP → ECHOLOCK → TRIFECTA.
51. Integration: UCP/HCP uses all layers.

F2. Corrected construction dependency

52. Observation definitions and state representation establish M, F, and O.
53. A declared metric and measure establish UIM geometry.
54. Candidate S_ent, C[F], Q_RC1, IG, RDS/IIM, and the divergence statistic become computable.
55. Reference distributions and boundary rules establish IDT and IBC.
56. DIR, CTL, and SPC define candidate interactions and dynamics.
57. THD indices and harmonic constructs may then be instantiated.
58. Protocols consume frozen definitions and produce auditable outputs.
59. Awareness, physical, computational, ledger, and convergence models remain downstream applications or hypotheses.

F3. Circularity controls

60. Data used to define a threshold may not also be the sole test of that threshold.
61. A protocol cannot validate a metric merely by reusing the metric as its success criterion.
62. A downstream application cannot serve as independent evidence for an upstream assumption without an external observation link.
63. Awareness cannot be concluded solely from a score whose definition already includes awareness.
64. A fitted 3–6–9 mapping must be evaluated on held-out data and against the full search space.

Classification / specification / disposition. D/P; CS1 as governance. **V1.2 disposition: historical graph retained; construction order corrected; unresolved UIF preserved.**

Appendix G — V1.2 to V2.0 Revision and Disposition Ledger

Status layer. N — Normative traceability.

V1.2 item	V2.0 disposition	Principal revision
0 Ontology	Retained / operationalized	Added model-conformance requirements
1 Need	Retained / expanded	Added versioning and provenance
2 Substrate	Retained / operationalized	Added typing and observation map
3 Triadic Form	Retained / corrected	Separated T_THD(n) from F0
4 Structure	Retained	Nine parts preserved

V1.2 item	V2.0 disposition	Principal revision
5 Empirical Foundations	Corrected / unresolved	Separated EB from UIPO support; EIE unresolved
6 I–E–A relations	Retained / reclassified	Awareness links remain hypotheses
7 CEP	Retained / corrected	Conditional expectation and tolerance added
8 IBC	Retained / operationalized	Window, uncertainty, flux, sensitivity added
9 Triadic Mathematics	Retained / operationalized	Types, units, and model comparison added
10 Core Indices	Retained / unresolved	TEI name restored; missing components flagged
11 Tensor Geometry	Retained / operationalized	Metric construction and invariance required
12 Coherence / Curvature	Retained / reclassified	CF-1 and RC-1 designated candidate forms
13 IG	Retained / corrected	Gradient sign linked to declared objective
14 IIM	Retained / scope-corrected	Directional similarity is not full identity
15 IDT	Retained / corrected	External null/reference threshold removes circularity
16 DIR	Retained / operationalized	Typing, units, lags, and null added
17 CTL	Retained / corrected	Local balance law; original sink is special case
18 SPC	Retained / corrected	Circular phase formulation added
19 Informational Action	Retained / unresolved	Action-versus-entropy notation separated
20 Cosmology	Retained / reclassified	Research program; ANC unresolved
21 Zero-Point/Time	Retained / reclassified	Clock and metric requirements added
22 IQD	Retained / reclassified	Benchmark and discriminating-prediction requirements
23 R/D/N	Retained / unresolved	Projection semantics required
24 TEI/Phase Lock	Retained / operationalized	Circular/frequency interpretation required
25 Resonance/HCS	Retained / unresolved	Physical resonance criteria required
26 Archion	Retained / unresolved	Pipeline preserved; stage definitions required
27 Luminarch Prime	Retained /	Original metric set preserved

V1.2 item	V2.0 disposition	Principal revision
	operationalized	
28 PROFILE	Retained / scope-limited	Representational versus metaphysical identity separated
29 GLYPH/GID/GRD	Retained / unresolved	Grammar, geometry, and controls required
30 SMEP/ECHOLOCK	Retained / operationalized	Ledger integrity distinguished from truth
31 TRIFECTA	Retained / operationalized	Independence criteria made explicit
32 ACM	Retained / reclassified	Awareness link remains hypothesis
33 CFB	Retained / corrected	Duplicate heading removed; scope clarified
34 Manifestation Equation	Retained / type-corrected	Direction field added conditionally
35 Physical Models	Retained / reclassified	Provisional registry; acronyms unresolved
36 Computational Models	Retained / operationalized	Model-card and prospective evaluation requirements
37 Archion Token	Retained / reclassified	Downstream application, not ontology evidence
38 UCP/HCP	Retained / unresolved	Protocol/point distinction required
39 Dictionary	Retained / expanded	Versioned terms and unresolved entries added
40 Dependency Graph	Retained / corrected	Historical and construction graphs separated
Appendix A	Retained / operationalized	Vector reporting and aggregation sensitivity
Appendix B	Retained / operationalized	All seven items preserved
Appendix C	Retained / operationalized	Indeterminate states added alongside binary result
Appendix D	Retained / operationalized	Experimental records and specification progression
Appendix E	Retained / expanded	Complete V2.0 dictionary
Appendix F	Retained / corrected	Circularity controls and corrected construction order

Appendix H — Worked Operationalization: Synthetic Dynamical System

Status layer. N/H — Operational example only.

This appendix is a fully frozen CS2 protocol specification for one finite synthetic claim. It is not a result, an implementation, or empirical evidence for UIPO, CEP, THD, or a fundamental informational substrate. A conforming versioned implementation and reproduced outputs would be required for CS3.

H1. State, dynamics, observation, streams, and computational profile

Let M=R^2, state x_t∈R^2, field family F_set={x_t}, and operator set O_set={A_0,A_1}. The baseline process is

$$\mathrm{x\_(t+1) = A\_0\,x\_t \;+\; \varepsilon\_t,\;\; A\_0 = [[0.8,-0.2],[0.2,0.8]],} \qquad (49)$$

and the primary shifted process is

$$\mathrm{x\_(t+1) = A\_1\,x\_t \;+\; \varepsilon\_t,\;\; A\_1 = [[1.02,-0.2],[0.2,1.02]],} \qquad (50)$$

with epsilon_t~N(0,0.05^2 I_2). Observe

$$\mathrm{y\_t = h\_obs(x\_t) + nu\_t = x\_t + nu\_t,\;\; nu\_t \sim N(0{,}0.02\text{^}2\,I\_2),} \qquad (51)$$

independently across time and independently of process noise. Treat x and y as dimensionless. Every sequence contains observations t=0,...,120 and transitions t=0,...,119. Use A_0 through transition t=99; transition t=100 is the first alternative transition and produces y_101. Fix x_0=(0.25,0)^T and W=10.

The reference computational profile is Python 3.12.x, NumPy 2.1.x, IEEE-754 float64, and NumPy PCG64. Generate every stream from SeedSequence([root_seed, condition_code, replicate_index]), drawing all process-noise values before observation-noise values. Use root seed 3692026 for calibration and 9632026 for evaluation; condition codes are 0 calibration baseline, 1 evaluation baseline, 2 primary shift, and 3 hard shift. Calibration contains 10,000 all-A_0 sequences. Evaluation contains 2,000 new sequences for each condition. Streams may not overlap.

H2. UIPO-labeled statistic and exact sequence-level calibration

Using the frozen baseline operator, define residual e_t=y_(t+1)-A_0y_t. Estimate Sigma_e from all 1,200,000 calibration residuals (10,000×120) after subtracting their pooled sample mean, using the unbiased denominator N_e-1. No shrinkage, diagonalization, or regularization is allowed unless inversion fails; inversion failure is a protocol failure, not permission to alter the estimator. Define

$$\mathrm{c\_t = exp[-0.5\; e\_t\text{^}T\,\Sigma\_e\text{^}(-1)e\_t],\;\; C\_W(t) = (1/W)\Sigma\_(j=0)\text{^}(W-1)c\_(t-j).} \quad (52)$$

Set the target sequence-level false-alarm probability to alpha_FA=0.05. For calibration replicate b, set m_b=min_(t=100,...,119) C_W(t) and sort m_(1)≤...≤m_(10000). Set C_min=m_(500) and alarm only when C_W<C_min; the strict inequality makes the empirical sequence-level false-alarm rate no greater than 499/10000. No interpolation is used. For boundary reporting, compute

$s_b=\max_{(t=101,\ldots,120)}||x_t||_2$ and set r_{IBC} to NumPy quantile $q=0.99$, method="higher". Freeze Σ_e, C_{min}, and r_{IBC} before evaluation. Boundary exits are reported but never removed from analysis.

H3. Conventional comparators and equal false-alarm calibration

For residual-energy CUSUM [22], define

$$q_t = e_t^T \Sigma_e^{-1} e_t,\quad G_t = \max(0, G_{t-1} + q_t - 2.5),\quad G_{99} = 0. \quad (53)$$

The reference value is fixed at $k_{CUSUM}=2.5$. For each calibration sequence, compute $g_r=\max_{(t=100,\ldots,119)}G_t$, sort the 10,000 values, set $h_{CUSUM}=g_{(9501)}$, and alarm only when $G_t>h_{CUSUM}$. This method="higher"-equivalent rule and strict crossing are frozen.

For the Gaussian likelihood-ratio comparator [24,26], use exact one-step predictive densities from two linear-Gaussian Kalman filters. Initialize both with mean x_0 and covariance $P_0=0$; use process covariance $0.05^2 I_2$, observation matrix I_2, and observation covariance $0.02^2 I_2$. Both filters use A_0 through transition 99; from transition 100 onward the null filter uses A_0 and the alternative filter uses the declared A_1:

$$L_t = \Sigma_{(s = 100)}^t \log[p_{A1}(y_{(s+1)}|y_{(0:s)})/p_{A0}(y_{(s+1)}|y_{(0:s)})]. \quad (54)$$

For each calibration sequence, compute $l_r=\max_{(t=100,\ldots,119)}L_t$, sort the values, set $h_{LR}=l_{(9501)}$, and alarm only when $L_t>h_{LR}$. All filters use standard predict-then-update recursions with no covariance inflation. All three detectors use the same sequences and monitoring interval.

H4. Frozen claims, multiplicity, non-detection, and decision rule

The finite detection claim is

$$P(\text{first alarm within } y_{101},\ldots,y_{120} \mid A_1) \ \geq\ 0.80. \quad (55)$$

Report false-alarm and detection probabilities with 95% Wilson intervals [23]. Define delay as the post-change observation number of first alarm (1,...,20); assign non-detections a truncated delay of 21 and report their rate separately. Construct paired bootstrap confidence intervals from 10,000 paired resamples with PCG64 seed 271828 for UIPO-minus-comparator differences [25].

Added detection value is supported only against **each** comparator $j\in\{CUSUM,LR\}$ when all six one-sided Bonferroni-adjusted bounds satisfy

$$U_{delay}^{(j)} < 0,\quad U_{FA}^{(j)} \leq 0.01,\quad L_{PD}^{(j)} \geq -0.02\quad \text{for every } j. \quad (56)$$

There are six checks (three outcomes times two comparators), so each one-sided bootstrap bound uses $\alpha=0.05/6$, or 99.1667% confidence. U_{delay} and U_{FA} are upper bounds; L_{PD} is a lower bound. If Equation (55) fails, the finite detection claim is falsified. If any condition in Equation (56) fails, this operationalization has no demonstrated added value. No threshold, window, covariance, exclusion, bootstrap rule, or margin may change after evaluation begins.

With 2,000 evaluation sequences, the maximum binomial Monte Carlo standard error is sqrt(0.25/2000)=0.0112; the example is not represented as powered to resolve effects materially smaller than its declared margins. That limitation affects interpretation, not the frozen decision rule.

H5. Harder sensitivity condition and interpretation

Repeat the pipeline as a separately labeled sensitivity analysis with A_1_hard=[[0.86,-0.2],[0.2,0.86]]. Fix that operator before evaluation. The alternative Kalman filter and any null-calibrated LR threshold specific to it may be computed from the existing calibration sequences before the hard-condition evaluation is opened; the UIPO statistic and CUSUM definitions remain unchanged. The sensitivity result cannot rescue failure of the primary claim.

The example supplies a typed I_sub, observation map, uncertainty, coherence-like estimator, IBC-style thresholds, exact sequence-level false-alarm calibration, conventional comparators, non-detection handling, multiplicity control, deterministic streams, and explicit failure rules. It does not show that Equation (52) is a universal coherence measure, that CEP is true, or that the model describes nature. Its status is **CS2**, not CS3.

Appendix I — THD Phase-Lock Worked Mapping

Status layer. H — Synthetic mapping specification only.

This appendix freezes one CS2 synthetic test of the corrected generalized phase-lock statistic. It does not claim that the statistic is new, that an implementation has been verified, or that natural systems exhibit the relationship.

I1. Frozen observed phase sequences

Set N=1000, Delta t=0.01 s, f=5 Hz, theta_0=0, delta_6=0.4 rad, and delta_9=-0.7 rad. With PCG64 seed 3692027, draw common phase increments zeta_t~N(0,0.04^2) for t=0,...,998, then draw independent observation jitters xi_3,xi_6,xi_9~N(0,0.08^2) for all 1,000 samples. Generate

$$\theta\_(t+1) = \theta\_t + 2\pi\, f\, \Delta\, t + z\eta\_t,\ \ \varphi\_3 = \theta + \xi\_3,\ \ \varphi\_6 = 2\theta + \delta\_6 + \xi\_6,\ \ \varphi\_9 = 3\theta + \delta\_9 + \xi\_9.\ \ (57)$$

Treat the wrapped phases modulo 2pi as the observed inputs; no band search or phase-extraction estimator is part of this finite test. Use the single full-record window W={0,...,999} and compute

$$R\_6{:}3 = |< e\hat{}(i(\varphi\_6 - 2\varphi\_3)) > \_W|,\ \ R\_9{:}3 = |< e\hat{}(i(\varphi\_9 - 3\varphi\_3)) > \_W|.\ \ (58)$$

Freeze the square-root product R_1:2:3=sqrt(R_6:3 R_9:3) as primary and report both components plus the minimum and product as labeled sensitivity summaries.

I2. Structure-preserving null and finite decision rule

The primary null preserves every univariate phase sequence and disrupts only their temporal alignment. With independent PCG64 seed 9632027, generate exactly 10,000 surrogate pairs of circular offsets (k_6,k_9), sampling each with replacement from integers 50,...,950; circularly shift phi_6 by k_6 and phi_9 by k_9 while leaving phi_3 fixed. Recompute the primary statistic for every pair. No bands, lags, windows, offsets, aggregations, or surrogate families are searched, so alpha_corr=0.01 for this single primary test. Domain studies must choose nulls that preserve the temporal properties relevant to their data; surrogate procedures are not interchangeable [21,27].

The finite implementation claim is

$$\mathrm{R\_1{:}\,2{:}\,3} \;>\; \max(0.80, \mathrm{Q\_0.99}[\mathrm{R\_1{:}\,2{:}\,3} \mid \mathrm{circular-shift\ surrogate}]). \quad (59)$$

Use NumPy quantile q=0.99, method="higher"; strict > resolves ties. Failure to exceed either the frozen effect threshold or surrogate threshold falsifies the finite synthetic recovery claim once a conforming implementation is run. Success would show only that the implementation recovers the injected common-phase relation under this null. It would not validate H-SPC-1 in nature, establish the THD mapping, or prove a physical mechanism. The protocol specification is **CS2**; CS3 requires versioned code, frozen outputs, and a conformance record.

Open author decisions before V2.0 public release

65. Expand or retire EIE, UIF, ANC, PHS, PCIM, ECHFD, SMEP, R/D/N, each Archion stage, and the Brown–Drake/HCS terms.
66. Supply canonical meanings, units, and estimators for all five TEI factors.
67. Resolve whether UCP and HCP denote protocols, points, or paired protocol/point constructs.
68. Identify any specific RNG, Casimir, interferometry, astrophysical, or biophysical studies intended as direct UIPO tests; otherwise leave them as candidate domains.
69. Approve funding, competing-interest, data/code-availability, repository, license, and correspondence statements.
70. Decide whether and when to commission a machine-readable ontology export after the human-readable specification is frozen.

Minimum release checklist

Gate	RC3 status	Note
Document type and formalization profile	Pass	Human-readable specification ontology distinguished from OWL/RDF and empirical theory; ontology-engineering source added
Governance postulates and consistency rules	Pass	P0–P4 and typed relations supplied
Publication profiles	Pass	Membership defined by explicit layer and section rules, not broad Part ranges

Gate	RC3 status	Note
Primitive information semantics	Pass	Six meanings separated; semantic content distinguished from pragmatic/functional use
Core hypothesis register	Pass	Five central hypotheses now state risky UIPO restrictions, independent selection, and prospective discriminators
Anti-flexibility controls	Pass	CEP-RID, failure retention, multi-level THD tests, and logged searches required
Symbol and dimensional audit	Pass	Time/target collision removed; mu_G, mu_X, omega_ref, canonical Q_RC1, and vector typing supplied
Correct wrapped 1:2:3 phase statistic	Pass	Aggregation treated as a choice; structure-preserving null and mechanism prediction required
Claim-specification status does not imply evidence	Pass	CS0–CS3 and EB remain separate from empirical support
Change-detection operationalization	Pass at CS2	Covariance, thresholds, filters, streams, multiplicity, precision, and non-detection rules frozen; no implementation supplied
THD-specific worked mapping	Pass at CS2	Exact signals, parameters, surrogate null, seeds, effect threshold, and quantile rule frozen; no implementation supplied
Methodological references	Pass	Kalman filtering, surrogate testing, ontology engineering, phase, sequential detection, intervals, and bootstrap sources cited
Publication equations and typography	Pass with limitation	PDF visually verified page by page; DOCX structure, equations, tables, fields, and OOXML verified; native DOCX rendering unavailable in the build environment
Funding, COI, repository, license, correspondence	Pending author	Required before public release
Companion evidence/falsification standard	Deferred	Begin only after author approval of V2.0

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Closing status

UIPO V2.0 Release Candidate 3 is ready for author review. It is internally tightened as a human-readable research ontology and scientific specification, not an OWL/RDF formal ontology or an empirically confirmed physical theory. The worked examples are CS2 specifications, not implemented results. Public release remains contingent on the author decisions, publication statements, and final author approval above. The companion *UIPO Scientific Validation, Evidence, and Falsification Standard* remains deferred until this ontology is approved.