

Dual-Time Projection Metrology and the Temporal Origin of Physical Constants

A Self-Contained Publishing Synthesis of Papers 1–24

Mohamed Haj Yousef

Physics Department, UAE University

`mhajyousef@uaeu.ac.ae`

Publishing update with reproducible TikZ figures – June 7, 2026

Abstract

This article gives a self-contained publishing synthesis of the Dual-Time Theory (DTT) constants program and its Single Monad Model (SMM) formulation after the expansion of Papers 1–24. The aim is to state the program in a form that can be read independently of the separate manuscripts: the ontology of stable projected records is introduced, the metrological role of physical constants is fixed, the theorem and certificate dependencies are ordered, and the no-backflow rules separating upstream construction from downstream comparison are made explicit. The central chain is that an inner generative layer projects stable outer records; additive record action and compact phase determine the structural role of $\hbar$; local completion cones determine the invariant speed c_* ; canonical complexification supplies the integer block 137; and the fractional residual in $\alpha_{\text{OS}}^{-1}(0) = 137 + \Delta_{\mathcal{R}}$ is reserved for a future source-blind physical-electron holonomy certificate. Hydrogen is treated as the principal post-freeze arena in which constants become visible, not as a pre-freeze source from which they are inferred.

The manuscript is deliberately status-disciplined. It distinguishes structural theorems, conditional theorem targets, finite-regulator certificates, SI calibrations, post-freeze consequences, and open physical discharges. No measured numerical constant is claimed to be derived unless the relevant constructor, normalization ledger, regulator limit, firewall scan, reproducibility data, and certificate hash are frozen before comparison with measured values. This version also replaces all former figure placeholders by actual TikZ source files, so the dependency graphs, certificate pipelines, source-firewall diagrams, and sector maps are reproducible from the LaTeX package itself.

Contents

1	Introduction and scope	4
1.1	Main contributions of this version	4
1.2	Reader’s map	4
1.3	Meaning of derivation, calibration, and certification	4
2	Publication update summary	5
3	Program principles	5
3.1	Central source-separation rule	5
3.2	Main theorem chain	5
3.3	Claim-status vocabulary	5

4	Expanded paper sequence	6
4.1	Paper 01. Dual-Time Projection Realism: Generative Order, Stable Records, and Observable Time	6
4.2	Paper 02. Projection Metrology and Constants: A Framework for Emergent Physical Constants	7
4.3	Paper 03. The Structural Emergence of Planck’s Constant from the Action-Phase Bridge	11
4.4	Paper 04. Emergent Additive Record Action from Dual-Time Projection and Stabilization	13
4.5	Paper 05. Finite-Stability Corrections and Effective $\hbar$ in Projection Metrology	13
4.6	Paper 06. Local Completion Cones and the Reconstruction Origin of the Invariant Speed	15
4.7	Paper 07. Canonical Complexification and the Structural Integer 137	19
4.8	Paper 08. The Holonomy Fraction: A Finite-Regulator Program for the Fractional Fine-Structure Residual	21
4.9	Paper 09. The Coupling-Correspondence Theorem: From Boundary Holonomy to Inverse Electromagnetic Coupling	23
4.10	Paper 10. The Physical Electron Certificate	25
4.11	Paper 11. Temporal Reconstruction of Hydrogen I: Alpha-Free Proton-Electron Record Geometry	27
4.12	Paper 12. Temporal Reconstruction of Hydrogen II: Derived Constants and the Bohr Spectrum	29
4.13	Paper 13. Temporal Reconstruction of Hydrogen III: Fine Structure, Lamb Shift, and Radiative Inner-Time Loops	31
4.14	Paper 14. Hydrogen as a Differential Test of the Holonomy Fraction	31
4.15	Paper 15. Primitive Charge Character and the Emergence of Electromagnetic Coupling .	33
4.16	Paper 16. Electron Mass as Temporal Inertia in Dual-Time Theory	35
4.17	Paper 17. Proton-Electron Mass Ratio from Multi-Layer Temporal Tick Hierarchies . . .	39
4.18	Paper 18. Boltzmann’s Constant as the Entropy-Energy Bridge in Projection Metrology .	41
4.19	Paper 19. Temporal Averaging of Gravitating Vacuum Energy in Dual-Time Theory . . .	43
4.20	Paper 20. Newton’s Constant as a Curvature-Record Response Coefficient in Dual-Time Theory	44
4.21	Paper 21. Hydrogen as the Rosetta Stone of Projection Metrology	48
4.22	Paper 22. The Constants Ledger in Dual-Time Theory: What Is Derived, Calibrated, Certified, and Open	48
4.23	Paper 23. Machine-Checkable DTT Certificates for Constants	50
4.24	Paper 24. Falsifiable Bounds and Experimental Roadmap for Dual-Time Projection Metrology	55
5	Expanded-paper inventory	57
6	Dependency graph and no-backflow rules	59
6.1	Phase organization	59
6.2	No-backflow theorem target	59
7	Master constants ledger	59
8	Hydrogen source quarantine	61
9	Certificate hierarchy	61
10	Global TikZ figure and diagram plan	61
11	Repository layout after this publishing update	61

12 TikZ figure source policy	66
13 Immediate next actions	66

1 Introduction and scope

Dual-Time Theory is presented here as a projection-metrological research program rather than as a list of fitted numerological targets. Its organizing claim is that the constants appearing in stable outer records are bridge structures: they relate record domains that have different operational types, such as additive action, compact phase, local completion distance and time, discrete charge character, entropy counts, response coefficients, and spectral records. The program therefore separates two tasks that are often conflated. First, it asks whether a constant has a structural role forced by the DTT/SMM construction. Second, it asks whether a numerical value can be produced by a source-blind finite certificate whose inputs were frozen before any comparison with measured data.

This synthesis is written to be read without opening the twenty-four companion papers. Each paper entry records its role, central formulae, added content, non-claim boundary, certificate status, and figures. The document also provides the global dependency graph, constants ledger, hydrogen quarantine rule, certificate hierarchy, and experimental-roadmap interface. The phrase “publishing synthesis” is used in a precise sense: the prose is organized as a coherent article, the terminology is defined before it is used, and every figure is backed by a TikZ source file rather than by a placeholder.

1.1 Main contributions of this version

The update makes four concrete changes. It rewrites the master program in publication prose, replacing outline-style fragments by complete explanatory paragraphs where the scientific status would otherwise be ambiguous. It adds a self-contained reader’s map of DTT/SMM, projection metrology, source firewalls, and finite-regulator certification. It preserves the expanded-paper inventory while making the dependency order and no-backflow constraints explicit enough to audit. Finally, it supplies reproducible TikZ code for every master figure and every paper-level diagram named in the expanded inventory.

1.2 Reader’s map

The document should be read in three passes. Sections 3–3.3 define the scientific grammar: what counts as a bridge, what counts as a derivation, and why downstream data are quarantined. Section 4 gives the paper-by-paper content map. Sections 6–13 provide the practical audit layer: dependencies, constants, certificates, hydrogen tests, repository layout, and next steps toward a source-blind physical-electron certificate.

1.3 Meaning of derivation, calibration, and certification

In this manuscript, a *structural derivation* identifies a role forced by the DTT/SMM formalism, such as the uniqueness of an action-phase bridge. A *calibration* assigns conventional SI numbers to dimensionful scales after the structural role is known. A *finite-regulator certificate* is a frozen, machine-checkable object containing primitive inputs, constructor code or exact arithmetic data, normalization conventions, regulator path, error control, firewall evidence, reproduction instructions, and a hash. A *post-freeze comparison* is allowed only after this certificate exists. This terminology is essential for the constants program because a correct structural role does not by itself supply a measured decimal value.

2 Publication update summary

What was updated

The original master skeleton listed the intended 24-paper program. This version updates that skeleton to match the expanded manuscripts now available for Papers 1–24. Each paper entry below now records the expanded title, page count, role, central formulae, new sections added, non-claims, certificate status, and figure files.

Global scientific posture

The series is deliberately status-disciplined. It distinguishes structural theorem, conditional theorem, theorem target, finite-regulator certificate, SI calibration, post-freeze consequence, and open physical discharge. No measured constant is declared derived unless the relevant constructor, normalization ledger, regulator limit, source-firewall scan, and certificate hash are frozen before comparison.

3 Program principles

3.1 Central source-separation rule

Hydrogen is the main physical proving ground, but alpha-containing hydrogen formulae must not be used to derive α . The safe chain is

$$\text{alpha-free temporal hydrogen structure} \longrightarrow \text{candidate record ontology}, \quad (1)$$

$$\{c_\star, \hbar, \alpha, m_e\} \text{ supplied upstream} \longrightarrow \text{Bohr, Rydberg, fine-structure,} \quad (2)$$

and Lamb-shift phenomenology.

The forbidden pre-freeze inputs include α , α^{-1} , the electron anomaly, the von Klitzing constant, measured electric charge normalization, Bohr velocity, Rydberg data, Lamb-shift numerics, Penning-trap mass ratios, measured G , cosmological best fits, and equivalent proxies.

3.2 Main theorem chain

$$\text{dual-time generative layer} \rightarrow \text{stable projected records}, \quad (3)$$

$$\text{compact phase} + \text{additive record action} \rightarrow \hbar, \quad (4)$$

$$\text{local completion cone} \rightarrow c_\star, \quad (5)$$

$$\text{canonical complexification} + \text{projection tower} \rightarrow 137, \quad (6)$$

$$\text{finite-regulator electron holonomy certificate} \rightarrow \Delta_{\mathcal{R}}, \quad (7)$$

$$137 + \Delta_{\mathcal{R}} \rightarrow \alpha_{\text{OS}}^{-1}(0), \quad (8)$$

$$\alpha, \hbar, c_\star, m_e, m_p \rightarrow \text{hydrogen spectroscopy and residual tests.} \quad (9)$$

3.3 Claim-status vocabulary

Status	Meaning
Structural theorem	A theorem about the formal DTT/projection-metrology structure, independent of measured constants.
Conditional theorem	A theorem that follows after explicit assumptions or certificate hypotheses are discharged.
Theorem target	A precise statement to be proved in a future physical construction.
Finite-regulator certificate	A frozen, machine-checkable finite object with canonical serialization, source-firewall scan, and regulator comparison.
SI calibration	Assignment of conventional SI numerical values to dimensionful bridge scales.
Post-freeze consequence	A calculation allowed only after upstream constants/certificates are frozen.
Open physical discharge	A mathematical or physical construction still required before a strong derivation claim is justified.

4 Expanded paper sequence

4.1 Paper 01. Dual-Time Projection Realism: Generative Order, Stable Records, and Observable Time

Expanded manuscript status

Expanded standalone paper: 36 pages.
PDF: `dtc_paper01_dual_time_projection_realism_expanded_final.pdf`.
Source: `dtc_paper01_dual_time_projection_realism_expanded_final.tex`.
Package: `dtc_paper01_dual_time_projection_realism_expanded_package.zip`.

Role. Foundational ontology and role separation. It defines generative order, projection/stabilization, stable records, outer record time, and the basic claim-status discipline used by the whole series.

Central formulae.

$$\mathcal{G} \xrightarrow{\Pi} \mathcal{R} \quad (10)$$

$$R \sim R' \iff \text{stable under admissible protocols} \quad (11)$$

$$t_{\text{out}} = \text{ord}(R_0, R_1, \dots) \quad (12)$$

What the expanded version adds.

- Full dual-time ontology: inner generative order vs. outer record order.
- Definitions of stable records, record histories, clock protocols, and record equivalence.
- Projection-realism section explaining why records are neither merely epistemic nor naively fundamental.
- Interfaces to all later constants papers, including the hydrogen and alpha source firewall.

Non-claim and firewall boundary. Does not derive any numerical constant; it supplies the ontology and language in which later constants are formulated.

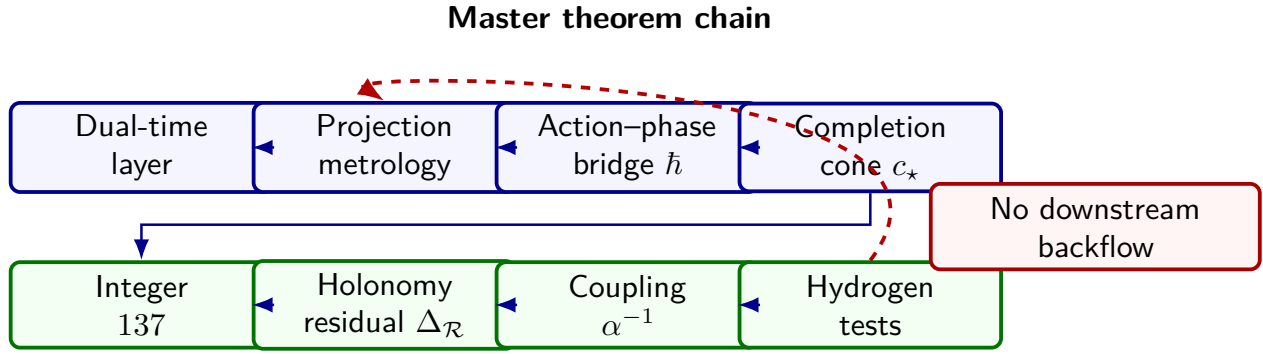
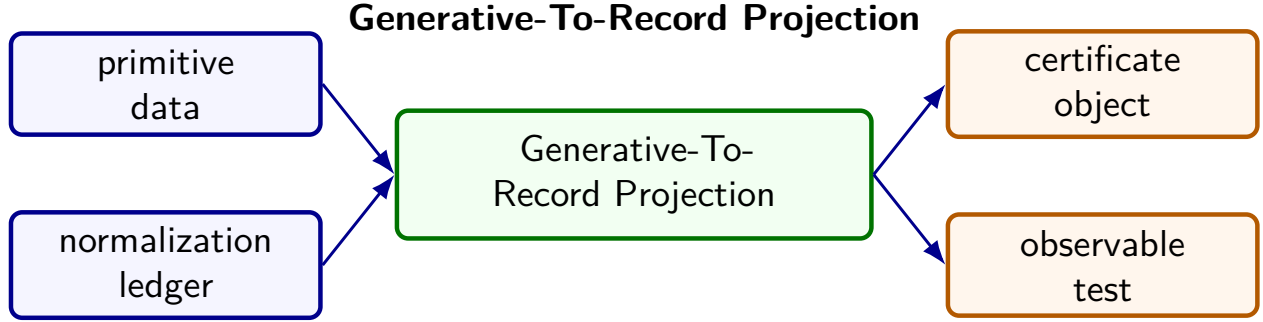


Figure 1: **Master theorem chain.** Flow diagram from dual-time projection realism to projection metrology, action, $\hbar$, completion cones, 137, holonomy fraction, electron certificate, hydrogen, ledgers, certificates, and experiments.

Certificate status. No physical certificate; foundational claim ledger and finite-certificate checklist.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 2: **Generative-To-Record Projection.** Schematic representation of generative-to-record projection.

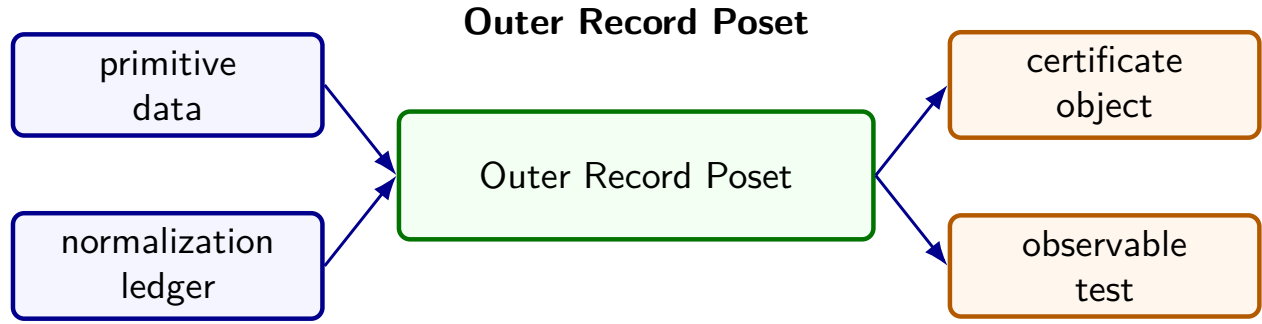
Figures supplied for this paper.

4.2 Paper 02. Projection Metrology and Constants: A Framework for Emergent Physical Constants

Expanded manuscript status

Expanded standalone paper: 38 pages.
 PDF: dtt_paper02_projection_metrology_constants_expanded_final.pdf.
 Source: dtt_paper02_projection_metrology_constants_expanded_final.tex.
 Package: dtt_paper02_projection_metrology_constants_expanded_package.zip.

Role. Metrology grammar for the entire program. It classifies constants as bridge laws between record domains and separates structural derivation from SI calibration.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 3: **Outer Record Poset**. Schematic representation of outer record poset.

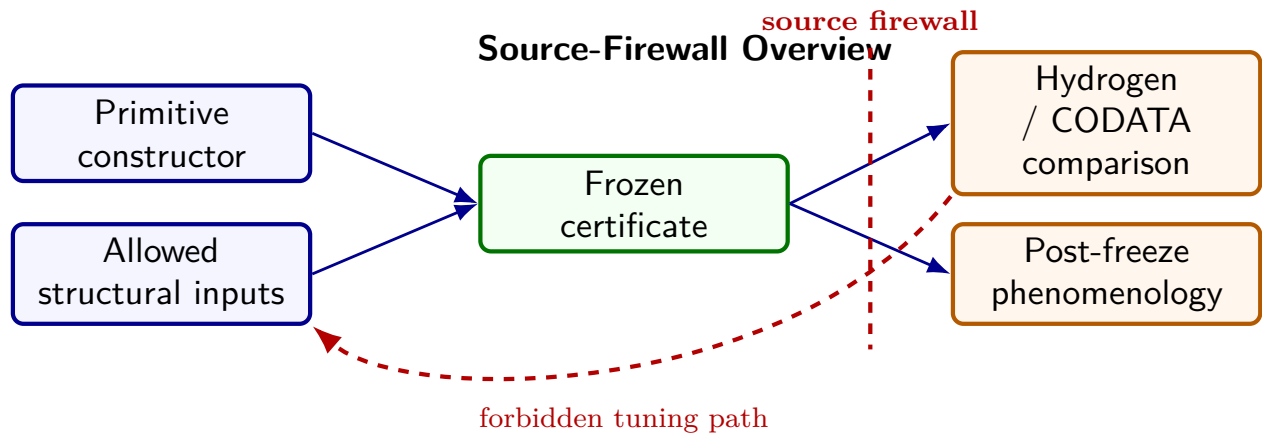
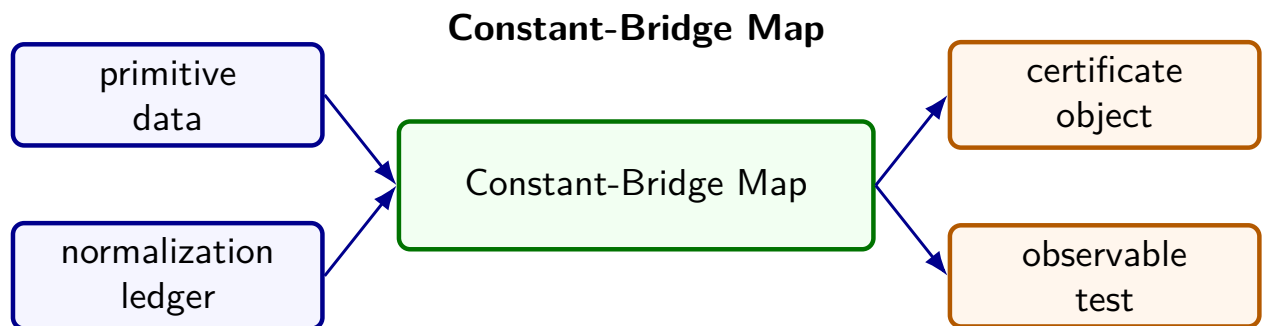


Figure 4: **Source-Firewall Overview**. Schematic representation of source-firewall overview.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 5: **Constant-Bridge Map**. Schematic representation of constant-bridge map.

Central formulae.

$$\theta(\Gamma) \equiv F(X(\Gamma)) \pmod{2\pi} \quad (13)$$

$$F(x + y) \equiv F(x) + F(y) \pmod{2\pi} \quad (14)$$

$$F(x) \equiv \beta x \pmod{2\pi} \quad (15)$$

What the expanded version adds.

- Taxonomy of observable domains: additive, compact, metric, multiplicative/logarithmic, discrete/topological, spectral, and response sectors.
- Classification of constants: dimensionless targets, conversion bridges, response coefficients, effective constants, and downstream derived quantities.
- Source-firewall and normalization-hazard audit rules.
- Certificate templates for dimensionless constants and finite-regulator derivations.

Non-claim and firewall boundary. Does not assign numerical values to constants; it defines what kind of claim each constant can legitimately support.

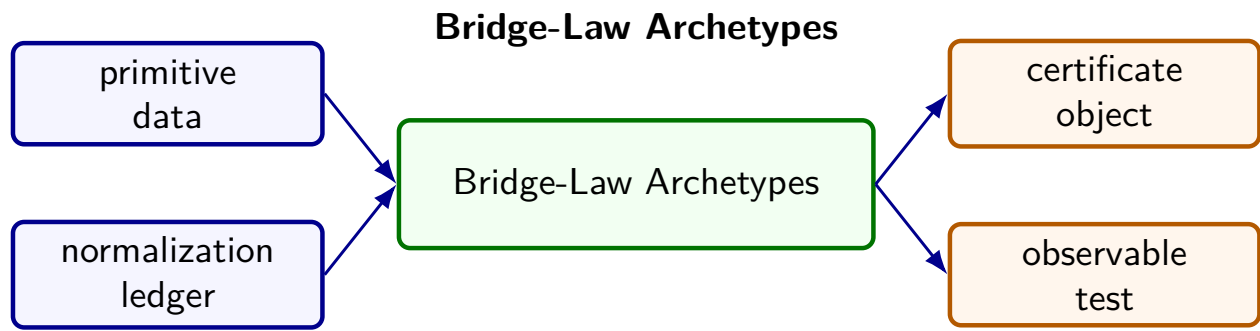
Certificate status. Framework certificate templates; no measured constant certified.

Observable-Domain Taxonomy

Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

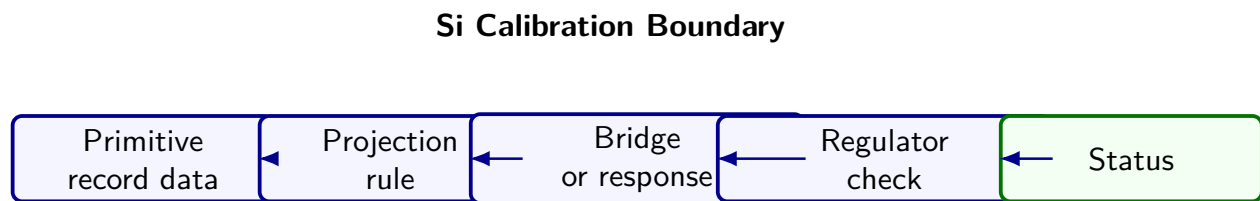
Figure 6: **Observable-Domain Taxonomy.** Schematic representation of observable-domain taxonomy.

Figures supplied for this paper.



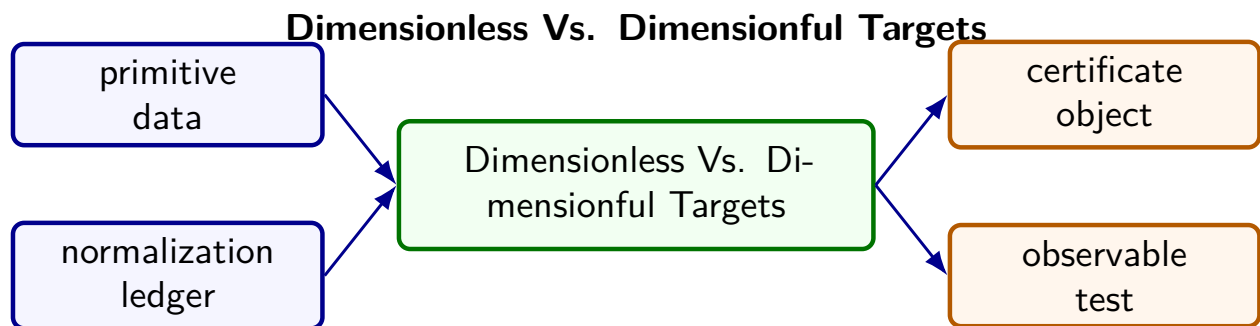
The diagram records dependencies, normalization choices, and audit outputs.

Figure 7: **Bridge-Law Archetypes**. Schematic representation of bridge-law archetypes.



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 8: **Si Calibration Boundary**. Schematic representation of SI calibration boundary.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 9: **Dimensionless Vs. Dimensionful Targets**. Schematic representation of dimensionless vs. dimensionful targets.

4.3 Paper 03. The Structural Emergence of Planck's Constant from the Action-Phase Bridge

Expanded manuscript status

Expanded standalone paper: 39 pages.

PDF: dtt_paper03_structural_emergence_hbar_expanded_final.pdf.

Source: dtt_paper03_structural_emergence_hbar_expanded_final.tex.

Package: dtt_paper03_structural_emergence_hbar_expanded_package.zip.

Role. First fully worked projection-metrological bridge theorem: compact phase plus additive record action forces a unique action-phase conversion scale.

Central formulae.

$$\Delta\theta(\Gamma) \equiv \frac{S(\Gamma)}{\hbar} \pmod{2\pi} \quad (16)$$

$$\chi(\Gamma) = \exp(iS(\Gamma)/\hbar) \quad (17)$$

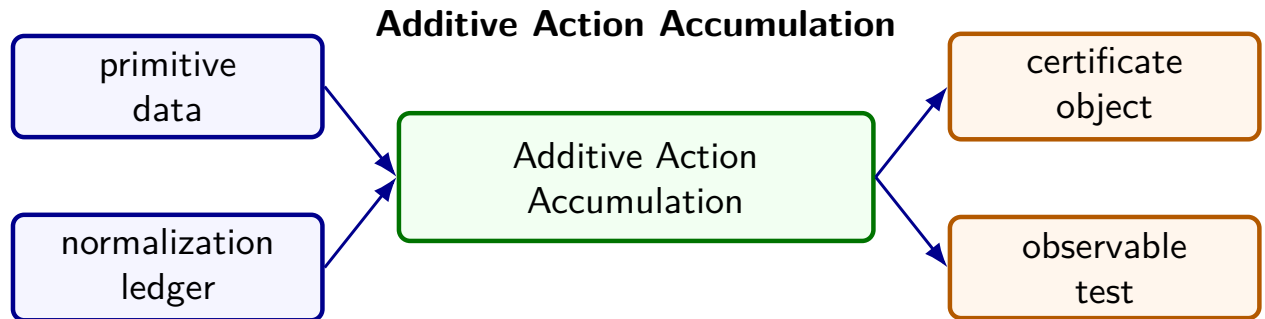
$$F : (\mathbb{R}, +) \rightarrow (\mathbb{R}/2\pi\mathbb{Z}, +) \quad (18)$$

What the expanded version adds.

- Classifies regular homomorphisms from additive action to compact phase.
- Derives the phase factor $\exp(iS/\hbar)$ as the multiplicative representation of record concatenation.
- Explains downstream appearances of $E=\hbar\omega$, $p=\hbar k$, stationary phase, and uncertainty scales.
- Separates structural $\hbar$ from exact SI numerical calibration.

Non-claim and firewall boundary. Does not derive the SI decimal value of $\hbar$; it derives the bridge role and uniqueness of $\hbar$.

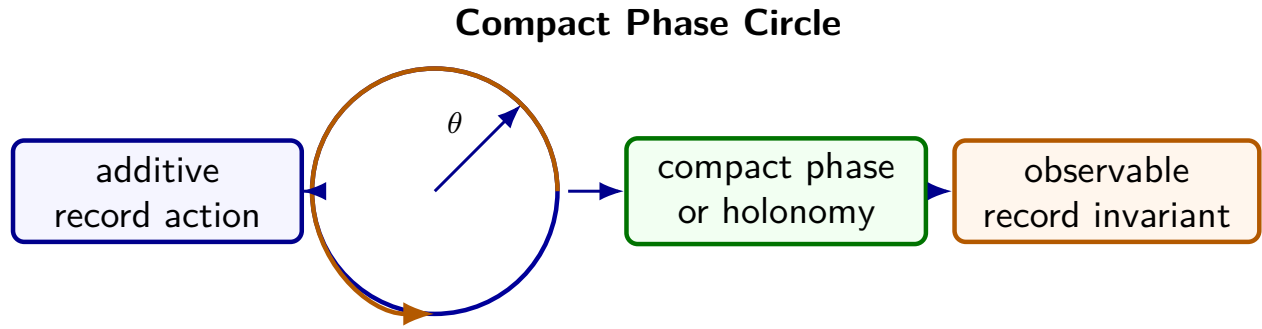
Certificate status. Finite-regulator and certificate formulations; primarily structural.



The diagram records dependencies, normalization choices, and audit outputs.

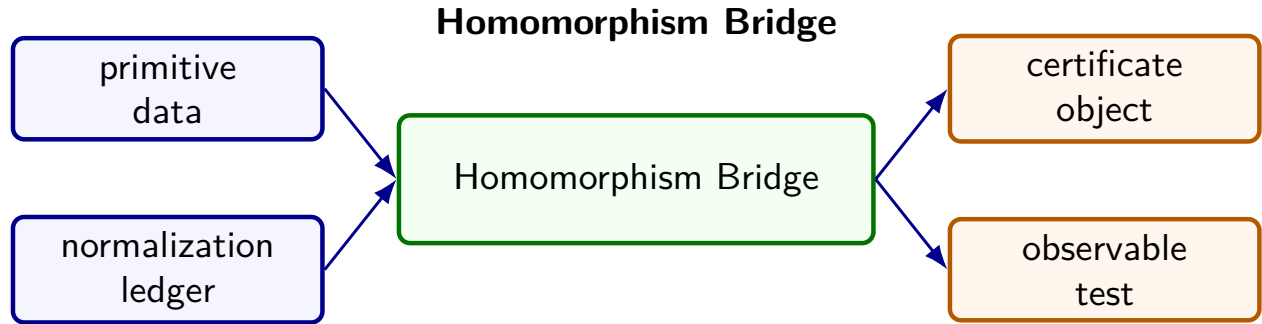
Figure 10: **Additive Action Accumulation.** Schematic representation of additive action accumulation.

Figures supplied for this paper.



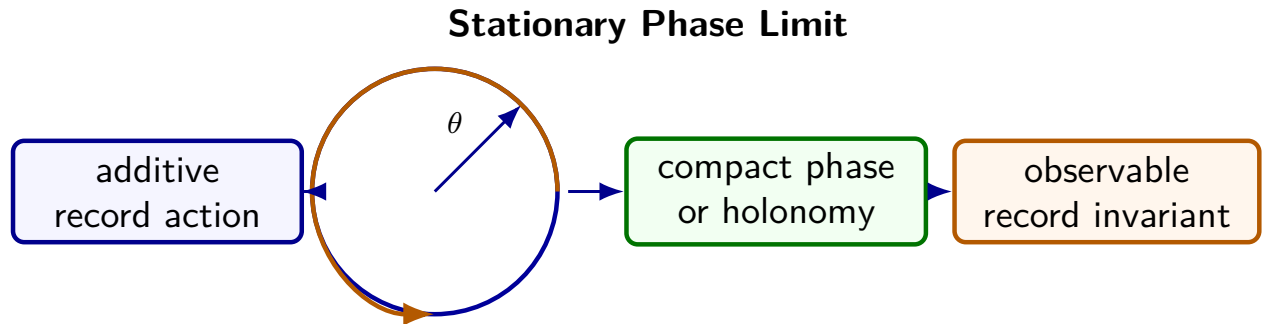
Concatenation becomes phase addition; branch choices are audited.

Figure 11: **Compact Phase Circle**. Schematic representation of compact phase circle.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 12: **Homomorphism Bridge**. Schematic representation of homomorphism bridge.



Concatenation becomes phase addition; branch choices are audited.

Figure 13: **Stationary Phase Limit**. Schematic representation of stationary phase limit.

4.4 Paper 04. Emergent Additive Record Action from Dual-Time Projection and Stabilization

Expanded manuscript status

Expanded standalone paper: 36 pages.

PDF: `dtc_paper04_emergent_additive_record_action_expanded_final.pdf`.

Source: `dtc_paper04_emergent_additive_record_action_expanded_final.tex`.

Package: `dtc_paper04_emergent_additive_record_action_expanded_package.zip`.

Role. Derives the additive record action assumed by the $\hbar$ bridge, closing the quantum-classical interface chain.

Central formulae.

$$S_{\text{geo}}[\Gamma] = -m_0 c_\star^2 \int_\Gamma d\tau \quad (19)$$

$$\Delta_\Gamma = \Psi(O_a) - \Psi(O_b) \geq 0 \quad (20)$$

$$S_{\text{rec}}^{(\lambda)}(\Gamma) = S_{\text{geo}}(\Gamma) + \lambda \Delta_\Gamma \quad (21)$$

What the expanded version adds.

- Endpoint-cocycle theorem for projection-sensitive scalar corrections.
- Finite-regulator action theorem and benchmark demonstrating additivity.
- Interfaces to rest recurrence, de Broglie relations, Hamilton-Jacobi phase, and $\hbar$ -eff deviations.
- Firewall preventing hydrogen or alpha formulas from feeding into the action derivation.

Non-claim and firewall boundary. Does not derive the Born rule, full Hilbert-space reconstruction, or interacting QFT; it supplies the additive action layer.

Certificate status. Worked finite-regulator benchmark and validator pseudocode.

Figures supplied for this paper.

4.5 Paper 05. Finite-Stability Corrections and Effective $\hbar$ in Projection Metrology

Expanded manuscript status

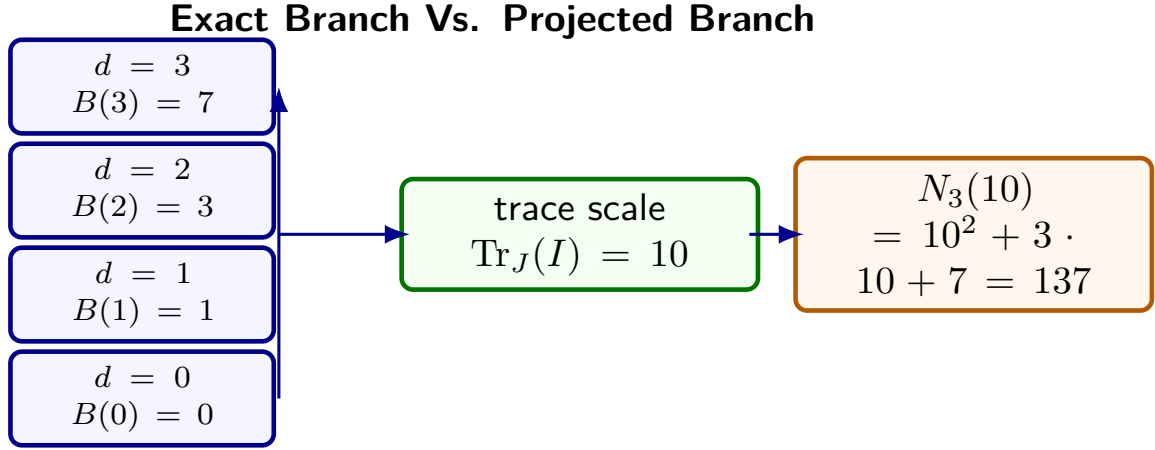
Expanded standalone paper: 41 pages.

PDF: `dtc_paper05_finite_stability_hbar_eff_expanded_final.pdf`.

Source: `dtc_paper05_finite_stability_hbar_eff_expanded_final.tex`.

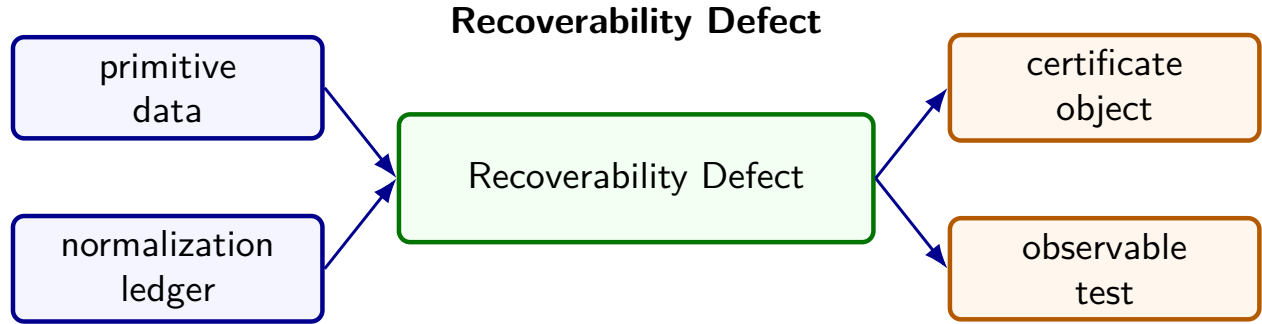
Package: `dtc_paper05_finite_stability_hbar_eff_expanded_package.zip`.

Role. Quantitative phenomenology of deviations from the ideal $\hbar$ bridge due to finite record stability and nonlinear projection.



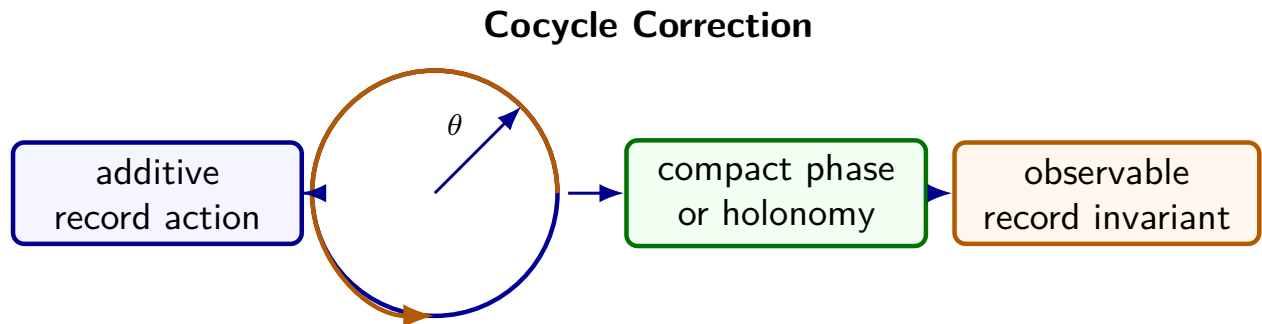
The finite tower supplies the integer block only; residual physics is separate.

Figure 14: **Exact Branch Vs. Projected Branch**. Schematic representation of exact branch vs. projected branch.



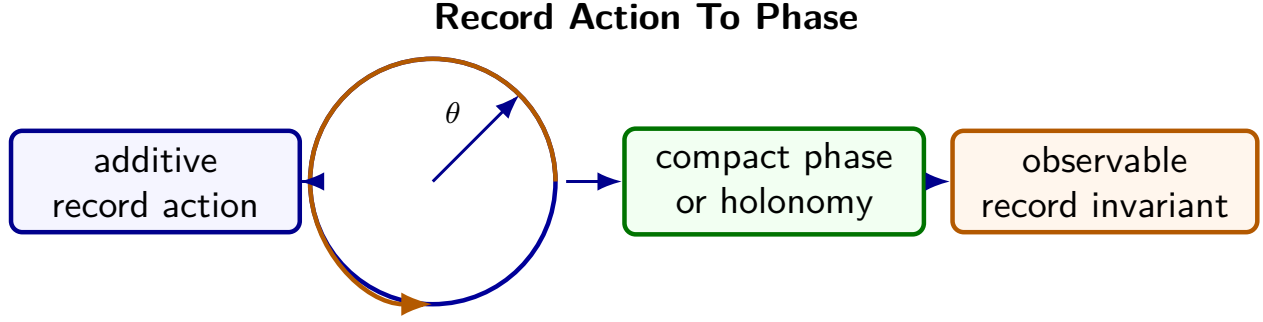
The diagram records dependencies, normalization choices, and audit outputs.

Figure 15: **Recoverability Defect**. Schematic representation of recoverability defect.



Concatenation becomes phase addition; branch choices are audited.

Figure 16: **Cocycle Correction**. Schematic representation of cocycle correction.



Concatenation becomes phase addition; branch choices are audited.

Figure 17: **Record Action To Phase**. Schematic representation of record action to phase.

Central formulae.

$$\Lambda(\eta, g) = (\cos g)^\eta \quad (22)$$

$$\Delta\varphi(\eta, g, \mathcal{E}) = c_1(\mathcal{E}) \frac{g^2}{\eta} + O(g^4/\eta) + O(\eta^{-2}) \quad (23)$$

$$\hbar_{\text{eff}} := \frac{S(\Gamma)}{\Delta\theta_{\text{obs}}(\Gamma)} \quad (24)$$

What the expanded version adds.

- Redundant Weak-Measurement Stabilizer model with redundancy η and weak-probe strength g .
- Separates visibility loss from projection-induced phase bias.
- High-stability recovery theorem: $\hbar_{\text{eff}}$ tends to $\hbar$.
- Experimental bounds pipeline translating phase null results into constraints on g^2/η .

Non-claim and firewall boundary. $\hbar_{\text{eff}}$ is not a fundamental variation of $\hbar$; it is an operational diagnostic of finite-stability regimes.

Certificate status. Machine-readable RWMS benchmark certificate; validator PASS.

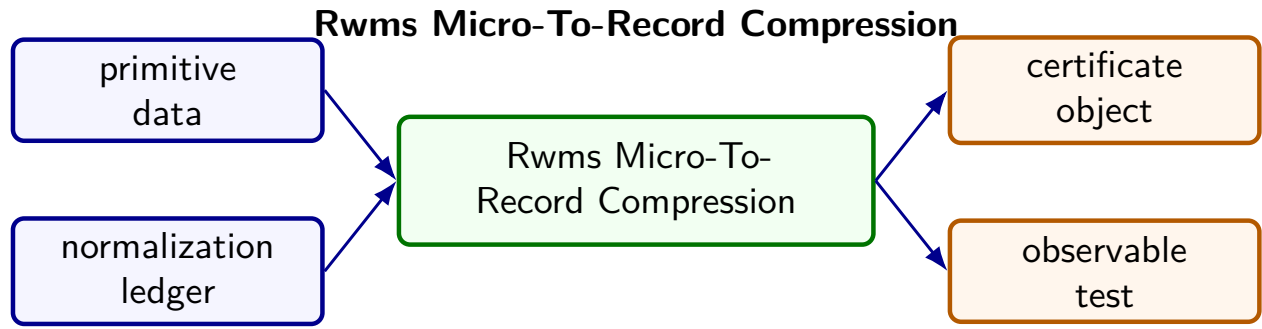
Figures supplied for this paper.

4.6 Paper 06. Local Completion Cones and the Reconstruction Origin of the Invariant Speed

Expanded manuscript status

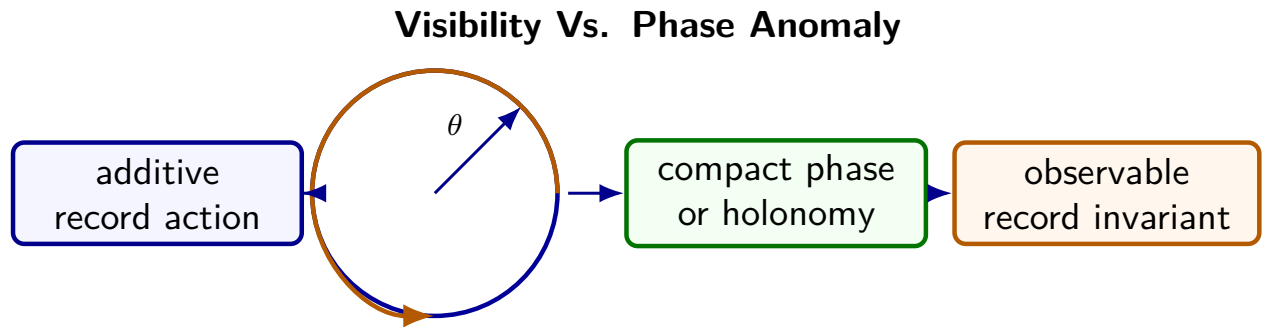
Expanded standalone paper: 34 pages.
 PDF: `dtc_paper06_local_completion_cones_cstar_expanded_final.pdf`.
 Source: `dtc_paper06_local_completion_cones_cstar_expanded_final.tex`.
 Package: `dtc_paper06_local_completion_cones_cstar_expanded_package.zip`.

Role. Kinematic layer deriving Lorentzian causal-cone structure from finite local completion, positive delay, observer quotient, and isotropic vacuum readout.



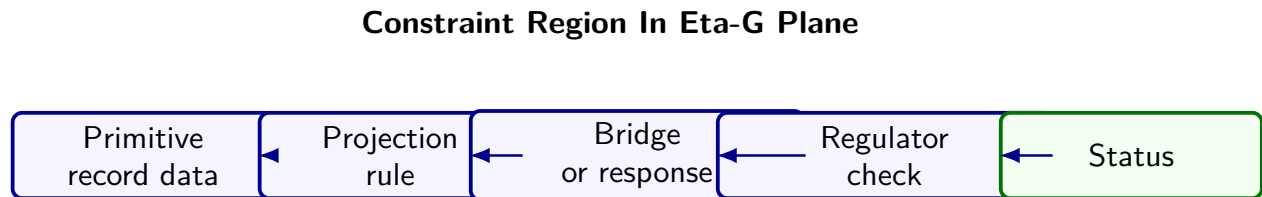
The diagram records dependencies, normalization choices, and audit outputs.

Figure 18: **Rwms Micro-To-Record Compression**. Schematic representation of RWMS micro-to-record compression.



Concatenation becomes phase addition; branch choices are audited.

Figure 19: **Visibility Vs. Phase Anomaly**. Schematic representation of visibility vs. phase anomaly.



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 20: **Constraint Region In Eta-G Plane**. Schematic representation of constraint region in eta-g plane.

Experimental Bound Pipeline

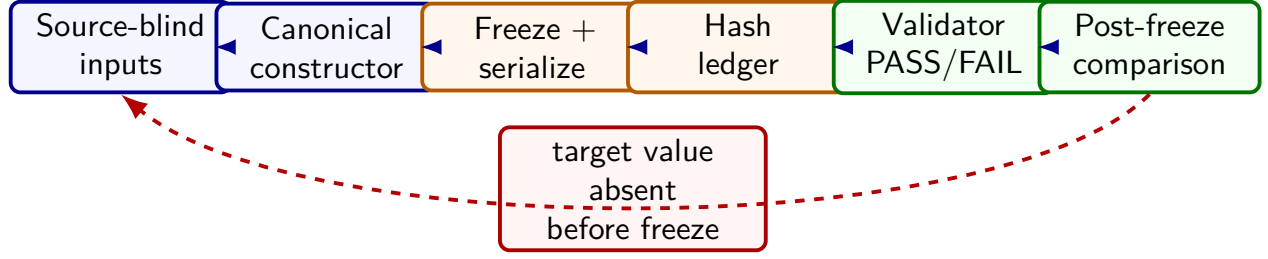


Figure 21: **Experimental Bound Pipeline.** Schematic representation of experimental bound pipeline.

Central formulae.

$$\|\Delta x\| \leq c_\star \Theta \quad (25)$$

$$Q_{c_\star}(\Theta, \Delta x) = c_\star^2 \Theta^2 - \|\Delta x\|^2 \geq 0 \quad (26)$$

$$c_\star = \ell_\star / \tau_\star \quad (27)$$

What the expanded version adds.

- Formal completion substrate and observer readout maps.
- Photon as the one-tick null benchmark; massive particles as delayed reconstruction classes.
- Lorentzian rigidity, velocity addition, time dilation, and mass-shell downstream structures.
- Finite-regulator graph realization and completion-cone certificate.

Non-claim and firewall boundary. Does not derive the SI numeral 299792458; it derives the structural invariant speed role and requires a unit dictionary.

Certificate status. Machine-checkable completion-cone benchmark certificate; validator PASS.

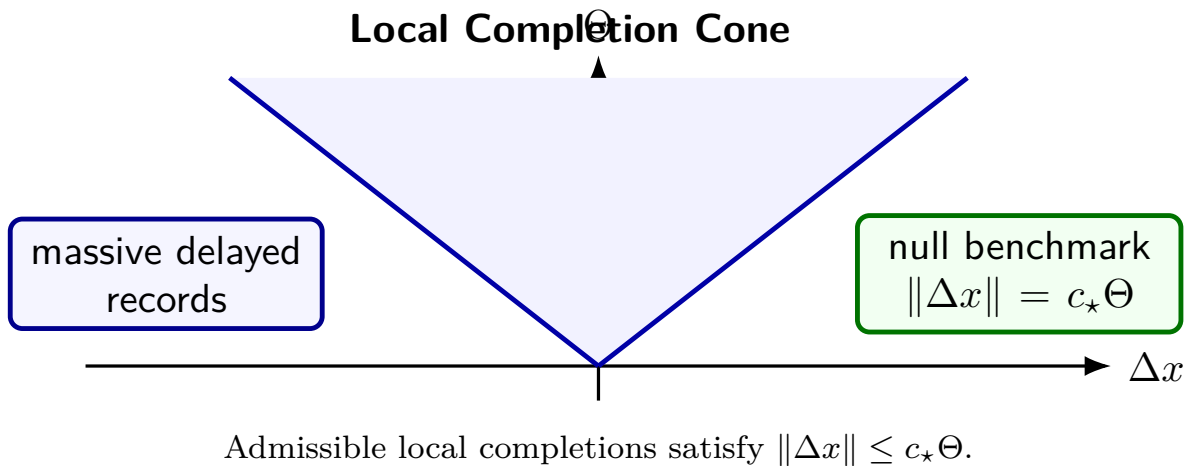


Figure 22: **Local Completion Cone.** Schematic representation of local completion cone.

Figures supplied for this paper.

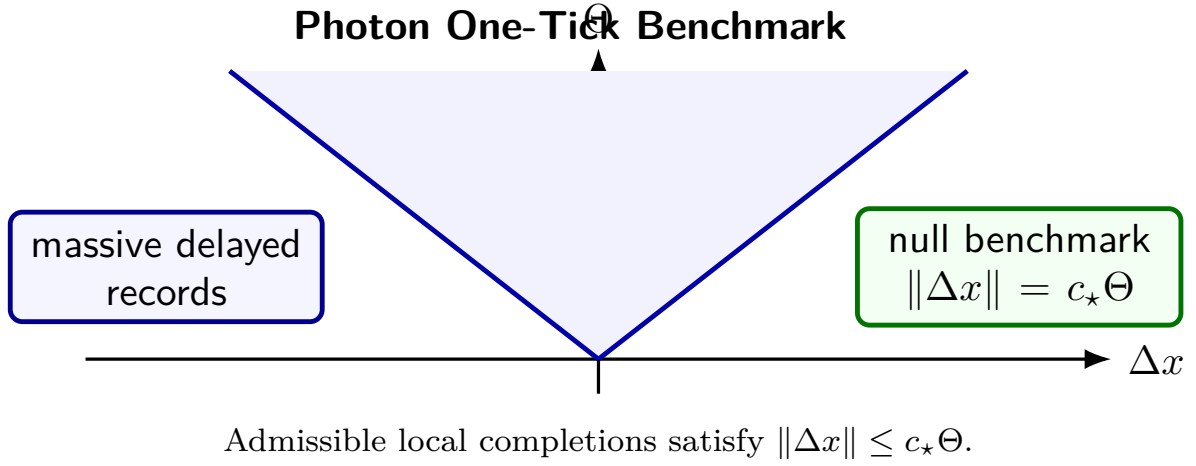


Figure 23: **Photon One-Tick Benchmark**. Schematic representation of photon one-tick benchmark.

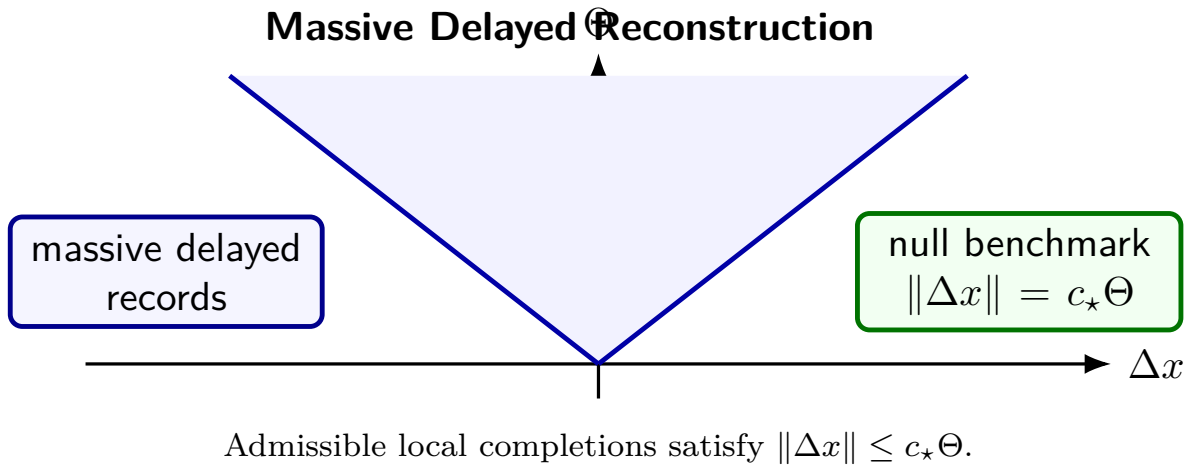


Figure 24: **Massive Delayed Reconstruction**. Schematic representation of massive delayed reconstruction.

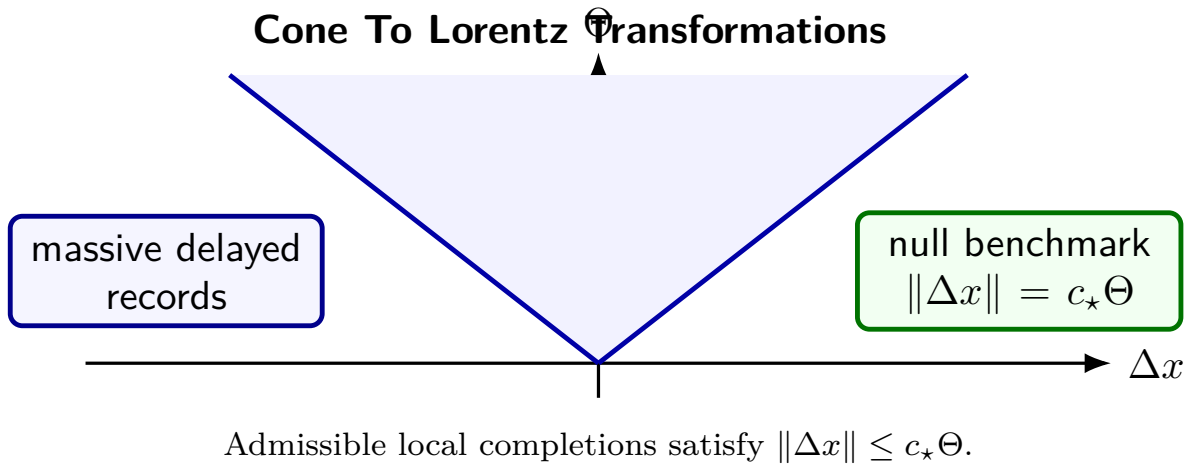


Figure 25: **Cone To Lorentz Transformations**. Schematic representation of cone to Lorentz transformations.

4.7 Paper 07. Canonical Complexification and the Structural Integer 137

Expanded manuscript status

Expanded standalone paper: 34 pages.

PDF: `dtc_paper07_canonical_complexification_137_expanded_final.pdf`.

Source: `dtc_paper07_canonical_complexification_137_expanded_final.tex`.

Package: `dtc_paper07_canonical_complexification_137_expanded_package.zip`.

Role. Structural integer theorem supplying the upstream flat count for the alpha program.

Central formulae.

$$0 \rightarrow K_d \rightarrow K_{d+1} \rightarrow \mathbb{C} \rightarrow 0, \quad d = 0, 1, 2 \quad (28)$$

$$\mathrm{Tr}_J(I_K) = 1 + 2 + 3 + 4 = 10 \quad (29)$$

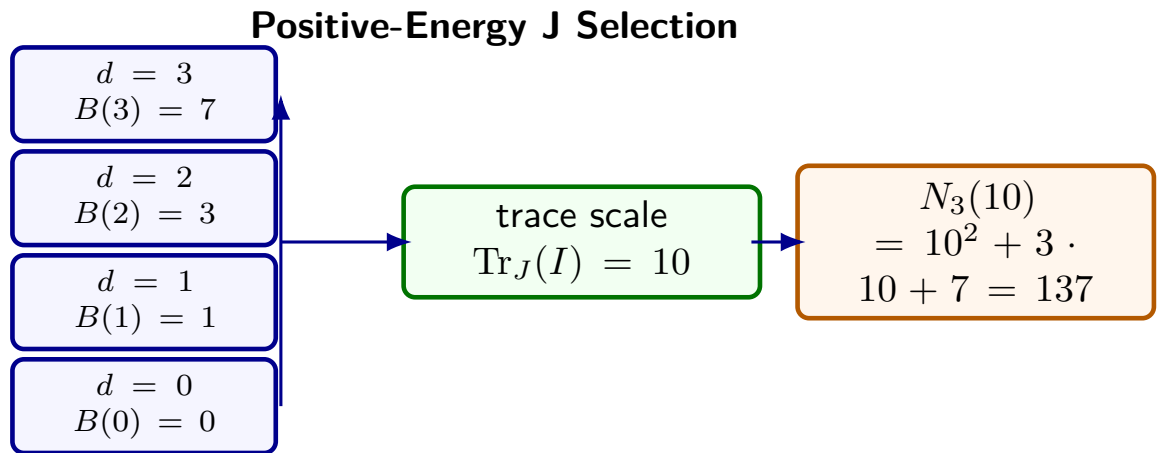
$$B(d) = 2^d - 1, \quad N_3(\lambda) = \sum_{d=0}^3 B(d)\lambda^{3-d} = \lambda^2 + 3\lambda + 7 \quad (30)$$

What the expanded version adds.

- Positive-energy Real-commutant complexification input.
- Exact one-innovation tower and trace scale 10.
- Formula hygiene: two-to-the-d minus one, never 2d-1.
- Safe interface to alpha: this paper supplies 137, not $\Delta_{\mathcal{R}}$.

Non-claim and firewall boundary. Does not derive the measured fine-structure constant; $\Delta_{\mathcal{R}}$ remains the holonomy-certificate target.

Certificate status. Machine-readable structural-137 benchmark certificate; validator PASS.



The finite tower supplies the integer block only; residual physics is separate.

Figure 26: **Positive-Energy J Selection.** Schematic representation of positive-energy J selection.

Figures supplied for this paper.

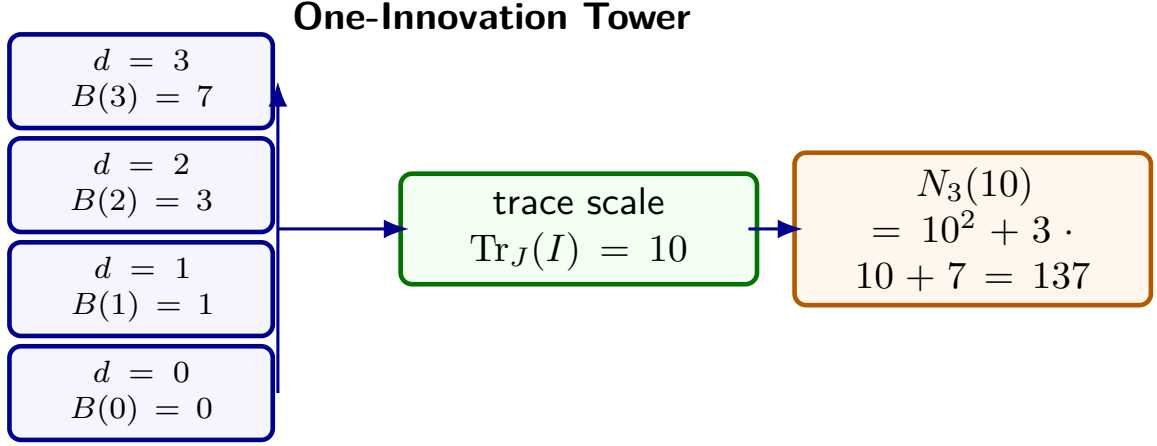


Figure 27: **One-Innovation Tower**. Schematic representation of one-innovation tower.

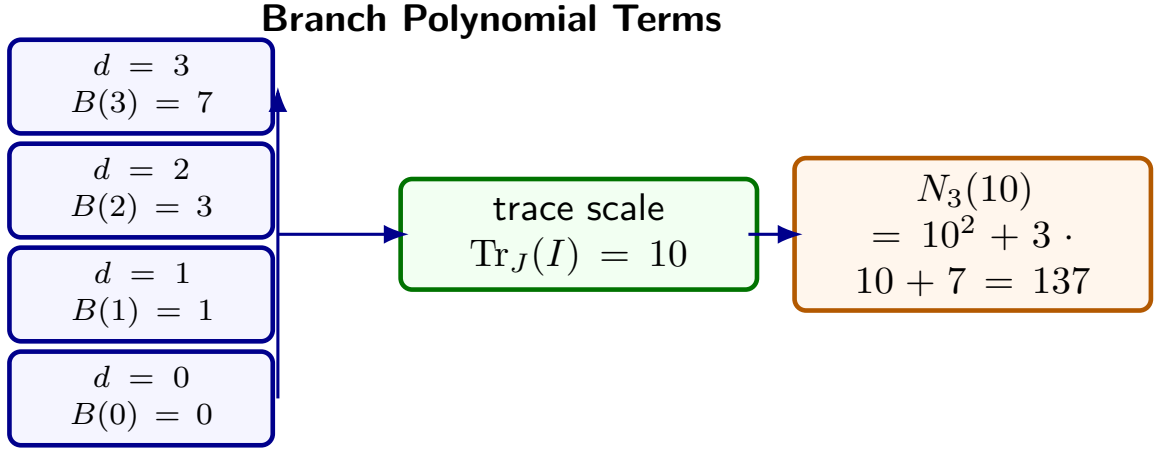


Figure 28: **Branch Polynomial Terms**. Schematic representation of branch polynomial terms.

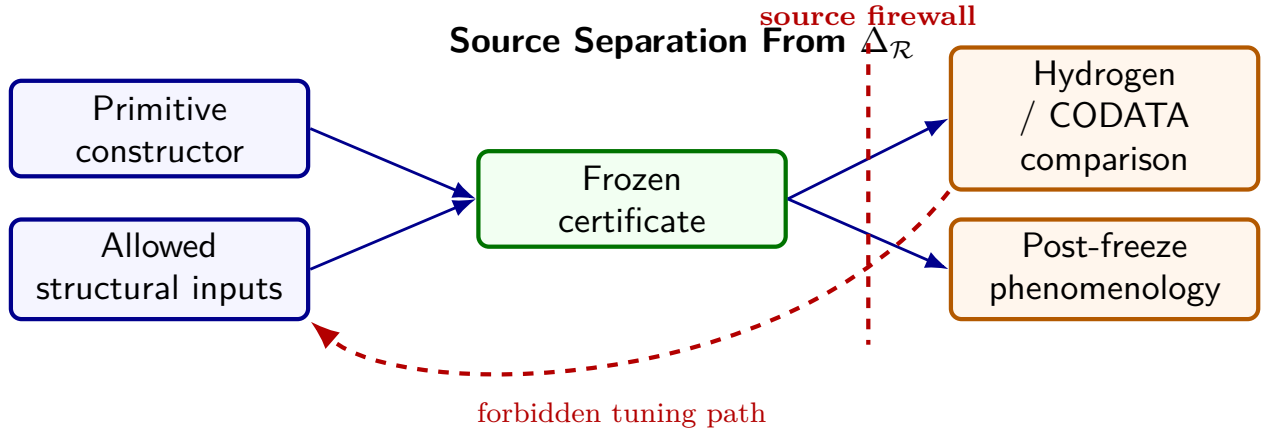


Figure 29: **Source Separation From $\Delta_{\mathcal{R}}$** . Schematic representation of source separation from $\Delta_{\mathcal{R}}$.

4.8 Paper 08. The Holonomy Fraction: A Finite-Regulator Program for the Fractional Fine-Structure Residual

Expanded manuscript status

Expanded standalone paper: 78 pages.
 PDF: dtt_paper08_holonomy_fraction_expanded_final.pdf.
 Source: dtt_paper08_holonomy_fraction_expanded_final.tex.
 Package: dtt_paper08_holonomy_fraction_expanded_package.zip.

Role. Certificate-ready finite-regulator program for the fractional residual $\Delta_{\mathcal{R}}$ in $\alpha_{\text{OS}}^{-1}(0) = 137 + \Delta_{\mathcal{R}}$.

Central formulae.

$$\alpha_{\text{OS}}^{-1}(0) = 137 + \Delta_{\mathcal{R}} \quad (31)$$

$$\Delta_{\mathcal{R}} = \text{br}_{(0,1/2)} \frac{1}{2\pi} \text{Arg} \det_{\mathcal{H}_e^{\text{low,phys}}} \text{Hol}_{C_e}(\nabla_{\text{D TT}}^e) \quad (32)$$

$$R_{e,r} = (V_r, E_r, F_r, \partial, \omega_r, J_r, \sim_{\text{obs}}) \quad (33)$$

What the expanded version adds.

- Canonical finite-regulator electron data contract.
- Connection convention safeguards and determinant compression routes.
- Source firewall forbidding alpha, a_e, R_K, Rydberg data, Bohr velocity, measured charge, and proxies before freeze.
- Benchmark certificates and validators for the holonomy machinery.

Non-claim and firewall boundary. Does not compute the physical electron determinant; it makes the computation executable and auditable.

Certificate status. Holonomy schema, benchmark certificates, validator PASS.

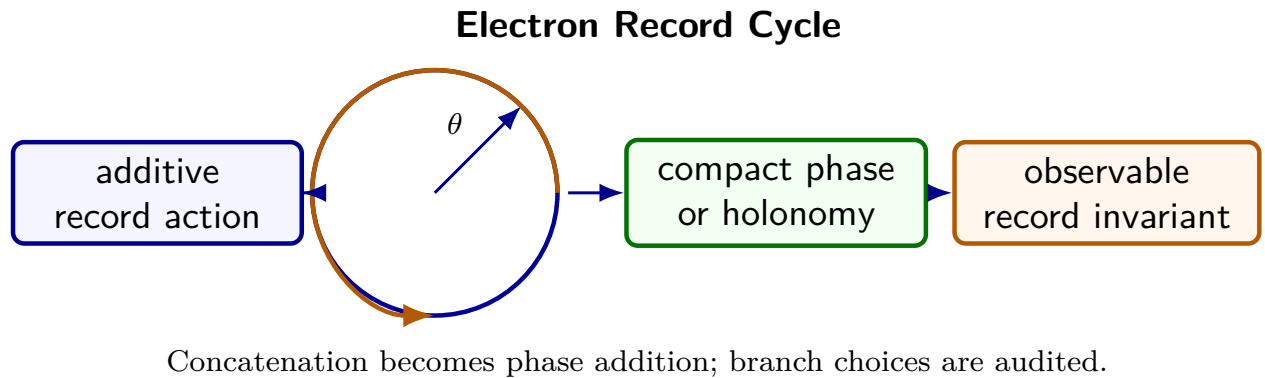
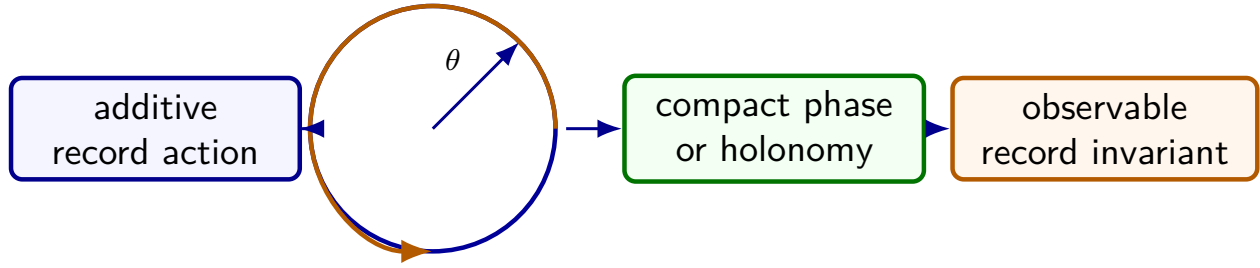


Figure 30: **Electron Record Cycle.** Schematic representation of electron record cycle.

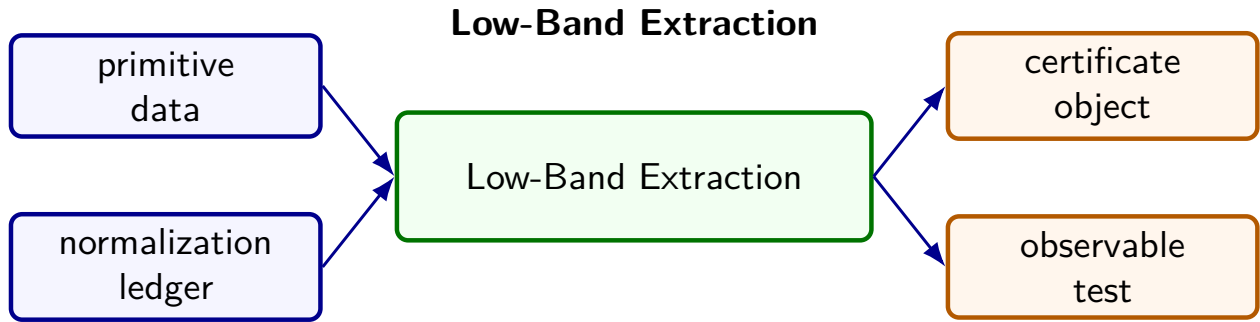
Figures supplied for this paper.

Prequantum Line And Lifted Connection



Concatenation becomes phase addition; branch choices are audited.

Figure 31: **Prequantum Line And Lifted Connection**. Schematic representation of prequantum line and lifted connection.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 32: **Low-Band Extraction**. Schematic representation of low-band extraction.

Certificate Freeze Pipeline

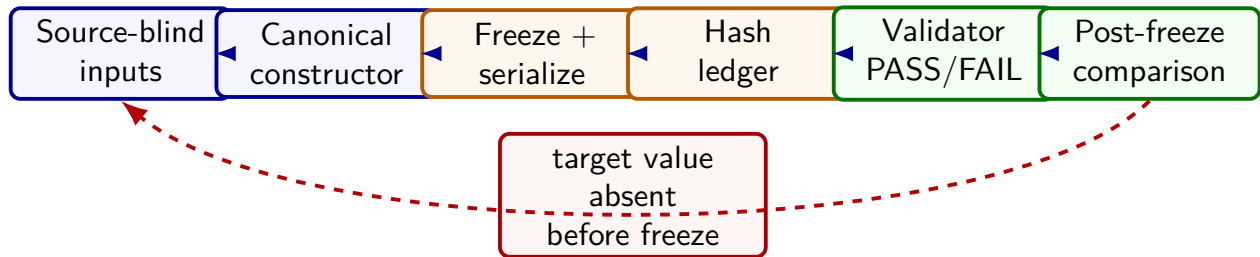


Figure 33: **Certificate Freeze Pipeline**. Schematic representation of certificate freeze pipeline.

4.9 Paper 09. The Coupling-Correspondence Theorem: From Boundary Holonomy to Inverse Electromagnetic Coupling

Expanded manuscript status

Expanded standalone paper: 43 pages.

PDF: dtt_paper09_coupling_correspondence_expanded_final.pdf.

Source: dtt_paper09_coupling_correspondence_expanded_final.tex.

Package: dtt_paper09_coupling_correspondence_expanded_package.zip.

Role. Physical bridge proving when an internal determinant phase is an inverse low-energy electromagnetic coupling defect.

Central formulae.

$$\frac{\partial}{\partial \Theta} \log Z_e(\Theta) = 2\pi i(N_{e,0} + H_e) + \text{higher boundary terms} \quad (34)$$

$$\alpha_{\text{OS}}^{-1}(0) = N_{e,0} + H_e \quad (35)$$

$$\Theta \in \mathbb{R}/2\pi\mathbb{Z} \quad (36)$$

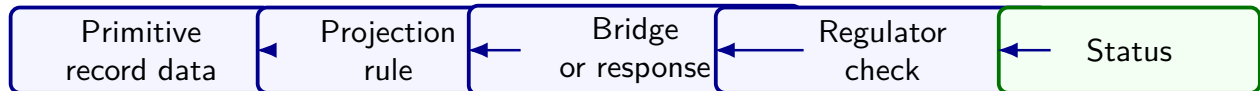
What the expanded version adds.

- Finite-regulator coupling-correspondence datum $B_{\{e,r\}}$.
- Boundary twist/source angle and primitive charged-sector character.
- Ward/Gauss-law, photon-record twist normalization, and on-shell zero-momentum matching route.
- Compatibility layer with QED running.

Non-claim and firewall boundary. Does not compute H_e ; it states and structures the physical identification that would make H_e equal the coupling defect.

Certificate status. Response-certificate schema and nonphysical benchmark; validator PASS.

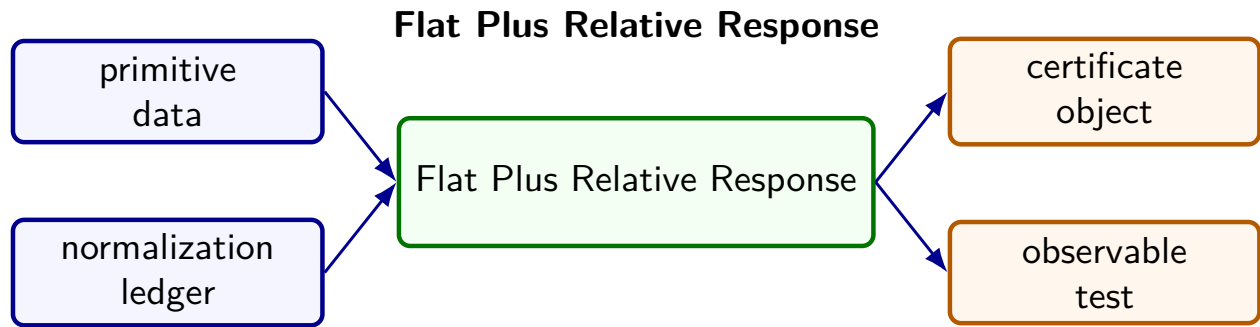
Boundary Twist Response



All arrows are admissible construction dependencies; comparison data enter only after freeze.

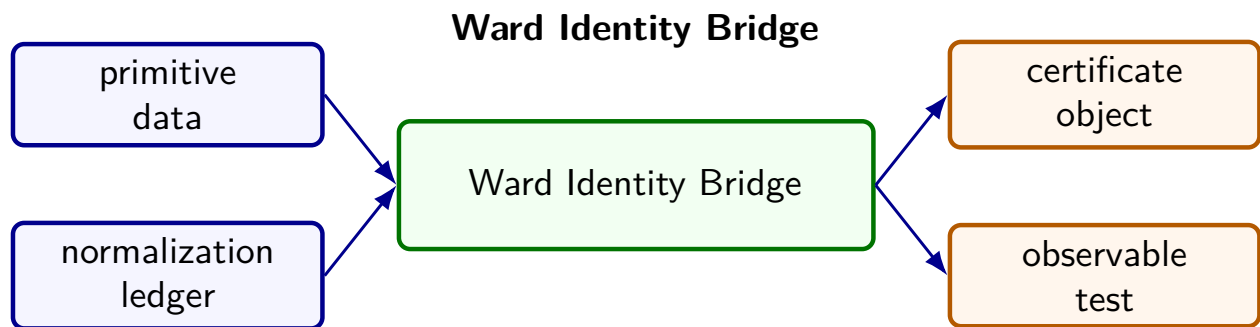
Figure 34: **Boundary Twist Response.** Schematic representation of boundary twist response.

Figures supplied for this paper.



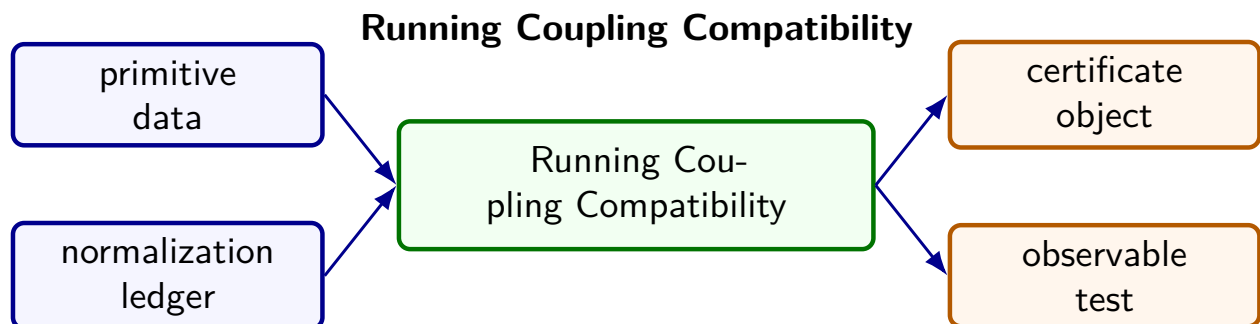
The diagram records dependencies, normalization choices, and audit outputs.

Figure 35: **Flat Plus Relative Response**. Schematic representation of flat plus relative response.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 36: **Ward Identity Bridge**. Schematic representation of Ward identity bridge.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 37: **Running Coupling Compatibility**. Schematic representation of running coupling compatibility.

4.10 Paper 10. The Physical Electron Certificate

Expanded manuscript status

Expanded standalone paper: 36 pages.

PDF: `dtc_paper10_physical_electron_certificate_expanded_final.pdf`.

Source: `dtc_paper10_physical_electron_certificate_expanded_final.tex`.

Package: `dtc_paper10_physical_electron_certificate_expanded_package.zip`.

Role. Decisive computation manual specifying the target-blind finite-regulator physical electron certificate.

Central formulae.

$$\mathcal{C}_{e,r} = (\mathcal{D}_r, \mathcal{R}_{e,r}, \Gamma_{e,r}^{\text{flat}}, \Gamma_{e,r}^{\text{phys}}, C_{e,r}, \Sigma_{e,r}, S_{e,r}, L_{e,r}, q_{\text{rec}}, \hbar_{\star}, A_{\text{DTT},r}^e, P_r, V_{e,r}, \mathcal{O}_{e,r}, H_{e,r}, \mathcal{B}_{e,r}, h_r) \quad (37)$$

$$m_{\text{cert}}(r) = \frac{\gamma_{\star}(r)}{M_r}(1 - q_r) - 2C_{\text{loc}}(r)\varepsilon_r - \frac{4\ell_r^2}{\Gamma_r} \quad (38)$$

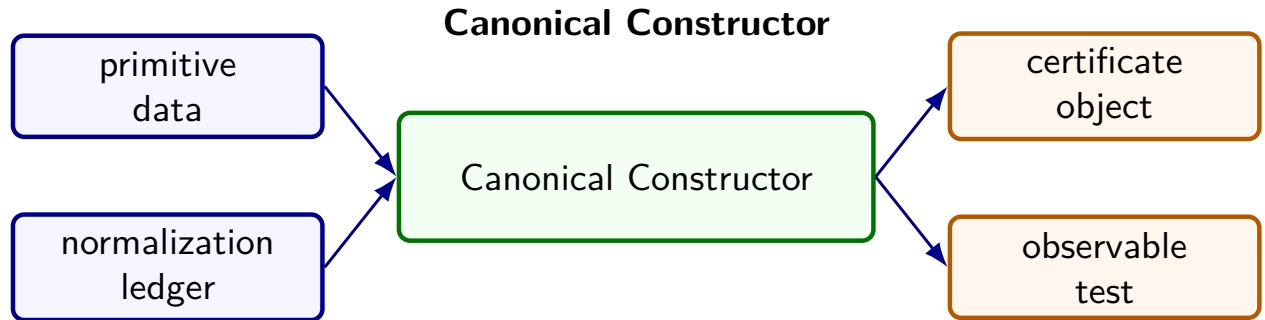
$$H_e = \lim_{r \rightarrow \infty} H_{e,r} \quad (39)$$

What the expanded version adds.

- Primitive-input contract `D_r` and canonical constructor `Can_e`.
- Functorial canonicity theorem target.
- Low-band, compression, orientation, regulator-Cauchy, and boundary response layers.
- Template certificate and validator accepting `physical_claim=false` until populated.

Non-claim and firewall boundary. Does not fabricate the still-missing physical electron determinant value.

Certificate status. Unpopulated physical-electron certificate template; validator PASS as template.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 38: **Canonical Constructor**. Schematic representation of canonical constructor.

Figures supplied for this paper.

H1-H16 Protocol

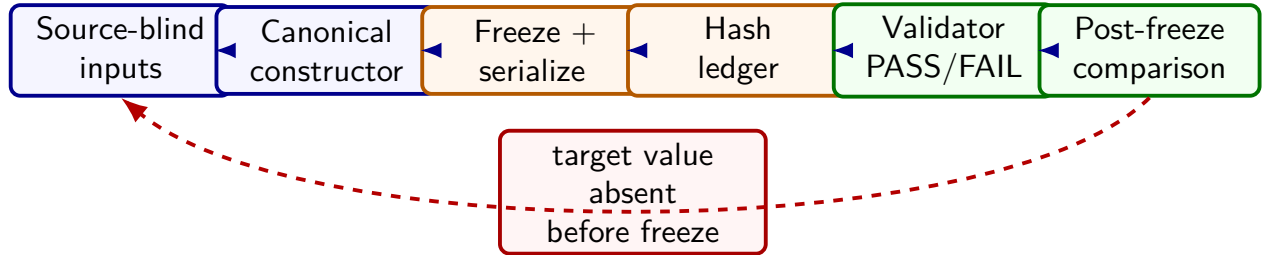
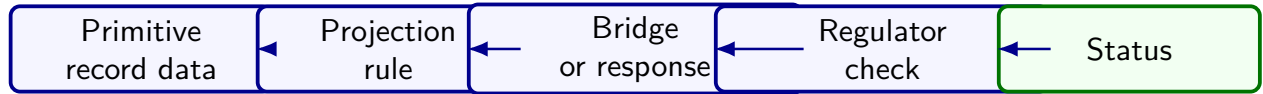


Figure 39: **H1-H16 Protocol**. Schematic representation of H1-H16 protocol.

Determinant Route Decision Tree



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 40: **Determinant Route Decision Tree**. Schematic representation of determinant route decision tree.

Freeze-Hash Verification

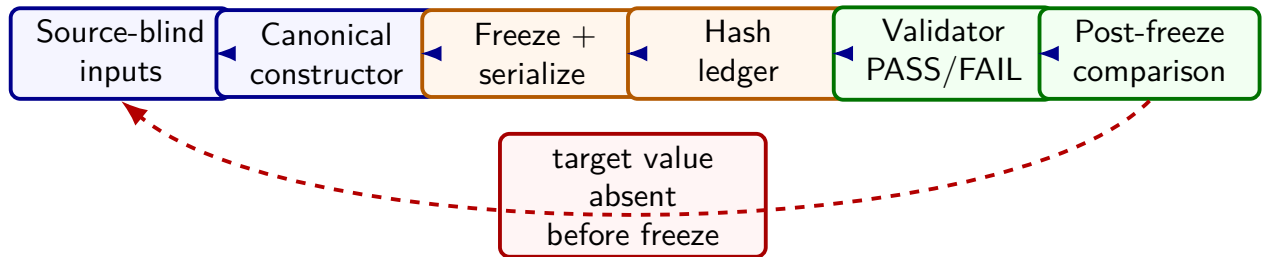


Figure 41: **Freeze-Hash Verification**. Schematic representation of freeze-hash verification.

4.11 Paper 11. Temporal Reconstruction of Hydrogen I: Alpha-Free Proton-Electron Record Geometry

Expanded manuscript status

Expanded standalone paper: 35 pages.

PDF: dtt_paper11_hydrogen_alpha_free_temporal_resonance_expanded_final.pdf.

Source: dtt_paper11_hydrogen_alpha_free_temporal_resonance_expanded_final.tex.

Package: dtt_paper11_hydrogen_alpha_free_temporal_resonance_expanded_package.zip.

Role. First hydrogen paper. It builds hydrogen as a neutral proton-electron temporal record resonance without using alpha-dependent tick formulas.

Central formulae.

$$U_p = e^{+i\theta_p}, \quad U_e = e^{-i\theta_e} \quad (40)$$

$$\Delta\theta_{pe} = \theta_p + \theta_e \quad (41)$$

$$\Phi_{pe}(n) \equiv 0 \pmod{2\pi} \quad (42)$$

What the expanded version adds.

- Alpha-free hydrogen datum $D_{\{H,r\}}$.
- Neutral compatibility, phase-opposition support, neutral record cycles, and alpha-free temporal resonance.
- Temporal Dirac-type record operator and neutral-pair orientation functional.
- Charge-conjugation and antihydrogen interface targets.

Non-claim and firewall boundary. Does not derive the numerical hydrogen spectrum; Bohr, Rydberg, Lamb-shift, and fine-structure formulae remain post-freeze.

Certificate status. Alpha-free hydrogen certificate template; validator PASS.

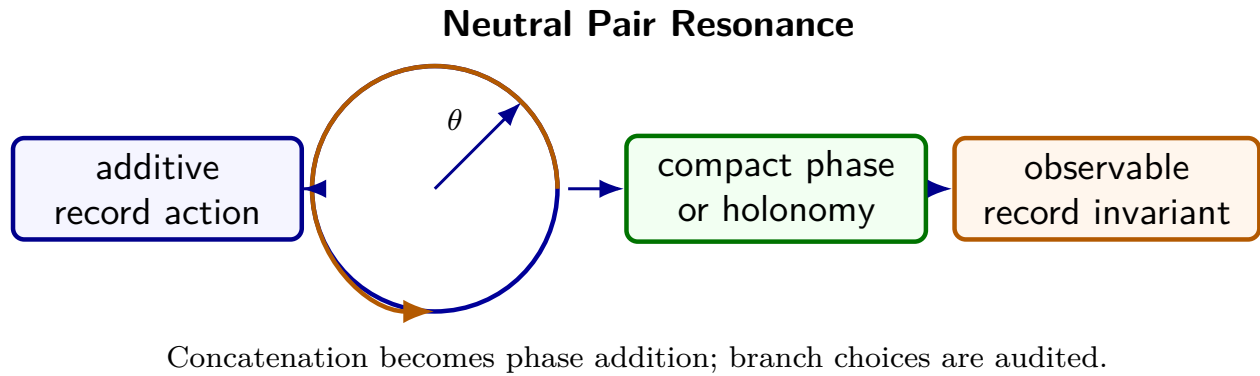
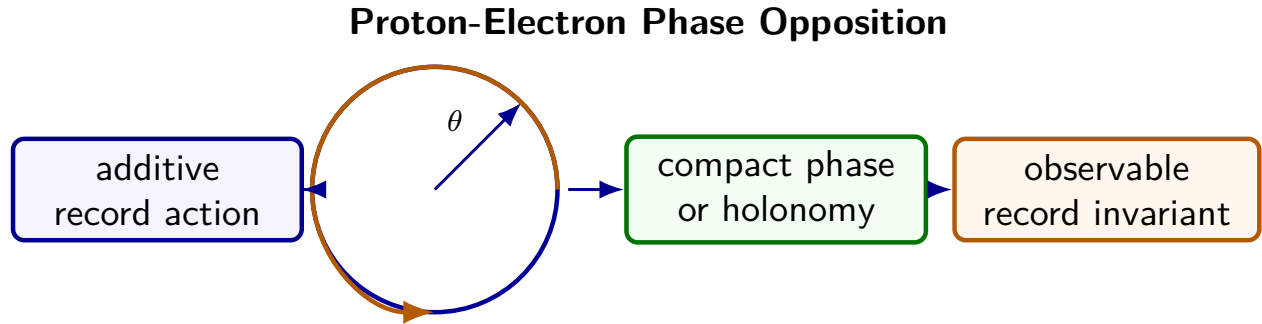


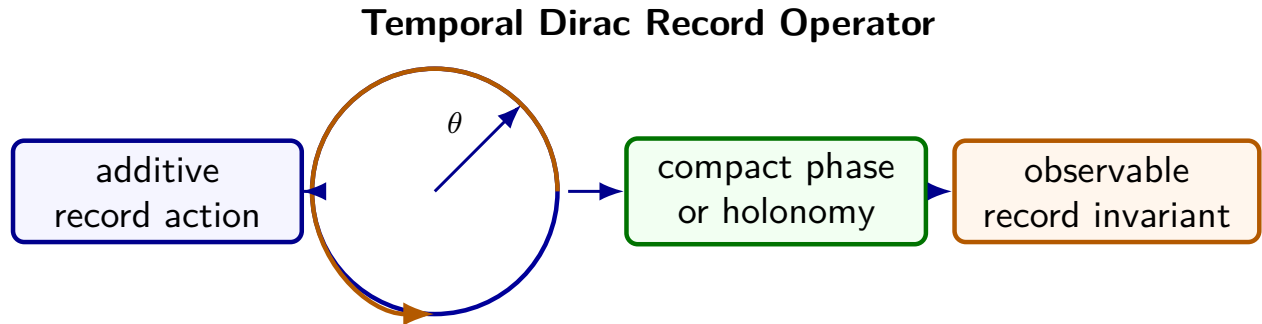
Figure 42: **Neutral Pair Resonance.** Schematic representation of neutral pair resonance.

Figures supplied for this paper.



Concatenation becomes phase addition; branch choices are audited.

Figure 43: **Proton-Electron Phase Opposition**. Schematic representation of proton-electron phase opposition.



Concatenation becomes phase addition; branch choices are audited.

Figure 44: **Temporal Dirac Record Operator**. Schematic representation of temporal Dirac record operator.

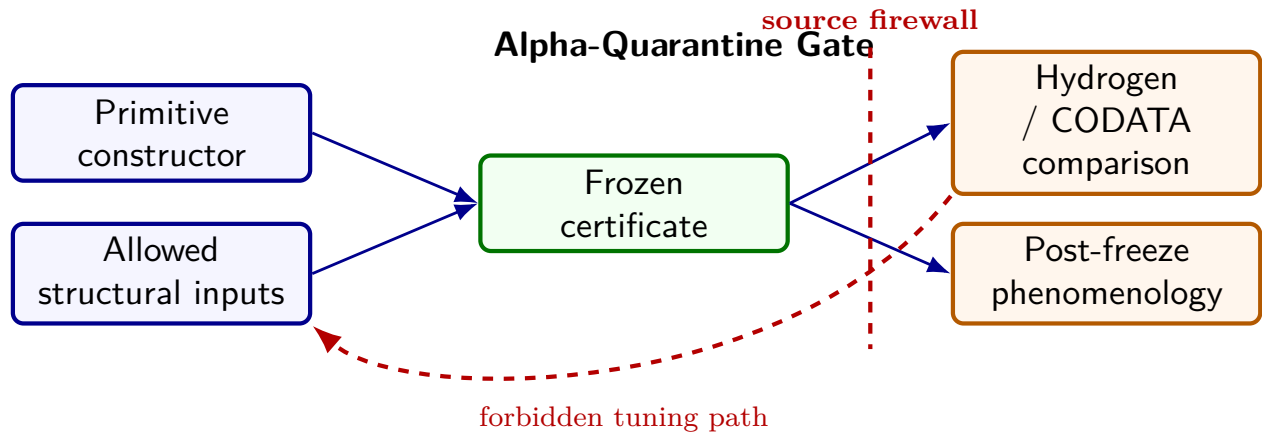


Figure 45: **Alpha-Quarantine Gate**. Schematic representation of alpha-quarantine gate.

4.12 Paper 12. Temporal Reconstruction of Hydrogen II: Derived Constants and the Bohr Spectrum

Expanded manuscript status

Expanded standalone paper: 36 pages.

PDF: dtt_paper12_hydrogen_derived_constants_bohr_spectrum_expanded_final.pdf.

Source: dtt_paper12_hydrogen_derived_constants_bohr_spectrum_expanded_final.tex.

Package: dtt_paper12_hydrogen_derived_constants_bohr_spectrum_expanded_package.zip.

Role. Post-freeze hydrogen gross-spectrum paper. It reconstructs Bohr and Rydberg scales after c_{star} , $\hbar$, α , m_e , and m_p are supplied upstream.

Central formulae.

$$\mu_H = \frac{m_e m_p}{m_e + m_p} \quad (43)$$

$$a_\mu = \frac{\hbar}{\mu_H c_\star \alpha} \quad (44)$$

$$E_n = -\frac{\mu_H c_\star^2 \alpha^2}{2n^2}, \quad R_H = \frac{\mu_H c_\star \alpha^2}{2h} \quad (45)$$

What the expanded version adds.

- Post-freeze hydrogen input object I_H .
- Bohr phase-locking derivation and Coulomb envelope operator derivation.
- Reduced-mass corrections, deuterium, positronium, muonium, and hydrogen-like ions.
- No-backflow theorem preventing hydrogen outputs from tuning upstream α .

Non-claim and firewall boundary. Does not derive α , m_e , m_p , fine structure, or Lamb shift; it uses frozen upstream constants.

Certificate status. Hydrogen gross-spectrum certificate; toy benchmark validator PASS.

Post-Freeze Input Ledger

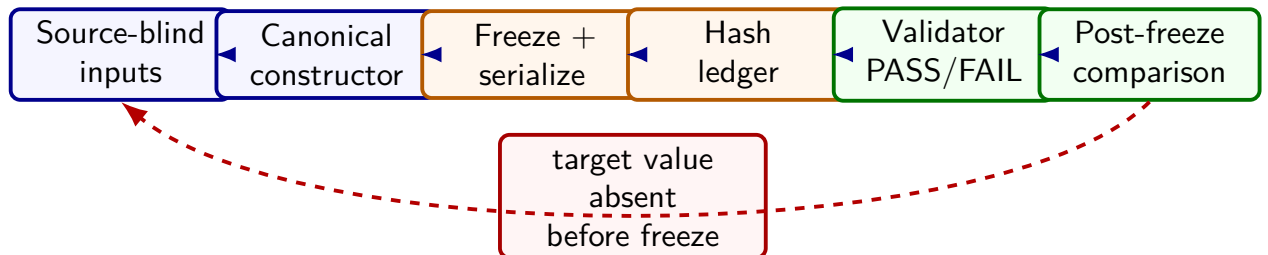
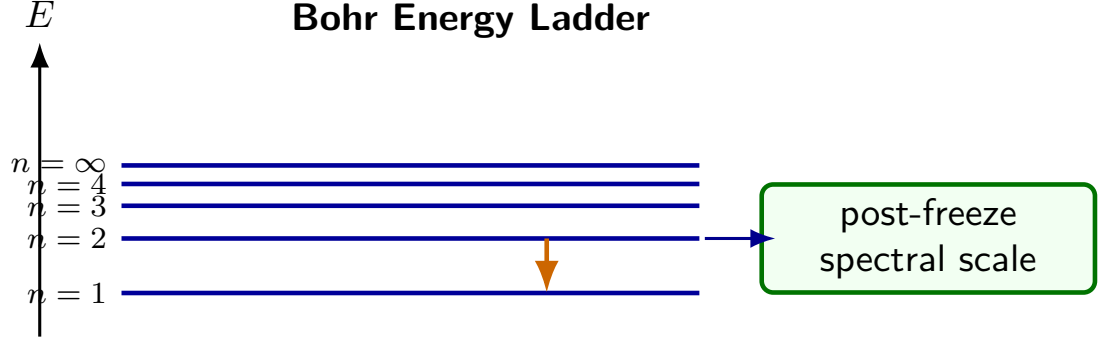


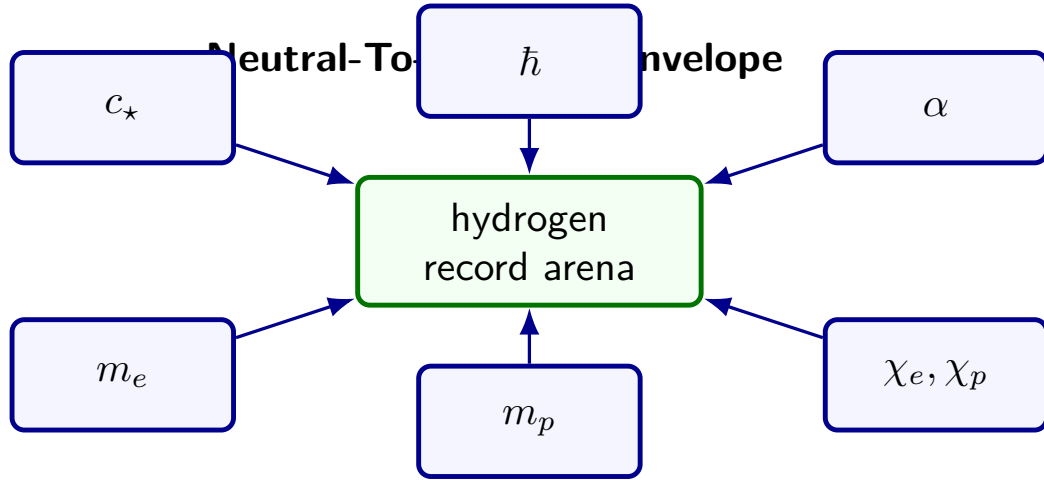
Figure 46: **Post-Freeze Input Ledger.** Schematic representation of post-freeze input ledger.

Figures supplied for this paper.



Bohr/Rydberg quantities are consequences after $c_\star, \hbar, \alpha, m_e, m_p$ are fixed upstream.

Figure 47: **Bohr Energy Ladder**. Schematic representation of Bohr energy ladder.



Constants enter as frozen inputs; residuals test the projection model.

Figure 48: **Neutral-To-Coulomb Envelope**. Schematic representation of neutral-to-Coulomb envelope.

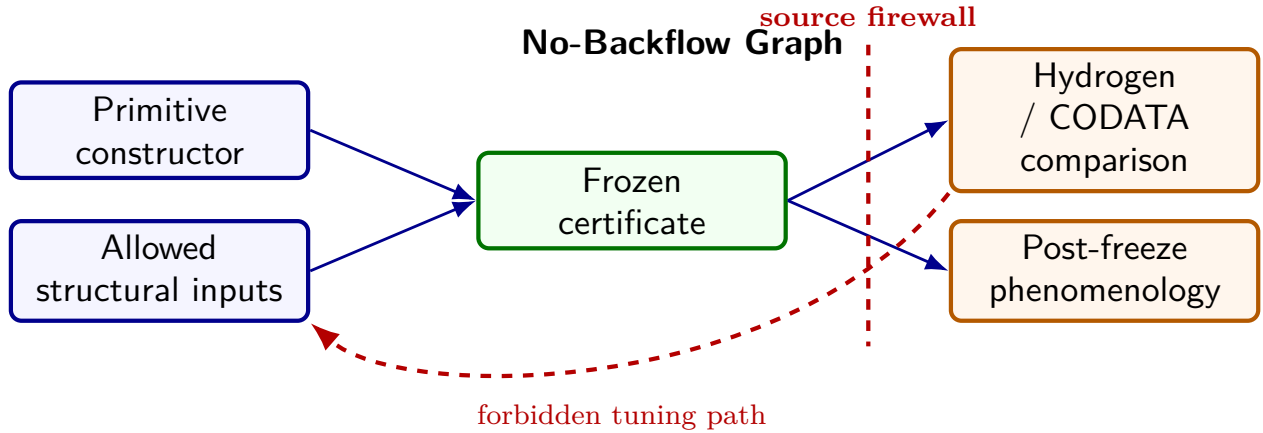


Figure 49: **No-Backflow Graph**. Schematic representation of no-backflow graph.

4.13 Paper 13. Temporal Reconstruction of Hydrogen III: Fine Structure, Lamb Shift, and Radiative Inner-Time Loops

Expanded manuscript status

Expanded standalone paper: 37 pages.

PDF: `dtc_paper13_hydrogen_fine_structure_lamb_shift_expanded_final.pdf`.

Source: `dtc_paper13_hydrogen_fine_structure_lamb_shift_expanded_final.tex`.

Package: `dtc_paper13_hydrogen_fine_structure_lamb_shift_expanded_package.zip`.

Role. Post-freeze radiative and fine-structure paper with strict separation between QED reproduction, temporal-loop interpretation, and new DTT residuals.

Central formulae.

$$E_{n\ell jF} = E_n^{(0)} + \Delta E^{\text{fs}} + \Delta E^{\text{Lamb}} + \Delta E^{\text{recoil}} + \Delta E^{\text{nuc}} + \Delta E^{\text{hfs}} + \Delta E^{\text{DTT,res}} \quad (46)$$

$$\Delta E_{nj}^{\text{fs}} = -\frac{\mu_H c_*^2 (Z\alpha)^4}{2n^3} \left(\frac{1}{j+1/2} - \frac{3}{4n} \right) + O((Z\alpha)^6) \quad (47)$$

$$\Delta E_{\text{Lamb}} \sim \frac{\alpha^5 m_e c_*^2}{6\pi} (\log \alpha^{-1} + C) + O(\alpha^6) \quad (48)$$

What the expanded version adds.

- Temporal interpretations of kinetic, spin-orbit, and Darwin/contact terms.
- Radiative inner-time loop families and finite-regulator proof obligations.
- Lamb-shift bookkeeping without claiming derived coefficients.
- No-backflow theorem for downstream spectroscopy.

Non-claim and firewall boundary. Does not yet derive the Lamb shift; finite-regulator loop measures and coefficients remain theorem targets.

Certificate status. Radiative hydrogen certificate schema and toy validator PASS.

Figures supplied for this paper.

4.14 Paper 14. Hydrogen as a Differential Test of the Holonomy Fraction

Expanded manuscript status

Expanded standalone paper: 36 pages.

PDF: `dtc_paper14_hydrogen_differential_holonomy_expanded_final.pdf`.

Source: `dtc_paper14_hydrogen_differential_holonomy_expanded_final.tex`.

Package: `dtc_paper14_hydrogen_differential_holonomy_expanded_package.zip`.

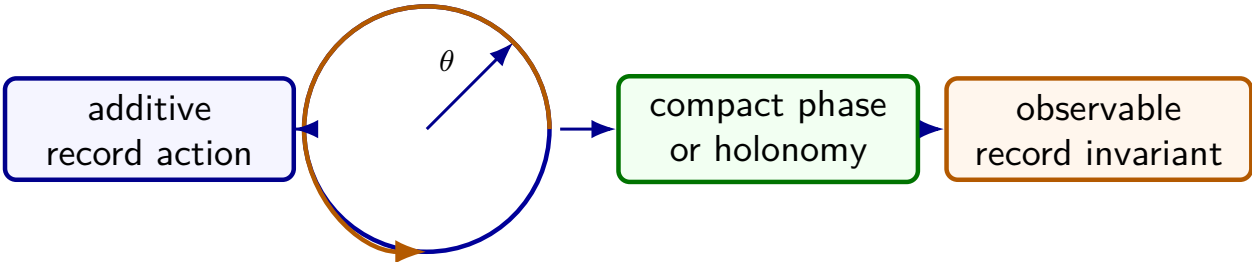
Role. Post-freeze spectroscopy test suite for state-dependent holonomy residuals and overconstrained residual shapes.

Correction Hierarchy

Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

Figure 50: **Correction Hierarchy**. Schematic representation of correction hierarchy.

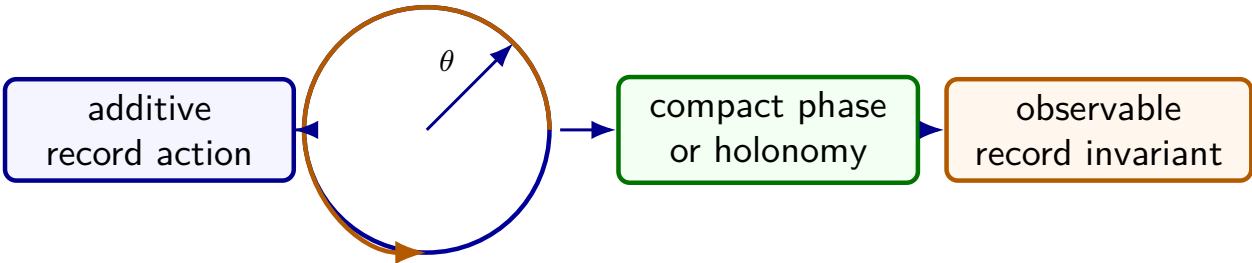
Spin-Orbit Temporal Orientation



Concatenation becomes phase addition; branch choices are audited.

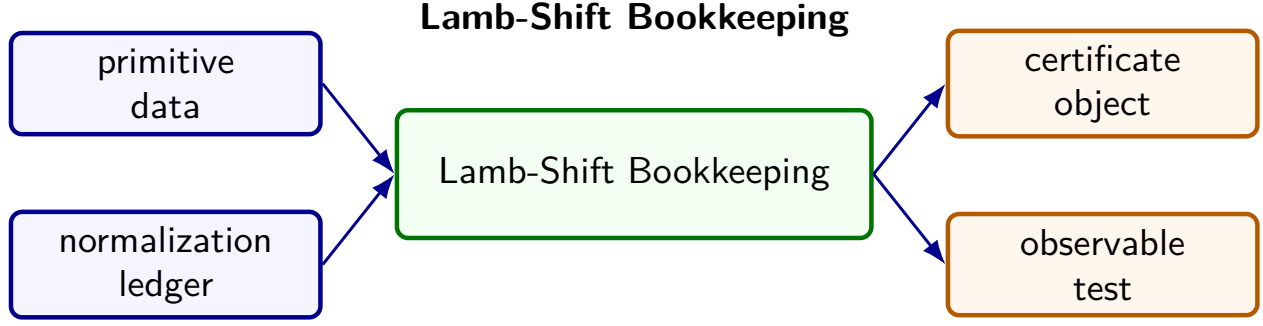
Figure 51: **Spin-Orbit Temporal Orientation**. Schematic representation of spin-orbit temporal orientation.

Radiative Loop Measure



Concatenation becomes phase addition; branch choices are audited.

Figure 52: **Radiative Loop Measure**. Schematic representation of radiative loop measure.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 53: **Lamb-Shift Bookkeeping**. Schematic representation of Lamb-shift bookkeeping.

Central formulae.

$$H_a = \text{br} \frac{1}{2\pi} \text{Arg} \det_{\mathcal{H}_a^{\text{low,phys}}} \text{Hol}_{C_a}(A_e) \quad (49)$$

$$\eta_a = H_a - H_{1S} \quad (50)$$

$$y_i = \nu_i^{\text{obs}} - \nu_i^{\text{QED}} - \nu_i^{\text{sys}} = \sum_A c_A S_A(i) + \epsilon_i \quad (51)$$

What the expanded version adds.

- State cycles $C_{\{n \mid j \mid F\}}$, state holonomies, and transition shapes.
- Covariance-aware spectroscopy comparison and nuisance projection.
- Shape families: S-contact, spin holonomy, high- l Rydberg suppression, isotope boundaries, antihydrogen orientation columns.
- Rejection of one free amplitude per transition.

Non-claim and firewall boundary. Does not use spectroscopy to tune alpha; all comparison is post-freeze.

Certificate status. Spectroscopy residual schema and toy overconstrained validator PASS.

Figures supplied for this paper.

4.15 Paper 15. Primitive Charge Character and the Emergence of Electromagnetic Coupling

Expanded manuscript status

Expanded standalone paper: 33 pages.

PDF: `dtc_paper15_charge_character_electromagnetic_coupling_expanded_final.pdf`.

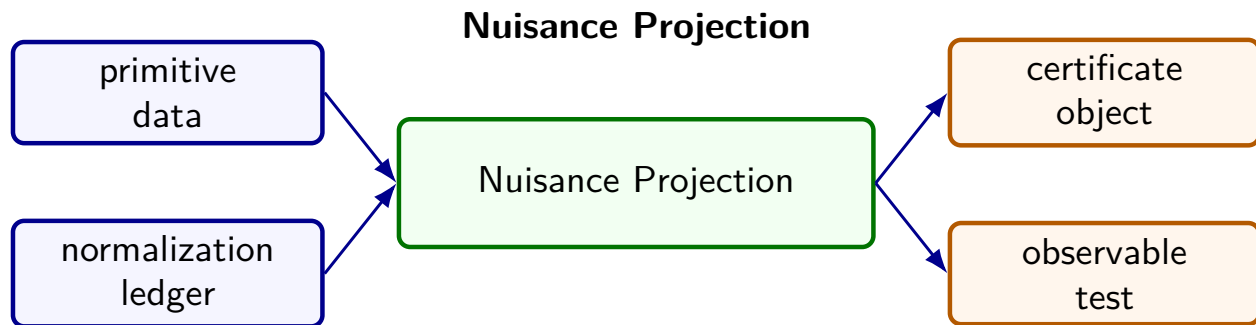
Source: `dtc_paper15_charge_character_electromagnetic_coupling_expanded_final.tex`.

Package: `dtc_paper15_charge_character_electromagnetic_coupling_expanded_package.zip`.

Spectroscopy Residual Matrix

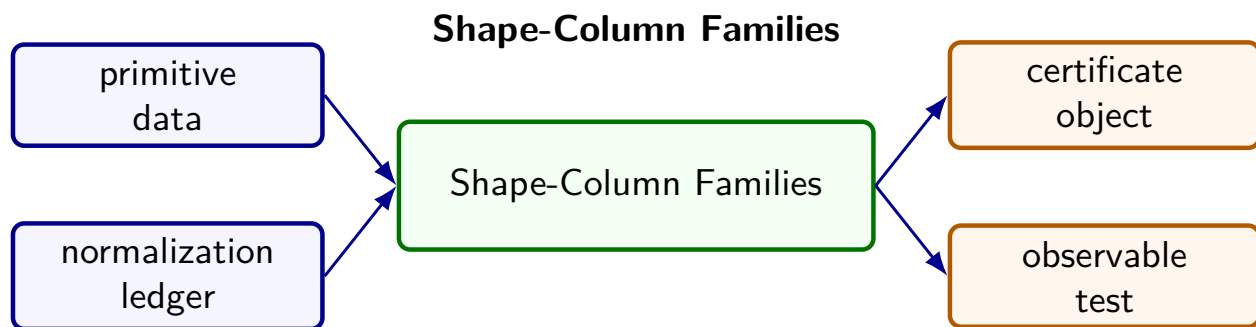
Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

Figure 54: **Spectroscopy Residual Matrix**. Schematic representation of spectroscopy residual matrix.



The diagram records dependencies, normalization choices, and audit outputs.

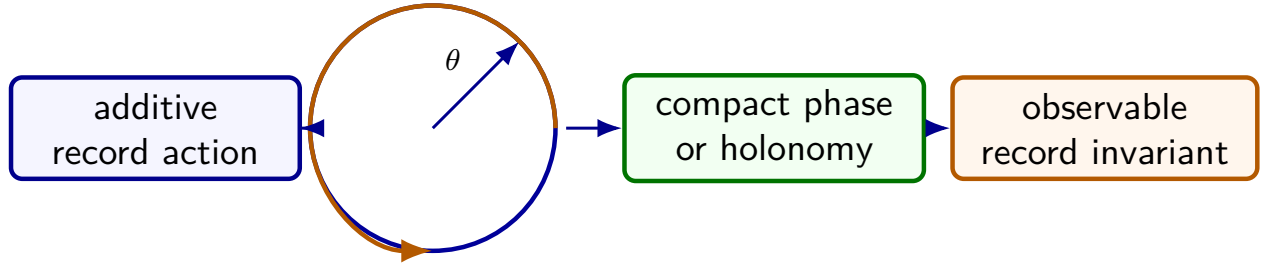
Figure 55: **Nuisance Projection**. Schematic representation of nuisance projection.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 56: **Shape-Column Families**. Schematic representation of shape-column families.

Antihydrogen Orientation Test



Concatenation becomes phase addition; branch choices are audited.

Figure 57: **Antihydrogen Orientation Test**. Schematic representation of antihydrogen orientation test.

Role. Charge and electromagnetic-unit layer. It separates compact charge character, record charge normalization, alpha, and the SI coulomb value.

Central formulae.

$$\chi_n(e^{i\Theta}) = e^{in\Theta}, \quad \text{Char}(U(1)) \cong \mathbb{Z} \quad (52)$$

$$\chi_e = \chi_{-1}, \quad \chi_p = \chi_{+1}, \quad \chi_p \chi_e = 1 \quad (53)$$

$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c_\star} = \frac{\mu_0 e^2 c_\star}{2h} \quad (54)$$

What the expanded version adds.

- Source firewall forbidding measured e, alpha, mu0, epsilon0, R_K, K_J, electron anomaly, Bohr/Rydberg data, and line fits.
- Rationalized SI dictionary and modern electromagnetic-unit interpretation.
- Boundary-response and Ward/Gauss-law interface.
- Finite cyclic approximants and primitive-character stability.

Non-claim and firewall boundary. Does not derive the SI number for e; alpha is the physical dimensionless coupling target.

Certificate status. Charge-character certificate schema and toy validator PASS.

Figures supplied for this paper.

4.16 Paper 16. Electron Mass as Temporal Inertia in Dual-Time Theory

Expanded manuscript status

Expanded standalone paper: 38 pages.

PDF: dtt_paper16_electron_mass_temporal_inertia_expanded_final.pdf.

Source: dtt_paper16_electron_mass_temporal_inertia_expanded_final.tex.

Package: dtt_paper16_electron_mass_temporal_inertia_expanded_package.zip.

Charge Character Lattice

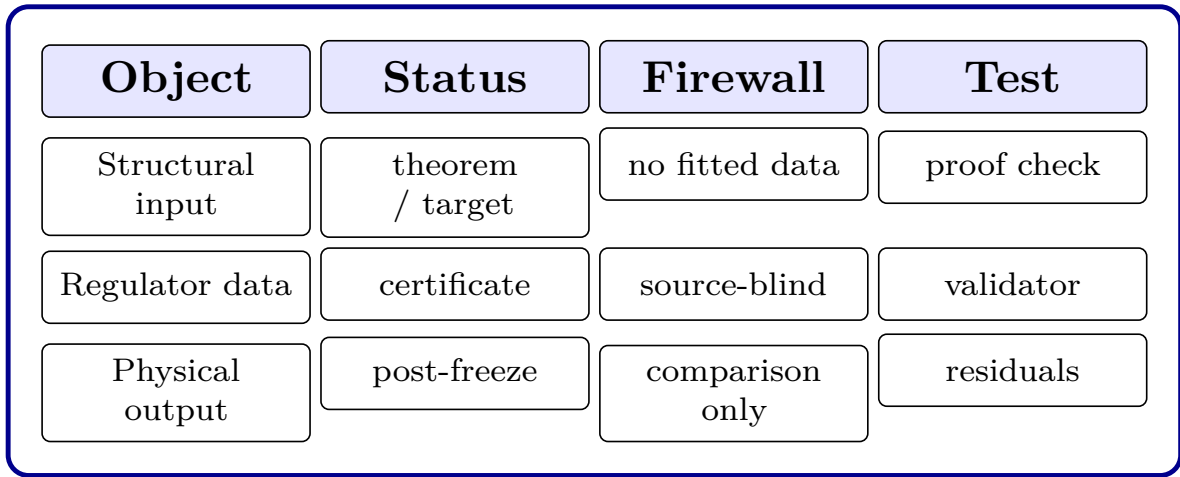
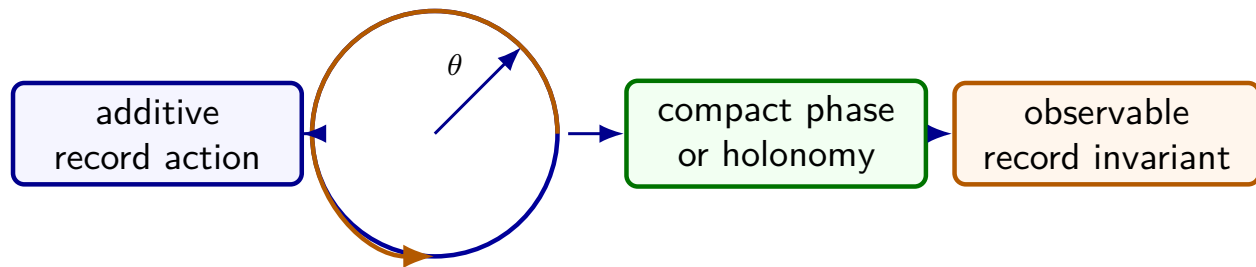


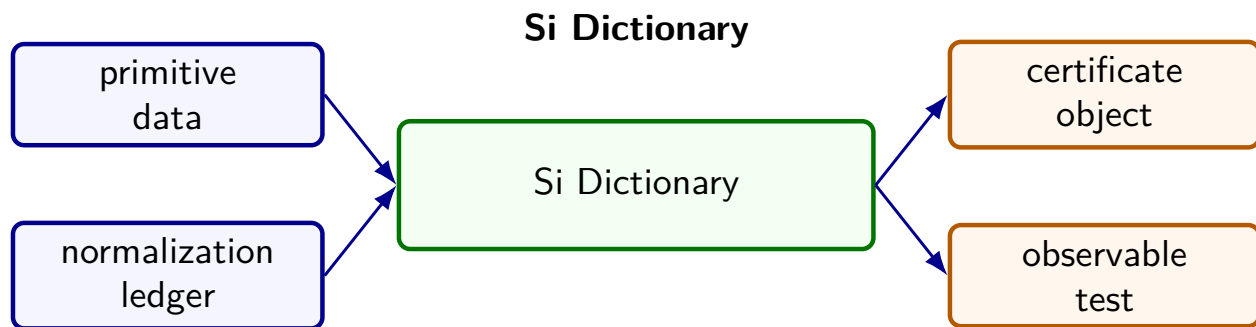
Figure 58: **Charge Character Lattice**. Schematic representation of charge character lattice.

Neutral Hydrogen Character Pairing



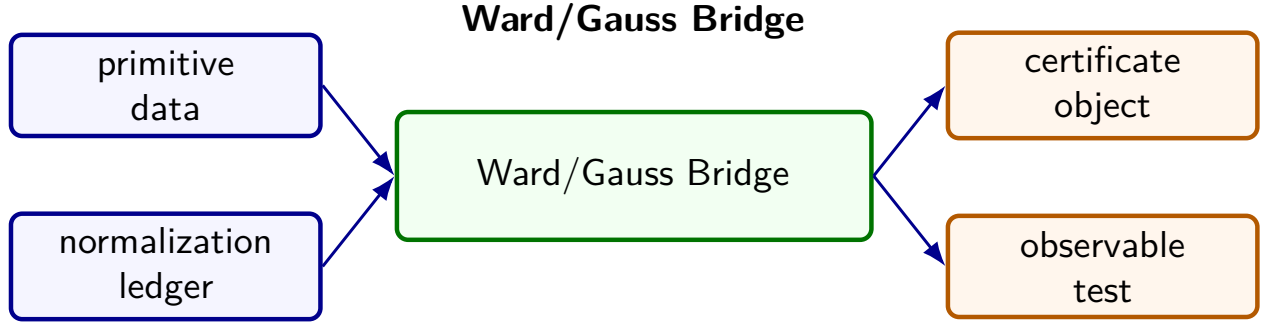
Concatenation becomes phase addition; branch choices are audited.

Figure 59: **Neutral Hydrogen Character Pairing**. Schematic representation of neutral hydrogen character pairing.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 60: **Si Dictionary**. Schematic representation of SI dictionary.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 61: **Ward/Gauss Bridge**. Schematic representation of Ward/Gauss bridge.

Role. Mass-layer manuscript defining mass as stable temporal inertia and preparing electron mass certification.

Central formulae.

$$E_{\text{rest}} = mc_{\star}^2 = \hbar\omega_{\text{rest}} \quad (55)$$

$$m = \frac{\hbar\omega_{\text{rest}}}{c_{\star}^2} \quad (56)$$

$$T_C = \frac{h}{mc_{\star}^2}, \quad \lambda_C = \frac{h}{mc_{\star}} \quad (57)$$

What the expanded version adds.

- Spectral rest-generator, rest-band isolation, non-aliasing, gap certification, and regulator convergence.
- Firewall forbidding measured m_e , Compton wavelength, Rydberg data, Bohr radius, hydrogen spectra, Penning-trap ratios, and CODATA values before freeze.
- Interfaces to Dirac/Klein-Gordon limits, pole mass, dressing, and gravitational mass equivalence.
- M1-M16 protocol for a future physical electron mass certificate.

Non-claim and firewall boundary. Does not derive the measured electron mass; it defines the temporal-inertia certificate architecture.

Certificate status. Mass-certificate schema and nonphysical toy validator PASS.

Figures supplied for this paper.

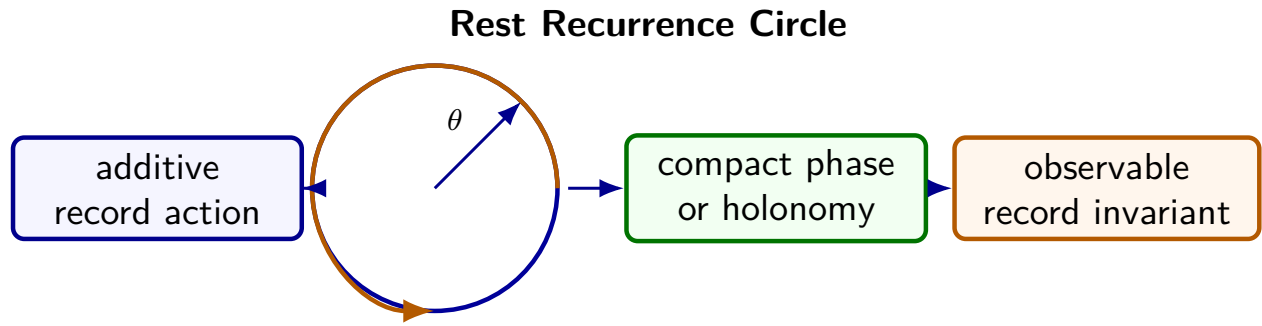
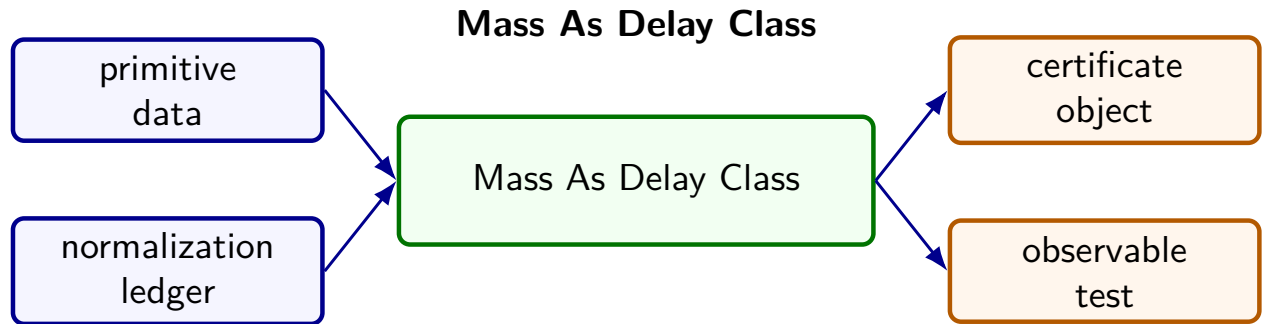
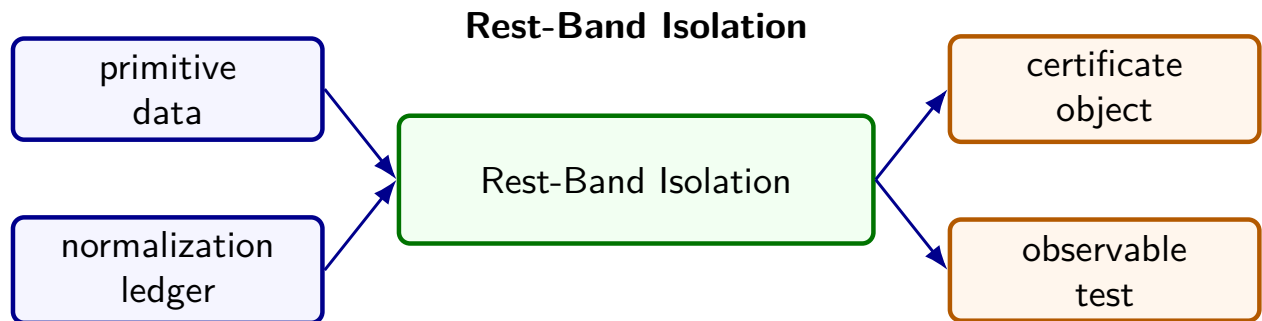


Figure 62: **Rest Recurrence Circle**. Schematic representation of rest recurrence circle.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 63: **Mass As Delay Class**. Schematic representation of mass as delay class.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 64: **Rest-Band Isolation**. Schematic representation of rest-band isolation.

Mass Certificate Pipeline

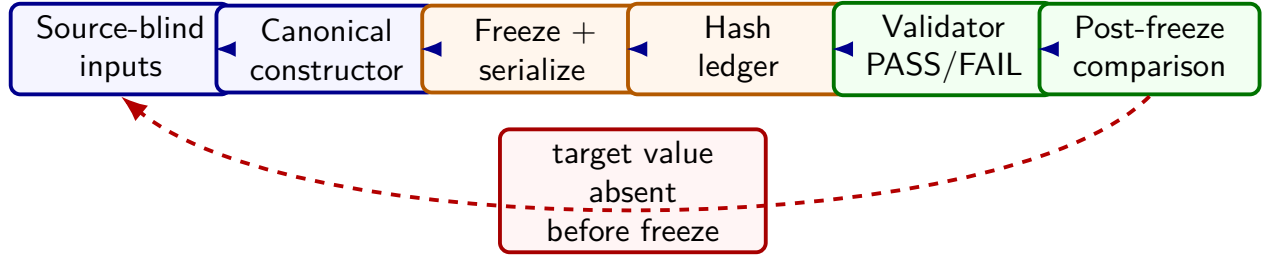


Figure 65: **Mass Certificate Pipeline**. Schematic representation of mass certificate pipeline.

4.17 Paper 17. Proton-Electron Mass Ratio from Multi-Layer Temporal Tick Hierarchies

Expanded manuscript status

Expanded standalone paper: 33 pages.
 PDF: dtt_paper17_mass_ratio_tick_hierarchies_expanded_final.pdf.
 Source: dtt_paper17_mass_ratio_tick_hierarchies_expanded_final.tex.
 Package: dtt_paper17_mass_ratio_tick_hierarchies_expanded_package.zip.

Role. Dimensionless mass-ratio paper treating m_p/m_e as a source-blind temporal-hierarchy certificate problem.

Central formulae.

$$\frac{m_p}{m_e} = \frac{\omega_p}{\omega_e} \quad (58)$$

$$N^{(k+1)} = a_k N^{(k)} + N^{(k-1)} \quad (59)$$

$$\mathsf{T}(a_k) = \begin{pmatrix} a_k & 1 \\ 1 & 0 \end{pmatrix} \quad (60)$$

What the expanded version adds.

- Corrects the older circular risk: coefficients a_k may not come from the empirical continued fraction of m_p/m_e .
- DTT-internal coefficient generator $\text{Gen}_{\{p/e,r\}}$.
- Transfer-matrix convergence, projective contraction, periodic and aperiodic generators, exact arithmetic, and hash discipline.
- QCD-compatibility target and post-freeze hydrogen/molecular tests.

Non-claim and firewall boundary. Does not derive the measured mass ratio; real success requires internal generation of the coefficient sequence before comparison.

Certificate status. Mass-ratio certificate schema and toy transfer-matrix validator PASS.

Tick Hierarchy Layers

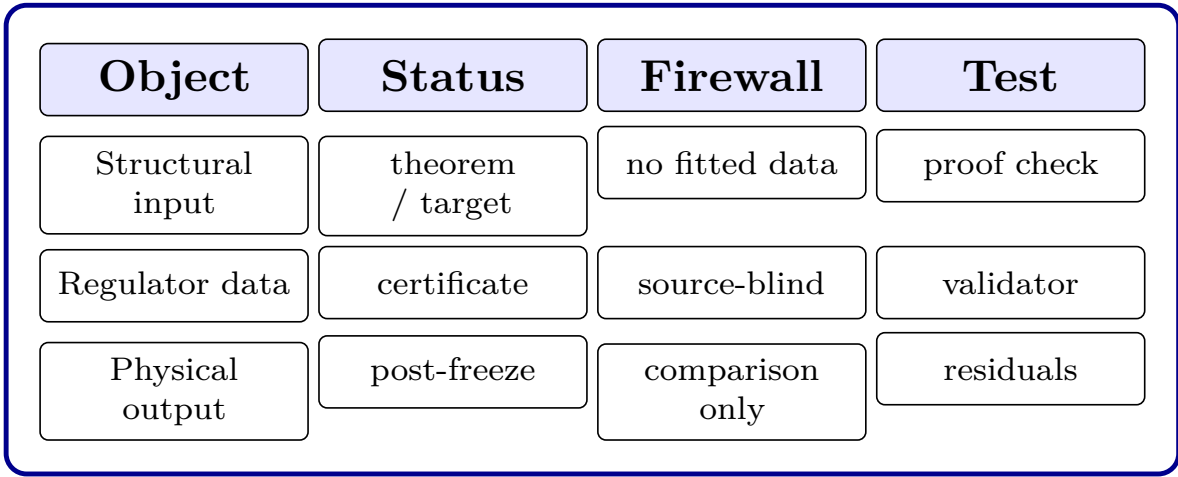


Figure 66: **Tick Hierarchy Layers**. Schematic representation of tick hierarchy layers.

Transfer Matrix Action

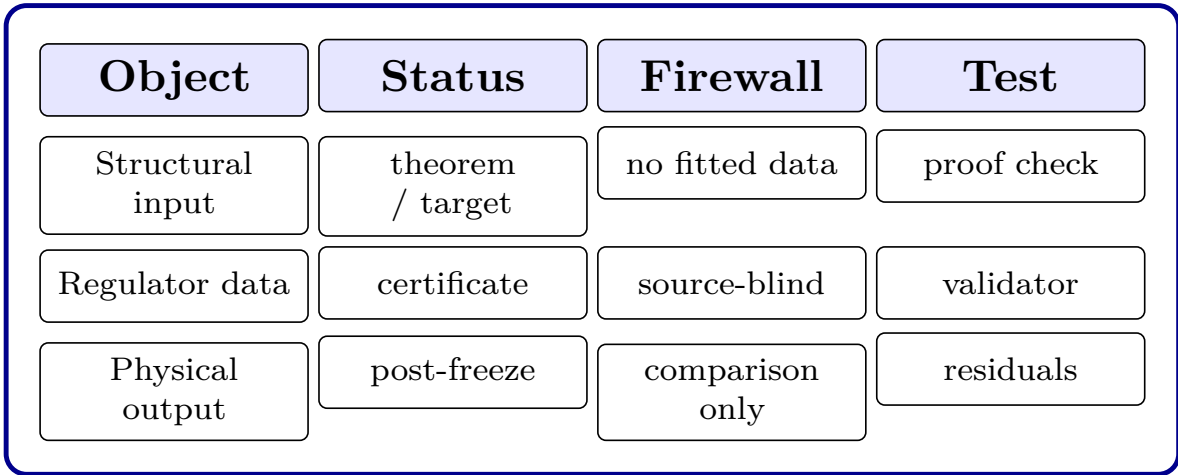
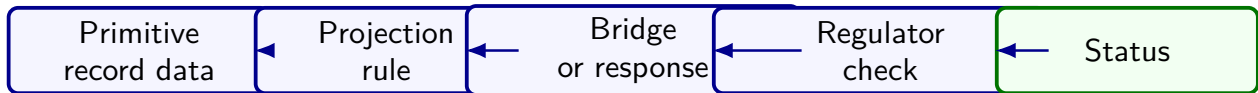


Figure 67: **Transfer Matrix Action**. Schematic representation of transfer matrix action.

Coefficient Generator Routes



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 68: **Coefficient Generator Routes**. Schematic representation of coefficient generator routes.

Post-Freeze Comparison Gate

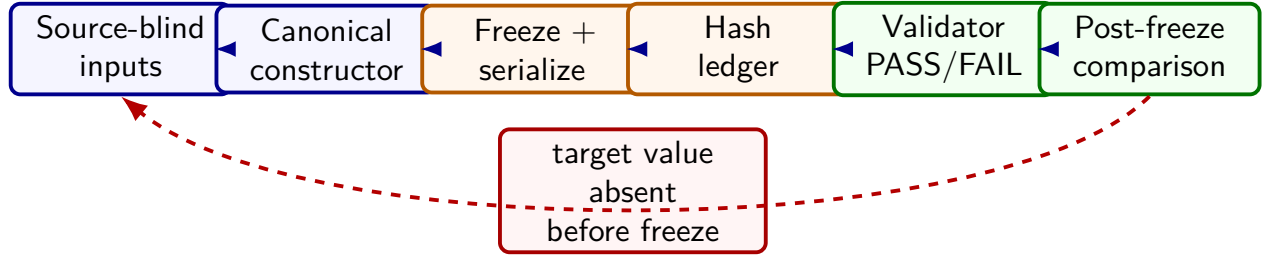


Figure 69: **Post-Freeze Comparison Gate**. Schematic representation of post-freeze comparison gate.

Figures supplied for this paper.

4.18 Paper 18. Boltzmann's Constant as the Entropy-Energy Bridge in Projection Metrology

Expanded manuscript status

Expanded standalone paper: 39 pages.
 PDF: dtt_paper18_boltzmann_entropy_energy_bridge_expanded_final.pdf.
 Source: dtt_paper18_boltzmann_entropy_energy_bridge_expanded_final.tex.
 Package: dtt_paper18_boltzmann_entropy_energy_bridge_expanded_package.zip.

Role. Thermodynamic bridge paper deriving the structural role of k_B as log-count-to-energy-temperature conversion.

Central formulae.

$$s_{\text{rec}}(M) = \log \Omega(M) \quad (61)$$

$$S_{\text{th}} = k_B s_{\text{rec}} \quad (62)$$

$$\beta_{\text{th}} = \frac{\partial s_{\text{rec}}}{\partial E} = \frac{1}{k_B T} \quad (63)$$

What the expanded version adds.

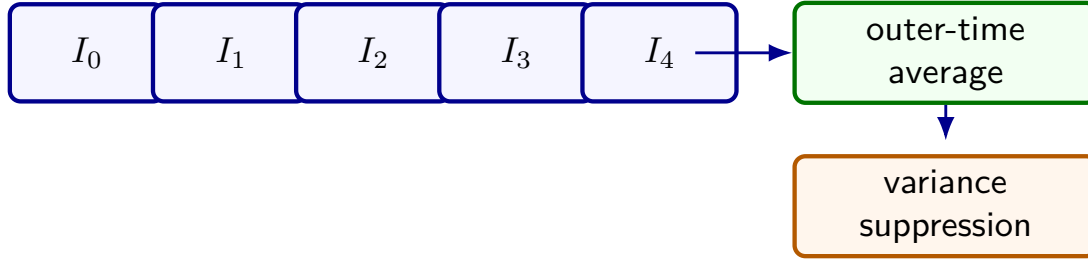
- Microcanonical, canonical, grand-canonical, information-theoretic, and finite-regulator sectors.
- Canonical weights from reservoir record multiplicity.
- Thermodynamic-law reconstructions and Landauer/log 2 interfaces.
- Operational $k_{\text{B,eff}}$ as finite-stability diagnostic, not fundamental variability.

Non-claim and firewall boundary. Does not derive the exact SI decimal value of k_B ; it derives its bridge role.

Certificate status. Boltzmann-bridge certificate schema and toy thermodynamic validator PASS.

Figures supplied for this paper.

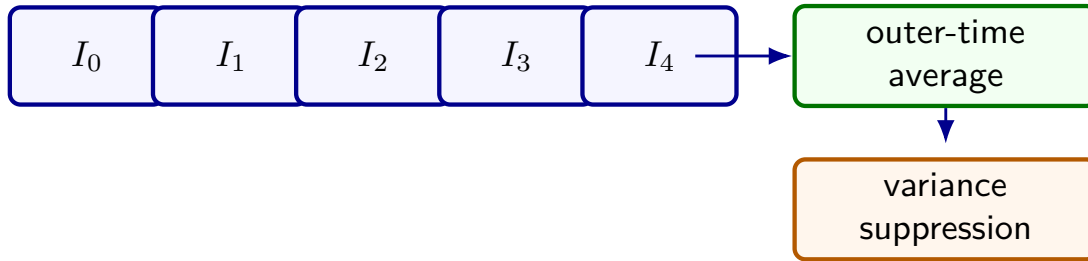
Multiplicative Counts To Logarithmic Entropy



Sequential activation is averaged over records rather than summed as simultaneous sources.

Figure 70: **Multiplicative Counts To Logarithmic Entropy**. Schematic representation of multiplicative counts to logarithmic entropy.

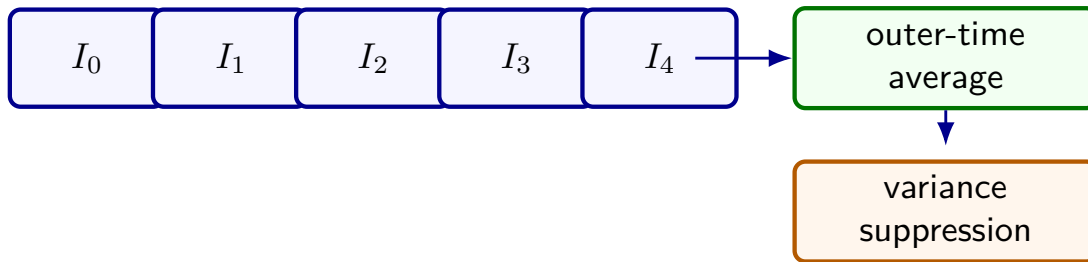
Reservoir Derivation Of Boltzmann Weights



Sequential activation is averaged over records rather than summed as simultaneous sources.

Figure 71: **Reservoir Derivation Of Boltzmann Weights**. Schematic representation of reservoir derivation of Boltzmann weights.

Temperature Response Slope



Sequential activation is averaged over records rather than summed as simultaneous sources.

Figure 72: **Temperature Response Slope**. Schematic representation of temperature response slope.

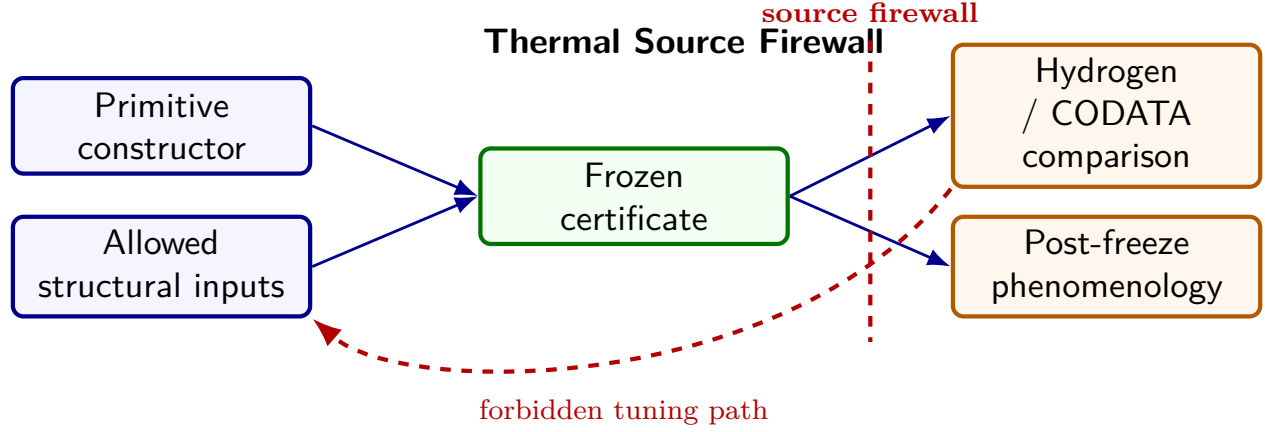


Figure 73: **Thermal Source Firewall**. Schematic representation of thermal source firewall.

4.19 Paper 19. Temporal Averaging of Gravitating Vacuum Energy in Dual-Time Theory

Expanded manuscript status

Expanded standalone paper: 37 pages.
 PDF: `dtc_paper19_temporal_averaging_vacuum_energy_expanded_final.pdf`.
 Source: `dtc_paper19_temporal_averaging_vacuum_energy_expanded_final.tex`.
 Package: `dtc_paper19_temporal_averaging_vacuum_energy_expanded_package.zip`.

Role. Vacuum-energy/cosmological-constant sector replacing simultaneous zero-point summation by outer-time temporal averaging over sequential inner-time micro-configurations.

Central formulae.

$$T_{\mu\nu,r}^{\text{eff}}(x; M) = \frac{1}{M} \sum_{n=0}^{M-1} T_{\mu\nu}^{(I_n,r)}(x) \quad (64)$$

$$T_{\mu\nu,r}^{\text{eff}} \rightarrow -\rho_{\text{eff},r} g_{\mu\nu} \quad (65)$$

$$\text{Var}(\bar{\rho}_M) = \frac{1}{M^2} \left[M\gamma(0) + 2 \sum_{k=1}^{M-1} (M-k)\gamma(k) \right] \quad (66)$$

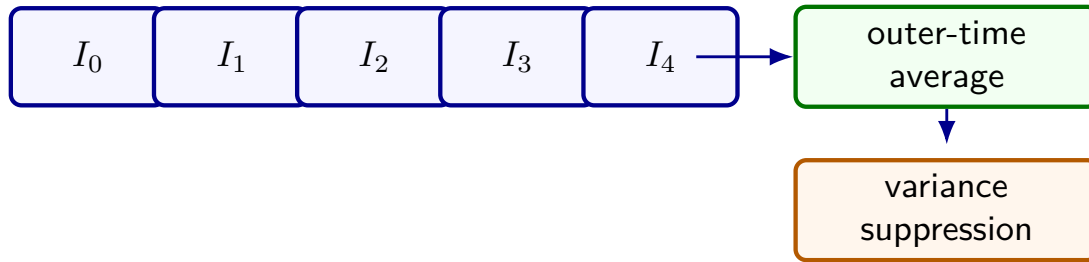
What the expanded version adds.

- Stationary sequential activation process and ergodic averaging theorem.
- Uniform-activation average-not-sum corollary.
- Effective independent sample size, short-range and fractal-time fluctuation scaling.
- Relational mode/event counting and finite-regulator vacuum certificate.

Non-claim and firewall boundary. Does not derive the observed cosmological constant; it gives the temporal-averaging mechanism and certificate architecture.

Certificate status. Vacuum-energy certificate schema and exact toy validator PASS.

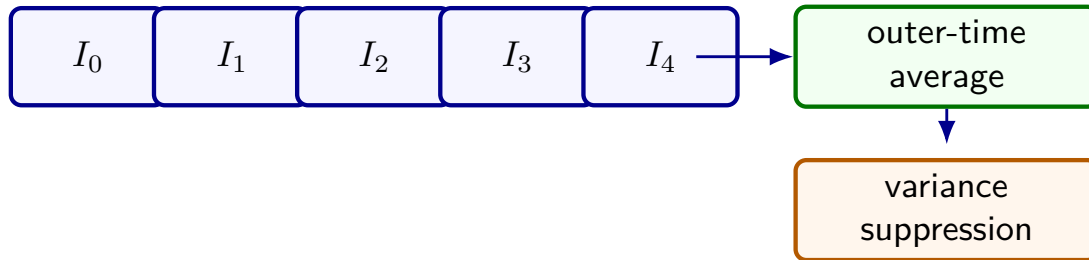
Sequential Microstate Activation



Sequential activation is averaged over records rather than summed as simultaneous sources.

Figure 74: **Sequential Microstate Activation**. Schematic representation of sequential microstate activation.

Average Vs. Sum



Sequential activation is averaged over records rather than summed as simultaneous sources.

Figure 75: **Average Vs. Sum**. Schematic representation of average vs. sum.

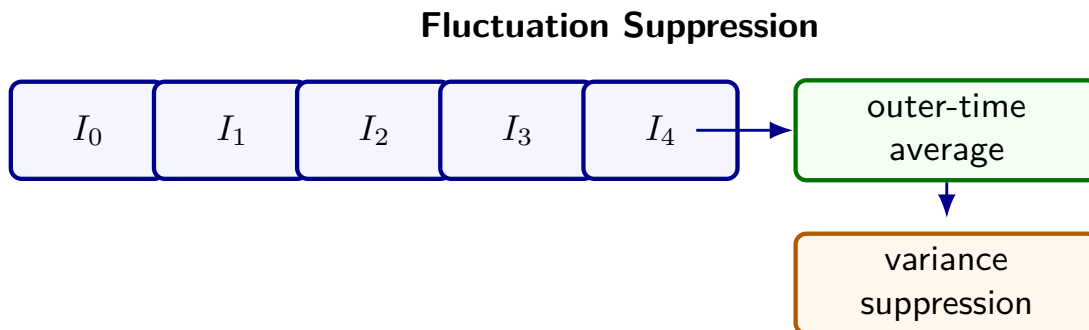
Figures supplied for this paper.

4.20 Paper 20. Newton's Constant as a Curvature-Record Response Coefficient in Dual-Time Theory

Expanded manuscript status

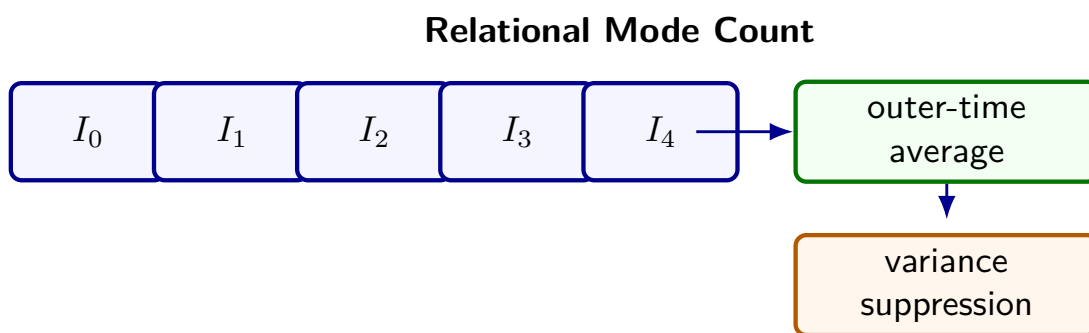
Expanded standalone paper: 32 pages.
 PDF: dtt_paper20_newtons_constant_curvature_record_response_expanded_final.pdf.
 Source: dtt_paper20_newtons_constant_curvature_record_response_expanded_final.tex.
 Package: dtt_paper20_newtons_constant_curvature_record_response_expanded_package.zip.

Role. Gravitational-response paper interpreting G as the response coefficient between record stress sources and emergent curvature.



Sequential activation is averaged over records rather than summed as simultaneous sources.

Figure 76: **Fluctuation Suppression**. Schematic representation of fluctuation suppression.



Sequential activation is averaged over records rather than summed as simultaneous sources.

Figure 77: **Relational Mode Count**. Schematic representation of relational mode count.

Central formulae.

$$G_{\mu\nu}[g] + \Lambda_{\text{eff}} g_{\mu\nu} = \kappa_G T_{\mu\nu}^{\text{rec}} \quad (67)$$

$$\kappa_G = \frac{8\pi G}{c_\star^4} \quad (68)$$

$$\nabla^2 \Phi = 4\pi G \rho \quad (69)$$

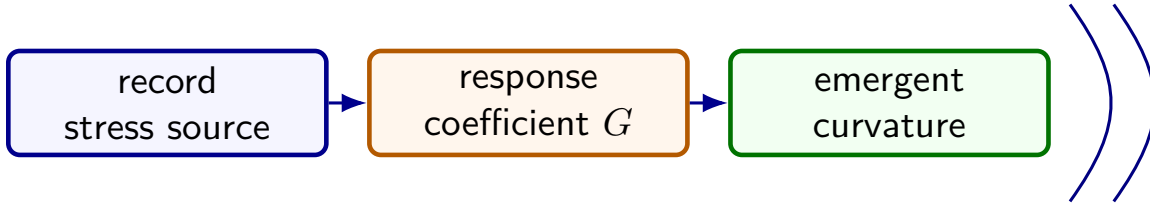
What the expanded version adds.

- Metric reconstruction from local-completion cones and clock-diamond data.
- Record stress-energy from variation of a record source action.
- Finite curvature estimators, Einstein estimators, Bianchi admissibility, and gauge projection.
- Newtonian-limit extraction, weak-field, PPN, gravitational-wave, and radiative-stability sections.

Non-claim and firewall boundary. Does not derive the measured value of G ; a future physical gravity certificate must compute κ_G source-blind.

Certificate status. Gravity-response certificate schema and toy validator PASS.

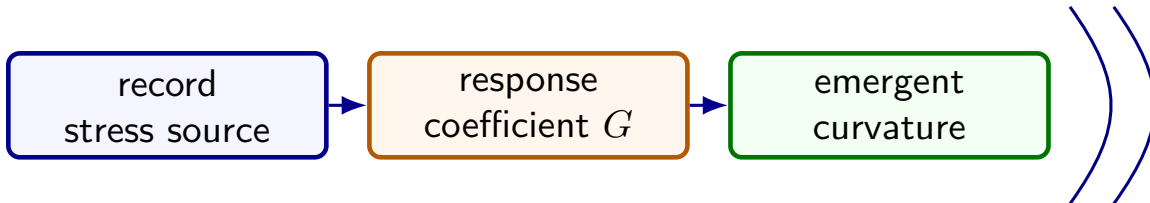
Record Stress To Curvature



G is treated as a calibrated or certified response, not as an input hidden in geometry.

Figure 78: **Record Stress To Curvature.** Schematic representation of record stress to curvature.

Bianchi/Gauge Projection

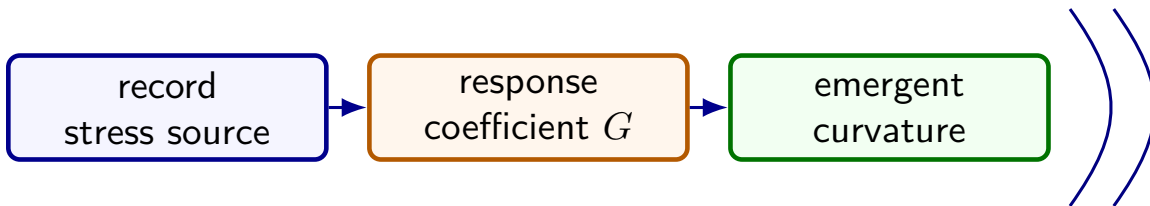


G is treated as a calibrated or certified response, not as an input hidden in geometry.

Figure 79: **Bianchi/Gauge Projection.** Schematic representation of Bianchi/gauge projection.

Figures supplied for this paper.

Newtonian Limit



G is treated as a calibrated or certified response, not as an input hidden in geometry.

Figure 80: **Newtonian Limit**. Schematic representation of Newtonian limit.

Gravity Certificate

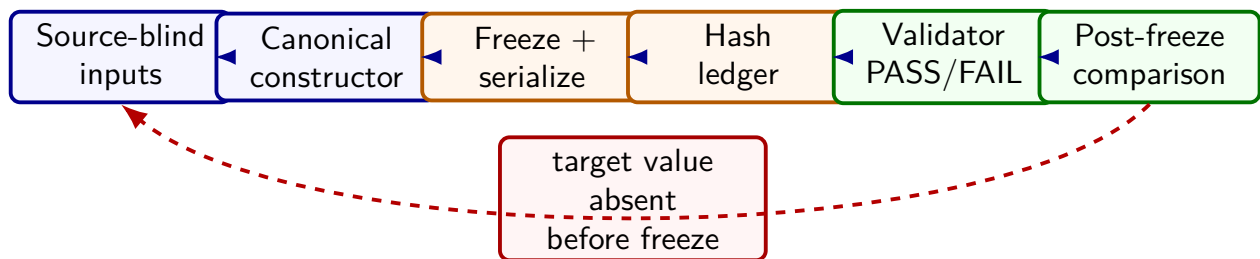


Figure 81: **Gravity Certificate**. Schematic representation of gravity certificate.

4.21 Paper 21. Hydrogen as the Rosetta Stone of Projection Metrology

Expanded manuscript status

Expanded standalone paper: 42 pages.

PDF: `dtc_paper21_hydrogen_rosetta_projection_metrology_expanded_final.pdf`.

Source: `dtc_paper21_hydrogen_rosetta_projection_metrology_expanded_final.tex`.

Package: `dtc_paper21_hydrogen_rosetta_projection_metrology_expanded_package.zip`.

Role. Synthesis paper showing hydrogen as the arena where constants become visible after upstream freeze, not as the input from which they are smuggled.

Central formulae.

$$\mathcal{I}_H = (c_\star, \hbar, \alpha, m_e, m_p, \chi_e, \chi_p, \mathcal{D}_H^{\text{af}}, \mathfrak{s}, \mathfrak{u}) \quad (70)$$

$$a_\mu = \frac{\hbar}{\mu_H c_\star \alpha} \quad (71)$$

$$E_n = -\frac{\mu_H c_\star^2 \alpha^2}{2n^2} \quad (72)$$

What the expanded version adds.

- Four-layer hydrogen organization: alpha-free geometry, post-freeze Bohr/Rydberg, fine/radiative corrections, differential holonomy tests.
- Constant-by-constant hydrogen dictionary.
- Hydrogen-family atlas: H, D, ions, muonium, positronium, antihydrogen, Rydberg states, molecular ions.
- HRS1-HRS20 synthesis protocol.

Non-claim and firewall boundary. Does not use hydrogen to derive or tune upstream constants; it integrates and tests them after freeze.

Certificate status. Hydrogen Rosetta certificate schema and toy validator PASS.

Figures supplied for this paper.

4.22 Paper 22. The Constants Ledger in Dual-Time Theory: What Is Derived, Calibrated, Certified, and Open

Expanded manuscript status

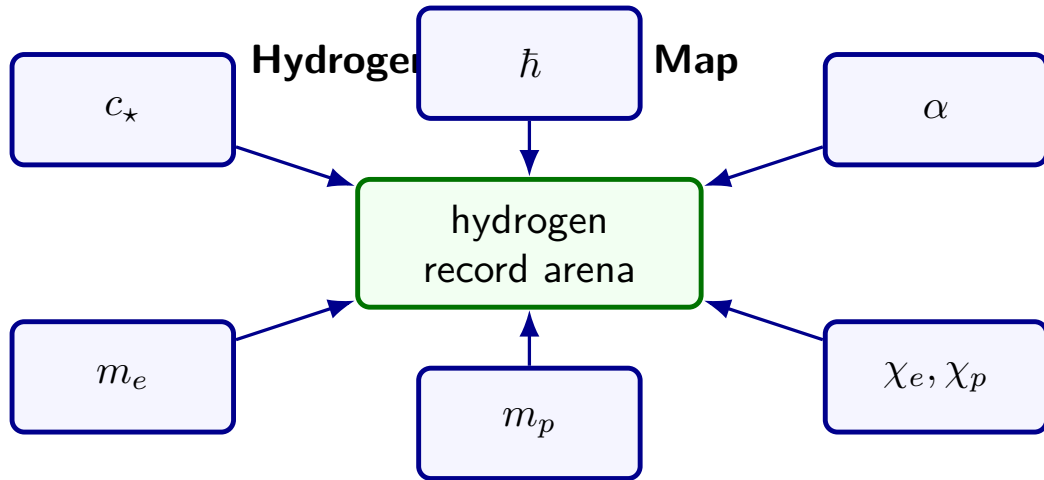
Expanded standalone paper: 37 pages.

PDF: `dtc_paper22_constants_ledger_expanded_final.pdf`.

Source: `dtc_paper22_constants_ledger_expanded_final.tex`.

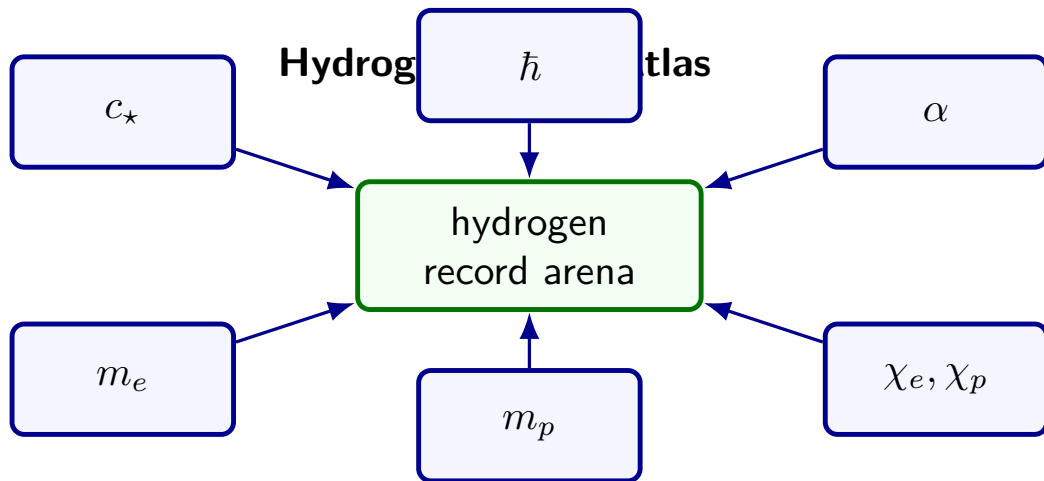
Package: `dtc_paper22_constants_ledger_expanded_package.zip`.

Role. Audit and claim-status spine for the whole series.



Constants enter as frozen inputs; residuals test the projection model.

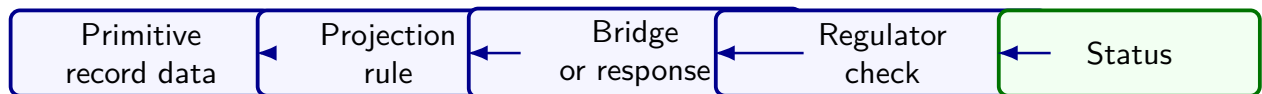
Figure 82: **Hydrogen Constants Map**. Schematic representation of hydrogen constants map.



Constants enter as frozen inputs; residuals test the projection model.

Figure 83: **Hydrogen Family Atlas**. Schematic representation of hydrogen family atlas.

Rosetta Dependency Graph



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 84: **Rosetta Dependency Graph**. Schematic representation of Rosetta dependency graph.

Residual Design Matrix

Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

Figure 85: **Residual Design Matrix**. Schematic representation of residual design matrix.

Central formulae.

$$\text{status} \in \{\text{structural theorem, conditional theorem, certificate target, SI calibration, post-freeze consequence, open}\} \quad (73)$$

$$\text{dimensionless target} \neq \text{dimensionful SI numeral} \quad (74)$$

$$\text{downstream data} \not\rightarrow \text{upstream constructor} \quad (75)$$

What the expanded version adds.

- Master constants taxonomy and ledger for c_* , $\hbar$, 137, $\Delta_{\mathcal{R}}$, α , e , q_{rec} , m_e , m_p/m_e , k_B , G , Λ_{eff} , and hydrogen-derived scales.
- SI calibration boundary and CODATA-update rule.
- Source-firewall ledger and no-backflow theorem.
- Paper-by-paper dependency ledger for Papers 1-21.

Non-claim and firewall boundary. Certifies no measured constant; it defines what future certification must prove.

Certificate status. Machine-readable constants-ledger certificate; validator PASS.

Figures supplied for this paper.

4.23 Paper 23. Machine-Checkable DTT Certificates for Constants

Expanded manuscript status

Expanded standalone paper: 47 pages.
 PDF: dtt_paper23_machine_checkable_certificates_expanded.pdf.
 Source: dtt_paper23_machine_checkable_certificates_expanded.tex.
 Package: dtt_paper23_machine_checkable_certificates_expanded_package.zip.

Status Lattice

Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

Figure 86: **Status Lattice**. Schematic representation of status lattice.

Constant Taxonomy

Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

Figure 87: **Constant Taxonomy**. Schematic representation of constant taxonomy.

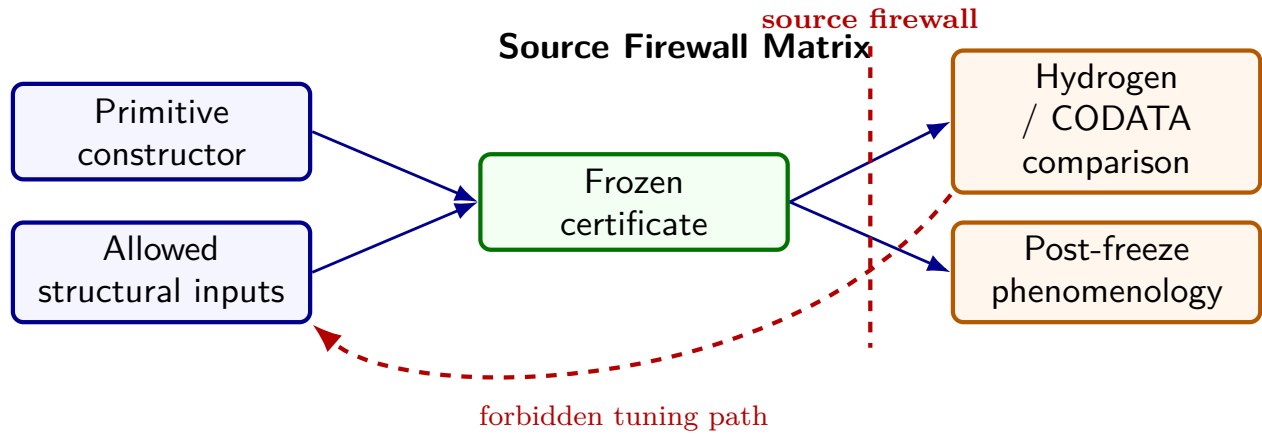


Figure 88: **Source Firewall Matrix**. Schematic representation of source firewall matrix.

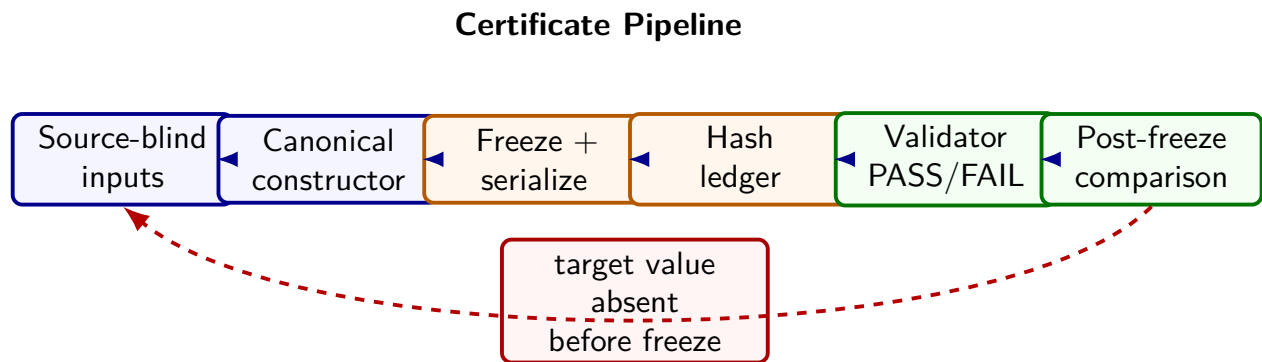


Figure 89: **Certificate Pipeline**. Schematic representation of certificate pipeline.

Role. Common certification infrastructure for future constant claims.

Central formulae.

$$\mathcal{C}_{K,r} = (\text{meta, kind, claim, inputs, constructor, normalizations,} \quad (76)$$

regulator, output, errors, firewall, proofs, reproduction, hash)

$$h = \text{SHA256}(\text{canonical_serialize}(\mathcal{C})) \quad (77)$$

$$\text{validate}(\mathcal{C}) = \text{PASS} \Rightarrow \text{post-freeze comparison allowed} \quad (78)$$

What the expanded version adds.

- DTT-CERT-1 standard.
- Exact-arithmetic rules for integers, rationals, matrices, chains, phases, and regulator maps.
- Validator levels: schema, arithmetic, firewall, regulator convergence, reproduction, comparison.
- Registry, versioning, threat model, and failure semantics.

Non-claim and firewall boundary. Certifies no measured physical constant; it defines the audit standard.

Certificate status. Multi-constant nonphysical benchmark bundle; validator PASS.

Certificate Bundle Anatomy

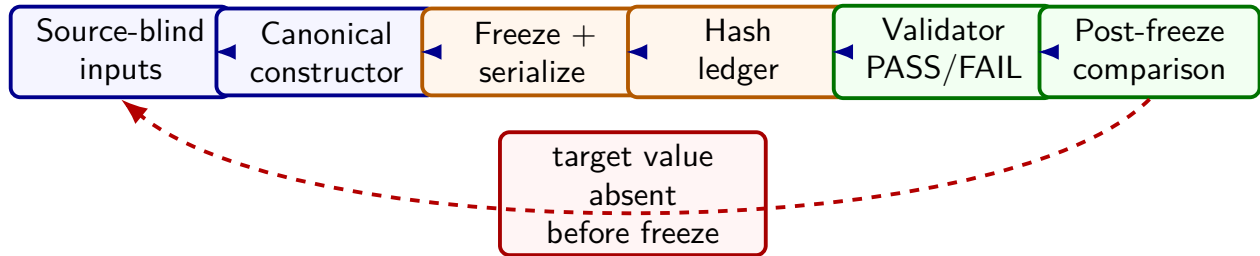


Figure 90: **Certificate Bundle Anatomy.** Schematic representation of certificate bundle anatomy.

Hash Freeze Flow

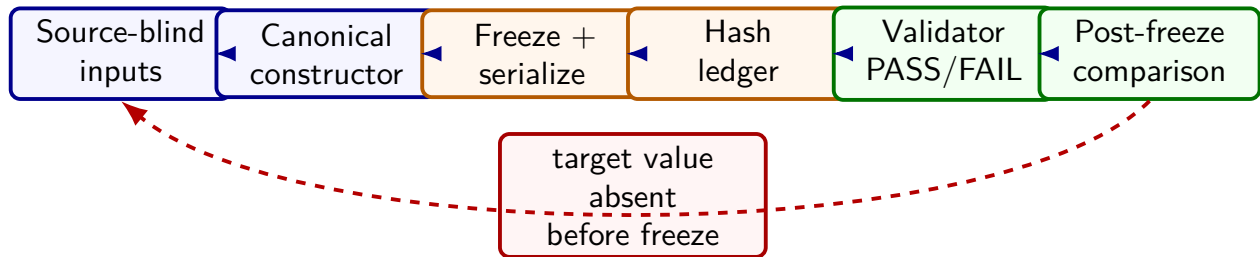


Figure 91: **Hash Freeze Flow.** Schematic representation of hash freeze flow.

Figures supplied for this paper.

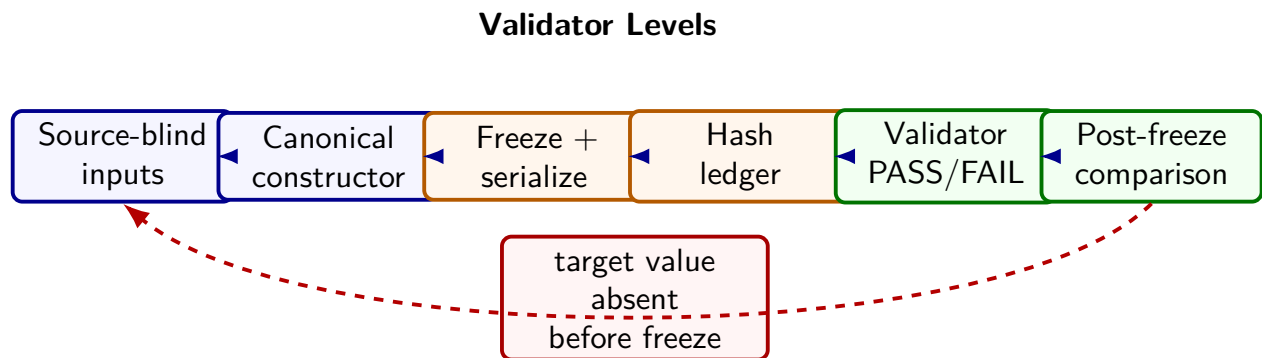
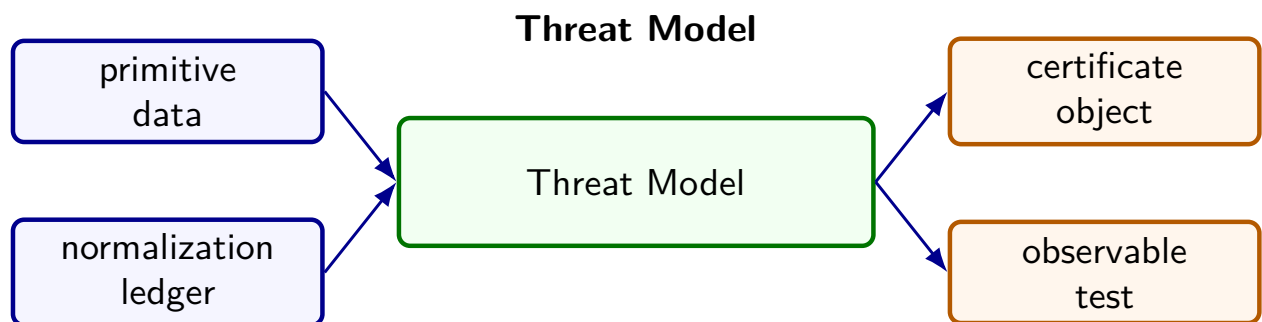


Figure 92: **Validator Levels**. Schematic representation of validator levels.



The diagram records dependencies, normalization choices, and audit outputs.

Figure 93: **Threat Model**. Schematic representation of threat model.

4.24 Paper 24. Falsifiable Bounds and Experimental Roadmap for Dual-Time Projection Metrology

Expanded manuscript status

Expanded standalone paper: 46 pages.

PDF: `dtb_paper24_falsifiable_bounds_experimental_roadmap_expanded_final.pdf`.

Source: `dtb_paper24_falsifiable_bounds_experimental_roadmap_expanded_final.tex`.

Package: `dtb_paper24_falsifiable_bounds_experimental_roadmap_expanded_package.zip`.

Role. Experimental capstone converting frozen certificates into covariance-aware comparisons, bounds, and falsification tests.

Central formulae.

$$C_K^{\text{freeze}} \rightarrow \hat{y}_K \rightarrow P_Z^\perp r \rightarrow \chi^2, p\text{-value, bounds} \rightarrow \text{decision} \quad (79)$$

$$P_Z = Z(Z^T C^{-1} Z)^{-1} Z^T C^{-1} \quad (80)$$

$$\hat{c} = (X^T C^{-1} X)^{-1} X^T C^{-1} r \quad (81)$$

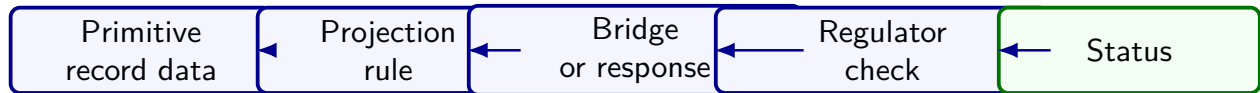
What the expanded version adds.

- Construct-freeze-validate-compare pipeline.
- Universal experimental-roadmap certificate.
- Experimental protocols for `hbar_eff`, `c_star`, `alpha`, hydrogen residuals, charge, masses, `k_B`, `G`, and `Lambda`.
- Falsification matrix and data-status classes.

Non-claim and firewall boundary. Makes no new measurement claim; it defines how future claims are to be tested, bounded, rejected, or supported.

Certificate status. Experimental-roadmap schema and toy benchmark validator PASS.

Program-To-Experiment Graph



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 94: **Program-To-Experiment Graph.** Schematic representation of program-to-experiment graph.

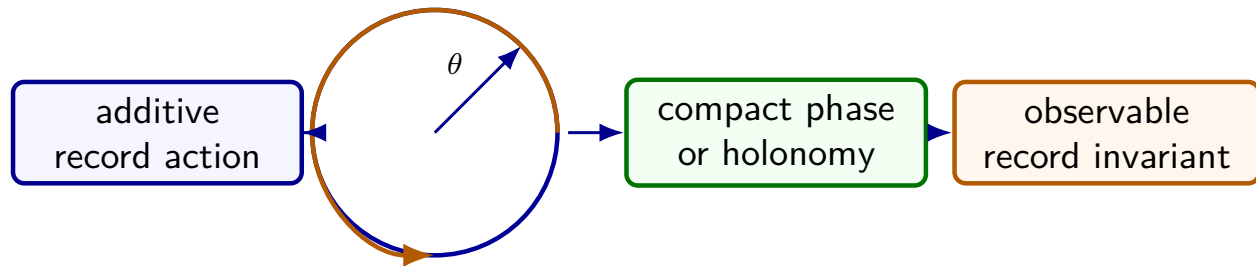
Figures supplied for this paper.

Hydrogen Residual Matrix

Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

Figure 95: **Hydrogen Residual Matrix**. Schematic representation of hydrogen residual matrix.

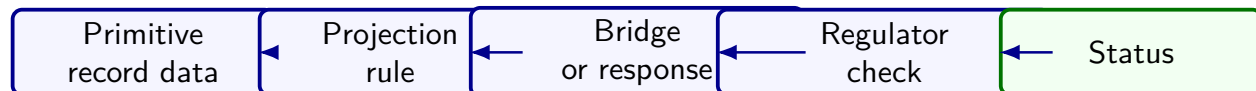
Phase Anomaly Platforms



Concatenation becomes phase addition; branch choices are audited.

Figure 96: **Phase Anomaly Platforms**. Schematic representation of phase anomaly platforms.

Global Falsification Matrix



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 97: **Global Falsification Matrix**. Schematic representation of global falsification matrix.

5 Expanded-paper inventory

No.	Expanded paper	Pages	Primary status
01	Dual-Time Projection Realism	36	Foundational ontology and role separation. It defines generative order, projection/stabilization, stable records, outer record time, and the basic claim-status discipline used by the whole series.
02	Projection Metrology and Constants	38	Metrology grammar for the entire program. It classifies constants as bridge laws between record domains and separates structural derivation from SI calibration.
03	Structural Emergence of $\hbar$	39	First fully worked projection-metrological bridge theorem: compact phase plus additive record action forces a unique action-phase conversion scale.
04	Emergent Additive Record Action	36	Derives the additive record action assumed by the $\hbar$ bridge, closing the quantum-classical interface chain.
05	Finite-Stability Corrections and $\hbar_{\text{eff}}$	41	Quantitative phenomenology of deviations from the ideal $\hbar$ bridge due to finite record stability and nonlinear projection.
06	Local Completion Cones and c_{star}	34	Kinematic layer deriving Lorentzian causal-cone structure from finite local completion, positive delay, observer quotient, and isotropic vacuum readout.
07	Canonical Complexification and 137	34	Structural integer theorem supplying the upstream flat count for the alpha program.
08	Holonomy Fraction	78	Certificate-ready finite-regulator program for the fractional residual $\Delta_{\mathcal{R}}$ in $\alpha_{\text{OS}}^{-1}(0) = 137 + \Delta_{\mathcal{R}}$.
09	Coupling-Correspondence	43	Physical bridge proving when an internal determinant phase is an inverse low-energy electromagnetic coupling defect.
10	Physical Electron Certificate	36	Decisive computation manual specifying the target-blind finite-regulator physical electron certificate.
11	Alpha-Free Hydrogen Geometry	35	First hydrogen paper. It builds hydrogen as a neutral proton-electron temporal record resonance without using alpha-dependent tick formulas.
12	Hydrogen Derived Constants and Bohr Spectrum	36	Post-freeze hydrogen gross-spectrum paper. It reconstructs Bohr and Rydberg scales after c_{star} , $\hbar$, α , m_e , and m_p are supplied upstream.

No.	Expanded paper	Pages	Primary status
13	Hydrogen Fine Structure and Lamb Shift	37	Post-freeze radiative and fine-structure paper with strict separation between QED reproduction, temporal-loop interpretation, and new DTT residuals.
14	Hydrogen Differential Holonomy Tests	36	Post-freeze spectroscopy test suite for state-dependent holonomy residuals and overconstrained residual shapes.
15	Primitive Charge Character	33	Charge and electromagnetic-unit layer. It separates compact charge character, record charge normalization, alpha, and the SI coulomb value.
16	Electron Mass as Temporal Inertia	38	Mass-layer manuscript defining mass as stable temporal inertia and preparing electron mass certification.
17	Proton-Electron Mass Ratio	33	Dimensionless mass-ratio paper treating m_p/m_e as a source-blind temporal-hierarchy certificate problem.
18	Boltzmann Entropy-Energy Bridge	39	Thermodynamic bridge paper deriving the structural role of k_B as log-count-to-energy-temperature conversion.
19	Temporal Vacuum Averaging	37	Vacuum-energy/cosmological-constant sector replacing simultaneous zero-point summation by outer-time temporal averaging over sequential inner-time micro-configurations.
20	Newton Constant and Curvature Response	32	Gravitational-response paper interpreting G as the response coefficient between record stress sources and emergent curvature.
21	Hydrogen Rosetta Stone	42	Synthesis paper showing hydrogen as the arena where constants become visible after upstream freeze, not as the input from which they are smuggled.
22	Constants Ledger	37	Audit and claim-status spine for the whole series.
23	Machine-Checkable Certificates	47	Common certification infrastructure for future constant claims.
24	Experimental Roadmap and Falsification	46	Experimental capstone converting frozen certificates into covariance-aware comparisons, bounds, and falsification tests.

6 Dependency graph and no-backflow rules

6.1 Phase organization

1. **Foundations and metrology:** Papers 1–5 define projection realism, bridge laws, hbar, record action, and finite-stability deviations.
2. **Kinematics and integer structure:** Papers 6–7 define the invariant completion speed and the structural integer 137.
3. **Fine-structure coupling:** Papers 8–10 define the holonomy residual, physical coupling correspondence, and physical electron certificate.
4. **Hydrogen:** Papers 11–14 split alpha-free hydrogen ontology from post-freeze spectra and differential holonomy tests.
5. **Other constants:** Papers 15–20 handle charge, mass, mass ratios, thermodynamics, vacuum energy, and gravity.
6. **Synthesis, audit, and tests:** Papers 21–24 provide the Rosetta synthesis, constants ledger, certificate standard, and experimental roadmap.

6.2 No-backflow theorem target

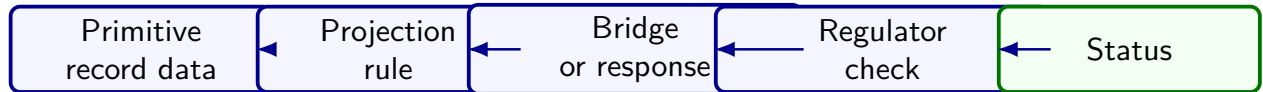
No-backflow theorem target

Let $\mathcal{C}_K$ be any pre-freeze DTT certificate for a constant or structural bridge K . Let $D_{\text{downstream}}$ denote data from hydrogen spectroscopy, CODATA adjustments, SI conventions, cosmology, Penning traps, quantum Hall/Josephson metrology, or other post-freeze comparison channels. A certificate is admissible only if

$$\text{Constructor}(\mathcal{C}_K) \perp D_{\text{downstream}}$$

in the explicit operational sense that no field, normalization, branch, regulator path, window dimension, coefficient sequence, or error budget in $\mathcal{C}_K$ is chosen after reading those data.

Global dependency graph



All arrows are admissible construction dependencies; comparison data enter only after freeze.

Figure 98: **Global dependency graph.** A DAG with Papers 1–5 feeding Papers 6–10, hydrogen split into Papers 11–14, constants sectors in Papers 15–20, and audit/certification/testing in Papers 21–24. Red arrows mark forbidden backflow.

7 Master constants ledger

Quantity	Kind	DTT target	Current expanded-series status
$c_\star$	conversion/slope bridge	local-completion cone invariant	Paper 6 gives theorem/certificate architecture; SI value is calibration.
$\hbar$	conversion bridge	unique action-phase scale	Papers 3–5 give structural and finite-stability analysis.
$\hbar_{\text{eff}}$	effective regime parameter	finite-stability diagnostic	Paper 5 supplies RWMS scaling and bounds.
137	discrete structural integer	$N_3(10)$ after complexification and tower	Paper 7 supplies structural theorem architecture.
$\Delta_{\mathcal{R}}$	dimensionless residual	physical electron holonomy certificate	Papers 8–10 define certificate architecture; not yet physically populated.
α	dimensionless coupling	$137 + \Delta_{\mathcal{R}}$ plus coupling correspondence	Papers 8–10 establish target; measured value not yet derived.
e	charge-unit image	primitive compact character plus SI dictionary	Paper 15 separates χ_e , q_{rec} , α , and e_{SI} .
m_e	mass scale	stable temporal inertia/rest recurrence	Paper 16 defines certificate; measured value post-freeze.
m_p/m_e	dimensionless ratio	internally generated tick hierarchy limit	Paper 17 repairs circularity by requiring internal coefficient generator.
k_B	entropy-energy bridge	log-count to temperature-response conversion	Paper 18 supplies structural bridge and certificate.
Λ_{eff}	effective vacuum response	temporal average over sequential vacuum configurations	Paper 19 supplies averaging theorem; observed value open.
G	curvature-response coefficient	record stress to curvature bridge	Paper 20 supplies response architecture; measured value open.
Hydrogen scales	post-freeze consequences	a_μ, E_n, R_H , fine/radiative corrections	Papers 11–14 and 21 organize use and tests without backflow.

8 Hydrogen source quarantine

Alpha-containing hydrogen formulae are downstream only

The following expressions may appear in Papers 12–14 and 21 only after upstream freeze:

$$\Delta t_r = \alpha \frac{\hbar}{m_e c_\star^2}, \quad (82)$$

$$a_\mu = \frac{\hbar}{\mu_H c_\star \alpha}, \quad (83)$$

$$R_H = \frac{\mu_H c_\star \alpha^2}{2\hbar}, \quad (84)$$

$$E_n = -\frac{\mu_H c_\star^2 \alpha^2}{2n^2}. \quad (85)$$

They cannot be used in Papers 1–10 or 15–20 to tune α , m_e , q_{rec} , $\hbar_\star$, branch choice, low-band dimension, regulator path, mass-ratio coefficients, or any pre-freeze certificate field.

9 Certificate hierarchy

Certificate class	Paper	Purpose
Completion-cone certificate	6	Validate local-completion inequality and $c_\star$ reconstruction.
Structural-137 certificate	7	Validate $B(d) = 2^d - 1$, trace scale 10, and $N_3(10) = 137$.
Holonomy certificate	8	Validate determinant phase machinery and source firewall.
Coupling-response certificate	9	Validate boundary response link to inverse coupling.
Physical electron certificate	10	Future populated certificate for H_e ; currently template only.
Hydrogen certificates	11–14, 21	Validate alpha-free geometry, post-freeze spectra, residual shapes, and Rosetta synthesis.
Charge, mass, thermal, and gravity certificates	15–20	Validate sector-specific bridge or response claims.
Ledger, certificate, and experiment certificates	22–24	Validate claim status, machine-checkability, and experimental comparison protocols.

10 Global TikZ figure and diagram plan

11 Repository layout after this publishing update

```

dtc_master_updated_from_expanded_versions/
dtc_constants_hydrogen_publishing.tex

```

Certificate pipeline

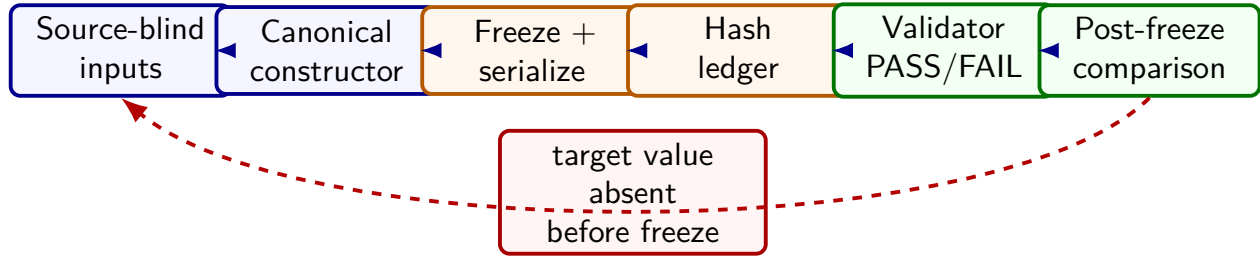
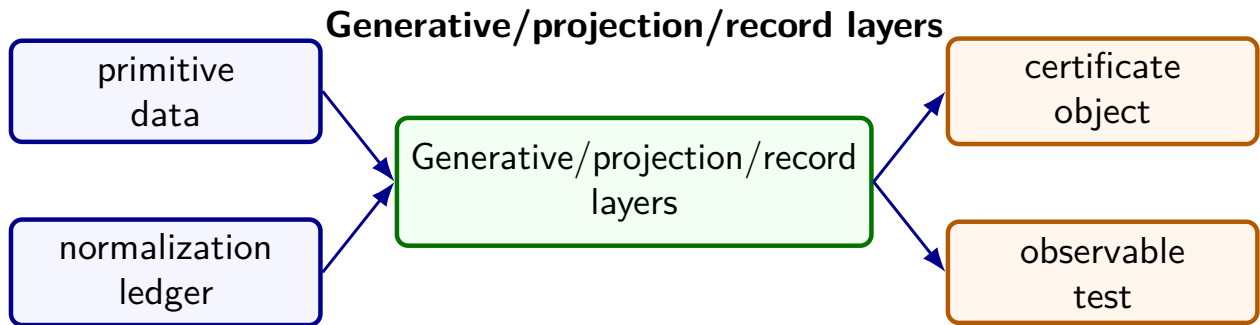


Figure 99: **Certificate pipeline**. Construct, freeze, serialize, hash, validate, reproduce, compare. The target value is never present before freeze.



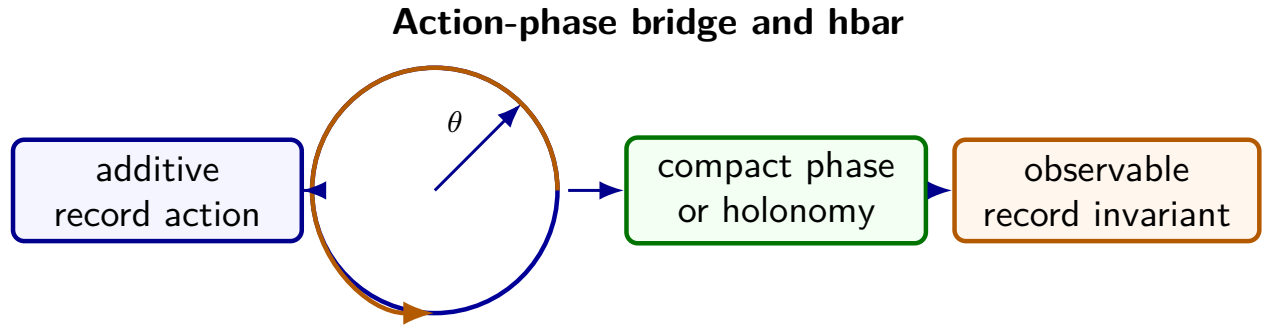
The diagram records dependencies, normalization choices, and audit outputs.

Figure 100: **Generative/projection/record layers**. DTT/SMM role separation and stable-record projection.

Classification of constants

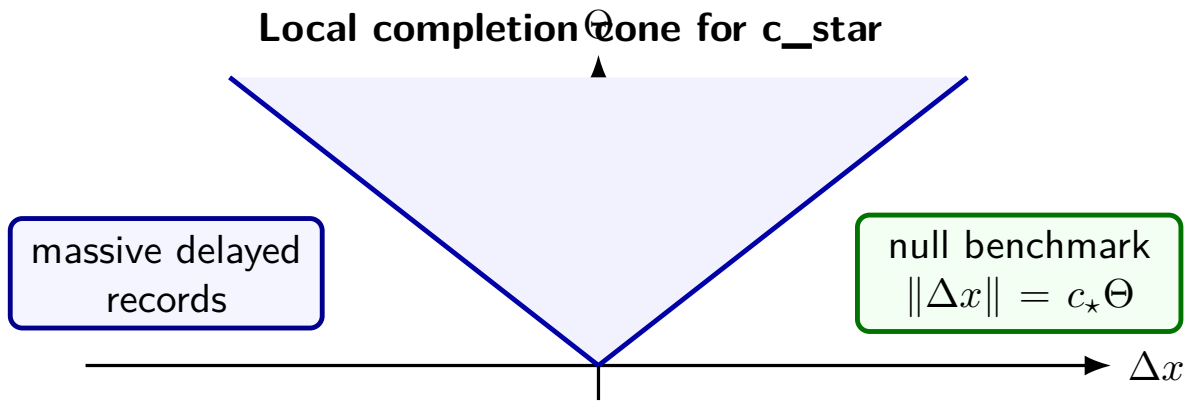
Object	Status	Firewall	Test
Structural input	theorem / target	no fitted data	proof check
Regulator data	certificate	source-blind	validator
Physical output	post-freeze	comparison only	residuals

Figure 101: **Classification of constants**. Discrete, dimensionless, conversion, response, effective, calibration, and downstream derived constants.



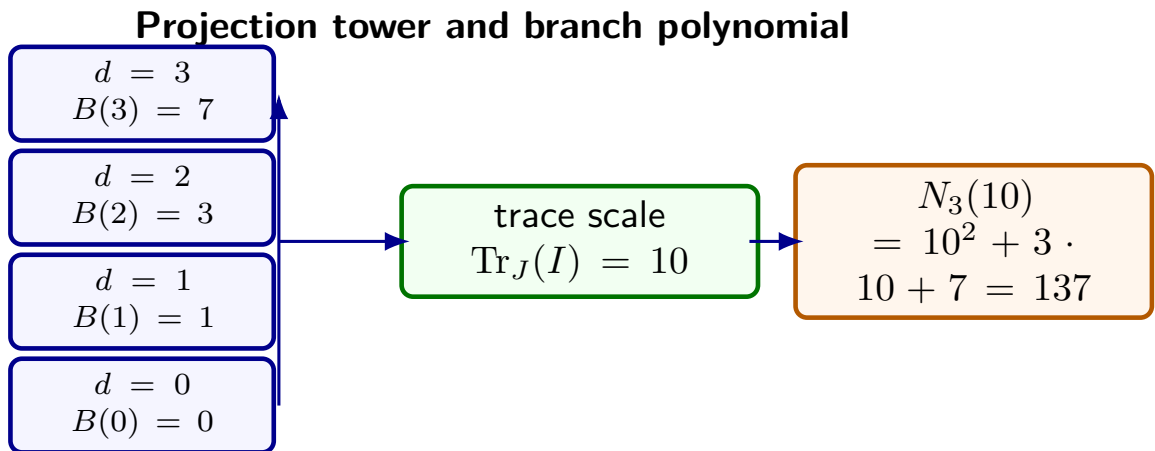
Concatenation becomes phase addition; branch choices are audited.

Figure 102: **Action-phase bridge and hbar**. Additive record action mapped to compact phase.



Admissible local completions satisfy $\|\Delta x\| \leq c_{\star} \Theta$.

Figure 103: **Local completion cone for $c_{\star}$** . Cone inequality, photon one-tick benchmark, and massive delayed class.



The finite tower supplies the integer block only; residual physics is separate.

Figure 104: **Projection tower and branch polynomial**. Positive-energy complexification, exact one-innovation tower, $B(d)$ coefficients, and $N_3(10)$.

Electron holonomy certificate pipeline

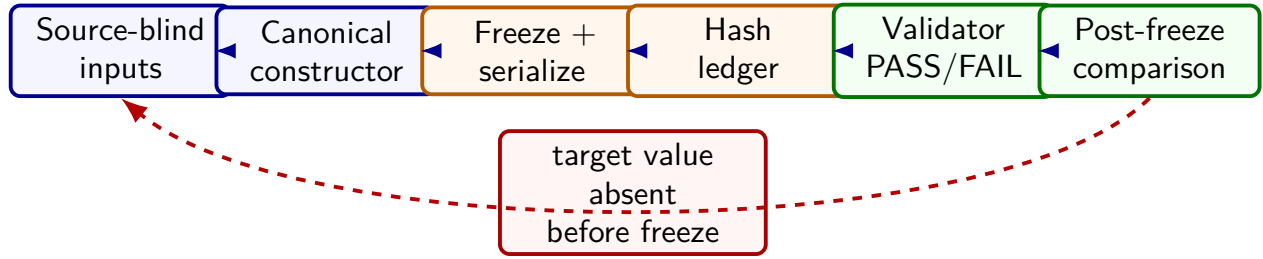


Figure 105: **Electron holonomy certificate pipeline**. Record complex, cycle, connection, low band, determinant route, orientation, and hash.

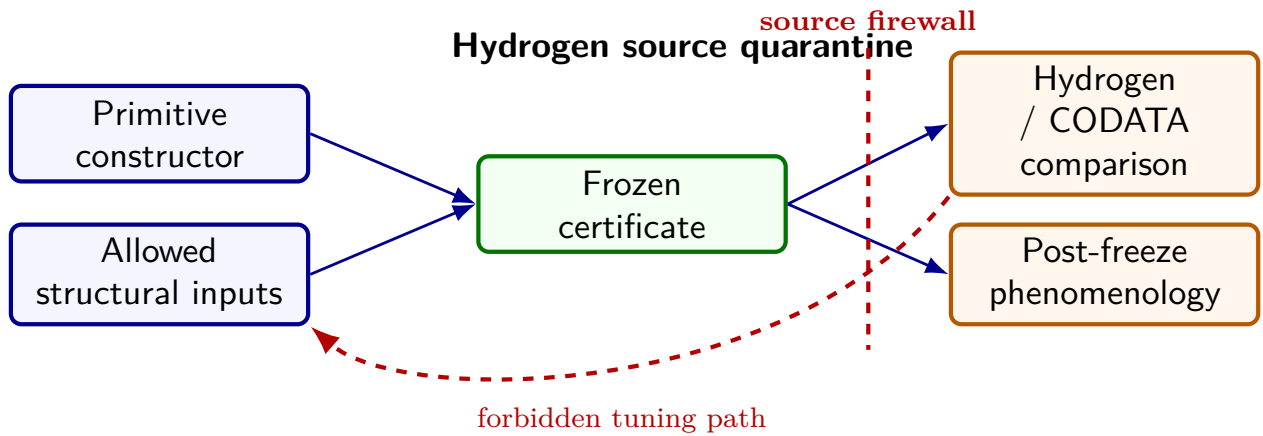
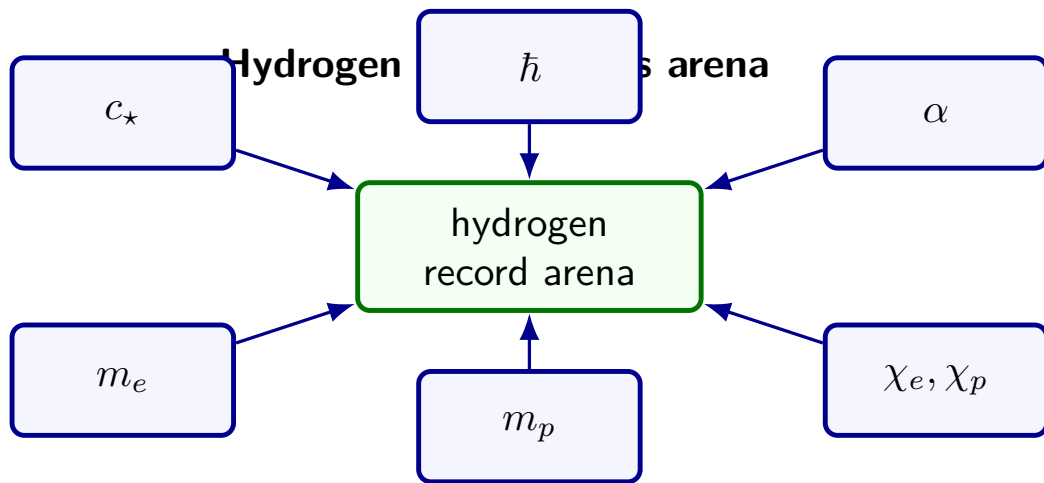


Figure 106: **Hydrogen source quarantine**. Alpha-free hydrogen geometry upstream; alpha-containing spectroscopy downstream.



Constants enter as frozen inputs; residuals test the projection model.

Figure 107: **Hydrogen as constants arena**. How c_* , $\hbar$, α , e , m_e , m_p , and corrections become visible in hydrogen.

Machine-checkable certificate schema

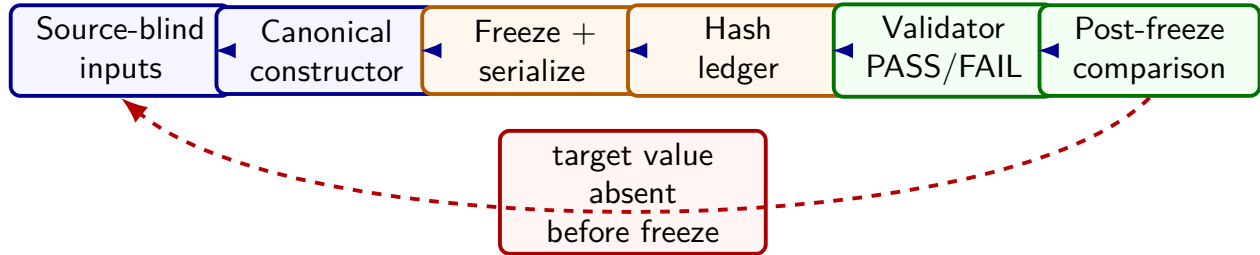


Figure 108: **Machine-checkable certificate schema.** DTT-CERT-1 common schema and validation levels.

Experimental roadmap and falsification matrix

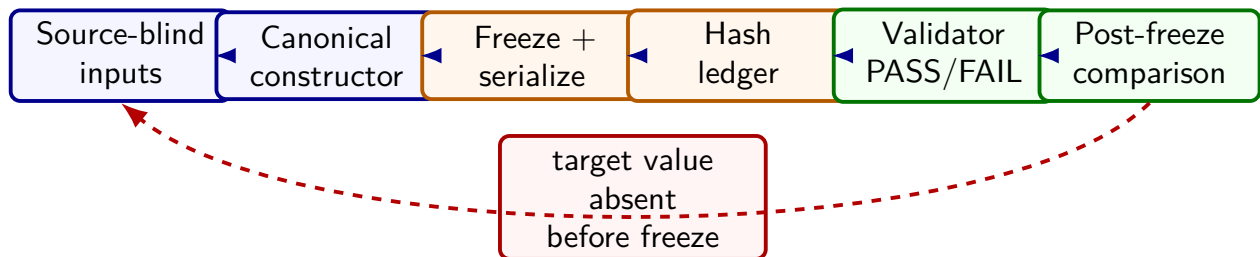


Figure 109: **Experimental roadmap and falsification matrix.** Frozen certificates mapped to precision tests and pass/fail decisions.

```

dtc_constants_hydrogen_publishing.pdf
figure_index.csv
expanded_papers_inventory.csv
expanded_papers_inventory.json
README.md
figures/
fig-master-theorem-chain.tex
...
standalone_figures/
fig-master-theorem-chain_standalone.tex
...
papers_expanded/
dtc_paper01_dual_time_projection_realism_expanded_final.pdf
dtc_paper01_dual_time_projection_realism_expanded_final.tex
...
dtc_paper24_falsifiable_bounds_experimental_roadmap_expanded_final.pdf
dtc_paper24_falsifiable_bounds_experimental_roadmap_expanded_final.tex

```

12 TikZ figure source policy

Every diagram in this version is generated from a TikZ source file. The main manuscript inputs the snippets in `figures/`; the matching files in `standalone_figures/` wrap the same snippets in a minimal standalone document so that an individual diagram can be compiled or revised without touching the master source. The file `figure_index.csv` records the label, source filename, standalone wrapper, title, and caption note for every figure.

The figures are intentionally schematic. Their purpose is to make the dependency structure, source-firewall boundaries, bridge maps, certificate pipelines, and post-freeze comparison routes visually auditable. They are not numerical plots and they do not constitute additional physical evidence beyond the theorem, certificate, and experimental protocols stated in the prose.

13 Immediate next actions

1. Use Papers 1–2 as the public language layer. They should be refined first for readability because every later paper imports their vocabulary.
2. Preserve formula hygiene in Paper 7 and all master documents: define $B(d) = 2^d - 1$ before $N_3(\lambda)$ and avoid any typography that can be read as $2d - 1$.
3. Treat Papers 8–10 as the decisive alpha block. Further conceptual expansion is less important than a first source-blind physical electron certificate attempt.
4. Keep Papers 11–14 alpha-quarantined. Hydrogen is the arena where constants become visible, not the pre-freeze source of α .
5. Use Paper 22 as the claim-status gate before circulating any strong claim.
6. Use Paper 23 as the shared certificate standard for all numerical claims.
7. Use Paper 24 to turn null results, residuals, and covariance-aware comparisons into explicit bounds or falsification decisions.