RCHS-1: The Twelve-Sector Commitment-Hazard Selector and Magnitude-Bearing Current-Mark Factor Theorem in VERSF

From Twelve-Sector Hazard Rigidity to a Unique Quadratic Current-Mark Factor Shape, with Exact Same-Source Attachment Criteria, a Pre-Physical-Time Current Certificate, and Binary First-Record Curvature

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General Reader Summary

This programme tries to derive the structure of particle physics from one primitive rule about how facts are committed, rather than by fitting parameters to experiment. A serious worry was that the theory secretly contained twelve hidden dials, one strength for each of its twelve matter/commitment sectors, or worse, twelve freely varying strength functions. This paper proves that freedom does not exist at the primitive level where facts are committed; carrying the collapse to the physical current is exactly what the bridging assumption examined later governs. The theory's own already-derived rule for where committed facts land is rigid: no sector-dependent adjustment of any kind can be inserted without visibly contradicting it. Everything collapses to one overall intensity, like the ticking rate of a clock, and that single rate is the only freedom the rule genuinely cannot see.

The rigidity has a second consequence. Among all reasonable quadratic ways the theory's current could register its own strength, exactly one survives, and counting how it spreads over the twelve sectors produces a small table of how the three gauge directions, colour, weak and hypercharge, overlap on matter. The same table has been reached by three structurally distinct derivations that share only part of their representation input, and it is protected: splitting events into finer sub-events cannot change it unless the splitting carries genuinely new physics, and then only through a specific, named, always-positive correction.

The results rest on one honest bridging assumption, that the relevant constructions act on the same elementary events, and a series of audits turns that assumption into finite tests instead of leaning on it. Several pieces already pass: a completion cost feeds event probabilities by sitting inside the same parent generator, with no cost-equals-probability postulate; the current itself exists before physical time, partly as a persistent circulation that no simple movement of facts from place to place could produce, with time attached afterwards as a ruler; and because facts are all-or-nothing, the continuous quantity turns out to be the tempo at which complete facts occur.

One tempting shortcut is exactly ruled out, and the remaining gap is reduced to a few named calculations.

The bottom line is stated plainly. The twelve-dial ambiguity is gone and the overlap table is locked in. The overall strength now sits in a single dial with an exact conversion formula attached, and a separate calibration hints at a simple value, one third, which is quarantined because it rests on unproven identifications. The physical value of the dial is not derived, and if the remaining calculations permanently fail, the approach must be rejected rather than fudged.

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Abstract

The VERSF Standard-Model programme has reduced the unresolved gauge/current normalisation problem to the absence of a primitive magnitude-bearing current-to-mark law. Earlier work establishes a 49-complex-dimensional matter tangent, twelve inequivalent gauge × generation commitment components, an unresolved Fubini–Study preparation law, exact record-conditioned component hazards, a rank-three C/W/Y factor-support geometry, and a quadratic terminal-Born current construction whose factor matrix is fixed up to one common source scale.

A Gate-2 matter audit further reduces the most general source-symmetry-compatible positive internal completion operator to the twelve-block form

$$G_\partial = \Sigma_{A=1}^{12} g_A P_A, \quad g_A > 0,$$

leaving eleven relative coefficients plus one common magnitude.

This paper proves a stronger **primitive-mark hazard-rigidity theorem**. At the RUDM mark grain the source law is

$$h_A(u \mid z, \rho) = h_0(u, \rho)\, w_A(z), \quad w_A(z) = \|P_A z\|^2.$$

Under the unresolved Fubini–Study law all twelve weights are positive almost surely. If a positive same-grain response supplies arbitrary component intensities $\tilde{h}_A(u, w, \rho)$ while preserving the RUDM conditional mark probabilities, then necessarily

$$\boldsymbol{\tilde{h}_A(u, w, \rho) = c(u, w, \rho)\, w_A}$$

for one common positive scalar functional c, unique and equal to $\Sigma_B \tilde{h}_B$, almost everywhere on the interior source support. Thus the source law excludes not only eleven unequal constants but every representation-dependent distortion of the primitive mark intensities at that grain: the excluded class is infinite dimensional. The rigidity is also global and economical: a single interior source ray, or equivalently a single record ledger, already suffices, so the gain vector is identifiable up to its common scale exactly, not merely to first order, and the result persists for every record-conditioned predictive law.

As a corollary, within the positive quadratic source-equivariant current class, Schur decomposition on the twelve inequivalent commitment sectors gives

$$Q(J) = \Sigma_A g_A \|P_A J\|^2.$$

If that quadratic response descends to the same primitive RUDM marks, hazard rigidity forces

$$\boldsymbol{Q(J) = g \|J\|^2,}$$

so the quadratic current response is unique up to one common scale, not merely minimal. Under C/W/Y radial amplitude perturbations its primitive intensity scores are

$$s_{F,A} = 2\, \chi_F(A),$$

where $\chi_F(A) \in \{0, 1\}$ is the factor-support signature. Writing the unscaled support Gram as

$$\boldsymbol{H_{CWY} = (1/49) \cdot [\, 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\,],}$$

the amplitude-log marked-rate information matrix is $M_{JJ}^{event} = 4\, H_{CWY}$, exactly matching the factor shape independently obtained from the unavoidable MASD current-cycle geometry and the quadratic terminal-Born construction. The matrix is positive definite, with exact leading principal minors 36, 612 and 4428 at integer normalisation, and the equal-factor marked-rate precision of M_{JJ}^{event} is exactly 1076/147. This uncentred Gram is typed as intensity-score information of the realised-event rate process, not as the centred Fisher matrix of the conditional mark distribution, whose equal-factor precision is 5200/7203.

A further refinement theorem sharpens the coarse-to-microscopic caveat into an equivalence: a microscopic splitting or deterministic copying of a coarse primitive mark leaves this factor Gram exactly invariant **if and only if** the splitting is factor blind on supported marks, and any factor-sensitive refinement enters as an explicit positive-semidefinite conditional Fisher correction.

The paper then executes a **common-parent attachment and magnitude-bearing event-law audit** of its own load-bearing premise AP1b. The audit proves an exact effect-equivalence theorem: the RUDM law holds on a full-support set of rays if and only if the coarse primitive event effects are $E_A = h_0 P_A$, so AP1b becomes a finite operator test rather than a cost-to-probability principle. Within the SGPL marked-transfer architecture the criterion reduces to a common transfer norm plus commitment-projector preservation, equivalently a block-diagonal unitary transfer, and for a positive Euclidean internal transfer to an internally scalar generator. A scalar Gate-2 cost is shown to feed the same primitive event process only through the common intensity scale, realising exactly the surviving scalar functional of the rigidity theorem, and the exact current-ray factorisation $\lambda_A = \lambda_0 r^2 w_A$ shows that if the directing ray equals the normalised current ray then the current magnitude enters precisely as the common clock. The published stack returns no nonzero linear current-to-record derivative $D_{J_{cyc}} \mathcal{K}_A$. A binary first-record retyping now proves that this linear amplitude is sufficient but not necessary: the alternative primitive release object is a source-selected quadratic curvature of the complete-fact occurrence rate, equivalently $D^2_{J_{cyc}} \Gamma_F$ or $D^2_{J_{cyc}} NR$. The RCCSJ positive history witness returns this curvature exactly, with stationary nonuniform coefficient 1/62 and full-cycle coefficient 2/31 multiplying $g_{cyc}^2 H_{CWY} \otimes I_2$, but its common gain remains an unselected existence-family parameter. Full AP1b therefore still does not pass physically, but its third gate is now a precise complete-fact-rate curvature test rather than an exclusive search for a partially written record amplitude, and its permanent failure would require rejecting the quadratic current-mark successor rather than normalising it by convention.

A second audit then executes the first of those gates, the common-parent ancestry AP1b-I, with the verdict **not yet proved**, and with a shortcut exactly ruled out. The Gate-2 spoke competition cost factorises as $Q_{comp} = (I + P)^T(I + P)$ over the C_6 shift P, with exact spectrum {0, 1, 1, 3, 3, 4} and one-dimensional kernel spanned by the alternating transport mode; adding the circulation penalty gives spectrum {0, 1, 1, 3, 3, 10} with the same kernel. The HMGBC canonical-wheel Fisher metric is positive definite with exact spectrum {3/31, 39/248, 45/248, 54/217, 12/31, 12/31}. Sylvester inertia excludes any invertible identification, and a stronger theorem excludes every faithful linear pullback of the wheel metric, indeed of any positive-definite compressed metric, because it would have to annihilate precisely the nontrivial alternating transport response Gate-2 is built to retain. The AP1b-I target is thereby sharpened to one named object: the source-returned full-carrier Jacobian L_λ into the local parent before Fisher compression, whose parent-Hessian pullback must reproduce the Gate-2 quadratic with a degenerate direction along the image of the alternating mode.

A further source-stack audit establishes that the current carrier itself is pre-physical-time. The MASD constitutive relation $D\_J(e) = J\_e − \kappa\_e (\rho\_t − U\_e \rho\_s)$ is defined entirely from oriented endpoint/transport data and contains no physical-time coordinate. At the neutral common background its zero-locus linearisation gives the Relative-Birth Current relation $\delta J = \kappa (\delta\rho\_t − \delta\rho\_s)$ in a common local frame. More strongly, the unavoidable current-cycle component lies in $\ker(B \otimes I_{49})$, so a nonzero pure cycle-current perturbation can obey $(B \otimes I_{49}) \delta J\_cyc = 0$ with no independent density update, and exactly 3/5 of the squared magnitude of the physical CRTF radial tangent lies in this irreducible cycle component. For non-static configurations, MASD continuity is written in the primitive refinement variable, $D\_T = \partial\_\sigma \rho + \partial U J$, *where the inherited refinement audit types σ as a substrate update/refinement parameter rather than an ordinary pre-existing physical time coordinate, and on the canonical reversible K = 7 branch the current-divergence and history/refinement constructions agree exactly:* $B C B^T = Q_7 = (1/31)$ $L(W_7)$. The independently derived temporal attaching theorem gives $T(\delta) = \delta a\_t/c\star$ for the Fold-opportunity parameter δ. If the source returns the remaining same-step relation $\sigma = s\_\sigma\delta\ \delta$ with $s\_\sigma\delta > 0$, the physical-time-normalised discrete current is forced to be $J\^(t) = s\_\sigma\delta (c\star/a\_t) J$ and the primitive continuity equation becomes $\Pi\ \partial\_t \rho + B J\^(t) = 0$, with $J\^(t) = (c\star/a\_t) J$ in the strict same-step case $\sigma = \delta$. This does not determine λ_J, since temporal coordinate conversion and physical history/Fisher pricing are differently typed operations, and it does not yet establish a Lorentz four-current; the remaining temporal-current obligations are the source derivation of the σ-to-δ bridge and the continuum pushforward proving the appropriate Lorentz transformation and covariant conservation law.

A binary first-record calculation then supplies an exact bridge between the positive current-cycle Fisher metric and the occurrence rate of complete facts. Writing $\Gamma\_F = −\log(1 − h\_F)$, the RCCSJ current-cycle law has $D\_(J\_cyc)\ \Gamma\_F |_0 = 0$ but $D^2\_(J\_cyc)\ \Gamma\_F |_0 \neq 0$. On the representation-resolved m = 2/4 sector, the stationary curvature is g_cyc^2 (1/62) $H\_CWY \otimes I_2$; the uniform sector contributes g_cyc^2 (3/62) $H\_CWY \otimes I_2$; and the full cycle contributes g_cyc^2 (2/31) $H\_CWY \otimes I_2$. This is exactly the RCCSJ marked Fisher metric, so the physical scale is retyped as a binary event-rate curvature. With $M_0 = K\_cyc\^(2)\ H\_CWY$ and $K\_cyc\^(2) =$ 0.212610974570295, canonical full-cycle matching yields the exact symbolic family $\lambda\_J = (2/(31\ K\_cyc\^(2)))\ g\_cyc^2$, numerically 0.303446843055259 g_cyc^2 at the inherited $K\_cyc\^(2)$. Positivity, D_6 covariance and the factor shape do not select g_cyc. Combining the earlier saturated first-birth matching equation with same-grain equality of the neutral and visible sector coefficients gives the conditional target $\lambda\_birth = 1/(3\kappa\_J^2)$, hence $\lambda\_J = 1/3$ at $\kappa\_J = 1$ only if the birth and current-cycle compensators and their history normalisations are proven identical, with implied $g\_cyc = \sqrt{(31\ K\_cyc\^(2)/6)} = 1.048088753532$ on that branch. That numerical value is not promoted.

The remaining physical gauge/current problem is therefore reduced to: (i) the three attachment gates, (ii) one common absolute magnitude/history scale, and (iii) the surviving Abelian closure portal. The paper does **not** derive the physical value of λ_J.

PART I: HAZARD RIGIDITY, QUADRATIC UNIQUENESS AND THE C/W/Y FACTOR THEOREM

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1. Programme Position

The current VERSF Standard-Model derivation is no longer blocked by the existence of the Standard-Model representation census, by the C/W/Y support directions, by the availability of an E_2 current tangent, or by the algebraic form of a candidate positive current metric. Those pieces have already been substantially reduced.

The present obstruction is narrower.

PMS-EX125 shows that a target-space operational metric cannot determine the physical current pullback without the current-to-operational-state derivative. PMS-EX126 sharpens the missing object to the primitive mark-score matrix

$S_J = (s_C^e, s_W^e, s_Y^e)$,

with

$\mathbf{M_{JJ}^{phys} = S_J \Lambda S_J^T}$

before any explicitly retained auxiliary shorting. The already-executed PFDMI current writer cannot return a pure common-radial magnitude score because it depends on the current only through its normalised ray.

Separately, the current-cycle programme establishes a six-dimensional $E_2 \otimes (C, W, Y)$ geometry and a quadratic marked construction with factor shape

$H_{CWY} = (1/49) \cdot [\ 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\ ]$,

but its absolute current-record strength remains one common open scale.

A recent Gate-2 matter-lift audit then reduced the most general source-symmetry-compatible positive matter operator from an arbitrary 49×49 positive matrix to the twelve-block form

$G_\partial = \Sigma_{A=1}^{12} g_A P_A,\ g_A > 0$,

where the P_A are the finest source-returned gauge × generation commitment projectors.

The questions addressed here are therefore:

Can the already-derived primitive commitment probability law itself eliminate the eleven relative coefficients g_A/g_B, and more, before any physical Standard-Model target is consulted? And can the remaining same-source attachment premise be turned from a verbal assumption into an exact, executable test?

The answer to both is yes. The first is proved conditional on the attachment premise; the second is executed, with the honest verdict that one leg of the test does not yet pass on the published stack.

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2. Claim Grades and Firewalls

The results of this paper are separated into four grades.

Grade G1: exact finite-dimensional and information-geometric mathematics

These statements are unconditional once the supplied dimensions, projectors and factor signatures are fixed. They include:

- global identifiability of relative sector gains;
- the functional hazard-rigidity theorem and the uniqueness of its common scalar;
- the rank-eleven selector Jacobian and one-dimensional common-gain kernel;
- the quadratic source-equivariant classification $G = \Sigma_A g_A P_A$;
- the exact C/W/Y factor-Gram calculation with its spectral data;
- the microscopic mark-refinement decomposition, its positive-semidefinite correction theorem, and the factor-blind equivalence;
- the effect-equivalence theorem $E_A = h_0 P_A$, the common-parent variation identity, the block-unitary transfer characterisation, and the exact current-ray factorisation of the attachment audit.

Grade G2: inherited VERSF source law

The RUDM source law is consumed at its existing declared grade. The twelve commitment projectors are exact on the frozen 49-complex-dimensional tangent, while the unresolved Fubini–Study preparation law remains conditional on the inherited full-refinement/isosymmetry premise. RUDM also closes the relative component hazards while leaving their common absolute scale open.

The shared-interface record-localisation line supplies an additional inherited fact: under the declared GSJB-16 premises, one primitive relational fact is written on one common interface token before later copying, and combining the primitive interface locations with the twelve internal projectors yields the corresponding component-resolved primitive mark carrier. This materially narrows the carrier-typing problem but does not by itself derive the Fold/Gate-2-to-tangent map.

The SGPL marked-transfer architecture and the HMGBC history parent are likewise consumed at their declared grades: the event-resolved primitive Kraus density $K_e = P_y P_{(r(e))} e^{(-a_t \hat{H}/2)} P_x$ and the parent $\hat{H} = -\hat{\Delta} + V_{loc} + \cdots$ with $\hat{T} = e^{(-a_t \hat{H})}$.

Grade G3: same-source attachment gate, now decomposed

The earlier single premise AP1 was first split into carrier and intensity halves; the attachment audit of Part II sharpens the intensity half into three exact gates.

AP1a (primitive carrier compatibility). The current/completion response relevant to this paper acts at the primitive shared-interface commitment stage, before post-copy proliferation, on the same component-resolved commitment carrier on which the twelve RUDM projectors classify primitive marks.

AP1a is **partly source supported** by the shared-interface record-localisation and twelve-projector results. It is not fully closed because the actual Fold/K_4-to-tangent intertwiner remains unreturned.

AP1b (intensity-descent identification). The Gate-2/raw-current positive quadratic response changes the same primitive component-resolved mark intensities $h_A(u \mid z, \rho)$ that enter the RUDM law, rather than defining a differently typed completion cost, later history weight, or post-copy maintenance observable.

AP1b is the load-bearing open source theorem. Part II **operationally reduces** it, within the adopted SGPL/HMGBC architecture, to a finite set of operator identities (Sections 26–27): common-parent ancestry (AP1b-I), mark-projector and realised-ray identity (AP1b-II), and a magnitude-bearing complete-fact event law (AP1b-III). A nonzero linear current-to-record amplitude is one sufficient realisation of the third gate, but the binary first-record audit of Part V shows it is not the only one: a source-selected nonzero quadratic curvature $D^2_{(J_{cyc})} \Gamma_F$, equivalently $D^2_{(J_{cyc})}$ NR, is enough. The linear-amplitude route fails on the currently published stack; the RCCSJ binary-curvature route passes only as a positive existence witness with free gain; and Part III proves AP1b-I is itself not yet closed, with the wheel-metric shortcut exactly ruled out and the required deeper object named. The hazard-rigidity and quadratic-uniqueness results are exact consequences **if AP1b holds**; the paper does not silently identify a completion cost with a probability or intensity, and Part II shows no such identification is needed even in principle.

For compactness, when later sections say "the same-grain attachment passes," they mean AP1a and AP1b (all three gates) together.

Grade G4: physical Standard-Model normalisation

The common absolute current-event strength, the source-derived microscopic history weighting, the physical value of λ_J, and the surviving Abelian closure portal remain open. The exact symbolic family $\lambda_J = (2/(31 K_{cyc}^{(2)})) g_{cyc}^2$, numerically $0.303446843055259\, g_{cyc}^2$ at the inherited $K_{cyc}^{(2)}$, is now available, but the completed primitive source still does not select g_{cyc}; $\lambda_J = 1/3$ is retained only as a same-event saturated-birth consistency target at unit current normalisation.

No measured Standard-Model coupling, CKM entry, mass, mixing angle or target matrix is used anywhere in the selector, factor-Gram derivation, or attachment audit.

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3. Inherited Twelve-Sector Commitment Geometry

The 49-complex-dimensional projective matter tangent decomposes into twelve inequivalent gauge × S_3 components:

Component	$\dim_{\mathbb{C}}$
e_R^{triv}	1
e_R^{std}	2
N_R^{std}	2
L_L^{triv}	2
L_L^{std}	4
H	2
d_R^{triv}	3
d_R^{std}	6
u_R^{triv}	3
u_R^{std}	6
Q_L^{triv}	6
Q_L^{std}	12

so that

$$\Sigma_{A=1}^{12} d_A = 49.$$

Write

$$w_A(z) = \|P_A z\|^2, \quad \Sigma_A w_A(z) = 1.$$

At the unresolved void, RUDM inherits the Fubini–Study law and therefore the exact Dirichlet disintegration

$(w_1, \ldots, w_{12}) \sim \mathrm{Dirichlet}(d_1, \ldots, d_{12})$.

Lemma 0 (almost-sure interior support)

Because every $d_A > 0$, the $\mathrm{Dirichlet}(d_1, \ldots, d_{12})$ law is absolutely continuous with respect to Lebesgue measure on the open simplex, and every face of the simplex has Lebesgue measure zero there. Hence

$w_A(z) > 0$ for every A, almost surely.

The source therefore supports strictly interior weight vectors with probability one, which is exactly the support condition consumed by the selector and rigidity theorems below. Moreover the Fubini–Study law has full support on the unit sphere of the carrier, a fact consumed by the effect-equivalence theorem of Part II. ■

The first-fact component probability is

$p_A = d_A / 49$.

After a component-resolved record ledger with counts n_A, the exact RUDM predictive law is

$p_A(\rho) = (d_A + n_A) / (49 + N)$, $N = \Sigma_A n_A$.

The relative hazard form is

$h_A(u \mid z, \rho) = h_0(u, \rho)\, w_A(z)$,

with the common absolute opportunity/hazard scale h_0 left open.

This separation between relative component law and common event scale is central below.

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4. The Representation-Resolved Gate-2 Matter Family

The scalar Gate-2 completion primitive determines an endpoint-label sum-square structure at its declared grade. Once the matter tangent is resolved by the twelve physical projectors, the general positive source-symmetry-compatible internal quadratic weighting can be written

$G_\partial = \Sigma_A g_A P_A$, $g_A > 0$.

The corresponding soft matter cost has the form

$$Q_\partial(z_t, z_s) = \langle z_t + U z_s, G_\partial (z_t + U z_s) \rangle$$

on the sum-square branch, or the corresponding sign-reversed form on the other branch.

Positivity implies that changing the g_A's does not alter the hard zero set when all $g_A > 0$. It does, however, alter the off-shell representation-resolved response.

Therefore the hard Gate-2 zero condition is insufficient to choose the g_A's. A probability-level selector is required.

RUDM supplies such a selector, and more, if the same-grain attachment holds.

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5. Twelve-Sector Source-Law Selector and Hazard-Rigidity Theorems

Theorem 1 (conditional twelve-sector gain collapse, single-ray form)

Assume the same-grain intensity-descent identification AP1b. Let the component-resolved primitive mark intensity be modified by positive constants g_A:

$$h_A^{(g)} = h_0 g_A w_A.$$

Then the conditional mark probability given that an event occurs is

$$q_g(A \mid z, \text{event}) = g_A w_A / \Sigma_B g_B w_B.$$

The RUDM source law requires

$$q(A \mid z, \text{event}) = w_A.$$

Let z be **any single ray** whose weight vector is strictly interior, $w_A(z) > 0$ for all A. Then

$$q_g(\cdot \mid z, \text{event}) = q(\cdot \mid z, \text{event})$$

if and only if

$$\mathbf{g_1 = g_2 = \cdots = g_{12}}.$$

By Lemma 0, source-supported rays are strictly interior almost surely, so the source law itself supplies the required test ray with probability one.

Proof

Set $q_g(A) = w_A$. Since $w_A > 0$, division gives

$$g_A / \Sigma_B\, g_B w_B = 1$$

for every A. The denominator is one scalar independent of A, so every g_A equals the same number g. Conversely, a common gain cancels from the conditional mark law. ■

Remark (global identifiability, not first-order identifiability)

Theorem 1 is exact, not a linearisation. The map from positive gain vectors modulo their common scale into conditional mark laws is injective on every interior ray. The rank-eleven Jacobian of Section 7 is only the infinitesimal shadow of this global statement.

Theorem 1A (functional primitive-hazard rigidity)

The constant-gain theorem can be strengthened to an arbitrary positive same-grain hazard family.

Fix opportunity variable u, record state ρ, and an interior component-weight vector

$$w = (w_1, \ldots, w_{12}),\ w_A > 0,\ \Sigma_A\, w_A = 1.$$

Let

$$\tilde{h}_A(u, w, \rho) > 0$$

be any measurable positive component-resolved primitive hazard family. Suppose its conditional mark law agrees with the RUDM source law:

$$\tilde{h}_A(u, w, \rho) / \Sigma_B\, \tilde{h}_B(u, w, \rho) = w_A$$

for every A, for source-almost-every interior w.

Then there exists one positive common scalar functional

$$c(u, w, \rho) > 0$$

such that

$$\boldsymbol{\tilde{h}_A(u, w, \rho) = c(u, w, \rho)\, w_A \text{ for all } A,}$$

for source-almost-every interior w. The functional c is unique, and it is exactly the total intensity: $c = \Sigma_B \tilde{h}_B$. Conversely, every hazard family of this form has exactly the RUDM conditional mark law.

Proof

Define $c(u, w, \rho) = \Sigma_B \tilde{h}_B(u, w, \rho)$. Multiplying the assumed conditional probability equation by this common denominator gives $\tilde{h}_A = c\, w_A$ for every A. Uniqueness is immediate: summing $\tilde{h}_A = c'\, w_A$ over A gives $c' = \Sigma_B \tilde{h}_B = c$. The converse follows by cancellation of c. ■

Corollary 1A.1 (infinite-dimensional relative rigidity)

At the RUDM primitive mark grain, the source law is not merely insensitive to one common multiplicative constant. It is rigid against **all representation-dependent positive hazard distortions**: the excluded class is infinite dimensional, containing every A-dependent function of the opportunity, weight and record variables.

The surviving freedom is exactly one common scalar functional

$c(u, w, \rho)$,

which may depend on common opportunity, state or record variables but may not carry an A-dependent distortion without changing the source mark probabilities.

If the same-grain physical hazards are continuous on the simplex interior, source-almost-everywhere equality under the full-support Dirichlet/Fubini–Study law extends to equality throughout the interior.

Corollary 1.1 (identity form up to common scale)

For the constant quadratic block family of Section 4, AP1b implies

$$\mathbf{G_\partial = g\, I_{49}}.$$

Thus the twelve-sector source law removes the eleven representation-anisotropic directions without assuming full U(49) invariance of the physical interaction: the selector operates directly on the already-resolved physical component alphabet and consumes only one interior ray rather than an invariance postulate over the whole unitary group. The functional theorem shows that this is the finite-dimensional shadow of a stronger rigidity: the relative component law itself is fixed.

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6. Marginal and Record-Conditioned Selector Theorems

The same conclusion follows without conditioning on a realised ray.

At first fact,

$p_A = d_A / 49$.

A gain-weighted model predicts

$p_A^{(g)} = g_A d_A / \Sigma_B g_B d_B$.

Because every $d_A > 0$, equality with the source law for all A again requires $g_A = g$. The marginal first-fact law alone is therefore already a complete selector.

The result also survives record conditioning, and in strengthened form: no accumulation of records is needed, and no ledger can hide a relative gain.

Theorem 2 (single-ledger selector)

Fix **any one** component-count ledger ρ with counts $n_A \geq 0$. The RUDM predictive law is

$p_A(\rho) = (d_A + n_A) / (49 + N)$.

If a gain-weighted law

$p_A^{(g)}(\rho) = g_A (d_A + n_A) / \Sigma_B g_B (d_B + n_B)$

agrees with the RUDM law for every A at this single ledger, then

$g_A = g$ for all A.

Proof

Since every $d_A \geq 1$, every effective count $d_A + n_A$ is strictly positive whatever the ledger, so the twelve predictive probabilities are strictly positive. The argument of Theorem 1 applies verbatim with w_A replaced by $(d_A + n_A)/(49 + N)$. ■

Hence record accumulation cannot hide a relative representation gain at any stage of the ledger: the empty ledger, every finite ledger, and every conditional law each separately enforce the collapse. Agreement "for every ledger" is sufficient but far more than necessary.

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7. Rank-Eleven Certificate

Parameterise

$g_A = e^{\gamma_A}$

around $g_A = 1$. The derivative of the first-fact probability vector is

$$J_g = \mathrm{diag}(p) - p\,p^T,\quad p_A = d_A / 49.$$

This is the covariance matrix of the twelve-category source law.

Lemma 3 (exact kernel)

For any strictly interior probability vector p,

$$\ker(\mathrm{diag}(p) - p\,p^T) = \mathrm{span}\{(1, 1, \ldots, 1)\}.$$

Proof

If $(\mathrm{diag}(p) - p\,p^T)\,v = 0$ then $p_A v_A = p_A (p \cdot v)$ for every A. Since $p_A > 0$, $v_A = p \cdot v$ is one constant for all A, so v is proportional to the all-ones vector. Conversely $(\mathrm{diag}(p) - p\,p^T)(1, \ldots, 1)^T = p - p = 0$. With twelve categories the rank is therefore exactly eleven. ■

The frozen execution confirms

rank J_g = 11, nullity J_g = 1,

with the null vector the common gain direction (1, 1, …, 1) at numerical alignment

1.000000000000000.

Thus every one of the eleven relative gain directions changes the source probability law to first order, and Lemma 3 shows this is forced by interiority alone, independent of the particular dimension vector.

For the deliberately nonuniform, target-blind positive gain vector of the frozen certificate, the first-fact probability changes by total variation

TV = 0.048501275510,

and across 20,000 Fubini–Study/Dirichlet rays the mean conditional-mark total variation is

0.047797636485.

The same gain vector changes one explicit record-conditioned predictive law by a nonzero total variation.

Reproducible independent diagnostic

Because the certificate's gain vector is internal to the frozen package, this paper carries one fully reproducible diagnostic with a declared gain. Take the canonical target-blind nonuniform choice $g_A = d_A$. The perturbed first-fact law is $p_A^{(g)} = d_A^2 / 303$, and the exact first-fact total variation against the source law is

$TV(g = d) = 1140/4949 = 0.230349565569$,

verified by direct rational arithmetic. A seeded Monte Carlo over 20,000 Dirichlet(d) rays (generator seed 0) gives mean conditional-mark total variation 0.232893 under the same gain. Both diagnostics confirm, with a gain vector any reader can reconstruct, that nonuniform gains are macroscopically visible to the source law. The same declared choice reappears in the attachment audit of Part II as a per-sector transfer attenuation, where it produces the identical exact total variation, so the two diagnostics cross-check one another.

These tests are diagnostics, not the proof. The proof is algebraic, global and now functional (Theorems 1, 1A and 2); the numerical executions verify that the frozen implementation realises the theorems with the expected rank, null space and sensitivity.

---

8. Quadratic Current-Response Uniqueness and Magnitude-Bearing Mark Scores

The rigidity theorems fix the relative representation law at the primitive mark grain but leave one common magnitude. We now classify the complete positive quadratic response class before writing the mark scores.

Theorem 4 (source-equivariant quadratic classification)

Let the 49-complex-dimensional matter/current carrier decompose into the twelve inequivalent irreducible commitment sectors

$$\mathscr{H} = \bigoplus_{A=1}^{12} \mathscr{H}_A, \quad P_A : \mathscr{H} \to \mathscr{H}_A.$$

Let

$$Q(J) = \langle J, G J \rangle$$

be a positive Hermitian quadratic functional that respects the source gauge × generation symmetry.

Because the twelve $\mathscr{H}$_A are inequivalent irreducible source components, equivariance eliminates cross-irrep blocks and Schur's lemma makes the restriction of G to each $\mathscr{H}$_A scalar. Therefore

$G = \Sigma$_A g_A P_A, g_A ≥ 0,

and

$Q(J) = \Sigma$_A g_A ‖P_A J‖^2.

If Q is strictly positive on every source sector, then g_A > 0 for every A. The decomposition is unique, because the P_A are the minimal central projections of the commutant of the source symmetry on $\mathscr{H}$, so the twelve scalars g_A are intrinsic to Q rather than a choice of presentation.

This classification is exact within the declared quadratic, source-equivariant class. No "minimality" prescription has been used.

Theorem 5 (unique positive quadratic same-grain current law up to common scale)

Assume AP1b: the sector contributions of the quadratic response enter the same primitive component-resolved mark intensities governed by RUDM.

Then Theorem 1, or equivalently Theorem 1A, forces

g_A = g for all A.

Hence

$G = g\, I_{49}$

and

$Q(J) = g\,$‖J‖^2.

Equivalently, the unique component-additive positive quadratic intensity family has the form

λ_A = λ_0 ‖P_A J‖^2,

with one common coefficient λ_0.

Thus the quadratic raw-current intensity used below is not merely the simplest admissible candidate. **Within the positive source-equivariant quadratic same-grain class, it is unique up to the one common magnitude.**

Physical factor perturbations

Let $F \in \{C, W, Y\}$. Define the support signature

$\chi_F(A) \in \{0, 1\}$

according to whether component A carries factor F.

A radial amplitude perturbation acts as

$P_A J \mapsto e^{(\varepsilon_F \chi_F(A))} P_A J.$

Therefore

$\lambda_A \mapsto e^{(2 \varepsilon_F \chi_F(A))} \lambda_A,$

and the primitive intensity score is

$\mathbf{s_{F,A} = \partial \log \lambda_A / \partial \varepsilon_F |_{(\varepsilon=0)} = 2 \chi_F(A).}$

This score is magnitude bearing. The common-radial change is not removed by projective normalisation because the total event intensity changes. It is precisely the information the existing projective PFDMI current writer discards, and it is why the present construction can supply a score support where that instrument cannot.

The resulting coarse score matrix is

$\mathbf{S_J^{coarse} = 2 \chi^T.}$

Lemma 5.1 (radial-coordinate convention invariance)

The factor of two reflects the choice of amplitude-log radial coordinate. Any smooth scalar reparameterisation of the common radial coordinate rescales every factor-score row by one common Jacobian factor at the reference point. It therefore multiplies the factor Gram by one positive scalar while leaving the factor shape, entry ratios, rank and eigenvectors unchanged.

No radial-coordinate convention can change the C/W/Y factor shape derived in Section 9. ■

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9. Exact C/W/Y Factor-Gram Closure and the Refinement Theorem

The twelve finest components carry the factor signatures

Class	(C, W, Y)
N_R	(0, 0, 0)
e_R	(0, 0, 1)
L_L / H	(0, 1, 1)
d_R / u_R	(1, 0, 1)
Q_L	(1, 1, 1)

Weighting the twelve finest components by their exact first-fact source probabilities $d_A/49$ gives

$$H_{CWY} = \Sigma_A (d_A/49)\, \chi(A)\, \chi(A)^T.$$

Direct evaluation returns

$49\, H_{CWY} = [\, 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\,]$

and therefore

$H_{CWY} = (1/49) \cdot [\, 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\,].$

Each integer entry is an exact representation count: the diagonal entries 36, 26 and 47 are the total complex dimensions carrying C, W and Y respectively, and each off-diagonal entry is the total dimension carrying both factors, so (C, W) = $\dim(Q_L)$ = 18, while (C, Y) = 36 and (W, Y) = 26 because every coloured and every weak component is hypercharged.

This is exactly the factor matrix previously obtained from two structurally distinct constructions:

1. the unavoidable representation-resolved MASD current-cycle geometry; and
2. the quadratic terminal-Born current-to-terminal construction.

The equality is structural. No downstream Standard-Model target enters it.

Exact spectral data

The integer Gram is positive definite, with leading principal minors

36, 612, 4428,

all strictly positive, trace 109 and determinant 4428. Positive definiteness means the three factor directions are informationally independent at event grain: no linear combination of C, W and Y radial perturbations is invisible to the realised-event marked-rate law.

Using the amplitude-log scores $s_{F,A} = 2\,\chi_F(A)$, the primitive marked-rate intensity-score Gram, the factor information per unit realised-event rate, is

$$M_{JJ}^{event} = S_J^{coarse}\,\mathrm{diag}(p_A)\,(S_J^{coarse})^T = 4\,H_{CWY}.$$

Hence

$$\mathbf{M_{JJ}^{event} = (4/49) \cdot [\ 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\ ].}$$

The machine residual against the exact matrix is

$$\mathbf{1.132 \times 10^{-15},}$$

and this paper independently reconstructs the matrix from the component ledger with exact integer arithmetic, so the residual is a floating-point artefact of the frozen package only. Its eigenvalues are

$$\mathbf{(0.314682300680,\ 1.010864036230,\ 7.572412846763),}$$

reverified to fifteen digits from the exact rational matrix. The equal-factor unit direction

$$f = (1, 1, 1)^T / \sqrt{3}$$

has marked-rate precision

$$\mathbf{f^T\, M_{JJ}^{event}\, f = 1076/147 = 7.319727891156,}$$

stated exactly: $f^T\,(49\,H_{CWY})\,f$ is one third of the total entry sum 269, and the amplitude-log factor four gives $4 \cdot 269/147 = 1076/147$.

The overall factor four is not a new physical number. It is the universal conversion between the chosen amplitude-log radial coordinate and an intensity-log coordinate (Lemma 5.1). The physically relevant result here is the **factor shape and relative overlap structure**, not the common scalar normalisation.

Typing note (uncentred rate Gram versus conditional-mark Fisher matrix)

M_{JJ}^{event} is an **uncentred intensity-score Gram of the realised-event rate process**. It is not the Fisher matrix of the conditional categorical mark distribution q_A. For the latter, the score must be centred because the probabilities sum to one:

$$s_{F,A}^{cond} = 2\,(\,\chi_F(A) - \mu_F\,),\quad \mu = (1/49)\,(36, 26, 47)^T,$$

where μ_F is the p-mean of the factor signature, so the conditional-mark Fisher matrix is

$$\mathbf{F_{mark} = 4 \, (H_{CWY} - \mu \, \mu^T),}$$

with the exact centred matrix

$$H_{CWY} - \mu \, \mu^T = (1/2401) \cdot [\, 468 \; -54 \; 72 \, ; \, -54 \; 598 \; 52 \, ; \, 72 \; 52 \; 94 \,]$$

and equal-factor conditional-mark precision

$$f^T F_{mark} \, f = 5200/7203 = 0.721921421630,$$

not 1076/147. The two objects answer different questions. The uncentred Gram is the physically relevant one here because, as Section 35 makes precise, a change in the **total occurrence rate is itself physical information** in the binary event-rate/waiting-rate process; conditioning it away is exactly what the projective PFDMI writer does and exactly what a magnitude-bearing law must not do. The centred matrix F_{mark} is what an instrument restricted to the conditional mark alphabet could at most recover. Both are stated so the typing can never be silently conflated.

Theorem 6 (microscopic mark-refinement decomposition)

The event-grain factor matrix above is computed on the twelve coarse primitive commitment components. We now ask whether a finer microscopic realised-event mark alphabet can alter it.

Let coarse component A split into microscopic marks (A, α) with intensities

$$\lambda_{A\alpha} = \lambda_A \, r_{A\alpha}, \quad r_{A\alpha} \geq 0, \quad \Sigma_\alpha \, r_{A\alpha} = 1.$$

Let

$$s_{F,A} = \partial_F \log \lambda_A$$

be the coarse factor score and define the refinement score

$$u_{F,A\alpha} = \partial_F \log r_{A\alpha}.$$

Then

$$s_{F,A\alpha} = s_{F,A} + u_{F,A\alpha}.$$

Because $\Sigma_\alpha \, r_{A\alpha} = 1$,

$$\Sigma_\alpha \, r_{A\alpha} \, u_{F,A\alpha} = \Sigma_\alpha \, \partial_F \, r_{A\alpha} = 0.$$

Therefore the microscopic marked-rate information matrix decomposes exactly as

$M_{FG}^{micro} = M_{FG}^{coarse} + \Sigma_A \lambda_A I_{FG}^{ref}(A)$,

where

$I_{FG}^{ref}(A) = \Sigma_\alpha r_{A\alpha} u_{F,A\alpha} u_{G,A\alpha}$

is the conditional Fisher matrix of the microscopic splitting inside component A.

Each $I^{ref}(A)$ is positive semidefinite. The decomposition is the exact chain rule of Fisher information for the two-stage mark (A, α): total information equals coarse information plus the intensity-weighted conditional information of the splitting.

Corollary 6.1 (factor-blind refinement equivalence)

The following are equivalent for a refinement family that is smooth in the factor parameters:

1. the microscopic splitting is factor-radial blind on supported marks: $\partial_F r_{A\alpha} = 0$ for every F and every (A, α) with $\lambda_A r_{A\alpha} > 0$;
2. $I^{ref}(A) = 0$ for every supported A;
3. **$M^{micro} = M^{coarse}$.**

That (1) implies (2) implies (3) is immediate from the decomposition. Conversely, if $M^{micro} = M^{coarse}$ then $\Sigma_A \lambda_A I^{ref}(A) = 0$; each term is positive semidefinite, so every supported $I^{ref}(A)$ vanishes, and a vanishing conditional Fisher matrix forces $u_{F,A\alpha} = 0$ on the support of r_A, that is, factor blindness. ■

Thus any deterministic copying, bookkeeping refinement or factor-blind subdivision of a primitive mark leaves the C/W/Y factor Gram exactly unchanged, and **nothing else does**: invariance of the Gram is not merely a sufficient-condition safe harbour but a complete characterisation.

Corollary 6.2 (factor-sensitive refinement can only add information)

If the refinement is factor sensitive, then

$M^{micro} - M^{coarse} \geq 0$.

The coarse factor matrix is therefore not arbitrarily deformable by microscopic refinement. A change in shape must be traced to a **specific factor-sensitive microscopic splitting mechanism**, and its contribution is an explicit positive-semidefinite conditional Fisher term. In particular no refinement, however constructed, can reduce any factor direction's information or rotate information out of the coarse Gram.

This theorem materially narrows the coarse-to-microscopic caveat in PMS-EX126. It also fits the inherited shared-interface record-localisation result: downstream deterministic copying of one primitive record cannot alter the primitive factor Gram unless the copy process itself acquires new factor-sensitive physics.

---

10. Triple Convergence of the Factor Shape

The present result produces a useful convergence which did not exist at the beginning of the current-normalisation programme.

The same matrix

$H_{CWY} = (1/49) \cdot [\ 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\ ]$

now appears from three conceptually different routes.

Route A: representation/current action geometry

The unavoidable cycle part of the physical current tangent carries the exact C/W/Y support geometry and yields the same uncentred factor Gram.

Route B: quadratic terminal-Born successor

The minimal positive terminal-resolved quadratic current intensity yields the same factor matrix when the invariant terminal populations are used.

Route C: primitive commitment-mark score law

The present twelve-sector RUDM rigidity plus the unique quadratic magnitude-bearing current intensity yields the same matrix directly from the source component alphabet and mark-score support.

The three routes consume different corpus inputs: Route A consumes the current-cycle geometry, Route B the terminal populations, Route C only the commitment ledger and the quadratic intensity law. Their agreement is therefore not a single calculation repeated three times; it is one integer matrix reached from three distinct places in the source architecture. And Route C now carries a uniqueness theorem rather than a minimality choice: within its declared class there was no other quadratic law whose Gram could have been computed.

These routes do not yet prove the physical common scale. They do, however, make the relative factor orientation substantially harder to regard as an arbitrary modelling choice.

The remaining freedom is scalar at this grade.

---

11. Relation to M_JJ^phys and the Existing Standard-Model Chain

PMS-EX126 gives the physical architecture

$M\_JJ\text{^}phys = S\_J\ \Lambda\ S\_J^T$.

The present paper supplies, under the positive quadratic same-grain theorem, the coarse primitive score support

$S\_J\text{^}coarse = 2\ \chi^T$.

Theorem 6 then proves that a microscopic refinement preserves the corresponding factor Gram exactly if and only if it is factor blind, while a factor-sensitive refinement must enter as a named positive-semidefinite correction.

The physical history metric still requires the correct history-weighted primitive intensity measure, the microscopic mark descent, the absolute common event scale, and the physical two-quadrature spatial weighting.

Corollary 6.3 (direct current-metric reduction)

Assume:

1. AP1a and AP1b;
2. the microscopic mark refinement is factor blind at the retained quadratic order, or its factor-sensitive correction is separately derived and shown absent;
3. the two E_2 quadratures are related by the required D_6 covariance;
4. the history weighting of the factor scores is common across C/W/Y at the retained grain.

Then all remaining direct current-metric freedom is scalar and

$M\_JJ\text{^}direct = \Lambda\_common \cdot H\_CWY \otimes I_2$,

up to the universal radial-coordinate convention.

This is the strongest direct result that follows from the present source law alone. It does not determine Λ_common.

Corollary 6.4 (handoff to the inherited current-cycle normalisation)

The independently derived current-cycle/terminal-Born continuation supplies the spatial factor

$K\_cyc^{(2)} = 0.212610974570295$

and defines

$M_0 = K\_cyc^{(2)}\ H\_CWY = [\ 0.156203981317\ 0.078101990658\ 0.156203981317\ ;\ 0.078101990658\ 0.112813986507\ 0.112813986507\ ;\ 0.156203981317\ 0.112813986507\ 0.203932975608\ ]$,

each entry verified here as $K\_cyc^{(2)} \cdot (49\ H\_CWY)\_FG / 49$ to better than 5×10^{-13}.

Within that inherited quadratic continuation, all universal radial-coordinate and history-normalisation factors can be absorbed into one nonnegative source coefficient λ_J, giving

$$\mathbf{M\_JJ^{quad} = \lambda\_J\ M_0 \otimes I_2.}$$

The present paper therefore supplies a source-level explanation for why the **relative C/W/Y factor freedom has collapsed before λ_J is fixed**.

For

$f = (1, 1, 1)^T / \sqrt{3}$,

the inherited direct axle precision remains

$$\mathbf{f^T\ M_0\ f = 0.389063620132,}$$

with the exact form $f^T\ M_0\ f = K\_cyc^{(2)} \cdot 269/147$, since $f^T\ H\_CWY\ f = 269/147$ exactly.

No part of this corollary sets $\lambda\_J = 1$, derives the physical history scale, or licenses the canonical wheel magnitude as physical. It merely makes explicit how RCHS-1 hands its factor-rigidity result into the already-reduced Standard-Model current chain.

The current paper therefore changes the outstanding problem from a representation-dependent matrix choice to the derivation of one common source scale and the surviving Abelian shorting.

---

12. The Common-Scale Boundary

The rigidity theorems deliberately leave one common gain g, and in the functional case one common scalar functional c.

That is not a defect of the proof. It is exactly what a conditional mark distribution cannot see.

If

$h_A = h_0\, g\, w_A,$

then g can be absorbed into the common absolute event rate. All conditional component probabilities remain unchanged. Lemma 3 records the same fact infinitesimally: the common-gain direction is the entire kernel of the selector Jacobian, so the invisibility of g is exact, structural, and confined to precisely one dimension. Theorem 1A records it functionally: the surviving object $c(u, w, \rho)$ is a full scalar functional, but it is common to all twelve components. The attachment audit of Part II then exhibits this surviving functional concretely: a scalar cost in the common Euclidean parent produces exactly $c = h_0 e^{(-a_t Q)}$, and a current magnitude entering through the realised ray produces exactly $c = \lambda_0 r^2$.

This is consistent with the RUDM result that relative component hazards close while the common absolute hazard remains open.

Therefore

RUDM selects representation ratios, not the absolute current-event clock/intensity scale.

The remaining absolute current-normalisation problem is no longer twelve-dimensional, and no longer infinite dimensional in the relative directions. It is one common scalar functional at this grain.

---

13. Why This Is Not Yet a Derivation of λ_J

It would be tempting to identify the common event scale surviving hazard rigidity with the λ_J multiplying the inherited terminal-Born/current-cycle metric. That step is not licensed.

The remaining chain contains distinct source obligations:

primitive Fold / Gate-2 response ↓ component-resolved RUDM primitive marks ↓ microscopic realised-event current/terminal law ↓ history-weighted M_{JJ}^{phys}.

AP1a concerns the first carrier-level attachment. Existing shared-interface work partly supports the primitive carrier typing, but the actual Fold/K_4-to-tangent intertwiner remains open.

AP1b is sharper and more important: it requires the Gate-2/raw-current quadratic response to modulate the **same RUDM primitive mark intensities** rather than a differently typed cost or later history observable. Part II operationally reduces AP1b to three exact operator gates within the SGPL/HMGBC architecture and shows the magnitude gate does not yet pass on the published stack.

Theorem 6 then controls the coarse-to-microscopic mark refinement. Factor-blind refinement is exactly harmless, and only factor-blind refinement is; factor-sensitive refinement must be explicitly derived and contributes a positive-semidefinite Fisher correction.

Finally, the common absolute event/history scale remains invisible to conditional mark probabilities and must be returned by the primitive transfer/history law.

Until these obligations are closed,

λ_J remains open.

What this paper does establish is that the missing λ_J is no longer hiding eleven independent representation coefficients, nor any representation-dependent hazard function, at the same primitive mark grain.

---

14. Same-Source Attachment Dichotomy

The paper yields a sharper falsifiable dichotomy than the earlier single-premise version.

Branch A: AP1a and AP1b pass

If the primitive carrier match is established and the Gate-2/raw-current quadratic response is proven to feed the RUDM primitive component-mark intensities, then the functional hazard-rigidity theorem applies.

The complete positive quadratic source-equivariant current law collapses to

$G = g\, I_{49},\ Q(J) = g\, \|J\|^2.$

The representation-normalisation problem has then collapsed to one common magnitude, with the C/W/Y factor score support fixed.

Branch B: carrier compatibility survives but AP1b fails

If the relevant objects live on the same primitive carrier but Gate-2 cost is not the source of the RUDM mark intensities, then RUDM does not determine the Gate-2 soft-cost coefficients.

However, Gate-2 soft cost also cannot be used as the missing physical current-to-mark law. The gauge/current programme must then seek a different magnitude-bearing primitive intensity map, and Theorem 1A still constrains whatever positive same-grain intensity family that search produces.

Branch C: AP1a itself fails

If the Gate-2/raw-current response is shown to live on a different primitive carrier or event grain from the RUDM component marks, the present rigidity remains valid for RUDM but cannot be promoted to a theorem about the Gate-2 matter operator.

Again, this does not restore eleven useful gauge-normalisation parameters. It removes the Gate-2 route from the mark-normalisation chain.

Thus every outcome is informative:

pass ⇒ relative current law fixed; fail ⇒ incorrect source route excluded.

No branch licenses fitting the eleven relative coefficients to Standard-Model data. Part II turns the pass conditions of Branch A into concrete operator identities and records exactly which of them the published stack already meets.

---

15. Why the Existing Block-Fold RG Does Not Replace This Result

The primitive-source uniqueness audit proves that the previously used minimal Fold action is underselected. In addition to the separate σ and ω nearest-neighbour terms, a mixed invariant

$J_{\sigma\omega}\ (1 - \sigma_i\sigma_j)(1 - \omega_i\omega_j)$

is allowed and changes physical outcome distributions.

The same audit also identifies higher Wilson harmonics and nonlinear completion-amplitude counterfamilies. Therefore a genuine whole-action uniqueness theorem requires an enlarged block-Fold RG basis.

The published block-Fold calculation predates that audit and uses the older truncated action. It is useful as an RG prototype but cannot be invoked to set the additional couplings to zero by derivation.

The present paper therefore does not manufacture a twelve-sector RG flow.

Instead, it uses an already-derived primitive probability law to eliminate the eleven relative matter gains, and every representation-dependent hazard distortion, **at the mark grain where that law has authority**.

An enlarged action-level RG remains relevant to whole-action uniqueness and to the common scale, but it is no longer needed merely to choose the eleven ratios g_A/g_B if the same-grain attachment passes.

16. Relation to the Hard Gate-2 Matter Sign

A later current audit warns that the hard internal Gate-2 sign should not be used as a physical normalisation theorem because the source does not yet select the internal orientation action.

The present paper does not depend on selecting

$z\_t = -U z\_s$.

The twelve-sector rigidity is probability based and operates on component weights and primitive mark intensities.

Therefore the central results

$g_1 = \cdots = g_{12}$ and $\tilde{h}\_A = c\ w\_A$

survive even if the hard Gate-2-to-matter sign remains unselected.

This separates two questions that had previously been entangled:

1. **relative internal orientation/sign**, and
2. **relative representation-resolved magnitude weighting.**

The present paper addresses the second.

17. Falsifiers

The following observations would invalidate or downgrade the physical use of the paper's strongest conclusions.

F1: primitive carrier mismatch

If the Gate-2/raw-current response is proven to act on a different primitive carrier or event grain from the component-resolved RUDM marks, AP1a fails. The RUDM hazard-rigidity theorem remains mathematically true but cannot be used to derive the Gate-2 matter operator.

F2: intensity-descent mismatch

If the Gate-2/raw-current response is a completion cost or later history observable that does not modulate the RUDM primitive mark intensities, AP1b fails. The quadratic uniqueness theorem then cannot be promoted to the physical current-mark law. Part II sharpens this falsifier into the failure of specific operator identities.

F3: source component law incomplete

If the true primitive source modifies

$h\_A \propto w\_A$

by additional representation-dependent coefficients at the same primitive event, the RUDM source law consumed here was incomplete. Such coefficients must be independently source derived; they may not be inserted to repair a desired gauge metric.

F4: quadratic class insufficient

If the leading magnitude-bearing primitive current response is not quadratic, or if the physical source permits non-Hermitian or nonpositive same-order structures outside the classification of Theorem 4, the quadratic uniqueness theorem is not the complete physical classification.

The functional hazard-rigidity theorem still constrains any resulting positive same-grain mark intensities.

F5: microscopic refinement is factor sensitive

If the primitive microscopic mark alphabet has factor-sensitive splitting probabilities,

$\partial\_F \ r\_A\alpha \neq 0,$

then the coarse factor Gram is not the final metric. Theorem 6 requires an explicit positive-semidefinite refinement Fisher term, and Corollary 6.1 guarantees the term is nonzero in this case. A claimed distortion without such a mechanism is not source licensed.

F6: history weighting is factor dependent

If the physical history law supplies source-derived C/W/Y-dependent temporal weights after the primitive mark stage, the final history metric need not be a scalar multiple of the event-grain factor Gram. The weighting mechanism must be named and computed.

F7: E_2 quadrature anisotropy

The physical two-quadrature current metric must satisfy the required D_6 covariance. A source-derived mismatch between the two E_2 quadratures falsifies the separable

$H\_CWY \otimes I_2$

continuation.

F8: common-scale derivation disagrees with the quadratic continuation

If the source-derived absolute event/history scale produces a current metric whose factor shape is not the present H_CWY after all named refinement corrections are included, then at least one of AP1b, the quadratic response class, or the inherited terminal-Born/current-cycle continuation is incomplete.

This is a genuine falsifier. The present paper does not define success as reproducing the previously preferred matrix at any cost.

F9: primitive effects are not projector effects

If the physical primitive instrument's coarse component effects, computed from the source-derived parent transfer, fail the operator identity $E\_A = h_0 P\_A$ of Part II on the primitive carrier, then either the RUDM law or the claimed same-grain attachment is wrong at operator level. This falsifier is decidable by a finite computation once the physical parent is returned.

F10: no magnitude-bearing complete-fact trigger exists

If the completed source stack returns neither a nonzero current-to-record derivative $D\_(J\_cyc)$ $\mathcal{K}\_A$ nor an equivalent nonzero quadratic complete-fact curvature $D^2\_(J\_cyc)$ Γ_F or $D^2\_(J\_cyc)$ NR on the full representation-resolved carrier, then the quadratic current-mark successor must be rejected rather than normalised by convention, and the magnitude route of this paper terminates. The RCCSJ/BCTR-2 existence witness does not defeat this falsifier unless the primitive source selects its gain.

F11: parent-Hessian degeneracy mismatch

If the source-derived local parent Hessian H_loc is strictly positive definite on the image of every admissible spoke map, then by Corollary 32.1 no faithful Gate-2 pullback exists, the alternating transport mode cannot be both nontrivial and cost free in the parent, and AP1b-I fails permanently for the Gate-2 route.

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18. What Has Moved Forward

Before this calculation the Gate-2/current matter normalisation could be represented as

$(g_1, \ldots, g_{12})$

plus an absolute event scale.

The constant-gain theorem reduced this to

$g \cdot (1, \ldots, 1)$.

The functional hazard-rigidity theorem goes further. At the same primitive RUDM mark grain, a completely general positive component hazard family must have the form

$$\tilde{h}_A = c\, w_A,$$

with one common scalar functional c. Thus the source law removes an **infinite-dimensional class of representation-dependent relative distortions**, not merely eleven constants, and it does so globally: one interior ray or one record ledger already excludes every non-uniform alternative, so no refinement of the statistics can reopen the freedom without contradicting the source law itself.

Within the positive quadratic source-equivariant class, Theorems 4 and 5 then give

$$Q(J) = g\, \|J\|^2,$$

so the quadratic current response is unique up to the common magnitude rather than merely "minimal."

Before this paper PMS-EX126 specified

$$M_{JJ} = S_J\, \Lambda\, S_J^T$$

while the magnitude-bearing score support remained abstract. The quadratic primitive mark law now gives

$$s_{F,A} = 2\, \chi_F(A)$$

and reproduces the independently derived C/W/Y factor matrix in exact integer arithmetic.

The microscopic-refinement theorem then removes another loophole, and removes it exactly: factor-blind splitting or deterministic copying cannot change that Gram, nothing except factor-blind splitting leaves it unchanged, and any factor-sensitive refinement must add an explicit positive-semidefinite conditional Fisher correction.

The attachment audit of Part II moves the last verbal assumption onto operator ground. AP1b is no longer a "cost feeds probability" principle: it requires the finite effect test $E_A = h_0 P_A$ together with a source-selected magnitude-bearing complete-fact law. A linear current-to-record amplitude is one sufficient factorisation, but the binary audit shows that a quadratic curvature of Γ_F or NR is the more primitive release object. The common-parent mechanism replaces any cost-to-probability axiom, the scalar-cost and current-ray computations exhibit the surviving common functional concretely, the published linear-amplitude failure is retained as a precise negative, and the RCCSJ curvature result is graded correctly as a positive existence witness rather than a physical source return.

The binary first-record calculation then gives the common scale an exact one-parameter form. The full positive current-cycle curvature is $g_{cyc}^2 (2/31) H_{CWY} \otimes I_2$, so the inherited current-cycle convention gives the exact symbolic relation $\lambda_J = (2/(31 K_{cyc}^{(2)})) g_{cyc}^2$, numerically $0.30344684305525943 g_{cyc}^2$. A same-event saturated first-birth identification collapses conditionally to $\lambda_J = 1/3$ at unit current normalisation, but the required source identity is not yet proved.

The outstanding problem has therefore changed from

"Which representation-resolved current metric should be chosen?"

to

"Does the primitive source return the three attachment identities, and what common absolute event/history scale does it return?"

That is both smaller and more falsifiable.

Within the inherited current-cycle continuation, the direct gauge/current metric is consequently reduced to

$$M_{JJ}^{quad} = \lambda_J M_0 \otimes I_2,$$

with the complete relative factor matrix M_0 already fixed and only the common source coefficient λ_J left before the surviving Abelian portal.

PART II: THE AP1b COMMON-PARENT ATTACHMENT AND MAGNITUDE-BEARING EVENT-LAW AUDIT

Question. Can the current VERSF source stack prove that the Gate-2/raw-current response feeds the same primitive component-resolved event intensities as RUDM?

Verdict. Common-parent attachment criterion: exactly derived. Full AP1b: not yet proved. Linear-amplitude realisation: negative on the published stack. Binary-curvature realisation: positive existence witness, with the physical source coefficient still open.

The audit nevertheless reduces the open statement to a small set of exact operator equalities, so AP1b stops being a philosophical premise and becomes a finite computation.

---

19. RUDM as a Primitive Event-Effect Identity

Let the 49-complex-dimensional internal commitment carrier be $\mathscr{H}$, with exhaustive mutually orthogonal projectors

$$\Sigma_{A=1}^{12} P_A = I_{\mathscr{H}}.$$

For a fixed primitive opportunity and record state, let $E_A \succeq 0$ be the coarse primitive event effect for component A. The event intensity on a unit ray z is

$$h_A(z) = \langle z, E_A z \rangle.$$

RUDM requires

$$h_A(z) = h_0 \|P_A z\|^2$$

for every source-supported ray, with one common h_0.

Theorem A (RUDM effect-equivalence theorem)

For a full-support set of rays,

$$\mathbf{h_A(z) = h_0 \|P_A z\|^2 \text{ for all } z \Leftrightarrow E_A = h_0 P_A \text{ for all } A.}$$

Proof

The forward implication follows because

$$\langle z, (E_A - h_0 P_A) z \rangle = 0$$

for every z, and the complex polarization identity gives $E_A - h_0 P_A = 0$. The converse is immediate. ■

Remark (source-almost-everywhere suffices)

The hypothesis need not hold on literally every ray. If the quadratic-form equality holds on a set of rays of full Fubini–Study measure, that set is dense in the unit sphere because the Fubini–Study law has full support (Lemma 0); the map $z \mapsto \langle z, (E_A - h_0 P_A) z \rangle$ is continuous, so it vanishes on the whole sphere, and polarization applies as before. The effect identity is therefore forced by exactly the support the source law itself guarantees, with no extra regularity assumption.

Summing over A,

$$\boldsymbol{\Sigma_A E_A = h_0 I_{\mathscr{H}}}.$$

Thus AP1b can be tested at operator level: the physical primitive instrument must coarse-grain to the RUDM projector effects with one common multiplier. This is falsifier F9.

---

20. SGPL Gives the Correct Common-Parent Architecture

SGPL writes the event-resolved primitive Kraus density as

$$K_e(y, x) = P_y P_{(r(e))} e^{(-a_t \hat{H}/2)} P_x.$$

For the component-A coarse event, define

$$E_A^{SGPL} = \int_{(r(e)=A)} \int K_e(y, x)^\dagger K_e(y, x) \nu(dy, de).$$

Therefore the same physical parent $\hat{H}$ determines the primitive event effects.

Theorem B (common-parent attachment theorem)

If the Gate-2/raw-current source response is a term in the **same** parent generator $\hat{H}$ used in the SGPL primitive Kraus density, its variation necessarily changes the same primitive event effects E_A^{SGPL}. For

$$\hat{H}(\varepsilon) = \hat{H}_0 + \varepsilon \dot{H} + O(\varepsilon^2),$$

Duhamel differentiation of $U = e^{(-a_t \hat{H}/2)}$ gives

$$\dot{U} = -(a_t/2) \int_0^1 e^{(-(1-s) a_t \hat{H}_0/2)} \dot{H} e^{(-s a_t \hat{H}_0/2)} ds,$$

and hence

$$\boldsymbol{\dot{E}_A = \int (\dot{K}_e^\dagger K_e + K_e^\dagger \dot{K}_e) d\nu}.$$

No separate "cost = probability" axiom is needed. A source cost feeds primitive event probabilities by entering the common parent transfer, not by being identified directly with a Born probability. ■

This also resolves the earlier semantic problem that a Gate-2 completion cost vanishes at exact completion. If a scalar cost Q enters the Euclidean parent, its transfer factor is

$e^{(-a_t Q/2)}$,

so $Q = 0$ gives unit transfer weight, not zero event probability. A vanishing cost is the least suppressed transfer, exactly as completion semantics require.

---

21. Exact Operator Criterion for Reproducing the RUDM Law

In the simplest internally closed form, after exhaustive next-state coarse-graining the SGPL effect is

$E_A = U^\dagger P_A U.$

Then Theorem A gives

$\mathbf{U^\dagger P_A U = h_0 P_A}$ **for all A.**

Summing over A,

$U^\dagger U = h_0 I.$

Hence

$U = \sqrt{h_0} \cdot V$

with V an isometry, and the individual projector identities imply

$V^\dagger P_A V = P_A.$

On a finite equal input/output carrier, V is unitary, and $V^\dagger P_A V = P_A$ for a unitary is equivalent to

$\mathbf{[V, P_A] = 0}$ **for all A,**

that is, V lies in the block-diagonal group $\bigoplus_A U(d_A)$: the commutant of the projector algebra. This dovetails exactly with Theorem 4: the admissible transfer, like the admissible quadratic response, must respect the twelve-sector commutant structure, and the only new freedom the transfer adds is the common norm.

Therefore

RUDM primitive relative hazards ⟺ common transfer norm + commitment-projector preservation.

For a positive Euclidean internal transfer $U = e^{-a_t H_{int}/2}$, the criterion reduces further: a positive operator that is a scalar multiple of a sector-preserving unitary must be that scalar times the identity, so

$$\mathbf{H_{int} = q\, I_{\mathscr{H}}},$$

an internally scalar generator, up to degrees of freedom external to the twelve-component internal carrier.

---

22. Scalar Gate-2 Cost Can Feed the Same Event Law Only as a Common Multiplier

Suppose a Gate-2/completion cost Q is established as a scalar local term in the same parent generator,

$$\hat{H} = \hat{H}_0 + Q\, I_{\mathscr{H}}.$$

Then

$$U = e^{-a_t Q/2}\, U_0$$

and

$$E_A = e^{-a_t Q}\, E_{(A,0)}.$$

If the baseline effects are RUDM,

$$E_{(A,0)} = h_0\, P_A,$$

then

$$\mathbf{E_A = \left(h_0\, e^{-a_t Q} \right) P_A.}$$

The conditional component law is unchanged. Thus a scalar Gate-2 cost can feed the same primitive RUDM event process, but only through the common opportunity/intensity scale.

This is precisely the surviving freedom of Theorem 1A made concrete: the common scalar functional is realised as

$c = h_0 e^{(-a_t Q)}$,

a legitimate dependence on common opportunity/state variables with no A-dependent distortion. The rigidity theorem and the common-parent mechanism therefore fit together without residue: everything a scalar cost can do lands exactly in the one dimension the source law leaves open.

---

23. Exact Current-Ray Factorisation

Let

$J = r\, z_J,\ r = \|J\|,\ \|z_J\| = 1.$

For the quadratic current component law,

$\lambda_A = \lambda_0 \|P_A J\|^2,$

one has identically

$\boldsymbol{\lambda_A = \lambda_0 r^2 \|P_A z_J\|^2.}$

Therefore, if the RUDM directing ray is the same realised ray as the normalised current direction,

$z = z_J,$

the quadratic current law has exactly the RUDM form

$\boldsymbol{h_A = h_0 \|P_A z\|^2,\ h_0 = \lambda_0 r^2.}$

The current magnitude then enters the event law precisely as the common clock/intensity scale of Section 12, and the relative law is automatic. This is the second concrete realisation of the surviving scalar functional: $c = \lambda_0 r^2$.

The remaining issue is source identity: the earlier Primitive Birth-Current Tangent Identity proves this ray equality only conditional on the GSJB birth mark being the same endpoint innovation entering MASD.

---

24. Binary Commitment Retypes the Magnitude-Bearing Gate

There are three distinct magnitude mechanisms, and they must not be conflated.

A scalar local cost in a Euclidean parent gives a common transfer factor such as

$e^{(-a_t Q(J))}$.

If $Q(J) = g \|J\|^2$ enters only as a scalar Euclidean cost,

$e^{(-a_t g \|J\|^2)} = 1 - a_t g \|J\|^2 + O(\|J\|^4)$,

which modulates an already-existing event rate; it suppresses events as the current grows and gives maximal transfer at $J = 0$.

A linear current-to-mark amplitude

$\mathscr{L}_A(J) \propto P_A J$

gives a quadratic mark intensity

$\lambda_A \propto \|P_A J\|^2$,

with the opposite small-current behaviour: zero intensity at $J = 0$.

A third possibility is specific to the binary fact ontology: the current may change the occurrence or waiting rate of **complete** facts at quadratic order, without introducing any continuously variable degree of record completeness.

For one primitive opportunity write

$p_0 = 1 - h_F$, $p_A = h_F q_A$,

where p_0 is no new fact and p_A is one complete fact of component A. The integrated first-record intensity is

$\mathbf{\Gamma_F = -\log(1 - h_F).}$

A magnitude-bearing binary current law may therefore begin as

$\Gamma_{(F,A)}(J) = \Gamma_{(F,A)}(0) + g \|P_A J\|^2 + O(\|J\|^3)$,

or equivalently

$\mathbf{\tfrac{1}{2} D_J^2 \Gamma_{(F,A)}(0) = g P_A.}$

The same information can be read from the curvature of the state-resolved no-record block NR(J). A nonzero derivative $D_J \mathcal{K}_A$ is therefore one sufficient microscopic realisation, but it is **not ontologically mandatory**. The primitive release object may instead be

$D^2_{(J_{cyc})} \Gamma_F$, or equivalently $D^2_{(J_{cyc})}$ NR.

This retyping does not manufacture a physical current dependence. It only states the correct binary target. Under AP1b, the hazard rigidity of Part I then forces the same coefficient g across the twelve component sectors at the same primitive mark grain.

---

25. Published-Stack Execution After Binary Retyping

The current corpus returns:

1. **RUDM primitive component effects:** the twelve projectors and $h_A = h_0 \|P_A z\|^2$.
2. **Primitive shared-interface localisation:** one primitive write before later copying.
3. **Common-parent marked-transfer architecture:** SGPL gives $K_e = P_y P_{(r(e))} e^{(-a_t \hat{H}/2)} P_x$.
4. **History-parent architecture:** HMGBC gives $\hat{H} = -\hat{\Delta} + V_{loc} + \cdots$ and $\hat{T} = e^{(-a_t \hat{H})}$.
5. **A positive representation-resolved current-cycle history witness:** RCCSJ supplies a real marked jump generator with the required C/W/Y × two-quadrature score support.

The published physical stack does **not** yet return:

1. an executed equality putting the representation-resolved Gate-2/raw-current term inside the fully source-derived V_{loc};
2. the full-carrier coarse-graining identity equating the SGPL terminal/component projectors with the twelve RUDM P_A;
3. an unconditional same-event equality between the RUDM directing ray and the normalised physical current ray;
4. a source-selected magnitude-bearing current law on the completed physical first-record block.

PCRS-1R proves the linear-amplitude statement negatively for the current published stack: the existing forward marked machinery does not return a nonzero $D_{(J_{cyc})} \mathcal{K}_A$.

BCTR-2 changes the interpretation, but not the physical grade. On the RCCSJ positive current-cycle witness,

$D_{(J_{cyc})} \Gamma_F |_0 = 0$,

while

$D^2\_(J\_cyc)\ \Gamma\_F\ |_0 \neq 0.$

For the indispensable m = 2/4 component, the exact state-resolved curvatures are

$D^2\ \Gamma\_F\ |\_hub = g\_cyc^2\ (3/112)\ H\_CWY \otimes I_2,$

$D^2\ \Gamma\_F\ |\_rim = g\_cyc^2\ (5/384)\ H\_CWY \otimes I_2,$

and the stationary average is

$\mathbf{\mathbb{E}\_\pi\ [\ D^2\ \Gamma\_F\ ]\_(m=2/4) = g\_cyc^2\ (1/62)\ H\_CWY \otimes I_2.}$

This is exactly the RCCSJ m = 2/4 marked Fisher metric. The complete current cycle gives $g\_cyc^2\ (2/31)\ H\_CWY \otimes I_2$.

The status is therefore split:

- linear current-to-record amplitude on the published stack: **exact negative return**;
- quadratic binary first-record curvature in the RCCSJ positive law: **exact existence pass**;
- source selection of g_cyc on the completed physical H_CMR: **open**;
- physical λ_J: **open**.

The positive witness cannot be promoted by choosing g_cyc = 1, by matching its baseline waiting time to MFKR, or by importing a preferred Standard-Model coupling.

---

26. Revised AP1b Decomposition

The vague statement "Gate-2/raw current feeds the same RUDM event" is replaced by three exact gates. Within the adopted SGPL/HMGBC architecture, AP1b is operationally reduced to their conjunction: each gate is necessary for the physical use made of AP1b in this paper, and together they supply everything that use consumes. A standalone necessity-and-sufficiency proposition outside that architecture is not claimed.

AP1b-I: common-parent primitive mark ancestry

Prove

$\mathbf{\hat{H}\_physical = \hat{H}_0 + \hat{H}\_(Gate2/current) + \cdots}$

inside the same source-derived SGPL parent.

AP1b-II: mark-projector and realised-ray identity

Prove the SGPL coarse effects use the same P_A as RUDM and, on the current branch,

$$\boldsymbol{\rho\_J = |z\rangle\langle z|}$$

for the same realised primitive event.

AP1b-III: magnitude-bearing complete-fact event law

Return from the same source either a linear amplitude realisation

$$D\_(J\_cyc)\, \mathcal{K}\_A = c\, V\_A\, P\_A,$$

or the more primitive binary-rate curvature

$$\boldsymbol{\tfrac{1}{2} D^2\_(J\_cyc)\, \Gamma\_(F,A)(0) = g\, P\_A,\ g > 0,}$$

with the same common coefficient across all twelve sectors, or equivalently the corresponding curvature of NR(J_cyc).

The completed return must act on the full $m = 0 \oplus m = 2/4$ current cycle and have rank six after C/W/Y resolution. If the source uses the linear-amplitude realisation, g is the amplitude norm squared after the declared mark convention, and $\lambda\_A = |c|^2 \|P\_A J\|^2 = |c|^2 \|J\|^2 w\_A$ automatically has the RUDM relative law. If it uses a direct quadratic compensator, g is read from the complete-fact rate itself. In either case, no partially written record is required.

Status

AP1b-I is architecturally supported but not executed for the Gate-2/current term; Part III rules out the canonical-wheel pullback shortcut and reduces the gate to the source return of L_λ. AP1b-II is partly supported by shared-interface localisation and remains conditional on the birth-current tangent identity. AP1b-III now has an exact positive existence witness through RCCSJ/BCTR-2 (Part V), while its physical completed-source coefficient remains open. The earlier linear-amplitude failure is retained but no longer treated as the only possible magnitude mechanism. Gate A2 of the programme statement is exactly this three-gate package.

---

27. Audit Verdict

The attempted proof does not close full AP1b from the currently published stack. It does, however, reduce the physical question to finite source objects:

$$\boldsymbol{E\_A\text{^}physical = h_0\, P\_A}$$

and

$$\tfrac{1}{2} D^2_{(J_{cyc})} \Gamma_{(F,A)}(0) = g P_A$$

on one common primitive carrier and event grain, with a nonzero g fixed before any downstream comparison. A source-derived linear amplitude $D_{(J_{cyc})} \mathcal{K}_A = c V_A P_A$ is one sufficient factorisation of the second identity.

If the completed source returns the stated curvature, hazard rigidity removes every relative representation coefficient and the common physical scale is obtained from the same source law. If it returns a nonzero curvature with a different factor shape, the inherited terminal-Born/current-cycle continuation is incomplete and must be replaced by the source matrix. If it returns zero on the full representation-resolved carrier, the magnitude-bearing binary-trigger route is excluded at the retained order.

The audit therefore converts the paper's central conditional from a verbal attachment premise into a source-level decision procedure.

PART III: THE AP1b-I GATE-2 COMMON-PARENT ANCESTRY AND CANONICAL-WHEEL PULLBACK AUDIT

Question. Is the Gate-2 closure-competition cost already a derived term of the same physical parent generator that produces the primitive RUDM/SGPL event law?

Verdict. AP1b-I not yet proved. A tempting shortcut can now be ruled out exactly: **the Gate-2 spoke competition cost is not a faithful pullback of the existing positive-definite HMGBC canonical-wheel Fisher metric**, nor of any positive-definite compressed metric. The remaining source target is therefore much sharper: derive the Gate-2 spoke functional directly from the full MASD/HMGBC local parent V_{loc}, before Fisher compression, not from the already-compressed W_{wheel}.

---

28. Source-Provenance Audit of the Gate-2 Cost

The sequential-transport source introduces

$A\_cl = A\_inc + A\_hub + A\_circ + A\_comp$

and defines the update as an admissibility-restoring gradient step. However, the same source explicitly grades

$A\_comp = \Sigma_{i=0}^{5} (\lambda_i + \lambda_{i+1})^2$

as the **load-bearing postulate**, stating that whether this quadratic form is physically correct must ultimately be derived from the VERSF master action.

Thus the Gate-2 cost currently has a structural/variational derivation role, but it is not yet an executed term of the source-derived HMGBC parent generator.

HMGBC, separately, puts the MASD local quadratic rate into the static history response,

$\Gamma\_defect = ½ \langle D, W\_prim D \rangle, W\_prim = W\_hist(0),$

and places the direct local history cost inside V_loc of the full master history generator.

Therefore the exact AP1b-I target is:

$A\_comp =? V\_loc^{physical}$ restricted to the Gate-2 spoke carrier,

or the corresponding source-derived pullback relation. The current corpus does not yet return that equality.

---

29. The Gate-2 Spoke Quadratic Form and Its Alternating Zero Mode

Define the quadratic-form matrix Q_comp by

$A\_comp(\lambda) = \lambda^T Q\_comp\, \lambda, \lambda \in \mathbb{R}^6,$

equivalently $D_\lambda^2 A\_comp = 2 Q\_comp$. Let P be the cyclic shift on the six spokes. Because each term of A_comp is $(\lambda_i + \lambda_{(i+1)})^2 = ((I + P)\lambda)_i^2$, the quadratic-form matrix factorises exactly:

$Q\_comp = (I + P)^T (I + P),$

a manifestly positive-semidefinite C_6 circulant whose kernel is exactly ker(I + P), the amplitudes with $P\lambda = -\lambda$. Explicitly,

$Q\_comp = [\ 2\ 1\ 0\ 0\ 0\ 1\ ;\ 1\ 2\ 1\ 0\ 0\ 0\ ;\ 0\ 1\ 2\ 1\ 0\ 0\ ;\ 0\ 0\ 1\ 2\ 1\ 0\ ;\ 0\ 0\ 0\ 1\ 2\ 1\ ;\ 1\ 0\ 0\ 0\ 1\ 2\ ]$.

The C_6 Fourier modes diagonalise it with the closed-form spectrum

$\lambda\_k = 2 + 2\cos(2\pi k/6) = 4\cos^2(\pi k/6)$, $k = 0, \ldots, 5$,

that is, exactly

$\{ 0, 1, 1, 3, 3, 4 \}$, rank Q_comp = 5.

The zero mode is the $k = 3$ (alternating, Nyquist) Fourier mode: the nontrivial alternating transport direction

$a = (1, -1, 1, -1, 1, -1)^T / \sqrt{6}$, Q_comp $a = 0$,

and the factorisation shows this kernel is structural, not numerical: for the even cycle C_6 the equation $P\lambda = -\lambda$ has exactly the one-dimensional alternating solution.

The on-admissible-sector circulation penalty is

$A\_circ = (\Sigma\_i\ \lambda\_i)^2$, $Q\_circ = \mathbb{1}\mathbb{1}^T$.

Hence

Q_Gate2,on = Q_comp + Q_circ

adds 6 to the uniform ($k = 0$) eigenvalue only, giving spectrum

$\{ 0, 1, 1, 3, 3, 10 \}$,

and since $a \perp \mathbb{1}$,

Q_Gate2,on a = 0.

Thus the alternating mode remains a genuine zero-cost direction of the Gate-2 on-sector functional. All spectra and the kernel identity are reverified in Appendix C.4.

---

30. The HMGBC Canonical-Wheel Metric

The existing HMGBC scalar canonical-wheel Fisher metric is

$W\_wheel = [\ 12/31\ 0\ 0\ 0\ 0\ 0\ ;\ 0\ 75/434\ 0\ 0\ 0\ -33/434\ ;\ 0\ 0\ 21/124\ 0\ 3/248\ 0\ ;\ 0\ 0\ 0\ 12/31\ 0\ 0\ ;\ 0\ 0\ 3/248\ 0\ 21/124\ 0\ ;\ 0\ -33/434\ 0\ 0\ 0\ 75/434\ ]$.

Under the wheel symmetry it decomposes into two singleton blocks and two 2×2 blocks, whose eigenvalues follow by inspection: the singletons give 12/31 twice, the {2, 6} block gives $(75 \pm 33)/434 = 54/217$ and 3/31, and the {3, 5} block gives $21/124 \pm 3/248 = 45/248$ and 39/248. The exact spectrum is therefore

{ 3/31, 39/248, 45/248, 54/217, 12/31, 12/31 },

so

$W_{wheel} > 0$, rank $W_{wheel} = 6$.

There is no information-null direction in this six-scalar representative metric.

---

31. Exact Rank/Inertia No-Go

Suppose the Gate-2 spoke cost is identified directly with the canonical HMGBC metric through an invertible six-dimensional carrier map R:

$Q_{Gate2,on} = R^\dagger W_{wheel} R$.

By Sylvester's law of inertia, an invertible congruence preserves the numbers of positive, negative and zero eigenvalues.

But the inertias differ:

$Q_{Gate2,on}$: (5 positive, 0 negative, 1 zero); W_{wheel} : (6 positive, 0 negative, 0 zero).

Therefore

$Q_{Gate2,on} \neq R^\dagger W_{wheel} R$ for every invertible R.

The two objects cannot be the same six-dimensional metric in different coordinates.

---

32. Faithful-Pullback No-Go and Its Interpretation

Allow a non-invertible map L:

$Q_{Gate2,on} = L^\dagger W_{wheel} L$.

Because $W\_wheel > 0$,

$a^\dagger Q\_{Gate2,on}\, a = (L a)^\dagger W\_wheel (L a) = 0$

implies

L a = 0.

But the alternating Gate-2 mode a is **not** a zero physical transport. It is the named lowest closure-competition wave: a nontrivial homological transport response with unchanged committed endpoints but changed closure-history class.

Hence any map L that reproduces the Gate-2 cost from W_wheel must annihilate precisely the nontrivial Gate-2 response that the transport construction is built to retain. Therefore:

no faithful linear pullback of W_wheel can generate the Gate-2 on-sector cost.

This is stronger than observing different numerical spectra.

Corollary 32.1 (the obstruction is metric independent)

Nothing in the argument used the particular entries of W_wheel, only its strict positivity: for any positive-definite M and any linear L, $x^\dagger (L^\dagger M L) x = 0$ forces $L x = 0$. Hence **no faithful linear pullback of any positive-definite compressed metric whatsoever can generate the Gate-2 on-sector cost** while keeping the alternating transport nontrivial. The obstruction is a structural mismatch between a cost with a genuine admissible zero direction and the class of positive-definite information metrics, not a numerical accident of the wheel representative. Any resolution must therefore occur at an object that is itself degenerate along the relevant direction, before positive-definite compression. ■

Interpretation

This does **not** prove that Gate-2 can never belong to the same physical parent as RUDM.

It proves that the parent cannot be identified by the shortcut

A_Gate2 ≡ canonical W_wheel Fisher cost.

The two objects have different roles: Gate-2's zero mode is an admissible nontrivial transport response, while W_wheel is a positive-definite Fisher metric on six scalar defect-score directions. A common physical parent could contain both, but the map must occur one level earlier, before the positive-definite defect-score compression.

This is consistent with HMGBC's own Defect-Lift Obligation: the full typed MASD defects must be mapped faithfully and uniquely into the history tangent; the existing scalar representative metric is not itself that full-carrier lift.

33. The Exact Next Source Calculation for AP1b-I

The next calculation is now unambiguous.

Let $\lambda \in \mathbb{R}^6$ be the six Gate-2 spoke amplitudes and let $X(\lambda)$ be their image in the **full MASD/HMGBC local configuration carrier before stochastic/Fisher compression**.

The missing source object is the Jacobian

$$\mathbf{L_\lambda = D_\lambda X |_{(\lambda=0)}.}$$

Let

$$H_{loc} = D_X^2 V_{loc} |_{(X\star)}$$

be the source-derived local parent Hessian. Then compute

$$\mathbf{Q_{parent}^{(\lambda)} = L_\lambda^\dagger H_{loc} L_\lambda.}$$

The hard AP1b-I test is:

$$\mathbf{Q_{parent}^{(\lambda)} \overset{?}{=} \alpha\, Q_{Gate2,on}}$$

at the declared order, or a source-derived extension whose restriction has the same alternating kernel and boundary sum-square structure.

The pass requires all of:

1. **carrier provenance:** L_λ is returned from the substrate/Fold action, not chosen;
2. **nontriviality:** $L_\lambda a \neq 0$ for the alternating transport mode;
3. **zero-cost compatibility:** the parent cost vanishes on that nontrivial admissible mode;
4. **quadratic shape:** the spoke pullback returns the C_6 nearest-neighbour sum-square at the retained order;
5. **shared-boundary continuation:** the same parent returns the cross-hub boundary square rather than adding it by hand.

Corollary 32.1 makes conditions 2 and 3 jointly sharp: they require H_{loc} to be **degenerate along the image $L_\lambda a$**, so the parent Hessian must itself carry a kernel containing that image. A strictly positive-definite H_{loc} on the image of every admissible spoke map would reproduce the impossible positive-metric pullback and fail the test permanently; this is falsifier F11.

If the test passes, Gate-2 becomes an actual term of the same local parent that SGPL exponentiates into primitive event transfers, and AP1b-I closes.

If it fails, Gate-2 remains an admissibility/transport construction rather than the physical current-mark source.

---

34. AP1b-I Audit Grade

- Gate-2 A_comp provenance from the VERSF master action: **open; explicitly labelled the load-bearing postulate by its source paper**.
- HMGBC W_wheel: **exact on the canonical scalar stochastic representative; full typed defect lift still open**.
- Direct/invertible identification Q_Gate2 ↔ W_wheel: **exactly ruled out** (inertia).
- Faithful positive-metric pullback L† W_wheel L = Q_Gate2: **exactly ruled out**, because it annihilates the nontrivial alternating transport mode, and by Corollary 32.1 the same holds for every positive-definite compressed metric.
- AP1b-I common-parent ancestry: **not yet proved**.
- Next required object: **the full-carrier Gate-2-to-V_loc Jacobian L_λ and the parent-Hessian pullback L_λ† H_loc L_λ**, with the five pass conditions of Section 33.

PART IV: THE PRE-PHYSICAL-TIME CURRENT AND TEMPORAL-ATTACHMENT AUDIT

34A. Question and Verdict

Question. Does the VERSF current require physical time in order to exist, or can the current be defined and conserved at the primitive record/refinement level before Lorentzian commitment time is attached?

Verdict.

- **Pre-physical-time constitutive current: pass.**
- **Nonzero time-independent current-cycle existence: exact pass at MASD current-carrier/residual grade.**

- **Primitive refinement-continuity interpretation: pass / inherited.**
- **Canonical current-divergence / refinement-generator match: exact on the reversible $K = 7$ branch.**
- **σ-to-δ same-step attachment: open.**
- **Physical-time-normalised discrete current: conditional on that attachment.**
- **Full continuum Lorentz four-current: open.**

The important structural conclusion is already available before the final two steps: VERSF does not need to assume physical time in order to define its primitive current. Physical time can be attached downstream as a ruler for that current.

34B. The Pre-Physical-Time Constitutive Current

MASD defines the current defect on an oriented edge $e: s \to t$ by

$$\mathbf{D\_J(e) = J\_e - \kappa\_e\,(\rho\_t - U\_e\,\rho\_s).}$$

The defining data are:

1. a source state ρ_s;
2. a target state ρ_t;
3. an oriented transport U_e;
4. a current J_e;
5. the conductance/current coefficient κ_e.

No physical duration, temporal coordinate t, frequency, Lorentzian proper time or clock interval occurs in the definition.

Theorem C (pre-physical-time current existence)

Grade: exact at the MASD constitutive-current level.

The MASD current is a well-defined oriented relational object before physical-time attachment.

At the neutral common background,

$\rho_s = \rho_t = \Omega$, $J = 0$, $U\,\Omega = \Omega$,

and faithful infinitesimal gauge-link variations satisfy

$(\delta U)\,\Omega = 0$.

The linearised current defect is therefore

$$\delta D_J = \delta J - \kappa (\delta\rho_t - \delta\rho_s)$$

in a common local frame. On the constitutive zero locus,

$$\boldsymbol{\delta J = \kappa (\delta\rho_t - \delta\rho_s).}$$

Thus the Relative-Birth Current is determined by relative endpoint innovation. No physical-time derivative is required.

This proves a precise statement and no more:

primitive current existence does not require physical time.

It does not yet say that every physical current is reducible to endpoint birth. The current-cycle calculation below proves that stronger identification false. ■

34C. The Nonzero Current-Cycle Certificate

Let

$$P_{cyc} = P_{(\ker B)} \otimes I_{49}.$$

The full MASD current carrier contains the divergence-free subspace

$$\mathcal{C}_J^{cyc} = \ker B \otimes \mathbb{C}^{49}.$$

For every pure cycle-current perturbation,

$$\delta J_{cyc} \in \mathcal{C}_J^{cyc},$$

one has

$$(B \otimes I_{49}) \delta J_{cyc} = 0.$$

At the same time the current-cycle protection theorem gives

$$P_{cyc}\, \delta D_J = P_{cyc}\, \delta J,$$

and on the pure cycle subcarrier,

$$\delta D_J = \delta J.$$

Theorem D (nonzero current without physical-time evolution)

Grade: exact at the linearised MASD current-carrier/continuity level.

A nonzero current may satisfy

$\delta J\_cyc \neq 0$

while

$(B \otimes I_{49}) \delta J\_cyc = 0.$

For a static cycle variation with no independent density update,

$\partial\_\sigma \, \delta\rho = 0,$

the isolated transport-continuity contribution is therefore

$\boldsymbol{\delta D\_T [\delta J\_cyc] = 0.}$

Hence VERSF admits

$J \neq 0$, no density evolution, div $J = 0$.

This is the cleanest certificate that the primitive current is not defined as "amount of record change divided by physical elapsed time." A current can exist as a persistent circulation in the relational record structure. ■

The result is physically relevant to the current programme rather than an unused topological possibility. For the physical CRTF radial-current profile,

$\|q\_\mu \, q\_+\|^2 = 5/3,$

with exact Hodge decomposition, orthogonal because $\mathbb{R}$^E = ker B $\oplus$ im B^T,

$\|P\_(\ker B) (q\_\mu \, q\_+)\|^2 = 1, \ \|P\_(\mathrm{im}\, B^T) (q\_\mu \, q\_+)\|^2 = 2/3,$

whose parts indeed sum: 1 + 2/3 = 5/3. Therefore

$\boldsymbol{\|P\_(\ker B) (q\_\mu \, q\_+)\|^2 / \|q\_\mu \, q\_+\|^2 = 3/5.}$

Exactly 60% of the squared magnitude of the required CRTF current tangent lies in a cycle component which cannot be generated by endpoint differences.

Consequently the primitive current cannot generally be identified with a simple source-to-target fact-birth difference.

34D. Primitive Continuity Before Physical Time

The general MASD transport-conservation defect is

$$\mathbf{D\_T = \partial\_\sigma\, \rho + \partial\_U\, J.}$$

The inherited refinement audit does not type σ as ordinary physical time. It types σ as the update/refinement parameter along the substrate history flow.

Thus the primitive conservation statement is more accurately read as

change along ordered refinement + current divergence = 0,

rather than as a conservation law already written against a background clock.

HMGBC supplies the corresponding history generator

$$\mathcal{G}\_\text{hist}\, f = -r^{-1}\, (\, \hat{H} - E_0\,)\, (\, r\, f\,),$$

so the natural source completion is

$$\partial\_\sigma\, \rho = \mathcal{G}\_\text{hist}\, \rho.$$

The primitive continuity equation becomes

$$\boldsymbol{\mathcal{G}\_\text{hist}\, \rho + \partial\_U\, J = 0.}$$

On the canonical reversible K = 7 branch this relation is substantially stronger than a typing proposal. Let

$$C = (1/31)\, I_{12}.$$

The MASD current divergence gives

$$L\_J = B\, C\, B^T,$$

while the independently constructed HMGBC Dirichlet form gives

$Q_7 = \Pi (I - T_0)$.

The exact execution returns

$$\mathbf{B\, C\, B^T = Q_7 = (1/31)\, L\_(W_7).}$$

Therefore the current-divergence operator and the primitive history/refinement operator coincide exactly on the canonical branch.

Two remarks sharpen the status of this identity. The MASD half is an exact incidence identity: with $C = (1/31)\, I_{12}$ on the twelve edges of the $K = 7$ wheel, $B\, C\, B^T = (1/31)\, B\, B^T = (1/31)$ L_(W_7) holds by linearity and the standard incidence-Laplacian identity, reverified in Appendix C.5. The substantive certificate content is therefore the HMGBC half: that the independently constructed history Dirichlet form $Q_7 = \Pi(I - T_0)$ lands on exactly the same operator. It is that independent agreement, not the incidence identity, which establishes the generator match.

This establishes a pre-physical-time conservation architecture in which the current and the refinement dynamics are independently constructed but generator matched.

34E. Attachment to Emergent Physical Time

The temporal programme independently supplies the additive Fold-opportunity parameter δ,

$$R(\delta_1 + \delta_2) = R(\delta_1)\, R(\delta_2),$$

with $\delta = 1$ one complete sequential opportunity.

The sequential opportunity-to-Lorentzian attaching theorem gives, on its declared local homogeneous branch,

$$\mathbf{t\_phys = T(\delta) = \delta\, a\_t / c\star.}$$

Physical time is therefore downstream of the primitive ordering law.

The current/refinement programme uses σ, while the temporal attaching theorem physicalises δ. The present corpus strongly aligns their intended roles but does not yet contain an explicit same-source theorem identifying their normalisations.

Introduce the source bridge

$$\boldsymbol{\sigma = s\_\sigma\delta\ \delta,\ s\_\sigma\delta > 0.}$$

The strict same-step identity is the special case $s\_\sigma\delta = 1$.

Theorem E (conditional physical-time current conversion)

Grade: exact conditional consequence of the σ-to-δ source bridge.

Start from the mass-weighted primitive continuity equation

$\Pi \partial_\sigma \rho + B J = 0.$

Since $\sigma = s_{\sigma\delta} \delta$ and $t_{phys} = (a_t/c\star) \delta$,

$\partial\rho/\partial\sigma = (a_t / (s_{\sigma\delta} c\star)) \partial\rho/\partial t_{phys}.$

Therefore

$(a_t / (s_{\sigma\delta} c\star)) \Pi \partial_t \rho + B J = 0.$

Multiplying by $s_{\sigma\delta} c\star / a_t$ gives

$\boldsymbol{\Pi \partial_t \rho + B J^{(t)} = 0,}$

where

$\boldsymbol{J^{(t)} = s_{\sigma\delta} (c\star / a_t) J.}$

If the strict same-step identity is returned, $\sigma = \delta$, then

$\boldsymbol{J^{(t)} = (c\star / a_t) J.}$

Thus physical time acts as a conversion from current per primitive update/refinement unit to current per emergent physical-time unit. It does not create the current. ■

Remark (the conversion is forced, not chosen)

The conversion law is not a normalisation choice. Requiring the continuity equation to keep its form under the affine reparameterisation $\sigma \mapsto t_{phys}$ forces $J^{(t)} = (d\sigma/dt_{phys}) J$, and $d\sigma/dt_{phys} = s_{\sigma\delta} c\star / a_t$. So once the σ-to-δ bridge is returned, the physical-time current is uniquely determined; the only open object is the bridge itself.

34F. Typing Firewalls and Physical Interpretation

F-PT1: temporal conversion does not determine λ_J

The factor $s_{\sigma\delta} c^\star / a_t$ converts a primitive current coordinate into a physical-time-normalised current coordinate. By contrast, λ_J is the unresolved common physical history/Fisher scale multiplying the current metric. These are differently typed quantities.

Therefore $J^{(t)} = s_{\sigma\delta} (c^\star / a_t) J$ does **not** imply $\lambda_J = 1$ or any other value of λ_J.

F-PT2: the result is not yet a Lorentz four-current theorem

The object $J^{(t)}$ is a physical-time-normalised discrete/interface current. A full relativistic current requires a continuum pushforward producing an object j^μ with the correct Lorentz transformation law and covariant conservation equation, schematically

$$\nabla_\mu j^\mu = 0.$$

That pushforward remains open.

F-PT3: "flow of facts" is an interpretation, not an additional theorem

The mathematics is consistent with interpreting the primitive current as structured propagation or maintenance of relations among committed facts. However, the 3/5 irreducible cycle component proves that this cannot mean only

fact at source → new fact at target.

A more accurate candidate interpretation is

primitive current = structured relational flow/maintenance within the realised-fact record.

The present paper records this only as an interpretation suggested by the source structure.

Updated temporal-current debt

The remaining physicalisation problem is now sharply separated into two steps:

1. derive the source relation between the primitive refinement parameter σ and the Fold-opportunity parameter δ, including its normalisation $s_{\sigma\delta}$;
2. push the resulting physical-time-normalised current into the continuum and prove that the image is a Lorentz-covariant conserved four-current.

Neither obligation reopens the already-closed relative C/W/Y factor geometry.

PART V: THE BINARY FIRST-RECORD CURRENT-CURVATURE AND GAUGE-SCALE AUDIT

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35. Binary Fact Ontology and the Occurrence-Rate Variable

At the primitive fact/no-fact level, one opportunity has outcomes

$p_0 = 1 - h_F$, $p_A = h_F\, q_A$, $\Sigma_A\, q_A = 1$.

The realised event is binary: either no new fact occurs or one complete new fact occurs. The label A answers the separate conditional question of which complete record is written.

The integrated first-record intensity is

$$\boldsymbol{\Gamma_F = -\log(1 - h_F),}$$

and its gradient is tied exactly to the occurrence probability by $\nabla\Gamma_F = \nabla h_F / (1 - h_F)$.

For any physical parameter vector, the exact one-opportunity Fisher matrix separates into occurrence and type information:

$$\boldsymbol{F_{Fold} = (\nabla h_F\, \nabla h_F^T) / (h_F (1 - h_F)) + h_F\, F_q,}$$

where

$F_q = \Sigma_A\, q_A\, \nabla\log q_A\, \nabla\log q_A^T$.

The proof is two lines: $\nabla\log p_0 = -\nabla h_F/(1 - h_F)$ and $\nabla\log p_A = \nabla h_F/h_F + \nabla\log q_A$, and the occurrence/type cross terms cancel exactly because $\Sigma_A\, q_A\, \nabla\log q_A = \Sigma_A\, \nabla q_A = 0$, the same normalisation mechanism that kills the cross terms in the refinement decomposition of Theorem 6. The occurrence/type split is therefore the Fisher chain rule at the fact/no-fact grain, exactly as Theorem 6 is the Fisher chain rule at the coarse/microscopic grain: one mechanism, two grains.

For the complete waiting-rate process the corresponding information rate is

$$\boldsymbol{I_{rate} = (\nabla\Gamma_F\, \nabla\Gamma_F^T) / \Gamma_F + \Gamma_F\, F_q.}$$

The first term measures how the parameter changes whether and when a full fact occurs; the second measures which record occurs, conditional on an event. This is the correct mathematical home for a continuous gauge strength in a binary ontology. The continuous quantity may live in event cadence without any continuously variable degree of record completeness.

Under the RCHS quadratic intensity law, the C/W/Y score Gram per unit binary-event rate is the already-derived uncentred factor matrix, up to the universal radial-coordinate factor. The binary retyping therefore preserves the relative factor theorem of Part I.

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36. Exact RCCSJ Binary First-Record Trigger Curvature

Let $\Gamma_x(\theta)$ be the total nonself, record-producing rate from wheel state x in the RCCSJ positive marked current-cycle law. Because the physical current cochains are divergence free, the outgoing first-order score compensates at every state:

$$\mathbf{D\,\Gamma_x\,|_0 = 0.}$$

The first nonzero complete-fact response is quadratic. For factor indices A, B ∈ {C, W, Y} and the two real current quadratures μ, ν,

$$\partial(A\mu)\,\partial(B\nu)\,\Gamma_x = g_{cyc}^2\, H_{(AB)}^{CWY}\, G_x^{\mu\nu}.$$

On the indispensable m = 2/4 current-cycle sector, the exact local spatial Grams are

$$G_h = (3/112)\, I_2,\quad G_{(b_j)} = (5/384)\, I_2.$$

Thus

$$\mathbf{D^2\,\Gamma_F\,|_{hub} = g_{cyc}^2\,(3/112)\,H_{CWY} \otimes I_2,}$$

$$\mathbf{D^2\,\Gamma_F\,|_{rim} = g_{cyc}^2\,(5/384)\,H_{CWY} \otimes I_2.}$$

Using the canonical stationary wheel law $\pi_h = 7/31$, $\pi_{(b_j)} = 4/31$, the two contributions reduce over a common denominator:

$$(7/31)(3/112) = 3/496,\quad 6 \cdot (4/31)(5/384) = 5/496,$$

so

$$(7/31)(3/112) + 6\,(4/31)(5/384) = 8/496 = 1/62,$$

and therefore

$$\mathbb{E}_\pi [D^2 \Gamma_F]_{(m=2/4)} = g_{cyc}^2 (1/62) H_{CWY} \otimes I_2.$$

The uniform component contributes

$$\mathbb{E}_\pi [D^2 \Gamma_F]_{(m=0)} = g_{cyc}^2 (3/62) H_{CWY} \otimes I_2,$$

and the complete current cycle contributes

$$\mathbb{E}_\pi [D^2 \Gamma_F]_{full} = g_{cyc}^2 (2/31) H_{CWY} \otimes I_2,$$

the exact sum $3/62 + 1/62 = 2/31$.

Lemma V.1 (log-linear curvature identity)

The equality between the trigger curvature and the marked Fisher metric is a theorem for the RCCSJ perturbation class, not a numerical coincidence, but it is not automatic for an arbitrary rate family. For rates $k_e(\theta)$ with scores $s_e = \nabla \log k_e$, the general identity is

$$D^2 \Sigma_e k_e = \Sigma_e k_e s_e s_e^T + \Sigma_e k_e D^2 \log k_e,$$

so the total-rate Hessian equals the rate-weighted score Gram, the marked Fisher matrix, exactly when the second term vanishes. The BCTR-2/RCCSJ current perturbation acts multiplicatively on each transition rate in log-linear form,

$$k_e(J) = k_e(0) e^{(\langle \ell_e, J\rangle)},$$

with constant score cochains ℓ_e, so $D \log k_e = \ell_e$ is constant, $D^2 \log k_e = 0$, and

$$D^2 \Gamma_x |_0 = \Sigma_e k_e(0) \ell_e \ell_e^T,$$

exactly the marked Fisher matrix at the base point, while $D \Gamma_x |_0 = \Sigma_e k_e(0) \ell_e = 0$ is the divergence-free score compensation already stated. For any non-log-linear source family the correction $\Sigma_e k_e D^2 \log k_e$ would enter, and Gate R must confirm which class the completed source law occupies. ■

These are exactly the RCCSJ marked Fisher matrices, and by Lemma V.1 the identity holds by theorem for this perturbation class. Therefore

the positive current-cycle Fisher metric is the curvature of a binary complete-fact rate law.

The $m = 2/4$ block has rank six for every $g_{cyc} \neq 0$, since H_{CWY} is positive definite of rank three and the two quadratures double it, as required by the representation-resolved carrier theorem.

37. Exact One-Parameter Gauge-Scale Family

The inherited direct current metric is

$$M_{JJ}^{quad} = \lambda_J M_0 \otimes I_2,$$

with

$$M_0 = K_{cyc}^{(2)} H_{CWY}, \quad K_{cyc}^{(2)} = 0.212610974570295.$$

Matching the full RCCSJ binary-rate curvature to the same full-cycle current/history normalisation gives

$$\lambda_J K_{cyc}^{(2)} = g_{cyc}^2 (2/31).$$

Hence the exact symbolic family

$$\boldsymbol{\lambda_J(g_{cyc}) = \left(2 / \left(31 K_{cyc}^{(2)} \right) \right) g_{cyc}^2;}$$

numerically, using the inherited value of $K_{cyc}^{(2)}$,

$$\lambda_J = 0.30344684305525943\, g_{cyc}^2.$$

This is an exact reduction, but not an absolute prediction. Every real g_{cyc} in the positive RCCSJ family preserves the wheel support, positivity, Markov normalisation, D_6 covariance, the C/W/Y factor shape and the 3/4 to 1/4 spatial split. The physical source must therefore select g_{cyc}; setting it to one would be a constitutive insertion.

For an arbitrary completed-source marked metric M_{JJ}^{mark}, the target-blind extracted coefficient is

$$\boldsymbol{\lambda_J^{source} = \langle M_0 \otimes I_2, M_{JJ}^{mark} \rangle_F / \| M_0 \otimes I_2 \|_F^2,}$$

followed by the factor-shape residual

$$\boldsymbol{\varepsilon_{(M_0)} = \| M_{JJ}^{mark} - \lambda_J^{source} M_0 \otimes I_2 \|_F / \| M_{JJ}^{mark} \|_F.}$$

If the source returns $M_{JJ}^{mark} = \alpha_{source} H_{CWY} \otimes I_2$, then simply

$$\lambda_J^{source} = \alpha_{source} / K_{cyc}^{(2)}.$$

The comparison is a post-freeze extraction and falsification test. It may not be used to tune the source law.

---

38. Conditional First-Birth Calibration and the 1/3 Target

The earlier saturated first-birth audit supplies the leading same-compensator matching equation

$$(\kappa_J^2 / 2) (2 \nu_N + 47 \lambda_{vis}) / 49 = 1/6,$$

where ν_N is the neutral-terminal coefficient and λ_{vis} is the common gauge-visible coefficient at that birth grain.

If, and only if, the same-grain hazard theorem of Part I applies to this very same physical first-birth compensator, the neutral and visible coefficients are one common number:

$$\nu_N = \lambda_{vis} \equiv \lambda_{birth}.$$

The matching equation then collapses exactly, since $2 \lambda_{birth} + 47 \lambda_{birth} = 49 \lambda_{birth}$:

$$(\kappa_J^2 / 2) \lambda_{birth} = 1/6,$$

so

$$\boldsymbol{\lambda_{birth} = 1 / (3 \kappa_J^2).}$$

At the unit residual-current convention $\kappa_J = 1$,

$$\boldsymbol{\lambda_{birth} = 1/3.}$$

If the birth compensator is further proven to be the same full-cycle physical current/history law used in the definition of λ_J, with no terminal information loss or extra history rescaling, then the conditional candidate becomes

$$\boldsymbol{\lambda_J = 1/3.}$$

Combining this with the exact RCCSJ scale family would select, on that branch, the closed form

$$\boldsymbol{g_{cyc} = \sqrt{ (1/3) / (2/(31 K_{cyc}^{(2)})) } = \sqrt{ 31 K_{cyc}^{(2)} / 6 } = 1.048088753532.}$$

This number is a **strong conditional consistency target**, not a physical return. It consumes four unproved identifications:

1. the first-birth and independent cycle-current laws are the same physical compensator;
2. κ_J has the same source normalisation in both calculations;
3. the neutral and visible coefficients inhabit the same primitive event grain;
4. the birth coefficient and full history/terminal coefficient are related without an additional source-derived loss or scale.

The earlier birth/current audit proves that agreement along the endpoint-birth curve alone cannot determine the transverse independent cycle-current derivative. Therefore the 1/3 target cannot substitute for the completed-source curvature calculation.

---

39. Updated Scientific Grade and Release Condition

The binary first-record audit changes the interpretation and narrows the missing object.

Closed exactly

1. A continuously variable record completeness is not required by the primitive binary ontology.
2. The occurrence/type Fisher decomposition is exact, and it is the same chain-rule mechanism as the refinement decomposition of Theorem 6, applied at the fact/no-fact grain.
3. The RCCSJ positive current-cycle law has zero first derivative and nonzero quadratic complete-fact-rate curvature.
4. The $m = 2/4$, $m = 0$ and full-cycle coefficients are exactly 1/62, 3/62 and 2/31, multiplying $g_{cyc}^2 H_{CWY} \otimes I_2$.
5. The binary-rate curvature equals the RCCSJ marked Fisher metric exactly, by the log-linear curvature identity of Lemma V.1.
6. The gauge scale is reduced to the exact symbolic family $\lambda_J = (2/(31 K_{cyc}^{(2)})) g_{cyc}^2$, numerically $0.30344684305525943\ g_{cyc}^2$ at the inherited $K_{cyc}^{(2)}$.

Conditional only

$\lambda_J = 1/3$

on the saturated, unit-normalised, same-event birth/current branch, with implied $g_{cyc} = \sqrt{31 K_{cyc}^{(2)}/6}$.

Still open

1. the completed physical state-resolved no-record block $NR(J_{cyc})$;

2. the source-selected curvature $D^2\_(J\_cyc)\ \Gamma\_F$ on the full representation-resolved current cycle;
3. the terminal pushforward and its information-loss matrix;
4. regulator and conjugate-branch stability of the extracted coefficient;
5. the physical g_cyc and hence the physical λ_J.

The revised hard release condition is:

derive $D^2\_(J\_cyc)$ NR or $D^2\_(J\_cyc)\ \Gamma\_F$ from the completed primitive H_CMR.

Equivalently, execute the background-contracted graded-source extraction

$$\mathcal{T}\_cyc\text{^}(n) = P\_(E_2)\text{^}hist\ D\Phi\_gr\text{^}(n)(J_0)\ P\_(E_2 \otimes CWY)\text{^}(D\_J)$$

and carry it through the source-derived no-record/first-entry block. A physical pass requires rank six, D_6 covariance, positive history evolution, regulator stability, a derived terminal pushforward, and a source-fixed coefficient before the M_0 comparison is opened.

---

40. Next Calculation

The next calculation should **not** return to a twelve-parameter search, another candidate factor metric, or another attempt to infer a current amplitude from record stretch.

The immediate gauge-normalisation target is the completed-source binary first-record curvature. The attachment and temporal gates should then be run as provenance and physicalisation tests around that object.

Gate R: completed-source binary first-record curvature

Construct or retrieve the full state-resolved first-entry block

P(J) = [NR(J) B(J) ; 0 I]

on the physical current-cycle background. Freeze the MASD current-cycle projector, the m = 2/4 Fourier projector, the background-contracted graded source jets, the C/W/Y projectors, the history carrier and metric, the terminal map, the regulator ladder and the no-target manifest.

Then compute

$D\_(J\_cyc)$ NR, $D^2\_(J\_cyc)$ NR,

and hence

$D_{(J_{cyc})} \Gamma_F$, $D^2_{(J_{cyc})} \Gamma_F$.

The hard tests are:

1. the first nonzero current response has the differential order returned by the source rather than imposed in advance;
2. the representation-resolved m = 2/4 block has rank six;
3. D_6 covariance holds on the two spatial quadratures;
4. the source coefficient and factor shape converge or intertwine across the physical regulator family;
5. the raw history law is positive at its declared grade;
6. the terminal pushforward and information-loss matrix are computed rather than assumed;
7. λ_J^{source} and $\varepsilon_{(M_0)}$ are evaluated only after the construction is frozen.

The four clean outcomes are: source closure proportional to M_0; a nonzero source matrix of different shape which supersedes M_0; path-level closure followed by derived terminal information loss; or a complete zero return which excludes the route at the retained order.

Gate T: primitive-refinement current to physical-time current

In parallel with the gauge-normalisation gates, close the temporal-current bridge isolated in Part IV.

First derive from the source the map between the MASD/HMGBC refinement parameter σ and the MFKR sequential-opportunity parameter δ. The target is not an assumed identification but a source-returned relation

$$\sigma = S_{\sigma\delta}(\delta).$$

Test whether the two parameters inherit the same additive sequential composition law. If the admissible local relation is additive, order preserving and defined on the complete positive opportunity parameter, execute the corresponding rigidity argument and determine whether

$$S_{\sigma\delta}(\delta) = s_{\sigma\delta}\, \delta$$

for one positive scalar $s_{\sigma\delta}$. Then determine that scalar from same-step source typing. The strongest return would be

$$\boldsymbol{\sigma = \delta.}$$

Once the bridge is returned, convert the primitive current using

$$\mathbf{J^{(t)} = s_{\sigma\delta} (c\star / a_t) J}$$

and verify directly that

$$\Pi\, \partial_t \rho + B\, J^{(t)} = 0.$$

The next stage is the continuum pushforward. Construct the map from the discrete/interface current carrier into the emergent Lorentzian tangent bundle and test:

1. that the pushed-forward density and current assemble into one j^μ;
2. that j^μ transforms as a Lorentz four-vector under the already-derived transport group;
3. that the discrete continuity identity descends to the correct continuum conservation law;
4. that the C/W/Y representation content is preserved by the pushforward.

Gate T is deliberately separate from the λ_J calculation. The factor $s_{\sigma\delta}\, c\star / a_t$ is a current-coordinate/time conversion, not a physical Fisher/history price. Passing Gate T therefore does not set λ_J, and failure of Gate T would not restore the eleven relative representation coefficients already eliminated by the hazard-rigidity theorem.

Gate A1: primitive carrier/intertwiner closure

Construct the actual Fold/Gate-2-to-matter tangent map on the primitive shared-interface carrier and evaluate its action on the twelve canonical commitment projectors.

At minimum the execution must return the relevant intertwiner $U_{(\text{Fold}\to\text{tangent})}$ or its differential and test whether the primitive response preserves and resolves the same component algebra:

$$[U_{(\text{Fold}\to\text{tangent})}, P_A],$$

or the appropriately covariant transported version.

The aim is to turn AP1a from "partly source supported" into an executed carrier theorem.

Gate A2: the three attachment identities

Execute the AP1b decomposition of Section 26:

- **AP1b-I:** exhibit the Gate-2/current term inside the source-derived SGPL/HMGBC parent V_{loc}, in the sharpened form of Section 33: return the full-carrier Jacobian L_λ and verify the parent-Hessian pullback $L_\lambda^\dagger H_{loc} L_\lambda = \alpha\, Q_{\text{Gate2,on}}$ with the five pass conditions, the wheel-metric shortcut being excluded by Sections 31 and 32;
- **AP1b-II:** prove the SGPL coarse effects equal the twelve RUDM projector effects, $E_A^{\text{physical}} = h_0 P_A$, and establish the realised-ray identity $\rho_J = |z\rangle\langle z|$ unconditionally;

- **AP1b-III:** return the source-selected magnitude-bearing complete-fact law, preferably as $\frac{1}{2} D^2_{(J\_cyc)} \Gamma_{(F,A)}(0) = g P_A$ or the corresponding D^2 NR block; a linear amplitude $D_{(J\_cyc)} \mathcal{K}_A = c V_A P_A$ is one sufficient factorisation.

The hard pass is not support agreement but the identities themselves, with the same common scalar and no hidden representation-dependent coefficient. Theorem 1A supplies the exact target shape: any deviation from proportionality to w_A at the same grain is a falsification, not a fittable correction. Theorem A makes the test finite: it is an operator equality on a 49-dimensional carrier.

Passing Gate A2 promotes the hazard-rigidity theorem from a conditional selector to a primitive source-normalisation theorem. The common scale is then read directly from the binary-rate curvature, or as $|c|^2$ when the source supplies the linear-amplitude factorisation.

Gate B: absolute common intensity/history scale

Derive the surviving common event rate or history intensity from the same primitive transfer/history law:

h_0, λ_0, or equivalently the retained Λ_common.

The calculation must identify its action/probability currency and its one-Fold or history-time grain. It must not be calibrated from a Standard-Model coupling or from the older typed κ_E_2 benchmark. If Gate A2 passes through AP1b-III, this gate collapses into the same completed-source event-rate return. The exact RCCSJ relation $\lambda\_J = (2/(31 K\_cyc^{(2)})) g\_cyc^2$ may then be used as the conversion to the inherited current-cycle convention, not as a source input.

Gate C: microscopic refinement and history pushforward

Push the twelve-component score law through the actual primitive microscopic mark alphabet.

Test Theorem 6 explicitly:

- factor-blind refinement should reproduce the coarse H_CWY exactly;
- any factor-sensitive refinement must return the predicted positive-semidefinite conditional Fisher correction;
- both E_2 quadratures must agree under D_6.

Only after Gates A1 through C pass should the direct physical current metric be issued.

Then, and only then, execute the surviving Abelian closure portal

$M_{(2,short)}^{phys} = M_{JJ}^{phys} - g_C g_C^T / a_C$.

A successful Gate A2 plus Gate B would be the decisive next advance: it would turn the remaining common scale from a named debt into a source-derived gauge/current normalisation.

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41. Conclusion

The representation-resolved current-normalisation problem has been narrowed again, and its last verbal assumption has been converted into a finite source test.

The exact twelve-sector RUDM law is incompatible with independent positive representation gains at the same primitive mark grain. More strongly, any positive same-grain component hazard family preserving the RUDM conditional mark law must be

$$\tilde{h}_A = c\, w_A,$$

with one common scalar functional c, unique and equal to the total intensity, and the rigidity is global: one interior ray or one ledger enforces it. Within the positive quadratic source-equivariant class this forces

$$Q(J) = g\, \|J\|^2,$$

so the relative current law is unique up to one common magnitude.

Its primitive C/W/Y intensity scores reproduce

$$H_{CWY} = (1/49) \cdot [\ 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\ ],$$

positive definite with exact spectral data and equal-factor marked-rate precision 1076/147, the same relative geometry independently returned by the MASD current-cycle and terminal-Born calculations. The microscopic refinement theorem proves that factor-blind splitting or downstream copying leaves this matrix exactly unchanged, that nothing else leaves it unchanged, and that any factor-sensitive refinement contributes an explicit positive-semidefinite conditional Fisher term.

The common-parent audit identifies the remaining provenance requirements. The physical event effects must satisfy $E_A = h_0 P_A$, the Gate-2/current term must descend from the same local parent, and the current branch must use the same realised component ray. The Gate-2 wheel-metric shortcut is excluded exactly because its alternating zero-cost transport mode cannot arise as a faithful pullback of a positive-definite compressed metric, W_{wheel} or any other. AP1b-I therefore waits on the pre-compression Jacobian L_λ and the parent-Hessian pullback $L_\lambda^\dagger H_{loc} L_\lambda$.

The binary first-record audit then corrects the typing of the magnitude gate. A primitive fact is all-or-nothing; the continuous quantity can be the rate at which complete facts occur. A nonzero linear current-to-record amplitude remains one possible microscopic mechanism, but it is not required. The more primitive source target is the quadratic curvature of the complete-fact occurrence law,

D^2_(J_cyc) Γ_F, or equivalently D^2_(J_cyc) NR.

On the explicit positive RCCSJ current-cycle witness, the first derivative vanishes by divergence-free row compensation and the second derivative is nonzero. The nonuniform and full-cycle stationary curvatures are exactly

g_cyc^2 (1/62) H_CWY ⊗ I_2 and g_cyc^2 (2/31) H_CWY ⊗ I_2,

respectively, and they coincide exactly with the corresponding marked Fisher metrics. Thus the missing gauge strength has a precise binary meaning: it prices how strongly the physical current cycle changes the cadence of complete facts.

Using M_0 = K_cyc^(2) H_CWY, with K_cyc^(2) = 0.212610974570295, the full-cycle comparison gives the exact symbolic family

λ_J = (2 / (31 K_cyc^(2))) g_cyc^2,

numerically 0.30344684305525943 g_cyc^2 at the inherited K_cyc^(2).

This is a real reduction, not a physical numerical prediction. Positivity, Markov completeness, D_6 covariance and the factor shape all survive a continuous gain orbit, so the completed primitive source must still select g_cyc.

Combining the saturated first-birth matching equation with same-grain equality of the neutral and visible sector coefficients produces the conditional target

λ_birth = 1 / (3 $κ\_J^2$),

and hence λ_J = 1/3 at κ_J = 1 only if the first-birth and independent current-cycle laws, their current normalisations, and their history/terminal scales are all proven identical. The corresponding RCCSJ gain would be g_cyc = √(31 K_cyc^(2)/6) = 1.048088753532. These numbers are quarantined consistency targets, not source returns.

The current/time audit remains orthogonal to this normalisation problem. MASD already defines the primitive current without physical time, the current-cycle sector supplies a nonzero divergence-free current with no independent density evolution, and the canonical current-divergence and refinement generators coincide on the reversible K = 7 branch. Physical time enters downstream through the still-open σ-to-δ bridge and the conversion

J^(t) = s_σδ (c⋆ / a_t) J.

That conversion does not determine λ_J, because current per unit emergent time and Fisher/history pricing are differently typed quantities.

The programme now has two sharply separated current frontiers:

Gauge/current normalisation: derive the completed-source binary first-record curvature on the full representation-resolved current cycle, close the AP1b ancestry/projector identities, perform the terminal pushforward, and extract one source-fixed λ_J before the Abelian portal.

and

Continuum/temporal physicalisation of the current: derive the σ-to-δ source bridge and prove the continuum Lorentz four-current pushforward.

The first frontier has been reduced to one concrete derivative and one source gain rather than a twelve-parameter metric choice. The second does not reopen the first. The strongest present statement is therefore:

$\lambda\_J = (2 / (31 K\_cyc^{(2)})) g\_cyc^2$ exactly, numerically 0.30344684305525943 g_cyc^2 at the inherited $K\_cyc^{(2)}$, with g_cyc still source-unselected.

Closing $D^2\_(J\_cyc)$ NR or $D^2\_(J\_cyc)$ Γ_F on the completed physical H_CMR, with rank, covariance, positivity, regulator and terminal certificates, would promote this result from a positive existence family and conditional calibration target to a genuine primitive gauge/current normalisation theorem.

Appendix A: Exact Component Ledger

Component A	d_A	(C, W, Y)
e_R^triv	1	(0, 0, 1)
e_R^std	2	(0, 0, 1)
N_R^std	2	(0, 0, 0)
L_L^triv	2	(0, 1, 1)
L_L^std	4	(0, 1, 1)
H	2	(0, 1, 1)
d_R^triv	3	(1, 0, 1)
d_R^std	6	(1, 0, 1)
u_R^triv	3	(1, 0, 1)
u_R^std	6	(1, 0, 1)
Q_L^triv	6	(1, 1, 1)

Component A	d_A	(C, W, Y)
Q_L^{std}	12	(1, 1, 1)

Summing the uncentred signature products gives

$$\Sigma_A d_A \chi(A) \chi(A)^T = [\ 36\ 18\ 36\ ;\ 18\ 26\ 26\ ;\ 36\ 26\ 47\ ].$$

Entry accounting: (C, C) = 3 + 6 + 3 + 6 + 6 + 12 = 36; (W, W) = 2 + 4 + 2 + 6 + 12 = 26; (Y, Y) = 49 − 2 = 47 (all dimensions except N_R^{std} are hypercharged); (C, W) = 6 + 12 = 18 (the Q_L components only); (C, Y) = 36 and (W, Y) = 26, since every coloured and every weak component carries hypercharge.

Appendix B: Selector Jacobian

For

$$p_A = d_A / 49$$

and log gains $g_A = e^{\gamma_A}$,

$$p_A(\gamma) = e^{\gamma_A} p_A / \Sigma_B e^{\gamma_B} p_B.$$

Thus

$$\partial p_A / \partial \gamma_B = p_A (\delta_{AB} - p_B),$$

or

$$J_g = \mathrm{diag}(p) - p\, p^T.$$

Because every $p_A > 0$, Lemma 3 gives

$$\mathrm{rank}\ J_g = 11,\ \ker J_g = \mathrm{span}\{(1, \ldots, 1)\},$$

for any strictly interior twelve-category law, so the rank statement is a structural property of interiority and not an accident of the particular dimension vector (1, 2, 2, 2, 4, 2, 3, 6, 3, 6, 6, 12).

The common-gain null is exactly the statement that conditional mark probabilities cannot determine an absolute event clock.

Appendix C: Machine Certificates and Independent Verification

C.1 Selector and factor-Gram certificate

The associated frozen calculation package records:

- twelve-sector first-fact selector rank: **11**;
- selector nullity: **1**;
- common-direction null alignment: **1.000000000000000**;
- nonuniform-gain first-fact total variation: **0.048501275510**;
- 20,000-ray mean conditional total variation: **0.047797636485**;
- exact integer factor Gram: 49 H_CWY = [36 18 36 ; 18 26 26 ; 36 26 47];
- magnitude-bearing event-Gram residual: $\mathbf{1.132 \times 10^{-15}}$.

C.2 Attachment-audit certificate

The 49-dimensional direct-sum implementation with the twelve source dimensions records:

- common scaled block-unitary maximum effect residual: $\mathbf{1.148 \times 10^{-15}}$;
- summed effect residual: $\mathbf{2.197 \times 10^{-15}}$;
- RUDM conditional-probability residual: $\mathbf{1.110 \times 10^{-16}}$;
- scalar Euclidean-cost conditional-probability residual: $\mathbf{5.551 \times 10^{-17}}$;
- measured common rate ratio: **0.750511728837068**, equal to the predicted e^(−a_t Q) to all printed digits;
- nonuniform twelve-sector attenuation total variation: **0.072429283693**, so sector anisotropy is visible at the effect level;
- quadratic-current factorisation residual: max_A | λ_A − λ_0 ‖J‖² w_A | = $\mathbf{8.882 \times 10^{-16}}$;
- normalised quadratic current marks reproduce the current-ray projector weights to $\mathbf{5.551 \times 10^{-17}}$.

C.3 Independent verification layer

This paper carries an independent verification layer, executed in exact and floating arithmetic separately from both frozen packages:

- component ledger sum: Σ d_A = 49, confirmed;
- integer Gram reconstructed from the ledger by exact arithmetic: identical to the certificate matrix, entry by entry;
- Jacobian rank 11, nullity 1, null alignment with (1, …, 1) equal to 1 to machine precision, confirmed;
- eigenvalues of M_JJ^event recomputed from the exact rational matrix: 0.314682300680, 1.010864036230, 7.572412846763, agreeing with the certificate to all stated digits;

- equal-factor marked-rate precision $f^T M\_JJ\text{^}event f = 1076/147$ exactly, decimal 7.319727891156, confirmed;
- leading principal minors of 49 H_CWY: 36, 612, 4428, all positive, so H_CWY is positive definite; trace 109, determinant 4428;
- reproducible nonuniform-gain diagnostic with declared gain g_A = d_A: exact first-fact total variation 1140/4949 = 0.230349565569; seeded 20,000-ray mean conditional total variation 0.232893;
- handoff matrix M_0 = K_cyc^(2) H_CWY recomputed entrywise from K_cyc^(2) = 0.212610974570295 and the exact Gram: maximum deviation from the stated entries below 5×10^{-13}; axle precision $f^T M_0 f = 0.389063620132$ confirmed, with exact form K_cyc^(2) · 269/147;
- Theorem 6 refinement identity verified numerically on a randomised factor-sensitive splitting of all twelve components: M^micro reproduces M^coarse + Σ_A λ_A I^ref(A) to finite-difference precision, with the correction positive semidefinite, and the factor-blind limit returning M^micro = M^coarse exactly;
- centred conditional-mark check: with $\mu = (36, 26, 47)^T/49$, the exact identity 2401 $(H\_CWY - \mu \mu^T) = [\ 468\ -54\ 72\ ;\ -54\ 598\ 52\ ;\ 72\ 52\ 94\ ]$ is confirmed by rational arithmetic, and the equal-factor conditional-mark precision $f^T 4(H\_CWY - \mu\mu^T) f = 5200/7203 = 0.721921421630$, so the uncentred/centred typing note of Section 9 is exact;
- attachment-audit operator algebra independently rebuilt with declared reproducible parameters: a random per-sector block-diagonal unitary with common norm h_0 returns $E\_A = h_0 P\_A$ and $\Sigma\_A E\_A = h_0 I$ to $\leq 1.0 \times 10^{-15}$ and the RUDM conditional law to 5.6×10^{-17}; a declared scalar cost with a_t Q = ln(4/3) leaves the conditional law unchanged to 1.2×10^{-16} with rate ratio exactly 0.75; a declared per-sector attenuation d_A produces exact first-fact total variation 1140/4949, coinciding with the Section 7 diagnostic because both are the g = d gain; the current-ray factorisation $\lambda\_A = \lambda_0 r^2 \|P\_A z\_J\|^2$ holds to 3.6×10^{-15} and the normalised marks reproduce the projector weights to 2.8×10^{-17}.

C.4 AP1b-I audit verification

The Part III spectra and kernel claims are independently reverified in exact and floating arithmetic:

- Q_comp reconstructed from A_comp: equal to the stated integer circulant; factorisation Q_comp = $(I + P)^T(I + P)$ exact; spectrum {0, 1, 1, 3, 3, 4} matching the closed form 4 $\cos^2(\pi k/6)$ to machine precision; Q_comp a = 0 and (I + P) a = 0 exactly for the alternating mode;
- Q_Gate2,on = Q_comp + $\mathbb{1}\mathbb{1}^T$: spectrum {0, 1, 1, 3, 3, 10}; Q_Gate2,on a = 0 to 5.6×10^{-17}; inertia (5 positive, 0 negative, 1 zero) confirmed;
- W_wheel: exact rational eigenvalues {3/31, 39/248, 45/248, 54/217, 12/31, 12/31} confirmed by symbolic computation via the two singleton and two 2 × 2 symmetry blocks; all strictly positive, so the inertia mismatch (6, 0, 0) versus (5, 0, 1) underlying Section 31 is exact.

C.5 Part IV verification

The Part IV exact claims that are checkable without the frozen packages are independently reverified:

- Hodge additivity of the CRTF split: $1 + 2/3 = 5/3$ exactly, and the cycle share $1/(5/3) = 3/5$, so the 60% statement is exact rational arithmetic on the certified Hodge norms;
- the MASD half of the generator match: for the $K = 7$ wheel (hub plus six rim vertices, twelve edges) the incidence identity $B B^T = L_{(W_7)}$ holds exactly in integer arithmetic, so with $C = (1/31) I_{12}$ the identity $B C B^T = (1/31) L_{(W_7)}$ is automatic; the independent certificate content is the HMGBC equality $Q_7 = \Pi(I - T_0) = (1/31) L_{(W_7)}$, consumed at its source grade;
- the Theorem E conversion algebra: the chain $\sigma = s_{\sigma\delta}\, \delta$, $t_{phys} = (a_t/c\star)\, \delta$ gives $\partial_\sigma = (a_t/(s_{\sigma\delta}\, c\star))\, \partial_t$, and the round-trip factor $(s_{\sigma\delta}\, c\star/a_t)(a_t/(s_{\sigma\delta}\, c\star))$ simplifies to 1 symbolically, so the continuity equation retains its exact form with $J^{(t)} = s_{\sigma\delta}\, (c\star/a_t)\, J$ and no residual factor.

C.6 Binary first-record curvature certificate

The BCTR/RCCSJ calculation supplies the following exact or machine-certified identities:

- $D_{(J_{cyc})}\, \Gamma_F |_0 = 0$ by divergence-free outgoing-score compensation;
- local $m = 2/4$ spatial Grams $G_h = (3/112)\, I_2$ and $G_{(b_j)} = (5/384)\, I_2$;
- stationary coefficient $(7/31)(3/112) + 6\, (4/31)(5/384) = 1/62$ exactly;
- uniform, nonuniform and full-cycle coefficients $3/62$, $1/62$ and $2/31$;
- equality of the binary-rate curvature and RCCSJ marked Fisher matrices;
- full representation-resolved rank six for $g_{cyc} \neq 0$;
- numerical scale conversion using the inherited $K_{cyc}^{(2)}$: $(2/31) / 0.212610974570295 = 0.30344684305525943$;
- conditional unit-normalised birth target $\lambda_{birth} = 1/3$ and implied $g_{cyc} = 1.048088753531807$, explicitly dependent on the same-event and same-normalisation premises of Section 38.

The numerical identities verify the algebra of the positive witness. They do not select the physical gain or replace the completed-source extraction.

C.7 Part V independent verification

The Part V arithmetic checkable without the frozen packages is independently reverified in exact and symbolic arithmetic:

- stationary reduction over the common denominator: $(7/31)(3/112) = 3/496$ and $6\, (4/31)(5/384) = 5/496$, summing to $8/496 = 1/62$ exactly; full-cycle additivity $3/62 + 1/62 = 2/31$ exactly;
- scale conversion $(2/31)/K_{cyc}^{(2)} = 0.303446843055259448$, agreeing with the certificate to all printed digits, with the exact form $\lambda_J = \left(2/(31\, K_{cyc}^{(2)}) \right) g_{cyc}^2$;

- the conditional gain in closed form: $g_{cyc}^2 = (1/3)/\lambda_J(1) = 31\, K_{cyc}^{(2)}/6 = 1.098490035280$, so $g_{cyc} = \sqrt{31\, K_{cyc}^{(2)}/6} = 1.048088753531807$, agreeing with the certificate to all printed digits;
- the occurrence/type Fisher decomposition verified symbolically on a two-parameter, three-type family: the full categorical Fisher matrix equals $(\nabla h\, \nabla h^T)/(h(1-h)) + h\, F_q$ identically, with the cross terms vanishing through $\Sigma_A \nabla q_A = 0$, and $\nabla\Gamma_F = \nabla h_F/(1 - h_F)$ confirmed;
- rank six of the curvature blocks: H_{CWY} is positive definite of rank three (minors 36, 612, 4428), so $H_{CWY} \otimes I_2$ has rank six for every nonzero gain;
- Lemma V.1 verified numerically on a randomised eight-transition log-linear rate family with first-order compensation imposed: the finite-difference Hessian of the total rate matches the rate-weighted score Gram to finite-difference precision and the first derivative vanishes at the base point.

The numerical packages are verification certificates; none of these diagnostics substitutes for the source-provenance grades stated in the main text, and the audits' analytic verdicts on the published stack are unaffected by them.

Appendix D: Mark-Refinement Identity

For completeness, let

$\lambda_{A\alpha} = \lambda_A\, r_{A\alpha},\ \Sigma_\alpha\, r_{A\alpha} = 1.$

Then

$s_{F,A\alpha} = \partial_F \log \lambda_{A\alpha} = s_{F,A} + u_{F,A\alpha},\ u_{F,A\alpha} = \partial_F \log r_{A\alpha}.$

The microscopic contribution at fixed coarse component A is

$\Sigma_\alpha\, \lambda_A\, r_{A\alpha}\, (s_{F,A} + u_{F,A\alpha})(s_{G,A} + u_{G,A\alpha}).$

Using

$\Sigma_\alpha\, r_{A\alpha}\, u_{F,A\alpha} = \Sigma_\alpha\, \partial_F\, r_{A\alpha} = 0$

the cross terms vanish, giving

$\lambda_A\, s_{F,A}\, s_{G,A} + \lambda_A\, \Sigma_\alpha\, r_{A\alpha}\, u_{F,A\alpha}\, u_{G,A\alpha}.$

Summing over A,

$M^{micro} = M^{coarse} + \Sigma_A\, \lambda_A\, I_A^{ref}$,

with

$I\_A^{ref} = \Sigma\_\alpha \ r\_A\alpha \ u\_A\alpha \ u\_A\alpha^T \geq 0$,

and $I\_A^{ref} = 0$ exactly when $u\_A\alpha$ vanishes on the support of r_A, that is, when the splitting is factor blind. This exact identity is the basis of Theorem 6 and its equivalence Corollary 6.1.

Appendix E: Attachment-Status Ledger

Object	Status after RCHS-1 and the attachment audit
Twelve source projectors P_A	exact on frozen 49D commitment tangent
RUDM relative hazards $h\_A = h_0 \ w\_A$	closed at inherited source grade
Common absolute RUDM hazard h_0	open
One primitive shared-interface record before copying	strong conditional inherited pass
Twelve-projector resolution on primitive commitment carrier	source supported / exact projector algebra
Fold/K_4-to-tangent intertwiner	open
AP1a primitive carrier compatibility	partly source supported; not fully executed
AP1b decomposed into AP1b-I/II/III	operational reduction within SGPL/HMGBC, exactly derived (Part II)
Effect-equivalence criterion $E\_A = h_0 \ P\_A$	exactly derived; finite operator test (F9)
Common-parent variation mechanism (Theorem B)	exactly derived; no cost-to-probability axiom needed
Block-unitary transfer characterisation	exactly derived; transfer must lie in the sector commutant
Scalar Gate-2 cost as common multiplier $c = h_0 \ e^{(-a\_t Q)}$	exactly derived; realises Theorem 1A's surviving functional
Current-ray factorisation $h_0 = \lambda_0 \ r^2$	exact identity; conditional on realised-ray equality
AP1b-I common-parent ancestry of Gate-2/current term	**not yet proved (Part III)**; wheel-metric shortcut exactly ruled out; reduced to the L_λ Jacobian return
Gate-2 A_comp provenance from the master action	open; load-bearing postulate per its source paper
$Q\_comp = (I + P)^T(I + P)$, spectrum {0, 1, 1, 3, 3, 4}, alternating kernel	exact
Q_Gate2,on spectrum {0, 1, 1, 3, 3, 10}, same kernel	exact

Object	Status after RCHS-1 and the attachment audit
W_{wheel} spectrum $\{3/31, 39/248, 45/248, 54/217, 12/31, 12/31\}$, positive definite	exact; full typed defect lift still open
Invertible identification $Q_{Gate2} \leftrightarrow W_{wheel}$	exactly ruled out (inertia)
Faithful pullback of W_{wheel}, or of any positive-definite metric	exactly ruled out (Corollary 32.1)
Pre-compression Jacobian L_λ and parent pullback $L_\lambda^\dagger H_{loc} L_\lambda$	open; the named AP1b-I object (F11)
AP1b-II mark-projector and realised-ray identity	partly supported; conditional on birth-current tangent identity
Linear current-to-record amplitude $D_{J_{cyc}} \mathcal{K}_A$	**fails on published stack (PCRS-1R)**
Binary first-record curvature in RCCSJ/BCTR-2	exact positive existence pass; $D\Gamma_F = 0$, $D^2\Gamma_F \neq 0$; common gain free
AP1b-III completed-source magnitude-bearing event law	open; derive $\frac{1}{2} D^2_{J_{cyc}} \Gamma_{F,A} = g P_A$ or equivalent D^2 NR
Exact RCCSJ gauge-scale family	$\lambda_J = \left(2/(31 K_{cyc}^{(2)}) \right) g_{cyc}^2$, numerically $0.30344684305525943\, g_{cyc}^2$; symbolic relation exact, gain not selected
Saturated same-event birth target	$\lambda_J = 1/3$ at $\kappa_J = 1$, with $g_{cyc} = \sqrt{31 K_{cyc}^{(2)}/6}$; strong conditional target only
Functional relative hazard rigidity	exact conditional on AP1b
Positive quadratic current law $Q = g\|J\|^2$	exact within source-equivariant quadratic class conditional on AP1b
Coarse magnitude-bearing score support $s_{F,A} = 2\chi_F(A)$	exact for that quadratic law
H_{CWY} factor shape	exact
Factor-blind microscopic refinement invariance	exact, and an equivalence (Corollary 6.1)
Factor-sensitive refinement correction	exact PSD formula; physical value open
Common physical current/history scale λ_J	open; fixed by the completed-source full-cycle binary trigger curvature or an equivalent source amplitude; never by temporal coordinate conversion (F-PT1)
Abelian closure portal (g_C, a_C)	open
Primitive MASD constitutive current $D_J = J - \kappa(\rho_t - U\rho_s)$	exact current definition; no physical-time coordinate required
Relative-Birth Current $\delta J = \kappa(\delta\rho_t - \delta\rho_s)$	exact at neutral common-background zero locus

Object	Status after RCHS-1 and the attachment audit
Pure current-cycle J_cyc ∈ ker(B ⊗ I_{49})	exact nonzero divergence-free current subcarrier
Nonzero cycle current with no independent density update	exact static continuity pass at isolated MASD current-cycle grade
Physical CRTF current-cycle norm fraction	exact 3/5 of squared current-tangent magnitude
σ refinement parameter	inherited primitive update/refinement typing; not ordinary pre-existing physical time
Canonical current-divergence/refinement matching B C B^T = Q_7 = (1/31)L_(W_7)	exact on reversible K = 7 branch
Fold-opportunity-to-Lorentzian-time map T(δ) = δ a_t/c⋆	source-derived on declared local homogeneous branch
σ-to-δ source bridge	open; determine s_σδ in σ = s_σδ δ (Gate T)
Physical-time-normalised discrete current	conditional: J^(t) = s_σδ (c⋆/a_t) J
Strict same-step current conversion	conditional on σ = δ: J^(t) = (c⋆/a_t) J
Continuum Lorentz four-current pushforward	open
"Flow of realised facts" interpretation	structurally supported interpretation; not promoted to theorem

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1. **ETRG-2 / RUDM-1: Record-Updated Directing Measure and Commitment-Projector Closure.**
2. **Primitive Matter Selection in VERSF: cumulative execution through PMS-EX125 and PMS-EX126.**
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6. **PSU-1: Primitive-Source Uniqueness and Blind Whole-Action Reproduction Audit.**
7. **Constitutive Completion and the Gate-2 Verdict.**
8. **Gate-2 Matter-Tangent Lift and Hazard–Current Bridge Audit.**
9. **Gate-2 Representation-Resolved Tensor-Lift Source Audit.**
10. **The terminal-Born/current-cycle quadratic successor calculation in the sequential opportunity-to-commitment-time attaching-map programme.**
11. **RCCSJ-1: The Representation-Resolved Current-Cycle Source Jet and Positive-History Realisation in VERSF**, consumed both as a boundary/no-go predecessor and, in

Part V, as the positive marked current-cycle witness whose Fisher metric equals the binary trigger curvature.
12. **SGPL: the event-resolved primitive marked-transfer (Kraus) architecture.**
13. **HMGBC: the history-parent generator and physical-admission architecture.**
14. **GSJB-16: shared-interface record localisation and the primitive birth-current tangent identity.**
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18. **CRTF-EX2C: Canonical Generator-Matching Calculation**, source of $B C B^T = Q_7 = (1/31)L\_(W_7)$.
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22. **CRTF-EX2K: Linearised MASD Relative-Birth Current and Haar Universality Theorem**, source of the relative endpoint-innovation current relation.
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25. **BCTR-2: Binary First-Record Trigger Curvature of the RCCSJ Positive Current-Cycle Witness**, source of the exact hub, rim and stationary trigger curvatures and their identity with the RCCSJ Fisher metric.