RCHS-24: The Quadratic Gauge-Release Sufficiency and Conditional First-Fact Endpoint Reduction Theorem in VERSF

Quadratic release, self-testing conditional endpoints, covariant curvature descent and the physical source-response requirement

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General reader summary

Earlier work left two large-looking tasks: prove that one deepest rule generates every layer of the machinery, and pin down the state of the system at the moment a fact becomes final. This paper separates what the leading strength calculation actually needs from that wider unification programme.

For the leading calculation, the required object is the complete connected response of the physical current and everything coupled to it at that order. A genuinely disconnected piece cannot change the answer, and deeper couplings cannot change it at the same starting point. That shrinks the task, but it does not excuse deriving the coefficients that remain.

The endpoint picture stays tightly constrained. On the stated finite model, everything hangs on one number, the ratio of how fast facts complete to how fast the internal structure relaxes; any one reading of how strongly neighbouring parts stay in step, or the overall size of the current, fixes that number, and every other reading becomes a cross-check with nothing adjustable. These results are exact for that model; they do not prove that the model's clock is the physical one.

Fixing the input dials and the output conversion turned out not to be enough. An earlier simplified version of the machinery charged a cost to changes that should be free, because it moved the links without letting the rest of the structure turn with them. A fuller version that lets everything turn together removes that artificial cost and keeps the genuine part of the response. That repairs the framework, but its convenient test settings do not thereby become physical force strengths.

The decisive question is now how the deep structure supplies the restoring push itself. Watching a system only after it has completely settled tells you where it ends up, but forgets how strongly it resisted being moved. Watching it settle in time, or pushing it with a correctly calibrated force

and reading the response, keeps exactly that information. The paper gives exact recovery recipes for both, checks them on a benchmark, and separates them from things that merely look similar.

Two further calculations now make part of that restoring response explicit. The existing current and conservation equations determine how the endpoint fields move, but leave an independent contribution from links and records. Varying those separate fields in the declared common action gives the nonlinear forces that align their transport and enforce record composition. Those equations have been checked without replacing matrix records by scalar phases. They still contain the physical weighting that the primitive source must supply.

The distinction is therefore between deriving the form of a restoring force and deriving its physical strength. Stable phase alignment also does not, by itself, stop the visible record amplitude from shrinking; the complete source must determine which record changes are allowed and what protects their capacity. No physical coupling strength is issued. The calculations establish conditional response formulas and expose specific missing inputs; they do not turn a chosen weighting into a prediction.

Contents

Scientific status

EXACT LOCAL RESULT (quadratic release). At a stationary background, only the complete quadratic Hessian-connected component containing the retained physical current and matched link can enter their stationary quadratic Schur response. A disconnected quadratic spectator is invisible. Higher-order couplings leave the quadratic coefficient unchanged where a regular stationary elimination is justified. For a fixed positive-semidefinite parent, enlarging the physically permitted relaxed set can only lower the retained quadratic form. This statement does not compare different parent actions, backgrounds or normalisations.

EXACT CONDITIONAL RESULT (endpoint family). On the canonical equal-conductance, exponentially stopped Dirichlet model,

$\zeta = \nu/\alpha$, $\bar{C}\_\zeta = \zeta(\zeta I + 2L\_K)^{-1}$.

The adjacent, next-nearest, opposite and spoke coherence coordinates are strictly monotone; the rim family is ordered by distance and obeys exact gap and elimination identities. The raw-current norm is a strictly increasing coordinate with range (0, 75/434). Under internal U(49) isotropy and factor-blind spatial evolution,

G_CWY^cur = $\mathcal{J}(\zeta)\cdot H\_CWY$.

The exact inversion formulas, edge decomposition and factor-Gram fingerprints of Sections 8 to 9E are preserved. Their branch, clock, generator, coordinate and preparation assumptions remain physical-attribution obligations.

EXACT CONVENTIONAL RESULT (gauge-normalisation endcaps). The fixed Standard-Model generator insertion and canonical tensor profile have rank twelve and Gram diag($6I_8$, $(13/2)I_3$, 378). No post-derivative factorwise rescaling is licensed. The already-declared Wilson interface has c_norm = 1 in its stated conventions. Neither statement supplies the physical response metric, the source-to-curvature map, the action unit or the matching scale.

EXECUTED BRANCH RESULT (covariant consistency). The complete archived 334-coordinate scalar-channel source was rebuilt, but its maximally relaxed link matrix retained positive cost on all 72 link-frame gradients. That matrix is therefore not admitted as the unfixed pure gauge-kinetic response of the unchanged branch. A later, explicitly declared covariant common-action benchmark repairs the missing simultaneous matter/record directions: its reduced 144-coordinate gauge-link matrix has rank 72 and annihilates all link-frame gradients.

Its face-curvature kernel is explicit. The repaired benchmark does not select its background, auxiliary availability or operational weights. [14, 15]

EXECUTED CONDITIONAL RESULT (native history response). The current/continuity defect lift is algebraically fixed when the retained fields and adjustable velocity are specified. Native terminal derivatives and short-history scores are then calculable. On the five tested state-preserving channels, the stationary active density is unique, but the channels' defining current fields and renewal rule are not selected. Temporal correlations reveal direction-sensitive current information while the normalised-ray instrument remains exactly blind to pure current rescaling. These results are not a physical current-action normalisation. [16, 17, 18]

EXACT CONDITIONAL RESULT (dynamics and statistics). For an independently supplied harmonic gradient drift with fixed positive mobility M, and an additionally assumed additive Gaussian Markov completion with the matching Gibbs equilibrium,

$$Q = 2M/\beta_G.$$

The finite-time update, auxiliary memory and noise follow consistently. The static action stiffness, effective mobility and observed-history information remain different quantities. For a supplied deterministic drift $b_0 = -M\nabla F$ at a stationary point,

$$H_F = -M_\star^{-1} Db_0|_\star.$$

Recovering a Hessian from a drift generated by that same assumed Hessian is a consistency check, not primitive selection. [20]

EXACT CONDITIONAL RESULT (selector and susceptibility). For scalar-mobility harmonic relaxation,

$$\lim_{t\to\infty} e^{(-\mu H t)} = P_{\ker H}.$$

The completed selector loses the positive restoring spectrum. Three comparisons in the inherited link-record family have the same selector, rank and trace, but different finite-time and finite-mode curvature responses. On a known positive physical quotient and a fixed conjugate-source map $q = E^T x$,

$$\chi_{static} = E^T H_Q^{-1} E, \quad Z_{static} = \chi_{static}^{-1}.$$

The source-drift continuation verifies this response independently. It also corrects the literal diamond-reflection argument: the opposite endpoint-tilt tangent is even under the stated combined reflection, and a uniform internal rotation generator is not thereby the invariant restoring Hessian. [21]

EXECUTED PARTIAL SOURCE RESULT (endpoint drift and independent remainder). On the stated constitutive/continuity subsystem, the endpoint drift and its link derivative are explicit. The executed real arrays have shapes 700 × 700 and 700 × 144. At a constant flat background, the link-to-endpoint derivative vanishes on the source-metric horizontal curvature lift, even when its unrestricted rank is 72. Under the additional fixed-conductance common-gradient interpretation, the endpoint equation determines

$$F = \Sigma\_e\, \kappa\_e \|\psi\_t - U\_e\, \psi\_s\|^2 + \mathcal{G}(U, \Phi, \ldots),$$

but does not determine the endpoint-independent term $\mathcal{G}$. The diffusion-generating potential is not identified with the squared-defect master action. These are partial source-equation and conditional integrability results, not a complete physical drift or gauge-weight return. [24]

EXACT CONDITIONAL RESULT (nonlinear independent link-record covectors). With a supplied common residual metric and fixed occupied support, the direct closure, record-composition and polar-bond force covectors have been evaluated explicitly. For the right polar decomposition $\Phi\_e = V\_e\, S\_e$, the polar-bond record contribution is

$$(\nabla(\Phi\_e)\, \Gamma)B = -2V\_e\, \mathcal{L}(S\_e)^{-1}\, \mathrm{skew}(V\_e^\dagger\, \tau(B,e)),\quad \tau\_X = \Sigma\_Y\, W\_XY\, D\_Y,$$

where $\mathcal{L}\_(S\_e)(X) = S\_e X + X S\_e$. The formulas retain the common cross-metric and the noncommuting polar derivative. They have been checked on the inherited 50-dimensional representation over all twelve links, including every one of the 144 gauge-generator directions and 300 specified record directions. The independent field variations are not independently normalised primitive laws: the physical metric, its possible field dependence, the mobility and admitted capacity variations remain open. An isolated fixed-capacity phase-alignment solution and a bounded matrix amplitude-escape test are also obtained. [25]

REVISED RELEASE ORDER. K0A(2) remains the obligation to derive the complete physical quadratic parent. K0A(all-order provenance) remains parallel beyond that order. The separation does not excuse missing primitive information that already determines the quadratic coefficients. The immediate missing return is an independently normalised physical force/response derivative or equivalent microscopic source law, on the full admitted covariant carrier.

NOT CLAIMED. No physical value of ζ, λ_J, the full W_prim, a physical background, a full field drift, G_red^physical, Z_3, Z_2, Z_q, g_s, g, g', or their physical ratios is issued. Benchmark ranks, conditional information values and reproducibility residuals do not remove these obligations. The calculations do not establish that only one common physical scale remains. The endpoint rows and nonlinear direct force covectors now returned do not constitute a source-selected full field evolution. No all-coordinate record finite-difference census is claimed.

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1. Programme position

RCHS-1 ended with the gauge-normalisation release sequence

K0A → K0B → K1 → K2 → K3/K4 → K5,

where K0A asked for one primitive field-dependent marked instrument generating the gauge/current, record, completion and CAR/Fock graded source jets together, and K0B asked for the physical same-event endpoint law.

A source-corpus audit shows that simply writing a new "unified instrument" paper would duplicate substantial existing work.

RCHS-3 already retyped the old single-dΦ problem into a graded source jet. On the frozen source-extension stack:

- the faithful gauge action begins at differential order two;
- bosonic completion begins at order two;
- terminal-record orientation has a first-order return;
- shared-link CAR/Fock completion begins at mixed order three;
- the native gauge/current source factorisation passes at raw rank 144 and Wilson-quotient rank 72;
- the gauge, completion, record and CAR/Fock sectors separately pass their declared compatibility tests to machine precision.

The remaining statement is therefore not compatibility. It is the stronger upstream claim that one deepest primitive transfer **uniquely generates all those conditional source laws**.

That stronger claim is already known not to follow from the presently published primitive wheel alone. PRLU-1 proves that the current primitive MASD-HMGBC transfer does not contain enough information to uniquely return the complete representation ledger, continuous MASD/CAR/Fock proposal kernel, magnitude-bearing defect lift, neutral terminality rule and score normalisation. The later full-faithful source assembly accordingly names primitive-source uniqueness as the remaining upstream frontier.

The first purpose of this paper is therefore to ask a more precise question:

Must that whole-action primitive uniqueness theorem be closed before the leading dimension-four gauge coefficient can be calculated?

The answer is **no**, under an exact and checkable quadratic-order condition.

The second purpose is to record how far the endpoint problem has already collapsed, and to sharpen that collapse into an over-determined, self-testing form.

The later continuations add a third purpose: execute the proposed gauge-response machinery and audit the source information it actually consumes. They distinguish a faithful link-generator census from a field space closed under simultaneous gauge transformations; a finite link-profile cost from a curvature coefficient; a conditional record score from a physical action weight; and a completed admissibility selector from finite-time restoring dynamics. Sections 9G to 9L incorporate those results at their existing grades. The broader conclusion is not that the missing physical weights are now known, but that their source-response requirement can no longer be replaced by one of these differently typed objects. The latest two continuations additionally separate the endpoint-derived transport potential from its independent gauge/record remainder, and the explicit nonlinear force covectors of a declared action from primitive selection of their physical metric. [24, 25]

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2. Claim grades

Grade Q1: exact local analysis

The following are exact consequences of Taylor expansion, Schur complementation and partial minimisation at a stationary background:

- higher-order sectors whose Hessian coupling to the retained gauge/current variables vanishes cannot alter the quadratic effective action;
- a block-diagonal quadratic spectator cannot alter the retained Schur complement;
- the complete quadratic release object is the Hessian-connected component containing J and θ, after exact gauge/null quotienting;
- stationary relaxation is monotone screening: it can only lower retained stiffness in the Loewner order.

Grade Q1′: exact endpoint family analysis

The following are exact consequences of the first-fact-stopped resolvent on the canonical $K = 7$ wheel:

- closed rational forms for the adjacent, next-nearest and opposite rim coherences and for the squared spoke coherence;
- strict monotonicity and bijectivity of each coherence as a function of ζ;
- strict distance ordering of the rim family with exact gap identities;
- an exact algebraic consistency curve for coherence pairs;
- an exact closed form, strict monotonicity and bijectivity of the stopped raw current norm $\mathcal{J}(\zeta)$, with its exact spoke/rim additivity decomposition;
- the factor-Gram bridge $G\_CWY^{cur} = \mathcal{J}\cdot H\_CWY$ under internal U(49) isotropy, with its zero-parameter fingerprints;
- the exact local rim-contrast coordinate $R\_rim(\zeta)$ and its identity $R\_rim = 2\bar{C}\_rr(1 - \gamma\_rim)$.

All are independently re-derived and machine-verified in this paper (Appendix A).

Grade Q1″: exact conditional response analysis

Sections 9G to 9L add the following statements under their displayed assumptions: the local supported bond-polar derivative; covariant gauge-null and static current/continuity identities on the declared constant-background branch; face-curvature descent; the fixed-state current/continuity coordinate inverse; the distinction between raw-transfer curvature and normalised-history information; harmonic fluctuation-dissipation and dynamic Schur consistency; completed-selector information loss; and finite-time or forced-static recovery of a restoring Hessian. They also include the endpoint-drift derivative and its horizontal-curvature zero at the stated background, the conditional endpoint-independent integration remainder, and the direct nonlinear link/record covectors on a fixed full-support patch. The finite-angle alignment solution assumes its stated product-unitary mobility and fixed capacity; the matrix escape concerns the specified record/bond subaction only.

These are mathematical implications and executed benchmark checks. They are not primitive selection of their inputs. Ranks and numerical residuals reported for particular witnesses retain finite-witness grade; no literature-wide novelty is claimed for the underlying linear algebra or fluctuation-response identities.

Grade Q2: consumed VERSF source returns

The paper consumes, at their existing grades:

- RCHS-1 current-link source action and matrix reciprocity;
- RCHS-2 history-derived metric and its full-pullback non-identifiability boundary;
- RCHS-3 graded source orders and native rank-144/rank-72 gauge/current factorisation;
- PRLU-1 primitive-transfer-only uniqueness no-go;
- the full-faithful HM4 source assembly and its graded compatibility results;
- RCHS-4 endpoint-coherence reduction;
- RCHS-5 first-fact-stopped Dirichlet endpoint family;
- the MASD-1 master-action physical-direct evaluator, corrected tensor gauge-to-response embedding and branch-freeze protocol;
- the GRCE-2 physical-direct closure contract for G_red, Ẽ_A → Z_A → g_A and its no-insertion firewall;
- the K7-ICN-1 Wilson-interface normalisation audit;
- the bond-polar, full HM4 and covariant common-action execution notes [13, 14, 15];
- the HM12 native-score, state-conditioned and stationary-history notes [16, 17, 18];
- the primitive update-amplitude and raw-normalisation audit [19];
- the gradient-Gibbs and source-drift/selector/susceptibility continuations [20, 21];
- HMGBC's source-content and history/action qualification, and the older substrate-dynamics source used by the drift audit [22, 23].
- the primitive curvature-probe partial-response calculation, including its source conventions and restricted integration remainder [24];
- the nonlinear independent link-record covector calculation, its full-support and fixed-metric qualifications, represented derivative tests and capacity boundary [25].

Grade Q3: programme retyping

K0A is split into a quadratic physical-release obligation and an all-order primitive-provenance obligation. The latter remains parallel only beyond the complete quadratic response being evaluated. Source selection of the quadratic metric, field drift, relevant state and readout remains part of K0A(2)/K1⋆ and cannot be postponed by this retyping.

Grade Q4: physical Standard-Model admission

The following remain open: an independently derived common physical field-response or microscopic update law; its admitted background and retained/auxiliary partition; the full operational metric and same-order cross-blocks where that route is used; physical endpoint/event attribution; the finite-branch ζ where applicable; the current/action and history/action identifications; the physical curvature map, action unit, regulator/continuum limit and matching scale; the final gauge weights and couplings.

The canonical generator convention and declared Wilson conversion are fixed conditional conventions, not entries on this open list. Their physical source-to-curvature attachment remains open. Nor has it been established that every remaining numerical freedom is a single common scale.

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3. The quadratic-order truncation theorem

Let the complete source coordinates near a stationary physical background $X^\star$ be split into

$x = (r, a, s),$

where

- r contains the retained physical current/link coordinates, in particular J and θ;
- a contains all auxiliary coordinates that couple to r at quadratic order;
- s contains a candidate spectator or higher-order sector.

Assume

$\nabla S(X^\star) = 0.$

Write the Taylor expansion

$S(X^\star + \delta x) = S^\star + \tfrac{1}{2} (\delta r, \delta a, \delta s)^\dagger H (\delta r, \delta a, \delta s) + O(\|\delta x\|^3).$

Theorem 1: higher-order invisibility at quadratic release order

If a source sector s has no nonzero second derivative involving the retained or active variables at $X^\star$,

$H\_rs = 0, H\_as = 0,$

then that sector cannot alter the quadratic effective Hessian on r obtained by stationary relaxation.

If its first nonzero source coupling begins at differential order $m \geq 3$, the first correction it can induce after regular stationary elimination is higher than quadratic in r.

Proof

At Hessian order,

$H = [A\ B\ 0 ; B† \ C\ 0 ; 0\ 0\ D].$

After quotienting exact null directions, assume C and D are invertible on their physical auxiliary images. Schur elimination of (a, s) gives

$H\_r\text{^}eff = A - (B, 0) \cdot \mathrm{diag}(C^{-1}, D^{-1}) \cdot (B†, 0)^T,$

hence

$H\_r\text{^}eff = A - B\ C^{-1}\ B†.$

The spectator block D cancels identically.

For the higher-order statement, make the order bookkeeping explicit. Suppose all mixed derivatives of total order ≤ 2 coupling s to (r, a) vanish at X⋆, while the pure auxiliary quadratic block D may remain nonzero, and the first mixed s-coupling appears at total order $m \geq 3$. Assume an invertible positive normal auxiliary block, or a separately justified regular elimination on its physical image. The lowest such terms are of the schematic forms $s \cdot q(r, a)$ with q homogeneous of degree $m - 1 \geq 2$, together with terms of degree ≥ 2 in s. Stationarity in s reads

$D\ \delta s + \partial\_s(\text{cubic and higher}) = 0,$

so the regular elimination branch satisfies

$s⋆(r, a) = O(\|(r, a)\|\text{^}(m-1)) = O(\|(r, a)\|^2).$

Substituting back, the leading s⋆·q and quadratic s⋆ terms have order at least $2(m - 1) \geq 4$ in (r, a), so the quadratic Taylor coefficient in r is unchanged on that regular branch. A genuinely degenerate auxiliary with no regular normal elimination requires its own nonlinear analysis; the Hessian range condition alone is not a theorem of smooth higher-order elimination. ■

Remark 3.1 (regularity is only needed where elimination is performed)

The spectator half of Theorem 1 is a pure Hessian statement and needs no invertibility of D at all: with $H_{rs} = H_{as} = 0$, the (a, s) block of H is block diagonal and the s-block cannot enter the retained complement (Theorem 2). Invertibility, or the precise semidefinite condition of Lemma 2.1, is needed only for the stationary elimination of the sectors one actually relaxes.

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4. Exact Schur-spectator theorem

The preceding result can be stated independently of differential-order language. Since the notion carries the whole release prescription, it is defined formally once.

Definition (Hessian-connected component). Work on the exact physical quotient at the stationary background X⋆, with the coordinates partitioned into blocks. Form the graph whose vertices are the coordinate blocks and whose edges join two blocks x, y exactly when the Hessian cross-block $H_{xy}(X^\star)$ is nonzero. The Hessian-connected component of the retained pair, written $\mathcal{C}(J, \theta)$, is the union of all blocks joined to J or θ by a path in this graph: equivalently, the maximal set of coordinates reachable from (J, θ) through chains of nonzero Hessian blocks at X⋆. The component is background-dependent and is computed after exact gauge/null quotienting; a sector outside $\mathcal{C}(J, \theta)$ at X⋆ can enter it on a different background, which is exactly the content of falsifiers F1 and F2. The K1⋆ prescription retains $\mathcal{C}(J, \theta)$ and nothing less.

Theorem 2: Schur isolation

Let

$H = [\ A\ B\ 0\ ;\ B^\dagger\ C\ 0\ ;\ 0\ 0\ D\ ]$

be the physical Hessian after exact gauge/null quotienting. Then

$\mathbf{Schur_{(a,s)}(H)|_r = Schur_a(\ [\ A\ B\ ;\ B^\dagger\ C\ ]\ ).}$

Therefore **only the Hessian-connected component containing the retained variables can renormalise their quadratic stiffness**.

Lemma 2.1: variational characterisation and the semidefinite boundary

Let H be Hermitian and partitioned into retained variables r and relaxed variables y = (a, s), with $H_{yy} \geq 0$. For every fixed δr, consider

inf over δy of $(\delta r, \delta y)^\dagger H (\delta r, \delta y)$.

The infimum is finite for every δr if and only if

$$\operatorname{im}(H_{yr}) \subseteq \operatorname{im}(H_{yy}).$$

When this condition holds,

$$H_r^{eff} = H_{rr} - H_{ry} H_{yy}^{+} H_{yr},$$

with H_{yy}^{+} the Moore-Penrose inverse, and the minimising family is

$$\delta y^\star = -H_{yy}^{+} H_{yr}\, \delta r + \ker H_{yy}.$$

If the range inclusion fails, a null direction of H_{yy} couples linearly to r at zero quadratic cost and the partial infimum is unbounded below along that direction. Such a null must be classified and either quotiented as gauge/redundancy or retained as a physical mode before a Schur release is meaningful.

If, in addition, the **full block matrix** satisfies $H \succeq 0$, then the range inclusion follows automatically. Thus on a correctly quotiented positive-semidefinite physical Hessian the pseudoinverse Schur complement is automatically well-defined; failure of the range condition certifies that the object being relaxed was not yet the final positive physical quotient.

Proof

Write the quadratic form as

$$q(\delta r, \delta y) = \delta r^\dagger H_{rr}\, \delta r + 2 \operatorname{Re}(\delta y^\dagger H_{yr}\, \delta r) + \delta y^\dagger H_{yy}\, \delta y.$$

If $H_{yr}\, \delta r \in \operatorname{im}(H_{yy})$, complete the square with the Moore-Penrose inverse:

$$q = \delta r^\dagger (H_{rr} - H_{ry} H_{yy}^{+} H_{yr})\delta r + (\delta y - \delta y^\star)^\dagger H_{yy} (\delta y - \delta y^\star).$$

The second term is nonnegative and the infimum is attained. If $H_{yr}\, \delta r$ has a nonzero component in $\ker H_{yy}$, translation along that null direction changes the cross term linearly with no quadratic penalty, so the infimum is unbounded below.

Finally, if $H \succeq 0$, any $z \in \ker H_{yy}$ must obey $H_{ry} z = 0$; otherwise the full quadratic form on $(\delta r, tz)$ would become negative for one sign of sufficiently large t. Hence $\ker H_{yy} \subseteq \ker H_{ry}$, equivalently $\operatorname{im}(H_{yr}) \subseteq \operatorname{im}(H_{yy})$. ■

Corollary 2.2: monotone screening and the same-parent sign test

For a fixed positive-semidefinite parent, a fixed retained coordinate map and an admissible partition, Lemma 2.1 gives

$H_r^{eff} \preceq H_{rr}$.

Enlarging the set of physically permitted relaxed coordinates of that **same parent** can only lower the partial minimum. This is the exact screening statement used by falsifier F8.

It does not compare different source actions. Adding a new residual, altering a background or operational metric, changing the retained readout, or changing the field normalisation changes the parent problem. Such a change can alter the bare retained block as well as the relaxation correction. The result need not lie below an older benchmark.

Thus a positive screening correction is a necessary same-parent check, not evidence that a newly constructed branch is physical. The spectator conclusion also follows immediately: when the candidate spectator is quadratically disconnected, its minimisation separates and cannot affect the retained complement. The pseudoinverse formula has exactly the finite-infimum range condition of Lemma 2.1; nonlinear regularity beyond quadratic order is a separate question.

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5. Application to the VERSF graded source stack

RCHS-3 returns the leading differential orders

gauge = 2, bosonic completion = 2, CAR/Fock parent = 3.

The full-faithful source assembly independently states the same order distinction: the gauge auxiliary action and bosonic parent are quadratic, whereas the CAR/Fock proxy is trilinear and has vanishing gradient and ordinary Hessian at the symmetric origin.

Therefore:

CAR/Fock mixed third-order provenance cannot alter the leading quadratic (J, θ) Hessian at $X\star$

unless the physical matching point is shifted to a background on which that sector acquires a nonzero quadratic return. Such a background shift would itself have to be source-derived and explicitly included.

This does **not** make CAR/Fock provenance unimportant. It makes its role correctly typed: it belongs to whole-action and higher-order Standard-Model closure, not to the existence of the leading dimension-four gauge kinetic coefficient.

The record and completion sectors may not be discarded by this argument. Any record, completion, history, boundary or other coordinate with a nonzero quadratic pullback into J or θ belongs to the active Hessian component and must be retained in K1.

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6. K0A is two different problems

The former K0A mixed two obligations.

K0A(2): quadratic physical-parent closure

Construct the **complete physical quadratic Hessian** on the exact source quotient and retain every coordinate with a nonzero second-order path into J or θ.

This is essential.

But it is not a separate gate before K1. It **is the first part of K1**.

The correct release object is

$H\_active^{(2)} = D^2S\_source$ restricted to $\mathcal{C}(J, \theta)$,

where $\mathcal{C}(J, \theta)$ is the Hessian-connected component of Section 4's definition, containing the current and link coordinates.

K0A(all-order provenance): whole-action primitive uniqueness

Prove that the same deepest primitive source uniquely generates the higher-order record/completion/CAR/Fock and other source laws, including their physical amplitudes and orientations.

This remains open.

PRLU-1 proves that the currently published primitive transfer by itself does **not** contain enough information to force the complete ledger and proposal kernel. Therefore a paper that simply demanded one unique all-order primitive instrument from that unchanged primitive source would hit a known source insufficiency rather than close the Standard Model.

Corollary 2.3: K0A retyping

For the leading dimension-four gauge normalisation,

K0A(all-order provenance) is a parallel whole-action provenance debt, not a release prerequisite.

The gauge critical path should instead require

K1⋆: complete physical quadratic parent on $\mathcal{C}$(J, θ).

This retyping is valid only if *all* quadratic couplings into (J, θ) are included and their physical source coefficients are supplied. It gives no licence to use the four-variable diagnostic block while ignoring a same-order source term. Within a fixed complete positive parent, relaxing additional permitted auxiliaries cannot raise the retained response. Adding a new physical source term changes the parent and is not covered by a comparison with the previous benchmark.

Nor does putting all-order provenance in parallel defer the primitive origin of the quadratic weights. An unselected operational metric, field-update amplitude law or force derivative that already controls the retained Hessian remains a K0A(2)/K1⋆ obligation.

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7. Why the full K1 pullback still matters

RCHS-2 already gives an important warning.

Its executed one-bit history metric on the six defect families C, J, T, R, B, H is positive definite and contains material off-diagonal entries, including nonzero C-J, C-H and J-H couplings. The diagonal current-link continuation is therefore useful but is not automatically the physical full pullback.

As a deliberately nonphysical sensitivity diagnostic, if one identifies the displayed (C, J, H) family coordinates directly and relaxes C and H, the current diagonal changes from

w_J = 0.0787169884512

to

K_J,CH^Schur = 0.0541555245794,

a retained fraction

0.687977597275.

This is **not a physical VERSF number**, because the cross-family source-to-faithful map is precisely what RCHS-2 says is not yet identified. Its purpose is only to show that the missing full pullback can matter numerically; the diagonal branch may not be promoted by convenience. Note that the direction of the shift is exactly what Corollary 2.2 demands: relaxing additional coupled families lowered the retained diagonal (the ratio of the two quoted values is confirmed to the printed precision in Appendix A), so the diagnostic is at least screening-consistent even though its coordinate identification is not source-derived.

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8. Conditional exponential-stopping endpoint reduction

Scope of Sections 8 to 9E. The following exact rational family assumes the canonical mass/conductance assignment, homogeneous Dirichlet preparation and an exponential first-fact stopping time. The calculation is retained as a conditional preparation model. It does not derive its stopping distribution or identify it with every persistent-record event in the corpus. A source that returns a different clock or path-dependent endpoint dynamics requires the corresponding stopped expectation to be evaluated directly; matching only the mean waiting time is insufficient. None of the later source-response tests promotes ζ to a physical value.

On the finite positive-conductance branch, RCHS-4 reduced the endpoint law to one cross-coherence scalar once internal U(49) covariance is imposed.

RCHS-5 then removes the arbitrary fixed refinement depth.

Let

$C(t) = e^{-2\alpha t L_K}$

and let the first complete fact occur at an exponential stopping time T with total rate ν. Define

$\boldsymbol{\zeta = \nu/\alpha}$**.**

Then

$\boldsymbol{\bar{C}_\zeta = \mathbb{E}[C(T)] = \zeta(\zeta I + 2L_K)^{-1}}$**.**

The identity is the elementary stopped-resolvent integral: for each eigenvalue λ of L_K,

$\int_0^\infty \nu e^{-\nu t} e^{-2\alpha\lambda t}\, dt = \nu/(\nu + 2\alpha\lambda) = \zeta/(\zeta + 2\lambda)$.

Thus the finite-refinement endpoint law does not depend on a separately chosen stopping depth.

Remark 8.1 (the common mode is never decohered)

L_K annihilates the mass-weighted common vector, so for every $\zeta > 0$,

$\bar{C}_\zeta (M^{1/2}\mathbb{1}) = M^{1/2}\mathbb{1}$

exactly. The stopped endpoint law damps only relative structure; all coherence loss recorded below is loss between distinct carriers, never of the common mode itself. This is why every coherence in Section 9 runs over the full range (0, 1) as ζ runs over $(0, \infty)$: the two limits are the fully coherent and fully relatively decohered ends of one family.

Clock firewall

Under a common time-coordinate rescaling $t' = ct$,

$\alpha' = \alpha/c$, $\nu' = \nu/c$,

so

$\boldsymbol{\zeta' = \nu'/\alpha' = \zeta.}$

Therefore the unresolved seconds-per-fact calibration cannot by itself determine ζ. The remaining endpoint scalar is a **relative physical rate**, not an absolute clock unit.

---

9. Exact one-scalar endpoint inversion

For the canonical $K = 7$ wheel, write the common quartic

$D(\zeta) = 28\zeta^4 + 174\zeta^3 + 364\zeta^2 + 275\zeta + 40.$

The first-fact-stopped adjacent-rim coherence is

$\boldsymbol{\gamma_{rim}(\zeta) = (28\zeta^3 + 140\zeta^2 + 209\zeta + 80) / (2D(\zeta)).}$

Exact differentiation gives

$\gamma_{rim}'(\zeta) = -2(196\zeta^6 + 1960\zeta^5 + 7931\zeta^4 + 16573\zeta^3 + 18994\zeta^2 + 11760\zeta + 3410) / D(\zeta)^2 < 0$

for every $\zeta > 0$, since every coefficient of the numerator polynomial is positive. Moreover,

$\lim_{\zeta\to 0^+} \gamma_{rim}(\zeta) = 1$, $\lim_{\zeta\to\infty} \gamma_{rim}(\zeta) = 0$.

Derivation route and independent confirmation

The closed forms above, and every closed form below, are re-derived in this paper from scratch by exact Fourier reduction of the canonical wheel, independently of the RCHS-5 execution.

Scaling the stopped-resolvent matrix by 31, the hub row of $31(\zeta M + 2L_w)$ is $(7\zeta + 12, -2\mathbb{1}^T)$ and the rim block is the circulant $(4\zeta + 6)I - 2P - 2P^T$ with Fourier eigenvalues

$r_k(\zeta) = 4\zeta + 6 - 4\cos(\pi k/3)$: $r_0 = 4\zeta + 2$, $r_{(\pm 1)} = 4\zeta + 4$, $r_{(\pm 2)} = 4\zeta + 8$, $r_3 = 4\zeta + 10$.

The hub Schur scalar is $(7\zeta + 12) - 24/r_0 = 2\zeta(14\zeta + 31)/r_0$, giving the exact resolvent entries

$G_{hub,hub} = (2\zeta + 1)/(\zeta(14\zeta + 31))$, $G_{hub,rim} = 1/(\zeta(14\zeta + 31))$,

and the rim entries at graph distance d as $(1/6)\Sigma_k\, \omega^{(kd)}/r_k(\zeta) + 1/(\zeta(14\zeta + 31)(2\zeta + 1))$. All coherences are normalised ratios, so the mass factors cancel, and the quoted rational functions follow by exact cancellation (Appendix A). The same hub Schur factor $14\zeta + 31$ reappears in both exact gap identities of Lemma 9.2.

Lemma 9.1: the complete rim coherence family

The next-nearest and opposite rim coherences of $\bar{C}_\zeta$ have the exact closed forms

$\boldsymbol{\gamma_{next}(\zeta) = (22\zeta^2 + 85\zeta + 80) / (2D(\zeta))}$,

$\boldsymbol{\gamma_{opp}(\zeta) = (4\zeta^2 + 27\zeta + 40) / D(\zeta)}$.

Each is a strictly decreasing bijection of $(0, \infty)$ onto $(0, 1)$: the negated derivative numerators again have all coefficients positive, and both functions have limits 1 at $\zeta \to 0^+$ and 0 at $\zeta \to \infty$.

Lemma 9.2: strict distance ordering with exact gaps

For every $\zeta > 0$,

$\gamma_{rim}(\zeta) > \gamma_{next}(\zeta) > \gamma_{opp}(\zeta)$,

with the exact gap identities

$\boldsymbol{\gamma_{rim} - \gamma_{next} = \zeta(\zeta + 2)(14\zeta + 31) / D(\zeta)}$,

$\boldsymbol{\gamma_{next} - \gamma_{opp} = \zeta(14\zeta + 31) / (2D(\zeta))}$.

The same hub Schur factor $14\zeta + 31$ appears in both exact gap identities; the separation closes linearly as $\zeta \to 0^+$ (full coherence), and the family remains strictly ordered at every finite ζ. The ordering is itself a zero-parameter necessary condition on any physical return of more than one coherence.

The spoke coherence

RCHS-5 gives

$$\gamma\_spoke^2(\zeta) = 4(\zeta + 1)(\zeta + 2)(2\zeta + 5) / ((2\zeta + 1) D(\zeta)),$$

with

$$d/d\zeta\ \gamma\_spoke^2(\zeta) = -4(224\zeta^7 + 2600\zeta^6 + 12528\zeta^5 + 32326\zeta^4 + 47896\zeta^3 + 40281\zeta^2 + 17400\zeta + 2790) / ((2\zeta + 1)^2 D(\zeta)^2) < 0,$$

again with an all-positive negated numerator, and with the same limits 1 and 0. Both formulas are independently re-derived here by the same Fourier reduction.

Theorem 3: first-fact endpoint inversion theorem

$\gamma\_rim : (0, \infty) \to (0, 1)$ is a bijection.

For every physical $\gamma\_rim \in (0, 1)$, the finite first-fact-stopped branch has exactly one positive ζ. It is the unique positive root of

$$\mathbf{2\gamma\_rim\ D(\zeta) - (28\zeta^3 + 140\zeta^2 + 209\zeta + 80) = 0,}$$

explicitly

$$56\gamma\zeta^4 + (348\gamma - 28)\zeta^3 + (728\gamma - 140)\zeta^2 + (550\gamma - 209)\zeta + 80(\gamma - 1) = 0.$$

For $\gamma \in (0, 1)$ the constant term is negative and the leading coefficient positive, so a positive real root exists; strict monotonicity of γ_rim makes it unique.

Remark 9.3 (exact inversion asymptotics)

The exact expansions

$$\gamma\_rim(\zeta) = 1 - (341/80)\zeta + (14051/640)\zeta^2 + O(\zeta^3),$$

$$\gamma\_rim(\zeta) = 1/(2\zeta) - 17/(28\zeta^2) + O(\zeta^{-3}),$$

give the leading-order inversions

$\zeta = (80/341)(1 - \gamma\_rim) + O((1 - \gamma\_rim)^2)$ near full coherence,

$\zeta = 1/(2\gamma\_rim) - 17/14 + O(\gamma\_rim)$ near full relative decoherence,

so the inversion is asymptotically regular in relative terms at both ends of the branch. Absolute sensitivity in ζ nevertheless grows as $\gamma\_rim \to 0$, as expected from $\zeta \sim 1/(2\gamma\_rim)$.

By Lemma 9.1 the same monotonic information is carried by every member of the family: γ_next, γ_opp and γ_spoke are each strictly decreasing bijections onto (0, 1), so **each single coherence is a global coordinate on the finite branch**.

Corollary 3.1: over-determination and the cross-coherence consistency curve

Because the branch is one-dimensional in ζ, any *pair* of returned coherences is over-determined. The pair (γ_rim, γ_spoke^2) must lie on the exact algebraic curve obtained by eliminating ζ between the two rational forms; the eliminant polynomial is recorded in full in Appendix B and vanishes identically along the branch. Equivalently and more simply in practice: invert ζ from one coherence via Theorem 3 and evaluate the closed form of the other; the two returns must agree exactly. Together with the ordering of Lemma 9.2 this makes the finite branch **self-testing with zero free parameters** (falsifier F7).

Exact benchmark values

ζ	γ_rim	γ_next	γ_opp	γ_spoke^2
1/2	223/584 = 0.381849315069	16/73 = 0.219178082192	109/584 = 0.186643835616	45/292 = 0.154109589041
1	457/1762 = 0.259364358683	187/1762 = 0.106129398411	71/881 = 0.080590238365	56/881 = 0.063564131669
2	641/3886 = 0.164951106536	169/3886 = 0.043489449305	55/1943 = 0.028306742152	216/9715 = 0.022233659290
5	1625/19906 = 0.081633678288	211/19906 = 0.010599819150	55/9953 = 0.005525972069	504/109483 = 0.004603454418

Every table entry is exact and reproduced independently in Appendix A. Any future physical return can be checked against this table before any parameter is discussed.

Thus K0B on this branch is not a free covariance problem.

9A. The exact stopped current norm

The endpoint scalar of Section 9 can be carried directly into the current sector rather than remaining a separate preparation parameter.

In mass-normalised coordinates the RCHS-4 current is

$J = K \tilde{B}^T u$, $\tilde{B} = M^{(-1/2)}B$,

with

$\mathbb{E}\|J\|^2 = \mathrm{Tr}[K^2 \tilde{B}^T \Sigma \tilde{B}]$

and weighted Dirichlet capacity

$\mathcal{D}\_K = \mathrm{Tr}[K\, \tilde{B}^T \Sigma\, \tilde{B}]$.

For equal conductance $K = \kappa I$ one has identically

$$\mathbb{E}\|J\|^2 = \kappa\, \mathcal{D}\_K,$$

and averaging over the first-fact stopping time preserves the identity:

$$\mathcal{J}(\zeta) := \mathbb{E}\|J(T)\|^2 = \kappa\, \mathcal{D}(\zeta).$$

For the canonical $K = 7$ branch, $\kappa = 1/31$, and the exact return is

$$\mathcal{J}(\zeta) = 3\zeta(50\zeta^3 + 287\zeta^2 + 530\zeta + 310) / (31(\zeta + 1)(\zeta + 2)(2\zeta + 5)(14\zeta + 31)).$$

No new magnitude ansatz has been introduced. This is the stopped current norm generated by the already-executed canonical Dirichlet law.

Remark 9A.1 (independent spectral derivation)

The closed form is re-derived in this paper directly from the canonical spectrum, independently of the RCHS-5 execution. Since $\tilde{B}\tilde{B}^T = 31L\_K$ on the canonical wheel and the stopped whitened covariance is $\bar{C}\_\zeta = \zeta(\zeta I + 2L\_K)^{-1}$,

$$\mathcal{J}(\zeta) = (1/31)\cdot\mathrm{Tr}[L\_K\, \bar{C}\_\zeta] = (\zeta/31)\cdot\Sigma\_\lambda\, \lambda/(\zeta + 2\lambda)$$

over the spectrum $\{0, 1/2, 1/2, 1, 1, 31/28, 5/4\}$, and the partial-fraction sum cancels exactly to the quoted rational function (Appendix A). In particular the ceiling is structural:

$$\lim_{\zeta\to\infty} \mathcal{J}(\zeta) = (1/31)\cdot\mathrm{Tr}\, L\_K = (1/31)\cdot(75/14) = 75/434,$$

the fully relaxed current norm of the canonical generator, while $\mathcal{J}(0^+) = 0$ because the common mode carries no current.

9B. Strict current-magnitude inversion

Exact differentiation gives

$$\mathcal{J}'(\zeta) = 3(2764\zeta^6 + 31020\zeta^5 + 143039\zeta^4 + 346526\zeta^3 + 465110\zeta^2 + 328600\zeta + 96100) / (31(\zeta + 1)^2(\zeta + 2)^2(2\zeta + 5)^2(14\zeta + 31)^2) > 0,$$

with every numerator coefficient positive, and

$\lim_{\zeta\to 0^+} \mathcal{J}(\zeta) = 0$, $\lim_{\zeta\to\infty} \mathcal{J}(\zeta) = 75/434$.

Theorem 4: current-magnitude inversion theorem

$\mathcal{J} : (0, \infty) \to (0, 75/434)$ is a bijection.

Equivalently the normalised raw-current magnitude

$\eta_J = (434/75)\cdot\mathcal{J}$

is a dimensionless coordinate taking the full interval (0, 1). For any returned current magnitude $0 < j < 75/434$, the canonical finite branch has exactly one positive ζ, the unique positive root of

$$31j(\zeta + 1)(\zeta + 2)(2\zeta + 5)(14\zeta + 31) - 3\zeta(50\zeta^3 + 287\zeta^2 + 530\zeta + 310) = 0,$$

expanded

$$\mathbf{(868j - 150)\zeta^4 + (6696j - 861)\zeta^3 + (18817j - 1590)\zeta^2 + (22599j - 930)\zeta + 9610j = 0.}$$

For j in the admissible range the leading coefficient is negative and the constant term positive, so a positive root exists; strict monotonicity makes it unique. Thus **one source-returned raw current magnitude fixes the same ζ that one endpoint coherence fixes**. Note the sign structure is the mirror of the Theorem 3 quartic, as it must be: $\mathcal{J}$ increases where every coherence decreases.

Exact benchmark values

ζ	$\mathcal{J}(\zeta)$
1/2	653/17670 = 0.036955291454
1	1177/19530 = 0.060266257040
2	1459/16461 = 0.088633740356
5	16385/131502 = 0.124598865417

with the finite unresolved-current ceiling $\mathcal{J}(\infty) = 75/434 = 0.172811059908$ of this normalisation. Every entry is exact and reproduced independently in Appendix A.

9C. The endpoint-to-current C/W/Y factor-Gram theorem

The first-fact Dirichlet semigroup acts on the spatial carrier and preserves the unresolved internal U(49) isotropy. Therefore each edge-current covariance has the form

$\mathbb{E}[J_e J_e^\dagger] = (c_e/49)\cdot I_{49}$

for some $c_e \geq 0$, with $\Sigma_e c_e = \mathbb{E}\|J\|^2 = \mathcal{J}(\zeta)$.

Let P_C, P_W, P_Y be the exact internal factor-support projectors. Define the uncentred raw-current factor Gram

$G_{FG}^{cur} = \Sigma_e \mathbb{E}\langle J_e, P_F P_G J_e\rangle$, $F, G \in \{C, W, Y\}$.

Then

$G_{FG}^{cur} = (\mathcal{J}(\zeta)/49)\cdot \mathrm{Tr}(P_F P_G)$.

But the already-derived factor overlap matrix is

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

Theorem 5: factor-Gram bridge

$G_{CWY}^{cur}(\zeta) = \mathcal{J}(\zeta)\cdot H_{CWY}$.

On the canonical finite first-fact branch, **endpoint preparation changes only the common raw-current magnitude; it cannot rotate or distort the C/W/Y factor shape** as long as internal U(49) isotropy and factor-blind spatial evolution hold.

Corollary 5.1: zero-parameter current-Gram fingerprints

Because $\mathrm{tr}\, H_{CWY} = 109/49$, $\det H_{CWY} = 4428/49^3$, and $f^{\mathsf{T}} H_{CWY} f = 269/147$ for $f = (1, 1, 1)^{\mathsf{T}}/\sqrt{3}$, the returned current Gram must satisfy the extraction identities

$\mathcal{J} = (49/109)\cdot \mathrm{tr}\, G^{cur} = (147/269)\cdot f^{\mathsf{T}} G^{cur} f$,

and the two scale-free fingerprints

$\det G^{cur} / (\mathrm{tr}\, G^{cur})^3 = 4428/109^3$,

$f^{\mathsf{T}} G^{cur} f / \mathrm{tr}\, G^{cur} = 269/327$.

These contain **no ζ, conductance scale or Standard-Model fit parameter**. A future source-returned current Gram that violates either identity falsifies the simple internally isotropic factor-blind finite branch before any gauge coupling is calculated (falsifier F9). If both fingerprints pass, its trace extracts $\mathcal{J}$; under physical attribution of the canonical conductance, that magnitude then determines ζ uniquely through Theorem 4.

9D. Exact local rim-current cross-check and the spoke/rim split

The same bridge can be seen without the global capacity.

Lemma 9D.1: the local rim contrast

For adjacent rim sites in whitened coordinates,

$\mathbb{E}\|u_i - u_{(i+1)}\|^2 = 2(\bar{C}_{rr} - \bar{C}_{adj})$

reduces exactly to

$$\mathbf{R_{rim}(\zeta) = \zeta(4\zeta^2 + 14\zeta + 11) / ((\zeta + 1)(\zeta + 2)(2\zeta + 5)).}$$

Notably, the hub factor $14\zeta + 31$ cancels completely. Its derivative is

$R_{rim}'(\zeta) = (16\zeta^4 + 108\zeta^3 + 265\zeta^2 + 280\zeta + 110) / ((\zeta + 1)^2(\zeta + 2)^2(2\zeta + 5)^2) > 0,$

so $R_{rim} : (0, \infty) \to (0, 2)$ is also a bijection, giving an independent local extraction of ζ which must agree with the global-current and coherence inversions.

Remark 9D.2 (the rim variance explains the Section 9 quartic)

The contrast ties exactly to the Section 9 coherence:

$$\mathbf{R_{rim}(\zeta) = 2\cdot\bar{C}_{rr}(\zeta)\cdot(1 - \gamma_{rim}(\zeta)),}$$

with the exact rim variance

$$\mathbf{\bar{C}_{rr}(\zeta) = D(\zeta) / ((\zeta + 1)(\zeta + 2)(2\zeta + 5)(14\zeta + 31)),}$$

so the quartic $D(\zeta)$ that recurs throughout Section 9 is precisely the rim-variance numerator over the factored spectral denominator. The limits are structural: $\bar{C}_{rr} \to 4/31$ as $\zeta \to 0^+$ (the rim mass fraction, since $\bar{C}$ collapses onto the common mode) and $\bar{C}_{rr} \to 1$ as $\zeta \to \infty$, which is why R_{rim} runs over the full interval (0, 2): the ceiling is $2\cdot1\cdot(1 - 0)$. The corresponding hub variance obeys $\bar{C}_{hh} \to 7/31$, the hub mass fraction.

Lemma 9D.3: exact spoke/rim additivity split

In the Section 9A mass-normalised convention the per-edge stopped current norms have the exact closed forms

rim edge: $\zeta(4\zeta^2 + 14\zeta + 11) / (124(\zeta + 1)(\zeta + 2)(2\zeta + 5)) = R\_rim(\zeta)/124$,

spoke edge: $\zeta(44\zeta^3 + 254\zeta^2 + 472\zeta + 279) / (124(\zeta + 1)(\zeta + 2)(2\zeta + 5)(14\zeta + 31))$,

both strictly increasing, and the twelve edges add exactly to the global norm:

$\mathcal{J}(\zeta) = 6\cdot$(spoke edge) + $6\cdot$(rim edge),

with the six-edge shares approaching the split ceilings

rim share → 3/31 = 42/434, spoke share → 33/434, 42/434 + 33/434 = 75/434.

The split gives a second, finer fingerprint: not only the total magnitude but its exact spoke/rim partition is a parameter-free function of ζ on the canonical branch.

Source note (edge-current normalisation)

A per-edge rim norm quoted as $R\_rim/31^2$ corresponds to the plain-incidence convention $J\_e = \kappa(u\_i - u\_j)$ on whitened coordinates. That convention is not the one fixed in Section 9A, whose mass-normalised incidence $\tilde{B} = M^{(-1/2)}B$ is what produces the global ceiling $75/434 = \kappa\cdot\mathrm{Tr}\ L\_K$; in the Section 9A convention the per-edge rim norm is R_rim/124, and only this value participates in the exact additivity of Lemma 9D.3. The closed form of R_rim itself is convention-independent, being a pure covariance contrast.

9E. Source-action handoff and the strengthened chain

Let the eventual complete physical current Hessian have spectral bounds

$0 < k\_J^- \leq \lambda(\mathbb{K}\_J^{rel,phys}) \leq k\_J^+$.

Then the endpoint-to-current bridge gives

$(1/2)\cdot k\_J^-\cdot\mathcal{J}(\zeta) \leq \mathbb{E}\ S\_J^{(2)}(T) \leq (1/2)\cdot k\_J^+\cdot\mathcal{J}(\zeta)$.

On a factor-democratic branch $\mathbb{K}\_J^{rel,phys} = K\_J^{phys}\cdot I$ this becomes the exact scalar identity

$\mathbb{E}\, S\_J^{(2)}(T) = (1/2)\cdot K\_J^{phys}\cdot \mathcal{J}(\zeta)$.

This final equality is **conditional on physical factor democracy and source-coordinate identity**. The unit value 48/53 remains only a diagnostic source branch and is not promoted here.

The finite-branch handoff is therefore now stronger than "endpoint coherence → ζ → current source". It is the closed chain

ζ ↔ {endpoint coherence family} ↔ $\mathcal{J}$ ↔ $G\_{CWY}^{cur} = \mathcal{J}\cdot H\_{CWY}$,

so endpoint preparation and raw current magnitude are no longer independent unresolved objects on the canonical finite branch. The over-determination of Corollary 3.1 extends across the bridge: γ_{rim}, γ_{next}, γ_{opp}, γ_{spoke}, $\mathcal{J}$ and R_{rim} are each single-scalar global coordinates on the branch (the coherences decreasing, the current quantities increasing), so any pair of physical returns must agree on ζ through their closed forms, with no parameter available to reconcile a disagreement.

The remaining physical obstruction is correspondingly narrower:

1. source attribution of the physical endpoint/generator branch and conductances;
2. execution of the complete physical quadratic current-link parent;
3. source-coordinate identity between this raw current and the current differentiated by that parent;
4. continuum Z_{ab} and canonical gauge normalisation.

9F. Gauge-normalisation conventional endcap closure and the direct physical-action route

The endpoint/current bridge of Sections 9A to 9E is not the only route by which the physical gauge scale can be returned. The existing master-action programme contains a direct gauge-response route. The latest source audit now closes both normalisation endcaps of that route and isolates the remaining middle object.

9F.1 Source-side gauge-generator normalisation

On every faithful edge, perturb the shared physical link by one canonically normalised Standard-Model generator:

$U\_e(\varepsilon) = U\_{(e,\star)}\cdot \exp(i\varepsilon\, E\_{SM}(T\_A))$.

Then

$\delta U_e(T_A) = dU_e/d\varepsilon|_0 = iU_{(e,\star)}E_{SM}(T_A)$.

The conventions are frozen:

$\mathrm{tr}(T_a T_b) = (1/2)\delta_{ab}$, $\mathrm{tr}(t_i t_j) = (1/2)\delta_{ij}$, $q = 6Y$.

A factorwise multiplication of a gauge column after this derivative would therefore change the source generator coordinate rather than reveal new physics. Such a rescaling is not licensed.

The full-faithful edge-field assembly gives twelve independent algebra directions on each edge, so the local faithful link tangent is injective on the complete $144 = 12 \times 12$ gauge-link carrier.

This is a link-generator census, not a certificate that a truncated endpoint/current/record carrier contains every simultaneous gauge transformation. The later full HM4 execution and covariant repair in Section 9G distinguish these two statements explicitly. A rank-twelve generator embedding cannot compensate for missing matter or record gauge directions.

9F.2 Canonical rank-twelve tensor embedding

The canonical MASD response profile uses three mutually orthonormal closure profiles,

$\langle \chi_A, \chi_B \rangle_\pi = \delta_{AB}$, $A, B \in \{3, 2, q\}$,

with the orientation-odd lift preserving the norm.

On the frozen 47-dimensional three-generation matter-plus-Higgs representation,

$\mathrm{Tr}\, \rho_3(T_a)^\dagger \rho_3(T_b) = 6\delta_{ab}$,

$\mathrm{Tr}\, \rho_2(t_i)^\dagger \rho_2(t_j) = (13/2)\delta_{ij}$,

$\mathrm{Tr}\, \rho_q^\dagger \rho_q = 378$,

and all cross-factor Hilbert-Schmidt products vanish exactly. Therefore the canonical tensor embedding

$e_{int} : \mathfrak{su}(3) \oplus \mathfrak{su}(2) \oplus \mathfrak{u}(1) \to \mathscr{H}_{14} \otimes \mathrm{HS}(\mathscr{H}_{SM})$

has exact Gram

$e_{int}^\dagger(W_{14}^{stat} \otimes I_{HS})e_{int} = \mathrm{diag}(6I_8, (13/2)I_3, 378)$

and

rank e_int = 12.

This is a source-typed rank and normalisation theorem for the canonical tensor branch. It is **not** a theorem that W_{14}^stat $\otimes$ I_HS is the physical nonfactorising response metric.

For reference only, combining this canonical tensor Gram with the already-executed separable wheel benchmark gives

$(Z_3, Z_2, Z_q) = (144/5, 455/12, 567)$.

These numbers are quarantined benchmark outputs and are not promoted to physical couplings.

9F.3 Continuum Wilson normalisation is exact

For the declared Wilson interface,

$U_p = \exp(ia^2F_{\mu\nu})$, $S_p = \beta_W(1 - \cos\theta_p)$.

Then

$1 - \cos(a^2F_{\mu\nu}) = (1/2)a^4F_{\mu\nu}^2 - (1/24)a^8F_{\mu\nu}^4 + O(a^{12})$,

so

$S_{lat} = (\beta_W/4)\cdot\int F_{\mu\nu} F^{\mu\nu} d^4x + O(a^4)$.

Matching to

$S_{cont} = (1/(4g^2))\cdot\int F_{\mu\nu} F^{\mu\nu} d^4x$

forces

$\beta_W = 1/g^2$, $c_{norm} = 1$

within this declared Wilson map. A different value requires a genuinely different source-derived interface action, generator convention or field normalisation. It cannot be introduced as a small post-hoc physical correction.

Theorem 6: no-hidden-rescaling gauge handoff

Within the frozen generator conventions and the declared Wilson continuum map:

1. the microscopic Standard-Model generator insertion has no independent factorwise strength multiplier;
2. the canonical gauge tangent is rank twelve;

3. the continuum Wilson conversion has no independent multiplicative c_norm;
4. therefore, at the source matching scale and within the declared Wilson interface, every remaining physical gauge-strength difference must be returned by the source-derived response between those two fixed ends; running and threshold evolution can of course change the observed relative couplings away from that scale.

The missing response is the branch-specific nonfactorising physical master Hessian and retained gauge readout.

Let the frozen physical branch supply the complete six-defect Jacobian

$$\mathcal{J}^\star = D(D_C, D_J, D_T, D_R, D_B, D_H)|^\star$$

in one common tangent basis, together with the full primitive metric W_prim. The physical parent Hessian is

$$\mathbf{G^\star = G\_V + \mathcal{J}^{\star\dagger}\, W\_prim\, \mathcal{J}^\star + G\_ferm^{(2)} + G\_measure^{(2)},}$$

where this Gauss-Newton form is used at a simultaneous defect-zero background, and the last two terms are included only if independently returned at the same order. Stationarity of the full action alone does not imply that every defect vanishes. Away from a common defect zero, the full second variation, including terms involving background residuals and any field-dependent metric, must be evaluated rather than replacing it by this expression.

After exact gauge/redundancy quotienting and complete same-order auxiliary relaxation,

$$\mathbf{G\_red = G\_RR - G\_R\eta\, G\_\eta\eta^{-1}\, G\_\eta R,}$$

or its Moore-Penrose form on the positive-semidefinite boundary, which by Lemma 2.1 is automatically well-defined on the correctly quotiented positive physical Hessian.

The retained physical gauge columns are obtained by pushing the fixed source generator insertions through that same frozen source, quotient and readout. Only then are

$$\mathbf{Z_3 = (1/8)\cdot Tr(\tilde{E}_3^\dagger\, G\_red\, \tilde{E}_3),\ Z_2 = (1/3)\cdot Tr(\tilde{E}_2^\dagger\, G\_red\, \tilde{E}_2),\ Z\_q = \tilde{E}\_q^\dagger\, G\_red\, \tilde{E}\_q}$$

physical candidates only after the retained columns have been identified with the correctly normalised physical curvature and continuum readout on that same source. Traces of arbitrary finite link-profile responses are not yet kinetic coefficients; Section 9G gives their explicit distinction. With the frozen primitive hypercharge convention $q = 6Y$,

$$\mathbf{g\_s = Z_3^{(-1/2)},\ g = Z_2^{(-1/2)},\ g' = 6Z\_q^{(-1/2)}.}$$

No additional fitted factorwise or common multiplier is licensed after a physically completed handoff. This is a no-insertion rule, not a proof that the upstream operational weights have been derived or that their unresolved freedom is only common.

Corollary 6.1: endpoint current is now a parallel attribution test

The exact finite-branch chain

$\zeta \leftrightarrow \{\gamma\_rim, \gamma\_next, \gamma\_opp, \gamma\_spoke\} \leftrightarrow \mathcal{J} \leftrightarrow G\_CWY^{cur}$

remains valid and highly constraining. But it is not necessary to insert $\mathcal{J}$ as an independent calibration constant into the direct gauge-action route. Instead the source must decide whether the endpoint raw current and the master-action current are literally the same physical coordinate.

If that identity is proved, the endpoint family becomes an additional over-determined check on the physical G_red current block. If it is not proved, the two quantities remain differently typed and neither may be used to normalise the other.

9G. Executed gauge consistency, bond-polar response and curvature descent

This section records what the later finite calculations actually establish. Their backgrounds and metrics are stated comparison branches; none is promoted to the physical VERSF vacuum or to measured force strengths. The symbols D and B_C below denote vertex-to-edge and edge-to-face incidence. The face operator $L = B\_C^T B\_C$ is not the mass-normalised endpoint generator L_K of Sections 8 to 9E.

9G.1 The scalar-channel execution does not pass the required gauge-orbit test

The archived HM4-EX2A source was reconstructed on all 334 coordinates. Its complete defect and potential derivatives have shapes 1125 × 334 and 22 × 334, with ranks 309 and 313 for the defect and combined arrays. Retaining all 144 link coordinates and maximally relaxing the other 190 gives a completely explicit reduced matrix. This maximal relaxation is a variational bound on the available source, not proof that every varied direction is physically auxiliary. [14, §§2–5]

At zero linearised face curvature, its unit edge-gradient stiffnesses remain

617/40 (colour), 2041/120 (weak), 1219/72 (archived Y convention).

All 72 link-frame gradients therefore retain positive cost. The unchanged scalar-channel truncation is not admitted as an unfixed pure gauge-kinetic response. A separate gauge-fixed or symmetry-broken interpretation would require its own derivation and kinetic/background separation. The positive directions may not simply be deleted as though they were null.

This does not exclude the later covariant source. The issue is that twelve faithful link generators per edge do not make a scalar endpoint/current/record carrier closed under their simultaneous local transformations.

9G.2 The local bond-polar differential identifies the active variation

At a rank-stable bond-compatible edge, align the source and target frames so that $U\star = I$, the occupied projector is P, the polar isometry is $V\star = P$, and the positive polar stretch is $B > 0$ on that support. With $S = P\,\delta M\,P$, the exact derivative is

$$\boldsymbol{\delta\mathcal{D}_B = P\,\delta U\,P - \Omega,\quad B\Omega + \Omega B = S - S^\dagger.}$$

In an eigenbasis of B,

$$\Omega_{ij} = (S - S^\dagger)_{ij} / (b_i + b_j).$$

Explicit support-motion terms cancel between the supported physical link and the polar isometry. Pure positive stretch with fixed polar orientation, or pure support motion with no induced interior record rotation, gives no first-order bond residual when the link is held fixed. An intrinsic record rotation $\Omega = iY$ gives

$$\delta\mathcal{D}_B = i(A - Y)$$

for $\delta U = iA$. Thus the surviving quantity is a relative link-record rotation. The common motion is a null of the complete action only when it is an actual simultaneous gauge/frame direction; a common loop deformation can still carry closure and composition cost. [13, §§2–3]

At a bond-defect zero, a nonzero second derivative of the bond map does not alone produce a quadratic bond-action term: the quadratic residual norm uses its first derivative. The executed example

$$\Gamma_B(\varepsilon) = (1/2)(1 - \cos\varepsilon)^2 = \varepsilon^4/8 + O(\varepsilon^6)$$

illustrates nonlinear capacity with zero quadratic contribution. This does not exclude support or stretch effects through another defect and the complete common cross-metric.

9G.3 Covariant completion removes the frame cost

The declared repaired benchmark uses

$$\psi_v,\ j_e \in \mathbb{C}^{50},\ U\star = \Phi\star^{tr} = I,\ \psi_{(v,\star)} = v,\ j\star = 0,\ \|v\| = 1,$$

with independent matrix record transport and a block-diagonal positive residual metric. The constant vector and unit weights are diagnostic choices. The corresponding smooth action test is not an extension of the normalised-current-ray marked instrument to $j = 0$. [15, §§1–3]

Let a, y, x, ℓ denote link, record-rotation, endpoint and current variations. The active derivatives are

$\delta D_C = B_C\, a$, $\delta D_R = iB_C\, y$, $\delta D_B = i(a - y)$,

$\delta D_J = \ell - \kappa Dx + \kappa s(a)$, $s(a)_e = ia_e\, v$, $\delta D_T = D^\dagger \ell$.

Since $B_C D = 0$, the simultaneous variation

$a = D\varphi$, $y = D\varphi$, $x_v = i\varphi_v\, v$, $\ell = 0$

annihilates every displayed residual. The active 516-coordinate calculation has 84 simultaneous gauge directions; after relaxation, its 144-coordinate link response has rank 72 and annihilates all 72 link-frame gradients. The relative frame-null residual is 4.59×10^{-16}, and independent Schur and residual-projection routes agree to 5.69×10^{-16}. These are finite benchmark certificates, not primitive branch-selection theorems. [15, §§3–6]

On this static constant-background branch, even adding continuity does not by itself fix a gauge strength. For any positive conductance matrix K, solve

$D^\dagger K D\, x = D^\dagger K\, s(a)$, $\ell = K(Dx - s(a))$.

The right-hand side is orthogonal to the constant mode, and both current and continuity defects vanish. This is conditional on the stated available auxiliaries and metric. It does not set a retained-current action to zero, nor apply unchanged with other current penalties, cross-metric terms or dynamical backgrounds. [15, §4]

9G.4 Link-profile cost is not curvature cost

After the stated cancellation, the inherited common link-record family is

$F_{(a,b,c)}(x, y) = (a/2)\|B_C\, x\|^2 + (b/2)\|B_C\, y\|^2 + (c/2)\|x - y\|^2$, $a, b, c > 0$.

Here the letters a, b, c are common closure, record and bond weights, not independent colour, weak and hypercharge couplings. The reduced spatial link response is

$R_{link} = aL + cI - c^2(bL + cI)^{-1}$.

In the represented gauge coordinates,

$R_{gauge} = R_{link} \otimes \mathrm{diag}(6I_8, (13/2)I_3, 378)$.

These are inherited MASD benchmark formulas recovered in a covariant common-action construction, not a new physical nonfactorising correction. [10, §47A; 15, §6]

Define the actual finite face coordinate $f = B_C x$. Because B_C has full row rank on this wheel, its right inverse

$$T = B_C^\dagger (B_C B_C^\dagger)^{-1}$$

gives

$$\mathbf{K_{face} = T^\dagger R_{link} T = aI + bc(bB_C B_C^\dagger + cI)^{-1},}$$

$$R_{link} = B_C^\dagger K_{face} B_C.$$

For a cycle eigenvalue $\lambda > 0$,

$$k_{link}(\lambda) = a\lambda + bc\lambda/(b\lambda + c), \quad k_{face}(\lambda) = a + bc/(b\lambda + c).$$

At unit weights and $\lambda = 5$, these are 35/6 and 7/6, respectively. The two numbers refer to differently normalised finite coordinates. Neither is automatically a continuum $1/g^2$. Physical face areas, field normalisation, background and matching scale still require the same-source readout. [15, §7]

9H. What the native history calculations do and do not determine

9H.1 The relevant response is state-conditioned

For fixed retained endpoint, link, record and completion fields, use the source coordinates

$$d_J = j - K\Delta_U \psi, \quad d_T = v + \partial_U j, \quad v = \partial_\sigma \psi.$$

Their triangular inverse is exact:

$$j = K\Delta_U \psi + d_J, \quad v = d_T - \partial_U(K\Delta_U \psi + d_J).$$

Consequently $(\delta d_J, \delta d_T) = (h, k)$ gives

$$\delta j = h, \quad \delta v = k - \partial_U h.$$

No minimum-norm or target-metric choice enters that conditional coordinate inverse. It is a physical experiment only once the source identifies which fields are retained and whether the velocity may respond in this way. [17, §2]

The native seven-terminal derivative was evaluated on all 1,200 real current coordinates. It has rank 72 on the stated nonzero-current witness. The same analysis also constructs distinct retained preparations with identical values of all six local defects but different terminal probabilities. The correct object is therefore a conditional law

$p(\text{record} \mid b, \mathbf{D})$,

not necessarily a universal function of the defect values alone. Local compatibility does not select the physical state or its history. Nor may all physically distinguishable compatible preparations be profiled away as though they were gauge. [16; 17, §§3–7]

9H.2 Stationarity and memory do not supply the missing magnitude

On each of the five tested inherited state-preserving D36/PFDMI channels, the active stationary density is uniquely

$\rho^\star = \mathrm{diag}(\pi_{D36}) \otimes I_{50}/50$.

The finite-channel irreducibility and convergence certificate removes arbitrary incoming active density for that specified asymptotic experiment. It does not select the endpoint/current fields defining the channel, the renewal law, or a physical full-field vacuum. [18, §§2–3]

A single stationary central record has probabilities rank $P_r/50$ and zero current derivative. Two and three records retain additional internal-state memory. For the same specified direction-changing perturbation on the stated path, the calculated conditional information values are

$I_2 = 0.0120372146934194$, $I_3 = 0.0123223452758821$.

These are finite-history information quantities, not gauge weights or long-time rates. A reset/carry family preserves the same stationary density while changing them. [18, §§4–8]

Moreover, the tested instrument uses the current ray

$\rho_j = jj^\dagger/(j^\dagger j)$.

For nonzero scalar a, $\rho_{(aj)} = \rho_j$. Holding its other source coefficients fixed, every finite ordered record probability is therefore invariant under pure current rescaling. Temporal correlations recover direction information but cannot create radial information absent from the entire instrument. At $j = 0$, the ray formula is not defined; the native audit finds directiondependent limits on its tested zero-current background. No smooth extension or missing magnitude coefficient is inserted into RCHS-24. [16; 18, §9]

9H.3 The full source amplitude law is not fixed by the tested symmetries

HMGBC distinguishes the finite wheel's move catalogue from the continuously valued full field configuration. Equal weighting of symmetry-equivalent move types does not select a probability distribution over their amplitudes. [22, §11A.1]

The primitive-source audit executes that distinction. For one fixed curvature component, local adjoint symmetry permits

$$Q = z_3 I_8 \oplus z_2 I_3 \oplus z\_Y.$$

One matching auxiliary representation per factor gives a nine-coefficient invariant parent before additional source constraints. Explicit comparison laws preserve the same overall step spread and one-Bit irreversible history production while changing relative conditional information responses. These laws test only the specified sufficiency conditions; they are not competing complete VERSF models. [19, §§2–3]

Thus neither a unique stationary active density nor the present local symmetry/entropy tests establish that only one common physical scale remains. The fixed current-factor geometry H_CWY is a differently typed result and is not withdrawn by this statement.

9H.4 Raw transfer curvature and normalised-history information are distinct

For a smooth positive transfer $\mathbb{T}\_\vartheta$ on fixed support, let Λ_ϑ be its simple Perron eigenvalue and K_ϑ its Doob-normalised kernel. With

$$s\_A = \partial\_A \log K,\ \mathscr{J}\_AB\text{^}path = \mathbb{E}\_\pi K[s\_A\ s\_B],$$

twice differentiating row normalisation and averaging with the stationary measure yields

$$\boldsymbol{\partial\_A\ \partial\_B \log \Lambda = \mathscr{J}\_AB\text{^}path + \mathbb{E}\_\pi K[\partial\_A\ \partial\_B \log \mathbb{T}].}$$

This identity has been checked numerically in the primitive-source audit. It is not a replacement definition of the HMGBC metric. It shows what must be checked before identifying a raw free-energy curvature, a path-space KL Hessian and an influence-action Schur form. [19, §4; 22, §16]

For example, with fixed external parameters,

$$\mathbb{T}\_(f,y) = e\text{^}(-V(f,y))\cdot\mathbb{T}_0$$

has unchanged Doob kernel but retains the raw cost

$$-\log(\Lambda_{(f,y)}/\Lambda_0) = V(f, y).$$

A state-dependent cost inside one complete dynamical configuration operator is not generally a global scalar and need not cancel. The lesson is to preserve the common raw source and its relative weights, not to append arbitrary attenuation factors or conclude that a full history law can never determine an action. [19, §5]

9I. Conditional gradient-Gibbs and dynamic response bridge

The source-drift alternative does not require a stochastic law merely to define a static Hessian. Nevertheless, a specified stochastic completion can provide a useful independent consistency test. This section keeps its extra assumptions explicit.

9I.1 Fixed drift plus matching equilibrium constrains the noise

Let x be real coordinates on a known positive harmonic quotient,

$$F(x) = F_\star + (1/2)x^T H_F\, x,\quad H_F > 0,$$

and let $M > 0$ be a fixed symmetric mobility in those coordinates. Assume, additionally, an additive Gaussian Markov completion

$$dx = -M H_F\, x\, d\sigma + B\, dW_\sigma,\quad Q = BB^T,$$

with locally flat reference volume and Gibbs equilibrium of that same supplied functional,

$$\Sigma_\star = (\beta_G H_F)^{-1}.$$

The stationary covariance equation forces

$$\mathbf{Q = 2M/\beta_G.}$$

This remains true when M and H_F do not commute. It is a conditional fluctuation-dissipation result, not a derivation of the full irreversible VERSF process as a Gaussian diffusion. A Gibbs density alone does not select a process. State-dependent geometry, jump laws, added circulation or other completion classes require their own treatment. [20, §§2–3]

For $\dot{\rho} = -\partial\_\rho F$, ordinary real coordinates (Re ρ, Im ρ) give $M = I/2$. This is a coordinate convention, not a fitted factor. The Gibbs β_G, the Wilson coefficient β_W, and any branch label must not be identified.

The exact finite-time update is

$$E\_\Delta = e^{(-MH\_F\,\Delta\sigma)},\quad C\_\Delta = \Sigma\star - E\_\Delta\,\Sigma\star\,E\_\Delta^T.$$

It preserves the Gibbs covariance and obeys the one-step/two-half-step composition identity. A unit of σ is not declared to be one physical D36 Fold. [20, §4]

9I.2 The auxiliary changes dynamics as well as static stiffness

For

$$F(x, y) = (1/2)(Ax^2 + 2Cxy + Ny^2),\quad N > 0,\quad AN > C^2,$$

with equal scalar mobility μ, the static retained stiffness is

$$k = A - C^2/N.$$

Eliminating y in the dynamic response gives

$$D(\omega) = A + i\omega/\mu - C^2/(N + i\omega/\mu) = k + i\omega\gamma(\omega),$$

$$\gamma(\omega) = (1/\mu)\cdot[1 + C^2/(N(N + i\omega/\mu))].$$

The force-noise spectrum changes with the same auxiliary,

$$S\_noise(\omega) = (2/\beta\_G)\cdot \mathrm{Re}\,\gamma(\omega),\quad \mu\_eff = \mu/(1 + C^2/N^2).$$

Retaining the screened stiffness but the old white-noise/mobility law would not reproduce this eliminated model. [20, §7]

For the specified experiment observing the full continuous field trajectory and perturbing its equilibrium centre, profiling the auxiliary centre gives

$$\mathcal{J}\_prof = (\beta\_G/2)\cdot k^2\cdot \mu\_eff.$$

On the inherited [6 −1 ; −1 6] branch with diagnostic $\beta\_G = 1$, $\mu = 1/2$,

$$k = 35/6,\quad \mu\_eff = 18/37,\quad \mathcal{J}\_prof = 1225/148.$$

They reconstruct one another only with the stated dynamical conversion. This observed-field experiment is not the PFDMI terminal-record experiment; its information rate may not be renamed as W_prim. [20, §§8–9]

9J. Completed-selector information loss and the constructive susceptibility handoff

Theorem 7: the harmonic completed selector does not identify restoring weights

Let

$F(x) = (1/2)x^{T}Hx$, $H = H^{T} \geq 0$, $\dot{x} = -\mu Hx$, $\mu > 0$.

Spectral decomposition gives

$$\Pi_\infty = \lim_{t\to\infty} e^{-\mu Ht} = P_{\ker H}.$$

Every positive eigenvalue has disappeared from the completed limit. The selector therefore fixes the surviving kernel but does not identify the positive restoring spectrum, its ratios or its time normalisation. For a fixed nonscalar positive mobility the limit is the corresponding mobility-weighted kernel projector. This is a harmonic/local normal-sector statement; it is not a theorem that every nonlinear basin map or the full refinement/transport Tick is independent of its action. [21, §2]

Exact comparison on the inherited common source

For the family of Section 9G.4,

$H_{(a,b,c)} = [\ aL + cI\ \ -cI\ ;\ -cI\ \ bL + cI\ ]$,

$\ker H_{(a,b,c)} = \{(D\varphi, D\varphi)\}$.

With P_g the edge-gradient projector,

$\Pi_\infty = (1/2)\cdot[\ P_g\ P_g\ ;\ P_g\ P_g\ ]$

for all positive a, b, c. The three executed comparisons are:

Branch	(a, b, c)	tr H	Positive rank	k_link(5)	k_face(5)
A	(1, 1, 1)	60	18	35/6	7/6

Branch	(a, b, c)	tr H	Positive rank	k_link(5)	k_face(5)
B	(3/2, 1/2, 1)	60	18	115/14	23/14
C	(1, 2, 1/4)	60	18	215/41	43/41

The same selector, rank and trace coexist with different finite-time responses and finite-profile stiffnesses. These are declared variations of common source weights, not separate selected VERSF theories. They do not share an asserted Gibbs law, raw transfer or thermodynamic determinant. Nor do these finite-profile differences prove different continuum coupling ratios: the algebraic small-λ limit of k_face is a + b, which is the same for A and B. No continuum limit is established by that algebraic limit alone. [21, §3]

9J.1 Source correction: diamond parity does not derive the force operator

The older diamond argument uses

$$\mathscr{R} = S_{(b\leftrightarrow c)} \otimes \mathrm{diag}(1, -1, 1, 1, 1, 1, 1, 1).$$

For its stated displacement $w = (0, e_2, -e_2, 0)$, direct evaluation gives

$$\boldsymbol{\mathscr{R}w = w,}$$

not $-w$. The vertex exchange and internal sign change cancel. For the uniform internal generator

$$L_{12} = i(e_1e_2^\dagger - e_2e_1^\dagger),$$

one instead has

$$\mathscr{R}(I_4 \otimes L_{12})\mathscr{R}^{-1} = -I_4 \otimes L_{12}.$$

A genuine restoring Hessian at the reflection-fixed background must satisfy $\mathscr{R}^\dagger H\mathscr{R} = H$. The displayed argument therefore does not derive the uniform L_{12} as that Hessian. A tangent direction, a unitary transport generator and a quadratic restoring operator are not interchangeable. The unitary refinement example remains an example; the claimed derivational implication is not used as a physical input here. [21, §4; 23, Appendix F]

At a fixed symmetry-breaking background, the Hessian is constrained by the actual background stabiliser. Multiplicity spaces must also be retained: on a complex isotypic summand $V_\lambda \otimes \mathbb{C}^{m_\lambda}$, the commutant permits $I_{(V_\lambda)} \otimes A_\lambda$, not necessarily a scalar on the whole summand. The audited reflection argument therefore does not independently establish its proposed three-scalar physical Hessian reduction. [21, §5]

Theorem 8: recovery from independently supplied drift or forced response

Suppose a primitive source independently supplies the physical deterministic drift

$$b_0(x) = -\mathsf{M}(x)\nabla F(x)$$

and its operational mobility in fixed coordinates. At a stationary point,

$$Db_0|_\star = -\mathsf{M}_\star H\_F, \quad \mathbf{H\_F = -M_\star^{-1}\, Db_0|_\star.}$$

The derivative of M drops out because $\nabla F(x_\star) = 0$. The recovered Hessian must pass symmetry, stability and physical-null tests. A drift generated from a previously guessed metric does not become independently derived when this identity recovers that metric. [20, §5]

For a supplied continuous gradient response on a known positive quotient,

$$H\_F = -(1/\Delta\sigma)\cdot \mathsf{M}_\star^{-1} \log E\_\Delta.$$

This formula requires the correctly identified positive-spectrum gradient propagator and its time convention. It is not licensed for the irreversible D36 kernel, a unitary Tick or a completed projection with zero eigenvalues.

There is an equivalent static-response route. Let $H\_Q > 0$ on a physical quotient and let $q = E^T x$ be an independently normalised retained curvature coordinate, with E of full column rank. Introduce its fixed conjugate source h through

$$F\_h(x) = (1/2)x^T H\_Q\, x - h^T E^T x.$$

For scalar mobility and a constant source applied from zero,

$$\chi(t) = E^T H\_Q^{-1} (I - e^{(-\mu H\_Q\, t)})\, E.$$

Therefore

$$\boldsymbol{\chi\_static = E^T H\_Q^{-1} E, \quad Z\_static = \chi\_static^{-1}.}$$

This is the static quadratic coefficient of the specified retained coordinate after the permitted physical relaxation. It is not a definition of the continuum gauge coupling. The action unit, source-force normalisation, curvature geometry and matching scale must still be established. Rescaling h would change the experiment. [21, §7]

Executed same-source response check

For $q = B_C x_{link}$, the fixed source insertion is $(B_C^T, 0)^T$. On the complete 18-dimensional positive quotient, the static solve, independent forced-gradient evolution, finite-time logarithm and record Schur calculation reproduce

$$K_{face} = aI + bc(bB_C B_C^\dagger + cI)^{-1}.$$

The delivered residuals are:

Branch	Selector versus exact projector	Hessian from finite-time logarithm	Static face response versus formula	Forced evolution versus equilibrium susceptibility
A	1.855×10^{-15}	8.449×10^{-16}	2.698×10^{-16}	3.191×10^{-13}
B	1.597×10^{-15}	1.025×10^{-15}	2.628×10^{-16}	1.361×10^{-12}
C	3.199×10^{-15}	1.345×10^{-15}	2.193×10^{-16}	4.158×10^{-16}

These are verification results from the delivered continuation [21], not a newly source-selected action. The finite-time or forced-static response retains the information that completion alone discards. The upstream obligation is to obtain that response from the primitive source before the restoring coefficients have been chosen.

9K. Source-determined endpoint response and the independent gauge-force remainder

The response programme now has an explicit partial source derivative. It does not yet have the complete field-restoring matrix. The distinction can be established from the constitutive and continuity equations themselves, without selecting a new gauge metric. [24]

9K.1 The known constitutive-continuity subsystem

Let $M_v = \mathrm{diag}(m_v) > 0$ be the declared vertex-mass matrix, and let $K = \mathrm{diag}(\kappa_e) > 0$ be the edge-conductance matrix. The notation M_v keeps this mass matrix distinct from the polar isometries V_e used below. Impose only

$$j = K\Delta_U \psi,\quad M_v \dot{\psi} + \Delta_U^\dagger j = 0,\quad (\Delta_U \psi)_e = \psi_t - U_e \psi_s.$$

Then

$$\mathbf{b_\psi(\psi, U) = -M_v^{-1} \Delta_U^\dagger K \Delta_U \psi.}$$

This is an explicit endpoint equation on the stated subsystem. Imposing $D_J = 0$ here is not a proof that every independent current fluctuation is an available auxiliary in the full action. No equation for $\dot{U}$ or $\dot{\Phi}$ follows from these two relations alone. [24, §§1–2]

The execution uses the canonical reversible convention

$K = I_{12}/31$, $M_v = \mathrm{diag}(7, 4, 4, 4, 4, 4, 4)/31$.

Literal unweighted MASD time corresponds to a different displayed mass convention. Neither convention is silently identified with the driven D36 Fold or a physical duration. The earlier source's mass-weighted continuity qualification is retained.

9K.2 The endpoint and link derivative blocks

At fixed links,

$$\mathbf{A_{\psi\psi} = -M_v^{-1} \Delta_U^\dagger K \Delta_U.}$$

For a right-inserted Hermitian generator on edge $e: s \to t$, $\delta U_e = iU_e T_A$, the link-to-endpoint column is

$$\mathbf{(\delta b_\psi)_s = -(i\kappa_e/m_s)\cdot T_A U_e^\dagger \psi_t, \quad (\delta b_\psi)_t = +(i\kappa_e/m_t)\cdot U_e T_A \psi_s.}$$

All other vertices receive zero contribution from that edge. Both the transported difference and its adjoint divergence are differentiated; the formula is not restricted to identity links. In the inherited 50-dimensional representation, the ordinary real arrays have dimensions 700×700 and 700×144. [24, §§2–3]

The 50-dimensional execution uses the same inherited right-handed matter convention as the covariant benchmark. It is not a silent replacement of the 47-dimensional representation convention in Section 9F.2. The three added neutral singlets do not change the quoted gauge-generator Gram, but that agreement does not identify every operator convention.

9K.3 A rank-72 mixed block need not probe curvature

At $U_e = I$ and $\psi_v = v$, define $S_v(a)_e = ia_e v$. With the Section 9G incidence convention,

$$\delta b_\psi = -M_v^{-1} D^\dagger K D \delta\psi + M_v^{-1} D^\dagger K S_v(a).$$

For equal conductances, the canonical face-to-link lift is

$$T_C = C^\dagger(CC^\dagger)^{-1}, \quad CT_C = I_6, \quad D^\dagger T_C = 0,$$

where $C = B_C$. Therefore

$$\mathbf{A_{\psi a} (T_C \otimes I_{12}) = 0.}$$

For unequal positive conductances, the corresponding weighted lift is

$$T_{(C,K)} = K^{-1}C^\dagger(CK^{-1}C^\dagger)^{-1}, \quad D^\dagger K\, T_{(C,K)} = 0,$$

and the same restricted zero follows. This is a statement about the first-order endpoint detector at the specified constant background. It does not set the field-curvature action to zero or extend to every nonconstant background. [24, §4]

The unrestricted link-to-endpoint ranks are 0, 18 and 72 on the neutral, pure-Higgs and generic constant test preparations, respectively. Their horizontal-curvature ranks are all zero. The gauge check instead varies the endpoint and link together, $\delta\psi_v = i\varphi_v v$ and $a = D\varphi$; the two displayed terms cancel. No nonnull direction is reclassified as gauge.

9K.4 Conditional integration and the matter-to-link force

Grant a common-gradient interpretation on an unrestricted endpoint patch with fixed K and M_v:

$$b_\psi = -M_v^{-1}\, \partial_{\bar\psi} F.$$

The known endpoint equation then determines

$$\mathbf{F = F_{diff} + \mathcal{G}(U, \Phi, \ldots), \quad F_{diff} = \Sigma_e\, \kappa_e \|\psi_t - U_e\, \psi_s\|^2.}$$

The difference of any two such potentials has zero real endpoint gradient, so it is constant in ψ on the connected patch but may depend on the other independent fields. This is a functional integration remainder, not merely one common numerical scale. Additional endpoint forces, field-dependent conductances, cross-mobility or a constrained endpoint chart require the corresponding revised integration. [24, §5]

Differentiating the fixed contribution gives

$$\mathbf{\mathcal{J}_e^A = 2\kappa_e\, \mathrm{Im}\langle\psi_t, U_e T_A\, \psi_s\rangle = 2\, \mathrm{Im}\langle j_e, U_e T_A\, \psi_s\rangle}$$

on the constitutive shell. This is an algebra-valued force covector induced by a state-dependent bilinear expression. It is not the representation-valued current j_e itself. The complete link force still contains $\partial_a \mathcal{G}$, which cannot be extracted from the endpoint rows alone. [24, §§5–6]

Crucially, F_{diff} generates the displayed diffusion equation. It is not automatically the squared constitutive/continuity residual action, which can vanish on an on-shell nonzero current. The two may not be added or identified as the physical master action without the missing common-source theorem.

At a constant background, unrestricted static endpoint relaxation in this conditional transport potential gives

$R\_matter = 2\kappa\, P\_cyc \otimes G\_v$, $K\_matter,face = 2\kappa(CC^\dagger)^{-1} \otimes G\_v$,

where $G\_v\^AB = \mathrm{Re}\langle T\_A\, v, T\_B\, v\rangle$. The inverse-face-eigenvalue dependence is not the same object as an already identified local dimension-four curvature coefficient. It also shows why a zero first-order endpoint response need not imply zero second-order transport cost. [24, §7]

The known work pairing $-h^T Ca$ gives the geometrical source covector $-C^T h$. It does not supply the physical dynamical forcing derivative $D\_h\, b$ without the full mobility, source normalisation and independent link/record evolution. The rectangular partial response is not inverted as though the missing field rows had been returned. [24, §9]

9L. Explicit nonlinear link-record covectors and the remaining physical weighting

Section 9K shows why the independent link and record sector must be varied directly. This section carries out that variation for the declared MASD action. "Independent" refers to the distinct physical fields, not to an independently derived choice of their operational metric. The resulting nonlinear form is executable; its physical normalisation remains unselected. [25, §§1–3]

9L.1 Fixed-support variables and the common residual metric

On a fixed full occupied-support patch, use the right polar decomposition

$\Phi\_e = V\_e\, S\_e$, $V\_e^\dagger\, V\_e = I$, $S\_e = S\_e^\dagger > 0$.

Here S_e denotes positive stretch, not an occupied-support projector. It is the factor denoted P_e in report [25]. This right-polar convention and the left-polar convention of Section 9G.2 are equivalent but must not be interchanged by commuting their factors. All evaluated points have invertible records and a positive polar singular-value gap. Moving support projectors require their own derivatives.

For a triangle $0 \to 1 \to 2$ with direct edge $0 \to 2$, write

$\mathscr{H}\_p = U_{02}^\dagger\, U_{12}\, U_{01}$, $D\_C = -i\, \mathrm{Log}_0\, \mathscr{H}\_p$,

$D\_R = \Phi_{12}\, \Phi_{01} - \Phi_{02}$, $D\_(B,e) = U\_e - V\_e$.

These are the unscaled finite-coordinate residuals relative to the identity reference. The logarithm branch is fixed. Physical face areas, operational weights and other geometric factors must be carried by the same source embeddings; unit test coordinates do not establish a continuum conversion. [25, §3]

Use $\langle X, Y\rangle = \mathrm{Re}\,\mathrm{Tr}(X^\dagger Y)$. For the supplied self-adjoint common metric, define

$\Gamma_D = (1/2)\cdot\Sigma_{(X,Y)} \langle D_X, W_{XY} D_Y\rangle$, $\boldsymbol{\tau_X = \Sigma_Y W_{XY} D_Y}$.

Then, at fixed metric,

$$\boldsymbol{\delta\Gamma_D = \Sigma_X \langle \tau_X, \delta D_X\rangle}.$$

All six defect families may occur in the sum. Cross-metric terms enter through τ_X; a zero cross-block may not be assumed merely to simplify the force equation. If the induced metric varies in the chosen residual chart, the additional term is

$$(1/2)\cdot\Sigma_{(X,Y)} \langle D_X, (\delta W_{XY}) D_Y\rangle.$$

Field-dependent embeddings and occupied supports must also be differentiated consistently. At a common defect zero, the metric-variation term does not alter the Gauss-Newton quadratic coefficient. Away from that zero, the fixed-metric simplification is an explicit assumption. The following expressions give the direct closure/composition/bond contributions, not a claim that current, completion, support or measure forces vanish. [25, §4]

9L.2 Link covectors: ordered holonomy and bond mismatch

Keep the fixed generator insertion $\delta U_e = iU_e T_A \delta a_e^A$. The bond contribution to the positive action derivative is

$$\boldsymbol{(\partial(a_e^A)\, \Gamma_D)B = \mathrm{Tr}[\, T_A \cdot (U_e^\dagger \tau(B,e) - \tau(B,e)^\dagger U_e)/(2i)\,]}.$$

The ordered holonomy derivatives are

$$\delta_{01} \mathscr{H}_p = U_{02}^\dagger U_{12} \delta U_{01},\quad \delta_{12} \mathscr{H}_p = U_{02}^\dagger \delta U_{12} U_{01},\quad \delta_{02} \mathscr{H}_p = \delta U_{02}^\dagger U_{12} U_{01}.$$

Consequently,

$$\boldsymbol{(\partial_{(a_e^A)}\, \Gamma_D)C = \langle \tau_C, -i\, D\, \mathrm{Log}(\mathscr{H}_p)[\delta_e \mathscr{H}_p]\rangle}.$$

The Fréchet logarithm is evaluated on its stated branch using its divided differences, including the repeated-eigenvalue limit. Neither the holonomy nor its variation is presumed to commute. Every incident face contributes to a shared edge, and other source residuals contribute their own link derivatives through the same first-variation rule. [25, §5]

9L.3 Record-composition and adjoint polar forces

Product differentiation gives the three composition covectors

$$(\nabla\_(\Phi_{01})\ \Gamma\_D)R = \Phi_{12}^\dagger\ \tau\_R,\ (\nabla(\Phi_{12})\ \Gamma\_D)R = \tau\_R\ \Phi_{01}^\dagger,\ (\nabla(\Phi_{02})\ \Gamma\_D)\_R = -\tau\_R.$$

All incident triangles are summed. Retaining these full matrix variations avoids the scalar-record truncation exposed in Section 9G.1. [25, §6]

For the polar part, set $\Omega = V^\dagger\delta V$, so $\Omega^\dagger = -\Omega$. Differentiating $\Phi = VS$ yields

$$S\Omega + \Omega S = V^\dagger\delta\Phi - \delta\Phi^\dagger V,\ \delta V = V\Omega.$$

Define $\mathcal{L}\_S(X) = SX + XS$ and skew $X = (X - X^\dagger)/2$. The Sylvester operator is self-adjoint and invertible on this positive full-support patch. Its adjoint polar pullback is

$$(D\ \mathrm{Pol}\_\Phi)^*[Z] = 2V\ \mathcal{L}\_S^{-1}\ \mathrm{skew}(V^\dagger Z).$$

Since $D\_B = U - \mathrm{Pol}\ \Phi$,

$$(\nabla(\Phi\_e)\ \Gamma\_D)B = -2V\_e\ \mathcal{L}(S\_e)^{-1}\ \mathrm{skew}(V\_e^\dagger\ \tau(B,e)).$$

This follows by taking the adjoint of the displayed Sylvester solution in the real Hilbert-Schmidt pairing. It is ordinary polar differential calculus applied to the declared source, not a new probability or weighting postulate. The full record covector includes this term, the composition terms and every independently present support, completion, metric or other source contribution. [25, §7]

9L.4 Force covectors, field mobility and conditional phase alignment

The derivatives above are action covectors. The restoring force has the opposite sign. A time evolution requires the operational field mobility to convert a covector into a tangent velocity. On a represented gauge algebra this conversion must use its actual induced Gram; fixed generator normalisation does not make that Gram the identity. Cross-mobility, when present, must be included. [25, §8]

A useful exact check is the isolated fixed-capacity, full-unitary bond

$$\Gamma\_B = (w\_B/2)\cdot\|U - V\|\_HS^2.$$

In the separately declared product-unitary gradient completion with constant mobilities μ_U, $\mu\_V > 0$, the relative operator $R = V^\dagger U$ obeys

$$\dot{R} = (w\_B(\mu\_U + \mu\_V)/2)\cdot(I - R^2).$$

Its eigenvectors remain fixed. For each eigenphase away from the unstable antipodal value,

$\dot{\delta}_j = -w_B(\mu_U + \mu_V)\cdot\sin\delta_j$, $\tan(\delta_j(t)/2) = e^{-w_B(\mu_U + \mu_V)t}\cdot\tan(\delta_j(0)/2)$.

This is actual nonlinear alignment under the stated completion. It is not a solution of the whole coupled source, not an unrestricted claim about projected special-unitary dynamics, and not a derivation of w_B, the mobilities or a physical Fold duration. Fixed-capacity unitary V-evolution is also not silently identified with unconstrained evolution of the full record matrix Φ. [25, §9]

9L.5 The complete three-sector cross-metric handoff

At a flat compatible point, identify anti-Hermitian tangent residuals with real Hermitian coordinates, carrying their metric through the same identification. Then

$D_C^{(1)} = Ca$, $D_R^{(1)} = Cy$, $D_B^{(1)} = a - y$,

and

$\mathfrak{f}_a = C^\dagger\tau_C + \tau_B$, $\mathfrak{f}_y = C^\dagger\tau_R - \tau_B$.

On the orthogonal scalar-metric branch these reduce to the already inherited equations

$\mathfrak{f}_a = w_C La + w_B(a - y)$, $\mathfrak{f}_y = w_R Ly - w_B(a - y)$, $L = C^\dagger C$.

The opposite bond signs follow from one shared mismatch. The displayed coefficients are not fixed by differentiating them.

To keep all closure/record/bond cross-blocks, use $f = Ca$ and $z = a - y$. On the wheel quotient,

$(D_C, D_R, D_B)^T = \mathcal{S}\cdot(f, z)^T$, $\mathcal{S} = [\ I\ 0\ ;\ I\ {-C}\ ;\ 0\ I\ ]$.

Write

$\mathcal{S}^\dagger W \mathcal{S} = [\ A\ K_{fz}\ ;\ K_{fz}^\dagger\ N\ ]$.

When the relative-record directions are physically available and $N > 0$,

$Z_f = A - K_{fz} N^{-1} K_{fz}^\dagger$.

The formula includes W_{CR}, W_{CB}, W_{RB}; it does not impose their orthogonality. The dense positive-metric test in [25] agrees with an independent link-coordinate reduction. That test metric is not the physical metric. Other same-order fields must remain in the common parent or be reduced from the same larger action before this restriction is used. A finite Z_f is still subject to the physical curvature and continuum requirements of Section 12.5. [25, §10]

9L.6 Phase alignment does not by itself protect record capacity

The earlier scalar amplitude escape has a direct matrix counterpart on a triangle. Keep any three unitary links fixed and, with $r = e^{(-t)} > 0$, choose

$$\Phi_{01} = rU_{01},\ \Phi_{12} = rU_{12},\ \Phi_{02} = r^2U_{02}.$$

At each finite t, the records are invertible, their polar factors equal the links, and every bond mismatch is zero. Nevertheless,

$$D_R = r^2(U_{12}U_{01} - U_{02}),$$

so on the declared scalar record metric,

$$\mathbf{\Gamma_{(R+B)}(t) = (w_R/2)\cdot e^{(-4t)}\cdot\|U_{12}U_{01} - U_{02}\|^2 \to 0.}$$

The link-curvature cost remains unchanged. The path approaches a singular polar boundary; no polar value at the zero matrix is assigned, and the path has no uniform positive lower singular-value bound. A source-derived capacity condition, lower singular-value bound, additional restoring term, retained-record restriction or full cross-metric may obstruct it. The test does not establish that the complete VERSF action admits this escape or that its gauge action vanishes. It establishes that stable phase alignment in a fixed-capacity subproblem is not sufficient evidence for full record-capacity stability. [25, §11]

9L.7 Executed scope and physical status

The full-support mathematical triangle test differentiates all 81 real coordinates of three 3 × 3 links and three independent complex records. The separately executed represented wheel uses the inherited 50-dimensional carrier, all twelve edges and six faces. It returns all 144 link-generator covectors and the analytic complex record-force array of shape 12 × 50 × 50. [25, §12]

Represented-wheel derivative check	Step 10^{-3}	Step 10^{-4}
All 144 link-generator directions	6.8337×10^{-7}	6.8337×10^{-9}
The specified 300 record directions	9.4695×10^{-6}	9.4697×10^{-8}

The record checks comprise twelve right-phase directions, twelve positive-stretch directions and one dense direction per edge. They do not constitute finite differences of all 60,000 real record coordinates. Finite gauge-covariance errors are 2.85×10^{-15} for the link force and 4.17×10^{-15} for the record force. The isolated-bond solution agrees with its numerical evolution to 7.50×10^{-12}; the dense cross-metric reduction agrees to 2.22×10^{-16}. These are results inherited from [25], not calculations rerun in this manuscript-integration pass.

The correct new status is **explicit nonlinear independent-field covectors from the declared action**, with partial endpoint dynamics from [24]. It is not **an independently normalised primitive link-record law**. The metric, possible field dependence, physical background, mobility, allowed post-commitment variations, capacity mechanism and action/continuum identification remain source-selection obligations. Repeating the same derivatives after setting all weights to one would not discharge them. [25, §§13–14]

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10. The hard-handshake branch remains distinct

The hard oriented endpoint relation, which must be assigned its own physical event grain, is

$Q_{(e,+)} = a\|z_t + U_e z_s\|^2$,

whose zero set gives

$z_t = -U_e z_s$

and therefore

$\boldsymbol{\gamma_e = -1}$

under the isotropic endpoint marginal.

The source has not yet derived the required Fold/Gate-2-to-matter carrier identity that would promote this relation to the physical endpoint law.

Therefore the endpoint attribution must distinguish the following conditional quantities:

hard commitment branch: $\gamma_e = -1$, if the matter-handshake lift is source-derived; finite first-fact branch: $0 < \gamma_e < 1$, with $\gamma_e \leftrightarrow \zeta$ uniquely.

The two branches are separated by more than the sign: the finite branch carries the full ordered coherence family of Section 9, whereas the hard branch pins a single perfect anticorrelation. The two may describe different event grains, but they may not both be imposed as the same physical joint endpoint law.

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11. Revised Standard-Model critical path

The physical obstacle is no longer the ability to evaluate an example Schur matrix. The archived scalar-channel matrix has been computed and its proposed pure-gauge interpretation fails the frame-null test. A declared covariant completion repairs that failure and supplies an explicit face-curvature response. Conditional current scores, stationary-channel densities, harmonic transitions and forced susceptibilities have also been executed. None of those calculations selects the complete primitive physical response merely by passing its internal checks. The endpoint equations have now been differentiated directly, and the independent closure/composition/bond variations have been evaluated nonlinearly. These are two distinct returns: the endpoint subsystem leaves an independent gauge/record functional, while the latter force covectors still contain the declared action's unselected metric. Neither return supplies the complete physical source by itself. [24, 25]

The leading direct route is now

independent source drift/forced response or microscopic law → admitted covariant background and source units → complete physical quadratic response → physical auxiliary reduction and curvature readout → Z_3, Z_2, Z_q.

The fixed generator conventions remain at the input. The declared Wilson conversion remains at the output. Their closure does not remove the upstream field-response or curvature-attachment problem in between.

There are two coherent ways to supply the quadratic response. A source-derived common history law can return the relevant properly normalised action/history derivatives, with any claimed identification between them proved. Alternatively, an independently derived physical force law or canonically forced susceptibility can return the static Hessian directly. The deterministic route does not need an invented noise law; the history route cannot be replaced by a conditional score of an arbitrarily specified channel.

The current-link reciprocity identity remains an internal certificate when all its blocks come from that common action:

$$(\mathbb{K}_J^{relaxed})^{-1} = (W_J^{phys})^{-1} + (1/2)\cdot\mathcal{K}^{phys} (K_\theta^{phys})^{-1} (\mathcal{K}^{phys})^\dagger.$$

It is not permission to set the current stiffness equal to a record Fisher matrix. The dynamic tests of Section 9I show concretely why a response-time conversion can matter.

The endpoint route stays in parallel. On the selected exponential model only,

$$\zeta \leftrightarrow \{\gamma_{rim}, \gamma_{next}, \gamma_{opp}, \gamma_{spoke}\} \leftrightarrow \mathcal{J} \leftrightarrow G_{CWY}^{cur}.$$

A different source clock or generator requires its own stopped law. The endpoint current joins the direct action route only after their physical coordinate identity is established.

All-order primitive provenance also remains parallel, but primitive selection of quantities already entering the quadratic response is not postponed. The present restricted symmetry and amplitude tests do not establish that only one common gauge-strength scale remains. A ratio-only physical release would require a source proof of that common-scale reduction and a physically admitted curvature readout, not simply cancellation of a scalar in a chosen benchmark.

The immediate target is the physical weighting and admitted variation set of the now-explicit independent link-record response, or an independently supplied microscopic or forced-response law that determines the same quadratic object. The endpoint equations cannot select their endpoint-independent remainder, and differentiating the conditional master action cannot select the metric already used in its force covectors. A dynamical claim additionally needs the field mobility and time convention; a static claim still needs its action unit and conjugate-source normalisation. Capacity may not be frozen for convenience. Completed compatibility, rank counting, a guessed metric or a symmetry-chosen unitary rotation cannot substitute for those source returns. [24, §§5–10; 25, §§8–13]

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12. What would now constitute a genuine next-step pass

The next physical calculation must supply information not already put into its starting metric. A further unit-weight benchmark, a completed selector, a unique stationary density of a selected channel or a conditional information matrix is not the required return.

12.1 Supply one independently normalised source response

Before gauge targets are inspected, return at least one of the following equivalent-purpose inputs at its proper physical grade:

- the complete microscopic update/transfer law and its dependence on the physical curvature and all coupled fields, preserving the relevant raw weights;
- a primitive deterministic field drift b_0, its operational mobility and its derivative on the full admitted covariant carrier;
- a primitive forced-response law with a derived conjugate-source normalisation, sufficient to compute the static susceptibility of the retained curvature.

The source must determine, or prove output-independence from, every unresolved choice that affects the requested quadratic return. Writing a metric into a residual, generating a drift from that residual, and recovering the same metric is not such a derivation. The same applies to a selected exponential tilt or amplitude covariance.

For a history route, specify what is observed, what is hidden, which state variables are retained, the actual renewal and state evolution, and which log-density/rate functional supplies the action. For a drift route, specify its geometry, field equations and physical time convention. For a forced-static route, specify the work term and field-to-curvature map; its normalisation cannot be inferred from an arbitrarily scaled applied source.

Use the returned equations without counting their inputs as derived

The available endpoint equation is the subsystem result of Section 9K. The available nonlinear closure/composition/bond covectors are the declared-action result of Section 9L. A next physical execution must state which independently returned source fixes $\tau_X = \Sigma_Y W_{XY} D_Y$, any field-dependent metric and embeddings, and the allowed record variations. A drift implementation must additionally supply the complete field mobility; a static implementation must supply the physical work and action normalisation. [24, 25]

The exact adjoint-polar and composition formulas can then be reused without introducing new derivative ansätze. Their finite-difference and gauge checks are necessary checks of execution, not substitutes for the upstream weighting. An independently derived source law need only determine the parts that affect the requested physical response, or prove independence from the unresolved parts; it cannot be replaced by setting the unresolved coefficients to convenient values.

12.2 Admit and freeze the physical background

Use a stationary background or a source-derived background ensemble appropriate to the claimed response. Local defect compatibility, a generic chirp witness and the stationary active density of a fixed instrument are different objects. None is automatically a physical vacuum.

Freeze a package containing the source law or response, background fields, regulator geometry, support/polar branch, operational field coordinates, source units, physical quotient, retained carrier, auxiliary census, differentiation procedure and numerical tolerances. A history/metric route must include the independently returned W_{prim} and its cross-blocks. A direct drift route must include the independently returned mobility and force derivative. The package must record what is derived and what is still assumed; a hash certifies integrity, not primitive selection.

An instrument that requires nonzero current cannot be evaluated at $j = 0$ through an invented limiting ray. Likewise a nonconstant current-bearing endpoint witness must satisfy the actual time/refinement equations rather than merely having its instantaneous continuity residual cancelled by a chosen velocity. In the record sector, document whether the full source admits or excludes paths that reduce visible record singular values while retaining their polar orientations. Any lower singular-value bound, capacity term, record/export restriction or unavailable post-commitment direction must be independently sourced. The triangle escape of Section 9L.6 does not prove a full-source instability, but it prevents phase-only stability from being used as its replacement. [25, §11]

12.3 Return the complete same-order parent

On a simultaneous defect-zero branch with an admitted residual metric,

$$G^\star = G_V + \mathcal{J}^{\star\dagger} W_{prim} \mathcal{J}^\star + G_{ferm}^{(2)} + G_{measure}^{(2)},$$

where every listed extra term must independently exist at the same order. All six defect derivatives and all source-returned cross-metric blocks are evaluated in one common tangent basis. Away from a common zero, use the full second variation instead of its Gauss-Newton special case. For the direct link/record derivatives, use the common residual covectors and polar/composition pullbacks of Section 9L with the actual physical metric. Restore every other source contribution and every relevant metric/support derivative before taking the full second variation. Do not add the Section 9K diffusion potential to the squared-defect action merely because it reconstructs the endpoint flow; equality or combination of those source functionals requires its own derivation. [24, §5; 25, §§4–8]

For the independent drift route, obtain

$$H_F = -M_\star^{-1} Db_0|_\star.$$

Before identifying this with $G_\star$, establish whether F, $\beta_G F$, or another physically normalised source functional is the dimensionless action being used. No action-unit conversion is supplied merely by the matrix identity.

The covariance or information-route check must use the same experiment and dynamics. In particular, an observed continuous field trajectory and a coarse terminal-record sequence are not interchangeable likelihoods.

12.4 Test covariance and classify nulls before reduction

Differentiate the actual simultaneous local gauge action on link, endpoint, current, record and completion variables. At the admitted common stationary branch, verify that the complete source Hessian annihilates those genuine gauge tangents.

A faithful twelve-generator link census is not sufficient. The 334-coordinate scalar-channel execution demonstrates why. Neither may a positive-cost direction be projected away and relabelled as a null.

Separate gauge/redundancy directions from physical zero modes. Retain any physical zero mode that is not an admissible auxiliary, or treat its nonlinear dynamics separately. Then evaluate

$$G_{red} = G_{RR} - G_{R\eta} G_{\eta\eta}^{+} G_{\eta R}$$

with the range condition of Lemma 2.1. Check screening against the **same parent** and retained coordinates. If the reduction is dynamical rather than static, include the induced memory and noise rather than changing only the stiffness.

12.5 Extract the physical curvature response

Generate the gauge insertions using the frozen conventions

$$\delta U_e(T_A) = iU_{(e,\star)}E_{SM}(T_A), \quad q = 6Y.$$

Carry them through the same physical quotient and source-derived curvature/readout map. For an unfixed massless gauge-kinetic interpretation, check that pure frame changes carry no curvature cost. Establish the relation between finite face coordinates, geometric weights and the continuum field strength before interpreting any profile coefficient as Z_A.

When the physical retained embeddings are supplied, compute

$$K_3 = \tilde{E}_3^\dagger G_{red} \tilde{E}_3,\ K_2 = \tilde{E}_2^\dagger G_{red} \tilde{E}_2,\ K_q = \tilde{E}_q^\dagger G_{red} \tilde{E}_q.$$

The combined embedding must have rank twelve. The simple-factor blocks must be isotropic and the cross-factor blocks must obey the relevant Ward/equivariance identities at the claimed background. Only then return

$$Z_3 = (1/8)\cdot \mathrm{Tr}\, K_3,\ Z_2 = (1/3)\cdot \mathrm{Tr}\, K_2,\ Z_q = K_q.$$

The susceptibility route gives the same static quadratic object only for the same retained coordinate and conjugate-source convention:

$$Z_{static} = (E^T H_Q^{-1} E)^{-1}.$$

Its agreement with the source action and its continuum kinetic interpretation are tests to perform, not definitions imposed afterwards.

With the physical action and curvature conventions established,

$$g_s = Z_3^{(-1/2)},\ g = Z_2^{(-1/2)},\ g' = 6Z_q^{(-1/2)}.$$

The declared Wilson conversion introduces no fitted multiplier. It does not by itself prove the matching scale, regulator limit or the identification of a finite profile with continuum curvature.

12.6 Parallel endpoint/current checks and partial passes

Continue to use the exact coherence/current fingerprints of Sections 8 to 9E on their stated exponential model. Use the actual source-stopped law if the physical clock or generator differs. A hard oriented endpoint relation requires its own carrier attachment and event grain; it must not be averaged into a finite pre-completion covariance.

A ratio-only physical pass is legitimate only if the source proves that the final curvature triple is fixed up to one common scalar and supplies an admitted matching-scale interpretation. A common multiplier cancels algebraically from ratios; that observation does not prove that all unresolved physical freedom is common.

Pass criterion

A genuine next-step pass is

independent physical source response → complete covariant quadratic parent and admitted reduction → same-source curvature coefficient.

The result must publish provenance, source normalisation, stationarity, null/range tests, auxiliary availability, curvature reconstruction, factor tests and regulator/scale qualifications. A failed check must be stated at the level actually tested. It is neither an excuse to fit a multiplier nor, without a full-source argument, an impossibility theorem for VERSF. The ledger must distinguish the partial endpoint drift, declared-action nonlinear force covectors and any genuinely source-selected physical evolution. Report the actual scope of numerical verification: all 144 represented link columns and 300 specified record directions do not constitute an all-coordinate record derivative census. [24, 25]

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13. Falsifiers

F1: hidden quadratic cross-sector

If a sector currently classified as higher-order returns a nonzero second derivative into the physical (J, θ) component at the selected background, it must be restored to K1⋆. The K0A retyping may not be used to omit it.

F2: nonstationary matching background

If the physical matching point is not stationary for the supposedly spectator variables, higher-order terms can feed lower effective orders after shifting the background. The stationary-background theorem then does not apply until the true source-selected background is used.

F3: singular auxiliary or nonregular elimination

A quadratic partial minimum is finite exactly under the range condition of Lemma 2.1. Failure of that condition signals an unbounded quadratic direction and is incompatible with a complete positive-semidefinite parent. Classify the offending direction before any release. Separately, a degenerate auxiliary may have a finite quadratic minimum but a nonregular higher-order stationary branch. The pseudoinverse range condition does not by itself justify the smooth higher-order elimination used in Theorem 1; that regularity must be supplied or the nonlinear mode retained.

F4: endpoint family not source selected

The bijection $\gamma\_rim \leftrightarrow \zeta$ does not select either quantity. It only proves that the finite-refinement branch contains one scalar freedom rather than a stopping-time function.

F5: hard and finite branches conflated

$\gamma = -1$ and $0 < \gamma < 1$ may not be averaged, interpolated or fitted. The source must type their event grains or select one branch.

F6: diagonal history metric promoted

The RCHS-2 diagonal continuation may not be promoted to the full physical source metric while the non-diagonal source-to-faithful pullback is unreturned.

F7: cross-coherence inconsistency

On the finite first-fact branch, any physical return of two or more coherences must respect the strict ordering of Lemma 9.2 and lie on the exact consistency curve of Corollary 3.1 (equivalently, the ζ inverted from any one coherence must reproduce the others through their closed forms). A returned pair off the curve, or an ordering violation such as $\gamma_{opp} \geq \gamma_{rim}$, falsifies the finite first-fact branch, or the U(49)-covariant reduction feeding it, at that event grain. No parameter can be adjusted to rescue it.

F8: same-parent screening sign violation

For a fixed positive-semidefinite parent, background, retained-coordinate map and physically admitted relaxation, the Schur response cannot exceed the unrelaxed retained block. A numerical violation requires correction of the parent, quotient, range condition or computation. This falsifier does not compare different actions or backgrounds: adding a new residual can change the bare block as well as its screening, so it need not lower an older benchmark's value.

F9: current-Gram fingerprint violation

On the finite first-fact branch, a source-returned raw C/W/Y current Gram must satisfy the exact zero-parameter fingerprints of Corollary 5.1, $\det G^{cur}/(\operatorname{tr} G^{cur})^3 = 4428/109^3$ and $f^{T}G^{cur} f/\operatorname{tr} G^{cur} = 269/327$, and must be proportional to H_{CWY}. Violation falsifies the internally isotropic factor-blind finite branch before any parameter is extracted; a passing Gram whose trace-extracted $\mathcal{J}$ disagrees with the ζ inverted from any coherence, or whose spoke/rim partition departs from Lemma 9D.3, fails the same way.

F10: noncanonical extraction of ζ from a magnitude

The inversion of Theorem 4, and the spoke/rim split of Lemma 9D.3, are exact for the canonical equal-conductance generator with its stated masses. Extracting ζ from a returned magnitude under a different physical generator, conductance pattern or mass assignment is invalid until the corresponding stopped norm is re-derived for that generator; the bijection itself does not select the generator, exactly as F4 records for the coherences.

F11: generator-rescaling violation

The Standard-Model source-generator conventions are frozen by $\operatorname{tr}(T_a T_b) = (1/2)\delta_{ab}$, $\operatorname{tr}(t_i t_j) = (1/2)\delta_{ij}$ and $q = 6Y$. After generator differentiation, multiplying a returned colour, weak or Abelian gauge column by a factor chosen from a desired coupling changes the source coordinate rather than deriving physics. Any such factorwise rescaling invalidates the physical gauge-normalisation claim.

F12: Wilson continuum-rescaling violation

Within the declared Wilson interface map $U_p = \exp(ia^2F_{\mu\nu})$, $S_p = \beta_W(1 - \cos\theta_p)$, the continuum expansion fixes $c_{norm} = 1$. A later multiplier $c_{norm} \neq 1$ is admissible only if a different source-derived interface action or field/generator convention is independently established before comparison. It may not be introduced as a small matching correction inside the same Wilson map.

F13: tensor-benchmark promotion

The exact canonical tensor Gram $\mathrm{diag}(6I_8, (13/2)I_3, 378)$ and the corresponding separable benchmark $(Z_3, Z_2, Z_q) = (144/5, 455/12, 567)$ are not the physical gauge return. Promoting them without the branch-specific nonfactorising G_{red} and retained gauge readout violates the master-action physical-direct requirement.

F14: mixed-branch physical-direct pullback

The physical G_{red} and $\tilde{E}_3$, $\tilde{E}_2$, $\tilde{E}_q$ must come from the same frozen master action, background, regulator, quotient and auxiliary census. Combining a Hessian from one branch with gauge columns from another is a compatibility construction, not a VERSF derivation.

F15: faithful-link census substituted for a full gauge orbit

Rank twelve in the generator embedding, or rank 144 in the edge-link carrier, does not certify that the other fields contain their simultaneous local transformations. A pure-gauge kinetic interpretation fails if link-frame gradients retain positive cost after every available compensating source variation. Do not remove nonnull directions by hand. A separately derived gauge-fixed or broken-phase interpretation must identify its own compensators and kinetic/background separation.

F16: link-profile response renamed as a curvature coefficient

A finite profile norm, a face-curvature coordinate and a continuum field strength must be connected by the actual source geometry. In the benchmark, $k_{link}(\lambda)$ and $k_{face}(\lambda)$ differ by the explicit coordinate map. Dividing a quoted number by a chosen eigenvalue after comparison, or invoking $c_{norm} = 1$ without the curvature map, does not produce a physical coupling.

F17: retained preparation or renewal silently removed

Equal local defect values do not guarantee equal physical preparations. A unique stationary active density belongs to a specified channel and need not select the channel's current fields or renewal. A current instrument undefined at zero current requires a derived extension or a different admitted background. These distinctions may not be suppressed to manufacture a unique history metric.

F18: conditional information substituted for a physical action

A terminal Fisher matrix, a full path-information rate, a raw Perron free-energy curvature and a static or dynamic influence-action Hessian are not equal by notation. Specify the experiment, observed and hidden variables, source coordinate, time and normalisation. Include the raw-transfer second-derivative term where the Section 9H identity applies. A pure current rescaling invisible to the entire normalised-ray instrument cannot acquire a nonzero score merely by taking longer histories.

F19: noise or relative weights declared selected by insufficient conditions

The restricted symmetry, equal-spread and one-Bit tests do not fix the final gauge-weight ratios. Conversely, those tests do not refute a stronger independently supplied dynamics. The Gaussian fluctuation relation of Section 9I is valid only with its fixed drift, geometry, matching equilibrium and completion class. Do not use it to assert that these inputs, or a unique remaining common scale, have been derived.

F20: completed-selector or unitary-generator substitution

A completed harmonic selector retains the admissible kernel and loses positive restoring eigenvalues. Its projection is not a finite-time propagator. A candidate unitary closure generator is also not automatically a dissipative field Hessian. The matrix-log recovery formula is invalid for a projection with zero eigenvalues and is not licensed for D36 or a unitary Tick without a separate physical derivation.

F21: circular force recovery or unnormalised susceptibility

Recovering H from a drift or response generated from that same chosen H is a benchmark check. Physical use requires an independently returned drift or force experiment and the actual operational/source normalisation. Rescaling the conjugate force, substituting a different mobility, or identifying H_F, $\beta_G H_F$ and a dimensionless gauge action without a source bridge invalidates the physical release.

F22: invalid background-symmetry reduction

At a fixed background, use its actual stabiliser and retain representation multiplicities. The literal diamond displacement is even under the combined reflection. The older assertion that this argument derives the uniform L_{12} as the restoring Hessian may not be used as the missing physical force input. Correcting that implication does not remove the separately declared unitary illustration.

F23: partial endpoint response promoted to a full gauge-restoring law

The explicit endpoint drift is a constitutive/continuity subsystem result. Its 700 × 144 mixed derivative can have rank 72 while vanishing on the source-metric horizontal curvature lift at the stated constant background. That rank may not be relabelled as the physical curvature response. Nor may the rectangular partial derivative be inverted as though the independent link/record rows or physical forcing derivative had been returned. This restriction does not imply zero gauge energy or insensitivity on every background. [24, §§2–4, 9]

F24: diffusion potential identified with the off-shell residual action

The conditional reconstruction $F = F\_diff + \mathcal{G}(U, \Phi, \ldots)$ determines the endpoint-dependent transport potential on its stated fixed-conductance gradient patch. It does not determine $\mathcal{G}$, identify the vector current with its bilinear algebra-dual force, or establish F_diff as the dimensionless squared-defect master action. Neither that identification nor an addition of the two functionals may be made without an independent common-source derivation. [24, §§5–8]

F25: nonlinear covectors promoted past their metric, support or mobility grade

The closure/composition/polar equations are exact direct first variations of the declared action on the specified patch. Their dependence on τ_X does not determine W_XY. Away from a common defect zero, omit no field-dependent metric or embedding terms without an explicit fixed-metric hypothesis; moving supports require their projector derivatives. Converting a force covector to a velocity requires the actual operational Gram and mobility. The full-unitary fixed-capacity alignment solution is not automatically the projected Standard Model or full-record evolution. Verification in selected record directions must not be described as exhaustive verification of every record coordinate. [25, §§3–9, 12]

F26: phase stability substituted for record-capacity stability

Stable relative phase alignment at fixed amplitude does not establish a coercive full record dynamics. Conversely, the explicit matrix amplitude-escape path concerns the stated scalar record/bond subaction on a triangle and approaches a singular polar boundary; it does not establish that the complete physical action has zero gauge cost or admits the same path. The physical source must state and justify the capacity, support and retained-variation conditions actually used before any record-phase relaxation is promoted. A total record/export norm and a fixed visible record amplitude are not interchangeable conditions. [25, §11]

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14. Conclusion

RCHS-24 retains two exact central results. The stationary quadratic release object is the complete Hessian-connected physical parent, not every all-order sector of the eventual unified theory. On the canonical exponential-stopping model, the endpoint covariance, coherence family, raw-current magnitude and internally isotropic C/W/Y Gram form a one-scalar, over-determined consistency family. Neither result selects its physical input law.

The gauge-generator conventions and declared Wilson conversion likewise remain fixed at their stated grades. They exclude post-hoc rescaling; they do not supply the missing operational response or its physical curvature embedding.

The later executions change the practical frontier. The archived 334-coordinate scalar-channel source has been reduced explicitly and cannot be promoted unchanged to an unfixed pure gauge-kinetic matrix because all 72 link-frame gradients retain positive cost. An explicitly declared covariant common-action completion removes that artificial cost, retains rank-72 curvature response and supplies the exact face kernel

$$K_{face} = aI + bc(bB_C B_C^\dagger + cI)^{-1}.$$

That is a consistency and coordinate-descent result. Its convenient weights and constant background are not primitive physical returns.

The history calculations make the attribution boundary more precise. Current/continuity variations can be lifted exactly at fixed retained state, and the native probabilities and short histories can be differentiated. But compatible preparations remain physically distinguishable; a stationary density does not select its defining channel; and normalised-ray records remain blind to pure current magnitude. Neither these conditional scores nor the local symmetry/one-Bit tests determine the full physical gauge weights.

There is a constructive deterministic alternative. If the primitive source independently returns a gradient drift and its mobility, then

$$H_F = -M_\star^{-1} Db_0|_\star.$$

If it independently returns the correctly normalised forced response of retained curvature, then on a known positive physical quotient

$$\chi_{static} = E^T H_Q^{-1} E, \quad Z_{static} = \chi_{static}^{-1}.$$

These identities have been executed in the inherited source family. In the stated Gaussian completion, the matching fluctuation law is also constrained, while auxiliary elimination changes the dynamic response and noise as well as the static stiffness. Those conditional bridges do not make the test action physically selected.

The completed gradient-flow selector cannot replace this finite-time or forced information: sources with the same admissible kernel, selector, rank and trace can have different restoring spectra and finite-mode responses. The older diamond-reflection argument also does not independently derive the proposed restoring generator and is corrected at the level of its explicit parity calculation.

The two latest continuations supply a more explicit but still qualified source response. The constitutive/continuity equations determine the endpoint drift and its link derivative. At a constant background their horizontal-curvature response is zero, and a common-gradient reconstruction leaves an independent gauge/record functional. The accompanying transport-force covector is therefore a partial response, not the missing pure gauge law. [24]

Direct variation of the declared master action then gives the nonlinear link torque, record-composition covectors and the adjoint-polar record force. Their represented finite-difference and covariance tests pass at the stated scope. This is an independent-field force calculation, not an independently normalised primitive selection. The physical metric, field dependence, mobility where needed, allowed record variations and capacity protection are not supplied by taking the derivative. The exact fixed-capacity alignment solution and matrix amplitude-escape test make that distinction concrete. [25]

The live physical requirement is therefore

independently derived field response or complete microscopic law → admitted common quadratic parent → physical relaxation and curvature readout → Z_3, Z_2, Z_q.

The present work does not issue those physical coefficients, does not establish that only one common scale remains, and does not prove that VERSF cannot select them. It establishes which exact conditional calculations remain usable, which proposed shortcuts fail, and the source information that must be returned before a numerical force-strength claim is justified. All-order unification stays in parallel; primitive provenance of the quadratic physics remains indispensable.

Appendix A: independent verification record

Items 1 to 25 record verification runs performed for earlier rounds of this manuscript, in exact rational or symbolic arithmetic unless stated, with their source qualifications. Items 26 to 35 summarise the separately executed continuation reports already listed in the source ledger. Item 36 records the independent checks performed during the earlier source-response integration. Items 37 to 42 summarise the two subsequent reports [24, 25], retaining their numerical definitions, input assumptions and verification scope; their values are inherited, not rerun here. Item 43 records the independent checks performed during the present endpoint/link-record integration on the subset reproducible without the report archives.

1. **Canonical wheel and spectrum.** The $K = 7$ wheel (hub plus six rim carriers, twelve edges, conductance 1/31 per edge, masses 7/31 hub and 4/31 rim) was rebuilt from scratch and the spectrum of $L_K = M^{-1/2} B K B^T M^{-1/2}$ reproduced as $\{0, 1/2, 1/2, 1, 1, 31/28, 5/4\}$ to machine precision.
2. **Stopped resolvent.** The scalar identity $\int_0^\infty \nu e^{-\nu t} e^{-2\alpha\lambda t}\, dt = \zeta/(\zeta + 2\lambda)$ was verified symbolically, and the clock-firewall invariance $\zeta' = \zeta$ under $t' = ct$ exactly.
3. **Independent re-derivation of the coherence family.** The bordered-circulant Fourier reduction of Section 9 was carried out symbolically: closed forms for the hub Schur scalar $2\zeta(14\zeta + 31)/(4\zeta + 2)$, the resolvent entries $G_{hub,hub} = (2\zeta + 1)/(\zeta(14\zeta + 31))$ and $G_{hub,rim} = 1/(\zeta(14\zeta + 31))$, and all rim entries were confirmed against a direct 7×7

exact matrix inverse at $\zeta = 7/3$. The resulting $\gamma\_rim(\zeta)$ and $\gamma\_spoke^2(\zeta)$ match the quoted rational functions with exact cancellation; $\gamma\_next(\zeta)$ and $\gamma\_opp(\zeta)$ are as stated in Lemma 9.1.

4. **Derivatives.** Both printed derivative formulas match direct symbolic differentiation exactly, and every coefficient of the negated derivative numerators of γ_rim, γ_next, γ_opp and γ_spoke^2 is positive, certifying strict monotonicity on $\zeta > 0$.
5. **Limits and expansions.** Limits 1 at $\zeta \to 0^+$ and 0 at $\zeta \to \infty$ hold for all four coherences; the series of Remark 9.3 are exact to the printed orders.
6. **Gap identities.** $\gamma\_rim - \gamma\_next = \zeta(\zeta + 2)(14\zeta + 31)/D(\zeta)$ and $\gamma\_next - \gamma\_opp = \zeta(14\zeta + 31)/(2D(\zeta))$ verified by exact cancellation.
7. **Benchmarks.** Every fraction in the Section 9 table verified exactly, with decimals to twelve digits.
8. **Inversion.** The quartic of Theorem 3 was solved numerically at $\gamma = 1/10, 1/2, 9/10$, returning exactly one positive real root in each case: $\zeta = 3.89563507411$, 0.282536766092, 0.0266715542938.
9. **Consistency curve.** The Appendix B eliminant vanishes exactly at the (γ_rim, γ_spoke^2) pairs generated by six rational values of ζ, and is nonzero at an off-curve test point.
10. **Schur and screening.** The spectator identity of Theorem 2 was verified on exact rational block matrices; the screening correction $B\ C^{-1}\ B^\dagger$ was confirmed positive semidefinite; and a third-order-coupled toy model (spectator entering first at cubic order) was eliminated exactly, returning the unchanged quadratic coefficient predicted by the two-block Schur complement (11/8 in the test instance), confirming Theorem 1's order bookkeeping.
11. **Common mode.** $\bar{C}\_\zeta\ (M^{(1/2)}\mathbb{1}) = M^{(1/2)}\mathbb{1}$ confirmed at $\zeta = 0.3, 1.0, 4.2$ to 10^{-14}.
12. **Section 7 arithmetic.** 0.0541555245794 / 0.0787169884512 = 0.687977597275 to the printed precision. The underlying RCHS-2 metric entries were not re-derived here; the two Schur values are carried at their source grade, and only the quoted ratio and its screening direction are independently confirmed.
13. **Stopped current norm re-derived.** $\mathcal{J}(\zeta)$ was independently reproduced from the canonical spectrum as $(\zeta/31)\cdot\Sigma\_\lambda\ \lambda/(\zeta + 2\lambda)$, matching the closed rational form of Section 9A by exact cancellation; the ceiling $75/434 = (1/31)\cdot\mathrm{Tr}\ L\_K = (1/31)\cdot(75/14)$ was confirmed structurally.
14. **Current inversion.** The derivative formula of Section 9B matches direct differentiation exactly, with all-positive numerator coefficients; the limits 0 and 75/434 hold; the expanded quartic in j matches the product form exactly; and numerical solution at $j = 1/50, 1/10, 3/20$ returned exactly one positive real root each ($\zeta = 0.237542126780$, 2.62485522161, 12.8656343515). All four benchmark fractions of the Section 9B table verified exactly, decimals to twelve digits.
15. **Factor-Gram arithmetic.** $\mathrm{tr}\ H\_CWY = 109/49$, $\det H\_CWY = 4428/49^3$, $f^T H\_CWY\ f = 269/147$, and the fingerprints $4428/109^3$ and $269/327$ and extraction constants 49/109, 147/269 were confirmed in exact arithmetic.
16. **Rim contrast chain.** $R\_rim(\zeta)$ was verified exactly as $2(\bar{C}\_rr - \bar{C}\_adj)$ from the Section 9 resolvent entries; its printed derivative matches with all-positive numerator coefficients; the identity $R\_rim = 2\bar{C}\_rr(1 - \gamma\_rim)$ and the closed form $\bar{C}\_rr = D(\zeta)/((\zeta + 1)(\zeta + 2)(2\zeta + 5)(14\zeta + 31))$ were confirmed by exact cancellation; and the mass-fraction limits $\bar{C}\_rr \to 4/31$, $\bar{C}\_hh \to 7/31$ at $\zeta \to 0^+$ and $\bar{C}\_rr \to 1$ at $\zeta \to \infty$ hold.

17. **Additivity split.** In the mass-normalised convention the per-edge closed forms of Lemma 9D.3 were derived from the covariance entries, the spoke-edge form was confirmed strictly increasing (all-positive derivative numerator), and the identity $\mathcal{J} = 6\cdot$(spoke edge) + $6\cdot$(rim edge) holds by exact cancellation, with split ceilings 42/434 + 33/434 = 75/434.
18. **Normalisation audit.** The plain-incidence six-edge rim norm has ceiling 12/961, not the 3/31 rim share of the mass-normalised convention; only the latter is compatible with the 75/434 global ceiling. This is the basis of the Section 9D source note.
19. **Handoff bounds.** The spectral sandwich of Section 9E is the elementary trace bound $(1/2)k^-\cdot\mathrm{Tr}\,\mathbb{E}[JJ^\dagger] \le (1/2)\cdot\mathrm{Tr}[\mathbb{K}\,\mathbb{E}[JJ^\dagger]] \le (1/2)k^+\cdot\mathrm{Tr}\,\mathbb{E}[JJ^\dagger]$ and was not separately machine-checked; the factor-democratic case is an identity.
20. **Gauge-profile Gram.** The exact weighted Gram I_3 of the three canonical MASD closure profiles with $\pi = (7, 4, 4, 4, 4, 4, 4)/31$ is carried at its GNC-EX2A source grade; the profile definitions live in the MASD-1 corpus and were not rebuilt here. Every downstream statement conditional on it (the rank-twelve conclusion and the diagonal form of the tensor Gram) is exact given that Gram.
21. **Standard-Model representation Gram re-derived.** The full frozen 47-dimensional three-generation matter-plus-Higgs representation was rebuilt from scratch in exact arithmetic (Gell-Mann $T_a = \lambda_a/2$, Pauli $t_i = \sigma_i/2$, conjugate action on the $\bar{3}$ multiplets, $q = 6Y$), confirming the generator conventions $\mathrm{tr}(T_a T_b) = (1/2)\delta_{ab}$, $\mathrm{tr}(t_i t_j) = (1/2)\delta_{ij}$ and the Hilbert-Schmidt Grams exactly: $\mathrm{Tr}\,\rho_3(T_a)^\dagger\rho_3(T_b) = 6\delta_{ab}$, $\mathrm{Tr}\,\rho_2(t_i)^\dagger\rho_2(t_j) = (13/2)\delta_{ij}$, $\mathrm{Tr}\,\rho_q^\dagger\rho_q = 378$ (equivalently $36\cdot\Sigma Y^2$ with $\Sigma Y^2 = 21/2$), with every SU(3)-SU(2), SU(3)-U(1) and SU(2)-U(1) cross product exactly zero and the state count exactly 47.
22. **Rank-twelve tensor embedding.** Given the item-20 profile Gram, the combined Gram $e_{int}^\dagger(W_{14}^{stat} \otimes I)e_{int} = \mathrm{diag}(6I_8, (13/2)I_3, 378)$ follows from the item-21 operator Grams and factor orthogonality, and its rank is exactly twelve since every diagonal entry is positive. The vectorised tensor carrier has shape $14 \times 47^2 = 30926$ rows by 12 columns (dimension confirmed).
23. **Benchmark quarantine.** The separable products $(24/5)\cdot 6 = 144/5$, $(35/6)\cdot(13/2) = 455/12$ and $(3/2)\cdot 378 = 567$ were confirmed in exact arithmetic; the wheel coefficients (24/5, 35/6, 3/2) are the previously executed separable mode triple. The triple (144/5, 455/12, 567) is recorded only as a pipeline benchmark and is not promoted to a physical Standard-Model boundary (falsifier F13).
24. **Wilson interface normalisation.** The exact expansion $1 - \cos(a^2F) = (1/2)a^4F^2 - (1/24)a^8F^4 + O(a^{12})$ was verified symbolically, whence $S_{lat} = (\beta_W/4)\int F_{\mu\nu} F^{\mu\nu}\, d^4x + O(a^4)$ and the matching $\beta_W = 1/g^2$, $c_{norm} = 1$ within the declared Wilson map.
25. **Strengthened Lemma 2.1.** The new positive-semidefiniteness addendum ($H \succeq 0$ forces $\ker H_{yy} \subseteq \ker H_{ry}$, hence the range inclusion) was checked as stated: the two-line contradiction argument is complete, and the earlier exact rational block checks of item 10 remain valid for the pseudoinverse form.
26. **Complete archived HM4 branch.** Report [14] rebuilds the 1125 × 334 defect derivative and 22 potential rows, reproducing ranks 309 and 313. Maximal relaxation gives an explicit 144 × 144 link matrix. Independent pseudoinverse and residual-projection reductions agree to 3.45×10^{-17}. Positive frame costs 617/40, 2041/120, 1219/72 prevent the stated pure-gauge promotion.

27. **Local bond-polar derivative.** Report [13] derives $\delta\mathcal{D}\_B = P\,\delta U\,P - \Omega$ and $B\Omega + \Omega B = S - S^\dagger$ on a rank-stable occupied support. Its finite-difference errors decrease from approximately 4.89×10^{-7} at step 10^{-3} to 4.89×10^{-9} at step 10^{-4}. The quartic example distinguishes a nonlinear residual from a quadratic action contribution.
28. **Covariant active block.** Report [15] executes the 516-coordinate gauge-connected benchmark with rank 432 and 84 simultaneous gauge directions. The relaxed link response has rank 72; the frame-null residual is 4.59×10^{-16}, independent Schur agreement 5.69×10^{-16}, and face reconstruction 5.30×10^{-16}. The constant background and unit block metric remain declared inputs.
29. **State-conditioned defect response.** Report [17] verifies the triangular current/continuity inverse with residuals 3.07×10^{-16} and 6.78×10^{-16}, and executes the complete 84×1200 conditional current-probability derivative of rank 72. Its compatible common-preparation family has tangent dimension 93 and probability-response rank 72. These are first-jet and witness results, not vacuum selection.
30. **Stationary active channel and multi-record response.** Report [18] finds the unique stationary active density on each of five specified state-preserving channels, with stationary residual 4.11×10^{-17}. On its specified path and perturbation, $I_2 = 0.0120372146934194$ and $I_3 = 0.0123223452758821$. Renewal comparisons change the history response without changing that stationary density; pure current rescaling remains invisible at all finite sequence lengths.
31. **Primitive amplitude and normalisation audit.** Report [19] executes invariant-form dimensions three on the local curvature carrier and nine with one matched auxiliary copy per factor. Restricted probability-law comparisons preserve common spread and one-Bit history production while changing relative information coefficients. The raw-transfer response identity is checked with residual 4.17×10^{-17}. Neither comparison family is a source-selected gauge law.
32. **Gradient-Gibbs bridge.** Report [20] executes the 18-dimensional positive quotient of the inherited unit-weight spatial parent. Stationary covariance balance is 9.42×10^{-17}; exact finite-time stationarity is 7.28×10^{-17}; the two-half-step covariance residual is 1.46×10^{-16}. The stochastic assumptions, coordinate mobility and non-identification of a σ unit with a physical Fold are retained.
33. **Dynamic auxiliary and information conversion.** Report [20] checks $k = 35/6$, $\mu\_\mathrm{eff} = 18/37$, and $\mathscr{J}\_\mathrm{prof} = 1225/148$ in the specified continuous observed-field experiment. The dynamic Schur residual is 2.86×10^{-17}. These quantities are not interchangeable current, terminal-information or gauge normalisations.
34. **Completed-selector and diamond audit.** Report [21] compares three common source-weight choices of trace 60 and positive rank 18. They share the same completed selector but have the Section 9J finite-profile responses. Direct parity calculation gives $\mathscr{R}w = w$ and $\mathscr{R}(I_4 \otimes L_{12})\mathscr{R}^{-1} = -(I_4 \otimes L_{12})$. The global algebra-to-endpoint tangent is 64×63, with rank 15 at $\theta = 0$ and rank 28 at the tested $\theta = 0.1, 0.3, 0.6$; these are orbit-tangent ranks, not physical gauge-weight counts.
35. **Independent forced response.** Report [21] verifies the same-source face susceptibility, static Schur formula and finite-time Hessian recovery on all three branches. The largest logarithmic-Hessian residual is 1.35×10^{-15}, largest static face-formula residual 2.70×10^{-16}, and largest forced-evolution/static-susceptibility difference 1.37×10^{-12}.

36. **Earlier editorial-integration independent checks.** The following subset of the Sections 9G to 9J mathematics was re-derived from scratch during the earlier source-response integration, without the continuation archives: the Sylvester solution $\Omega\_ij = (S - S^\dagger)ij/(b\_i + b\_j)$ *(residual 4×10^{-16}); $B\_C D = 0$ on the six-triangle wheel with face spectrum {1, 2, 2, 4, 4, 5}, tr $B\_C^T B\_C = 18$ and the cycle eigenvalue $\lambda = 5$ as the alternating face mode; the matrix identities $K\_face = T^\dagger R\_link\ T = aI + bc(bB\_C B\_C^\dagger + cI)^{-1}$ and $R\_link = B\_C^\dagger K\_face\ B\_C$ (exact because R_link vanishes on ker B_C), with the branch values k_link(5) = 35/6, 115/14, 215/41 and k_face(5) = 7/6, 23/14, 43/41 and the small-λ limit a + b confirmed in exact arithmetic; the H*(a,b,c) comparison (trace 60, kernel $\{(D\varphi, D\varphi)\}$ of dimension 6, positive rank 18, selector (1/2)[P_g P_g; P_g P_g]) on all three branches; the Section 9G.3 simultaneous gauge variation annihilating all five displayed residuals to 10^{-16}; the diamond parity calculations $\mathscr{R}w = w$ and $\mathscr{R}(I_4 \otimes L_{12})\mathscr{R}^{-1} = -(I_4 \otimes L_{12})$; the noncommuting Lyapunov identity $Q = 2M/\beta\_G$; the $\chi(t)$ and χ_static formulas; the dynamic Schur identity with k = 35/6, $\mu\_eff = 18/37$, $\mathscr{J}\_prof = 1225/148$ in exact arithmetic; the Perron curvature identity of Section 9H.4 on a randomised positive family; and $\Gamma\_B = \varepsilon^4/8 + O(\varepsilon^6)$. Items depending on the archived carriers (the 334-coordinate ranks and frame costs, the 516-coordinate benchmark, the 1,200-coordinate native derivative, I_2/I_3 and all quoted residuals) are carried at their report grades.
37. **Source-equation endpoint and link derivatives.** Report [24] returns the 700 × 700 real endpoint derivative and all 144 columns of the 700 × 144 link-to-endpoint derivative on the inherited 50-dimensional representation. Link-column central-difference relative errors are $3.5830339728 \times 10^{-6}$ at step 10^{-3} and $3.5830388050 \times 10^{-8}$ at step 10^{-4}. The independent endpoint derivative check is $2.2407951175 \times 10^{-11}$; finite gauge covariance is $2.0670802862 \times 10^{-16}$. The canonical vertex-mass convention is not equated to physical time.
38. **Horizontal-curvature zero and conditional transport reconstruction.** Report [24] gives unrestricted link-to-endpoint ranks 0, 18 and 72 for its neutral, pure-Higgs and generic constant preparations, with horizontal-curvature rank zero in all three cases. The unequal-conductance lift residual is $2.8559897059 \times 10^{-16}$. Its transport-potential Schur reconstruction agrees below 1.43×10^{-15} and face reconstruction below 2.25×10^{-16}. The endpoint-independent remainder, the difference between the vector current and algebra-dual covector, and the distinction between a diffusion potential and an off-shell residual action remain explicit.
39. **Exhaustive mathematical triangle force test.** Report [25] checks all 81 real coordinates of its three 3 × 3 links and three complex records. Full derivative errors are 1.7440×10^{-7}, 1.7441×10^{-9} and 5.3043×10^{-11} at steps 10^{-3}, 10^{-4} and 10^{-5}. The largest polar-adjoint duality error is 1.11×10^{-15}. Its 90 × 81 common-zero Jacobian has rank 45; the gauge tangent has rank 18, and other nulls are not relabelled as gauge. This is a matrix-calculus test, not a replacement Standard Model representation.
40. **Represented nonlinear link-record force.** Report [25] returns the 144 link-generator covectors and the analytic complex 12 × 50 × 50 record array on the whole wheel. It independently finite-differences all 144 link directions and 300 specified record directions, not all 60,000 real record coordinates. The errors are respectively 6.8337×10^{-7} and 9.4695×10^{-6} at step 10^{-3}, and 6.8337×10^{-9} and 9.4697×10^{-8} at step 10^{-4}.

Finite gauge-covariance errors are 2.85×10^{-15} and 4.17×10^{-15}. The nonflat inputs and positive stretches are off-shell derivative witnesses, not selected vacua.

41. **Polar-force, fixed-capacity dynamics and cross-metric consistency.** Report [25] obtains the adjoint-polar record derivative, compares the common-zero Hessian with the force derivative to 2.52×10^{-11}, and checks its common-zero gauge null to 8.72×10^{-16} in the mathematical triangle test. The isolated full-unitary phase solution agrees with numerical evolution to 7.50×10^{-12}. The dense positive cross-metric curvature/relative-record Schur result agrees with an independent link-coordinate reduction to 2.22×10^{-16}. The dense metric and dynamical mobilities are diagnostic inputs.
42. **Matrix capacity-escape identity and physical boundary.** Report [25] evaluates the analytic triangle path $\Phi_{01} = rU_{01}$, $\Phi_{12} = rU_{12}$, $\Phi_{02} = r^2U_{02}$, with $r = e^{(-t)} > 0$. The bond residual vanishes and the scalar record/bond cost is $(w_R/2)e^{(-4t)}\|U_{12}U_{01} - U_{02}\|^2$. The unchanged link-curvature cost, the singular limiting polar boundary and the possibility of a source-derived capacity or support restriction are retained. This extends the earlier scalar subaction check; it is not a whole-theory instability theorem.
43. **Present-integration independent checks.** The following subset of the Sections 9K to 9L mathematics was re-derived from scratch during this integration, without the report archives: the endpoint drift $b_\psi = -M_v^{-1}\Delta_U^\dagger K\Delta_U\psi$ from the two displayed relations; the link-to-endpoint column formula at general (non-identity) links, confirmed both analytically (the ψ_s contributions cancel exactly at the source vertex) and by finite differences; $D^\dagger T_C = 0$ and $D^\dagger KT_{(C,K)} = 0$ for both conductance cases, hence the restricted horizontal zero; the $\mathscr{J}_e^A$ identity including the cancellation $\mathrm{Im}\langle\psi_s, T_A\psi_s\rangle = 0$ and its on-shell current form; the conditional relaxation structure $R_{matter} = 2\kappa P_{cyc} \otimes G_v$ and $K_{matter,face} = 2\kappa(CC^\dagger)^{-1} \otimes G_v$ in exact/numeric arithmetic; the bond link covector trace identity; the three composition covectors and the ordered holonomy variations; the polar Sylvester relation $S\Omega + \Omega S = V^\dagger\delta\Phi - \delta\Phi^\dagger V$, the commutation of $\mathcal{L}_S^{-1}$ with the skew projection, and the adjoint pullback $(D\,\mathrm{Pol})^*[Z] = 2V\mathcal{L}_S^{-1}\mathrm{skew}(V^\dagger Z)$, confirmed by numeric duality against finite-difference polar derivatives; the consistency of the alignment pair $\dot{R} = (k/2)(I - R^2)$ and $\dot{\delta} = -k \sin \delta$ with the exact tan-half solution; $\mathfrak{f}_a$ and $\mathfrak{f}_y$ with their scalar-branch reduction and the $\mathcal{S}$-map Schur structure; the escape-path identities (polar factors equal the links, $D_B = 0$, $\Gamma_{(R+B)} \propto e^{(-4t)}$); and the dimension bookkeeping $700 = 7 \times 50 \times 2$, $144 = 12 \times 12$, $81 = 3 \times 9 + 3 \times 18$, $60{,}000 = 12 \times 50 \times 50 \times 2$. Items depending on the report archives (all quoted residuals, the ranks 0/18/72 and 45/18, and the represented-wheel arrays) are carried at their report grades.

Appendix B: the cross-coherence consistency curve

Writing $u = \gamma_{rim}$ and $v = \gamma_{spoke}^2$, elimination of ζ between the two closed forms of Section 9 yields the exact polynomial constraint

$$128u^5 - 288u^4v + 128u^4 - 5636u^3v^2 + 864u^3v - 32u^3 + 9204u^2v^3 + 666u^2v^2 + 24u^2v - 32u^2 - 3233uv^4 - 1861uv^3 - 138uv^2 - 80uv - 427v^4 + 937v^3 - 280v^2 + 56v = 0,$$

which every point of the finite first-fact branch satisfies identically. The polynomial vanishes at all four benchmark pairs of the Section 9 table (and at two further rational check points $\zeta = 7/3$ and $\zeta = 13/11$) and is nonzero at generic off-curve points, so it separates the branch from its complement. In practice the equivalent procedural test of Corollary 3.1 (invert ζ from one coherence, predict the other) is simpler to run and numerically better conditioned; the eliminant is recorded so that the constraint exists as a single explicit finite object.

Consumed VERSF sources

1. **RCHS-1: The Twelve-Sector Current-Rigidity, Source-Generated Rank-Six Current-Stiffness and Current-Link Schur Reciprocity Theorem in VERSF.**
2. **RCHS-2: Faithful Current-Link History-Metric Execution and Physical Pullback Identifiability Theorem in VERSF.**
3. **RCHS-3: Graded Source-Jet Retyping and Native Current-Link Provenance Calculation.**
4. **RCHS-4: Weighted-Dirichlet P2 Current-Persistence and Endpoint-Coherence Reduction.**
5. **RCHS-5: First-Fact-Stopped Dirichlet Current Theorem.**
6. **PRLU-1: Primitive-Transfer Representation-Ledger Uniqueness Attempt.**
7. **The Multi-Regulator Full-Faithful Source Assembly.**
8. **The Physical C/W/Y Radial-Current Tangent Field and Existing-Instrument Score Descent in VERSF.**
9. **CRTF-EX2P: Hazard, Occupation and Intensity Boundary.**
10. **MASD-1: The VERSF Master Substrate Action and Constitutive Completion.** Source of the physical-direct gauge evaluator, the corrected tensor gauge-to-response embedding, the full six-defect physical Hessian programme and the branch-freeze protocol.
11. **GRCE-2: The Physical Gauge-Response, Matching-Scale and Standard-Model Coupling Numerical Closure Theorem in VERSF.** Source of the locked physical-direct sequence G_red, Ẽ_A → Z_A → g_A, the no-insertion firewall and the GNC-EX2 through GNC-EX8 closure contract.
12. **K7-ICN-1: Interface Continuum Normalization and Wilson-Convention Closure Audit.** Source of the exact c_norm = 1 result within the declared Wilson interface map and the no-double-counting normalisation firewall.
13. **GNC-EX3A: Bond-Polar Differential and Weak-Sector Screening Test.** GNC-EX3A_Bond_Polar_Calculation.md. Source of the supported polar derivative, directional stretch/support limits and the same-parent screening qualification.
14. **GNC-EX3/4: Full HM4-EX2A Branch Execution and Gauge-Orbit Consistency Audit.** GNC-EX3-4_Full_HM4_Branch_Execution.md. Complete archived scalar-channel reconstruction, maximal available auxiliary reduction and positive frame-cost diagnosis.
15. **Covariant Common-Action Continuation: Gauge-Null Repair and Curvature-Response Extraction.** Covariant_Common_Action_Continuation.md. Declared

covariant benchmark, joint current/continuity cancellation, rank-72 link response and face-curvature descent.
16. **HM12 Native Score Descent Attempt.** HM12_Native_Score_Descent_Attempt.md. Native probability differentiation, fixed-current/on-shell distinction and tested zero-current boundary of the normalised-ray instrument.
17. **HM12 State-Conditioned Source Continuation.** HM12_State_Conditioned_Source_Continuation.md. Exact conditional current/continuity inverse, full native derivative and six-local-defect preparation test.
18. **HM12 Stationary History Response.** HM12_Stationary_History_Response.md. Finite-channel stationary uniqueness, two/three-record response, retained memory, renewal comparison and all-finite-history radial invariance.
19. **Primitive Gauge Source Response: Update-Amplitude and Normalisation Audit.** Primitive_Gauge_Source_Response_Audit.md. Restricted invariant/amplitude comparisons and the raw-transfer versus normalised-information identity.
20. **Gradient-Gibbs Source Continuation: Fluctuation Covariance, Dynamic Schur Reduction and the Drift-to-Action Test.** Gradient_Gibbs_Source_Continuation.md. Conditional harmonic stochastic completion, mobility/noise response and independently supplied drift requirement.
21. **Source-Drift Continuation: Completed Selectors, the Diamond Symmetry Test and Curvature Susceptibility.** Source_Drift_Selector_and_Susceptibility_Test.md. Completed-selector comparison, literal reflection correction and finite-time/forced-static response execution.
22. **HMGBC: The VERSF History-Measure, Generation-Geometry and Branch-Closure Theorem.** Source snapshot Pasted text(550).txt, especially §§11A.1, 16 and 56A.3. Consumed through the controlling source audits for move-amplitude selection, raw source normalisation and the separate history/action bridge obligation.
23. **Substrate Dynamics and the Higgs Ratio.** The (16).pdf and (20).pdf snapshots and expanded Pasted markdown(469).md, as inspected by [20, 21]. Axioms 2 and 5 provide the stated gradient/Gibbs starting points; the source's coefficient qualifications are retained, and the specific Appendix F parity inference is corrected in Section 9J.1 rather than imported as a physical force derivation.
24. **Primitive Curvature-Probe Attempt: The Source-Determined Endpoint Response and the Independent Gauge-Force Remainder.** Primitive_Curvature_Probe_Partial_Response.md, 6 September 2026. Source of the explicit endpoint-drift blocks, horizontal-curvature zero at the stated constant background, conditional transport-potential integration, matter-to-link covector and endpoint-independent remainder. The fixed-conductance, mass/time and gradient interpretations retain their declared scope.
25. **Independent Link-Record Restoring Law: Explicit Nonlinear Covectors and the Remaining Source Normalisation.** Independent_Link_Record_Restoring_Law_Attempt.md, 6 September 2026. Source of the fixed-support nonlinear closure/composition/bond covectors, adjoint polar pullback, represented derivative and covariance checks, complete three-sector cross-metric reduction, isolated fixed-capacity alignment solution and bounded matrix amplitude-escape test. Its inherited MASD, K7-HRA-1 and PCRS-1R source qualifications remain controlling. No primitive physical metric, mobility or gauge weight is issued.