The Primitive Field-Dependent Marked Instrument Programme in VERSF: Identity-Field No-Go, Typed-Carrier Construction and Native Score Closure

Executed constructions and exact remaining obstructions: an identity-field no-go, blind identification of the Standard Model ledger within an inherited faithful graded carrier, a noncentral native probability score closing the physical gauge quotient, a dimensionless Fold clock, and the residual scaling boundary

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DELIVERABLES 1–3 EXECUTED, D4 PARTIAL, D5 OPEN, D6 STAGEWISE / IDENTITY-FIELD NO-GO EXACT / SEVEN-ROLE LEDGER AND FOUR CHANNELS RECOVERED BY BLIND IDENTIFICATION WITHIN THE INHERITED FAITHFUL GRADED CARRIER / NATIVE PROBABILITY SCORE CLOSES THE 72-DIMENSIONAL PHYSICAL QUOTIENT AT LINEAR ORDER (COORDINATE AND ON-SHELL TANGENT CERTIFIED) / DIMENSIONLESS FOLD CLOCK DERIVED; DURATION STEP CONDITIONAL ON SERIAL COMPOSITION / S_7/D_6 AN ORBIT-STABILIZER RELATION / TWO RESIDUAL SCALING FREEDOMS WITHIN THE DECLARED RELATION SUBSYSTEM — LOCKED AS EX2I

Scope note: this paper issues primitive-instrument audit certificates and a locked construction programme. It does not issue an HFB-1 certificate or a physical Standard Model certificate.

General reader summary

Deep inside this programme there is a small machine that keeps records. This paper first proved, exactly, that the original machine was blind — it stamped every document flawlessly without reading a word, so the physical laws found earlier could not have come from it — and then built a seeing replacement that reads the world it records while staying fully reliable, each design sealed before any answers were looked up.

Within the structure it had been handed, and without supplying particle names or fitting any measured value, the rebuilt machine separated an anonymous carrier into exactly the familiar particle-family blocks — the right family types in three copies each, exactly four allowed ways matter can finish a record and no fifth, the grammar of the forces rebuilt from its own anonymous labels, and, on the simpler of its two branches, the relative pattern of charges pinned down by consistency requirements, though the ingredients already carried their charge labels and the richer branch leaves one direction open. The forces now genuinely tilt the odds of outcomes, nothing physically meaningful is missed and nothing wasted, and every finished record is preserved in a permanent ledger.

The machine also has a heartbeat, computed rather than assumed — though it rests on a stated reading of which outcomes count as events — and the dynamics settles which way the world turns: a unique rotation, though the tendency to turn was built into the engine it was handed, so this is commitment to a built-in twist rather than rotation conjured from nothing. Each tick touches the geometric circuit at one departure and one arrival contact, so a full tour takes at least seven ticks and typically about twenty-one, with that spin reinforced at better than 99.99% odds; whether the two contacts occupy two successive stretches of time is a stated assumption the tick rate depends on. And the one apparent flaw in the shape dissolved: a world where everything is interchangeable cannot single any one thing out with a fixed label, so the moment one constraint is labelled with the binding role — with the stated requirements of matched opposite pairs and neighbour-to-neighbour linking — the rest settle into a ring of six, and the two pictures are the same world before and after commitment.

What remains is measured rather than merely open. The families were found inside a structure handed to the machine, not built by it — a discovery *within* that structure, and where the structure came from is the single biggest open question. Two free scalings survive, one of length and one of action, so every ratio is fixed while nothing yet says how big a metre or a second is; the machine's finer internal posture is undetermined; and one clock step rests on the stated assumption about a tick's two halves. Each gap is named, each has a test written in advance, and supplying them from the same source is the sealed next step.

Contents

Abstract

We audit the strongest currently executable primitive marked instrument in VERSF — the joint FCHI/CMHRE/SGPL construction — for one exact question: does the primitive marked kernel *select* the retained representation, score and neutral-sector laws, or merely admit them? Deliverable 1 answers exactly. The instrument is internally complete (217 marks on 63 states, residual 3.269×10^{-15}) and returns three completed generation-keyed terminal orbits with exact S_3 symmetry (Theorem 1); but its retained-field extension is the identity, so the complete field-to-mark Jacobian is the exact zero of $\mathbb{R}^{217\times102}$ with vanishing jets at all orders (Theorem 2, Corollary 2.1), the charged-only and neutral-extended ledgers produce byte-identical primitive arrays (Theorem 3), and the score axioms admit inequivalent three- and four-channel relaxation laws (Theorem 4). The identity-field candidate is therefore exactly incapable of source selection, and field dependence is proved necessary (Theorem 6).

The execution series then constructs, stage by stage, exactly what the no-go demands. EX2A: a completeness-preserving field-dependent instrument at full source rank 155 = 144 + 5 + 6, covariant, branch-conjugate and regulator-stable, with support-preserving species selection excluded exactly (Theorems 8–10). EX2B: a blind central-projector census of the inherited faithful graded carrier returning seven atoms of dimensions [3, 3, 6, 2, 9, 9, 18] and copy multiplicities [3, 3, 3, 1, 3, 3, 3], identified post-hash with (Q_L, u_R, d_R, L_L, e_R, N_R, H); four completion channels and no fifth; a typed 1302/1519-mark instrument, complete and stable (Theorems 11–16). EX2C: canonical reconstruction of all twelve faithful generators from the anonymous census at residual 0.000, commutant reduction 55 → 13 → 7, unique anomaly-rigid charged-minimal hypercharge grade, the exact $Y \oplus (B-L)$ neutral plane, Loewner incomparability of the Dirac/Majorana routes, and an exact 108-tangent source deficit (Theorems 17–21). EX2D: the faithful 144-dimensional matrix link on a 334-variable source, Wilson quotient rank 72, a native Kraus law of rank 156 — and the fourth exact obstruction: the direct central population score is identically zero (Theorems 22–24). EX2E: the demanded noncentral same-action carrier — a covariant 2120-variable endpoint/current source and a thirteen-channel

current instrument, parameter-free given the maximal-positivity prescription (P-PF23), whose native mark and terminal-population Jacobians close the full 72-dimensional physical Wilson quotient at linear order — certified in both the coordinate and on-shell residual-tangent prescriptions (P-PF24, D-PF34) — with an exact persistent-ledger renewal isometry (Theorems 25–30). EX2F: the history instrument is identically the D36 Fold kernel at $\alpha = 0.959001109719975$; its slow mode selects a unique oriented rim profile; state-dependent hazards — under the declared event-semantics reading (P-PF25) — give finite mean waiting 2.3096 Folds and a clocked 72/72 score with zero Gram drift; the internal frame retains at most 836 flat directions and the dimensionful rate is invisible to all dimensionless data by exact ν-scaling (Theorems 31–37). EX2G: within the declared admissible class the incidence attaching map is forced, $\mathcal{A}(x \to y) = C\_y^+ + C\_x^-$, rank 13; minimal closure is exactly 7 Folds $\leftrightarrow$ 14 oriented incidences over 12 Hamiltonian cycles; the dynamics selects the orientation at odds $e^{10\alpha} \approx 14618$; the first complete closure cover is an exact 21.278-Fold law; and under the serial-composition premise P-PF21 the master rate follows up to one length, $\nu\_F = (21/16\pi)(c/\xi)$, conditionally superseding the Route-M identification (Theorems 38–42). EX2H: full S_7 invariance admits only the two constant binary role labellings, so committed invariant binary role distinction forces the 1 + 6 split, and the declared three-axis cyclic-locality requirements then select $C_6 \to D_6$, with the exact orbit-stabiliser census $420 = |S_7|/|D_6|$ and hub-boundary eigenvalue 7; the residual scale freedom is an exact two-dimensional nullity — one length orbit and one action orbit (Theorems 43–47).

Every claim is graded; every premise, falsifier and debt is individually named and cross-referenced, and every gap is carried as a numbered debt with a predeclared pass contract. What the programme does not yet derive — the carrier's primitivity, the score weights, the internal Hamiltonian, neutral-route selection, the endpoint frame, absolute units, the event-semantics classification, and the serial-composition step of the clock chain — is stated with the same exactness as what it does. The next locked deliverable is PFDMI-EX2I: the same-action UV ruler and absolute master-action coefficient.

Executive verdict

The HM4 compatibility programme established that the conditional RCMO/RRHF/FCHI source laws are mutually compatible with the faithful quotient — and named primitive *selection*, not fit, as the remaining frontier (the primitive-source uniqueness debt of HM4-EX4B). This paper begins at that distinction; Deliverable 1 settles its audit component.

Deliverable 1 (HM4-EX5A): the strongest executable primitive instrument is internally complete on the 63-state carrier with 217 product marks, returning exactly three closed terminal components at every level with $P\_terminal^{(n)} = K_7 \otimes I_3$ at zero residual — generation-keyed record orbits freely permutable by S_3, not species orbits, and this paper forbids reading them as such. Decisively, the full mark factorises as $\mathcal{K}_e\text{\^{}full} = H_e \otimes N_e \otimes I_{102}$, so

J_mark,field = 0 ∈ $\mathbb{R}^{217\times102}$

exactly — not a small failure or a regulator artefact, but the exact information content of the current instrument. Charged-only and neutral-extended reruns produce byte-identical primitive arrays, and the score axioms admit both three- and four-channel relaxation laws: the instrument selects neither the representation ledger nor the relaxation law. The positive conclusion is precise: primitive selection requires an explicit field-dependent family $\mathcal{K}_{n,e}^{(k)}(X)$ whose field derivatives generate species orbits, representation scores, the record response and the CAR/Fock jets before any downstream comparison.

PFDMI-EX2A builds that instrument on the faithful 45-dimensional representation, preserves completeness identically at finite field values, and returns rank J_mark,field = 155 = 144 (gauge) + 5 (record) + 6 (completion), with the CAR/Fock lift at rank 144, covariance and branch conjugacy exact, and post-freeze rank agreement passed. It also proves the deformation support-preserving, so the three generation-keyed orbits persist and species selection provably requires a support-changing refinement of the marks — locked as EX2B.

PFDMI-EX2B derives the support projectors from the frozen representation algebra with no names inserted and no data fitted: seven anonymous minimal central projectors — the exact atoms of the commuting invariant algebra on the inherited 50-dimensional graded carrier — are hashed before any ledger is opened, then identified exactly with (Q_L, u_R, d_R, L_L, e_R, N_R, H) in three fermionic copies. The identification is blind; the carrier is inherited and already representation-typed, so this is recovery within that carrier, not derivation of it (D-PF10). Exactly four admissible completion channels and no fifth; the typed 1302/1519-mark instrument is complete and stable with six mandatory typed orbits (seven neutral-extended). Two proved boundaries: N_R is conditional on the neutral branch, and the internal Hamiltonian is unselected — unrelated Hamiltonians in the 55-dimensional commutant give identical projectors, so masses and mixing lie provably outside the present constraints.

PFDMI-EX2C takes the frozen structure to its exact limit with three sharp reductions: the twelve faithful generators are canonically and exactly reconstructible from the anonymous census alone — the largest inherited structure is now redundant given the census, though not yet primitive; anomaly rigidity uniquely selects $q_Y \propto (1, 4, -2, -3, -6, 3)$ on the charged-minimal branch, while the neutral extension provably reopens exactly one B−L direction; and the residual freedom is counted — seven central coefficients survive key-blindness, the Dirac/Majorana routes are Loewner-incomparable, and the source is short by exactly 108 edge tangents and one native transition law — locked as EX2D.

PFDMI-EX2D closes that deficit: the full faithful matrix link on all twelve edges — landing exactly on the 334-variable faithful census — and a native field-dependent Kraus law of rank 156, with all 144 faithful gauge tangents present and rank 72 surviving the exact Wilson quotient. It also proves the sharpest no-go so far: centrality makes every terminal-type probability exactly link-independent, so the direct central population-score Jacobian is zero — exactly, not perturbatively. The missing object becomes a single specification — a noncentral, gauge-covariant, same-action carrier — locked as EX2E.

PFDMI-EX2E delivers that carrier. The representation-valued endpoint and current carriers form one covariant local source with the matrix links; the current instrument — parameter-free conditional on the maximal-positivity prescription, no coefficient fitted to observation — produces noncentral gauge-covariant terminal effects; and the native conditional probabilities — actual mark probabilities, not amplitude proxies or Fisher embeddings — carry the full gauge response: raw rank 144, physical Wilson-quotient rank 72, certified in both the coordinate and on-shell tangent prescriptions, with the seven terminal-type populations alone locally identifying all 72 physical directions at linear order. Completed records renew through an exact isometry into a persistent orthogonal ledger. Not yet derived, equally exactly: the endpoint/current background (witnessed generic, not selected), the TPB clock and absolute hazard, masses, mixing and the neutral branch — locked as EX2F.

PFDMI-EX2F gives the law its clock as far as dimensionless mathematics reaches. The frozen history instrument is *identically* the D36 discrete-Fold kernel — an exact cross-programme identity, not a fit — and its slow dynamics selects a unique oriented rim mode with phase step $-\pi/3$, the first endpoint profile dynamically selected within the driven primitive kernel. The channel split becomes a jump/no-jump law under the declared event-semantics reading, with state-dependent hazards, finite mean waiting 2.3096 Folds, and a clocked terminal score keeping the full 72/72 closure with zero Gram drift. Two exact negatives: the internal endpoint frame is *not* selected — 836 flat directions survive the gauge quotient, and the selected helix alone yields only ranks 36/18 — and the dimensionful attempt rate is *not* identified, by exact ν-scaling and the absence of any identity map between the 31 history marks and the 14 geometric traversals. The bridge plus one non-inserted coefficient — locked as EX2G.

PFDMI-EX2G executes the bridge. Within the declared admissible class the attaching map is *forced* — locality, orientation and covariance admit exactly one rule, $\mathcal{A}(x\to y) = C\_y^{+} + C\_x^{-}$, unique up to the global ± sense; seven Folds carry exactly the fourteen oriented *incidences* via the twelve Hamiltonian cycles of the wheel in one D_6 orbit; the D36 kernel reinforces the EX2F orientation at trajectory level with odds $e^{10\alpha} \approx 14618$; and the stochastic closure cover is absorbing with mean 21.28 Folds. Under the serial-composition premise P-PF21, full-orbit consistency yields the master-rate formula $\nu\_F = (21/16\pi)(c/\xi)$, *conditionally* superseding the Route-M identification — never silently adopted; absent that premise the duration question stays open (Remark 87.1). Remaining: one number, the absolute length ξ, and one honest identification question — the executable wheel is hub-fixing D_6, the abstract carrier S_7-symmetric — both locked as EX2H.

PFDMI-EX2H resolves the symmetry question as a necessary orbit-stabiliser relation, not a mismatch. Full S_7 invariance is incompatible with any nonconstant fixed binary role assignment — only the two constant labellings survive — so a committed invariant labelling *requires* the reduction; the global role gives the unique 1 + 6 orbit type, and the declared three-axis and connected two-neighbour locality requirements then select C_6 and its exact stabiliser D_6, with census $420 = |S_7|/|D_6|$ matching the labelled W_7 realisations exactly. The hub converts the floating boundary mode into a resolved relation at exact eigenvalue 7, leaving one global gauge redundancy; every prior certificate is retained (attaching rank 13, scores 72/72). The scale question closes to an exact no-go — nullity exactly 2, one length/rate orbit and one action orbit — so within the declared relation subsystem the action fixes every dimensionless ratio and no absolute unit, identifying precisely the two numbers the source must supply and proving no invariant of that subsystem can supply them, while leaving open, as EX2I intends, that the full action generates a further dimensionful relation. Locked as PFDMI-EX2I.

Deliverables 1, 2 and 3 are executed, the EX2C reductions bound what remains, EX2D supplies the native substrate, EX2E delivers the noncentral rank-72 score with exact ledger renewal, EX2F couples it to a dimensionless clock under the declared event reading, EX2G forces the tick-to-geometry bridge and the rate formula up to one length, and EX2H proves the symmetry reduction necessary and the residual scale freedom exactly two-dimensional. Deliverables 4 through 6, together with the locked EX2I ruler programme, define the remaining weight, recovery and convergence tests that would promote the conditional source laws to a primitive derivation — or refute that promotion under predeclared stop rules that make either outcome decisive.

Audit matrix

Deliverable	Required return	Status in this paper	Release condition
D1. Primitive instrument and orbit audit	Rebuild the strongest executable primitive instrument; compute terminal orbits, field derivative and score counterfactuals	**COMPLETE — EXACT NO-GO FOR CURRENT CANDIDATE**	Machine package and theorem published
D2. Field-dependent marked instrument	Explicit $\mathcal{K}_{n,e}^{(k)}(X)$ on the faithful source, with complete positive marks	**COMPLETE — PASS (PFDMI-EX2A): rank 155, finite-field completeness, covariance certified pre-comparison**	Nonzero source derivative, completeness and covariance before comparison
D3. Terminal species-orbit selection	Derive irreducible terminal roles rather than supplying labels	**EXECUTED — PASS (PFDMI-EX2B): five charged atoms + interface atom exact, blind; four channels blind; N_R atom CONDITIONAL (EX2C)**	Unique (Q, u, d, L, e, N, H) ledger up to declared equivalences
D4. Representation score-law selection	Derive direct and relaxable gauge/record/completion/CAR scores	**SUBSTANTIALLY ADVANCED: channels (EX2B), direct ledger (EX2C), native noncentral score at linear-order physical rank 72 (EX2E), clocked hazard-normalised law (EX2F). The relaxable weight ledger itself is not yet derived, and remains**	Select (d_3, d_2, d_q) and (r_3, r_2, r_q) from the same marks

Deliverable	Required return	Status in this paper	Release condition
		blocked on: derivation of the maximal-positivity prescription (D-PF30), endpoint-frame selection (D-PF17/D-PF21), serial-composition resolution (D-PF27), event-semantics derivation (D-PF35), and absolute ruler/action normalisation (D-PF22/D-PF24)	
D5. Blind source-jet recovery	Recover RCMO/RRHF/FCHI source jets after construction freeze	**OPEN — LOCKED**	Predeclared residuals on record, gauge, completion and CAR/Fock returns
D6. Regulator and branch theorem	Run levels 3–6 and both conjugate branches with blocking	**PARTIAL: stagewise regulator and branch certificates have passed at every execution stage (EX2A–EX2H); the end-to-end blocked convergence theorem for the fully selected instrument remains OPEN**	Convergent arrays and branch covariance or derived orientation
D7. HFB-1 integration	Add clock, absolute scale, neutral/global measure and scheme bridge	**DOWNSTREAM**	All source-selection rows and remaining physical rows close together

Part I — Question, source boundary, claim grades and premises

1. The exact question

The question is not whether one can write a representation-resolved source law that reproduces the successful charged, gauge, record and completion structures. RRHF-1 already supplies such an augmented parent law and differentiates it blindly after freeze. HM4-EX4A and HM4-EX4B show that its graded source jets descend through the faithful defect architecture.

The stronger question is:

Does one primitive finite-regulator marked instrument generate the representation ledger, score law and source jets?

A positive answer must begin before the particle roles, charges, completion-channel count, RCMO record law or RRHF score weights are supplied. It must obtain them as properties of terminal orbits and field derivatives of one frozen mark law.

2. Compatibility is not selection

The HM4 factorisation criterion asks whether a declared source is invisible on every primitive direction that is invisible to the defects. At first order,

$R\_HM4 = J\_s (I - J\_D^{+} J\_D).$

The graded extensions use the corresponding row-space conditions for quadratic and mixed source jets. These tests answer a compatibility question:

Can the source descend through the physical defect quotient?

They do not answer the upstream selection question:

Why is this the source rather than another compatible source?

The distinction is now operationally sharp. EX2B closed the scalar zero-sum density carrier exactly. EX4A closed the complete faithful gauge Hessian and the full-action completion Hessian. EX4B closed the terminal-record phase carrier and the shared-link CAR/Fock gauge and completion legs. EX5A now shows that the strongest primitive mark law has no field derivative at all. Compatibility is therefore strictly ahead of primitive selection, and the gap between them is the exact subject of this paper.

3. Claim grades used in this paper

PFDMI-1 uses four grades.

1. **Machine result.** A finite array, rank, residual, orbit or hash has been computed and independently checked.
2. **Exact theorem for the current candidate.** The conclusion follows algebraically from the implemented instrument, such as the zero field derivative of an identity field factor.
3. **Conditional source theorem.** A result follows after a named representation, record, completion or CAR/Fock source law is supplied.
4. **Primitive derivation.** The law itself is selected by one earlier field-dependent mark process without target access.

Deliverable 1 reaches grades 1 and 2. RCMO/RRHF compatibility reaches grade 3. The purpose of Deliverables 2 through 6 is to test grade 4. No statement in this paper may be promoted across a grade boundary by rhetorical placement; the falsifier ledger polices this.

4. Premise namespace

The following premises govern every claim in this paper. Each is declared, not derived here.

- **P-PF1 (frozen executable candidate).** The audited object is the previously frozen strongest executable primitive candidate: the $K = 7$ history instrument with 31 positive marks, the nine-state neutral terminal instrument with seven outcomes (one no-jump, three keyed active-to-singlet, three keyed singlet-to-completed-record), and their 217-mark product on the 63-state population carrier, exactly as published with the FCHI/CMHRE/SGPL executables and their hashes.
- **P-PF2 (retained field carrier).** The retained field carrier has 102 real directions with the declared decomposition 12 history/bath $\oplus$ 6 gauge $\oplus$ 18 completion $\oplus$ 36 charged $\oplus$ 24 neutral $\oplus$ 6 completed-record.
- **P-PF3 (regulator set and blocking).** Regulator levels $n = 3, 4, 5, 6$ with the declared blocking maps; second-order refinement inherited from the record/neutral continuation.
- **P-PF4 (score axioms).** The quadratic score admissibility axioms are those declared in the SGPL executable: positivity of reduced stiffnesses and the published admissibility checks, target-blind.
- **P-PF5 (graded source typing).** The source-jet order hierarchy of HM4-EX4A/EX4B is inherited unchanged: scalar density first order; record first order in the record field; gauge second order in the action; bosonic completion mixed second order; CAR/Fock mixed third order.
- **P-PF6 (targets frozen, not input).** The conditional comparison targets of Appendix C are frozen outputs of the prior programme. They are not inputs to any construction in this paper or in Deliverables 2 through 4.
- **P-PF7 (branch set).** The conjugate branches are $k \in \{1, 6\}$, with the rim-reflection presentation as the declared conjugation.
- **P-PF8 (EX2A field carrier).** The Deliverable 2 execution acts on the faithful 45-dimensional internal representation, with field coordinates: 144 faithful gauge-link coordinates on the twelve $K = 7$ edges, 5 independent zero-total six-slot terminal-record phases, and 6 completion-route logits; the CAR/Fock action is the exterior-algebra lift of the same link exponential.
- **P-PF9 (EX2A freeze discipline).** The EX2A core calculation and hash manifest were frozen before any prior conditional result was opened; the comparison of §41 is rank-level only and is not a Deliverable 5 array recovery.
- **P-PF10 (EX2B graded carrier and invariant algebra).** The Deliverable 3 census acts on the frozen 50-dimensional graded carrier — the 45-dimensional faithful charged representation, the three-dimensional completed neutral-record carrier, and the unique minimal colourless weak-doublet completion interface — with commuting invariant algebra generated by $C_3 = \Sigma_{a=1}^{8} T_a^2$, $C_2 = \Sigma_{i=1}^{3} t_i^2$, $q = 6Y$ and the fermionic (CAR), completion-interface and neutral-terminal grading operators. The 45-dimensional generators are inherited from the frozen faithful construction, not derived (debt D-PF10).

- **P-PF11 (commitment architecture).** Typed commitment follows the derived unitary pre-commitment and Lüders architecture $\rho \mapsto P_r U \rho U^\dagger P_r / \mathrm{Tr}(P_r U \rho U^\dagger)$, and the history Hamiltonian convention is the stationary-weighted polar decomposition of §47, adopted after the detailed-balance audit.
- **P-PF12 (anonymous factor data).** The EX2C reconstruction starts only from the EX2B census outputs: the seven block dimensions (3, 3, 6, 2, 9, 9, 18) and the anonymous local factor data $(c, w, q, m) \in \{(1,1,-6,3), (1,1,0,3), (1,2,-3,3), (1,2,3,1), (3,1,-2,3), (3,1,4,3), (3,2,1,3)\}$. These remain inherited (non-primitive) inputs; the primitive gap is carried by D-PF10/D-PF14.
- **P-PF13 (anomaly admissibility).** The admissibility conditions are the mixed non-Abelian, gravitational and cubic hypercharge anomaly cancellations on the census atoms, with completion covariance supplying the grade relations $(u, d, L, e) = (Q + H, Q - H, -3Q, -3Q - H)$ and, on the neutral branch, $N = L + H$.
- **P-PF14 (EX2D extended source).** The EX2D source replaces the 36 scalar link phases of the frozen 226-variable source by twelve faithful Lie-algebra coordinates on each of the twelve directed $K = 7$ edges, giving declared dimension $226 - 36 + 144 = 334$; the record-export dilation $c\_record = \mathrm{sech}\, s$, $c\_export = \tanh s$ (with $c\_record^2 + c\_export^2 = 1$) is part of the declared instrument, not a post-differentiation attachment; no target Hessian and no post-hoc Fisher isometry enters the construction.
- **P-PF15 (EX2E endpoint/current carriers).** The EX2E source replaces the scalar endpoint and current variables by $\psi_v \in \mathbb{C}^{50}$ at the seven vertices (700 real coordinates) and $j_e \in \mathbb{C}^{50}$ on the twelve edges (1200 real coordinates), with the same-source covariant residual $D\_J,e = j_e - (\psi\_t(e) - U_e(A)\psi\_s(e))$ and declared dimension $334 - 42 - 72 + 700 + 1200 = 2120$. The frozen background satisfies $D\_J,e = 0$ on every edge. The deterministic prime-chirp endpoint background is declared as a target-blind genericity witness, not a primitive selection of the physical endpoint frame (F-PF21).
- **P-PF16 (Fold and traversal conventions).** The D36 discrete-Fold kernel is the row-normalised Fold law with uniform hub transitions and driven clockwise/counterclockwise rim transitions at parameter α; one Fold is one application of the discrete marked instrument. The geometric closure clock is the fourteen oriented constraint traversals $\gamma_0 = \{C_1^+, C_1^-, \ldots, C_7^+, C_7^-\}$ with exact traversal duration $\Delta t_0 = (8\pi/21)\, c\_\xi$. The Route-M identification "one Fold = one oriented traversal" is expressly conditional (F-PF23) — and is superseded by the derived two-traversals-per-Fold bridge of Theorem 42 — and entropy per Fold remains dimensionless until a physical scale is separately derived.
- **P-PF17 (canonical wheel and attaching conventions).** The canonical transition substrate is the seven-state wheel with one distinguished hub and six boundary states; its automorphism group is D_6 of order 12, every element fixing the hub. Attaching conventions: each directed mark $x \to y$ attaches the arrival orientation C_y^+ and the departure orientation C_x^-; the global meanings of + and − are exchangeable. The Route-M absolute value of ξ is a conditional ruler only (F-PF27).
- **P-PF18 (scale-relation system).** The absolute-scale audit uses logarithmic variables (ξ, τ_F, ν_F, k_max, E_0, $\mathcal{A}\star$, ℓ_e) and the declared relations $\tau\_F \propto \xi/c$, $\nu\_F\, \tau\_F = 1$, $k\_max\, \xi = \mathrm{const}$, $\mathcal{A}\star/(E_0\, \xi) = \mathrm{const}$ and $\ell\_e/\xi = e^{\Theta\_M}$, with $\Theta\_M = 70.0341565881011$ the declared Route-M hierarchy exponent. Interpretation of graph kernels as physical floating freedom versus global gauge depends on the observer-protocol and admissibility bridge, and is declared, not derived here.

- **P-PF21 (serial composition of attached traversals).** For the purpose of Theorem 42 it is *declared* that each attached orientation corresponds to a distinct physical traversal; that the departure and arrival traversals of one Fold occur serially rather than simultaneously; that their durations add without overlap; and that the history Fold begins before the departure traversal and ends after the arrival traversal. This premise is not derived from the incidence combinatorics of Theorem 39 (Remark 87.1) and is owed as D-PF27.
- **P-PF22 (admissible attaching-map class).** The uniqueness statement of Theorem 38 is relative to the class of attaching maps that are linear in the mark, non-negative-integer coefficient-valued, normalised to exactly one arrival unit and one departure unit per mark (total incidence weight two), supported only on that mark's endpoint orientations, uniform in their treatment of self-marks, and covariant under the wheel automorphisms and mark reversal. Wider classes are not excluded (D-PF28).
- **P-PF23 (maximal-positivity prescription).** The current-channel normalisation saturates the positivity bound, $\eta_e = \lambda\_max(S_e)^{-1}$. Every $0 < \eta_e \leq \lambda\_max(S_e)^{-1}$ preserves positivity and completeness, so saturation is a declared constitutive rule and not a consequence of admissibility (D-PF30).
- **P-PF24 (coordinate tangent prescription for the native score).** The EX2E probability derivatives of Theorems 27–29 are unconstrained coordinate derivatives in A_e, taken with the current j_e and endpoint ψ_v variables — hence ρ_J,e, C_e,α and E_e,α,r — held fixed: the current is treated as an independent physical source, evaluated at the frozen background where the same-source residual vanishes. Residual-projected, kernel-tangent and on-shell derivatives are in general inequivalent alternatives; the projected certificate has since been executed (Remark 67.2, D-PF34): the on-shell rank equals the coordinate rank, 72, at the frozen background, so both prescriptions certify the same closure there (F-PF42 now polices scope).
- **P-PF25 (event-semantics reading).** The classification of the thirteen current channels into one no-event mark (C_0) and twelve accepted event marks (C_a, $a \geq 1$) is a declared semantic assignment. Completeness supplies a complement channel; it does not by itself establish that the complement physically means "nothing happened". The compensator, mean waiting and clocked chain are exact given this reading; deriving it from persistent-record production is D-PF35 (F-PF44).

5. Frozen source and non-insertion boundary

The first deliverable uses only the previously frozen primitive history kernel, neutral terminal instrument, FCHI product marks, SGPL score executable and their ledgers. No HCMR target array and no observed Standard Model datum enters the construction or the counterfactual reruns.

Future deliverables inherit the same firewall:

- observed masses, couplings, mixing angles and phases may not select a mark amplitude, orbit, channel count or branch;
- RCMO/RRHF arrays may be opened only after the new primitive kernel and its hashes are frozen;
- a construction identity is reported as an identity, not as evidence;

- regulator stability is necessary but does not establish physical correctness;
- a missing primitive derivative may not be reconstructed by downstream inversion.

Each of these clauses is backed by a named falsifier in the falsifier ledger.

Part II — Deliverable 1: primitive-transfer provenance audit

6. The executable primitive candidate

The strongest supplied candidate separates a seven-state $K = 7$ history process from a nine-state neutral-record instrument. The history instrument has 31 positive marks. The neutral instrument has seven outcomes: one no-jump outcome, three keyed active-to-singlet outcomes and three keyed singlet-to-completed-record outcomes. Their product gives

$31 \times 7 = 217$

product marks on a

$7 \times 9 = 63$

state population carrier.

The retained full-carrier construction contains 102 real directions in the P-PF2 decomposition. In the primitive marked instrument, this retained field carrier is appended through the identity:

$\mathcal{K}_e$^full $= H_e \otimes N_e \otimes I_{102}$.

Figure 1 displays the exact difference between this current candidate and the field-dependent object required by the new programme.

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7. Machine completeness and regulator audit

At levels $n = 3, 4, 5, 6$, the independently reconstructed product instrument satisfies

$\| \Sigma_e \mathcal{K}_e^\dagger \mathcal{K}_e - I \| \leq 3.2690366\times10^{-15}$.

The history and neutral factors are therefore combined consistently. The product kernels at successive regulators are non-identical and convergent, and the final differences scale close to the expected second-order refinement inherited from the record/neutral continuation (P-PF3).

Level	State dimension	Product marks	SCCs	Closed SCCs	Completeness verdict
3	63	217	9	3	PASS
4	63	217	9	3	PASS
5	63	217	9	3	PASS
6	63	217	9	3	PASS

This machine pass is important, and its role must not be inverted. The later no-go is not caused by a broken or incomplete instrument. It concerns what a complete but field-blind instrument can and cannot identify. A defective instrument would have made the no-go uninformative; a complete one makes it exact.

8. Terminal-orbit theorem

At each level the 63-state population kernel has nine strongly connected components. Exactly three are closed. Each closed component contains all seven history states paired with one completed neutral-record key.

After ordering the terminal carrier by history state and completed key,

$$P\_terminal^{(n)} = K_7 \otimes I_3$$

with zero numerical residual, at every level $n = 3, 4, 5, 6$.

Theorem 1 — Three-key terminal-orbit theorem

For the strongest executable FCHI product instrument, the closed terminal carrier is the direct sum of three isomorphic $K = 7$ history components. The terminal key permutation group contains S_3 acting freely on the keys. Therefore the primitive instrument identifies three completed record keys only up to permutation. It does not intrinsically identify seven species roles, and it does not order the three generation keys.

Proof

The exact terminal block is $K_7 \otimes I_3$. Every permutation matrix $P \in S_3$ obeys

$$(I_7 \otimes P)^T (K_7 \otimes I_3) (I_7 \otimes P) = K_7 \otimes I_3,$$

since $I_7 \otimes P$ commutes factor-wise with $K_7 \otimes I_3$ and $P^T I_3 P = I_3$. Thus every key relabelling is an exact symmetry of the terminal kernel, so the three keys are dynamically equivalent and carry no intrinsic order. The closed-class decomposition contains exactly three orbit types, not seven; any seven-fold classification would require structure outside the terminal kernel, which contains none. ■

Remark 8.1 — Agreement with the primitive-ledger audit

The result agrees with the earlier primitive-ledger audit: the K = 7 wheel and its antipodal quotient can organise three support-return layers, while particle-species roles live on a separate typed internal carrier. Theorem 1 shows that the strongest executable instrument realises exactly the first structure and none of the second.

Remark 8.2 — What the three keys are not

The three closed orbits are generation-keyed in the precise sense that they are indexed by completed neutral-record keys with free S_3 symmetry. They are not a derivation of three ordered fermion generations: no mass hierarchy, no mixing structure and no key ordering is present or claimed. Falsifier F-PF1 fires on any presentation of Theorem 1 as a generation-structure prediction.

9. Exact zero field-to-mark derivative

Theorem 2 — Identity-field derivative no-go

Let the full marks be

$\mathcal{K}_e$^full(X) = $H_e \otimes N_e \otimes I_{102}$

for every retained field configuration X. Then

D_X $\mathcal{K}_e$^full(X) = 0

for all marks e and all X, and the stacked field-to-mark derivative is

J_mark,field = 0 ∈ $\mathbb{R}^{217\times102}$.

Proof

The field factor is the constant identity operator, and neither the history factor H_e nor the neutral factor N_e depends on the retained field coordinates in the executable source (verified by direct source scan, Appendix B). Differentiation with respect to any of the 102 field coordinates therefore annihilates every one of the 217 marks, identically in X, not merely at the background. ■

Corollary 2.1 — Zero jets of every order and every derived score

Because the marks are constant in X, all higher field derivatives vanish as well: the full field-jet of the instrument is zero at every order. Consequently every object constructed from mark derivatives — Fisher blocks, Onsager blocks, bath couplings, score amplitudes, source jets of any graded order in the P-PF5 hierarchy — is identically zero for this instrument. The failure is not confined to first order and cannot be evaded by passing to Hessians or mixed jets.

Remark 9.1 — Contrast with the measured conditional stack

Corollary 2.1 immediately explains why the current candidate cannot generate the nonzero derivatives already measured in the conditional source stack:

- the normalised RCMO terminal-record derivative has rank 5;
- the faithful gauge tangent has rank 144;
- the shared-link CAR/Fock gauge derivative has rank 144;
- the completion source requires the full action stack.

Those objects are compatible with the defect quotient, but none of them can be a derivative — of any order — of a primitive instrument whose entire field-jet is zero.

10. Representation-ledger counterexample

Consider the charged-only ledger

$\mathcal{L}$_charged = (Q, u, d, L, e, H)

with three completion channels, and the neutral-extended ledger

$\mathcal{L}$_full = (Q, u, d, L, e, N, H)

with four completion channels. Since N_R is a gauge singlet with primitive charge zero, both ledgers have the same direct representation traces,

$(d_3, d_2, d_q) = (6, 13/2, 378)$.

A fresh FCHI rerun was performed after removing N_R and the fourth completion channel from the supplied ledger. The history Kraus operators, neutral instruments and full product instruments remained byte-identical. The maximum compared array difference was exactly zero.

Theorem 3 — Primitive-instrument ledger non-injectivity

The map from supplied representation ledger to executable primitive-instrument arrays is constant on {$\mathcal{L}$_charged, $\mathcal{L}$_full}. The strongest executable primitive instrument is therefore not injective with respect to the charged-only and neutral-extended ledgers, and cannot select neutral terminality or the seven-role ledger.

Corollary 3.1 — Data-processing rescue exclusion

Since the two counterfactual instrument packages are byte-identical, every downstream functional of the instrument — every orbit invariant, spectral quantity, score construction, coarse-graining or statistical readout, however elaborate — takes identical values on both ledgers. No post-processing of the current instrument can distinguish them. The ledger information, if it is to be primitive, must enter the marks themselves; it cannot be recovered afterwards.

Remark 10.1

This is strictly stronger than the observation that the wheel states are untyped. It is a direct executable counterfactual: changing the ledger does not change the primitive instrument, and Corollary 3.1 closes every indirect route around that fact.

11. Score-law counterexample

Once a ledger and score rules are supplied, one can compute direct and relaxable gauge responses. The charged-only branch gives

$(r_3, r_2, r_q) = (5, 3, 60), (Z_3, Z_2, Z_q) = (1, 7/2, 318)$.

The neutral-extended branch gives

$(r_3, r_2, r_q) = (5, 4, 80), (Z_3, Z_2, Z_q) = (1, 5/2, 298)$.

Both have positive reduced stiffnesses and satisfy the declared quadratic score admissibility checks (P-PF4). The current SGPL executable continues to return four channels after its ledger is replaced by the charged-only ledger, because the four weak and Abelian blocks are constructed directly in the source rather than derived from the marks — a source insertion in exactly the sense the non-insertion firewall forbids for primitive claims.

Theorem 4 — Score-law nonselection

The current primitive transition law and the quadratic score axioms do not select the number of completion channels. The score law (5, 4, 80) is a valid conditional extension of the neutral-complete ledger, but it is not an output of the present primitive instrument, and by Corollary 2.1 it cannot be: a derived score is a functional of mark derivatives, and every mark derivative is zero.

Remark 11.1

This conclusion does not diminish the RRHF result. RRHF demonstrates that the neutral-extended score law can be embedded in a positive parent action and can generate the desired conditional gauge and charged tensors. Deliverable 1 asks the earlier question — whether the primitive instrument itself chooses that law. It does not, and now provably cannot.

12. Regulator and branch stability

The terminal structure is constant across levels 3 through 6:

9 SCCs, 3 closed terminal components, $P\_terminal = K_7 \otimes I_3$.

The conjugate rim-reflection presentation (P-PF7) produces the same orbit and rank conclusions with zero permutation-covariance residual. The field derivative remains zero on both branches, for the structural reason that branch conjugation acts on the history and neutral factors and cannot create dependence on a field factor that is identically constant.

The failure of representation selection is therefore not regulator noise and not an artefact of choosing $k = 1$ rather than $k = 6$. It is a level-independent, branch-independent, exact property of the candidate.

13. Deliverable 1 verdict

The completed first deliverable establishes the following exact position:

Question	Return
Is the supplied primitive instrument internally complete?	**Yes — machine pass**
Does it identify terminal records?	**Yes — three generation-keyed completed orbits**
Does it identify the seven species roles?	**No**
Does it respond to the retained field carrier?	**No — field-jet exactly zero at every order**
Does it distinguish charged-only and neutral-extended ledgers?	**No — byte-identical rerun; no downstream functional can either**
Does it derive the four-channel score law?	**No**
Does this invalidate RCMO/RRHF compatibility?	**No**
What is required next?	**A field-dependent primitive instrument**

Part III — The exact theorem package supplied by Deliverable 1

14. Identity-field primitive-instrument no-go theorem

Theorem 5 — Primitive source-selection no-go for the current candidate

Fix the strongest executable FCHI/CMHRE/SGPL primitive candidate under premises P-PF1 through P-PF4. Then:

1. its terminal population law has exactly three closed generation-keyed orbits (Theorem 1);
2. its retained-field jet has rank zero at every order (Theorem 2, Corollary 2.1);

3. the charged-only and neutral-extended ledgers produce identical primitive arrays, and every downstream functional of the instrument is ledger-blind (Theorem 3, Corollary 3.1);
4. the three-channel and four-channel score laws are both admissible after their respective ledgers are supplied (Theorem 4).

Therefore this candidate cannot uniquely derive the Standard Model representation ledger, the neutral completion channel, the (5, 4, 80) score law, the RCMO record derivative, the faithful gauge response or the shared-link CAR/Fock source jets.

Scope

The theorem applies to the current identity-field primitive extension and to nothing else. It does not prove that no field-dependent MASD-HMGBC instrument can derive these structures; asserting that extension is itself a falsifier violation (F-PF2). The no-go converts an open-ended search into a bounded construction problem — that is its entire function.

15. Terminal-key/species-role separation theorem

The three terminal keys carry generation support, not particle species. Any attempted direct identification of the three keys, or of the six $K = 7$ rim states, with the seven representation roles would mix carriers of different type: a completed-record key index with a typed internal representation index. Type mixing of this kind is forbidden outright (F-PF9).

A valid species derivation must instead produce irreducible terminal-record/CAR orbits inside a field-dependent internal carrier. Generation and species must emerge as distinct commuting classifications,

$$\mathscr{H}\_\text{terminal} \simeq \mathscr{H}\_\text{generation} \otimes \mathscr{H}\_\text{species},$$

or through an equivalent declared non-product orbit decomposition. The present candidate supplies only the first factor. Whether the second factor exists as a dynamical output at all is an open structural question, recorded as debt D-PF7 rather than assumed.

16. Necessity of field dependence

Theorem 6 — Minimal field-dependence necessity

Suppose a primitive marked instrument is to derive any nonzero RCMO, faithful-gauge or CAR/Fock source derivative through the P-PF5 graded hierarchy. Then at the frozen background $X\star$ there must exist at least one mark e and one physical source direction v such that

$$D\mathcal{K}_e(X\star)[v] \neq 0.$$

Moreover, to derive all conditionally successful source sectors, the span of the mark derivatives (and, for the higher-graded sectors, of the mark jets through third mixed order) must have nontrivial restrictions to:

- the faithful gauge-link tangent;
- the terminal-record orientation tangent;
- the completion/interface tangent;
- the shared-link CAR/Fock tangent.

Proof

Every derived score, Fisher/Onsager block and source jet in the admissible construction of Part IV is, by definition, a functional of the mark jets and the frozen state/measure, with no independent postulated term (§18). By the chain rule, if every mark jet vanishes through the relevant order, every such functional vanishes through that order. The conditional stack contains nonzero returns in each of the four listed sectors; hence a deriving instrument must have a nonvanishing jet with a nontrivial restriction to each corresponding tangent. The current candidate fails the first and weakest necessary condition, since every mark derivative of every order is zero (Corollary 2.1). ■

17. Promotion theorem

Theorem 7 — Conditional-source promotion criterion

Let $\mathfrak{I}_n^{(k)}(X) = \{ \mathcal{K}_{n,e}^{(k)}(X) \}_e$ be a frozen field-dependent primitive instrument satisfying the admissibility conditions of Part IV. If

1. its terminal orbits uniquely return the representation ledger (Deliverable 3),
2. its derived score law returns the direct and relaxable response ledgers (Deliverable 4), and
3. its blind source jets reproduce the regulator-covariant RCMO/RRHF/FCHI outputs within the predeclared tolerances (Deliverables 5 and 6),

then those conditional source laws are promoted to primitive provenance for that instrument family.

If the instrument is complete and convergent but fails any one of the orbit, score or blind-recovery tests, the corresponding conditional law remains an effective constitutive extension rather than a primitive output. Both outcomes are certified results; neither may be softened after the fact (F-PF10).

Part IV — The required field-dependent primitive instrument

18. Definition of the target object

At regulator level n and branch $k \in \{1, 6\}$, let the primitive source configuration be

$X_n = (X\_hist, A, \rho, J, R, H, \Psi)_n$,

where A denotes faithful gauge links, R terminal-record variables, H completion/interface variables and Ψ the retained CAR/Fock carrier.

A field-dependent primitive marked instrument is a finite family

$\mathfrak{I}_n^{(k)}(X_n) = \{ \mathcal{K}_{n,e}^{(k)}(X_n) : e \in \mathcal{E}_n \}$

acting on the combined history–record–CAR carrier and satisfying

$\Sigma_e \mathcal{K}_{n,e}^{(k)}(X_n)^\dagger \mathcal{K}_{n,e}^{(k)}(X_n) = I$

throughout a declared neighbourhood of the background $X_{n,\star}$ — not merely at the background itself.

The primitive amplitude derivative is

$\mathcal{J}_{n,e,a}^{(k)} = \partial\mathcal{K}_{n,e}^{(k)}(X_n)/\partial x_a \,|_{x=x^\star}$.

Probability scores and Fisher/Onsager blocks may then be derived from these amplitude derivatives and the frozen state/measure. They may not be postulated independently; a postulated block re-enters the construction as an insertion and is graded conditional at best.

19. Admissibility conditions

The instrument must satisfy all of the following before any comparison is opened.

19.1 Complete positivity and normalisation

The marks must define a completely positive trace-preserving instrument, or the precise killed/absorbing analogue on a terminal sector. Completeness must hold at the field-dependent level: the derivative of the completeness sum must vanish identically,

$\Sigma_e (\partial\mathcal{K}_e^\dagger \mathcal{K}_e + \mathcal{K}_e^\dagger \partial\mathcal{K}_e) = 0$,

through at least second order, so that field dependence is genuine and not a normalisation leak.

19.2 Faithful gauge covariance

For every faithful gauge transformation g there must be an induced mark permutation or intertwiner σ_g such that

$$\mathcal{K}_{n,e}^{(k)}(g\cdot X) = U_g\, \mathcal{K}_{n,\sigma\_g(e)}^{(k)}(X)\, U_g^{\dagger}.$$

Gauge labels may not be attached to a scalar intensity while leaving the internal link derivative zero; that construction reproduces the identity-wire pathology in covariant dress.

19.3 Terminal-record covariance and terminality

Completed records must be persistent terminal outcomes of the field-dependent law. The instrument must distinguish orientation-sensitive terminal roles without making the already classified real-stretch coboundaries physical: the record-null classification of the graded HM4 programme (flat edge rescalings as pure redundancy) is inherited as a constraint, not reopened.

19.4 Shared-link CAR/Fock functoriality

Matter transport must use the same faithful link that supplies the gauge derivative. A separate matter-link normalisation, or a manually inserted representation score, is prohibited; the shared-link premise of the EX4B pass is here promoted from a verification convention to an admissibility requirement.

19.5 Completion consistency

The completion morphism must enter the primitive marks so that the bosonic mixed Hessian and the CAR/Fock mixed vertex are derivatives of the same ordered primitive transition structure. The full-action potential rows remain load-bearing for the common completion direction, as established in the graded closure.

19.6 Locality or controlled quasi-locality

Each primitive mark must have a declared finite support or controlled decay at the regulator scale. A global score matrix chosen after the fact does not constitute a primitive move law.

19.7 Regulator covariance

There must be blocking maps $B_{(n+1\to n)}$ such that the blocked mark law, its terminal-orbit projectors and its derived source jets converge, with published residuals at every level.

19.8 Branch covariance or orientation selection

The k = 1 and k = 6 branches must either be related by a declared conjugation/reflection law or be separated by an action-derived branch-odd term. A branch may not be selected because it agrees better with downstream data.

19.9 Non-insertion firewall

The representation ledger, channel count, RCMO matrix, RRHF stiffnesses and charged tensors are comparison targets only after the primitive instrument is frozen. They are not allowed as source inputs unless the resulting claim is explicitly graded conditional. The SGPL four-channel construction of §11 is the standing example of the pattern this clause excludes from primitive grading.

20. Minimal nontriviality test

The first release test is simple and unforgiving:

rank J_mark,field > 0.

A candidate that fails this returns to the EX5A no-go immediately, with no orbit or score analysis performed.

A candidate that passes must then be sector-audited without target fitting. The relevant conditional comparison ranks are known from the earlier programme; they are recorded here for the reader and are not imposed during construction:

- terminal-record normalised derivative rank 5;
- faithful gauge-link derivative rank 144;
- shared-link CAR/Fock gauge derivative rank 144;
- full-action completion direction present;
- regulator-covariant branch structure.

21. Source-jet hierarchy

PFDMI-1 retains the graded source typing established by HM4-EX4A and EX4B (P-PF5):

Source sector	Leading differential order
Scalar commitment density	1
Terminal-record orientation	1 in the record field; normalised operator derivative rank 5
Faithful gauge response	2 in the action / 1 in the link amplitude
Bosonic completion	Mixed order 2
CAR/Fock completion	Mixed order 3 in the parent action

The primitive instrument must generate this hierarchy from its own amplitude jets. It must not force every sector into one ordinary source matrix; the one-matrix stacking mistyping identified in the graded programme applies here with full force.

Part V — Locked deliverables and pass contracts

22. Deliverable 2 — Field-dependent primitive mark construction

Required construction

Build $\mathfrak{I}_n^{(k)}(X)$ at levels 3 through 6 with explicit dependence on faithful links, terminal records, completion variables and CAR/Fock states.

Required outputs

- mark arrays and labels;
- field-derivative arrays $\mathcal{J}_{n,e,a}^{(k)}$;
- completeness derivatives through at least second order;
- locality/support ledger;
- gauge and branch covariance certificates;
- frozen source and hash manifests.

Pass condition

- complete positivity and normalisation pass;
- rank J_mark,field > 0;
- no source coefficient selected from RCMO/RRHF or observed Standard Model data;
- stable numerical differentiation under step refinement.

Stop condition

Any failure of positivity, completeness or source cleanliness stops the branch before orbit or score analysis.

23. Deliverable 3 — Terminal species-orbit selection

Required calculation

Construct the population and marked transition graph induced by the field-dependent instrument and compute its irreducible persistent terminal orbits without pre-labelling them as particle species.

Pass condition

The orbit invariants must return, up to generation permutation, colour/weak basis, primitive-charge sign and conjugate notation,

$$3 \times (Q\_L \oplus u\_R \oplus d\_R \oplus L\_L \oplus e\_R \oplus N\_R)$$

plus one Higgs/interface carrier and exactly four gauge-admissible completion channels.

Counterfactual falsifier

The charged-only ledger and neutral-extended ledger must no longer produce identical primitive arrays. If removing N_R leaves the field-dependent instrument unchanged, neutral terminality remains unselected and the Theorem 3 counterexample stands against the new candidate as well.

24. Deliverable 4 — Representation score-law selection

Required calculation

Derive score amplitudes by differentiating the primitive mark probabilities or amplitudes. Construct the direct, bath and Schur-reduced response blocks from those scores.

Pass condition

The same frozen instrument must return the direct trace ledger and the relaxable ledger,

$$(d_3, d_2, d\_q) = (6, 13/2, 378), (r_3, r_2, r\_q) = (5, 4, 80),$$

or return a different source-clean ledger that supersedes the conditional RRHF candidate. The score law must distinguish three-channel from four-channel terminal structure through its own mark dependence.

Stop condition

A score matrix constructed with a fixed four-channel identity block regardless of the orbit ledger is not a pass (F-PF6).

25. Deliverable 5 — Blind recovery of conditional source jets

Only after Deliverables 2 through 4 are frozen may the conditional programme arrays be opened.

Comparison targets

- RCMO terminal-record derivative and its blocking law;
- faithful gauge Hessian/response;
- bosonic completion mixed Hessian;
- shared-link CAR/Fock gauge derivative;

- charged and neutral CAR/Fock completion tensors;
- branch parity identities.

Promotion outcomes

1. **Promotion.** The primitive return reproduces the conditional laws within the frozen tolerances.
2. **Supersession.** The primitive return differs but is complete, source-clean and convergent; it replaces the conditional candidate.
3. **Primitive failure.** The source jets do not descend or the instrument fails positivity/covariance.

No fourth outcome permits target fitting.

26. Deliverable 6 — Regulator and branch theorem

The complete construction must be executed at

$n = 3, 4, 5, 6, k = 1, 6.$

Required returns include:

- blocked mark-law residuals;
- terminal-orbit projector residuals;
- score-metric convergence;
- source-jet convergence;
- branch conjugacy or branch-gap certificate;
- final continuum/fixed-point estimate where justified.

A single-level or single-branch success is not a primitive provenance certificate (F-PF7).

27. Deliverable 7 — Downstream physical admission

PFDMI-1 does not attempt to close the remaining absolute physical rows. After source selection, HFB-1 still requires:

- physical clock and action normalisation;
- absolute completion/coherence scale;
- direct neutral-singlet scale and thresholds;
- global quotient measure and determinant-line phase;
- finite native-to-continuum scheme bridge;
- one same-branch manifest and threshold package.

The field-dependent instrument is necessary for primitive provenance but is not alone sufficient for a physical Standard Model derivation.

Part VI — Execution protocol, stop rules and promotion logic

28. Stage-ordered protocol

1. **Freeze the primitive source.** Publish the exact variables, backgrounds, regulator maps, branch action and mark-support rules.
2. **Construct marks with targets unavailable.** RCMO/RRHF/HCMR comparison directories remain empty.
3. **Verify field-dependent completeness.** Test the mark sum and its derivatives through second order.
4. **Compute terminal orbits blind.** No particle labels are loaded.
5. **Differentiate score laws.** Build Fisher/Onsager and bath blocks from the marks alone.
6. **Freeze arrays and hashes.** Seal all construction and outcome files.
7. **Open conditional programme targets.** Compare with RCMO/RRHF/FCHI only after freeze.
8. **Run regulator and branch transport.** Publish every pass and failure.
9. **Issue promotion, supersession or failure.** Do not adjust the source after comparison.

29. Predeclared stop rules

The calculation stops immediately if:

- the field derivative is zero;
- completeness fails beyond numerical tolerance;
- the field-dependent marks violate gauge covariance;
- terminal records cease to be absorbing or persistent;
- CAR/Fock parity or shared-link functoriality fails;
- the orbit ledger changes under an allowed basis transformation;
- the source uses a downstream target value;
- the regulator sequence does not converge, or converges to different orbit types at different levels.

30. Decision tree

The logic of the programme is:

field-dependent complete instrument ⟶ terminal orbits ⟶ score law ⟶ source jets ⟶ regulator/branch theorem.

A failure at an earlier arrow cannot be repaired by a later match to an observable. The arrows are one-directional in evidential force as well as in execution order.

31. Independent rebuild requirement

Each deliverable must ship with a compact verifier capable of reconstructing the load-bearing ranks, orbit counts, score residuals and comparison errors without importing the original execution state. The source manifest must identify exactly which prior papers are premises and which arrays are post-freeze targets. This continues the independent-replication discipline of the EX2B blind rebuild, which is here made contractual for every deliverable rather than exemplary for one.

Part VII — Consequences for the Standard Model closure programme

32. What Deliverable 1 has genuinely advanced

Before EX5A it remained possible that the successful RCMO/RRHF structures were implicit in the strongest primitive instrument but had not been read correctly. That is now excluded exactly for the current candidate: by Corollary 3.1 no reading can extract a ledger distinction from byte-identical arrays, and by Corollary 2.1 there is no differential order at which a score could first appear.

The exact result is:

complete primitive record process ≠ field-dependent representation-selecting process.

This ends any effort to extract a nonzero field score from an identity field factor, and partially discharges the HM4 primitive-source uniqueness debt: the audit half is done; the construction half is a frozen contract.

33. What a successful field-dependent instrument would mean

If Deliverables 2 through 6 pass, several conditional programme results would be upgraded simultaneously:

- the RCMO record action would become a derivative of the primitive mark law;
- the RRHF representation score would become a terminal-orbit output rather than a ledger premise;
- the faithful gauge and CAR/Fock HM4 passes would acquire primitive source selection;
- the four completion channels and neutral terminality would become dynamical orbit statements;
- the charged/gauge conditional boundary would no longer depend on a separately supplied representation ledger.

That would be a major provenance closure, even though the absolute scale, neutral/global and scheme rows would remain open (Deliverable 7).

34. What a failure would mean

A clean failure would be equally decisive: the RCMO/RRHF source laws would stand as effective constitutive laws at the retained level rather than unavoidable consequences of the current primitive substrate, and VERSF could then either:

- accept those laws as additional physical postulates;
- enlarge the primitive state space or move set;
- replace the defect-mediated marked architecture;
- narrow the claimed derivation level.

The goal is not to guarantee promotion but to make the promotion question executable, with both verdicts equally publishable and equally final for the candidate tested.

35. Relationship to HFB-1

HFB-1 should not be opened merely because the conditional source jets pass HM4. Primitive selection and physical admission are separate gates. The correct order is:

primitive source selection → faithful source descent → positive transfer and marked law → absolute physical normalisation → global/scheme completion → HFB-1 decision.

EX5A completes the first negative audit of the initial primitive candidate and locks the replacement construction.

Part VIII — Deliverable 2 execution: the completeness-preserving field-dependent instrument (PFDMI-EX2A)

36. Construction

Starting from the frozen FCHI factors — the 31 $K = 7$ history marks H_h and the seven neutral marks $N_m^{(n)}$ — the executed candidate is defined on the faithful 45-dimensional internal representation by

$$\mathcal{K}_{hm}^{(n'k)}(A, r, c) = [H_h \otimes R_k(r)\, N_m^{(n)}\, D_m^{(n)}(c)] \otimes U_{(e(h),k)}(A),$$

where:

- $U_{(e)}(A)$ is the faithful link exponential on one of the twelve K = 7 edges, attached mark-wise through the edge map e(h);
- $R_k(r)$ is a zero-total six-slot terminal-record phase, carrying 5 independent coordinates;
- $D_m^{(n)}(c)$ is the exact source-wise square-root normalisation of six completion-route logits;
- the CAR/Fock action is the exterior-algebra lift of the same $U_{(e)}(A)$, enforcing shared-link functoriality (§19.4) by construction rather than by audit.

The field coordinate count is 144 + 5 + 6 = 155. The construction uses no RCMO, RRHF, HCMR or observed Standard Model target (P-PF6, F-PF4), and its hash manifest was frozen before any comparison was opened (P-PF9, F-PF5).

The construction replaces the identity wire of §6 exactly where Theorem 2 located the failure: the constant factor I_{102} is replaced by field-dependent unitary and normalised factors acting on the faithful carrier.

37. Field-dependent completeness

Theorem 8 — Finite-field completeness of the EX2A instrument

The EX2A instrument satisfies

$$\Sigma_{hm} \mathcal{K}_{hm}^\dagger \mathcal{K}_{hm} = I$$

identically in the field variables, for every tested field value.

Proof and machine certificate

The gauge factor $U_{(e)}(A)$ and the record factor $R_k(r)$ act as unitaries on the left of each mark, so they cancel factor-wise in $\mathcal{K}^\dagger\mathcal{K}$. The completion factor $D_m^{(n)}(c)$ is normalised source-wise by exact square root, so the completion-weighted sum reproduces the frozen FCHI completeness sum. The identity therefore holds structurally, not perturbatively. The machine certificate confirms it: the maximum completeness residual at random nonzero field values, across levels 3–6 and both conjugate branches, is

$$7.1151\times10^{-16},$$

with first-derivative completeness residual 1.1657×10^{-15}. ■

The mixed-direction second-derivative finite-difference residual is 1.701×10^{-6} — consistent with finite-difference truncation rather than a completeness violation, since the identity is structural; an analytic second-order certificate replacing the finite-difference bound is nonetheless owed and recorded as debt D-PF9. The §19.1 requirement — completeness in a neighbourhood, not only at the background — is met in its finite-field form.

38. Nonzero field derivative

Theorem 9 — Rank-155 nontriviality

At the frozen background the independent sector derivative ranks are

rank $J_A = 144$, rank $J_R = 5$, rank $J_H = 6$,

the three sectors are orthogonal in the real Hilbert–Schmidt metric, and therefore

rank $J_{mark,field} = 155$.

The shared-link CAR/Fock lift has derivative rank 144, because its restriction to the one-particle sector is the faithful link derivative itself.

The minimal nontriviality gate of §20 — rank $J_{mark,field} > 0$, the gate at which the EX5A candidate failed identically — is passed by a wide margin, and passed sector-wise on exactly the four tangents demanded by Theorem 6: gauge-link, record orientation, completion/interface and shared-link CAR/Fock.

Analytic derivatives agree with independent finite differences to maximum relative errors

$\varepsilon_{record/completion} = 2.158\times10^{-10}$, $\varepsilon_{gauge} = 1.178\times10^{-15}$.

39. Covariance, branch and regulator certificates

- Maximum gauge-covariance residual (§19.2): 3.056×10^{-16}.
- Conjugate-branch derivative Gram agreement (§19.8): 0.000, exact to stored precision.
- Maximum level-to-level derivative-spectrum drift across $n = 3 \to 4 \to 5 \to 6$ (§19.7): 9.132×10^{-16}.

The instrument is therefore admissible under §§19.1, 19.2, 19.4, 19.7 and 19.8 as executed, with locality (§19.6) supplied by the edge-wise mark support and the terminality condition (§19.3) inherited from the unchanged support graph of §41.

40. Post-freeze rank comparison

Only after the core calculation and hash manifest were frozen were the prior conditional results opened (P-PF9). The independently constructed candidate returns:

Sector	EX2A return	Prior conditional return
Faithful gauge rank	144	144
Terminal-record rank	5	5
Shared-link CAR/Fock rank	144	144

This is rank agreement, not target fitting: the ranks were produced by a construction that had no access to the targets, and the comparison was opened only after freeze. Its grade must nevertheless be stated exactly. It is a machine result establishing rank-level consistency between the primitive candidate and the conditional stack. It is not a Deliverable 5 pass: Deliverable 5 requires recovery of the full arrays and jets within predeclared residuals, and its targets remain locked until Deliverables 3 and 4 are frozen (F-PF11).

41. The exact support boundary

Theorem 10 — Support-preservation species no-go

Every field-dependent factor of the EX2A instrument is either a positive reweighting of an existing mark (the completion factor) or a unitary acting on an existing mark's internal output (the gauge and record factors). Therefore the deformation changes mark amplitudes and internal field response but does not change which transitions exist: the 217-mark population support graph is identical to that of the EX5A candidate. Consequently its strongly-connected-component structure — nine SCCs, three closed terminal components, terminal block $K_7 \otimes I_3$ — is unchanged, and the three generation-keyed terminal orbits of Theorem 1 remain the terminal orbits of this instrument.

Corollary 10.1 — Localisation of the species obstruction

No support-preserving field-dependent instrument built on the FCHI factors can derive seven terminal species orbits, whatever its derivative rank. The obstruction to species selection is therefore combinatorial — it lives in the support graph — and not analytic: raising the field-derivative rank from 0 to 155 leaves it exactly in place. Deliverable 3 requires a support-changing refinement of the mark set itself.

Remark 41.1

This is not a failure of EX2A, and presenting it as one would misread the theorem. EX2A cleanly separates two questions that EX5A could not distinguish, because for the identity-field candidate both answers were no:

1. Can a complete primitive instrument depend nontrivially on the faithful fields? **Yes — now passed.**
2. Can it generate new internally typed terminal orbits? **Not without changing the support graph — now proved.**

The programme's remaining species question is thereby localised to a single, well-posed combinatorial construction.

42. Deliverable 2 verdict and the EX2B lock

Question	Return
Nontrivial field-dependent primitive instrument?	**PASS — rank 155**
Complete positivity and field-dependent completeness?	**PASS — structural identity, residual 7.12×10^{-16}**
Analytic differentiation and covariance?	**PASS**
Regulator and branch stability?	**PASS**
Rank consistency with the conditional stack?	**PASS — post-freeze, rank-level only**
Terminal species selection?	**NOT CLOSED — support-changing refinement required**

The next locked deliverable is:

PFDMI-EX2B — Support-Changing Local Mark Refinement.

Required construction

Refine the mark set locally so that the three generation-keyed routes split into internally typed terminal-record/CAR orbits, using representation invariants and completion admissibility only.

Pass condition

- the refined support graph carries irreducible persistent terminal orbits beyond the three keys;
- the splitting is driven by representation invariants and completion admissibility, with the labels (Q, u, d, L, e, N, H) not named in advance (F-PF12);
- the completeness, gauge-covariance, branch and regulator certificates of §§37–39 are preserved by the refinement;
- the Deliverable 3 counterfactual becomes live: removing N_R must now change the instrument.

Stop condition

A refinement that imports the target ledger, breaks finite-field completeness, or fails covariance stops the branch before orbit analysis; a refinement whose new orbits change type under an allowed basis transformation fails under the standing stop rules of §29.

Part IX — Deliverable 3 execution: the central-projector support refinement (PFDMI-EX2B)

43. The invariant algebra and the anonymous census

The refinement question left by Theorem 10 is answered from the representation algebra itself. On the frozen 50-dimensional graded carrier (P-PF10), the six operators

$C_3 = \Sigma_{a=1}^{8} T_a^2$, $C_2 = \Sigma_{i=1}^{3} t_i^2$, $q = 6Y$, F (CAR grade), H (completion grade), N_term (neutral-terminal grade)

commute, and their joint spectrum has exactly seven atoms.

Theorem 11 — Central support-projector census

The minimal central projectors E_r of the joint spectrum number exactly seven, with dimensions [3, 3, 6, 2, 9, 9, 18] and inferred copy multiplicities [3, 3, 3, 1, 3, 3, 3]. They satisfy

$\Sigma_r E_r = I_{50}$, $E_r^2 = E_r$, $E_r E_s = 0$ $(r \neq s)$

to maximum numerical residual 0.000, and commute with every faithful gauge generator to residual 0.000. The anonymous invariant table is:

Anonymous orbit	Dimension	$3C_3$	$4C_2$	q	CAR	Completion	Neutral terminal
R_0	3	0	0	−6	1	0	0
R_1	3	0	0	0	1	0	1
R_2	6	0	3	−3	1	0	0
R_3	2	0	3	3	0	1	0
R_4	9	4	0	−2	1	0	0
R_5	9	4	0	4	1	0	0
R_6	18	4	3	1	1	0	0

No particle *name* and no measured Standard Model datum entered the census, and no target ledger was consulted before hashing (F-PF12 respected): the projectors are outputs of the joint spectral decomposition alone. The claim must nonetheless be stated at its true strength (F-PF34). The carrier itself is inherited and already Standard-Model-typed: it supplies the faithful charged representation, the colour and weak factor dimensions, the operator q = 6Y — whose numerical values *are* charge data, albeit attached to anonymous blocks — the CAR, completion and neutral-terminal grades, the minimal colourless weak-doublet completion interface, and the local factor data (c, w, q, m) of P-PF12. What Theorem 11 establishes is therefore that the seven roles are the exact spectral atoms of that inherited graded algebra, recovered by blind identification rather than assigned; it is not a derivation of the carrier from pre-representation substrate data. That derivation is D-PF10, and it remains the largest open provenance question in the programme. The result is consistent with the Closure Trichotomy: admissible primitive operations reduce to point-local state operations, neighbouring comparisons and accumulated response, with no independent fourth primitive class.

44. Post-freeze representation identification

Before any particle label was viewed, the anonymous projectors, their dimensions, invariants and multiplicities were serialised and hashed. The representation ledger was opened only afterwards. The identification is exact:

$R_6 \leftrightarrow Q\_L$, $R_5 \leftrightarrow u\_R$, $R_4 \leftrightarrow d\_R$, $R_2 \leftrightarrow L\_L$, $R_0 \leftrightarrow e\_R$, $R_1 \leftrightarrow N\_R$, $R_3 \leftrightarrow H$,

with multiplicities (3, 3, 3, 1, 3, 3, 3) in anonymous order: three copies of each fermionic block and one completion-interface block. The hypercharge normalisation $q = 6Y$ makes every entry of the invariant table integral, and the recovered q-values are exactly the six-fold hypercharges of the seven roles.

Two gradings of this identification are recorded exactly:

- The completion block R_3 is not an arbitrary scalar insertion: the existing completion-interface theorem forces the minimal colourless, weak-active interface with a neutral vacuum direction into (1, 2, +½), which is precisely the two-dimensional atom recovered.
- The neutral block R_1 is **conditional**: its population enters through the extended FCHI neutral-terminal branch, not through the charged faithful generator carrier itself. Whether N_R is compulsory or optional is not decided by this census (F-PF13; debt D-PF11).

With this identification, the generation/species factorisation posed as debt D-PF7 is realised at census level: the multiplicity-three structure of every fermionic atom is exactly the $\mathscr{H}$_generation factor, now carried by typed species blocks rather than by anonymous keys.

45. Blind completion-channel census

Theorem 12 — Four-channel admissibility census

Using only colour compatibility, weak doublet-to-singlet contraction, and primitive-charge closure

$$-q\_L + q\_H + q\_R = 0,$$

the admissibility enumeration over the census atoms returns exactly four channels, and no fifth survives. After the frozen census was compared with the named ledger, the channels are:

$$L\_L + H \to e\_R,\ L\_L + \tilde{H} \to N\_R,\ Q\_L + H \to d\_R,\ Q\_L + \tilde{H} \to u\_R.$$

This recovers the four-channel Yukawa pattern from projector invariants rather than from a supplied Yukawa list. It also converts the EX5A score-law degeneracy of Theorem 4 into a decided census statement at the support level: the channel count is four because admissibility forbids a fifth — though the derivation of the score *weights* on these channels remains Deliverable 4.

46. The support-changing typed instrument

Theorem 13 — Typed refinement completeness

For each of the 31 history marks H_h, seven neutral marks N_m and central projectors E_r, define

$L_{hmr} = |r\rangle$_terminal $\otimes$ $[(H_h \otimes N_m) \otimes (E_r$ U_int$)]$.

Because the base instruments are complete, U_int is unitary and $\Sigma_r E_r = I$,

$\Sigma_{hmr} L_{hmr}^\dagger L_{hmr} = I$

structurally. The 217 marks become 217×6 = 1302 mandatory typed marks, or 217×7 = 1519 with the neutral-terminal branch retained. Machine certificates: history completeness 2.22×10^{-16}, neutral completeness $\leq 1.11\times10^{-15}$, product completeness $\leq 3.06\times10^{-15}$, maximum unitarity residual across levels 3–6 and both branches 2.175×10^{-15}, outcome-normalisation residual exactly 0.000. ■

The commitment step follows the Lüders architecture of P-PF11: reversible unitary pre-commitment followed by positive projective commitment. Two exact scope statements accompany the construction:

- It is genuinely support-changing at the terminal-record level: one undifferentiated terminal route per key is replaced by six or seven representation-typed terminal outcomes, so the D-PF8 contract is met where Theorem 10 located the obstruction.
- It does **not** rewrite the underlying geometric K = 7 adjacency complex itself (F-PF15); the refinement types the terminal outcomes, it does not alter the wheel.

The N_R counterfactual of §23 is now live at support level: removing the neutral branch changes the instrument from 1519 to 1302 marks — the byte-identity degeneracy of Theorem 3 is broken. What remains undecided is not whether the instrument sees N_R but whether the dynamics *requires* it (D-PF11).

47. The history Hamiltonian

A structural correction emerged during execution and is recorded as part of the certificate. The frozen K = 7 history transfer is **not detailed-balanced**: its detailed-balance residual is approximately 0.20865, so a symmetric-logarithm Hamiltonian construction would have been unjustified.

Theorem 14 — Stationary-weighted polar derivation

The canonical construction is the stationary-weighted polar decomposition

$A_\pi = \Pi^{1/2}\, T_0\, \Pi^{-1/2} = U_{hist}\, P_{hist}$, $H_{hist} = i \log U_{hist}$, separating the transfer into reversible partial-isometric transport U_{hist} and positive commitment contraction P_{hist}. Machine certificates: $\|U_{hist}^\dagger U_{hist} - I\| = 1.45\times10^{-15}$, $\|e^{(-iH_{hist})} - U_{hist}\| = 2.57\times10^{-15}$, $\|H_{hist} - H_{hist}^\dagger\| = 0$, weighted polar reconstruction residual 1.93×10^{-15}. ■

This is the appropriate architecture for the substrate: admissible refinement decomposes canonically into reversible transport plus irreversible commitment, matching the marked-instrument reading of emergent temporal structure — the arrow lives in P_{hist}, the coherent motion in U_{hist}, and neither is imposed by hand.

48. Blind typed terminal-orbit census

Theorem 15 — Six-plus-one typed orbit census

Across n = 3, 4, 5, 6 and both conjugate branches, the refined instrument returns

6 mandatory closed terminal type-orbits, and **7 with the neutral extension**,

regulator- and branch-stably, with branch probability difference 5.55×10^{-17}. The FCHI neutral transition blocks retain rank three for both active → singlet and singlet → completed at every level. ■

Together with Theorem 11 this discharges the Deliverable 3 pass condition for the charged and interface sectors: the orbit invariants return, up to generation permutation, colour/weak basis, primitive-charge sign and conjugate notation, three copies of ($Q_L \oplus u_R \oplus d_R \oplus L_L \oplus e_R$) plus the interface carrier and exactly four admissible channels — with the N_R component present but conditionally graded.

49. The Hamiltonian non-uniqueness boundary

Theorem 16 — Projector derivation without Hamiltonian selection

The Hermitian commutant of the gauge-plus-grade algebra has real dimension 55; its centre has dimension seven; imposing terminal S_3 invariance reduces the admissible family to dimension thirteen but does not select one element. Two separating central Hamiltonians with unrelated eigenvalue assignments return the same seven projectors to residual 0.000. Therefore:

1. the terminal support decomposition is invariant under arbitrary eigenvalue coding — the census of Theorem 11 is a derived, coding-independent object; and
2. the present constraints provably do not determine masses, generation-mixing matrices or dynamical transition strengths (F-PF14).

The CAR construction likewise supplies the uniform persistent spinorial sector and its algebra while leaving the species decomposition of its dynamics as separate structure. The boundary is exact: what the algebra fixes, it fixes exactly; what it leaves free, it leaves 55-dimensionally free.

50. Deliverable 3 verdict

Question	Return
Central support projectors derived blind from the frozen algebra?	**PASS — seven atoms, hashed before identification**
Five charged representation families as exact spectral atoms?	**PASS**
Mandatory completion interface (1, 2, +½)?	**PASS — forced by the completion-interface theorem**
Neutral-singlet N_R atom?	**CONDITIONAL — populated via the extended FCHI neutral branch**
Four completion channels?	**BLIND RECOVERY PASS — no fifth survives admissibility**
Typed 1302/1519-mark refinement complete?	**PASS**
Six-plus-one typed terminal orbits, regulator- and branch-stable?	**PASS**
N_R counterfactual live?	**YES — at support level; dynamical necessity undecided**
Unique physical internal Hamiltonian?	**NOT DERIVED — 55-dimensional commutant freedom proved**
K = 7 geometric adjacency complex rewritten?	**NO — terminal typing only**

51. The EX2C lock

The next locked deliverable is:

PFDMI-EX2C — Primitive-Action Coefficient and Neutral-Branch Selection.

Required construction

1. Derive the faithful 45-dimensional generators from the primitive marked action rather than inheriting them (discharging D-PF10 and closing the largest remaining provenance gap of P-PF10).
2. Decide the neutral branch: select or exclude N_R unconditionally from the primitive action (D-PF11), converting the conditional seventh atom into a theorem either way.
3. Collapse the remaining commutant freedom: select the physical internal Hamiltonian inside the 13-dimensional S_3-invariant family, or prove which further primitive structure is required to do so (D-PF12), including generation-mixing coefficients.

Pass condition

- the generators, branch decision and Hamiltonian coefficients emerge from the primitive action with targets frozen out (F-PF4, F-PF5);
- the derived structure preserves the census of Theorem 11 and the certificates of Theorems 13–15;
- the resulting instrument feeds Deliverable 4 with derived, not declared, score weights on the four channels of Theorem 12.

Stop condition

A coefficient selected from observed masses or mixing angles stops the branch (F-PF4); a construction that changes the census atoms under an allowed basis transformation fails under §29; a neutral-branch decision imported from the conditional ledger rather than derived fires F-PF13.

Part X — The canonical-generator, hypercharge-rigidity and neutral-branch theorems (PFDMI-EX2C)

52. Canonical reconstruction of the faithful generators

Theorem 17 — Canonical anonymous-block generator reconstruction

Let the frozen 50-dimensional carrier decompose into the seven mutually orthogonal central blocks of Theorem 11, with anonymous local factor data as in P-PF12. On every block, place the standard fundamental su(3) generators on the colour factor, the standard fundamental su(2) generators on the weak factor, and $Y = (q/6)I$ on the Abelian factor; extend by the identity on the multiplicity space and by zero on inactive factors. Then the resulting twelve generator matrices — eight su(3), three su(2), one u(1) — agree exactly with the frozen faithful references:

$\varepsilon\_\text{full50D} = 0.000$, $\varepsilon\_\text{charged45D} = 0.000$,

with su(3) and su(2) Lie-algebra closure residuals at machine zero, and the direct trace census is recovered exactly:

$\mathrm{Tr}(T\_C\^a\ T\_C\^a) = 6$, $\mathrm{Tr}(T\_W\^i\ T\_W\^i) = 13/2$, $\mathrm{Tr}((6Y)^2) = 378$. ■

Grading remark

This is an exact canonical representation-level reconstruction, and its consequence for the programme's provenance ledger is substantial: the 45-dimensional generator matrices declared inherited in P-PF10 are now redundant given the census — nothing about them is independent structure beyond the anonymous block data. It is not yet a primitive-action derivation, because the anonymous invariant blocks and their factor dimensions remain inherited inputs (F-PF16). The direct trace triple is exactly the Deliverable 4 direct ledger (d_3, d_2, d_q) = (6, 13/2, 378), now returned by reconstruction rather than declaration.

53. Key-blind commutant reduction

Theorem 18 — Reduction without Hamiltonian selection

The Hermitian commutant of the gauge-plus-grade algebra reduces as

$$55 \xrightarrow{(S_3 \text{ key symmetry})} 13 \xrightarrow{(U(3) \text{ key blindness})} 7,$$

and on the charged-minimal branch as 46 ⟶ 11 ⟶ 6. Under complete generation-key blindness the internal operator must be central:

$$H\_int = \Sigma_{r=0}^{6} h_r P_r.$$

The seven support projectors are thereby fixed, but the seven eigenvalue coefficients h_r are not: two inequivalent central Hamiltonians, of relative difference 0.5661237352, commute exactly with every generator and return the same projector decomposition. ■

The Theorem 16 boundary is thus sharpened from a 13-dimensional to a 7-dimensional residual freedom under the strongest blindness assumption — and no further. The calculation derives species-support structure; it does not manufacture masses or mixing from arbitrary projector eigenvalues, and any presentation to the contrary fires F-PF14.

54. Hypercharge rigidity and the neutral B−L reopening

Theorem 19 — Minimal hypercharge rigidity; neutral-extension grade plane

On the charged-minimal branch, write the completion-compatible grades as (u, d, L, e) = (Q + H, Q − H, −3Q, −3Q − H) (P-PF13). The mixed non-Abelian anomalies vanish identically, while

$$\mathcal{A}\_grav = H - 3Q,\ \mathcal{A}\_Y^3 = (H - 3Q)^3.$$

Anomaly freedom therefore forces H = 3Q, and the grade is unique up to normalisation and overall sign:

q_Y ∝ (1, 4, −2, −3, −6, 3) in the order (Q, u, d, L, e, H).

If the neutral completion relation N = L + H is imposed, all four anomaly expressions vanish identically for arbitrary (Q, H). The solution space is exactly two-dimensional, spanned by

q_Y = (1, 4, −2, −3, −6, 0, 3) and q_B−L = (1, 1, 1, −3, −3, −3, 0). ■

Remark 54.1 — Rigidity, not verification

The charged-minimal result is a genuine rigidity theorem: completion compatibility plus anomaly admissibility *selects* the minimal hypercharge grade rather than checking it after insertion. The uniqueness claim is branch-scoped (F-PF18): on the neutral-extended branch the derived statement is precisely that one independent B−L direction reopens — in agreement with the existing electroweak closure result that a right-handed neutral singlet, when included, must be the unique sterile representation typed as (1, 1, 0), with inclusion optional at the anomaly level. The disposition of the B−L grade is a new, exactly posed debt (D-PF15).

55. Dirac–Majorana non-selection

Theorem 20 — Loewner incomparability of the neutral routes

At every regulator level n = 3, 4, 5, 6, both the FCHI Dirac and Majorana support operators have rank three and are unitary to residual below 1.44×10^{-15}, and both strain matrices are positive and full rank. However, $D^{(n)} - M^{(n)}$ has eigenvalues of both signs at every level — at level six, approximately $(-4.37\times10^{-6}, 1.11\times10^{-5}, 1.20\times10^{-2})$. Therefore neither route dominates the other in Loewner order, and a lower trace or spectral norm cannot legitimately select between them unless the primitive action first derives an objective requiring it (F-PF17). ■

Three independent programme results align here: the completion-interface theorem treats the Dirac neutrino channel as conditional on the sterile module while permitting Majorana-like or effective completion without it; the primitive renewal construction states that the current attaching map does not select the right-handed-singlet branch; and Born weighting cannot create a record class before the class itself has been derived. The correct statement is a premise bifurcation:

Premise	Consequence
Charged-minimal	6 mandatory types, unique Y
Neutral-terminal completeness	7 types, unique sterile N_R
Majorana/effective closure	N_R not required

The present primitive source does not choose between the final two routes; that is the exact content of the conditional grading of the R_1 atom (F-PF13), now proved rather than merely recorded.

56. The primitive-action source-type no-go

Theorem 21 — 108-tangent deficit

The executable primitive source contains 36 scalar edge-phase tangents. A faithful twelve-edge connection requires

$$12 \times (8 + 3 + 1) = 144$$

independent edge tangents. The exact deficit is **108**. The same source supplies no native transition probability, Kraus instrument, hazard, stochastic kernel or physical attempt-rate return. Therefore it cannot dynamically generate the reconstructed matrix-valued generators, return a physical matrix-valued field-to-mark Jacobian, or fix the seven central Hamiltonian coefficients h_r. ■

This no-go is of a different type from Theorems 2 and 10 and extends the family of exact obstructions to a third kind. Theorem 2 was analytic (zero derivative), Theorem 10 combinatorial (unchanged support), Theorem 21 is a *source-type* deficit: the primitive substrate is dimensionally and structurally too small, by exactly counted margins, to carry the dynamics — independent of how ingeniously it is differentiated or refined.

57. EX2C status

Question	Return
Faithful generators from anonymous census data?	**EXACT PASS — Frobenius residual 0.000, traces (6, 13/2, 378)**
Primitive-action derivation of the generators?	**NO — census data inherited (F-PF16); carried to EX2D**
Hamiltonian freedom reduced?	**PASS — 55 → 13 → 7; centrality forced; seven coefficients remain**
Physical Hamiltonian, masses, mixing selected?	**NO — proved (two-Hamiltonian counterexample, relative difference 0.566)**
Charged-minimal hypercharge grade?	**UNIQUE PASS — anomaly rigidity forces H = 3Q**
Neutral-extended hypercharge grade?	**NOT UNIQUE — exact two-dimensional Y ⊕ (B−L) plane**
Dirac vs Majorana route?	**NOT SELECTED — Loewner-incomparable at every level**
Native primitive Hamiltonian return?	**BLOCKED — exact 108-tangent deficit and no native transition law**

58. The EX2D lock

The next locked deliverable is:

PFDMI-EX2D — Matrix-Valued Edge-Field and Native Marked-Kernel Descent.

Required construction

Extend the primitive source *before differentiation* to carry the matrix-valued edge field

$A\_e = \Sigma_{a=1}^{8} A\_e,C\^a\ T\_C\^a + \Sigma_{i=1}^{3} A\_e,W\^i\ T\_W\^i + A\_e,Y\ Y$

on all twelve edges — supplying exactly the 144 tangents whose absence Theorem 21 counts — together with a native field-dependent transition or Kraus law carrying its own probability, hazard or attempt-rate structure.

Pass condition

- the decisive pass object is a **native** field-to-mark Jacobian carrying all 144 faithful gauge tangents — not another post-hoc Fisher realisation (the §18 derivation order is mandatory: scores from marks, never marks from scores);
- the extended source preserves the census of Theorem 11, the typed instrument certificates of Theorems 13–15 and the reconstruction of Theorem 17;
- coefficient, branch and route decisions (h_r, N_R, Dirac/Majorana, B−L disposition) emerge from the extended action with targets frozen out (F-PF4, F-PF5), or are proved underivable from it.

Stop condition

A source extension tuned to observed masses or mixing stops the branch (F-PF4); a Fisher block postulated independently of the native marks fails the §18 derivation order; a route selection by unmotivated norm minimisation fires F-PF17.

Part XI — The faithful matrix-link, native Kraus descent and population-score no-go (PFDMI-EX2D)

59. Closing the 108-tangent deficit

The EX2D source extension installs exactly the carrier whose absence Theorem 21 counted. On every directed K = 7 edge,

$A\_e = \Sigma_{a=1}^{8} A\_e,C\^a\ T\_C\^a + \Sigma_{i=1}^{3} A\_e,W\^i\ T\_W\^i + A\_e,Y\ Y,$

replacing the 36 scalar link phases and giving all twelve faithful Lie-algebra directions on all twelve edges. The declared source dimension is

226 − 36 + 144 = **334**.

No target Hessian and no post-hoc Fisher isometry was used (P-PF14).

Remark 59.1 — The census coincidence

The extended dimension is not merely sufficient: it coincides exactly with the 334-variable faithful source census on which the entire conditional compatibility programme computed its descent certificates. The primitive substrate and the faithful compatibility carrier now share one variable set — the loop between the primitive and faithful layers is closed at the level of the carrier itself.

60. The Wilson gauge quotient

Theorem 22 — Wilson quotient

The linearised six-face curvature map $F = (B\_C \otimes I_{12})A$ has shape 72 × 144 with

rank J_W = 72, nullity J_W = 72,

and the null space is exactly the endpoint-coboundary gauge sector $A\_e = \varphi\_target(e) - \varphi\_source(e)$, with numerical null residual 2.865×10^{-15}. After quotienting the gauge directions, the physical Wilson Hessian has

rank H_W^phys = 72, minimum eigenvalue 6.

The finite Wilson action is invariant under independent endpoint transformations to 1.421×10^{-14}, and the conjugate branches agree exactly at stored precision. ■

The gauge content of the extended source therefore has the correct quotient structure: 144 link tangents, 72 pure-gauge, 72 physical curvature directions, with the coboundary sector playing the same structural role for the matrix link that Theorem L's incidence coboundaries played for the record carrier.

61. The native field-dependent Kraus law

Theorem 23 — Native factorised Kraus descent

With H_h the 31 history marks, N_m the seven neutral marks and P_r the seven central terminal projectors of Theorem 11, the source-extension instrument is

$K_{hmr}\_z(A, s) = c\_z(s_e)\, H_h \otimes N_m \otimes P_r\, U_h(A)$,

with record/export amplitudes

$c\_record(s) = \operatorname{sech} s$, $c\_export(s) = \tanh s$, $c\_record^2 + c\_export^2 = 1$,

so the minimal norm-preserving record-export dilation is part of the declared instrument rather than an attachment after differentiation. At generic export field the instrument has **2695** nonzero support marks. The exact compressed source-to-Kraus Jacobian has shape 19404 × 334 with

rank J_source→Kraus = 156 = 144 (gauge) + 12 (export),

and rank J_A^phys = 72 on the physical gauge quotient. The maximum completeness residual across levels 3–6 is 1.110×10^{-15}, and analytic gauge derivatives agree with central finite differences to 6.667×10^{-13}. ■

The decisive EX2D pass object demanded by §58 is thereby issued: a native field-to-mark Jacobian carrying all 144 faithful gauge tangents, generated by the declared law itself. The derivation order of §18 — scores from marks, never marks from scores — is respected throughout.

62. The central population-score no-go

Theorem 24 — Exact link-independence of central terminal populations

Every terminal projector P_r of Theorem 11 is central under the faithful gauge representation, $[P_r, T_a] = 0$. Therefore

$U_h(A)^\dagger P_r U_h(A) = P_r$,

so every terminal-type effect K†K is exactly independent of the matrix link. The native Kraus-amplitude Jacobian has rank 144, but the direct central terminal population-score Jacobian is

J_central population = 0,

exactly — not merely to first order. ■

Corollary 24.1 — Reconciliation of the field-response results

Theorem 24 dissolves the apparent tension between the programme's field-response returns: the faithful gauge response is genuinely present at first order in the Kraus *amplitudes* (rank 144, Theorem 23); the gauge-invariant Wilson response appears quadratically on the 72-dimensional physical curvature quotient (Theorem 22); and yet central species *populations* cannot directly carry the field score — the very centrality that made the census of Theorem 11 coding-independent (Theorem 16) makes the population probabilities link-blind. The strength of the projector derivation and the population no-go are two faces of one property.

Remark 62.1 — The fourth obstruction type

The programme's exact obstructions now come in four kinds, each closing a different escape route: analytic (Theorem 2 — zero field jet), combinatorial (Theorem 10 — unchanged support), source-type (Theorem 21 — counted tangent deficit), and representation-theoretic (Theorem 24 — centrality). Each was proved for the strongest candidate of its stage, and each converted its failure into an exact specification of the next construction.

63. EX2D status

Question	Return
Faithful 144-dimensional matrix-link carrier?	**PASS — declared 334-variable source**
Wilson gauge quotient?	**PASS — rank 72, exact coboundary null space**
Native field-dependent Kraus law?	**PASS — 2695 support marks, completeness 1.11×10^{-15}**
Native Kraus gauge derivative rank?	**144 (72 on the physical quotient)**
Same-source record-export derivative rank?	**12**
Direct central population-score rank?	**0 — EXACT (Theorem 24)**
Full physical marked-probability Jacobian?	**NOT YET ISSUED**
Clock, attempt rate, ledger renewal, masses, neutral branch?	**NOT CLAIMED**

The old scalar endpoint, current and record-comparison carriers have not yet been upgraded into one common faithful master action; that upgrade is exactly the EX2E object.

64. The EX2E lock

The next locked deliverable is:

PFDMI-EX2E — Representation-Valued Endpoint/Current Carrier and Noncentral Native Score Descent.

Required construction

Replace or extend the scalar endpoint-density, current and record-comparison channels of the source so that the same action generates a **noncentral but gauge-covariant** effect — a representation-valued endpoint/current carrier, interaction effect or equivalent reference structure that does not commute with every terminal projector.

Pass condition

- a nonzero native population-score Jacobian on the physical gauge quotient;
- same-action persistent-ledger renewal — the noncentral carrier must be generated by the declared action, not imported (F-PF20);
- no fitted score embedding (F-PF4, F-PF5, §18 derivation order);
- the census of Theorem 11, the typed certificates of Theorems 13–15, the reconstruction of Theorem 17 and the EX2D quotient and completeness certificates preserved.

Stop condition

A noncentral effect inserted as a declared score matrix rather than derived from the action fires F-PF20 and stops the branch; a population score realised only by breaking gauge covariance fails §19.2; tuning any carrier coefficient to observed data fires F-PF4.

Part XII — The representation-valued current, noncentral native score and ledger-renewal theorems (PFDMI-EX2E)

65. The covariant endpoint/current source

Theorem 25 — One covariant local source

Replacing the scalar endpoint and current variables by $\psi_v \in \mathbb{C}^{50}$ and $j_e \in \mathbb{C}^{50}$ with the same-source covariant residual

$D\_J,e = j_e - (\psi\_t(e) - U_e(A)\ \psi\_s(e))$

gives the declared 2120-dimensional source of P-PF15. At the frozen background D_J,e = 0 on every edge. The real residual Jacobian $J\_D \in \mathbb{R}^{1200x2120}$ has full rank 1200, and the independent infinitesimal gauge transformations at the seven vertices,

$\delta\psi_v = i\varphi_v^a\ T_a\ \psi_v,\ \delta j_e = i\varphi\_t(e)^a\ T_a\ j_e,\ \delta A_e^a = \varphi\_t(e)^a - \varphi\_s(e)^a,$

generate an exact 7 × 12 = 84-dimensional gauge-null family with numerical null residual 2.28×10^{-16}. ■

Remark 65.1 — The link variation is the trivial-background linearisation

The variation $\delta A_e^a = \varphi\_t(e)^a - \varphi\_s(e)^a$ is the linearisation of the non-Abelian gauge transformation at the trivial-link background; at a general nonzero connection the transformation carries the additional adjoint/background term, $\delta A_e = \varphi\_t - \varphi\_s + [\cdot, A_e]$-type contributions in the appropriate convention. The 84-dimensional null family above is certified at the frozen background at which it is computed.

The endpoint, current and link carriers therefore form one genuinely covariant local source — the "common faithful master action" upgrade named at the end of §63.

66. The noncentral current instrument under the maximal-positivity prescription

Theorem 26 — Thirteen-channel current instrument

For each edge, let $\rho\_J,e = |j_e\rangle\langle j_e| / \langle j_e|j_e\rangle$ be the normalised current density, $K\_e,a = i[T_a, \rho\_J,e]$ its orbit under the twelve faithful generators, and $S_e = \Sigma_a K\_e,a^\dagger K\_e,a$. The maximal positivity-preserving normalisation $\eta_e = \lambda\_max(S_e)^{-1}$ — a declared constitutive prescription, P-PF23 — defines thirteen current-channel Kraus operators

$$C\_e,0 = \sqrt{(I - \eta_e S_e)},\ C\_e,a = \sqrt{\eta_e}\, K\_e,a\ (a = 1, \ldots, 12),$$

satisfying $\Sigma\_\alpha\, C\_e,\alpha^\dagger\, C\_e,\alpha = I$ to maximum residual 1.92×10^{-14}, invariantly under orthogonal changes of the twelve-generator frame to 1.18×10^{-15}. No coefficient is fitted to observation: η_e is fixed by the maximal-positivity prescription. ■

Remark 66.2 — Parameter-free is conditional on the prescription

Complete positivity and completeness hold for every $0 < \eta_e \leq \lambda\_max(S_e)^{-1}$, so saturating the bound is a constitutive choice, not a consequence of positivity alone. The instrument is therefore *parameter-free conditional on the maximal-positivity prescription* (P-PF23), and describing it as coefficient-free without that qualification fires F-PF38. Two things are owed: a derivation of the prescription from the master action, and a stability audit showing whether the rank-72 closure of Theorems 27–28 persists across a nontrivial interval of η_e rather than only at saturation. Both are D-PF30.

Remark 66.1 — How the construction evades Theorem 24

The sequential current-and-terminal Kraus operator is $L\_e,\alpha,r(A) = P_r\, C\_e,\alpha\, U_e(A)$. EX2D used effects $U_e^\dagger P_r U_e$, link-independent because P_r is central. The EX2E effects are

$$E\_e,\alpha,r = C\_e,\alpha^\dagger\, P_r\, C\_e,\alpha,$$

and although every P_r is central, C_e,α is built from a particular representation-valued current direction, so $[E\_e,\alpha,r, T_a] \neq 0$ in general. This is exactly the noncentral, gauge-covariant, same-action object specified in §64: the noncentrality lives in the carrier, not the projectors, so the coding-independence of the census (Theorem 16) is untouched.

67. Native probability descent

Theorem 27 — Full-rank native mark-probability Jacobian

The native conditional mark probability is

$$p\_e,\alpha,r(A) = \mathrm{Tr}[\rho\_s(e)\, U_e(A)^\dagger\, E\_e,\alpha,r\, U_e(A)],$$

with analytic derivative $\partial p\_e,\alpha,r/\partial A_e^b = i\,\mathrm{Tr}[\rho\_s(e)(E\_e,\alpha,r\, T\_b - T\_b\, E\_e,\alpha,r)]$ — an unconstrained coordinate derivative, taken with j_e and ψ_v, hence ρ_J,e, C_e,α and E_e,α,r, held fixed (P-PF24). Stacking twelve edges, thirteen current outcomes and seven terminal outcomes gives $J\_mark \in \mathbb{R}^{1092\text{x}144}$ with

rank J_mark = 144, rank(J_mark Q_phys) = 72.

Every physical Wilson direction is visible in actual native mark probabilities. ■

This is the object the programme has pursued since Theorem 2: not a Kraus-amplitude proxy (F-PF19), not a Fisher embedding (§18), but the derivative of genuine outcome probabilities generated by the declared action.

Remark 67.1 — Tangent prescription and the residual shell

The rank statement is certified in the declared coordinate prescription P-PF24 and no wider. Because the source is tied together by the same-source residual D_J,e = j_e − (ψ_t(e) − U_e(A)ψ_s(e)), an on-shell change of A induces a change in j, hence in ρ_J, C_α and E_α,r; the unconstrained coordinate derivative, the tangent derivative to ker J_D, the source-projected derivative J_p(I − J_D$^+$J_D), and the on-shell derivative after solving j = ψ_t − U(A)ψ_s do not in general coincide. The certificate demanded here — the declared physical tangent space, the full derivative including the induced variation D_A E, the ranks before and after residual projection, the gauge-quotient rank, and confirmation of 72 — has now been executed and published as D-PF34 (Remark 67.2): the on-shell rank equals the coordinate rank. F-PF42 henceforth polices the scope of that certificate rather than its absence.

Remark 67.2 — The residual-tangent certificate (D-PF34 discharged for the frozen construction and background)

The published certificate (package PFDMI-EX2E-RT) computes the on-shell derivative directly. The explicit tangent lift L ∈ $\mathbb{R}^{2120\times144}$ — δψ = 0, δA arbitrary, δj solved from δD_J = 0 — satisfies ‖J_D L‖ = 0 exactly, so it lies in the residual shell ker J_D by construction. Along it:

- the on-shell terminal-probability Jacobian has raw rank 72 and Wilson-physical rank **72**, smallest physical singular value 1.2612×10^{-6}, with the terminal-normalisation identities satisfied to derivative residual 2.56×10^{-11};
- the full-shell rank is then pinned without differentiating all 920 residual-tangent directions by an exact sandwich: the explicit 72-dimensional physical subspace supplies the lower bound, and the twelve per-edge normalisation identities cap the independent rows at 12 × (7 − 1) = 72, so **rank J_terminal|_{ker J_D} = 72** on the full residual shell, and 72 again after the declared 84-dimensional gauge quotient;
- the induced-current term is *material*, not a negligible correction — Frobenius norm 1.0546 relative to the coordinate Jacobian, cosine −0.1857 — it rotates and reweights the gauge response, but removes no Wilson-physical direction;
- terminal probabilities are linear aggregations of mark probabilities, so the rank-72 terminal closure forces the on-shell mark-probability Jacobian to rank exactly 72 on the same physical domain;
- finite-difference stability: steps 10^{-4} and 3×10^{-4} agree to relative difference 3.82×10^{-5}, both return physical rank 72, and the raw singular spectrum shows gap ratio 1.096×10^{8} between the 72nd and 73rd values.

The coordinate and residual-projected prescriptions of P-PF24 therefore agree on everything the programme claims: the same 72 physical directions close in both, and the material induced-current rotation changes the Jacobian without changing its physical rank. The scope is exact and narrow (F-PF42): the certificate covers the frozen EX2E construction and the deterministic endpoint/current background at which it was computed. It does not select that background as the physical frame (D-PF17/D-PF21, F-PF21) and does not establish global nonlinear identifiability away from it (D-PF31).

68. Terminal-population closure

Theorem 28 — Exact terminal-type rank closure at linear order

Summing the unobserved current outcomes gives the terminal effect $M_{e,r} = \Sigma_\alpha C_{e,\alpha}^\dagger P_r C_{e,\alpha}$. The terminal-population Jacobian $J_{terminal} \in \mathbb{R}^{84\times144}$ satisfies

rank J_terminal = 72, rank(J_terminal Q_phys) = 72,

and the total-probability derivative vanishes identically, $\Sigma_r\, \partial p_{e,r}/\partial A_e^a = 0$. ■

Corollary 28.1 — Counting closure at linear order

Each edge contributes seven terminal probabilities with one normalisation relation, hence six independent returns; 12 × 6 = 72 = dim of the physical Wilson quotient. The seven terminal type probabilities are therefore **locally identifying at linear order** — they resolve the complete physical gauge content at the tested background — nothing is wasted on gauge directions and nothing physical is missed to first order. The current outcome index α need not remain externally visible for the physical score to survive.

This is a statement of local first-order identifiability, and no more (F-PF39). It does not establish global injectivity of the probability map, uniqueness away from the background, absence of nonlinear degeneracies, or statistical sufficiency in the formal probabilistic sense. Extending the rank statement to a global identifiability theorem is D-PF31.

69. Audits and genericity

Analytic probabilities agree with direct finite differences to 5.83×10^{-11}. Finite local gauge covariance holds to 1.25×10^{-16}. The conjugate-branch conditional Jacobians agree to 6.49×10^{-9} — a residual attributable to numerical square-root diagonalisation in nearly degenerate current-channel blocks, with both branches returning identical ranks and identical physical Gram structure; a degeneracy-aware analytic branch certificate is nonetheless owed (D-PF19).

Five unrelated deterministic endpoint backgrounds were tested; every one returned rank J_mark^phys = 72 and rank J_terminal^phys = 72. The closure is therefore not an accidental rank property of one chirp realisation — though genericity across witnesses is not selection of the physical frame (F-PF21).

70. The full recurrent marked instrument

Theorem 29 — Regulator-stable full descent

Combining the current effects with the frozen history and neutral instruments gives, at level three, $J\_full^{(3)} \in \mathbb{R}^{15288x144}$ with

rank $J\_full^{(3)} = 144$, rank$(J_full^{(3)}\ Q_phys) = 72$,

and the same raw and physical ranks at every regulator level n = 3, 4, 5, 6, with the physical Gram operator regulator-stable at stored precision. The blank-export support contains 15,288 edge/current/terminal marks plus 343 self-history terminal marks: **15,631** nonzero marks. ■

71. Exact persistent-ledger renewal

Theorem 30 — Record-preserving renewal isometry

Completed records are indexed by edge and terminal type, 12 × 7 = 84. The renewal isometry

$|e, r\rangle\_C \longmapsto |e, r\rangle\_A \otimes |e, r\rangle\_L$

has shape 7056 × 84, rank 84 and isometry residual exactly 0. The working carrier is reopened while the completed edge/type label survives in an orthogonal persistent ledger. ■

Remark 71.1 — Grading: a construction identity

The zero residual certifies that the declared renewal architecture is implemented exactly; by F-PF8 it is not evidence that the primitive dynamics *selects* that architecture over an erase-and-reset alternative. Record preservation is here a declared design of the instrument, and deriving it from the master action is D-PF33. The reading below is therefore an interpretation of the declared construction, not a derived property.

This implements record-preserving renewal rather than erase-and-reset: the fact, once committed, is never destroyed by the next attempt. In the emergent-time reading, this is the missing recurrence half of the arrow — Theorem 14 separated transport from commitment within one event; Theorem 30 shows committed facts accumulate isometrically across events.

72. EX2E status

Question	Return
Representation-valued endpoint carrier?	**PASS — $\psi_v \in \mathbb{C}^{50}$, covariant**
Representation-valued current carrier?	**PASS — $j_e \in \mathbb{C}^{50}$, same-source residual, rank 1200**

Question	Return
Noncentral gauge-covariant terminal effects?	**PASS — E = C†P_rC; parameter-free given the maximal-positivity prescription (P-PF23)**
Native conditional probability derivative?	**PASS — rank 144 raw**
Physical Wilson-quotient closure?	**PASS — 72/72, mark and terminal levels, certified in both the coordinate and on-shell residual-tangent prescriptions (P-PF24; D-PF34 discharged for the frozen construction and background)**
Terminal populations alone locally identifying?	**PASS at linear order — counting closure 12 × 6 = 72 (local identifiability; D-PF31)**
Persistent-ledger renewal?	**EXACT PASS as implemented — isometry residual 0; architecture declared, not derived (F-PF8, D-PF33)**
Fitted coefficients anywhere?	**NONE fitted to observation — η_e fixed by the declared maximal-positivity prescription (D-PF30)**
Physical endpoint/current background derived?	**NO — witnessed generic only (F-PF21)**
TPB clock, absolute hazard, attempt rate?	**OPEN**
Masses, mixing, Dirac/Majorana branch?	**OPEN**

73. The EX2F lock

The next locked deliverable is:

PFDMI-EX2F — Primitive Endpoint-Frame Selection and Physical Attempt-Rate Descent.

Required construction

1. Derive the physical endpoint/current background from the finite K = 7 master dynamics — replacing the genericity witness by a selected frame (discharging D-PF17);
2. derive the TPB clock and absolute event hazard/attempt rate from the same dynamics (D-PF18);
3. couple that native clock to the rank-72 probability law of Theorems 27–28 and the exact ledger renewal of Theorem 30.

Pass condition

- the selected endpoint frame and hazard emerge from the primitive dynamics with targets frozen out (F-PF4, F-PF5) and no fitted rate;

- the 72/72 physical closure, the census (Theorem 11), the typed certificates (Theorems 13–15) and the renewal isometry (Theorem 30) are preserved on the selected frame;
- the resulting clocked law feeds the Deliverable 4 weight derivation and the Deliverable 5 blind recovery with derived, not declared, normalisations.

Stop condition

An endpoint frame or attempt rate selected from observed data fires F-PF4; a frame presented as derived when only witnessed generic fires F-PF21; a clock imported from outside the declared dynamics is graded conditional and cannot support primitive promotion.

Part XIII — The history-mode endpoint profile, native Fold compensator and physical-clock boundary (PFDMI-EX2F)

74. The exact D36 history-kernel identity

Theorem 31 — D36/FCHI kernel identity

The population transition matrix extracted directly from the frozen 31-mark history instrument agrees with the independently specified D36 row-normalised discrete-Fold kernel at

$\alpha = 0.959001109719975$

to Frobenius residual 2.996×10^{-16}. Its unique stationary law is

$\pi = (0.189423730906, 0.135096044849, 0.135096044849, 0.135096044849, 0.135096044849, 0.135096044849, 0.135096044849)$,

agreeing with the exact D36 hub/rim stationary law. ■

This is a cross-programme identity, not a fit: the primitive history instrument of the FCHI line and the D36 Fold law of the entropy-dispersion line are the same object at one exactly determined parameter. The Fold and traversal conventions it activates are declared in P-PF16.

75. The unique oriented slow mode

Theorem 32 — Oriented endpoint-profile selection

The largest-modulus nonstationary eigenspace of the history kernel is the isolated conjugate pair

$\lambda\pm = 0.500000000000000 \pm 0.386111824966713i$, $|\lambda\pm| = 0.631729642631344$, with next modulus 0.399082341379126 and isolation gap 0.232647301252218. The selected mode has zero hub amplitude, equal rim amplitudes, and exact rim phase step $-\pi/3$ (residual 1.55×10^{-15}). The finite history law therefore selects a unique cyclic orientation profile, up to global phase and conjugate orientation. ■

Remark 75.1 — The circulation route delivers

This is the first endpoint profile dynamically selected within the driven primitive kernel, and it arrives by exactly the route the non-detailed-balance audit of §47 made available: the frozen transfer carries intrinsic circulation (detailed-balance residual 0.20865), and its dominant slow mode is an oriented rim wave. The frozen nonreversible dynamics thereby selects a unique long-lived orientation profile consistent with the circulation already declared in its drive: the sign and orientation of the parameter α enter through P-PF16, so the dynamics exposes and stabilises that orientation rather than deriving it from an orientation-neutral action (F-PF43). The conjugate pair matches the two-branch structure of P-PF7 — the two orientations are the two branches.

76. Internal endpoint-frame non-selection

Theorem 33 — 836 residual null directions

The representation-current residual Jacobian (1200×2120, rank 1200) has total linearised nullity 920. Removing the exact 84-dimensional *declared local gauge orbit* leaves

836 residual null directions after that quotient.

Whether all 836 are physically inequivalent is not established here: doing so would require proof that no further redundancies, stabilisers, reparameterisations or null symmetries act on them, so 836 is an upper bound on the frame moduli (F-PF40, D-PF32). Even as an upper bound it is nonzero by a wide margin, so the present current action cannot select a unique internal $\mathbb{C}^{50}$ endpoint/current frame. Moreover, dressing the selected $K = 7$ spatial helix of Theorem 32 with one common internal faithful ray returns only

rank J_conditional^phys = 36, rank J_terminal^phys = 18,

below the required 72. ■

Remark 76.1 — The fifth obstruction type

The obstruction typology of Remark 62.1 gains a fifth member: a *moduli* obstruction. The action is not too small (Theorem 21), not too symmetric (Theorem 24) — it is too flat: an 836-dimensional space of inequivalent frames sits at exactly zero cost, so no gradient, spectral or variational principle inside the current action can prefer one. The spatial orientation is selected by the dynamics; the internal frame requires genuinely new structure, not a better search of the existing landscape. Frame selection by any external preference fires F-PF21; identifying the spatial helix itself as the internal frame fires F-PF24, since 36/18 < 72 is proved.

77. The native jump/no-jump Fold law

Theorem 34 — State-dependent Fold compensator

The EX2E current channel already contains the exact split $C_0†C_0 + \Sigma_{a=1}^{12} C_a†C_a = I$. Reading C_0 as the no-event mark and C_a ($a \geq 1$) as accepted current marks — a declared semantic assignment, P-PF25, not a derived classification — gives the native edge jump probabilities

$h_e = \Sigma_{a=1}^{12} \mathrm{Tr}(\rho\_s(e)\ C\_e,a†\ C\_e,a) \in [0.528765611869, 0.540932484068]$.

Combining these with the D36 history kernel yields the state-dependent one-Fold hazards

$h(x) \in [0.424713168175, 0.458900416118]$,

the predictable discrete compensator $\Lambda_n = \Sigma\_k<n\ h(X_k)$, and the continuous-equivalent per-Fold intensity $\lambda(x) = -\log(1 - h(x))$. ■

Remark — The event reading is a premise of the clock chain

The exact split $C_0†C_0 + \Sigma_a C_a†C_a = I$ supplies one complement channel and twelve others; it does not by itself establish that the complement physically means "nothing happened" and the rest "an event happened". No operational record distinguishing an accepted event is yet specified. The hazard, compensator and mean-waiting results below are exact given the reading (P-PF25); presenting the classification as derived fires F-PF44, and deriving it from persistent-record production is D-PF35. The clocked chain of Theorems 35–36 inherits this premise exactly as it inherits serial composition (P-PF21) downstream.

This is no longer an assumed equal-hazard benchmark: the compensator is calculated from the actual noncentral EX2E current instrument, state by state.

78. Finite mean waiting

Theorem 35 — Accepted-event occurrence with probability one under P-PF25

The no-event survival kernel has spectral radius

$\rho(S) = 0.567167931708295 < 1$,

so an outcome classified as an accepted event under the declared reading P-PF25 occurs with probability one and the waiting time has finite mean; until D-PF35 closes, "commitment" is the physical interpretation of that mathematical statement. From the stationary history law,

E[N_event] = 2.309619142799032 Folds,

with state-wise means ranging approximately over [2.2466, 2.3305]. ■

79. The clocked probability score

Theorem 36 — Clocked law with full physical closure

Under the event-semantics premise P-PF25, the accepted jump-terminal derivative $J\_event \in \mathbb{R}^{84\times144}$ has rank 84 and physical-quotient rank 72. Normalising by the native hazard, the conditional destination probabilities B_r(A) = p_r^event(A)/h(A) have Jacobian rank 72 and physical rank 72, with derivatives summing to zero across the seven terminal destinations, as normalised conditional probabilities must. The same ranks are returned at regulator levels 3, 4, 5, 6 with stored Gram drift exactly 0. ■

The native clock, the rank-72 probability score of Theorems 27–28 and the exact ledger renewal of Theorem 30 now operate as one coherent discrete marked law — the coupled object demanded by §73 item 3. What that law measures time in is the remaining question.

80. The exact physical-clock boundary

Theorem 37 — Attaching-map necessity and scaling non-identifiability

(i) The history support contains 31 marks — 7 self marks and 24 directed nonself transitions represented by 12 signed branch edge labels — while the geometric closure orbit γ_0 contains 14 oriented constraint traversals (P-PF16). None of 31 ↔ 14, 24 ↔ 14 or 12 ↔ 14 is an identity map. The Fold-to-traversal bridge must therefore be a quotient, traversal bundle or stopping-time attaching map, not a mark-equals-traversal identification — exactly the bridge the ASAC analysis required before promoting the geometric traversal duration to the duration of one Fold.

(ii) For every $\nu > 0$, Poissonising the same discrete marked instrument at attempt intensity ν leaves the embedded history transition kernel, the state-dependent hazards, the conditional destination probabilities, the rank-72 score and the ledger renewal all unchanged, while multiplying every physical rate by ν. Therefore no dimensionless calculation can select a unique value in s^{-1}. ■

The two parts localise the remaining clock problem exactly: (i) says *which* combinatorial object is missing; (ii) says *why* nothing already computed can substitute for it.

81. Conditional SI values

Under the expressly conditional Route-M identification of P-PF16 — one Fold = one oriented traversal, $\Delta t_0 = 3.356217792\times10^{-13}$ s — the mean event interval would be

$\langle t\_event \rangle = 7.751584859\times10^{-13}$ s, $r\_event = 1.290058766\times10^{12}\ s^{-1}$.

These are useful conditional predictions and are not promoted to primitive returns (F-PF23). *Superseded: the EX2G bridge derives two traversals per Fold, not one — see §88 for the superseding conditional values.*

82. EX2F status and the EX2G lock

Question	Return
D36 history-kernel reconstruction?	**EXACT PASS — residual 2.996×10^{-16} at $\alpha = 0.959001\ldots$**
Unique oriented long-lived K = 7 mode?	**PASS — rim wave, phase step $-\pi/3$, gap 0.2326**
Unique internal endpoint frame?	**NOT SELECTED — 836 residual null directions after the declared gauge quotient; helix dressing gives 36/18**
Native state-dependent Fold compensator?	**PASS — $h(x) \in [0.4247, 0.4589]$, conditional on the event-semantics reading P-PF25**
Finite mean waiting time?	**PASS — $\rho(S) = 0.5672 < 1$; E = 2.3096 Folds, conditional on P-PF25**
Clocked physical score?	**PASS — 72/72, zero Gram drift, n = 3–6, under P-PF25**
Fold-to-traversal identity map?	**DOES NOT EXIST — attaching map required**
Universal attempt rate in seconds?	**NOT SELECTED — exact ν-scaling freedom**
Conditional Route-M SI values?	**$\langle t\rangle = 7.752\times10^{-13}$ s, $r = 1.290\times10^{12}$ s^{-1} — CONDITIONAL ONLY**

The next locked deliverable is:

PFDMI-EX2G — Primitive Fold-to-Traversal Attaching Map and Dimensionful Master-Rate Coefficient.

Required construction

1. Derive the stopping-time, quotient or bundle attaching map from the 31 history marks to the 14 oriented geometric traversals from the master action (discharging the Theorem 37(i) requirement);
2. return one non-inserted dimensionful coefficient from the same master action, breaking the Theorem 37(ii) scaling freedom (D-PF20);
3. couple the resulting dimensionful clock to the clocked rank-72 law of Theorem 36 without disturbing its Gram structure.

Pass condition

- the attaching map and coefficient emerge from the declared master dynamics with targets frozen out (F-PF4, F-PF5) and no rate fitted to observed times (F-PF25);
- the D36 identity (Theorem 31), the oriented mode (Theorem 32), the compensator and waiting-time laws (Theorems 34–35) and the clocked closure (Theorem 36) are preserved;
- the conditional Route-M values of §81 are either derived, superseded or refuted — never silently adopted.

Stop condition

An attaching map or attempt intensity chosen to reproduce a target SI rate fires F-PF25; a mark-equals-traversal identification asserted without derivation fails Theorem 37(i); promotion of §81's conditional values without the derived bridge fires F-PF23.

Part XIV — The canonical incidence attaching map, closure-cover stopping time and master-rate boundary (PFDMI-EX2G)

83. The forced attaching map

Theorem 38 — Canonical attaching map (within the declared admissible class)

Admissible class (declared, P-PF22): maps that are $\mathbb{R}$-linear in the mark, real non-negative integer coefficient-valued, normalised to exactly one arrival unit and one departure unit per mark — total incidence weight two — supported only on the endpoint orientations of that mark, uniform in their treatment of self-marks, and covariant under the wheel automorphisms and mark reversal.

On the canonical wheel (P-PF17), every directed history mark $x \to y$ has one source and one target endpoint. Within that class, locality, endpoint orientation, wheel-automorphism covariance and edge-reversal covariance force the attaching rule

$\boldsymbol{\mathcal{A}(x \to y) = C\_y^{+} + C\_x^{-}}$**:**

every history mark attaches exactly one arrival orientation and one departure orientation. The attaching matrix has shape 14×31 and rank 13, the sole universal row relation being the exact balance identity

$$\Sigma_j C_j^{+} = \Sigma_j C_j^{-}$$

(total arrival incidence equals total departure incidence). The map is exactly covariant under all twelve wheel automorphisms and under mark reversal, and is unique up to globally exchanging the meanings of $+$ and $-$. ■

The object Theorem 37(i) proved necessary is therefore not merely constructed but forced *within the declared admissible class*: there is exactly one such attaching map, and its single discrete ambiguity is the global orientation sense — which Theorem 40 then resolves dynamically.

Remark 83.1 — Scope of "forced"

Uniqueness is relative to P-PF22 and no wider. The classification does not yet exclude weighted incidence maps, phase-valued attachments, orientation-dependent coefficients, additional local endpoint terms, non-uniform treatment of self-marks, or maps related by basis transformations beyond the global $+ \leftrightarrow -$ exchange. A formal classification lemma stating the coefficient domain, linearity, normalisation and allowed support, and proving uniqueness within it, is owed as D-PF28; until then "forced" is read as "unique within the declared class" and any wider reading fires F-PF36.

84. The seven-Fold minimal closure bundle

Theorem 39 — Hamiltonian closure characterisation

A closed history trajectory covers every one of the fourteen attached orientations exactly once if and only if it is a Hamiltonian cycle of the seven-state wheel. Exhaustive enumeration returns exactly **12** directed minimal cycles, all in one D_6 symmetry orbit. Each contains seven history Folds and attaches $7 \times 2 = 14$ oriented incidences with zero multiplicity residual. ■

Terminology (Parts XIV–XV)

An **oriented incidence** is the combinatorial output of the attaching map: a labelled contact between a history mark and an oriented constraint. A **physical traversal interval** is a dimensionful stretch of time. Theorem 39 establishes the incidence relation only; identifying fourteen incidences with fourteen distinct additive traversal intervals requires P-PF21 and is not proved here (Remark 87.1).

This is the first concrete attaching relation of the programme:

7 Folds ↔ 14 oriented incidences,

resolving the 31/24/12-versus-14 mismatch of Theorem 37(i) at the combinatorial level of minimal closed bundles rather than individual marks — a quotient by trajectory, exactly the "stopping-time" species of bridge the theorem permitted.

85. Dynamical orientation selection

Theorem 40 — Orientation selection at trajectory level

Six minimal cycles follow the preferred rim orientation and six the conjugate orientation. Under the exact D36 kernel their probability odds are

$P_+/P_- = e^{10\alpha} = 14618.031752660811$, $\alpha = 0.959001109719975$,

so conditional on completing a minimal seven-Fold closure, the preferred orientation has probability **0.999931596017**. The six alternatives within each orientation class are rotationally related starting cuts: the dynamics selects the orientation but no privileged rim vertex. ■

Remark 85.1 — One selection, two levels

Theorem 32 selected the orientation spectrally — the slow mode of the kernel — and Theorem 40 now selects the same orientation at trajectory level, with exponential odds in the drive parameter. The ± ambiguity that Theorem 38 necessarily leaves in the attaching map is thereby resolved dynamically rather than conventionally — but relative to the declared drive: the odds $e^{10\alpha}$ inherit the sign of the drive parameter α (P-PF16), so both levels of selection expose and reinforce the circulation already encoded in the kernel rather than deriving orientation from an orientation-neutral action (F-PF43).

86. The closure-cover stopping time

Theorem 41 — Finite closed-cover law

The first closed complete cover — first return to the starting state after all seven wheel states have been visited — is absorbing with probability one (residual 8.882×10^{-15}). The exact distribution gives

E[N_cover] = 21.277682950916294 Folds,

with median 19, 90th percentile 34, 99th percentile 51, and minimum-achievement probability $P(N = 7) = 0.006694060598121$. Since every Fold attaches two incidences, the mean complete trajectory contains 42.555365901833 attached incidences: the fourteen distinct orientations plus 28.555365901833 repetitions (P-PF21 alone converts these into distinct physical traversal intervals). ■

The generic closure is therefore about three times the minimal one: the world usually retraces its steps before completing a circuit, and the excess is now an exactly computed distribution rather than a modelling choice.

87. The derived master-rate formula

Theorem 42 — Fold rate up to one length (conditional on serial composition)

The geometric closure orbit contains fourteen oriented traversals of duration $\Delta t_0 = (8\pi/21)(\xi/c)$ each (P-PF16). The minimal history bundle of Theorem 39 carries fourteen ordered oriented incidences in seven Folds, so each Fold attaches exactly two. **Under the serial-composition premise P-PF21** — each attached orientation corresponds to a distinct physical traversal, the two occur serially rather than simultaneously, their durations add without overlap, and the Fold begins before the departure traversal and ends after the arrival traversal — full-orbit time consistency gives

$\tau\_F = 2\Delta t_0 = (16\pi/21)(\xi/c)$,

and therefore the master-rate formula

$\nu\_F = (21/16\pi)(c/\xi)$, $21/16\pi = 0.417781725616225$.

The native EX2F clocked terminal and conditional-destination Jacobians remain at full physical rank 72/72 after the attaching calculation. ■

Remark 87.1 — The incidence count does not by itself fix the duration

The combinatorics of Theorem 39 establish that each Fold attaches one departure and one arrival incidence. They do **not** establish that those two incidences consume two consecutive, additive time intervals. The attachment is equally consistent with two endpoints of one physical transition, with simultaneous boundary incidences, or with overlapping geometric contributions; only the serial reading yields $\tau\_F = 2\Delta t_0$. P-PF21 is therefore a declared premise, not a derived result, and Theorem 42 is graded conditional on it (F-PF35). Deriving or refuting serial composition from the master action is debt D-PF27, and it carries the coefficient $21/16\pi$ and the §88 supersession with it.

The dimensionless coefficient demanded by the EX2G contract is thereby returned — derived, not inserted — and the residual freedom of Theorem 37(ii) is sharpened from an arbitrary attempt intensity ν to the single physical length ξ: the transformation $\xi \mapsto a\xi$, $\tau\_F \mapsto a\tau\_F$, $\nu\_F \mapsto \nu\_F/a$ leaves the D36 kernel, the attaching map, the closure-cover law in Fold units, the rank-72 score and the ledger renewal all unchanged. The clock question is now one number wide.

88. Supersession of the Route-M identification

The EX2G contract required that the §81 conditional values be derived, superseded or refuted — never silently adopted. The outcome is *conditional* supersession: the bridge attaches **two** incidences per Fold, so under the serial-composition premise P-PF21 the Route-M identification "one Fold = one oriented traversal" is superseded. Absent that premise the incidence count alone does not decide between the one- and two-interval readings (Remark 87.1), so §81 is displaced rather than refuted, and both readings remain on the table until D-PF27 closes. On the conditional Route-M value of ξ (the absolute ruler remains conditional, F-PF27), the serial-composition values are:

$\tau\_F = 6.71243558348\times10^{-13}$ s, $\nu\_F = 1.48977221094\times10^{12}$ s^{-1},

giving, with the EX2F mean event wait, the conditional current-event rate

$6.45029383128\times10^{11}$ s^{-1},

and the conditional first complete closure-cover rate

$7.00157162026\times10^{10}$ s^{-1}.

These remain conditional on three separate things — the Route-M absolute ξ, the serial-composition premise P-PF21, and the canonical wheel-to-constraint identification (§89) — and are not unconditional predictions.

89. The symmetry boundary

The abstract closure-orbit argument invokes permutation symmetry among seven equivalent constraints — an S_7-symmetric carrier. The executable history object has wheel automorphism group

D_6, $|D_6| = 12$,

with every automorphism fixing the hub. EX2G therefore establishes the canonical **D_6 wheel** attaching map, and does *not* establish primitive identification with an S_7-symmetric constraint carrier. The two structures are not silently treated as the same (F-PF26): the hub is dynamically distinguished in the executable object, while the abstract argument treats all seven constraints as exchangeable. Whether the identification is a theorem, a quotient construction or a genuine mismatch is the second EX2H question.

90. EX2G status and the EX2H lock

Question	Return
Canonical local attaching map?	**PASS within the declared admissible class P-PF22 — unique there, up to global ± exchange (D-PF28)**
Seven-Fold minimal closure bundle?	**PASS — 12 Hamiltonian cycles, one D_6 orbit, 7 Folds ⟷ 14 oriented incidences exact**
D36 orientation selection?	**PASS — odds $e^{10\alpha}\approx 14618$; probability 0.9999316**
Finite closed-cover stopping time?	**PASS — E = 21.278 Folds; absorption probability 1**
Fold-rate formula?	**CONDITIONAL — $\nu_F = (21/16\pi)(c/\xi)$ follows under the serial-composition premise P-PF21; coefficient not fitted (D-PF27)**
Route-M one-traversal identification?	**CONDITIONALLY SUPERSEDED under P-PF21; otherwise unresolved**
Clocked 72/72 score preserved?	**PASS**
Abstract S_7 identification?	**OPEN — executable symmetry is hub-fixing D_6**

Question	Return
Unconditional rate in seconds?	**OPEN — single residual freedom: absolute ξ**

The next locked deliverable is:

PFDMI-EX2H — Same-Action Absolute-Closure-Scale and Hub-to-Constraint Identification.

Required construction

1. Return the absolute closure scale ξ from the common primitive marked action — one non-inserted dimensionful number breaking the $\xi \mapsto a\xi$ freedom (discharging the residue of D-PF20 carried as D-PF22);
2. derive the hub-to-constraint identification: prove, construct as a quotient, or refute the identification of the D_6 wheel carrier with the S_7-symmetric abstract constraint carrier (D-PF23);
3. couple the resulting absolute clock to the clocked rank-72 law and closure-cover distribution without disturbing their certificates.

Pass condition

- the scale and identification emerge from the declared master action with targets frozen out (F-PF4, F-PF5, F-PF27) — no length, time or rate fitted to observation;
- the attaching map (Theorem 38), closure bundle (Theorem 39), orientation selection (Theorem 40), cover law (Theorem 41) and rate coefficient (Theorem 42) are preserved;
- the §88 conditional values are derived, superseded or refuted by the absolute result — never silently adopted.

Stop condition

An absolute ξ selected from observed times or lengths fires F-PF27; a hub-to-constraint identification asserted without derivation fires F-PF26; promotion of §88's conditional rates without the absolute scale fires F-PF23.

Part XV — Symmetry-stabilizer distinguishability, hub identification and the absolute-scale boundary (PFDMI-EX2H)

91. Transitivity forbids committed role distinction

Theorem 43 — S_7 transitivity excludes nontrivial *invariant binary* role labels

Let the seven closure constraints carry the full pre-role permutation action of S_7. Exhaustive enumeration of all $2^7 = 128$ binary role assignments finds exactly two that are S_7-invariant:

(0, 0, 0, 0, 0, 0, 0) and (1, 1, 1, 1, 1, 1, 1).

A committed, individually S_7-invariant binary role assignment therefore cannot distinguish one global constraint from six boundary constraints. Selecting one constraint as the global closure role gives seven labelled choices forming a single S_7 orbit; the stabiliser of any one choice has order $6! = 720$ and is S_6. The split

7 = 1 + 6

is consequently unique up to pre-role relabelling. ■

Remark 91.1 — The boundary is principled, and the scope of that claim

§89 left the S_7/D_6 relation open as a possible mismatch. Theorem 43 shows the reduction is principled rather than accidental: within the class of fixed binary role labellings, the only S_7-invariant ones are the two constant labellings, so a committed invariant role assignment cannot single out one constraint. The question was not whether the executable object had lost a symmetry it should have kept, but whether the loss had a reason. It does.

The claim must be held at that width (F-PF37). Theorem 43 does **not** show that every form of distinguishability requires explicit symmetry reduction. It does not exclude spontaneous symmetry breaking, covariant families of non-invariant states, order parameters transforming in nontrivial S_7 representations, or probabilistic and relational distinctions in place of fixed binary labels. Each of those remains a live alternative route to distinguishability, and closing or excluding them is D-PF29. What Theorem 43 does establish is enough to motivate the orbit-stabiliser construction of Theorem 44 and Corollary 44.1, which is how it is used here.

92. Three-axis locality forces the D_6 wheel

Theorem 44 — Three-axis, connected two-neighbour locality selects the C_6 wheel and D_6 stabiliser

The six boundary roles admit exactly 15 perfect matchings into three antipodal pairs; a fixed matching has stabiliser of order 48, the pair-preserving wreath product $C_2 \wr S_3$. Requiring connected two-neighbour cyclic locality, exhaustive enumeration of simple graphs on six labelled vertices returns exactly 60 connected 2-regular graphs, all labelled copies of C_6 in one S_6 orbit, each with automorphism group of order 12 — so $S_6 \longrightarrow D_6$. Exactly one of the 15 matchings is invariant under the full D_6, namely the hexagon's opposite vertices (0, 3), (1, 4), (2, 5); the induced action on the three pairs has order six, so all three spatial axes remain equivalent and no preferred axis is introduced. Adding a universal hub gives $W_7 = C_6 + h$, with exactly

$$7 \times 60 = 420 = 5040/12 = |S_7|/|D_6|$$

labelled realisations, all in one S_7 orbit, each with automorphism group D_6 and vertex orbits 1 + 6. ■

Corollary 44.1 — The S_7/D_6 relation is orbit-stabiliser

The two counts agree exactly, so {labelled committed W_7 structures} ≅ S_7/D_6. Hence

S_7 = pre-role equivalence of the seven constraints, D_6 = stabiliser of one committed, distinguishable 1 + 6 structure.

S_7 and D_6 are not competing proposed physical symmetries: they apply at different structural stages. The debt D-PF23 is thereby discharged in the "quotient construction" branch of its three permitted outcomes, and F-PF26 is retired into F-PF28, which now polices stage confusion rather than silent identification.

The source architecture already carried the same distinction: C_6 is vertex-transitive, whereas W_7 has a unique degree-six hub fixed by every automorphism together with a transitive six-vertex boundary orbit.

93. Spectral commitment

Theorem 45 — Hub conversion of the floating boundary mode

The exact Laplacian spectra are

Spec $L(C_6) = (0, 1, 1, 3, 3, 4)$, Spec $L(W_7) = (0, 2, 2, 4, 4, 5, 7)$.

The uniform boundary displacement is null on C_6. Once the independent hub is installed, the relative hub-boundary mode $(-6, 1, 1, 1, 1, 1, 1)$ has exact eigenvalue **7** (stored residual exactly zero), and only the global constant mode $(1, 1, 1, 1, 1, 1, 1)$ remains null. The transition is therefore

floating boundary freedom ⟶ resolved hub-boundary relation + global gauge redundancy. ■

Remark 93.1 — Necessary caveat

Graph connectivity alone explains the one-dimensional kernels. Their *interpretation* as physical floating freedom versus global gauge redundancy depends on the observer-protocol and admissibility bridge, and is declared rather than derived here (P-PF18, F-PF29). The physical reading agrees with the existing commitment architecture — six boundary modes carry three antipodal axes, while a separate hub prevents the residual uniform boundary freedom from remaining physically unresolved — but the agreement is corroboration, not proof.

94. Retention of the marked calculation

Theorem 46 — No prior certificate is weakened

The EX2G incidence attaching map retains rank 13, with every history mark carrying one departure and one arrival incidence. The native event-destination and jump-terminal physical Jacobians retain

rank $J_{event}^{phys} = 72$, rank $J_{jump}^{phys} = 72$.

The symmetry derivation therefore strengthens the interpretation of the S_7/D_6 boundary without weakening any part of the clocked gauge response. ■

95. The exact absolute-scale boundary

Theorem 47 — Two-dimensional scaling no-go

In logarithmic variables (ξ, τ_F, ν_F, k_{max}, E_0, $\mathcal{A}\star$, ℓ_e), the declared closure-clock, rate, cutoff, threshold and hierarchy relations of P-PF18 form an exponent matrix of shape 5×7 and rank 5. Its nullity is exactly

2.

The two independent continuous freedoms are:

- **Length/rate orbit:** $\xi \mapsto a\xi$, $\tau_F \mapsto a\tau_F$, $\nu_F \mapsto \nu_F/a$, $k_{max} \mapsto k_{max}/a$, $E_0 \mapsto E_0/a$, $\ell_e \mapsto a\ell_e$;
- **Action orbit:** $\mathcal{A}\star \mapsto b\mathcal{A}\star$, $E_0 \mapsto bE_0$.

Both leave the graph, the attaching map, the D36 probabilities, the closure phases and the physical rank-72 score unchanged. ■

Corollary 47.1 — What is genuinely returned, and what cannot be

The following are genuine derived returns of the programme and are all dimensionless:

$K = 7$, $|D_6| = 12$, $|\gamma_0| = 14$, $\lambda_{hub-boundary} = 7$, $21/16\pi = 0.417781725616225$, $\Theta_M = 70.0341565881011$.

None of them selects metres, seconds or a numerical action unit, and within the declared relation subsystem of P-PF18 the deficiency is exactly two-dimensional and invisible to every invariant listed. The absolute-scale question is therefore not "one unknown length" as §87 left it, but precisely **one length and one action** — sharper, and not resolvable within the present dimensionless relation subsystem. Theorem 47 does not prove that the full primitive action cannot generate a further dimensionful relation; supplying one is precisely the EX2I contract, and asserting a stronger impossibility fires F-PF41.

96. EX2H status and the EX2I lock

Question	Return
Full S_7 transitivity vs role distinction?	**INCOMPATIBLE — only two invariant labellings; reduction necessary**
Unique hub-plus-boundary split?	**PASS — 7 = 1 + 6, stabiliser S_6 of order 720**
Three-axis pairing and cyclic locality?	**PASS — 60 copies of C_6, unique D_6-invariant matching, no preferred axis**
Committed graph and stabiliser?	**PASS — $W_7 = C_6 + h$, Aut = D_6**
S_7/D_6 census?	**EXACT — 420 = 7 × 60 =
Spectral hub commitment?	**PASS — eigenvalue 7 exact; one global gauge mode remains**
EX2G attaching map and physical scores?	**RETAINED — rank 13; 72/72**
Absolute ξ, action unit, SI rate?	**NOT DERIVED — exact two-dimensional scaling no-go**

The next locked deliverable is:

PFDMI-EX2I — Same-Action UV-Ruler and Absolute Master-Action Coefficient Descent.

Required construction

Reduce the two-dimensional scaling null space of Theorem 47 using dimensionful quantities returned by the primitive action itself: one source-native UV ruler fixing the length/rate orbit (D-PF22, restated) and one numerical master-action coefficient fixing the action orbit (D-PF24).

Pass condition

- both quantities emerge from the declared master action with targets frozen out — **no Planck-ruler insertion and no Standard Model calibration** (F-PF4, F-PF5, F-PF27, F-PF30);
- the census (Theorem 11), typed certificates (Theorems 13–15), clocked law (Theorem 36), attaching bridge (Theorems 38–42) and symmetry chain (Theorems 43–45) are all preserved;
- the §88 conditional rates are then derived, superseded or refuted by the absolute result — never silently adopted.

Stop condition

A ruler imported from Planck units, from an observed length or time, or from Standard Model calibration fires F-PF30 and stops the branch; a dimensionless invariant presented as closing either orbit fails Theorem 47; promotion of any SI rate without both orbits closed fires F-PF23.

Falsifier ledger

Each falsifier names a presentation or construction move that voids the corresponding claim if committed.

- **F-PF1 (generation overclaim).** Presenting the three closed terminal orbits of Theorem 1 as a derivation of three ordered fermion generations fires. The keys are unordered under free S_3 action and carry no mass, mixing or typing structure.
- **F-PF2 (scope inflation).** Presenting the Theorem 5 no-go as a no-go for all field-dependent MASD-HMGBC instruments fires. The theorem is exact for the current identity-field candidate only.
- **F-PF3 (inversion reconstruction).** Reconstructing the missing primitive field derivative by downstream inversion of RCMO/RRHF/HCMR arrays fires. A derivative absent from the marks may not be manufactured from the targets it was supposed to predict.
- **F-PF4 (data-selected source).** Selecting any mark amplitude, orbit structure, channel count or branch from observed masses, couplings, mixing angles or phases fires.
- **F-PF5 (premature target opening).** Opening RCMO/RRHF/HCMR comparison arrays before the new primitive kernel and its hashes are frozen and published fires.
- **F-PF6 (inserted channel block).** Presenting a score matrix that carries a fixed four-channel identity block regardless of the orbit ledger as a derived score law fires. This is the standing SGPL pattern of §11.
- **F-PF7 (single-cell certificate).** Presenting a single-level or single-branch success as a primitive provenance certificate fires. Deliverable 6 is mandatory.
- **F-PF8 (identity as evidence).** Reporting a construction identity as evidence fires. Identities certify implementation, not physics.
- **F-PF9 (type mixing).** Identifying the three terminal keys, or the six $K = 7$ rim states, directly with representation roles fires. Generation-key carriers and typed species carriers are distinct objects (§15).
- **F-PF10 (post-comparison adjustment).** Adjusting the frozen source, tolerances or promotion criteria after the comparison stage opens fires. The three promotion outcomes of §25 are exhaustive.
- **F-PF11 (rank agreement overclaim).** Presenting the EX2A post-freeze rank agreement (§40) as a Deliverable 5 blind-recovery pass, or as ledger/score selection, fires. Ranks are consistency evidence; the array-level recovery contract and the selection deliverables remain open.
- **F-PF12 (pre-named split).** A support-changing refinement whose orbit splitting is selected by naming the target roles (Q, u, d, L, e, N, H), or their charges, in advance fires. The splitting must be driven by representation invariants and completion admissibility alone.
- **F-PF13 (unconditional N_R claim).** Presenting the R_1 neutral atom as unconditionally selected fires. Its population enters through the extended FCHI neutral-terminal branch, not the charged faithful carrier; selection or exclusion is the EX2C contract.
- **F-PF14 (mass/mixing overclaim).** Presenting the projector census as a derivation of masses, generation mixing or a physical internal Hamiltonian fires. Theorem 16 proves

two unrelated central Hamiltonians return identical projectors; the census fixes support, not spectra.

- **F-PF15 (geometry overclaim).** Presenting the typed refinement as a rewrite of the $K = 7$ geometric adjacency complex fires. The refinement types terminal outcomes; the wheel itself is unchanged.
- **F-PF16 (reconstruction overclaim).** Presenting the Theorem 17 canonical reconstruction as a primitive-action derivation of the generators fires. The anonymous blocks and factor dimensions are inherited census inputs; primitivity is the EX2D contract.
- **F-PF17 (unmotivated route selection).** Selecting the Dirac or Majorana neutral route by trace, spectral-norm or any other minimisation not derived as an objective from the primitive action fires. Theorem 20 proves Loewner incomparability.
- **F-PF18 (branch-scoped rigidity).** Presenting the charged-minimal hypercharge uniqueness of Theorem 19 as covering the neutral-extended branch fires. There the exact solution space is the two-dimensional $Y \oplus (B-L)$ plane.
- **F-PF19 (amplitude-for-population substitution).** Presenting the rank-144 native Kraus-amplitude gauge response of Theorem 23 as a physical field-to-population score fires. Theorem 24 proves the direct central population score exactly zero; amplitudes and populations are distinct claims.
- **F-PF20 (imported noncentral carrier).** A noncentral effect supplied as a declared score matrix, reference structure or embedding not generated by the same primitive action fires. The EX2E carrier must be same-action or the resulting claim is graded conditional.
- **F-PF21 (witness-for-selection substitution).** Presenting the deterministic prime-chirp endpoint background — or any genericity witness, however many unrelated alternatives confirm the rank — as a primitive derivation of the physical endpoint/current frame fires. Genericity across witnesses establishes robustness of the closure, not selection of the frame.
- **F-PF22 (unclocked absolutisation).** Presenting the rank-72 conditional probability law as an absolute physical event law before the TPB clock and attempt-rate hazard are derived fires. The EX2E probabilities are conditional on an event attempt; the dimensionless hazard is now derived (Theorem 34), and the falsifier henceforth polices the dimensionful step: absolutisation in seconds before the EX2G bridge fires.
- **F-PF23 (conditional SI promotion).** Presenting any conditional SI rate as a primitive physical return fires. The §81 values (built on "one Fold = one oriented traversal") are *conditionally* superseded under the serial-composition premise P-PF21 and otherwise merely displaced (§88, Remark 87.1); the §88 values remain conditional on the Route-M absolute ξ and on the §89 identification, and may not be promoted until the EX2H scale is derived.
- **F-PF24 (helix-for-frame substitution).** Presenting the selected spatial orientation mode of Theorem 32 as the internal endpoint frame fires. Dressing the helix with one common internal ray provably returns physical ranks 36/18 against the required 72 (Theorem 33).
- **F-PF25 (rate fitting).** An attaching map, attempt intensity or dimensionful coefficient selected to reproduce an observed rate, lifetime or time scale fires. The EX2G coefficient $21/16\pi$ is not fitted to observation, but its physical clock interpretation remains conditional on P-PF21; the EX2I scale must satisfy the same non-fitting requirement.

- **F-PF26 (retired — superseded by F-PF28).** The silent-identification falsifier is discharged by Corollary 44.1, which establishes the exact orbit-stabiliser relation S_7/D_6. Its policing role passes to F-PF28.
- **F-PF27 (absolute-scale insertion).** An absolute value of ξ imported from the Route-M ruler, from observed data, or from any source other than the common primitive marked action fires when used in a primitive claim. Conditional use under express grading is permitted.
- **F-PF28 (symmetry-stage confusion).** Presenting S_7 and D_6 as competing physical symmetries, or applying either at the wrong structural stage, fires. S_7 is pre-role equivalence; D_6 is the stabiliser of committed distinguishability (Corollary 44.1). Equally, presenting the reduction as a symmetry *loss* rather than as the condition of a nonconstant committed invariant binary role labelling (Theorem 43) fires.
- **F-PF29 (kernel-interpretation overclaim).** Presenting the C_6 and W_7 Laplacian kernels as *derived* physical floating freedom or global gauge redundancy fires. Connectivity explains the kernel dimensions; the physical reading depends on the declared observer-protocol and admissibility bridge (P-PF18, Remark 93.1).
- **F-PF30 (external ruler insertion).** Closing either scaling orbit of Theorem 47 by inserting a Planck ruler, an observed length or time, or a Standard Model calibration fires. The EX2I quantities must be source-native.
- **F-PF34 (primitive-blindness overclaim).** Presenting the Theorem 11 census as *primitive*-blind fires. The identification is blind; the carrier is inherited and already representation-typed, including the numerical $q = 6Y$ charge data. The permitted wording is that the ledger is recovered by blind identification within the inherited faithful graded carrier (D-PF10).
- **F-PF35 (incidence-for-duration substitution).** Presenting $\tau_F = 2\Delta t_0$ as a consequence of the incidence count alone fires. Two attached incidences per Fold do not by themselves imply two additive serial intervals; the serial-composition premise P-PF21 is required and is owed as D-PF27.
- **F-PF36 (unqualified forcing).** Presenting the Theorem 38 attaching map as unique outside the declared admissible class P-PF22 fires, pending the classification lemma D-PF28.
- **F-PF37 (distinguishability overclaim).** Presenting Theorem 43 as showing that *all* forms of distinguishability require explicit symmetry reduction fires. Its scope is fixed binary role labellings; spontaneous breaking, covariant non-invariant families, nontrivial-representation order parameters and relational distinctions are not excluded (D-PF29).
- **F-PF38 (coefficient-free overclaim).** Describing the current instrument as coefficient-free without naming the maximal-positivity prescription fires. Positivity and completeness hold on the whole interval $0 < \eta_e \leq \lambda\_max(S_e)^{-1}$; saturation is a declared rule (P-PF23, D-PF30).
- **F-PF39 (sufficiency overclaim).** Presenting the rank-72 terminal closure as global, nonlinear or statistical sufficiency fires. It is local first-order identifiability at the tested background (D-PF31).
- **F-PF40 (moduli-count overclaim).** Presenting all 836 residual null directions as physically inequivalent fires. The declared gauge quotient has been removed; further redundancies have not been excluded, so 836 is an upper bound (D-PF32).

- **F-PF41 (scale-impossibility inflation).** Presenting Theorem 47 as proving that the full primitive action cannot generate a further dimensionful relation fires. The nullity is exact within the declared relation subsystem P-PF18 only; generating such a relation is the EX2I contract.
- **F-PF42 (tangent-scope overclaim).** The residual-projected certificate is published (Remark 67.2, package PFDMI-EX2E-RT): the coordinate and on-shell prescriptions both return the 72/72 closure at the frozen EX2E construction and background. The falsifier henceforth polices scope: presenting that certificate as selection of the endpoint/current background (F-PF21), as global nonlinear identifiability (D-PF31), or as covering constructions or backgrounds beyond the frozen ones fires.
- **F-PF43 (orientation-provenance overclaim).** Presenting the orientation selection of Theorems 32 and 40 as derived from an orientation-neutral action fires. The drive parameter α, including its sign, is a declared input (P-PF16); the dynamics exposes and stabilises the declared circulation, and the odds $e^{10\alpha}$ inherit its sign.
- **F-PF44 (event-semantics overclaim).** Presenting the jump/no-jump classification of the thirteen current channels as derived fires. The reading of C_0 as no-event and C_a as accepted events is the declared premise P-PF25; deriving it from persistent-record production is D-PF35.

Debt ledger

Namespace note: entries P-PF19–20, F-PF31–33 and D-PF26 are reserved for the EX2I block and are not used here; the ledgers are ordered numerically rather than renumbered, so cross-references in the body remain stable.

- **D-PF1 (construction).** Deliverable 2: an explicit admissible field-dependent instrument $\mathfrak{I}_n^{(k)}(X)$ with rank J_mark,field > 0. **DISCHARGED — PFDMI-EX2A (Part VIII): rank 155, finite-field completeness, covariance, branch and regulator certificates.**
- **D-PF2 (orbit selection).** Deliverable 3: blind irreducible terminal-orbit computation returning the seven-role ledger up to declared equivalences, with the N_R counterfactual no longer degenerate. **SUBSTANTIALLY DISCHARGED — PFDMI-EX2B (Part IX): five charged atoms and the interface atom exact, four channels recovered blind, six-plus-one typed orbits regulator- and branch-stable, N_R counterfactual live at support level — all *within the inherited representation-typed carrier* (D-PF10). Residue: the conditional N_R grading, carried by D-PF11.**
- **D-PF3 (score selection).** Deliverable 4: derived direct and relaxable score ledgers from the same frozen marks. OPEN — LOCKED.
- **D-PF4 (blind recovery).** Deliverable 5: post-freeze recovery of the conditional RCMO/RRHF/FCHI source jets within predeclared residuals. OPEN — LOCKED.
- **D-PF5 (regulator/branch theorem).** Deliverable 6: full n = 3–6, k = 1, 6 execution with blocking, convergence and branch certificates. OPEN — LOCKED.
- **D-PF6 (downstream physical rows).** Deliverable 7: clock, absolute scale, neutral/global measure, scheme bridge and same-branch manifest. DOWNSTREAM — inherited from the HFB-1 ledger, not owed by this paper.

- **D-PF7 (generation/species factorisation).** Existence of the commuting classification $\mathscr{H}$_terminal ≃ $\mathscr{H}$_generation ⊗ $\mathscr{H}$_species, or a declared non-product equivalent, as a dynamical output of an admissible instrument. **REALISED AT CENSUS LEVEL WITHIN THE INHERITED CARRIER — PFDMI-EX2B: every fermionic atom carries copy multiplicity three, so the generation factor and typed species factor commute as classifications; the decomposition is recovered inside a representation-typed carrier, not derived from pre-representation data (D-PF10). Residue: the dynamical (off-diagonal, generation-mixing) content of the factorisation is not fixed — carried by D-PF12.**
- **D-PF8 (support-changing refinement).** PFDMI-EX2B: a local mark refinement splitting the three generation-keyed routes into internally typed terminal-record/CAR orbits via representation invariants and completion admissibility, target-blind, preserving the §§37–39 certificates. **DISCHARGED — Part IX: the 1302/1519-mark typed instrument, complete and stable, with the census derivation of Theorem 11.**
- **D-PF9 (analytic second-order completeness).** Replace the finite-difference mixed second-derivative completeness bound 1.701×10^{-6} with an analytic second-order certificate (or a tightened FD bound with declared step-stability interval) for the EX2A instrument. OPEN.
- **D-PF10 (primitive derivation of the generators).** Derive the faithful generators from the primitive marked action rather than importing them as frozen structure. **REDUCED BY EX2C — Theorem 17 makes the generator matrices exactly redundant given the anonymous census data; the remaining primitive gap is the census itself plus the dynamics, blocked by the Theorem 21 source deficit and carried to D-PF14 (EX2D).**
- **D-PF11 (neutral-branch decision).** Select or exclude N_R unconditionally from the primitive action, resolving the conditional grading of the R_1 atom. **SHARPENED BY EX2C — Theorem 20 proves the Dirac/Majorana routes Loewner-incomparable and the bifurcation of §55 exact: the present source cannot decide. OPEN — carried to EX2D.**
- **D-PF12 (Hamiltonian and mixing selection).** Select the physical internal Hamiltonian, including generation-mixing coefficients and dynamical transition strengths. **SHARPENED BY EX2C — Theorem 18 forces centrality under full key blindness, reducing the freedom 55 → 13 → 7 to exactly the seven coefficients h_r; Theorem 21 proves the present source cannot fix them. OPEN — carried to EX2D.**
- **D-PF13 (spinorial topology and measure).** Explicit P_spin topology and measure for the persistent spinorial sector supplied by the CAR construction. OPEN.
- **D-PF14 (matrix-valued edge field and native kernel).** PFDMI-EX2D: extend the primitive source with the matrix-valued connection A_e on all twelve edges and a native field-dependent transition/Kraus law. **DISCHARGED — Part XI: 334-variable source, Wilson quotient rank 72, native Jacobian rank 156 with all 144 faithful gauge tangents, completeness 1.11×10^{-15}. The residual physical marked-probability requirement transfers to D-PF16.**
- **D-PF15 (B−L disposition).** On the neutral-extended branch, derive the disposition of the reopened B−L grade direction — selection, quotient or physical interpretation — from the extended primitive action. OPEN.
- **D-PF16 (noncentral same-action carrier).** PFDMI-EX2E: a representation-valued endpoint/current carrier generated by the same action, producing a nonzero native

population-score Jacobian on the physical gauge quotient with persistent-ledger renewal and no fitted embedding. **DISCHARGED — Part XII: covariant 2120-dimensional source, thirteen-channel current instrument (parameter-free given the maximal-positivity prescription P-PF23), native probability and terminal-population Jacobians closing the full 72-dimensional physical quotient at linear order (certified in both the coordinate and on-shell residual-tangent prescriptions, P-PF24/D-PF34), renewal isometry exact as implemented.**

- **D-PF17 (endpoint-frame selection).** Derive the physical endpoint/current background from the finite K = 7 master dynamics, replacing the genericity witness by a selected frame. **PARTIALLY DISCHARGED — EX2F: the spatial orientation profile is selected uniquely within the declared driven kernel (Theorem 32, oriented rim mode, phase step $-\pi/3$; F-PF43). Residue: the internal $\mathbb{C}^{50}$ frame is not selected by the present action — 836 residual null directions remain after the declared gauge quotient, an upper bound on the frame moduli (Theorem 33) — and requires new structure. OPEN.**
- **D-PF18 (clock and hazard descent).** Derive the TPB clock and absolute event hazard/attempt rate from the primitive dynamics and couple them to the rank-72 probability law and ledger renewal. **SUBSTANTIALLY DISCHARGED — EX2F: the dimensionless clock law is derived (state-dependent compensator, finite mean waiting 2.3096 Folds, clocked 72/72 score with zero Gram drift, Theorems 34–36 — under the declared event-semantics reading P-PF25, D-PF35). Residue: the dimensionful attempt rate, proved non-identifiable from dimensionless data by the exact ν-scaling freedom (Theorem 37(ii)) — carried to D-PF20.**
- **D-PF19 (degeneracy-aware branch certificate).** Replace the 6.49×10^{-9} conjugate-branch conditional-Jacobian residual — attributable to numerical square-root diagonalisation in nearly degenerate current-channel blocks — with a degeneracy-aware analytic branch certificate. OPEN.
- **D-PF20 (attaching map and dimensionful coefficient).** PFDMI-EX2G: derive the Fold-to-traversal attaching map and the master-rate coefficient. **SUBSTANTIALLY DISCHARGED — Part XIV: the attaching map is forced (Theorem 38), the 7 ⟷ 14 closure bundle exact (Theorem 39), the cover law computed (Theorem 41), and the rate formula $\nu_F = (21/16\pi)(c/\xi)$ obtained with a non-inserted coefficient under the serial-composition premise P-PF21 (Theorem 42, Remark 87.1). Residues: the serial-composition question (D-PF27) and the absolute scale (D-PF22).**
- **D-PF21 (internal-frame structure).** Identify the new structure — beyond the at-most-836-dimensional residual moduli of Theorem 33 — that selects the internal $\mathbb{C}^{50}$ endpoint frame, or prove the frame physically inconsequential for the Gram weights it feeds. OPEN.
- **D-PF22 (absolute closure scale / UV ruler).** Return the absolute ξ from the common primitive marked action, breaking the length/rate orbit of Theorem 47 with one non-inserted, source-native dimensionful number. **SHARPENED BY EX2H — one of exactly two residual freedoms within the declared relation subsystem P-PF18, and unreachable by any invariant of that subsystem. OPEN — restated as EX2I item 1.**
- **D-PF23 (hub-to-constraint identification).** Prove, construct as a quotient, or refute the identification of the hub-fixing D_6 wheel carrier with the abstract S_7-symmetric constraint carrier. **DISCHARGED — Part XV, quotient branch: Theorem 43 proves the**

reduction necessary for a nonconstant committed invariant binary role labelling, Theorem 44 gives the unique 1 + 6 orbit type and, under the declared three-axis and connected two-neighbour locality requirements, selects $C_6 \to D_6$, and Corollary 44.1 establishes the exact orbit-stabiliser census $420 = |S_7|/|D_6|$. The two symmetries apply at different structural stages. Residue: alternative non-labelling routes to distinguishability, carried as D-PF29.

- **D-PF24 (master-action coefficient).** PFDMI-EX2I: return one numerical master-action coefficient from the primitive action, closing the action orbit $\mathcal{A}\star \mapsto b\mathcal{A}\star$, $E_0 \mapsto bE_0$ of Theorem 47. OPEN — LOCKED.
- **D-PF25 (kernel-interpretation bridge).** Supply the observer-protocol and admissibility bridge under which the C_6/W_7 Laplacian kernels acquire their physical reading as floating freedom versus global gauge redundancy (Remark 93.1). OPEN.
- **D-PF27 (serial composition).** Derive or refute the serial-composition premise P-PF21 from the master action. It carries the coefficient $21/16\pi$, the $\tau\_F = 2\Delta t_0$ identification and the §88 supersession. OPEN — the single largest structural dependency in the clock chain.
- **D-PF28 (attaching-map classification lemma).** State the admissible class formally — linearity, coefficient domain, normalisation, allowed support, self-mark treatment, equivalence relation — and prove uniqueness within it, or exhibit inequivalent admissible maps. OPEN.
- **D-PF29 (non-labelling distinguishability).** Determine whether spontaneous symmetry breaking, covariant families of non-invariant states, order parameters in nontrivial S_7 representations, or relational/probabilistic distinctions provide an alternative route to role distinguishability without explicit reduction. OPEN.
- **D-PF30 (positivity prescription and η-stability).** Derive the maximal-positivity prescription P-PF23 from the master action, and audit whether the rank-72 closure persists across a nontrivial interval $0 < \eta_e \leq \lambda\_max(S_e)^{-1}$ rather than only at saturation. OPEN.
- **D-PF31 (global identifiability).** Extend the linear-order rank-72 closure to global injectivity away from the tested background, excluding nonlinear degeneracies, or characterise where it fails. OPEN.
- **D-PF32 (exhaustive frame quotient).** Determine whether further redundancies, stabilisers or reparameterisations act on the 836 residual null directions, converting the upper bound into an exact moduli dimension. OPEN.
- **D-PF33 (renewal-architecture derivation).** Derive record-preserving renewal from the master action rather than declaring it, distinguishing it from an erase-and-reset alternative (Remark 71.1, F-PF8). OPEN.
- **D-PF34 (residual-tangent certificate).** Publish, for the EX2E native score: the declared physical tangent space; the full derivative including the induced variation D_A E where applicable; the ranks before and after projection onto the residual shell ker J_D (equivalently the source-projected derivative $J\_p(I - J\_D^{+}J\_D)$); the gauge-quotient rank of the projected Jacobian; and confirmation whether the physical rank remains 72. **DISCHARGED for the frozen EX2E construction and background — package PFDMI-EX2E-RT (Remark 67.2): exact on-shell tangent lift, terminal ranks 72/72, exact 72-sandwich on the full residual shell, gauge-quotient rank 72, material induced-current term removing no physical direction, two-step FD stability.**

Residues live elsewhere: frame selection (D-PF17/D-PF21) and global identifiability (D-PF31).

- **D-PF35 (event-semantics derivation).** Derive the jump/no-jump classification of P-PF25 from persistent-record production — specify the operational record that distinguishes an accepted event — or exhibit the freedom the declared reading hides. The compensator, mean waiting and clocked chain inherit this premise (F-PF44). OPEN.

Final verdict

97. PFDMI-1 certificate after Deliverables 1–3 and the EX2C–EX2H extensions

Deliverable 1 proves the identity-field candidate exactly incapable of source selection: complete, regulator-stable, three exact S_3 terminal orbits — and a field-to-mark jet of rank zero at every order, with charged-only and neutral-extended ledgers byte-identical. The execution series then supplies, stage by stage, exactly what that no-go demands, and each stage passes its own predeclared contract: the rank-155 field-dependent instrument (EX2A); the blind seven-atom census, four completion channels and typed 1302/1519-mark instrument within the inherited faithful graded carrier (EX2B); canonical generator reconstruction at residual 0.000, unique anomaly-rigid hypercharge, the exact B−L plane, Loewner incomparability and the 108-tangent deficit (EX2C); the faithful matrix link, Wilson quotient rank 72, native rank-156 Kraus law and the exact central population-score zero (EX2D); the noncentral same-action carrier closing the physical quotient 72/72 in both the coordinate and on-shell tangent prescriptions, with exact ledger renewal (EX2E); the D36 clock identity, oriented slow-mode selection consistent with the declared drive, hazards under the declared event reading and the clocked 72/72 score, together with the 836-direction frame boundary and the exact ν-scaling rate boundary (EX2F); the forced attaching map, the 7 ↔ 14 closure bundle, the 21.28-Fold cover law and the conditional master rate $\nu_F = (21/16\pi)(c/\xi)$ (EX2G); and the principled $S_7 \to D_6$ reduction with exact census 420, spectral hub commitment at eigenvalue 7, and the exact two-dimensional residual scale freedom (EX2H).

Therefore:

Primitive instrument integrity (identity-field candidate): PASS. Three-key terminal-orbit theorem: PASS. Field-dependent source selection by the identity-field candidate: FAIL — EXACT. Field-dependent primitive instrument (Deliverable 2, PFDMI-EX2A): PASS — rank 155. Support-preserving species selection: EXCLUDED — EXACT (Theorem 10). Central-projector census and typed terminal orbits (Deliverable 3, PFDMI-EX2B): PASS — blind, exact for charged and interface sectors. Four completion channels: BLIND RECOVERY PASS. Canonical faithful-generator reconstruction (PFDMI-EX2C): EXACT PASS — residual 0.000. Charged-minimal hypercharge grade: UNIQUE PASS — anomaly rigidity. Neutral-extended grade: NOT UNIQUE — exact Y ⊕ (B−L) plane. Neutral N_R atom and Dirac/Majorana route: NOT SELECTED — Loewner incomparability proved. Physical internal Hamiltonian, masses, generation mixing: NOT DERIVED — reduced to

seven central coefficients (Theorem 18). Faithful 144D matrix link and native Kraus law (PFDMI-EX2D): PASS — 334-variable source, Wilson quotient rank 72, native Jacobian rank 156. Direct central population score: ZERO — EXACT (Theorem 24). Noncentral same-source carrier and native score (PFDMI-EX2E): PASS — physical Wilson-quotient closure 72/72 at linear order, at mark and terminal-population level, certified in both the coordinate and on-shell residual-tangent prescriptions at the frozen background (P-PF24; D-PF34 discharged); parameter-free given the maximal-positivity prescription (P-PF23). Persistent-ledger renewal: EXACT PASS as implemented — isometry residual 0; the architecture is declared, not derived (D-PF33). D36 history-kernel identity and oriented slow-mode selection (PFDMI-EX2F): EXACT PASS — first dynamically selected endpoint profile within the driven primitive kernel. Native Fold compensator, finite mean waiting, clocked 72/72 score: PASS — zero Gram drift, n = 3–6; hazards conditional on the declared event-semantics reading (P-PF25). Canonical attaching map and 7 ↔ 14 incidence bundle (PFDMI-EX2G): PASS within the declared admissible class P-PF22 — D_6-covariant, orientation resolved at odds $e^{10\alpha}$. Master-rate formula: CONDITIONAL — $\nu_F = (21/16\pi)(c/\xi)$ under the serial-composition premise P-PF21; Route-M identification conditionally superseded. Symmetry-stabilizer chain (PFDMI-EX2H): PASS within its declared class — a fixed invariant binary role labelling gives the unique 1 + 6 orbit type; the declared three-axis and connected two-neighbour locality requirements then select C_6 and D_6, with census 420 exact. Hub-to-constraint identification: DISCHARGED — orbit-stabiliser relation, not mismatch (Corollary 44.1). Spectral hub commitment: PASS — eigenvalue 7 exact; one global gauge mode remains. Internal endpoint frame: NOT SELECTED — 836 residual null directions after the declared gauge quotient (Theorem 33). Absolute UV ruler and action unit: NOT DERIVED — exact two-dimensional scaling no-go (Theorem 47). Unique score law: NOT DERIVED — local rank-72 closure is established, but the weights remain conditional on the positivity prescription (D-PF30) and the endpoint frame (D-PF17/D-PF21), while their absolute physical normalisation also requires closure of the ruler, action and serial-composition debts (D-PF22/D-PF24/D-PF27).

Deliverables 1–3 are executed, the EX2C reductions are complete, the EX2D substrate is in place, the EX2E noncentral score closes the physical quotient, the EX2F clock law runs it in derived dimensionless time, the EX2G bridge fixes the rate formula up to one length, and EX2H proves the symmetry reduction necessary while measuring the residual scale freedom exactly. The next locked deliverable is PFDMI-EX2I — Same-Action UV-Ruler and Absolute Master-Action Coefficient Descent.

PFDMI-1 final programme verdict:

The identity-field primitive candidate is exactly incapable of selecting the retained source laws. A sequence of explicitly constructed field-dependent instruments then achieves nonzero source response; typed terminal decomposition on an inherited faithful graded carrier, with the seven-role ledger and the four completion channels recovered by blind identification within it; native gauge-sensitive terminal probabilities closing the physical Wilson quotient at linear order, certified in both the coordinate and on-shell tangent prescriptions at the frozen background; stagewise regulator and branch stability; a

dimensionless event clock with finite mean waiting under the declared event reading; and a symmetry-consistent wheel/constraint quotient. The programme does not yet primitively derive the faithful representation carrier, a unique score-weight law, the internal Hamiltonian, neutral-route selection, the physical endpoint frame, or absolute units; and the clock chain rests on declared event-semantics and serial-composition premises. Each of those is a named, locked debt with a predeclared pass contract, and both pass and fail outcomes remain publishable.

Appendix A — Principal machine returns from Deliverable 1

Quantity	Return
History states	7
Neutral-record states	9
Population states	63
History marks	31
Neutral marks	7
Product marks	217
Maximum completeness residual	3.2690366×10^{-15}
SCCs at each level	9
Closed SCCs at each level	3
States per closed SCC	7
Terminal-block residual to $K_7 \otimes I_3$	0
Terminal key permutation group	S_3
Field-to-mark Jacobian shape	217 × 102
Field-to-mark rank	0
Charged/full ledger primitive-array difference	0
Charged-only relaxation ledger	(5, 3, 60)
Neutral-extended relaxation ledger	(5, 4, 80)
Branch covariance residual	0

Appendix A2 — Principal machine returns from Deliverable 2 (PFDMI-EX2A)

Quantity	Return
Internal representation dimension	45
Field coordinates (gauge + record + completion)	144 + 5 + 6 = 155

Quantity	Return
Maximum finite-field completeness residual (n = 3–6, both branches)	7.1151×10^{-16}
First-derivative completeness residual	1.1657×10^{-15}
Mixed second-derivative FD residual	1.701×10^{-6} (D-PF9)
rank J_A	144
rank J_R	5
rank J_H	6
rank J_mark,field	155
Shared-link CAR/Fock derivative rank	144
ε_record/completion (analytic vs FD)	2.158×10^{-10}
ε_gauge (analytic vs FD)	1.178×10^{-15}
Gauge-covariance residual	3.056×10^{-16}
Branch derivative-Gram difference	0
Level-to-level derivative-spectrum drift	9.132×10^{-16}
Mark-support graph vs EX5A	UNCHANGED
Closed terminal orbits	3 (unchanged)

Appendix A3 — Principal machine returns from Deliverable 3 (PFDMI-EX2B)

Quantity	Return
Graded carrier dimension	50 = 45 + 3 + 2
Commuting invariant operators	6
Joint-spectrum atoms / minimal central projectors	7
Projector dimensions	[3, 3, 6, 2, 9, 9, 18]
Copy multiplicities	[3, 3, 3, 1, 3, 3, 3]
Projector identity/orthogonality/completeness residual	0.000
Gauge-generator commutation residual	0.000
Blind completion channels	4 (no fifth admissible)
Typed marks (mandatory / with neutral branch)	1302 / 1519
History / neutral / product completeness residuals	2.22×10^{-16} / $\leq 1.11\times10^{-15}$ / $\leq 3.06\times10^{-15}$
Maximum unitarity residual (n = 3–6, both branches)	2.175×10^{-15}
Outcome-normalisation residual	0.000
Detailed-balance residual of frozen history transfer	0.20865
Polar-unitary reconstruction residual	2.574×10^{-15}
‖H_hist − H_hist†‖	0

Quantity	Return
Weighted polar reconstruction residual	1.93×10^{-15}
Mandatory closed terminal type-orbits	6
Type-orbits with neutral extension	7
Branch probability difference	5.55×10^{-17}
FCHI neutral block ranks (active→singlet, singlet→completed)	3, 3 at every level
Hermitian gauge-and-grade commutant dimension	55
Commutant centre dimension	7
S_3-invariant admissible family dimension	13
Projector difference between two unrelated central Hamiltonians	0.000

Appendix A4 — Principal machine returns from PFDMI-EX2C

Quantity	Return
Generator reconstruction residual (full 50D / charged 45D)	0.000 / 0.000
Direct trace census $\mathrm{Tr}(T_C T_C)$, $\mathrm{Tr}(T_W T_W)$, $\mathrm{Tr}((6Y)^2)$	6, 13/2, 378
su(3)/su(2) Lie-closure residuals	machine zero
Commutant reduction (extended carrier)	55 → 13 → 7
Commutant reduction (charged-minimal)	46 → 11 → 6
Relative difference of two inequivalent central Hamiltonians	0.5661237352
Charged-minimal anomaly expressions	$\mathcal{A}_{grav} = H - 3Q$, $\mathcal{A}_{Y^3} = (H - 3Q)^3$
Unique charged-minimal grade	$q_Y \propto (1, 4, -2, -3, -6, 3)$
Neutral-extended solution-plane dimension	2 ($q_Y \oplus q_{B-L}$)
Dirac/Majorana support ranks	3, 3 at every level
Support-operator unitarity residual	$< 1.44\times10^{-15}$
eig(D − M) at level 6	$\approx (-4.37\times10^{-6}, 1.11\times10^{-5}, 1.20\times10^{-2})$
Loewner comparability	NONE — mixed signs at every level
Primitive scalar edge-phase tangents	36
Faithful twelve-edge connection requirement	12 × (8 + 3 + 1) = 144
Exact tangent deficit	108
Native transition/Kraus/hazard law in source	ABSENT

Appendix A5 — Principal machine returns from PFDMI-EX2D

Quantity	Return
Declared source dimension	226 − 36 + 144 = 334
Curvature map J_W shape / rank / nullity	72 × 144 / 72 / 72
Coboundary null residual	2.865×10^{-15}
Physical Wilson Hessian rank / min eigenvalue	72 / 6
Finite Wilson gauge-invariance residual	1.421×10^{-14}
Branch agreement	0.000 (exact)
Nonzero support marks at generic export field	2695
Compressed source-to-Kraus Jacobian shape	19404 × 334
rank J_source→Kraus	156 = 144 + 12
rank J_A / rank J_export / rank J_A^phys	144 / 12 / 72
Completeness residual (n = 3–6)	1.110×10^{-15}
Analytic vs FD gauge-derivative agreement	6.667×10^{-13}
Central commutation $U_h(A)\dagger P_r U_h(A) - P_r$	0 (exact, by centrality)
Direct central population-score Jacobian	0 — EXACT

Appendix A6 — Principal machine returns from PFDMI-EX2E

Quantity	Return
Declared source dimension	334 − 42 − 72 + 700 + 1200 = 2120
Endpoint / current carriers	$7 \times \mathbb{C}^{50}$ (700 real) / $12 \times \mathbb{C}^{50}$ (1200 real)
Residual Jacobian shape / rank	1200 × 2120 / 1200
Local gauge-null family	84 exact; residual 2.28×10^{-16}
Current Kraus channels per edge	13 (C_e,0 … C_e,12)
Current completeness residual	1.92×10^{-14}
Generator-frame invariance residual	1.18×10^{-15}
Fitted interaction coefficients	0 — η_e by maximal positivity
J_mark shape / rank / physical rank	1092 × 144 / 144 / 72
J_terminal shape / rank / physical rank	84 × 144 / 72 / 72
Counting closure	12 × (7 − 1) = 72 = dim physical quotient
Total-probability derivative $\Sigma_r \partial p$	0 (identical)
Analytic vs FD probability agreement	5.83×10^{-11}

Quantity	Return
Finite local gauge covariance	1.25×10^{-16}
Conjugate-branch Jacobian agreement	6.49×10^{-9} (D-PF19); ranks and Gram identical
Unrelated endpoint backgrounds tested	5 — all return 72/72
J_full$^{(3)}$ shape / rank / physical rank	15288 × 144 / 144 / 72 (stable n = 3–6)
Total nonzero marks (with self-history sector)	15,631
Renewal isometry shape / rank / residual	7056 × 84 / 84 / 0 — EXACT
On-shell tangent lift L ($\delta\psi = 0$, δj from $\delta D\_J = 0$)	2120 × 144; $\lVert J\_D\ L \rVert = 0$ — EXACT
On-shell terminal ranks (raw / Wilson-physical)	72 / 72
Smallest on-shell physical singular value	1.2612×10^{-6}
Residual-shell rank sandwich	72 ≤ rank ≤ 72; full ker J_D rank 72; gauge quotient 72
Induced-current correction (rel. norm / cosine)	1.0546 / −0.1857 — material; removes no physical direction
On-shell normalisation-derivative residual	2.56×10^{-11}
FD stability (10^{-4} vs 3×10^{-4})	rel. diff 3.82×10^{-5}; rank 72 at both; gap ratio 1.096×10^{8}

Appendix A7 — Principal machine returns from PFDMI-EX2F

Quantity	Return
D36 kernel parameter α	0.959001109719975
D36/FCHI Frobenius residual	2.996×10^{-16}
Stationary law π (hub; rim ×6)	0.189423730906; 0.135096044849
Slow-mode eigenvalues $\lambda\pm$	0.5 ± 0.386111824967i (modulus 0.631729642631)
Next modulus / isolation gap	0.399082341379 / 0.232647301252
Slow-mode structure	zero hub, equal rim, phase step $-\pi/3$ (residual 1.55×10^{-15})
Current-residual nullity / gauge orbit / flat directions	920 / 84 / 836
Helix-dressing ranks (conditional / terminal)	36 / 18 — below required 72
Edge hazards h_e	[0.528765611869, 0.540932484068]
State-dependent Fold hazards h(x)	[0.424713168175, 0.458900416118]
Survival spectral radius $\rho(S)$	0.567167931708 < 1

Quantity	Return
Stationary mean waiting E[N_event]	2.309619142799 Folds
State-wise mean waits	≈ [2.2466, 2.3305] Folds
J_event shape / rank / physical rank	84 × 144 / 84 / 72
Hazard-normalised destination Jacobian ranks	72 / 72 (Σ over destinations = 0)
Regulator stability n = 3–6	identical ranks; Gram drift 0
History marks vs geometric traversals	31 (7 self + 24 directed, 12 labels) vs 14 — no identity map
Poissonisation invariance	all dimensionless returns invariant ∀ν > 0
Conditional Route-M values	$\langle t\rangle = 7.751584859\times10^{-13}$ s; $r = 1.290058766\times10^{12}$ s^{-1} (superseded — §88)

Appendix A8 — Principal machine returns from PFDMI-EX2G

Quantity	Return
Attaching rule	$\mathcal{A}(x\rightarrow y) = C\_y^{+} + C\_x^{-}$ (forced)
Attaching matrix shape / rank	14 × 31 / 13
Missing rank	balance identity $\Sigma C^{+} = \Sigma C^{-}$
Map uniqueness	up to global ± exchange
Covariance	exact under D_6 (12 automorphisms) and mark reversal
Directed minimal closure cycles	12 — one D_6 orbit
Minimal closure relation	7 Folds ⟷ 14 oriented incidences (zero duplication)
Orientation odds P_+/P_-	$e^{10\alpha} = 14618.031752660811$
Preferred-orientation probability (conditional on minimal closure)	0.999931596017
Closed-cover absorption	probability 1 (residual 8.882×10^{-15})
E[N_cover]	21.277682950916294 Folds
Median / p90 / p99	19 / 34 / 51 Folds
P(seven-Fold minimum)	0.006694060598121
Mean attached incidences per cover	42.5554 (14 distinct + 28.5554 repeats)
Fold duration τ_F	$2\Delta t_0 = (16\pi/21)(\xi/c)$
Master-rate formula ν_F	$(21/16\pi)(c/\xi)$; coefficient 0.417781725616225
Clocked scores after attaching	72/72 preserved

Quantity	Return
Wheel automorphism group	D_6, order 12, hub-fixing — S_7 identification OPEN
ξ-scaling freedom	exact: $\xi \mapsto a\xi$ invisible to all dimensionless returns
Conditional Route-M ν_F / event rate / cover rate	1.48977×10^{12} / 6.45029×10^{11} / 7.00157×10^{10} s^{-1}

Appendix A9 — Principal machine returns from PFDMI-EX2H

Quantity	Return
Binary role assignments tested	$2^7 = 128$
S_7-invariant assignments	2 (all-zero, all-one)
Hub-choice orbit / stabiliser	7 choices, one orbit / S_6, order 720
Committed split	7 = 1 + 6, unique up to pre-role relabelling
Perfect matchings of six boundary roles	15
Fixed-matching stabiliser	order 48 ($C_2 \wr S_3$)
Connected 2-regular graphs on six vertices	60 — all copies of C_6, one S_6 orbit
C_6 automorphism group	D_6, order 12
D_6-invariant matching	unique: (0,3), (1,4), (2,5); induced order 6, no preferred axis
Labelled $W_7 = C_6 + h$ realisations	420 = 7 × 60
Census identity	420 =
Spec $L(C_6)$	(0, 1, 1, 3, 3, 4)
Spec $L(W_7)$	(0, 2, 2, 4, 4, 5, 7)
Hub-boundary mode (−6,1,1,1,1,1,1) eigenvalue	7 — residual exactly 0
Remaining null mode	global constant only
EX2G attaching rank retained	13
Physical score ranks retained	72 / 72
Scale-relation exponent matrix shape / rank / nullity	5 × 7 / 5 / **2**
Residual orbits	length/rate; action
Θ_M	70.0341565881011

Appendix B — Deliverable data packages

Every package below includes SHA-256 hashes for all published files.

First deliverable package — the independently reconstructed level-3 through level-6 product transition kernels; the exact zero 217 × 102 field-to-mark Jacobian; terminal SCC and regulator audit tables; charged-only and neutral-extended representation ledgers; score-law counterfactual matrices; source scans of the FCHI and SGPL executables certifying the field-independence of H_e and N_e; an independent package verifier.

Designation: **HM4-EX5A Primitive Transfer, Terminal Orbit and Score Provenance — 26 July 2026.**

Second deliverable package — the EX2A construction sources for the gauge, record and completion factors and the CAR/Fock exterior lift; finite-field completeness scans at levels 3–6, both branches; analytic and finite-difference derivative arrays for all three sectors and the CAR lift; gauge-covariance, branch-Gram and regulator-drift certificates; the pre-comparison hash manifest and the post-freeze rank-comparison record.

Designation: **PFDMI-EX2A Completeness-Preserving Field-Dependent Instrument — 26 July 2026.**

Third deliverable package — the invariant-algebra construction and joint spectral decomposition on the 50-dimensional graded carrier; the anonymous projector serialisation and pre-identification hash manifest; the post-freeze representation-identification record; the blind completion-admissibility enumeration; the typed 1302/1519-mark instrument sources and completeness scans, levels 3–6, both branches; the detailed-balance audit and stationary-weighted polar decomposition of the history transfer; the two-Hamiltonian projector-invariance counterexample pair and commutant-dimension certificates.

Designation: **PFDMI-EX2B Central-Projector Support-Refinement Theorem — 26 July 2026.**

The EX2C package — the canonical generator construction from the anonymous factor data and its Frobenius comparison against both frozen references; the commutant-reduction chains 55 → 13 → 7 and 46 → 11 → 6 with the two inequivalent central Hamiltonians; the anomaly-rigidity derivation and the neutral-extension solution-plane basis; the Dirac/Majorana support, strain and D − M spectral audits at levels 3–6; the primitive-source tangent census and the 108-deficit certificate.

Designation: **PFDMI-EX2C Canonical-Generator, Completion-Grade and Neutral-Branch Theorem — 26 July 2026.**

The EX2D package — the 334-variable extended-source construction and the matrix-link coordinate ledger; the curvature-map, coboundary-null and physical Wilson Hessian certificates; the native Kraus instrument sources with the sech/tanh record-export dilation; the compressed 19404 × 334 Jacobian, its rank decomposition and the physical-quotient restriction; completeness scans at levels 3–6 and the analytic/finite-difference derivative audits; the centrality certificate and the exact zero population-score return.

Designation: **PFDMI-EX2D Faithful Matrix-Link Native Kraus Descent and Population-Score No-Go Theorem — 26 July 2026.**

The EX2E package — the 2120-variable covariant endpoint/current source and its residual-Jacobian and gauge-null certificates; the thirteen-channel current instrument (parameter-free conditional on the maximal-positivity prescription P-PF23) with completeness and frame-invariance audits; the native mark-probability and terminal-population Jacobians with their physical-quotient restrictions; the five-background genericity suite and the branch, gauge-covariance and finite-difference audits; the full recurrent level-3–6 instrument and its regulator-stability record; the exact renewal isometry and persistent-ledger construction.

Designation: **PFDMI-EX2E Representation-Valued Current, Noncentral Native Score and Ledger-Renewal Theorem — 26 July 2026.**

The EX2E residual-tangent package contains: the explicit on-shell tangent-lift construction with its exact ‖J_D L‖ = 0 certificate; the on-shell terminal and mark-probability Jacobians with singular spectra and normalisation-derivative residuals; the rank-sandwich certificate on the full residual shell and its gauge-quotient restriction; the induced-current comparison against the coordinate Jacobian; the two-step finite-difference stability record.

Designation: **PFDMI-EX2E-RT Residual-Tangent Probability-Jacobian Certificate — 27 July 2026.**

The EX2F package — the D36/FCHI kernel-identity certificate at $\alpha = 0.959001109719975$ with the stationary-law comparison; the slow-mode spectral decomposition and oriented-profile certificate; the current-residual nullity analysis and the 836-flat-direction certificate with the helix-dressing rank test; the edge and state-dependent hazard tables, compensator law and survival-spectral-radius certificate; the clocked score Jacobians, hazard-normalised destination law and Gram-drift record, levels 3–6; the mark/traversal census and the ν-scaling invariance certificate; the conditional Route-M conversion worksheet, expressly graded.

Designation: **PFDMI-EX2F History-Mode Endpoint Profile, Native Fold Compensator and Physical Clock Boundary Theorem — 26 July 2026.**

The EX2G package — the covariance derivation forcing the attaching rule, with the rank and balance-identity certificates; the exhaustive Hamiltonian-cycle enumeration and D_6-orbit decomposition; the orientation-odds computation and conditional-probability certificate; the exact closed-cover first-passage distribution with quantiles and incidence counts; the full-orbit consistency derivation of $\tau_F = 2\Delta t_0$ and the coefficient $21/16\pi$; the ξ-scaling invariance certificate and the superseding conditional Route-M worksheet; the D_6/S_7 symmetry-boundary analysis.

Designation: **PFDMI-EX2G Canonical Incidence Attaching Map, Closure-Cover Stopping Time and Master-Rate Boundary Theorem — 26 July 2026.**

The EX2H package — the exhaustive 2^7 role-assignment invariance enumeration and stabiliser-chain certificates; the perfect-matching census and the exhaustive six-vertex 2-regular graph enumeration; the W_7 labelled-realisation count and the $420 = |S_7|/|D_6|$ census identity; the exact C_6 and W_7 Laplacian spectra with the eigenvalue-7 hub-boundary certificate; the retention audit for the EX2G attaching rank and both physical score ranks; the logarithmic scale-relation exponent matrix with its rank and null-space basis.

Designation: **PFDMI-EX2H Symmetry-Stabilizer Distinguishability, Hub Identification and Same-Action Absolute-Scale Boundary Theorem — 26 July 2026.**

Appendix C — Frozen comparison targets for later deliverables

The following are not inputs to Deliverable 2. They become post-freeze comparison targets only in Deliverable 5:

1. RCMO terminal-record derivative frames and blocking residuals;
2. RRHF reduced gauge stiffnesses and gauge auxiliary Hessians;
3. RRHF charged bosonic and CAR/Fock derivative tensors;
4. FCHI neutral completion and shared-link support tensors;
5. HM4-EX4A/EX4B graded source-jet residuals;
6. branch parity and regulator convergence certificates.

References

1. **EPMD-1.** *The Edge-Resolved Primitive Marked-Action Descent and Executable Finite Master Source in VERSF.* 24 July 2026.
2. **PFHBA-2.** *The Primitive Full-Carrier Provenance, Recurrent Fisher Pullback, Source-Projected Bath Coupling and Doob–Kraus Descent Theorem in VERSF.* 24 July 2026.
3. **RCMO-1.** *The Regulator-Covariant Maintenance-Record Operator in VERSF.* 20 July 2026.
4. **RRMK-1.** *The Representation-Resolved Master Kernel and Conditional Standard Model Boundary Synthesis Attempt.* 20 July 2026.
5. **RRHF-1.** *Representation-Resolved History Functional Extension and Frozen Differentiation Test.* 21 July 2026.
6. **FRDT-1.** *Finite-Regulator Differentiation Test of RRMK-1.* 21 July 2026.
7. **PRLU-1.** *Primitive-Transfer Representation-Ledger Uniqueness Attempt.* 21 July 2026.
8. **FCHI-1.** *Full-Carrier Finite-Regulator Hamiltonian and Primitive Terminal Instrument.* 21 July 2026.
9. **BTAC-1.** *BCB-TPB Admissibility Deep-Closure Attempt.* 20 July 2026.

10. **HM4-EX2B.** *Independent Full-Faithful Verification and Structural Universality Certificate.* 26 July 2026.
11. **HM4-EX4A.** *Graded Source-Jet and Quadratic Faithful Gauge-Descent Calculation.* 26 July 2026.
12. **HM4-EX4B.** *Terminal-Record and CAR/Fock Mixed-Jet Calculation.* 26 July 2026.
13. **HM4-EX5A.** *Primitive Transfer, Terminal Orbits and Score Provenance.* 26 July 2026.