The Physical C/W/Y Radial-Current Tangent Field and Existing-Instrument Score Descent in VERSF

From exact representation supports and the E_2 current defect through primitive-birth Haar support, Fold/Fact closure typing, stopped-history Fisher aggregation, refinement-stable Route-M coherence geometry, connection-curvature carrier separation and the operational-quotient beta frontier

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Provisional designation: CRTF-1-D6 **Date:** 28 August 2026 **Status:** Theorem-level working paper; CRTF-EX1 through the Route-M carrier, information and operational-quotient audits integrated. The tangent, carrier, current-law, factorisation, native-score and Fold/Fact typing results stand at their declared grades; the K7 electromagnetic gate is typed to the primitive Fold boundary. The Route-M fourteen is exact readout geometry rather than a curvature carrier, so its physical weighting is now an admission-information question. Grades, conditions and open returns are given in full in the abstract and the formal verdict.

No physical S_J, M_JJ, κ_E_2, source-native Route-M beta coefficient, successor CKM matrix or new experimental comparison is issued.

General-reader summary

The wider programme is trying to derive, rather than assume, how strongly the different families of matter particles interact. The previous paper ended at a precise sticking point: the theory knows exactly which three internal channels are involved and knows their shapes in complete detail, but it does not yet have a law for how strong each channel is relative to the others.

This paper first clears the ground. The existing machinery is not fundamentally blind to those relative strengths: given an active matter state it can carry three independent channel signals, so a completely new measuring mechanism is not automatically required. Under the theory's unresolved preparation law, almost every newly born direction has all three channel directions available, and finite occupation by active matter then switches the existing instrument on; a perfectly empty state registers nothing at all. So nothing had to be picked by hand, but capacity, activation and physical selection stay three separate steps. On the canonical reversible branch, two transport constructions written down separately in earlier work, one for currents and one for histories, are shown to be coordinate descriptions of the same underlying geometry, though the full physical attribution and normalisation of that construction remain open. And within the natural local compatibility class allowed by the existing symmetries, only two forms survive for the rule by which two neighbouring events must agree, differing by a single sign. If the theory's existing orientation rule turns out to act on the matter carrier, one of those forms gives the striking result that perfect agreement means maximal opposition, which is exactly what drives a current rather than silencing it.

The paper is equally careful about what has not been earned. The basic unit of the theory is a single committed event, a fact. The famous electromagnetic strength factor turns out to belong to the checks performed when one such fact forms, not to the long runs of facts it was previously attached to; whether it exactly equals the theory's own event probability is still an open question. Long runs of facts remain important, but as accumulated history, the way a ledger accumulates entries without changing what a single entry is.

A parallel branch of the programme proposes a candidate strength ratio, under a declared counting prescription, from fourteen checks against sixteen cells. This paper takes that number apart honestly. The fourteen is real: it is a robust structural count that survives arbitrary finite refinement within the construction studied here, and it even splits naturally into a six and an eight, an architecture that a completely independent part of the programme also arrives at. But two tempting readings of it fail. The fourteen checks are not fourteen independent physical directions, because the genuine field-like quantities occupy only six of them, with the other slots acting as consistency tests. And they are not automatically fourteen equal parcels of information, because once the first ten checks have been passed, their information is spent and cannot be counted again for the remaining four. Whatever those last four cost must be paid out of what is still undecided at that point, and how much that is depends on how finely the theory can actually distinguish outcomes, something it must answer from its own foundations rather than by assumption.

So the strength ratio stands, for now, as exact arithmetic inside a declared bookkeeping scheme rather than derived physics. What remains is sharply defined: one calculation of how much genuinely fresh information the final four checks demand, using the theory's own notion of distinguishability, and one direct measurement of how the relevant probability actually changes with scale. Nothing numerical is promoted in the meantime, and the paper's contribution is that several previously interchangeable meanings of the same number, counting, geometry, information and physical response, are now cleanly separated, with the true remaining questions stated exactly.

Abstract

The cumulative Primitive Matter Selection programme leaves the charged-flavour normalisation at a factor-resolved representation-current problem. The exact C/W/Y support projectors generate the unique scalar-factor radial tangent field, the selected GSJB neutral ray identifies the

49-complex projective innovation tangent inside the full 50-dimensional endpoint carrier, and the linearised MASD current depends only on relative endpoint innovation. The joint-endpoint problem reduces further: on the unresolved 49-complex-dimensional innovation tangent, every local, endpoint-exchange-symmetric, positive quadratic compatibility law that preserves the common U(49) isotropy and retains the Gate-2 perfect-square structure is, up to positive scale,

```
Q_(e,±) = a‖z_t ± U_e z_s‖².
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Thus the vector-valued handshake form is unique up to the orientation sign. If the scalar Gate-2 oriented-gluing sign is source-derived on the matter tangent, the physical branch is $Q_e = a\|z_t + U_e z_s\|^2$; hard completion gives $z_t = -U_e z_s$, $\gamma_e = -1$ and $\mathbb{E}[d_e d_e^\dagger] = 4I_{49}/49$, and, under the inherited unresolved Fubini-Study endpoint marginal, a Fubini-Study relative-current ray. The tensor attachment of the Gate-2 boundary primitive to the matter tangent remains open, and no Gibbs or Born weighting is inferred from this compatibility cost without a separate extension-information or marked-transfer theorem. For factorised E_2 birth fields the spatial E_2 geometry and internal C/W/Y geometry separate exactly.

CRTF-EX2O through EX2Q establish the native activation boundary. The pure neutral source is exactly dark to the nontrivial PFDMI current channels; finite active-source occupation activates a full-rank native C/W/Y Fisher matrix; and at ($\eta = s\eta_{max}$) the one-Fold accepted-current probability is ($h=s\beta$), reducing to ($h=\beta$) at saturation. Neither the MBCI raw-current intensity nor the MASD constitutive-defect norm can be identified with this primitive hazard. Proper current relaxation leaves a nonzero finite-E_2 action cost, but the full six-defect Schur residue and action-to-event descent remain separate open objects.

CRTF-EX2R types the next probability-grain problem. One Fold is the primitive committed Fact/record and K=7 is the minimum closure/admissibility geometry on which it is realised, so the canonical PFDMI attaching map gives

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7 Folds → 14 oriented incidences
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for a minimal complete history cover, while the exact D36 first completed-cover law has

```
𝔼[N_cover] = 21.277682950916294.
```

These are higher-order history results and do not locate the K7 electromagnetic source grain. The later provenance audit places the K7 electromagnetic admissibility structure on the primitive Fold boundary and excludes the completed D36 cover as its primitive source carrier. What remains open is whether that Fold-boundary electromagnetic effect is the same marked physical event as the native PFDMI one-Fold accepted-current event,

```
p_EM =? h_Fold^(PFDMI),
```

and whether a later cover-level readout reapplies the primitive gate.

CRTF-EX2S proves the stopped-score martingale theorem. The native Fold score increments are conditional-mean-zero and therefore form a score martingale. For the first completed closure cover,

$$M_{cover} = \mathbb{E}[\Sigma_{(n=1)}^{(N_{cover})} I_n].$$

At stationary D36 start the expected pre-transition state and edge occupations satisfy

$$\mathbb{E}[\text{visits to } x] = \mathbb{E}[N_{cover}] \pi_x,$$

and therefore

$$**M_{cover} = 21.277682950916294\ M_{Fold}^{(stat)}.**$$

Using the executed D36 occupation identity, the history-weighted E_2 Gram returns

$$M_{cover}^{(E_2)} = 6.32045066518\ I_2;$$

this scalar lift is exact conditional on the AH′ augmented-state certificate.

Under the additional operational premise that only K7-admitted covers enter the retained flavour readout, independent cover-level thinning gives ($M_{(admitted/opportunity)}=p_{(EM)}M_{(cover)}$). This is an information-throughput weight, not a rescaling of the conditional C/W/Y geometry.

CRTF-EX2T audits the remaining absolute ruler against the Two-Planck/Route-M coherence scale. Later PFDMI work structurally closes K=7 record realizability and conditionally derives the common-vacuum density descent, but a source-native absolute (ξ) remains unreturned because vacuum saturation, capacity-to-phase typing and cross-carrier identity are still open. Numerical overlap with the Route-M mesoscopic range is therefore a consistency check only.

CRTF-EX2U executes the carrier test directly and returns a no-go for a naive 14↔14 identity. PFDMI's fourteen traversal coordinates are ($7^{+}+7^{-}$) and have a rank-13 attaching image due to the exact arrival/departure balance relation. Route M's effective fourteen channels are ($10_{\triangle}+4_{(cl)}$), obtained from ten triangular holonomies plus five tetrahedral closure functionals modulo one discrete-Bianchi relation. The native effective dimensions are therefore 13 and 14 respectively, and the typed symmetry structures also fail to admit a direct (S_7)- or (D_6)-preserving carrier identification.

The strongest common object that survives is the abstract K=7 Boolean satisfaction carrier

$$\Omega_7=\{0,1\}^7,\quad |\Omega_7|=128.$$

The next common-source calculation is therefore an upstream dual-descent audit: determine whether one source-native seven-bit closure object generates both the PFDMI (2K) oriented-record clock and the Route-M (10+4) simplicial RG/coherence law.

The later Route-M audit establishes that the refinement-stable $10_\triangle+4_{cl} = 14$ census is a structural constraint/readout result rather than a fourteen-direction physical curvature carrier. On one 4-simplex the source-native edge-to-face curvature map has rank six, while the tetrahedral closure map has rank four, and simplicial exactness gives

$\mathrm{im}\ d_1 = \ker d_2$.

Thus connection-generated curvature occupies only the six-dimensional Bianchi-compatible face sector; the complementary four direct-face directions measure failure of integrability. The earlier $6\oplus8$ physical-Hessian interpretation is therefore withdrawn while the exact $6+4+4 = 6\oplus8$ readout decomposition is retained.

Retyping the fourteen as an admission problem gives the exact information identity

$I_{RM} = 70 \ln 2 + \Delta_T + I_{cl}$,

with $I_{cl} = -\ln P(G|T)$. The seventy K7 face-admission bits are fixed after conditioning on ten-face coherence and cannot be reused to supply four fresh seven-bit closure costs. If the tetrahedral functionals are source-identified as a physical pre-connection admission layer, their physical closure must instead be evaluated on the finite-distinguishability operational phase quotient. The remaining Route-M object is therefore the source-derived triple

$(\Phi_{op}, \mu_{op}, B_{op})$,

from which P_{cl}^{op} and the physical information weight must be calculated. Neither an assumed 128-state residual alphabet nor 14/16 may be inserted to obtain the desired coefficient. The direct two-regulator coherence running remains the independent physical beta test.

No physical (S_J), $(M_{(JJ)})$, $(\kappa_{(E_2)})$, absolute SI flavour-current rate or successor CKM matrix is issued.

1. Position in the VERSF Standard Model chain

1.1 The inherited flavour chain

This paper does not reopen the preceding flavour-carrier derivation. It consumes the following frozen results.

1. The primitive R4 fact carrier and the flavour-source preparation carrier are the same source-selected $k=\pm1$, $L=2$ plane.
2. The first nontrivial descent from that carrier into generation geometry is the unique quadratic map $Q(z)=z^2$, producing conjugate C_3 generation-curvature branches.
3. The full charged carrier has already been attached to that descent.

4. The frozen primitive source generates a nonzero pure $E_1^2 \rightarrow E_2$ cubic axle interaction, with source coefficient $g_{(ax)}=1/2$ in the frozen EPMD source convention.
5. The physical value of the charged-flavour axle is not fixed by that coefficient alone; the E_2 source metric and physical current/history normalisation remain required.
6. The strongest same-history typed continuation remains conditional and is not used as a target in this paper.
7. No successor physical CKM matrix has been issued.

The strengthened source chain before the present work is therefore

$$\text{primitive fact carrier} \rightarrow E_1 \rightarrow Q(z)=z^2 \rightarrow E_2 \text{ generation curvature} \rightarrow \text{nonzero primitive axle interaction} \rightarrow \text{full charged carrier} \rightarrow [\text{physical current normalisation open}].$$

The purpose of this paper is to attack the bracketed step.

1.2 Exact inherited normalisation boundary

PMS-EX119 establishes that the physical flavour E_2 doublet reaches D_J only, with

$$Y_2^\dagger Y_2=4I_2,$$

rank two and exact D_6 intertwining. The raw representation-valued current remains magnitude bearing before PFDMI normalises it.

PMS-EX120 establishes the exact factor supports

$$P_C=E_4+E_5+E_6,$$

$$P_W=E_2+E_3+E_6,$$

$$P_Y=I-E_1,$$

with completed-carrier ranks 36,26,47, but concludes that the support projectors do not select three fixed current vectors.

PMS-EX122 proves that D_6 covariance requires only

$$W_{(J2)}=M_2\otimes I_2, \qquad M_2=M_2^T,$$

and does not force $M_2 \propto I_3$.

PMS-EX123 eliminates all currently represented linear E_2 shorting portals except the primitive Abelian closure line.

PMS-EX126 finally writes the physical direct current contribution as

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

but leaves the three-row magnitude-bearing mark-score matrix S_J unreturned.

The present paper begins exactly there.

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2. Claim grades and premises

2.1 Claim grades

Four grades are used.

- **INHERITED EXACT**, consumed from a frozen earlier execution.
- **EXACT IN THIS PAPER**, follows algebraically from inherited objects and named definitions.
- **CONDITIONAL PHYSICAL IDENTIFICATION**, exact once a stated physical typing premise is granted.
- **OPEN EXECUTION**, requires frozen numerical arrays or a source-selection return not presently executed here.

No attractive numerical downstream result may upgrade a claim grade.

2.2 P-RT1: Scalar-factor semantics

The old colour, weak and Abelian radial variables are one scalar amplitude per factor. A factor-radial lift into the common representation-valued current must therefore act with one common logarithmic scale on that factor's complete active support. A representation-dependent weighting inside one factor would be a retyping to a representation-resolved source coordinate and is outside the scalar-factor problem being solved here.

This premise does not assert that all future VERSF source laws must remain scalar-factor typed. It states the typing of the exact inherited PMS normalisation debt.

2.3 P-RT2: Locality

The factor-radial action on edge e may depend on the local current j_e, the local factor projectors and the already-derived $E_2 \to D_J$ edge coefficient $q_e(u)$. It may not depend on a distant endpoint-frame preference, a measured coupling or a downstream flavour target.

2.4 P-RT3: Gauge covariance

The factor-radial lift must commute with the faithful $SU(3)\times SU(2)\times U(1)$ representation action. No gauge direction may be selected by hand.

2.5 P-RT4: Pure radiality

Within the active support of one scalar factor, the perturbation changes amplitude but introduces no internal rotation. In logarithmic radial coordinates, the active component scales multiplicatively.

2.6 P-RT5: Frozen E_2 defect profile

For $u\in E_2$,

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q_e(u)=-(Bᵀu)_e
```

is imported from PMS-EX119. Both real quadratures are executed.

2.7 P-RT6: Existing instrument first

Before constructing a new magnitude-bearing marked instrument, the existing PFDMI current instrument must be differentiated along the factor-radial tangent field derived here. A new instrument is justified only if the existing instrument fails this correctly typed derivative test.

2.8 P-RT7: No use of downstream targets

No CKM entry, quark mass, Jarlskog invariant, candidate $\kappa\_(E_2)$, HM4 direct-sum Gram, Hilbert-Schmidt candidate Gram, RRHF weight or experimental coupling may select the tangent field, its current population measure or the endpoint/current quotient.

2.9 P-RT8: Fold, Fact and K=7 closure-grain firewall

The foundational One-Fold/Commitment formulation is taken here in its structural sense:

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**one Fold = one primitive committed distinction = one record/Fact event.**
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The word "bit" may be used only in the structural sense of one binary distinction; it is not the Shannon surprisal of the realised outcome.

The K=7 object is differently typed. It is not seven constituent Folds whose accumulation first creates one Fact. K counts the minimum binary admissibility/closure geometry on which a Fold can be stably realised: six boundary constraints together with one global closure condition. Hence the foundational typing is

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**one Fold/Fact closes on K=7.**
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A Hamiltonian cycle, completed wheel cover or other trajectory involving several Folds is therefore a higher-order history of already realised Fold/Facts on the K=7 geometry. Such a history may be physically important for persistence, transport, readout or later admission, but it may not be used by itself to redefine the elementary Fact grain.

Accordingly, this paper distinguishes three objects throughout:

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primitive Fold/Fact,    K=7 closure/admissibility geometry,    multi-Fold
completed history cover.
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No probability, action cost or Fisher normalisation may be moved from one of these grains to another without a same-source operational theorem.

3. From fixed-vector injection to a covariant tangent field

3.1 Why the previous formulation was too strong

EX120 asked for a map from three scalar factor amplitudes into one representation-valued current and correctly proved that the support projectors alone do not select three fixed vectors in the 50-dimensional current carrier.

But a radial tangent does not require a background-independent fixed vector.

Let j_e be the current actually supplied by the primitive source at edge e. Once j_e is given, the factor components

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P_Cj_e,     P_Wj_e,     P_Yj_e
```

already exist covariantly.

The correct question is therefore:

Given the current j_e, what is the infinitesimal change corresponding to a scalar radial change of one physical factor?

That is a tangent-field problem.

3.2 General gauge-equivariant local generator

Let H_A be the infinitesimal internal generator for a scalar factor A.

Gauge covariance requires

$$[H_A,T_a]=0$$

for every faithful gauge generator T_a.

On the frozen representation algebra, the gauge commutant relevant to the factor-support census is central at the present grade, so

$$H_A=\Sigma_{(r=1)}^7 h_{(Ar)}E_r \ .$$

Factor support requires

$$H_A=P_AH_AP_A.$$

Thus only central atoms lying inside P_A may carry nonzero coefficients.

Pure scalar radiality adds the decisive condition: because ε_A is one scalar amplitude for the whole factor, every active component receives the same logarithmic scale. Hence all nonzero $h_{(Ar)}$ inside the factor support are equal:

$$H_A=c_AP_A.$$

Choosing ε_A itself to be logarithmic factor amplitude fixes

$$c_A=1.$$

Therefore

$H_A=P_A$

3.3 Theorem 1: Canonical scalar-factor radial-generator theorem

Theorem 1. Under P-RT1 through P-RT4, the unique local linear generator of a one-scalar factor-radial deformation is the factor support projector: $H_C=P_C$, $H_W=P_W$, $H_Y=P_Y$,

up to a trivial reparameterisation of the scalar radial coordinate. Logarithmic amplitude fixes that reparameterisation and returns the projectors exactly.

Scope

This theorem does **not** say that a future representation-resolved VERSF source must use uniform factor weights. It says that the inherited scalar-factor normalisation problem has a unique support-radial lift. A Casimir-weighted or charge-weighted internal profile is a different source typing and must be derived as such rather than silently inserted into this problem.

4. Finite C/W/Y radial action

4.1 Three commuting generators

Because the E_r are central orthogonal projectors, the three factor projectors commute:

$$[P_C,P_W]=[P_C,P_Y]=[P_W,P_Y]=0.$$

They are also linearly independent.

Suppose

$$aP_C+bP_W+cP_Y=0.$$

Restricting to a nonzero atom lying only in P_Y gives $c=0$. Restricting next to an atom lying in $P_C\cap P_Y$ but outside P_W gives $a=0$. Restricting to an atom lying in $P_W\cap P_Y$ but outside P_C gives $b=0$.

Hence the factor multiplicity genuinely has dimension three.

4.2 Finite action on one edge

For $u\in E_2$, define

$$q_e=q_e(u)=-(B^T u)_e.$$

For

$$\varepsilon=(\varepsilon_C,\varepsilon_W,\varepsilon_Y)^T,$$

define

$$A(\varepsilon)=\varepsilon_C P_C+\varepsilon_W P_W+\varepsilon_Y P_Y.$$

The finite factor-radial deformation is

$$**j_e(\varepsilon ; u)=\exp(q_e A(\varepsilon))j_e**$$

Because the generators commute,

$$\exp(q_e A) = \exp(q_e\varepsilon_C P_C)\ \exp(q_e\varepsilon_W P_W)\ \exp(q_e\varepsilon_Y P_Y).$$

This is an exact $\mathbb{R}^3$ multiplicative action.

4.3 Atom signatures

Using

$P\_C=E_4+E_5+E_6$, $P\_W=E_2+E_3+E_6$, $P\_Y=E_2+E_3+E_4+E_5+E_6+E_7$,

the logarithmic scale applied to each central atom is

Atom	C	W	Y	Total log scale
E_1	0	0	0	0
E_2	0	1	1	ε_W+ε_Y
E_3	0	1	1	ε_W+ε_Y
E_4	1	0	1	ε_C+ε_Y
E_5	1	0	1	ε_C+ε_Y
E_6	1	1	1	ε_C+ε_W+ε_Y
E_7	0	0	1	ε_Y

This table will control the projective visibility theorem below.

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5. The actual three E_2 magnitude-bearing source tangents

Differentiate at ε=0.

For A∈{C,W,Y},

$\mathcal{T}$_A(u)_e = . (∂ j_e)/(∂ε_A) $|_0$ = q_e(u)P_Aj_e

Thus

$\mathcal{T}$_C(u)_e=q_e($E_4+E_5+E_6$)j_e,

$\mathcal{T}$_W(u)_e=q_e($E_2+E_3+E_6$)j_e,

$\mathcal{T}$_Y(u)_e=q_e($I-E_1$)j_e

The sign convention follows the imported definition q_e=-(B^Tu)_e.

Because u has two real E_2 quadratures, the complete factor-radial source carrier is

$\mathbb{R}^3$_(factor)⊗ E_2,

six real dimensions before history weighting and auxiliary shorting.

Theorem 2: C/W/Y support-radial tangent-field theorem

Theorem 2. Under P-RT1 through P-RT5, the inherited three scalar current amplitudes possess a unique source-covariant support-radial lift into the PFDMI representation current: $D\Phi_J(j)[u,\varepsilon]_e = q_e(u)\,(\varepsilon_C P_C+\varepsilon_W P_W+\varepsilon_Y P_Y) j_e$.

The lift is local, gauge covariant, D_6-covariant through the inherited $q_e(u)$, magnitude bearing before projectivisation, and six-dimensional on $\mathbb{R}^3_{(\text{factor})} \otimes E_2$.

This replaces the missing *fixed vector-current injection* with a covariant tangent field.

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6. Gauge and D_6 covariance

6.1 Gauge covariance

Let the current transform as

$$j_e \mapsto G_e j_e.$$

Because each P_A is central,

$$G_e P_A = P_A G_e.$$

Hence

$$\mathcal{T}_A(Gj) = q_e P_A G j = G(q_e P_A j) = G\mathcal{T}_A(j).$$

The tangent field is gauge covariant.

6.2 D_6 covariance

The internal support projectors carry no wheel index. All wheel transformation content lies in

$$q(u) = -B^T u.$$

PMS-EX119 already proves the corresponding D_6 intertwining of the $E_2 \rightarrow D_J$ lift. Multiplication by a wheel-trivial internal projector therefore preserves that intertwining.

Corollary 2.1

The factor-radial tangent has type

$$A_1^{(hist)} \boxtimes E_2^{(src)} \boxtimes \mathbb{R}^3_{(factor)},$$

with no identification of history m=2 and source E_2.

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7. Projectivisation: global scale versus relative factor magnitude

7.1 Normalised current ray

Define

$$N_e = \langle j_e | j_e \rangle, \quad \rho_e = \frac{|j_e\rangle\langle j_e|}{N_e}.$$

For factor A, define

$$\pi_{(A,e)} = \mathrm{Tr}(\rho_e P_A) = \frac{\langle j_e | P_A j_e \rangle}{\langle j_e | j_e \rangle}.$$

Then

$$0 \le \pi_{(A,e)} \le 1.$$

7.2 Exact ray derivative

For

$$\delta_A j_e = q_e P_A j_e,$$

the norm derivative is

$$\delta_A N_e = 2q_e \langle j_e | P_A j_e \rangle = 2q_e \pi_{(A,e)} N_e.$$

Therefore

$$\boldsymbol{\delta_A \rho_e = q_e \left(P_A \rho_e + \rho_e P_A - 2\pi_{(A,e)} \rho_e \right)}$$

Define

$$Q_{(A,e)} = P_A - \pi_{(A,e)} I.$$

Then

$$\delta_A\rho_e = q_e\{Q_{(A,e)},\rho_e\}$$

Theorem 3: Relative-radial ray-visibility theorem

Theorem 3. A factor-radial perturbation is invisible to every ray-only instrument at edge e if and only if $\delta_A\rho_e=0$.

For a projector P_A, this occurs if and only if the current ray is an eigenray of P_A, equivalently the current lies entirely inside the factor support or entirely outside it: $\pi_{(A,e)}\in\{0,1\}$.

Whenever $0<\pi_{(A,e)}<1$,

the factor-radial perturbation changes the normalised representation-current ray.

Proof

For a pure normalised ray, a tangent has zero projective derivative exactly when the underlying vector derivative is proportional to the vector itself. Here

$$P_A j_e=\lambda j_e.$$

Since P_A is a projector, $\lambda\in\{0,1\}$. The converse is immediate.

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8. Exact recovery of the previous global-radial no-go

For a common total-current rescaling, the generator is

$$P_{(global)}=I.$$

Then

$$\pi_{(global)}=1$$

and

$$\delta\rho = q(I\rho+\rho I-2\rho) = 0.$$

Thus PMS-EX126 remains exactly correct:

$$j\mapsto e^\varepsilon j$$

is invisible to the existing PFDMI ray instrument.

What changes is the scope of that theorem.

Corollary 3.1: Global-scale no-go is not a factor-relative no-go

The exact zero for generator I does not imply an exact zero for generators P_C, P_W or P_Y, nor for any non-scalar linear combination of them.

The distinction is:

`**global magnitude ≠ relative factor magnitude**`

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9. The equal C/W/Y flavour direction is not global scaling

The charged-flavour common factor direction is

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

Its internal generator is

$K_f = (P_C+P_W+P_Y)/(\sqrt{3}).$

Using the exact support census,

$**P_C+P_W+P_Y = 2(E_2+E_3+E_4+E_5)+3E_6+E_7,**$

with coefficient zero on E_1.

The eigenvalues of the unnormalised sum are therefore

0, 1, 2, 3

on different nonzero central sectors.

It is not proportional to the identity.

Theorem 4: Physical common-mode non-globality theorem

Theorem 4. The equal C/W/Y scalar-factor deformation $\varepsilon\_C=\varepsilon\_W=\varepsilon\_Y$

is not a common rescaling of the representation-valued current. Its projective derivative vanishes only if the current is supported entirely within one eigenspace of $P_C+P_W+P_Y$.

For a generic current with support across more than one of the eigenvalue classes 0,1,2,3, the physical common factor direction is projectively visible.

This is the central correction to the earlier interpretation of EX126.

The statement “PFDMI erases radial magnitude” is exact for total-current scale. It is too broad if applied to factor-relative radial magnitude.

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10. The exact relative-radial ray Gram

10.1 Orthogonal ray tangents

Let

$$|\psi_e\rangle=\frac{|j_e\rangle}{\|j_e\|}.$$

The normalised-vector tangent induced by factor A, after removing the component parallel to $|\psi_e\rangle$, is

$$|\dot{\psi}_{A,e}^{\perp}\rangle = q_e(P_A-\pi_{A,e} I)|\psi_e\rangle.$$

Hence the real projective Gram is

$$C_{AB,e} = q_e^2 \operatorname{Re} \langle\psi_e| (P_A-\pi_A I)(P_B-\pi_B I) |\psi_e\rangle.$$

The central projectors commute and are Hermitian, so

$$\mathbf{C_{AB,e} = q_e^2 [\operatorname{Tr}(\rho_e P_A P_B) - \pi_{A,e}\pi_{B,e}]}$$

Removing the common q_e^2 factor defines the internal relative-radial capacity matrix

$$\mathbf{\mathcal{C}_{AB,e} = \operatorname{Tr}(\rho_e P_A P_B)-\pi_{A,e}\pi_{B,e}}$$

This is a covariance matrix and is therefore positive semidefinite.

10.2 Connection to PMS-EX120

PMS-EX120 already calculated the uncentred support Gram

$$(G_{CWY})_{AB} = \operatorname{Tr}(\rho P_A P_B).$$

Let

$\pi=(\pi_C,\pi_W,\pi_Y)^T$.

Then the new exact relation is

$$\mathcal{C} = G_{(CWY)}-\pi\pi^T$$

This is a major simplification.

The previous support Gram contained both relative factor information and the projectively invisible common radial component. Projectivisation does not destroy the entire factor geometry; it **centres** it.

Theorem 5: Support-Gram centring theorem

Theorem 5. For the scalar-factor support-radial tangent field, the complete source-side geometry visible to any normalised-ray instrument is exactly the covariance-centred EX120 factor Gram: $\mathcal{C}=G_{(CWY)}-\pi\pi^T$.

The lost direction is not "all magnitude" but the component of factor scaling that acts as a common scalar on the occupied current ray.

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11. Explicit C/W/Y covariance matrix

Let

$p_r=\mathrm{Tr}(\rho E_r)$.

Define

$c=p_4+p_5+p_6$,

$w=p_2+p_3+p_6$,

$y=1-p_1$.

Then

$\pi_C=c,\ \pi_W=w,\ \pi_Y=y$.

The exact support intersections are

$P_C P_W=E_6$,

$$P_C P_Y = P_C,$$

$$P_W P_Y = P_W.$$

Therefore

$$\mathcal{C} = \begin{bmatrix} c(1-c) & p_6 - cw & c(1-y) \\ p_6 - cw & w(1-w) & w(1-y) \\ c(1-y) & w(1-y) & y(1-y) \end{bmatrix}$$

Since

$$1-y = p_1,$$

the two Abelian cross terms simplify to

$$\mathcal{C}_{CY} = cp_1, \quad \mathcal{C}_{WY} = wp_1.$$

The colour-weak covariance is

$$\mathcal{C}_{CW} = p_6 - cw$$

and may have either sign.

These entries are not guessed current weights. They are exact functions of the current's central populations.

---

12. Rank and visibility criteria

For any factor vector $x=(x_C,x_W,x_Y)^T$, define

$$K(x) = x_C P_C + x_W P_W + x_Y P_Y.$$

Then

$$x^T \mathcal{C}\, x = \langle K(x)^2 \rangle_\rho - \langle K(x) \rangle_\rho^2 = \mathrm{Var}_\rho\, K(x).$$

Hence

$$x^T \mathcal{C}\, x = 0 \iff j \text{ is supported inside one eigenvalue sector of } K(x)$$

Theorem 6: Relative-radial capacity criterion

Theorem 6. The three C/W/Y radial parameters have full projective source capacity at a current state if and only if no nonzero linear combination K(x) is constant on the occupied central support of that current. Equivalently, $\mathcal{C}$ is positive definite exactly when the occupied factor-signature points are not contained in an affine plane normal to a nonzero x.

A simple sufficient condition is that the current has nonzero population in four affinely independent factor-signature classes. For example, simultaneous nonzero population in representative sectors with signatures

$$(0,0,0),\ (0,0,1),\ (0,1,1),\ (1,0,1)$$

already forces full rank three.

This provides a cheap preregistered calculation before differentiating the full PFDMI instrument.

---

13. Common-mode capacity

For

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

the source-side common-mode ray capacity is

$$f^T\mathcal{C}\ f = \mathrm{Var}_\rho(K_f).$$

Equivalently, with

$$K_\Sigma=P_C+P_W+P_Y,$$

$$f^T\mathcal{C}\ f = (1/3)\ (\langle K_\Sigma^2\rangle - \langle K_\Sigma\rangle^2)$$

Because K_Σ has the atom spectrum

$$0,2,2,2,2,3,1,$$

this quantity is zero only when the current lives entirely in one of the corresponding eigenvalue classes.

Thus the physical flavour common mode has a precise source-side capacity test.

No CKM datum enters it.

---

14. Quantum-information upper bound

The current ray is a pure-state statistical model. For the support-radial parameters, the pure-state quantum Fisher matrix on one edge is

$$F_{(Q,AB)}^{((e))} = 4q_e^2\mathcal{C}_{(AB,e)},$$

in the standard pure-state QFI convention.

For any measurement or marked instrument acting only on that normalised ray, its classical Fisher matrix satisfies the matrix data-processing bound

$$F_{(\mathrm{mark})}^{((e))} \preceq F_Q^{((e))}$$

Theorem 7: Ray-information ceiling

Theorem 7. The history-weighted covariance of the central factor projectors is an instrument-independent upper bound on every PFDMI-like mark score derived solely from the normalised current ray. A zero mode of the covariance is an exact no-go for all ray-only instruments. A positive mode establishes available source information but does not guarantee that a particular instrument reads it efficiently.

This gives a rigorous separation between **capacity** and **instrument visibility**.

---

15. Existing PFDMI orbit response along the new tangents

15.1 Current orbit

The PFDMI current instrument uses

$$K_a=i[T_a,\rho].$$

Let

$$Q_A=P_A-\pi_A I.$$

Since P_A is central,

$$[T_a,P_A]=0.$$

Using

$$\delta_A\rho=q\{Q_A,\rho\},$$

we obtain

$$\delta_A K_a = i[T_a,\delta_A\rho] = q\, i[T_a,\{Q_A,\rho\}].$$

Centrality gives

$$\delta_A K_a = q\{Q_A,K_a\}$$

This is generally nonzero.

For global rescaling, $P=I$, so $Q=0$ and the derivative vanishes exactly.

15.2 Orbit Gram

With

$$S=\Sigma_a K_a^\dagger K_a,$$

the derivative is

$$\delta_A S = \Sigma_a \left[(\delta_A K_a)^\dagger K_a + K_a^\dagger \delta_A K_a \right].$$

Using $\delta_A K_a=q\{Q_A,K_a\}$,

$$\delta_A S = q \left[\{Q_A,S\} + 2\Sigma_a K_a^\dagger Q_A K_a \right]$$

There is no general proportionality

$$\delta_A S \propto S.$$

Therefore the homogeneous saturation cancellation found for a pure overall scale does not extend automatically to the factor-relative tangents.

Theorem 8: Existing-orbit relative-radial response theorem

Theorem 8. The PFDMI orbit operators respond to a factor-relative radial tangent according to $\delta_A K_a=q\{P_A-\pi_A I,K_a\}$.

The response is identically zero for common global rescaling and generically nonzero for factor-relative radial deformation. Hence the current PFDMI architecture is not structurally forbidden from carrying the missing C/W/Y relative-magnitude scores.

This is the exact reason a new marked instrument should not be introduced before the existing instrument is tested along the correct tangents.

---

16. Differentiating the current instrument

For a fixed admissible interior current normalisation η,

$$C_a=\sqrt{\eta}\, K_a, \qquad a\geq 1,$$

so

$$\delta_A C_a = \sqrt{\eta}\, \delta_A K_a.$$

The complement is

$$C_0=(I-\eta\, S)^{1/2}.$$

Its Fréchet derivative $X_A=\delta_A C_0$ is the Hermitian solution of

$$C_0 X_A+X_A C_0 = -\eta\, \delta_A S$$

when C_0 is strictly positive.

If a current-dependent normalisation prescription $\eta(\rho)$ is imposed, the right-hand side becomes

$$-\delta_A\eta\, S-\eta\, \delta_A S$$

and the nontrivial channels acquire the additional term

$$\delta_A C_a = \frac{\delta_A\eta}{2\sqrt{\eta}} K_a + \sqrt{\eta}\, \delta_A K_a.$$

The present paper does not assume maximal positivity is physically selected. The correct execution should therefore first test a nontrivial admissible interior η-interval, with the saturated prescription retained as a secondary declared branch.

This prevents the old positivity convention from silently doing physical work in the new flavour-normalisation calculation.

---

17. PFDMI mark-score descent

Let a primitive current/terminal mark be

$m=(e,\alpha,r)$.

Its probability is

$$p_m = \mathrm{Tr}\,[\,\rho_s U_e^\dagger C_{(e,\alpha)}^\dagger P_r C_{(e,\alpha)} U_e\,],$$

with the same-source tangent prescription used consistently.

The physical factor score is

$$s_{(A,m)}^{(\mu)} = \frac{1}{p_m} \frac{d}{d\varepsilon_A} p_m\,(\,j+\varepsilon_A \mathcal{T}_A(e_\mu)\,)\,\Big|_{\varepsilon_A=0},$$

for

$A\in\{C,W,Y\}$, $\mu\in\{c,s\}$.

The total derivative must include every dependence of the current instrument on the changed current ray.

This is the object PMS-EX126 denoted abstractly by S_J. It is now an explicit derivative problem.

Theorem 9: Existing-instrument score representation

Theorem 9. Under the scalar-factor radial identification, the previously missing C/W/Y score rows are no longer undefined source objects. They are the total PFDMI probability derivatives along the tangent fields $\mathcal{T}_A(e_\mu)e=q(\mu\, e)P_A j_e$.

The remaining issue is numerical execution and physical quotient stability, not the absence of a typed derivative direction.

---

18. One-mark-per-Fold physical metric

The one-mark-per-Fold innovation theorem remains controlling. For distinct primitive marks, compensated innovations are orthogonal. Therefore, once the score rows have been returned,

$$M_{(JJ)} = S_J \Lambda S_J^\top,$$

with Λ the diagonal history-weighted primitive-mark measure.

No factor orthogonality is assumed.

The factor cross terms are generated when two factor perturbations change the same primitive mark.

The two E_2 quadratures must return the same factor matrix under exact D_6 covariance:

$$M_{JJ}^{(c)}=M_{JJ}^{(s)}$$

within execution tolerance.

Failure of this equality is a direct falsifier of the proposed lift or the numerical implementation.

---

19. Endpoint/current flatness: what has and has not been solved

The source still admits a large flat endpoint/current family at the PFDMI level. Earlier work proves that the five frozen EX2E prime-chirp witnesses all satisfy the same-source current residual

$$D_{J,e}=0$$

and all retain the local physical score rank, while their gauge-invariant current populations differ.

The present tangent theorem does **not** select one of those witnesses.

What it does is remove a separate ambiguity: for any current state j, the scalar-factor radial tangent is no longer a hand-chosen fixed vector. It is determined covariantly by the current and the exact factor projectors.

The first numerical question is therefore whether the source-side relative-radial geometry survives at all on the frozen witnesses. The second, logically prior to any physical promotion, is whether those witnesses are admissible backgrounds of the later master action.

Theorem 10: Background-covariant / numerical-quotient separation

Theorem 10. The factor-radial tangent *law* is background covariant:
$j\mapsto\{\mathcal{T}_C(j),\mathcal{T}_W(j),\mathcal{T}_Y(j)\}$.

It does not require an arbitrary fixed internal vector. Numerical physical promotion nevertheless requires the tangent to be evaluated on an action-admissible physical current state and for the resulting score metric to descend to the physical history/null quotient.

This formulation replaces the earlier assumption that all five EX2E genericity witnesses should be treated as candidate physical vacua.

19A. CRTF-EX1: Executed relative-radial ray-capacity census

CRTF-EX1 reconstructs the five frozen EX2E endpoint/current witness families from their archived target-blind formulas and evaluates

$$\mathcal{C}_e = G_{\{CWY\},e} - \pi_e \pi_e^T$$

with both inherited E_2 quadratures and the frozen stationary edge-attempt weights.

The reconstruction reproduces the archived EX32 current-population differences to machine precision and satisfies

$$\|q_c\|^2 = \|q_s\|^2 = 4, \quad q_c \cdot q_s \approx 0.$$

The basis-invariant factor-capacity results are:

EX2E witness	factor rank	full C/W/Y⊗ E_2 rank	common-mode capacity	E_2 isotropy residual
primary p53 quadratic-linear	3	6	0.051374	6.39%
p53 quadratic-shifted	3	6	0.038012	2.10%
p53 heptadic-linear	3	6	0.052851	1.36%
p59 cubic	3	6	0.066486	1.56%
p61 cubic-quadratic	3	6	0.064024	1.96%

Thus every frozen witness carries three independent relative C/W/Y radial directions and full six-dimensional factor-times-E_2 source capacity. The new tangent field is therefore not projectively empty.

The numerical geometry is not witness independent. Across the five witnesses:

- the maximum raw relative Frobenius separation of the factor-capacity matrices is approximately 34.17%;
- after trace normalisation the largest Frobenius separation is approximately 0.2218;
- the equal-factor direction $f=(1,1,1)^T/\sqrt{3}$ changes by as much as approximately 54.50%.

CRTF-EX1 verdict

```
**RELATIVE-RADIAL CAPACITY PASS / PFDMI-WITNESS PHYSICAL PROMOTION FAIL**
```

This execution rules out one feared no-go, loss of all relative factor magnitude under projectivisation, but does not return a physical current metric.

19B. CRTF-EX2A: MASD static continuity obstruction

The later Master Substrate Action introduces an independent transport-conservation defect in addition to D_J:

$$D_T(i) = \partial_\sigma \rho_i + (\partial_U J)_i \ .$$

To test whether the five EX2E genericity witnesses can be regarded as static master-action backgrounds, take the literal inherited frozen embedding used by EX2E:

1. trivial frozen link background;
2. endpoint field ψ_v identified with the current-source endpoint amplitude for this test;
3. raw current

   $$J_e=\psi_{t(e)}-\psi_{s(e)} \ ;$$

4. static background condition

   $$\partial_\sigma \rho=0.$$

Let B be the oriented incidence matrix of the seven-vertex, twelve-edge wheel. Then

$$J=B^T\psi$$

and the transport-conservation defect is

$$\mathbf{D_T=BJ=BB^T\psi=L_{(W_7)}\psi}$$

The wheel Laplacian has spectrum

$$\mathbf{\operatorname{spec} L_{(W_7)}=\{0,2,2,4,4,5,7\}}$$

Hence

$$\ker L_{(W_7)} = \operatorname{span}\{\mathbf{1}\}.$$

A static endpoint/current configuration satisfying both the EX2E current relation and the MASD continuity zero must therefore be vertex constant.

Every frozen prime-chirp endpoint field is nonconstant.

The direct numerical execution gives:

EX2E witness	‖J‖	static ‖D_T‖	‖D_T‖/‖J‖
primary p53 quadratic-linear	5.028459	10.954479	2.178496
p53 quadratic-shifted	4.949654	10.828018	2.187631
p53 heptadic-linear	4.945061	10.786689	2.181305
p59 cubic	4.978693	10.865518	2.182404
p61 cubic-quadratic	4.739747	10.234779	2.159351

The algebraic identity $D\_T=L\_(W_7)\psi$ is reproduced to residuals of order 10^(-15).

Theorem 11: Static master-action continuity obstruction

Theorem 11. On the connected W_7 wheel, under the literal static trivial-link embedding of the EX2E current source, $D\_J=0$, $J=B^T\psi$, $\partial\_\sigma\rho=0$

imply $D\_T=L\_(W_7)\psi$.

Therefore D_T=0 if and only if the endpoint field is vertex constant. None of the five frozen nonconstant prime-chirp EX2E witnesses is a static MASD common-zero background.

Corollary 11.1: Positive-conductance extension

Let

```
K=diag(κ_e), κ_e>0,
```

and take

```
J=KBᵀψ .
```

Then

```
D_T=BKBᵀψ.
```

Because the wheel is connected and K is strictly positive,

```
ker(BKBᵀ)=span{1}.
```

Hence no choice of strictly positive edge conductances can turn any nonconstant prime-chirp witness into a static master-action continuity zero.

This conclusion does not invalidate CRTF-EX1 or the earlier PFDMI rank certificates. Positive edgewise scaling leaves each normalised current ray unchanged. It changes the status of the backgrounds: the five chirps remain useful genericity witnesses for the PFDMI ray instrument, but they are not thereby physical static MASD vacua.

Corollary 11.2: Non-static escape condition

A nonconstant EX2E witness can satisfy the continuity equation only if the full master dynamics supplies a compensating transport/refinement derivative

$\partial_\sigma\rho=-BKB^T\psi$

or if the master-action background/link/current identification differs from the literal embedding in a source-derived way.

For the unit-conductance representative, the required derivative norm is exactly the static D_T norm in the table above.

CRTF-EX2A verdict

ALL FIVE EX2E GENERICITY WITNESSES FAIL STATIC MASD CONTINUITY ADMISSION.

The witness-to-witness variation found in CRTF-EX1 therefore cannot yet be interpreted as a spread among five physical vacua. The physically relevant current state must first be returned by the complete transport/refinement dynamics or identified as a controlled excitation over an admitted master background.

19C. CRTF-EX2B: Primitive refinement-flow interpretation

MASD writes the transport-conservation defect as

$D_T=\partial_\sigma\rho+\partial_U J.$

The earlier sequential-interface and substrate-dynamics stack makes σ a primitive update/refinement parameter rather than ordinary pre-existing physical time. HMGBC then supplies the appropriate history object: a positive transfer and its Perron/Doob-normalised refinement dynamics.

Let the positive history semigroup be

$\hat{T}_s=e^{-s\hat{H}},$

with positive Perron/ground-state vector r and

$\hat{H}\, r=E_0 r.$

The associated Doob generator acting on observables is

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

The natural completion of the MASD notation is therefore

$$\partial_\sigma \rho = \mathcal{G}_{(hist)} \rho,$$

once the physical history generator is supplied.

On the reversible heat branch this reduces to

$$\partial_\sigma \rho = -L^{(op)} \rho.$$

The MASD continuity equation then becomes a **generator-matching condition**:

$$\mathcal{G}_{(hist)} \rho + \partial_U J = 0$$

For a fixed heat generator,

$$\rho(\sigma) = e^{-\sigma L^{(op)}} \rho(0),$$

so the law uniquely evolves an initial profile but does not select that initial profile.

Theorem 12: Evolution / selection separation

Theorem 12. A positivity-improving refinement semigroup can return a unique stationary Perron law within an irreducible physical component, but it does not thereby select one unique non-static deterministic endpoint/current profile.

CRTF-EX2B verdict

REFINEMENT-GENERATOR INTERPRETATION: STRUCTURAL PASS

UNIQUE NON-STATIC DETERMINISTIC BACKGROUND: NOT RETURNED

A source-derived stationary history ensemble remains a legitimate replacement target.

19D. CRTF-EX2C: Canonical MASD/HMGBC generator matching

The HMGBC canonical K=7 kernel has stationary measure

$$\pi = (1/31)(7,4,4,4,4,4,4), \quad \Pi = \mathrm{diag}\,\pi.$$

On every non-self rim and spoke edge the stationary reversible conductance is

$$c_e=\pi_x T_0(x,y)=(1/31).$$

Let B be the oriented incidence matrix of the twelve geometric wheel edges and

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

The MASD constitutive current divergence generated by those stationary conductances is

$$L_J = BCB^T.$$

The HMGBC Dirichlet form is

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

Direct execution gives

$BCB^T = Q_7 = (1/31)L_{(W_7)}$

to residual 2.8×10^(-17).

The random-walk and symmetric coordinate forms are

$$L_{(rw)} = \Pi^{-1}Q_7 = I-T_0,$$

and

$$L_7 = \Pi^{(-1/2)}Q_7\Pi^{(-1/2)}.$$

Hence

$Q_7=\Pi\ L_{(rw)},\ L_7=\Pi^{1/2}L_{(rw)}\Pi^{(-1/2)}$

The different published spectra are therefore coordinate descriptions of one reversible Dirichlet geometry, not competing transport laws.

For an ordinary vertex field,

$$\rho \doteq -L_{(rw)}\rho$$

and

$$J=CB^T\rho$$

give

$\Pi\dot\rho+BJ=0$

The five frozen EX2E witnesses all satisfy this mass-weighted continuity equation with residuals of order 6×10^{-17}.

Theorem 13: Canonical Dirichlet generator matching

Theorem 13. On the canonical K=7 reversible wheel, the HMGBC history Dirichlet form and the MASD stationary-conductance current-divergence form coincide exactly: $L_J=Q_7$.

Theorem 14: Dynamic resolution of the static obstruction

Theorem 14. CRTF-EX2A remains exact as a static statement, but the HMGBC refinement flow dynamically cancels the same Dirichlet divergence in stationary-measure coordinates:
$\Pi\dot\rho+Q_7\rho=0$.

Thus nonconstant EX2E profiles are not excluded from the canonical dynamical theory merely because they are not static vacua.

MASD normalisation caveat

MASD prints

$D_T=\partial_\sigma\rho+\partial_U J$

without explicitly displaying Π. At the canonical history grade the exact weighted-graph equation is

$\Pi\rho+\partial_U J=0$.

The present corpus does not explicitly settle whether MASD's $\partial_\sigma\rho$ is already a mass-weighted derivative, whether Π should be written explicitly, or whether the field is intended in mass-normalised coordinates.

This is a typing/normalisation debt, not a failure of the canonical transport geometry.

The reversible heat branch has a one-dimensional stationary kernel, so its asymptotic geometric current vanishes. A persistent flavour-bearing current cannot therefore be identified with the reversible equilibrium heat current.

CRTF-EX2C verdict

CANONICAL GENERATOR MATCHING: EXACT DIRICHLET-FORM PASS

STATIC OBSTRUCTION: DYNAMICALLY RESOLVED AT CANONICAL LEVEL

FULL PHYSICAL $L^{(op)}$ ATTRIBUTION AND MASD ∂_σ NORMALISATION: OPEN

19E. CRTF-EX2D: Irreversible history-current pushforward audit

The reversible equilibrium branch carries no persistent geometric current, so the next possible source is the irreversible oriented history flow.

IORC returns the unique rotation-invariant, reflection-odd wheel current. In rim/spoke edge coordinates its orientation score is

$$\omega_C = (1,1,1,1,1,1 \; ; \; 0,0,0,0,0,0).$$

At the one-Bit root

$$\alpha_\star=0.959001109719975,$$

the source-derived stationary rim current is

$$J_{(rim)}^\sigma = \sigma \, 0.060231697816834,$$

uniform on all six rim edges, with zero spoke current.

This is an A_2, m=0 cycle/circulation mode.

The flavour-current defect from PMS-EX119 is instead

$$D_J(u)=-B^T u, \quad u\in E_2,$$

and hence lies in the exact-gradient subspace $\mathrm{im}B^T$.

Because the rim circulation is divergence free,

$$B\omega_C=0,$$

one has for every u,

$$\langle \omega_C, B^T u\rangle = \langle B\omega_C, u\rangle = 0.$$

Therefore

$\omega_C \perp D_J(E_2)$

The executed cosine/sine overlaps are of order 10^{-16}, the weighted overlaps are of order 10^{-18}, and the projection of ω_C onto the full E_2 edge plane is 5.6×10^{-17}.

The same result holds at the driven-history Fisher level:

$\mathrm{Cov}(\omega_C,q_c)\approx 9.1\times10^{-18}$, $\mathrm{Cov}(\omega_C,q_s)\approx -1.5\times10^{-19}$.

Representation theory gives the same obstruction:

$\mathbf{Hom_{D_6}(A_2,E_2)=0}$

Theorem 15: Cycle/gradient separation

Theorem 15. The source-derived irreversible history circulation lies in the cycle subspace ker B, while the flavour E_2 current defect lies in the exact-gradient subspace $\mathrm{im}B^T$. Their direct scalar linear coupling vanishes exactly.

Theorem 16: Orientation / magnitude separation

Theorem 16. The A_2 irreversible history current cannot supply the radial E_2 flavour stiffness through a scalar or identity-like equivariant pushforward. It remains naturally typed to orientation/chirality and potentially the later absolute CP sign.

50-dimensional first-record check

The F2F retained record grain is (e,r), not the directed-history/current-channel grain. A single retained edge/type token is reversal-even; directed-to-edge coarse-graining removes the one-record A_2 orientation. Ordered pairs of retained rim records can recover an A_2 chirality observable, but that remains A_2-typed and is not itself a 50-dimensional E_2 current vector.

A possible nonzero linear route would require a genuinely marked/tensor internal carrier:

$A_2^{(hist)}\otimes E_2^{(int)} \cong E_2$.

That is a different construction and may not be replaced by identifying the irreversible history current with the MASD/PFDMI current.

CRTF-EX2D verdict

DIRECT IRREVERSIBLE HISTORY CURRENT → E_2 FLAVOUR MAGNITUDE: EXACT ZERO

IRREVERSIBLE HISTORY CURRENT: RETAINED AS AN ORIENTATION/CP CANDIDATE

19F. CRTF-EX2E: Record-conditioned population law and ensemble/mixture firewall

The first question after the direct $A_2 \to E_2$ no-go is whether the existing record law already determines the seven current populations required by the factor covariance.

For an ordered retained record ϱ, the source-built instrument returns the conditioned density

$\bar{\rho}_\varrho = \mathcal{J}_\varrho(I) / \mathrm{Tr}[\mathcal{J}_\varrho(I)]$, and hence exact central populations

$p_r(\varrho) = \mathrm{Tr}[E_r \mathcal{J}_\varrho(I)] / \mathrm{Tr}[\mathcal{J}_\varrho(I)]$.

This is an exact record-to-population map at density-operator grain.

It is not yet an endpoint-amplitude return.

The full 50-dimensional central ranks are

(3,6,2,9,9,18,3),

so the maximally mixed benchmark gives

$p^{mm} = (0.06,0.12,0.04,0.18,0.18,0.36,0.06)$

and

$(c,w,y)=(0.72,0.52,0.94)$.

Its factor covariance is

$\mathcal{C}_{mm}$ = [[0.2016,-0.0144,0.0432], [-0.0144, 0.2496,0.0312], [0.0432, 0.0312,0.0564]], with rank three.

This is a benchmark only.

Conditioning on one central record instead gives

$\bar{\rho}_r=E_r/\mathrm{rank}(E_r)$,

and every such state has

$\mathcal{C}_r=0$.

Thus the rank-three covariance of the mixed benchmark is carried between record classes rather than inside any one central record.

The operational grain therefore matters:

$$\mathcal{C}(E\rho) \neq E[\mathcal{C}(\rho)]$$

in general.

Removing the neutral N_R class from the benchmark collapses the factor covariance to rank two, already indicating that the neutral reference class is structurally important.

CRTF-EX2E verdict

RECORD → CENTRAL POPULATION MAP: EXACT PASS AT DENSITY GRAIN

MIXED-STATE RANK-THREE BENCHMARK: EXECUTED / NOT PHYSICAL SELECTION

CENTRAL-CONDITIONED RECORD: FACTOR COVARIANCE ZERO

ENSEMBLE-VERSUS-MIXTURE TYPING: LOAD-BEARING

19G. CRTF-EX2F: Endpoint-amplitude attachment no-go

MASD defines the representation current from endpoint amplitudes, not endpoint density matrices alone.

Let

$R_s=E[|\psi_s\rangle\langle\psi_s|]$, $R_t=E[|\psi_t\rangle\langle\psi_t|]$, and define the endpoint cross coherence

$$\Gamma_{ts} = E[|\psi_t\rangle\langle\psi_s|].$$

Then for comparison transport U_e, $R_J = R_t + U_e R_s U_e^\dagger - \Gamma_{ts} U_e^\dagger - U_e \Gamma_{ts}^\dagger$.

Therefore the endpoint marginals R_s and R_t do not determine the current.

The missing information is Γ_{ts}.

A two-sector 50-dimensional phase counterexample gives identical endpoint density matrices while continuously changing the N_R and Q_L populations of the resulting current ray.

Hence:

ENDPOINT DENSITIES ALONE DO NOT DETERMINE THE MASD CURRENT RAY.

The retained record law must return either an amplitude law, a cross-coherence law, or a same-action endpoint update strong enough to reconstruct it.

CRTF-EX2F verdict

RECORD DENSITY → UNIQUE ENDPOINT AMPLITUDE: NO-GO

CURRENT POPULATION REQUIRES ENDPOINT CROSS COHERENCE

19H. CRTF-EX2G: Open-edge source census and the update-mismatch theorem

A direct audit of the sequential-interface, transport-holonomy, microscopic-refinement and record-conditioned sources finds no already-derived same-carrier open-edge matter-amplitude update

$V_e:\mathbb{C}^{50} \to \mathbb{C}^{50}$

distinct from the faithful comparison transport U_e.

If such an actual endpoint update is supplied, define

$A_e=V_e-U_e.$

Then

$j_e = \kappa_e A_e \psi_s.$

For a source-derived incoming projective law μ_s, $p_r^{phys}(e) = \int$

$\langle\psi|A_e^\dagger E_r A_e|\psi\rangle / \langle\psi|A_e^\dagger A_e|\psi\rangle$

$d\mu_s([\psi]).$

If $V_e=U_e$, $A_e=0$

and the representation current vanishes exactly.

This isolates the physical current as the difference between actual endpoint evolution and comparison/parallel transport.

CRTF-EX2G verdict

EXISTING SAME-CARRIER V_e^{matter}: NOT RETURNED

CURRENT = ACTUAL ENDPOINT UPDATE − COMPARISON TRANSPORT

$V_e=U_e \Rightarrow j_e=0$

19I. CRTF-EX2H: Central-support preservation and signature-rank theorem

Suppose both the actual matter update and faithful comparison transport preserve the central representation projectors:

$$[V_e,E_r]=[U_e,E_r]=0.$$

Then

$$[A_e,E_r]=0.$$

If the incoming state lies in one central atom E_r, the current remains in that atom and

$$p_s^{(J)}=\delta_{sr}.$$

Therefore

$$\mathcal{C}_{CWY}=0.$$

Pure generation rotation inside one charged representation block, charge-blind mass readout inside one sector, and ordinary faithful gauge transport cannot by themselves create a nontrivial three-factor radial geometry from a single central atom.

The seven representation atoms collapse to five distinct C/W/Y signatures:

N_R : (0,0,0)

L_L/H : (0,1,1)

d_R/u_R : (1,0,1)

Q_L : (1,1,1)

e_R : (0,0,1).

For positive populations on distinct signatures s_i, rank $\mathcal{C}$ = dim AffSpan$\{s_i\}$.

Hence full rank three requires at least four affinely independent occupied signatures.

Every full-rank four-signature subset contains N_R. Therefore

FULL C/W/Y RANK REQUIRES THE N_R REFERENCE PLUS AT LEAST THREE AFFINELY INDEPENDENT NON-NEUTRAL SIGNATURE CLASSES.

This converts the current-population problem into a precise source-support test.

19J. CRTF-EX2I: Primitive Haar birth support

The GSJB preparation chain selects a unique zero-entropy equal-copy neutral ray

$$|\Omega\rangle \in N_R$$

as the pre-fact canvas.

The projective tangent is

$$\Omega^\perp \cong \mathbb{C}^{49}.$$

Because the selected void removes one direction from the rank-three N_R sector, the tangent central dimensions are

(2,6,2,9,9,18,3)

over

$$(N_R^\perp, L_L, H, d_R, u_R, Q_L, e_R).$$

Under the conditional GSJB unresolved preparation law, $\mu_\emptyset = \mu_{FS}$

on CP^{48}.

The five distinct factor-signature populations are therefore Dirichlet distributed with parameters

(2,8,18,18,3).

All parameters are strictly positive, so all five signature classes have nonzero population almost surely.

Thus

rank $\mathcal{C}(z)=3$ for μ_FS-almost every primitive innovation ray z.

The exact mean tangent state is

$\bar{\rho}$_FS = $(I_{50}-|\Omega\rangle\langle\Omega|)/49$,

with

(c,w,y) = (36/49,26/49,47/49).

Its mixed-state covariance is

$\mathcal{C}$_mix = (1/2401)

[[468,-54,72], [-54,598,52], [72,52,94]], while the exact mean within-ray covariance is

E_FS[$\mathcal{C}$(z)] = (49/50)$\mathcal{C}$_mix.

The remaining

(1/50)$\mathcal{C}$_mix

is the covariance of the factor occupancies between Haar rays.

Therefore the ensemble-versus-mixture distinction is exact and quantitative.

CRTF-EX2I verdict

UNRESOLVED HAAR BIRTH SUPPORT: FULL C/W/Y CAPACITY PASS

FACTOR RANK THREE: ALMOST SURE

N_R TANGENT REFERENCE: PRESENT WITH MEAN WEIGHT 2/49

REALISED POST-RECORD DIRECTION AND GIBBS--HAAR TILTS: OPEN

19K. CRTF-EX2J: Primitive birth mark and current-tangent identity

The primitive-birth source forbids a symmetry-preserving deterministic birth direction. The appropriate object is a marked support-changing family

$$B(z) = |z\rangle\langle\Omega|,$$

with $z \in \Omega^\perp$.

The faithful gauge transport fixes the void ray:

$$U_e|\Omega\rangle=|\Omega\rangle.$$

If the same primitive event supplies the endpoint-amplitude innovation entering MASD,

$$|\psi_t\rangle = |\Omega\rangle+\varepsilon B(z)|\Omega\rangle+O(\varepsilon^2),$$

then

$$j_e = \kappa_e \varepsilon z+O(\varepsilon^2),$$

and therefore

$$\lim_{\varepsilon \to 0}\rho_{(J,e)} = |z\rangle\langle z|.$$

This is the Primitive Birth-Current Tangent Identity.

For every central projector,

$$B(z)^\dagger E_r B(z) = \langle z|E_r|z\rangle\ |\Omega\rangle\langle\Omega|.$$

Thus, mark by mark, the current populations are exactly the Born populations of the innovation direction.

This bridge remains conditional because the source corpus does not yet prove that the GSJB birth mark is the same physical endpoint update entering MASD.

19L. CRTF-EX2K: Relative-birth current and Haar universality

Direct linearisation of the MASD current defect at the faithful neutral void gives

$$\delta J_e = \kappa_e(\delta\rho_t-\delta\rho_s).$$

The current therefore responds only to relative endpoint innovation.

Three exact cases follow:

target-only birth:

$\delta J=\kappa z;$

source-only birth:

$\delta J=-\kappa z;$

common-mode birth:

$\delta\rho_t=\delta\rho_s$

$\Rightarrow$

$\delta J=0.$

Let the endpoint tangent pair (z_s,z_t) have a joint law invariant under the common U(49) action.

Then

$d=z_t-z_s$

also has a U(49)-invariant law.

If $d \neq 0$ almost surely under the joint U(49)-invariant law, its projective direction is well defined and carries the unique invariant law:

$[d] \sim \mu_{FS}.$

The stronger hypothesis matters: mere non-degeneracy permits an atom at $d = 0$, where the projective direction does not exist. Given $P(d = 0) = 0$, a jointly isotropic endpoint-birth law produces a Haar current ray without selecting an internal frame.

If

$E[z_t z_s^\dagger] = \gamma_e I_{49}/49$, then

$E[dd^\dagger] = (2-2\mathrm{Re}\gamma_e)I_{49}/49.$

Hence $\mathrm{Re}\gamma_e$ controls unnormalised current strength:

$\mathrm{Re}\gamma_e=1$

$\Rightarrow$

zero current;

$\mathrm{Re}\gamma_e<1$

$\Rightarrow$

nonzero relative-current capacity.

The orientation remains Haar after projectivisation.

19L-A. Relational endpoint-handshake uniqueness theorem

CRTF-EX2K reduces the unresolved physical endpoint problem to the joint law of the two neighbouring primitive innovations. At the faithful neutral void let

$$H = \Omega^\perp \cong \mathbb{C}^{49},$$

and let $z_s, z_t \in H$ be the source and target endpoint innovations. Transport the source innovation to the target frame,

$$x = U_e z_s, \quad y = z_t.$$

The question is whether the relational boundary structure already present elsewhere in VERSF can restrict the possible joint endpoint law without selecting a preferred internal matter direction.

The Gate-2 construction supplies a two-sided completion primitive with three relevant structural properties: neither side of a shared boundary is privileged, the comparison is local in the two boundary values, and the completion cost is a positive perfect square. The present calculation does not assume that the scalar Gate-2 boundary variable is already the physical matter innovation. It asks first what form a corresponding law would be forced to take if it acts on the primitive 49-dimensional matter tangent.

Relational-handshake premises

Consider a Hermitian quadratic endpoint compatibility functional

$$Q_e(y, x) = (y ; x)^\dagger M (y ; x).$$

Require:

1. **Locality:** Q_e depends only on the two endpoint innovations on edge e, after comparison transport into one frame.
2. **Unresolved internal covariance:** the compatibility law introduces no preferred direction in the unresolved 49-complex-dimensional tangent, $Q_e(Vy, Vx) = Q_e(y, x)$ for all $V \in U(49)$.
3. **Endpoint exchange symmetry:** before orientation is read, neither endpoint is privileged.
4. **Positivity:** $Q_e \geq 0$.

5. **Gate-2 perfect-square typing:** the primitive is one squared linear compatibility relation rather than a sum of independent endpoint penalties.

These conditions determine the vector-valued form almost completely.

Write

$$M = [\ A,\ B\ ;\ B^\dagger,\ D\ ].$$

Common U(49) covariance requires $V^\dagger A V = A$, $V^\dagger B V = B$, $V^\dagger D V = D$ for all $V \in U(49)$. By irreducibility of the defining action,

$$A = aI_{49}, \quad D = dI_{49}, \quad B = cI_{49}.$$

Exchange symmetry gives $a = d$, $c \in \mathbb{R}$. Hence

$$Q_e = a(\|x\|^2 + \|y\|^2) + 2c\,\mathrm{Re}\langle y, x\rangle.$$

The perfect-square requirement is rank one on the two-endpoint label space:

$$\det [\ a,\ c\ ;\ c,\ a\ ] = 0.$$

Therefore $c = \pm a$, and the complete admissible family collapses to only two branches,

$$\mathbf{Q_{(e,+)} = a\|y + x\|^2}$$

or

$$\mathbf{Q_{(e,-)} = a\|y - x\|^2.}$$

Theorem AM: Endpoint-handshake form theorem. Under locality, common U(49) covariance, endpoint exchange symmetry, positivity and the Gate-2 perfect-square premise, the unique nontrivial quadratic two-endpoint compatibility laws on the primitive matter tangent are, up to one positive overall scale,

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

No internal 49×49 weighting matrix, preferred matter ray or representation-dependent endpoint coefficient remains free inside this form class.

This is an exact form-class theorem. It does not yet determine which of the two signs is physically realised.

Oriented-gluing branch

The existing Gate-2 scalar boundary theorem selects the sum-square under coherent oriented gluing. If, and only if, the same orientation action is source-derived on the primitive matter tangent, the matter handshake becomes

$$Q_e^{(hs)} = a\|z_t + U_e z_s\|^2.$$

Its exact zero set is

$$z_t = -U_e z_s.$$

Thus a perfect relational match is anti-alignment in the common comparison frame.

This is not equivalent to ordinary parallel transport. Ordinary common-mode matching, $z_t = U_e z_s$, gives zero relative innovation and therefore zero constitutive current. The oriented handshake instead gives the maximal relative innovation compatible with equal endpoint norms.

Using $d_e = z_t - U_e z_s$, the handshake zero gives

$$d_e = -2U_e z_s.$$

Hence, for unit innovations,

$$\|d_e\|^2 = 4.$$

The Gate-2 handshake cost and the MASD relative-current magnitude obey the exact complementarity relation

$$\|z_t + U_e z_s\|^2 + \|z_t - U_e z_s\|^2 = 4$$

for unit endpoint innovations.

Corollary AM.1: Hard-handshake cross-coherence. Suppose the unresolved endpoint marginal remains isotropic,

$$\mathbb{E}[z_s z_s^\dagger] = I_{49}/49.$$

Under the hard-completion relation $z_t = -U_e z_s$, one has in the common target frame

$$\mathbb{E}[z_t (U_e z_s)^\dagger] = -I_{49}/49.$$

Therefore the CRTF-EX2K correlation parameter is

$$\gamma_e = -1.$$

Consequently,

$$\mathbb{E}[d_e d_e^\dagger] = (4/49)\, I_{49}.$$

This is the maximal anti-correlated endpoint value allowed by the unit-normalised isotropic model.

An isotropic second moment does not by itself fix a Fubini-Study law, so the projective conclusion requires the inherited preparation result as an additional hypothesis. If, in addition, the source endpoint ray carries the inherited unresolved Fubini-Study law,

```
[z_s] ~ μ_FS,
```

then, because $d_e = -2U_e z_s$ and unitary transport, sign reversal and scalar multiplication leave the projective Fubini-Study law invariant,

```
**[d_e] ~ μ_FS.**
```

Combining with CRTF-EX2I/EX2K therefore gives

```
**hard oriented handshake with the unresolved FS endpoint marginal ⟹ Haar
relative-current ray ⟹ rank 𝐶_CWY = 3 almost surely.**
```

No preferred internal current direction is selected.

Corollary AM.2: Comparison with the HMGBC benchmark. CRTF-EX2L's canonical HMGBC heat calculation gives finite-refinement benchmark correlations satisfying $0 < \gamma_e(s) < 1$, whereas the hard oriented-handshake lift gives $\gamma_e = -1$. These are not presently contradictory because the HMGBC values are explicitly conditional benchmarks whose physical matter-carrier generator attribution remains open.

They instead provide a sharp future discriminator:

```
**γ_e = −1 versus 0 < γ_e < 1.**
```

If the oriented Gate-2 matter attachment is source-derived, the canonical heat-correlation law cannot simultaneously be the physical primitive joint endpoint law at the same event grain.

Claim boundary

The result closes the form problem, not the complete physical-selection problem.

What is now exact is:

```
**if a Gate-2-type quadratic handshake acts on Ω^⊥, its form is a‖z_t ± U_e
z_s‖².**
```

What remains unreturned is the source theorem

```
**K_∂^(matter) = K_∂^(Gate2) ⊗ I_(Ω^⊥)**
```

or an equivalent same-source carrier attachment proving that the Gate-2 orientation sign acts on the primitive 49-dimensional matter innovation.

The present interface/transport corpus does not yet supply that identification. Therefore $\gamma_e = -1$ is an exact consequence of the hard oriented-handshake branch, but is not promoted to the physical VERSF endpoint coherence.

A second firewall is required. The quadratic compatibility cost may not automatically be converted into a probability law by writing $d\mu \propto e^{(-Q_e)}\, d\mu_0$. The VERSF probability programme derives $p = e^{(-\Delta I)}$ for extension information ΔI. A separate same-source theorem must identify the endpoint-handshake functional with that extension information, or derive an equivalent raw marked transfer/path measure, before a soft Gibbs handshake can be called physical.

CRTF relational-handshake verdict

49D ENDPOINT-HANDSHAKE FORM: EXACT WITHIN THE DECLARED FORM CLASS

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

GATE-2 ORIENTED SIGN → MATTER TANGENT: OPEN PHYSICAL ATTACHMENT

HARD ORIENTED BRANCH ⟹ $\gamma_e = -1$: EXACT CONDITIONAL CONSEQUENCE

HANDSHAKE COST → PROBABILITY WEIGHT: NOT DERIVED

19M. CRTF-EX2L: Canonical HMGBC heat-correlation benchmark

The prior source stack does not return a physical matter-amplitude value of γ_e.

A conditional benchmark is nevertheless available from the canonical HMGBC K=7 heat law.

For an initially uncorrelated internally isotropic 49-dimensional innovation field, $C(s)=e^{(-2sL)}$,

and the normalised endpoint correlation is

$\gamma_{ij}(s) = C_{ij}(s)/ \sqrt{[C_{ii}(s)C_{jj}(s)]}$.

On every connected wheel edge and every finite $s>0$, $0<\gamma_{ij}(s)<1$.

Thus the standardised relative-current capacity

$R_{ij}(s) = 2[1-\gamma_{ij}(s)]$

is strictly positive at every finite refinement depth and vanishes only asymptotically.

The global Dirichlet current capacity is

$$\mathcal{D}(s) = \mathrm{Tr}[Le^{(-2sL)}]$$

and, because the slowest nonzero eigenvalue is 1/2 with multiplicity two, $\mathcal{D}(s) \sim e^{(-s)}$.

Numerically, for the canonical benchmark, $\gamma_{spoke}(1) \approx 0.486617$, $\gamma_{rim}(1) \approx 0.502984$,

and

$\gamma_{spoke}(2) \approx 0.815845$, $\gamma_{rim}(2) \approx 0.813225$.

These numbers are canonical conditional benchmarks only; the physical generator attribution remains open.

19N. CRTF-EX2M: Exact 49↔50 carrier reconciliation

PFDMI uses the full endpoint carrier

$\psi_v \in \mathbb{C}^{50}$.

GSJB selects one physical void ray $|\Omega\rangle$ inside that carrier.

Therefore

$T_{[\Omega]}CP^{49} \cong \Omega^{\perp} \subset \mathbb{C}^{50}$,

with

$\dim_C \Omega^{\perp} = 49$.

The old 49-versus-50 discrepancy is therefore exactly a typing difference:

50 = full endpoint carrier;

49 = projective tangent after removal of the selected void ray.

No additional 49 → 50 embedding is required.

On the K=7 wheel the endpoint tangent field has dimension

$7 \times 49 = 343$

and the linearised incidence current map is

$\delta J = \kappa(B^T \otimes I_{49}) z.$

Since $\mathrm{rank} B=6$, $\mathrm{rank}(B^T \otimes I_{49}) = 294$,

with kernel dimension

49.

The kernel is exactly the spatial common mode

$\mathrm{span}\{1_7\} \otimes \mathbb{C}^{49}.$

The twelve-edge carrier has dimension

$12 \times 49 = 588$

and splits exactly as

294 gradient-current directions ⊕ 294 cycle-current directions.

Thus the previous cycle/gradient separation survives on the complete primitive internal tangent.

Each central sector contributes six times its internal tangent dimension to the relative-current rank:

N_R^std : 12

L_L : 36

H : 12

d_R : 54

u_R : 54

Q_L : 108

e_R : 18.

All five C/W/Y signature classes survive the spatial current construction.

19O. CRTF-EX2N: Exact E_2 × internal factorisation

Take

$\delta\psi_v = u_v z$,

with $u \in E_2$ and $z \in \Omega^\perp$.

Then

$j_e = \kappa q_e z$.

For every active edge, $\rho_{(J,e)} = |z\rangle\langle z|$.

Thus the spatial E_2 magnitude, sign and complex phase cancel exactly from the normalised background current ray.

They do not cancel from the factor-radial tangent.

For factor A and E_2 quadrature μ,

$|\dot{\psi}_{(A\mu,e)}^\perp\rangle = q_{(\mu,e)} \ (P_A - \pi_A I)|z\rangle$,

and hence

$G_{(A\mu)(B\nu)}^{(e)} = q_{(\mu,e)} q_{(\nu,e)}$

$\mathcal{C}_{AB}(z)$.

Summing with edge weights gives

$G_{total} = K_{E_2} \otimes \mathcal{C}_{CWY}$.

The unweighted spatial Gram is

$K_{E_2} = 4 I_2$.

Using the source-reproduced edge exposures

$w_{rim}=0.08097497887595351$, $w_{spoke}=0.054121065973082$, one obtains

$K_{E_2}^{hist} = h_{E_2} I_2$,

with

$h_{E_2} = 3w_{rim}+w_{spoke} = 0.2970460026009425$.

Under the unresolved Haar law the history-weighted factor-capacity matrix is

M_Haar^hist ≈ [[0.05674185,-0.00654714,0.00872952], [-0.00654714, 0.07250347,0.00630465], [0.00872952, 0.00630465,0.01139687]], with eigenvalues

0.00890681, 0.05671675, 0.07501863.

Thus its factor rank is three and the full E_2×C/W/Y capacity rank is six.

This remains a law-level ray-capacity result rather than a physical PFDMI score.

19P. CRTF-EX2O: Native PFDMI dark-source theorem and finite-occupation activation

The genuine PFDMI probability law depends on both the current ray and the source endpoint state:

```
p_(e,α,r) = Tr[ ρ_s

U_e† C_(e,α)† P_r
```

C_(e,α)

U_e

].

For the GSJB neutral source |Ω⟩ and any tangent current ray z, T_a|Ω⟩=0, ρ_z|Ω⟩=0,

and therefore

```
K_a(ρ_z)|Ω⟩=0.
```

Hence

```
C_0|Ω⟩=|Ω⟩, C_a|Ω⟩=0

for a=1,...,12,
```

and the complete current/terminal mark law is

```
p_(αr) = δ_(α0)δ_(r,N_R).
```

This result is independent of z.

Therefore every native C/W/Y factor derivative is exactly zero on the pure neutral source.

RAY CAPACITY DOES NOT IMPLY NATIVE MARK FISHER INFORMATION.

Now take a finite source occupation

$|\psi_s\rangle = \sqrt{(1-\beta)}|\Omega\rangle + \sqrt{\beta}|z\rangle.$

The mark law becomes exactly

$p_m = (1-\beta)\delta_{(m,m_0)} + \beta p_m^{exc}.$

For current-only factor deformation, $\partial_A p_m = \beta\partial_A p_m^{exc}$.

Thus the first nonzero factor Fisher information is

$F_{AB} = O(\beta) = O(\delta^2).$

The local score chain rule also factorises exactly:

$s_{(A\mu,m)} = q_{(\mu,e(m))}$

$s_{(A,m)}^{int}$.

A Haar execution of the actual PFDMI marked probabilities gives, on the declared saturated branch, $F_{int}^{Haar} \approx$ [[0.458128,-0.077431,0.001855], [-0.077431, 0.921310,0.001588], [0.001855, 0.001588,0.003014]], with eigenvalues

0.003002, 0.445536, 0.933913.

The native factor score is therefore full rank but strongly anisotropic.

Repeating the execution through a nontrivial η interval retains rank three while changing the numerical metric materially.

Hence maximal score rank does not select the maximal-positivity endpoint.

19Q. CRTF-EX2P: Native Fold hazard and occupation identity

For a pure current ray, $K_a=i[T_a,\rho]$, $S=\Sigma_a K_a^\dagger K_a$.

The current ray itself is an eigenvector of S with eigenvalue

$V(z) = \Sigma_a[\langle T_a^2\rangle_z - \langle T_a\rangle_z^2$

], and positivity gives

$\lambda\_max(S)=V(z)$.

Thus at

$\eta=s\eta\_max$,

a source component fully occupying z has accepted-current probability exactly s.

For the finite birth source with occupied weight β, **h_e=sβ_e.**

At maximal positivity, **h_e=β_e.**

For the complex E_2 rim chart, $\beta\_rim = \delta^2/(6+\delta^2)$,

so

$h\_rim = s\delta^2/(6+\delta^2)$,

and

$\delta^2 = 6h\_rim/(s-h\_rim)$.

At saturation, $\delta^2 = 6h\_rim/(1-h\_rim)$.

The arbitrary finite-birth coordinate can therefore be eliminated in favour of the native dimensionless event hazard.

At saturation the native score becomes

M_factor = 3w_rim h_rim

F_int^Haar,

and the full six-dimensional factor/E_2 object is

M_6 = 3w_rim h_rim

$I_2 \otimes F\_int$^Haar.

Every h_rim>0 gives factor rank three and total rank six.

The physical value of h_rim is nevertheless not selected. PFDMI-EX2F shows that numerical hazards vary across equally admissible endpoint frames.

The MBCI raw-current intensity is differently typed. On the same primitive birth chart, $\Gamma\_MBCI = O(\delta^6)$, whereas the PFDMI Fold intensity is

$$\lambda\_PFDMI = O(\delta^2).$$

Therefore first-current activation and post-birth raw-current magnitude cannot be identified without an additional same-action theorem.

19R. CRTF-EX2Q: Constitutive-defect hazard no-go and the Schur-action gate

The latest calculation asks whether the physical event hazard can be derived directly from the MASD constitutive-current cost.

Suppose

$$h\_e = \mathcal{H}(\|D\_(J,e)\|^2).$$

The constitutive shell is

$$D\_(J,e)=0,$$

and contains both the currentless void and nonzero currents satisfying

$$J\_e = \kappa\_e(\rho\_t-U\_e\rho\_s).$$

Hence every D_J-only hazard is constant on the complete constitutive shell:

$$h\_e=\mathcal{H}(0).$$

The exact dark-void theorem requires

$$h\_void=0,$$

so

$$\mathcal{H}(0)=0.$$

Therefore a D_J-only law would assign

$$h\_e=0$$

to every nonzero on-shell current.

Thus:

A HAZARD DEPENDING ONLY ON $\|D\_J\|^2$ IS EXACTLY EXCLUDED.

One might instead freeze the current before it responds. With $J=0$, $D\_J=-\kappa\Delta\_U\rho$

and the pre-Schur action is $O(\delta^2)$.

MASD itself forbids promoting this term, because current response is auxiliary and must be Schur-relaxed.

For the isolated static constitutive/continuity block, $\Gamma\_JT^{\wedge}(2) = (a/2)\lambda|y-\kappa x|^2 + (b/2)|\lambda y|^2$.

Stationarity gives

$y\_* = a\kappa/(a+b\lambda)\ x$,

and therefore

$K\_JT(\lambda) = ab\kappa^2\lambda^2/(a+b\lambda)$.

The Schur-relaxed action is

$\Delta\Gamma\_JT = (1/2)\ ab\kappa^2\lambda^2/(a+b\lambda)\ |x|^2$.

The pre-Schur and post-Schur costs satisfy

$\Delta\Gamma\_JT/\Delta\Gamma\_pre = b\lambda/(a+b\lambda)$.

As $\lambda \to 0$ the relaxed action begins at λ^2, reproducing the known $O(k^4)$ low-momentum result.

For the finite wheel E_2 eigenvalue

$\lambda\_E_2=4$, however, **$\Delta\Gamma\_JT^{\wedge}(E_2) = 8ab\kappa^2/(a+4b)|x|^2$,**

which is strictly positive for $a,b,\kappa>0$.

The recovered scalar CFB1/EPMD executable uses

$a=w\_J=0.5$, $b=w\_T=0.25$, $\kappa=1$,

giving the diagnostic benchmark

$K\_JT^{\wedge}(E_2)=4/3$

and

$\Delta\Gamma\_JT^{\wedge}(E_2) = (2/3)|x|^2$.

This is not the physical full-faithful activation cost.

The complete MASD action contains all six defect families with a common history-derived metric. If x denotes the physical E_2 birth coordinate and y all same-order auxiliary variables, the fully quotiented Hessian has block form

```
H = [A C;

C† B].
```

The only legitimate action-level activation matrix inside the present MASD class is therefore

$Z\_birth = A-CB^{+}C^{\dagger}$.

The physical quadratic birth cost is

```
ΔΓ_birth = (1/2)x†Z_birth x.
```

The complete cross-defect W_prim blocks required for this execution have not yet been returned at physical full-faithful multi-cell grade.

Even Z_birth would still be an action cost, not automatically a hazard. EPMD contains no native marked transfer, and the post-commitment programme requires a trajectory-to-effect/Kraus coarse-graining before an action can become a stochastic operation law.

A diagnostic smooth bridge

$$h=\mathcal{H}(\Delta\Gamma),\ \mathcal{H}(x)=c_H x+O(x^2)$$

would require, on the recovered scalar benchmark, c_H=1/4

to reproduce the native PFDMI small-birth slope. The naive unit-action formula

$$h=1-e^{(-\Delta\Gamma)}$$

has c_H=1 and therefore overpredicts the leading PFDMI birth hazard by a factor four.

This mismatch is diagnostic only; it does not derive c_H=1/4.

CRTF-EX2Q verdict

$\|D\_J\|^2$-ONLY HAZARD: EXACT NO-GO

PRE-SCHUR J=0 ACTIVATION: NOT PHYSICAL UNDER MASD

ISOLATED J/T FINITE-E_2 SCHUR COST: NONZERO

SCALAR CFB1/EPMD 2/3 COEFFICIENT: DIAGNOSTIC ONLY

PHYSICAL ACTION COST: FULL SIX-DEFECT Z_birth OPEN

ACTION → NATIVE HAZARD MAP: OPEN

19S. CRTF-EX2R: Fold/Fact/K7 grain retyping theorem

CRTF-EX2R asks whether the K7 electromagnetic admission probability can be identified directly with the native PFDMI one-Fold current-event probability.

The attaching-map calculation is exact:

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

so every nonself history Fold contributes one arrival and one departure incidence. A minimal Hamiltonian cover therefore gives

```
7 Folds ↔ 14 oriented incidences.
```

The stochastic first completed cover remains non-minimal in general, with

$$\mathbb{E}[N\_cover] = 21.277682950916294$$

Folds, median 19, p90 34, p99 51, and minimal-cover probability

```
P(N_cover = 7) = 0.006694060598121.
```

The physical interpretation of these statements is fixed by the foundational typing of P-RT8. Under the One-Fold ontology, each Fold is already one primitive committed Fact/record. K=7 is the closure/admissibility geometry on which that Fold is stably realised. The seven-Fold Hamiltonian cover is therefore a closed history of seven primitive Fold/Facts, not the first formation of a Fact.

Consequently the attaching-map calculation does not determine the event grain of p_EM.

In particular, neither implication follows:

```
7-Fold cover ⟹ p_EM must be cover grain,
```

nor

```
one Fold closes on K=7 ⟹ p_EM = h_Fold.
```

The first overuses the history-cover construction; the second would require a same-source identification of the electromagnetic admission law with the native PFDMI commitment law.

The exact result is therefore a grain firewall:

primitive Fold/Fact grain ≠ completed multi-Fold history grain

and the K7 electromagnetic probability must be placed on one of these grains by its own source derivation. Under the K7 constant-probability/renewal premise and a cover-grain placement, the derived waiting-time quantities

$$T_{EM} = \Sigma_{(k=1)}^{G} N_k, \quad \mathbb{E}[T_{EM}] = \mathbb{E}[N_{cover}] / p_{EM} = 2918.08223326852 \text{ Folds}, \quad \lambda_{EM} = p_{EM} / \mathbb{E}[N_{cover}] = 0.000342690822280189$$

remain exact conditional consequences of that placement, with $p_{EM} = 7/960$ and $1/p_{EM} = 960/7 = 137.142857\ldots$ for the leading K7 branch. They are not grain-selection theorems.

CRTF-EX2R verdict

ONE FOLD = ONE PRIMITIVE FACT/RECORD: INHERITED STRUCTURAL TYPING

K=7 = MINIMUM FOLD-CLOSURE / ADMISSIBILITY GEOMETRY

7-FOLD ↔ 14-INCIDENCE MINIMAL HISTORY COVER: EXACT

MEAN FIRST COVER = 21.277682950916294 FOLDS: EXACT

DIRECT h_Fold = p_EM: NOT DERIVED

DIRECT p_EM = COMPLETED-COVER ADMISSION: NOT DERIVED

K7 ELECTROMAGNETIC EVENT GRAIN: SUBSEQUENTLY RESOLVED AT SOURCE-CARRIER LEVEL BY CRTF-EX2V (§19W): PRIMITIVE FOLD BOUNDARY; SAME-MARK IDENTITY OPEN

19T. CRTF-EX2S: Stopping-time PFDMI Fisher aggregation

Let (θ) denote the C/W/Y factor parameters and let

$$p_\theta(Y_n|\mathcal{F}_{(n-1)})$$

be the normalized native PFDMI mark law on Fold (n). Define the one-Fold score

$$s_n = \partial_\theta \log p_\theta(Y_n \mid \mathcal{F}_{(n-1)}).$$

Probability normalization gives

$\mathbb{E}[s_n \mid \mathcal{F}_{(n-1)}] = 0.$

Hence the one-Fold score increments are martingale differences.

For the first completed closure cover, define the stopped score

$S_{cover} = \Sigma_{(n=1)}^{(N_{cover})} s_n.$

All distinct-Fold cross terms vanish, so

$M_{cover} = \mathbb{E}[\Sigma_{(n=1)}^{(N_{cover})} I_n],$

where

$I_n = \mathbb{E}[s_n s_n^T \mid \mathcal{F}_{(n-1)}]$

is the conditional one-Fold Fisher matrix.

The executed augmented-state D36 cover calculation gives, for stationary initial wheel state,

$\mathbb{E}[\text{visits to } x \text{ before completion}] = \mathbb{E}[N_{cover}] \pi_x$

for every state x, to machine precision. This occupation clause is an executed numerical D36 identity rather than a generic consequence of stationary initialisation, because arbitrary stopping times do not preserve expected occupation proportions; for a finite irreducible chain with finite expected stopping time it holds exactly when the stopping rule returns the chain to its initial distribution, and its promotion to an exact theorem requires the corresponding augmented-state certificate. The same identity holds for expected directed transition counts:

$\mathbb{E}[\text{directed } i \to j \text{ transitions}] = \mathbb{E}[N_{cover}] \pi_i P_{ij}.$ Therefore the completed-cover stopping rule preserves the stationary

Fold traffic in expectation. It changes the amount of accumulated information, not the stationary shape.

Thus

$M_{cover} = \mathbb{E}[N_{cover}] M_{Fold}^{(stat)}$ and numerically

$\mathbb{E}[N_{cover}] = 21.277682950916294$, so $M_{cover} = 21.277682950916294\, M_{Fold}^{(stat)}$.

Ontological scope of the stopped-score theorem

The multiplier $\mathbb{E}[N_{cover}]$ is a history-accumulation factor. It counts the expected number of primitive Fold/Facts contributing to the score before the selected cover stopping time. It is not the number of Folds required to manufacture one Fact and is not an elementary Fold normalisation.

Therefore M_Fold remains the primitive one-Fact information object, while M_cover is a derived cumulative-history object. Which of these is consumed by a particular physical readout must be selected by the source/readout law.Using the previously derived stationary history-weighted E_2 Gram,

$$M_{Fold}^{(stat, E_2)} = 0.2970460026009425\, I_2,$$

gives

$$\mathbf{M_{cover}^{(E_2)} = 6.32045066518\, I_2.}$$

The E_2 doublet remains exactly isotropic.

For the primitive rim-source chart the corresponding completed-cover scalar is

$$\mathbf{M_{cover}^{(rim)} = 5.16887978244.}$$

If a later completed-cover readout reapplies the Fold-boundary K7 electromagnetic gate, it enters only after this cover aggregation and only under an explicit readout semantics; that later application is itself a Stage 0B provenance question.

If every cover trajectory is retained whether or not the K7 gate succeeds, the gate contains no C/W/Y score and the flavour readout information remains

$$M_{readout} = M_{cover}.$$

If failed covers are unretained and only successful admitted covers contribute to the flavour readout, independent Bernoulli thinning gives information per eligible cover opportunity

$$\mathbf{M_{opportunity} = p_{EM}\, M_{cover}.}$$

For the leading K7 branch,

$$p_{EM}\, \mathbb{E}[N_{cover}] = 0.155149771517$$

and

$$\mathbf{M_{opportunity}^{(E_2)} = 0.0460866194336\, I_2.}$$

This is a throughput weight. Conditioned on a successful admitted cover, the internal Fisher shape is still ($M_{(cover)}$).

CRTF-EX2S verdict

STOPPED-SCORE MARTINGALE: EXACT PASS

D36 STATIONARY-OCCUPATION PROPORTIONALITY: EXECUTED NUMERICAL PASS / CERTIFICATE OWED

M_cover = 21.277682950916294 M_Fold^(stat): EXECUTED D36 RETURN / EXACT CONDITIONAL ON AH′

M_cover^(E_2) = 6.32045066518 I_2: EXECUTED D36 RETURN / EXACT CONDITIONAL ON AH′

p_EM ENTERS THE COVER-LEVEL LAW ONLY AS AN ADMISSION/THROUGHPUT FACTOR; ITS PRIMITIVE SOURCE GRAIN IS FIXED AT THE FOLD BOUNDARY (CRTF-EX2V), AND ANY COVER-LEVEL APPLICATION REMAINS CONDITIONAL.

19U. CRTF-EX2T: Route-M / PFDMI coherence-scale identity audit

PFDMI-EX2J-R2 already distinguishes several physical quantities that had previously shared the symbol (ξ):

ξ_cl = minimal distinguishable closure-coordinate cell,

ξ_Λ = vacuum causal-capacity crossover,

and system-dependent capacity-threshold lengths.

Their equality is not automatic.

PFDMI-EX2J-R3 proves the exact conditional relation

Γ_cl = ρ_Λ / ρ_src. Hence

ξ_cl = ξ_Λ

if and only if

Γ_cl ρ_src = ρ_Λ.

Later PFDMI work advances two parts of this condition. EX2J-R4 supplies an intrinsic persistent K=7 record realization within the declared (W_7+)ledger class. EX2J-R5 supplies the first-closure schedule. EX2J-R6 proves, under its unique-common-vacuum, source-free restriction, homogeneous metric-vacuum and no-independent-counterterm premises,

ρ_vac = ρ_Λ. However, the vacuum saturation

f_sat = ρ_vac / ρ_cap

and the capacity-to-phase/action typing remain unreturned. The final PFDMI certificate therefore still does not promote one absolute source-native (ξ).

Route M independently defines a simplicial coherence length by the scale at which the running coherence probability reaches the percolation threshold. Its recurring microphysical inputs include

$K=7,\ g_0^2=2^{-7},\ N_{loop}=14,\ b=\frac{14}{16}.$

This produces strong structural and numerical compatibility with the mesoscopic PFDMI ruler programme.

But compatibility is not identity.

If one conditionally inserts the Route-M (ξ) into

$\Gamma_{Fold} = (21/16\pi)(c/\xi),$

then one obtains a corresponding Fold rate, completed-cover rate and K7-admitted cover rate. These SI numbers remain quarantined because the common-source (ξ) identity has not been proved.

CRTF-EX2T verdict

ROUTE-M / PFDMI ξ STRUCTURAL COMPATIBILITY: STRONG

INTRINSIC K7 RECORD REALIZABILITY: PASSED WITHIN DECLARED PFDMI CLASS

COMMON-VACUUM DENSITY DESCENT: CONDITIONAL PASSbut

ξ_RouteM = ξ_PFDMI: NOT YET A SOURCE-NATIVE IDENTITY. The next valid test is a carrier audit, not another numerical

comparison.

19V. CRTF-EX2U: W7 / Route-M carrier-separation theorem

The direct carrier test exposes a previously hidden ambiguity in the repeated number fourteen.

The structural-clock/PFDMI fourteen is

$2K = 7^+ + 7^- = 14.$

Its canonical coordinates are

$\{C_1^+, C_1^-, \ldots, C_7^+, C_7^-\}$.

The PFDMI attaching image satisfies the exact balance law

$$\Sigma_{(j=1)}^7 C_j^+ = \Sigma_{(j=1)}^7 C_j^-,$$

so

$\dim L_{PFDMI} = 13$. Route M has a different construction. A 4-simplex has ten triangular

face-holonomy channels and five tetrahedral closure functionals. The discrete Bianchi identity gives one relation among those five closure functionals, leaving four independent closure channels:

$10 + 5 - 1 = 10 + 4 = 14$.

An explicit oriented simplicial boundary calculation returns

$\operatorname{rank} \partial_4 = 4$ for the five tetrahedral boundaries and

$\partial_3\partial_4 = 0$ exactly.

Therefore

$L_{RM} = 10_\triangle + 4_{cl}$.

At the native effective grains,

$13_{(PFDMI)} \neq 14_{(RM)}$.

No bijective linear same-carrier intertwiner exists between these two native effective modules.

The mismatch also survives the symmetry audit. PFDMI begins from pre-role (S_7) equivalence and, after one committed hub role plus cyclic locality, reaches a (D_6) wheel that is transitive on the six rim positions. Route M's seven coherence constraints are already semantically typed as

3 edge-admissibility + 1 loop-closure + 2 embedding-match + 1 chirality.

A full type-preserving (S_7) identification is therefore impossible. Mapping the single loop-closure condition to the PFDMI hub leaves a broad (3+3) rim typing whose largest (D_6)-preserving subgroup has order six. Retaining the fine (3+2+1) rim typing reduces the maximum stabilizer to order two over all assignments. Thus no current typed identification preserves the full committed (D_6) symmetry.

PFDMI-EX2H does contain an augmented fourteen-dimensional admitted census,

dim(augmented admitted census) = 14,

after removal of one global null direction. This removes the bare dimension mismatch but not the type mismatch: the added direction is the wheel hub-boundary relative mode, not an oriented traversal or Route-M tetrahedral closure channel. It is therefore only a possible staging space for a future source-derived intertwiner.

The maximal common structure that survives is one level upstream:

```
**Ω₇ = {0,1}⁷,    |Ω₇| = 128.**This abstract K=7 binary satisfaction/capacity
carrier can explain
```

recurrence of the factor

```
1/128
```

without requiring the two fourteen-channel descendants to be the same object.

The structurally allowed architecture is therefore

```
    **Ω₇ ⟶ 7⁺ + 7⁻ (PFDMI/K7 reversible record-clock branch), and Ω₇ ⟶ 10_△
+ 4_cl (Route-M simplicial RG/coherence branch).**
```

CRTF-EX2U verdict

DIRECT 14↔14 SAME-CARRIER IDENTIFICATION: FAIL

dim L_PFDMI = 13 ≠ 14 = dim L_RM

FULL TYPE-PRESERVING S_7/D_6 IDENTIFICATION: NO-GO AT CURRENT TYPED GRADEbut

```
**COMMON ABSTRACT K=7 BOOLEAN CARRIER: SURVIVES.**
```

This result does not undo CRTF-EX2R or CRTF-EX2S. Those calculations use the K7 (2K) oriented-traversal species, which is the same event species as the PFDMI attaching construction. What EX2U excludes is the separate identification of that (2K) traversal carrier with Route M's (10+4) loop-channel carrier.

19W. CRTF-EX2V: Primitive Fold/K7 electromagnetic admission provenance

CRTF-EX2V returns to the source construction of the K7 electromagnetic factor rather than inferring its operational grain from the later D36 history geometry.

The seven binary admissibility checks belong to the primitive Fold boundary. The electromagnetic source operator contains the K7 closure word and the associated transmissive gate but contains no completed-cover stopping variable, D36 cover counter or multi-Fold history functional.

Therefore the completed-cover construction cannot be used to place the electromagnetic admission factor at cover grain.

The source-level typing is instead

```
**primitive Fold boundary ⟶ K = 7 electromagnetic admissibility.**
```

This does not establish

```
p_EM = h_Fold^(PFDMI).
```

The native PFDMI accepted-current mark and the electromagnetic K7 admission effect remain separately typed observables. A same-source marked-event theorem would be required before their probabilities could be identified numerically.

Consequently the earlier cover-level formulas

```
𝔼[T_EM] = 𝔼[N_cover] / p_EM
```

and

```
M_opportunity = p_EM M_cover
```

remain mathematically valid only under an additional later readout rule which applies the electromagnetic gate to completed-cover opportunities. They are not the primitive provenance of p_EM.

CRTF-EX2V verdict

```
**K7 ELECTROMAGNETIC SOURCE CARRIER: PRIMITIVE FOLD-BOUNDARY**
```

```
**MANDATORY COMPLETED-COVER PLACEMENT: FAIL**
```

```
**p_EM = h_Fold^(PFDMI): NOT DERIVED**
```

The cover remains a higher-order history-information object; it no longer carries the burden of locating the primitive electromagnetic gate.

19X. CRTF-EX2W: Common K7 Boolean-cube dual-descent audit

The common upstream object survives:

$\Omega_7 = \{0,1\}^7, \quad |\Omega_7| = 128.$

On the PFDMI side the descent K ⟶ 2K is explicit: seven primitive closure labels generate fourteen oriented arrival/departure incidences.

Route M is different. Its current source chain contains

$\Omega_7 \longrightarrow g_0^{2} = 2^{-7}$

for the bare coherence probability, while independently the simplicial geometry gives

$\sigma^4 \longrightarrow$ 10_△ + 4_cl.

No source-native map

$\Omega_7 \longrightarrow$ 10_△ + 4_cl

is presently derived.

The numerical compatibility 2K = 14 = 10 + 4 therefore selects K = 7 as a structural count compatibility, not as a same-carrier theorem.

CRTF-EX2W verdict

Ω_7 COMMON ABSTRACT CAPACITY: PASS

K → 2K PFDMI DESCENT: PASS

Ω_7 → 10 + 4 ROUTE-M DESCENT: NOT RETURNED

COMMON ξ FROM BOOLEAN CAPACITY ALONE: NOT DERIVED

19Y. CRTF-EX2Y through EX3N: Effective three-dimensional history-cell and refinement-stable Route-M fourteen

The Route-M dimensional language must be corrected before the channel calculation is interpreted physically.

VERSF's effective physical spatial carrier is three-dimensional. Commitment ordering supplies an ordered history structure and eventual temporal flow; it is not a fourth primitive spatial coordinate.

Accordingly the four-simplex used in Route M is typed here as an effective history/coherence cell, not as proof of four physical spatial dimensions.

Within the effective manifold/refinement premise class, the minimal successor link is the tetrahedral sphere $\partial\Delta^3$, and adjoining the ordered successor commitment gives the coarse history/coherence boundary $\partial\Delta^4$.

The important refinement result is stronger than the raw minimal count.

Let K_r be any finite subdivision of $K_0 = \partial\Delta^4$ with

$$F_r = f_2(K_r), \qquad T_r = f_3(K_r).$$

The fine U(1) face carrier descends onto the ten coarse triangular faces with rank ten,

$$D_2: \mathbb{R}^{F_r} \to \mathbb{R}^{10}, \qquad \operatorname{rank} D_2 = 10.$$

Because $K_r \cong S^3$, the fine closure census is $T_r - 1$. Aggregating onto the five coarse tetrahedral closure functionals and quotienting their single Bianchi identity leaves

$$N_{cl}^{(coarse)} = 4.$$

Thus $N_{raw} = F_r + T_r - 1$, whereas

$$\mathbf{N_{coarse} = 10 + 4 = 14}$$

for every finite refinement in the declared U(1) coarse-graining class.

The ultraviolet surplus is

$$\mathbf{N_{UV} = F_r + T_r - 15.}$$

Therefore fourteen is not a raw microscopic cell count. It is a refinement-stable coarse constraint-family count.

19Z. CRTF-EX3O through EX3R: Correlation and information firewall

The refinement theorem strengthens the geometry but does not make fourteen a physical information weight.

Route M's ten face tests and four closure tests share underlying face variables. Their joint satisfaction probability cannot be factorised merely from small pairwise covariance.

Define the exact factorisation defect

$$\Delta_{14} = \ln [P(\text{all fourteen constraints}) / \Pi_{(a=1)}^{14} P(C_a = 1)].$$

The existing source stack does not derive $\Delta_{14} = 0$.

At the continuous linearised level the point is even sharper. Selecting four independent tetrahedral closures gives the residual map

$$A = [I_{10} ; RB],$$

where B is the tetrahedron-to-face incidence matrix and R selects four independent closure combinations.

Then

rank A = 10.

Thus fourteen labelled restrictions are not fourteen independent continuous Fisher directions.

This does not reduce the physical numerator to ten: several physically distinct restrictions can impose nonzero information cost on the same underlying variables. It does establish the firewall

14 labelled constraints ≠ 14 automatically equal Fisher units.

The physical block information $\mathcal{J}$_block and a source-derived information unit $\mathcal{J}$_unit remain unreturned. Route M's numerator fourteen is therefore geometrically strong but informationally conditional.

19AA. CRTF-EX3S through EX3U: Route-M denominator-sixteen audit

Physical space contributes three doubling directions:

$$N_{space} = 2^3 = 8.$$

Let m denote the number of primitive commitment/history intervals incorporated into one coarse block. Then

$N_{micro} = 8m$.

Equivalently, with dynamical exponent z,

$N_{micro}(z) = 2^{(3+z)}$.

Route M's N_micro = 16 therefore requires m = 2, or equivalently z = 1.

A relativistic fixed point with invariant finite c indeed forces $z = 1$. That does not make time fundamental: it only requires space and emergent ordering to scale linearly at the fixed point.

The remaining scale firewall is that Route M uses its block prescription upstream in the calculation that produces the mesoscopic coherence scale. A later infrared Lorentz law may not be used circularly to justify that ultraviolet denominator.

The strongest pre-IR support comes from the closure-traversal law, where the characteristic traversal time scales linearly with the closure length. This establishes $z = 1$ for that traversal clock. The remaining debt is the same-carrier identification of that clock with the physical Route-M blocking interval.

Therefore

$N_{micro} = 16$

is strongly compatible with VERSF's three-space-plus-emergent-ordering architecture, but is not yet an unconditional source return at the Route-M UV block.

19AB. CRTF-EX3V through EX3Y: Direct beta-coefficient execution and failed shortcuts

The physically decisive Route-M quantity is the scale derivative itself.

Because Route M defines its coherence coupling through a coherent-block probability, $g_n^2 = p_n$, a two-regulator physical beta coefficient would be

$b_{(n\to n+1)}^{(phys)} = (1/2)\ (p_{(n+1)}^{-1} - p_n^{-1}) / \ln(\mu_{(n+1)}/\mu_n)$.

This formula contains neither fourteen nor sixteen.

The existing source stack does not return the same Route-M coherent-block probability p_n at two physical regulator levels. Hence the numerical derivative cannot yet be executed.

Several apparent substitutes were tested and rejected.

The native PFDMI Fold hazard is an accepted marked-history event, not the Route-M spatial coherent-block probability. The PFD complete/partial classifier distinguishes colourless/lepton-like from colour-carrying/quark-like persistent defects; it is not a coherent-block versus incoherent-block variable. Substituting either quantity into $g^2 = p$ is a carrier error.

The result is therefore:

$b = 14/16$

remains an exact arithmetic value inside the declared Route-M counting/blocking prescription, but

$b_{phys} = 7/8$

has not yet been independently returned by the physical running action.

19AC. CRTF-EX3Z: Route-M 6⊕8 carrier-compatibility theorem

Supersession note. The physical-Hessian interpretation proposed in this section is retained as part of the audit history but is superseded by CRTF-EX3AG below. The exact 6⊕8 readout decomposition survives; its interpretation as a physical MASD curvature Hessian carrier does not.

The previous comparison between $14_{RM} = 10 + 4$ and $14_{BCB} = 6 + 8$ appeared to show different decompositions. The Route-M incidence geometry contains a more informative canonical decomposition.

Let $B: \mathbb{R}^{10} \to \mathbb{R}^5$ be the oriented tetrahedron-to-triangle incidence map.

Each tetrahedron contains four triangular faces and every pair of tetrahedra shares one face with opposite orientation. Therefore

$BB^T = 5I_5 - \mathbf{1}\mathbf{1}^T.$

Hence rank $B = 4$.

Define

$P_{sens} = (1/5)\, B^T B.$

Because the four nonzero singular values of B are $\sqrt{5}$,

$P_{sens}^2 = P_{sens}, \quad \text{rank } P_{sens} = 4.$

The complementary projector $P_{blind} = I_{10} - P_{sens}$ has rank $P_{blind} = 6$.

Thus the ten Route-M face directions split canonically as

$\mathbb{R}^{10} = \ker B \oplus \operatorname{im} B^T = 6 \oplus 4.$

The physical closure readout contains four additional independent channels. Therefore the complete labelled Route-M constraint/readout carrier reorganises as

$14 = 6_{\text{closure-blind}} + 4_{\text{closure-sensitive}} + 4_{\text{closure-readout}} = 6 + 8$.

Moreover, $U = B/\sqrt{5}$ is a partial isometry between the four-dimensional closure-sensitive face sector and the four-dimensional physical closure sector:

$$UU^T = P_{cl}, \qquad U^T U = P_{sens}.$$

This is an exact geometric result. It does not turn fourteen labelled constraint slots into fourteen independent continuous variables; the earlier rank-ten firewall remains intact.

The result is nevertheless structurally striking because the independent BCB closure architecture has

$$\Gamma_{min} = \Gamma_{int}^{(6)} \oplus \Gamma_{sub}^{(8)}.$$

Thus the two programmes now share the nontrivial dimensional architecture

$6 \oplus 8$.

Same dimension is still not same physical carrier. The BCB six originates in its internal CP^2 balance sector and its eight in four reversible substrate roles. The Route-M six is an incidence-kernel sector and its eight is a paired closure-sensitive/closure-readout sector. No canonical source theorem presently identifies these provenance structures.

The physical question can now be stated as a reduced-Hessian test.

Let P_6 and P_8 project onto the Route-M 6 and 8 sectors. A BCB-type physical bridge requires first

$P_6 H_{RM} P_8 = 0$

at the relevant quadratic order.

If the two blocks are additionally isotropic,

$$P_6 H_{RM} P_6 = \lambda_6 P_6, \qquad P_8 H_{RM} P_8 = \lambda_8 P_8,$$

define

$r_{RM} = \lambda_8 / \lambda_6$.

After normalising the six-sector unit, the weighted Route-M numerator is

$N_{eff} = 6 + 8 r_{RM}$.

Therefore, within the same denominator-sixteen blocking scheme,

b_weighted = (6 + 8 r_RM) / 16.

The original Route-M value follows if and only if r_RM = 1, because then b_weighted = (6 + 8)/16 = 7/8.

This converts the former equal-channel assumption into one explicit action-level question.

CRTF-EX3Z verdict

ROUTE-M 10 + 4 GEOMETRY: PASS

CANONICAL ROUTE-M 6 + 4 + 4 = 6 + 8 DECOMPOSITION: EXACT

PAIRING OF THE TWO FOUR-DIMENSIONAL SECTORS: EXACT

BCB 6 + 8 DIMENSIONAL COMPATIBILITY: STRONG PASS

SAME PHYSICAL CARRIER: OPEN

PHYSICAL HESSIAN BLOCK DECOUPLING: OPEN

r_RM = 1: NOT DERIVED

b_phys = 7/8: NOT YET DERIVED

19AD. CRTF-EX3AA through EX3AE: Route-M readout-metric and normalisation audit

The exact 6⊕8 incidence decomposition does not by itself determine a physical quadratic metric. To expose what an equal-labelled-readout prescription would mean, pass to the four-dimensional Bianchi-quotiented closure space and let

$U = \hat{B}/\sqrt{5},$

so that

$U^\dagger U = P_4, \quad UU^\dagger = I_4,$

where P_4 projects onto the four-dimensional closure-sensitive face sector and $P_6 = I_{10} - P_4$.

Represent the fourteen Route-M readouts on the ten direct face variables x by

$z = A x, \quad A = [\ I_{10}\ ;\ U\ ].$

Then

$$\text{rank } A = 10$$

and

$$\mathbf{A^\dagger A = I_{10} + P_4 = P_6 + 2P_4.}$$

Thus assigning equal unit quadratic cost to all fourteen labelled readouts would induce, on the underlying ten-dimensional face carrier,

$$K\_count = P_6 + 2P_4, \quad \text{spec } K\_count = \{1^{(6)}, 2^{(4)}\}.$$

This is an exact readout-geometry statement. It does not prove that the physical master action has this Hessian.

It also exposes an identifiability firewall. Since rank A = 10, the fourteen-dimensional readout space contains a four-dimensional null complement invisible to the physical ten-face action. Infinitely many fourteen-dimensional readout metrics therefore induce the same ten-dimensional quadratic form. A trace ratio formed directly on an arbitrary fourteen-dimensional readout metric is not a physical invariant.

A separate local-normalisation audit gives another exact result. Every triangular face lies in exactly two tetrahedra, so for the incidence projectors

$$(P_4)\_ff = 2/5, \quad (P_6)\_ff = 3/5$$

for every face f. For any positive local diagonal face metric $D = \mathrm{diag}(d_1, \ldots, d_{10})$, the mean restricted weights satisfy

$$\mathbf{(1/4)Tr(P_4D) = (1/6)Tr(P_6D) = (1/10)\Sigma\_f\ d\_f.}$$

Hence arbitrary local DEC face weights cannot generate a relative mean normalisation between the six- and four-dimensional incidence sectors. Any additional closure weighting would have to come from dynamics or admission, not from using a different local geometric ruler.

CRTF-EX3AA–EX3AE verdict

FOURTEEN READOUTS ON TEN FACE VARIABLES: EXACT

$A^\dagger A = P_6 + 2P_4$: EXACT FOR EQUAL LABELLED READOUT COST

FOURTEEN-DIMENSIONAL READOUT METRIC AS PHYSICAL INVARIANT: FAIL

LOCAL DEC MEAN V_6/V_4 NORMALISATION RATIO: EXACTLY ONE

PHYSICAL MASTER-ACTION WEIGHT: NOT RETURNED

19AE. CRTF-EX3AF through EX3AG: Source-native connection-curvature carrier theorem

The preceding readout calculation still treats the ten face variables as an available tangent carrier. MASD requires a stricter source-typing audit because its independent microscopic transport variables are edge links.

Let $d_1: C^1 \to C^2$ be the oriented edge-to-face coboundary of one 4-simplex and $d_2: C^2 \to C^3$ the face-to-tetrahedron coboundary.

The simplex has ten edges and ten triangular faces. Vertex gauge freedom removes four independent edge directions, giving

$$\mathrm{rank}\ d_1 = 6.$$

The tetrahedral closure map has rank $d_2 = 4$, so $\dim \ker d_2 = 10 - 4 = 6$. Simplicial exactness gives $d_2 d_1 = 0$, hence $\mathrm{im}\ d_1 \subseteq \ker d_2$. Because both spaces have dimension six,

$\mathrm{im}\ d_1 = \ker d_2$.

Therefore every infinitesimal face curvature generated by a genuine edge connection lies in the six-dimensional Bianchi-compatible sector.

Using the previous incidence notation, $V_6 = \ker d_2$ and $V_4 = \mathrm{im}\ d_2^\dagger$, so

physical MASD connection curvature $\subset V_6$

and

$P_4\ \delta F = 0$

for every source-native infinitesimal connection variation.

The four-dimensional V_4 sector is consequently not an additional physical curvature tangent sector. It measures the failure of arbitrary direct face data to be integrable as the curvature of one underlying connection.

This produces a direct carrier separation:

Route-M direct-face candidate carrier ≠ MASD connection-curvature tangent carrier.

The exact $14 = 6 + 4 + 4 = 6 + 8$ readout decomposition survives as constraint geometry, but its promotion to a physical $6\oplus8$ Hessian carrier fails.

Accordingly the earlier proposed physical test $P_6H\_RM\, P_8 = 0$, $r\_RM = \lambda_8/\lambda_6$, $N\_eff = 6 + 8r\_RM$ is withdrawn as a source-native MASD curvature test.

CRTF-EX3AG verdict

`**EDGE → FACE CURVATURE RANK: 6 / EXACT**`

`**TETRAHEDRAL CLOSURE RANK: 4 / EXACT**`

`**im d₁ = ker d₂: EXACT**`

`**TEN INDEPENDENT MASD FACE-CURVATURE TANGENTS: FAIL**`

`**V₄ AS PHYSICAL CONNECTION-CURVATURE TANGENT: FAIL**`

`**6⊕8 AS LABELLED ROUTE-M READOUT ARCHITECTURE: RETAINED**`

`**6⊕8 AS PHYSICAL BETA HESSIAN CARRIER: WITHDRAWN**`

19AF. CRTF-EX3AH through EX3AM: Route-M joint-information and fresh-residual theorem

Once the fourteen is typed as a constraint/readout census, the relevant physical question is the information cost of admission.

For each triangular face f let T_f denote K7 coherence. At the neutral primitive Fold-boundary grain, $P(T\_f) = 2^{-7}$, so one K7 face-admission cost is

`I_triangle = 7 ln 2.`

Let $T = \cap\_(f=1)\text{\^{}}10\ T\_f$ and define the exact ten-face correlation correction by

`Δ_T = -ln[ P(T) / 2⁻⁷⁰ ].`

Then

`**I₁₀ = -ln P(T) = 70 ln 2 + Δ_T.**`

Let G denote satisfaction of four independent tetrahedral closure conditions. The exact chain rule gives

I_RM = −ln P(T ∩ G) = 70 ln 2 + Δ_T + I_cl,   I_cl = −ln P(G|T).

Thus, measuring information in units of one K7 triangle,

N_info = 10 + (Δ_T + I_cl)/(7 ln 2).

No equality N_info = 14 has been assumed.

The K7 Boolean carrier cannot be reused after conditioning on T. Let X denote the seventy primitive pass/fail variables attached to the ten face-coherence tests. Conditional on T, X = 1 deterministically and therefore

H(X|T) = 0.

Consequently any closure variable measurable entirely from those already-consumed pass/fail bits also has zero conditional entropy. The four tetrahedral closure conditions cannot acquire four further seven-bit costs by recycling the original K7 tests.

The additional closure information must instead reside in degrees of freedom that survive face admission. In the U(1) Route-M representation these are the actual within-coherent-class face holonomies H_f = exp(iθ_f), not another copy of the K7 Boolean vector.

The tetrahedral incidence matrix itself has exact integer Smith form

SNF(B) = diag(1, 1, 1, 1, 0).

Thus the closure map contains four primitive independent constraints and no hidden torsion factor.

For a diagnostic uniform finite Abelian residual alphabet of order M, provided the induced four-component closure map is surjective, this gives

P_cl = M^{-4},   I_cl = 4 ln M.

Under the additional approximation Δ_T ≈ 0, N_info = 14 would require M = 128. This is a useful target identity, not a derivation of M = 128. The K7 value 128 cannot be transferred to the tetrahedral residual alphabet by cardinality alone.

CRTF-EX3AH–EX3AM verdict

EXACT JOINT-INFORMATION IDENTITY: PASS

ONE-TRIANGLE K7 INFORMATION: 7 ln 2

FOUR CLOSURES = FOUR FRESH K7 COPIES: FAIL

H(K7 FACE BITS | ALL FACES COHERENT): 0

TETRAHEDRAL SMITH RANK: FOUR / NO TORSION

M = 128 REQUIRED IN UNIFORM FINITE DIAGNOSTIC FOR EQUAL FOUR-UNIT COST: EXACT CONDITIONAL RESULT

PHYSICAL M = 128: NOT DERIVED

19AG. CRTF-EX3AI through EX3AN: Connection-order and operational-quotient closure theorem

There are two distinct grains at which tetrahedral compatibility can be discussed.

If the Route-M face holonomies are identified with the already-formed physical edge-transport holonomies, $H_f = h(\partial f)$, then for every tetrahedron τ,

$$C_\tau = \Pi_{(f\subset\partial\tau)} H_f^{(\sigma(\tau,f))} = h(\partial^2\tau) = 1.$$

Thus on the post-connection carrier

$P(G|T) = 1$

and the additional tetrahedral closure information is zero at that grain.

This does not prove that an upstream admission cost is zero. VERSF contains a broader commitment/admissibility architecture in which possibilities can be removed or identified before the final physical transport representation is constructed. The relevant unresolved construction-order question is therefore whether the Route-M direct-face closure map belongs to such a pre-connection admission stage.

Current source material supports the general ordering

possibility → commitment/admission → record/transport structure → connection → curvature → Bianchi identity,

but does not yet identify the four Route-M tetrahedral functionals with the primitive commitment projector. That physical identification remains open.

A second correction is supplied by finite distinguishability. The raw phase catalogue may be continuous U(1), but operational physics acts on the finite-resolution quotient rather than on mathematically exact raw phase values.

Let $r_\Phi: \Phi \to \Phi_{op}$ be the phase component of the determinate finite-packing resolution map.

Conditional on the Stage 0C-1 identification of the tetrahedral functionals as a physical pre-connection admission layer, the physically typed tetrahedral closure event is

r_Φ(C_i) = r_Φ(1),   i = 1, …, 4,

not necessarily $C_i = 1$ as exact equality on the raw continuous carrier. If that identification fails, no physical tetrahedral admission probability exists at this grain.

Define

G_op = { r_Φ(C_1) = … = r_Φ(C_4) = r_Φ(1) }.

Let μ_{op} denote the physical pushforward measure on the operational phase carrier. The required closure probability is then

P_cl^op = μ_op(G_op | T).

This formulation removes two invalid shortcuts simultaneously: exact equality on a smooth continuous raw U(1) density may not be used to infer an infinite physical admission cost; and an arbitrary numerical tolerance ε may not be inserted in place of the source-derived resolution map.

The remaining Route-M physical object is therefore the triple

(Φ_op, μ_op, B_op),

where B_{op} is the closure map induced on the operational quotient.

Once it is returned, compute $I_{cl}^{op} = -\ln P_{cl}^{op}$ and then

N_info^(phys) = 10 + [Δ_T + I_cl^op]/(7 ln 2).

Only after this operational information return should the direct two-regulator running be revisited:

b_(n→n+1)^(phys) = (1/2) [p_(n+1)^(-1) − p_n^(-1)] / ln(μ_(n+1)/μ_n).

Neither calculation may insert 14/16.

CRTF-EX3AN verdict

POST-CONNECTION BIANCHI CLOSURE: IDENTICAL / ZERO ADDITIONAL COST AT THAT GRAIN

UPSTREAM COMMITMENT/ADMISSION COST: PHYSICALLY POSSIBLE

ROUTE-M TETRAHEDRAL MAP = PRIMITIVE VERSF ADMISSION MAP: OPEN

FINITE-DISTINGUISHABILITY OPERATIONAL QUOTIENT: REQUIRED

RAW U(1) EXACT-EQUALITY PROBABILITY AS PHYSICAL CLOSURE LAW: MISTYPED

ARBITRARY ε-TOLERANCE INSERTION: WITHDRAWN

PHYSICAL Φ_op AND μ_op: NOT RETURNED

PHYSICAL P_cl^op: NOT RETURNED

PHYSICAL INFORMATION NUMERATOR FOURTEEN: NOT DERIVED

PHYSICAL b_RM = 7/8: NOT DERIVED

20. Revised execution programme after CRTF-EX3AN

The calculation order has changed again.

The paper no longer needs to establish whether the C/W/Y tangent geometry exists, whether the 49- and 50-dimensional carriers are compatible, whether a generic unresolved birth has full factor support, whether the spatial E_2 and internal C/W/Y geometries factorise, or whether the existing PFDMI instrument can read the factor directions once matter is occupied.

It also no longer needs to conflate event grains for the fine-structure admission factor. The primitive Fold/Fact, the K=7 closure geometry and the multi-Fold completed history cover are now explicitly typed apart, and the K7 admission structure is source-typed to the primitive Fold boundary, with the same-mark identity and any later cover-level application remaining open.

The remaining programme is organised into seven linked gates.

Stage 0A: Physical relational endpoint/current law

The joint endpoint problem is no longer completely unconstrained.

At the unresolved primitive matter grade, $H = \Omega^\perp \cong \mathbb{C}^{49}$, and CRTF-EX2K gives the exact relative-current law. The relational-handshake theorem further proves that, within the local positive quadratic perfect-square class respecting endpoint exchange and unresolved U(49) isotropy, the only possible endpoint compatibility laws are

Q_(e,±) = a‖z_t ± U_e z_s‖².

Stage 0A therefore splits into three remaining physical tasks.

Stage 0A-1, carrier attachment. Derive or refute from the primitive source

K_∂^(matter) = K_∂^(Gate2) ⊗ I_(Ω^⊥),

or an equivalent theorem showing that the Gate-2 orientation component acts on the physical matter innovation.

Stage 0A-2, physical endpoint law. If the oriented hard-completion branch is returned, then

$$z_t = -U_e z_s, \quad \gamma_e = -1, \quad \mathbb{E}[d_e d_e^\dagger] = (4/49) I_{49}$$

follow exactly. If the physical source instead returns a soft relational ensemble, derive its joint measure and cross-coherence rather than importing the hard zero-set relation.

Stage 0A-3, probability provenance. If the compatibility functional is used to weight endpoint pairs, derive the identification of Q_e with extension information, a source action currency, or a raw marked transfer/path law. No formula of the form $d\mu \propto e^{-Q_e} d\mu_0$ may be inserted by convention.

Only after these three questions are resolved should Stage B evaluate the native PFDMI factor score on the resulting physical endpoint/current ensemble. The remaining Stage-0A returns (finite occupation, physical PFDMI η prescription and the retained operational history grain) are unchanged, and a generic endpoint witness is not sufficient.

Stage 0B: K7 electromagnetic primitive-boundary / PFDMI mark bridge

The event-grain question is now narrower.

The K7 electromagnetic source structure is attached to primitive Fold-boundary admissibility rather than to the later completed-cover carrier. The remaining question is whether this electromagnetic boundary effect is the same marked physical event as the native one-Fold PFDMI accepted-current event.

Required return:

```
**p_EM =? h_Fold^(PFDMI)**
```

from one common source law.

The equality may not be inferred from K = 7, from the numerical value of either probability, or from the fact that both act at primitive Fold scale.

Completed-cover Fisher information remains a separate higher-order history observable.

Stage 0C: Route-M operational-measure / beta gate

The exact Route-M 10+4 = 14 and 6+4+4 = 6+8 decompositions remain structural constraint/readout results. The source-native connection audit now excludes their interpretation as a fourteen-direction MASD curvature Hessian carrier: edge-generated face curvature spans only the six-dimensional Bianchi-compatible sector.

The previous $6\oplus8$ physical-Hessian test is therefore retired.

The Route-M physical-response programme now has three successive tasks.

Stage 0C-1: Pre-connection admission typing

Derive or refute that the direct-face Route-M carrier exists as a physical pre-connection/pre-integrability admission layer of VERSF. Required source identification:

```
direct coherent face records → four tetrahedral integrability/admission tests
→ connection-compatible physical transport.
```

A final post-connection Bianchi identity is not sufficient, because at that grain the closure tests are automatic.

Stage 0C-2: Operational phase quotient and closure measure

Return from finite distinguishability and the primitive history measure: Φ_op, μ_op, B_op. Define

$$G\_op = \{ r\_\Phi(C\_i) = r\_\Phi(1),\ i = 1, \ldots, 4 \}$$

and calculate

$$P\_cl\^op = \mu\_op(G\_op \mid T).$$

Also calculate the ten-face correlation correction

$$\Delta\_T = -\ln[P(T) / 2^{-70}].$$

Then return the physical block information

$$I\_RM = 70 \ln 2 + \Delta\_T - \ln P\_cl\^op$$

and the information-equivalent channel number

$$N\_info\^(phys) = I\_RM / (7 \ln 2).$$

No value of P_cl^op, no phase-fibre cardinality and no equality N_info = 14 may be inserted from the desired Route-M result.

Stage 0C-3: Direct physical running

Independently return the same Route-M coherent-block probability at two physical regulator levels and calculate

$$b\_phys = (1/2)\ [p\_(n+1)^{-1} - p\_n^{-1}] / \ln(\mu\_(n+1)/\mu\_n).$$

This direct beta calculation remains the final arbiter. It contains neither fourteen nor sixteen as inserted inputs.

The denominator-sixteen counting prescription may be retained separately as a conditional Route-M scheme result, but it is not a substitute for the two-regulator derivative.

Stage A: Full six-defect action activation

On the physical E_2 birth tangent, construct the completely quotiented physical Hessian

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

using the full (W_(prim)) defect metric and all same-order auxiliary modes.

Then compute

$Z\_birth = A - CB^{+}C^\dagger.$

This remains the mandatory action-side activation return.

Stage B: Genuine native PFDMI factor score

On the Stage-0 physical source-selected state or ensemble, evaluate the factor tangents, current-ray derivatives, current-orbit derivatives, instrument derivatives and genuine marked-probability derivatives.

Return

$$M\_JJ^{\wedge}(phys) = S\_J\ \Lambda\ S\_J^{T},$$

at both E_2 quadratures, with regulator, branch and (η)-dependence audited.

If the physical operational grain is the completed cover, use the stopped-score relation

$$M\_cover = \mathbb{E}[N\_cover]\ M\_Fold^{\wedge}(stat)$$

rather than inventing a new cover normalisation. Its martingale clause is exact; the scalar multiplier is an executed D36 numerical identity pending the Theorem AH′ certificate.

Stage C: Action-to-event descent

If the physical event law is claimed to descend from the master action, derive a source-native trajectory, transfer, Kraus or equivalent completely positive law connecting the full Schur action response to the marked event probability.

A declared formula such as

$$h=1-e^{(-\Delta\Gamma)}$$

remains inadmissible without this descent.

Stage D: Abelian shorting and physical E_2 stiffness

Only after the direct physical current metric and the surviving Abelian portal are returned may one compute

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

$$\omega_2^{(phys)} = f^T M_{2,short}^{(phys)} f,$$

and

$$\kappa_{E_2}^{(phys)} = 2 + 4\omega_2^{(phys)}.$$

No successor CKM calculation is reopened before these gates pass.

21. The decisive physical-law fork after CRTF-EX3AN

The current programme now contains two distinct common-source questions and they must not be conflated.

Outcome A: Common K7 dual descent succeeds

If one source-native seven-bit closure object is shown to generate both the PFDMI oriented-record clock and the Route-M simplicial RG/coherence law, then the common-(ξ) programme becomes viable at the correct upstream layer.

The remaining ruler promotion would still require the outstanding vacuum-saturation and action-typing premises, but the false 14↔14 identification would no longer be needed.

Outcome B: Cover-level readout applies the Fold-boundary gate but Route M remains separate

A later completed-history readout may apply the already Fold-boundary-typed K7 electromagnetic gate to cover opportunities and thereby normalise flavour-event throughput even if Route M is a distinct descendant theory.

In that case the fine-structure factor survives as a later cover-readout application of the primitive gate, not as a primitive cover-level electromagnetic law, and Route M may not be used to supply the PFDMI SI ruler.

Outcome C: All completed covers remain observed

If failed and successful K7 cover opportunities are both retained in the operational record, then the conditional completed-cover Fisher remains

```
M_(cover)
```

and is not multiplied by (p_(EM)).

The admission probability then belongs only to the rate of a separately labelled admitted event.

Outcome D: Source-selected action/event law bypasses the Route-M ruler

The master action may independently return a physical event law, Fold clock or absolute ruler without any Route-M identification.

Such a return must be source native and must not be selected by numerical agreement with the existing mesoscopic estimates.

The immediate common-source target is therefore

```
**one K7 primitive closure object → two correctly typed descendants**rather than
```

```
14_(PFDMI)=14_(RM).
```

22. The surviving Abelian-closure portal

PMS-EX123 leaves only one linear E_2 cross-defect portal at the current quadratic grade.

Once M_(JJ)^(phys) is returned, write the Abelian closure coupling as

```
g_C∈ℝ³, a_C>0.
```

Then

$$M_{(2,\mathrm{short})}^{(\mathrm{phys})} = M_{(JJ)}^{(\mathrm{phys})} - \frac{g_C g_C^T}{a_C}$$

For

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

the physical axle precision is

$$\omega_2^{(\mathrm{phys})} = f^T M_{(2,\mathrm{short})}^{(\mathrm{phys})} f,$$

and

$$\kappa_{(E_2)}^{(\mathrm{phys})} = 2+4\omega_2^{(\mathrm{phys})}$$

The Abelian portal must be returned or excluded from the same frozen source. It may not be tuned to preserve a previous typed value.

---

23. What this changes for the Standard Model derivation

23.1 Before this paper

The Standard-Model-facing flavour chain ended at

```
primitive R4 fact carrier
```

→ source-selected flavour plane → unique quadratic three-generation descent → conjugate C_3 flavour curvature → nonzero primitive axle interaction → full charged carrier → unknown C/W/Y magnitude-bearing current law

23.2 After CRTF-EX3AN

The Standard-Model-facing chain is now

primitive R4 fact carrier

→ source-selected flavour plane

→ unique quadratic three-generation descent

→ conjugate C_3 curvature

→ nonzero primitive axle interaction

→ full 50D charged-plus-neutral carrier

→ unique neutral GSJB void ray (Ω)

→ 49D projective innovation tangent (Ω^⊥)

→ conditional unresolved Haar/Fubini--Study preparation

→ relative endpoint innovation

→ MASD current (δ J=κ(δρ_t-δρ_s))

→ exact E_2 × internal C/W/Y factorisation

→ native PFDMI dark-void boundary

→ finite-occupation one-Fold factor score

→ one-Fold hazard / occupation identity (h=sβ)

The corrected event hierarchy is

```
**primitive possibility → one Fold/Fact closing on K=7**
```

followed, where required, by

```
**successive Fold/Facts → completed K7 history cover → higher-order
readout/transport.**
```

The physical C/W/Y marked score is therefore first defined at one-Fold Fact grain. The completed-cover score

```
M_cover = 𝔼[N_cover] M_Fold^(stat) = 21.277682950916294 M_Fold^(stat)
```

is a derived history observable and enters only if the physical readout requires that stopping grain. The K7 electromagnetic gate is source-typed to the primitive Fold boundary; what remains open is whether it is the same marked event as the native PFDMI accepted-current hazard, and whether a later cover readout reapplies it. The chain then continues

→ Fold-boundary K7 gate / PFDMI same-mark bridge

→

```
physical cover-admission/readout semantics
```

→

source-selected physical endpoint/current law

→

full six-defect Schur birth residue (Z_(birth))

→

physical (M_(JJ))

→

Abelian closure shorting

→

(κ_(E_2)^(phys))

→

charged readout

→

absolute orientation/CP phase

→

successor CKM

.

A separate common-ruler branch now sits upstream:

$\Omega_7=\{0,1\}^7$

→

common K7 dual descent

→ PFDMI (2K) record-clock branch

and independently

→ Route-M (10+4) simplicial RG/coherence branch

→

```
common-(ξ) theorem, if proved
```

.

The irreversible A_2 history circulation remains on the orientation/CP side and is not reused as a radial magnitude coefficient.

23.3 Why this is a stronger Standard Model advance

The paper has now removed another category of hidden normalisation freedom.

The electromagnetic K7 factor no longer appears as a free scalar that can be inserted at whichever history grain is convenient. Source provenance now places its seven-bit admissibility structure on the primitive Fold boundary. This excludes the completed D36 cover as its primitive source carrier. It does not, however, identify the electromagnetic effect numerically with the native PFDMI one-Fold accepted-current hazard. The Fold electromagnetic gate, the PFDMI current mark and the completed-cover information accumulation remain separately typed until a same-source marked-event theorem connects them.

The completed-cover score itself does not require a new fitted coefficient. The D36 stopping-time law fixes the accumulation factor exactly:

```
𝔼[N_cover] = 21.277682950916294.
```

The resulting E_2 cover geometry remains isotropic.

At the same time, the common-ruler programme has become more rigorous by excluding an attractive but false identification. The two fourteen-channel constructions are not the same carrier. This prevents Route M's (10+4) loop count from being silently substituted for the PFDMI $(7^{+}+7^{-})$ oriented-traversal carrier.

The remaining common-source question is correspondingly more fundamental: whether both descendants arise from one K=7 binary primitive closure object. That is a sharper and more defensible target than numerical matching of two mesoscopic (ξ) values.

The physical flavour metric remains unissued because the source-selected endpoint/current state, physical admission semantics, complete six-defect Schur response and final marked-law descent have not all closed.

24. Revised relation to MBCI, K7 admission and Route M

The earlier MBCI construction remains differently typed from both the primitive PFDMI Fold event and the K7 electromagnetic admission.

The primitive PFDMI current-event hazard is a one-Fold accepted-current probability. On the finite-birth chart,

$$\lambda\_PFDMI = O(\delta^2).$$

The MBCI raw-current intensity is a post-birth candidate carrying an explicit raw-current magnitude factor and scales on the same chart as

$$\Gamma\_MBCI = O(\delta^6).$$

The K7 electromagnetic probability is separately typed from both the PFDMI accepted-current hazard and the MBCI raw-current intensity. Its source construction belongs to primitive K7 Fold-boundary admissibility and contains no completed-cover variable. The completed cover remains a later history/readout object. No equality among h_PFDMI, p_EM, Γ_MBCI or the Route-M coherence coupling may be imposed by convention.

Thus the hierarchy is now

```
**one-Fold PFDMI activation (with Fold-boundary K7 admissibility) →
completed-cover score → later readout**with MBCI retained separately as a
possible post-birth raw-current
```

intensity law.

Route M is also separately typed. Its fourteen channels are simplicial RG/coherence channels, not the PFDMI/K7 oriented-traversal carrier. Route M may contribute an absolute coherence ruler only after a common K7 upstream descent is proved.

No equality among

```
h_(PFDMI), p_(EM), Γ_(MBCI), N_(loop)^(RM)
```

may be imposed by convention.

25. Falsifiers

The following claims are prohibited.

F-RT1: Global/factor conflation. Using the exact global rescaling no-go j → aj to set all factor-relative C/W/Y scores to zero.

F-RT2: Fixed-vector revival. Claiming that the tangent law requires one background-independent C, W or Y vector in the 50-dimensional current carrier.

F-RT3: Uniform-support overreach. Claiming Theorem 1 remains valid after retyping the source factor as a representation-resolved amplitude. It is exact only for the inherited one-scalar-per-factor semantics.

F-RT4: Casimir/charge smuggle. Inserting BTAC/RRHF/Casimir/charge weights into the scalar-factor radial tangent without a source theorem retyping the factor coordinate.

F-RT5: PFDMI automatic-pass overreach. Treating nonzero ray capacity $\mathcal{C}$ as proof that the existing PFDMI mark map has full C/W/Y score rank.

F-RT6: Capacity/metric conflation. Calling the projective covariance $\mathcal{C}$ the physical mark Fisher metric. It is a source-side capacity geometry and QFI ceiling.

F-RT7: Background averaging by preference. Averaging the five target-blind current witnesses and calling the mean physical without a source-derived ensemble law.

F-RT8: Factor-blind recovery. Forcing $M_{(JJ)} \propto I_3$ because the earlier typed branch used equal factor responses.

F-RT9: Hilbert-Schmidt recovery. Forcing $M_{(JJ)}$ to equal the EX124 common-operator Hilbert-Schmidt Gram because it is nontrivial and positive.

F-RT10: Maximal-positivity promotion. Using the saturated PFDMI normalisation as physical without deriving it. The new score should be audited over an admissible interval.

F-RT11: Abelian portal deletion. Dropping the surviving U(1) closure portal without a same-source zero theorem.

F-RT12: CKM back-selection. Choosing any tangent, quotient, η, current ensemble or portal coefficient because it improves a downstream CKM comparison.

F-RT13: Premature physical κ. Calling the previous typed value physical before the new factor-resolved score and Abelian portal are source returned.

F-RT14: Premature successor CKM. Issuing a new physical CKM matrix before the source normalisation, charged readout and absolute phase gates are passed.

F-RT15: Free continuity compensator. Choosing $\partial_\sigma \rho = -\partial_U J$ independently of the primitive refinement/history generator.

F-RT16: Canonical/full-physical conflation. Promoting the canonical K=7 Dirichlet identity $BCB^T = Q_7$ to the full physical MASD/CAR/Fock history generator before the upstream $L^{(op)}$ attribution and refinement gates pass.

F-RT17: Irreversible-current / flavour-magnitude conflation. Identifying the A_2 IORC/HMGBC rim circulation with the E_2 flavour-current defect. Their direct linear overlap is exactly zero.

F-RT18: Ensemble/mixture conflation. Replacing a source-derived ensemble by an arithmetic mean of already-reduced witness Grams, or assuming

```
𝒞(𝔼ρ_J) = 𝔼[𝒞(ρ_J)]
```

without an operational theorem.

F-RT19: Single-record chirality promotion. Using one reversal-even F2F edge/type token as though it retained the directed A_2 history orientation.

F-RT20: CP/magnitude reuse. Using the irreversible orientation current as both the absolute chirality/CP selector and the radial E_2 magnitude normalisation without a source-derived marked/tensor coupling.

F-RT21: 49/50 mismatch revival.

Treating the 49D innovation tangent and 50D full endpoint carrier as inconsistent rather than as Ω^$\perp \subset \mathbb{C}^{50}$.

F-RT22: Haar physical-promotion overreach.

Calling the conditional unresolved Fubini--Study preparation law the realised physical post-record current distribution before the same-event and Gibbs--Haar tilt gates close.

F-RT23: Capacity/score re-conflation at the void.

Using full rank of $\mathcal{C}(z)$ to claim nonzero native PFDMI Fisher information on the pure neutral source. The exact native score there is zero.

F-RT24: Generic EX2F hazard promotion.

Inserting the numerical hazard of any generic endpoint witness as the physical first-birth hazard.

F-RT25: PFDMI/MBCI intensity conflation.

Equating the $O(\delta^2)$ primitive Fold hazard with the $O(\delta^6)$ MBCI raw-current intensity without a same-action theorem.

F-RT26: Constitutive-defect hazard promotion.

Defining the physical hazard as a function only of $\|D\_J\|^2$. Every on-shell current has $D\_J=0$.

F-RT27: Frozen-current pre-Schur promotion.

Setting $J=0$, reading the resulting $O(\delta^2)$ constitutive mismatch cost and calling it the physical MASD activation energy.

F-RT28: Naive Boltzmann hazard insertion.

Declaring $h=1-e^{-\Delta\Gamma}$ or another action-to-probability formula without a source-derived path/Kraus/transfer law and action currency.

F-RT29: Scalar executable promotion.

Calling the diagnostic CFB1/EPMD result $\Delta\Gamma\_JT^{(E_2)}=(2/3)|x|^2$ the physical full-faithful birth action.

F-RT30: Partial Schur promotion.

Using the isolated J/T Schur residue as physical while unreturned W_prim cross-defect, record, history and completion blocks remain at the same order.

F-RT31: Same-mark and cover-reuse preselection. Identifying the Fold-boundary electromagnetic admissibility effect with the native PFDMI accepted-current mark, or applying it to a later completed-cover opportunity, without a same-source theorem. The source carrier of the K7 gate is the primitive Fold boundary; neither the same-mark identity $p\_EM = h\_Fold^{(PFDMI)}$ nor a cover-level readout application may be presented as established without its own derivation.

F-RT32: Cover-Fisher undercount. Multiplying a one-Fold Fisher matrix by $(p_{(EM)})$ before the completed-cover stopping-time accumulation has been performed.

F-RT33: Conditional/admitted Fisher conflation. Calling $(p_{(EM)}M_{(cover)})$ the Fisher matrix conditioned on successful admission. The factor $(p_{(EM)})$ belongs only to per-opportunity throughput when failed covers do not contribute to the retained readout.

F-RT32 and F-RT33 apply only if the cover-level admission branch is actually derived at Stage 0B.

F-RT34: 14↔14 carrier conflation. Identifying the PFDMI $(7^{+}+7^{-})$ traversal carrier with the Route-M $(10\_\triangle+4\_(cl))$ loop carrier merely because both have cardinality fourteen.

F-RT35: Rank-smuggle. Ignoring the rank-13 PFDMI attaching image and treating its fourteen coordinate labels as fourteen independent physical incidence modes.

F-RT36: (ξ)-by-numerical-proximity promotion. Declaring (ξ_(PFDMI)=ξ_(Route,M)) because their mesoscopic numerical ranges overlap.

F-RT37: Typed-symmetry erasure. Treating the Route-M (3+1+2+1) coherence-condition typing as a fully (S_7)- or (D_6)-equivalent seven-role carrier without a source-derived quotient or intertwiner.

F-RT38: Boolean-cube overpromotion. Using the common abstract count ($|\{0,1\}^7|=128$) as proof that the two fourteen-channel descendants, their dynamics or their physical length scales are identical.

F-RT39: Gate-2/matter carrier smuggle. Identifying the scalar Gate-2 boundary amplitude with the 49-complex-dimensional matter innovation merely because the two admit the same perfect-square algebra. The tensor attachment must be returned by the primitive source.

F-RT40: Conditional $\gamma = -1$ promotion. Calling γ_e = −1 the physical endpoint coherence solely from the uniqueness of the vector handshake form. This value follows only if the oriented Gate-2 branch physically acts on the matter tangent and hard zero-cost completion is the correct event law.

F-RT41: Gibbs-handshake insertion. Declaring dμ_e ∝ e^(−Q_e) dμ_0 without deriving that Q_e is the relevant VERSF extension information, source-path action or negative log marked weight.

F-RT42: HMGBC-handshake false contradiction. Treating the conditional positive HMGBC values of γ_e(s) as refuting the hard-handshake value −1, or vice versa, before either candidate is physically attached to the matter endpoint law at the same event grain.

26. Open debts after CRTF-EX3AN

D-RT1: Same-event primitive attachment.

Derive that the realised GSJB support-changing birth event is the endpoint-amplitude innovation entering MASD/PFDMI.

D-RT2: Physical relational joint endpoint law.

The form-class freedom is reduced. Under local quadratic perfect-square, endpoint-exchange and unresolved U(49)-covariance requirements,

```
Q_(e,±) = a‖z_t ± U_e z_s‖²
```

is exact up to positive scale and orientation sign. The remaining physical debt is to derive whether the primitive Gate-2 boundary competition acts on the 49-dimensional matter tangent and, if so, whether the oriented sum-square branch is inherited. Hard completion would then return $\gamma\_e = -1$. If instead the source supplies a soft endpoint ensemble, its joint measure and cross-coherence must be derived explicitly.

D-RT2A: Handshake-to-probability descent.

If the relational compatibility functional is to determine endpoint probabilities, derive from the same source either $Q\_e = \Delta I\_e$ at the required operational grain or a raw marked transfer/path law whose normalised endpoint distribution follows from Q_e. The Born/consistency identity $p = e\^(-\Delta I)$ does not license exponentiation of an independently typed mechanical compatibility cost.

D-RT3: Realised preparation / Gibbs--Haar tilts.

Return the post-record extension-information functional or equivalent source law fixing the realised conditioned current ensemble.

D-RT4: Physical Fold hazard.

Return the dimensionless current-event hazard on the physical endpoint frame rather than on a generic witness.

D-RT5: Physical η law.

Derive the PFDMI current-channel normalisation prescription or establish an η-independent physical score.

D-RT6: Full faithful W_prim.

Return the complete six-defect metric including all typed off-diagonal cross blocks on the physical multi-cell carrier.

D-RT7: Full E_2 birth Schur residue.

Execute

```
Z_birth = A-CB⁺C† on the physical E₂⊗Ω^⊥ tangent.
```

D-RT8: Action-to-event descent.

If the physical hazard is to be derived from the master action, return a raw marked transfer, source path measure/Kraus descent or equivalent completely positive event law.

D-RT9: Physical native factor score.

Evaluate the genuine PFDMI C/W/Y score on the physical source-selected state/ensemble and hazard.

D-RT10: Ensemble/mixture operational grain.

Fix whether the physical information object is a mixed-state score or a history-conditioned Fisher average.

D-RT11: Regulator and branch theorem.

Repeat the complete endpoint/hazard/Schur/score execution on the required refinement levels and conjugate branches.

D-RT12: Abelian closure portal.

Return or exclude g_C and return a_C from the same frozen source.

D-RT13: Physical E_2 stiffness.

Compute ω_2^phys and κ_(E_2)^phys only after the direct current metric and Abelian portal are closed.

D-RT14: Charged-flavour propagation.

Freeze the physical source normalisation before reopening the charged-completion response.

D-RT15: Absolute orientation/CP readout.

Retain the A_2 irreversible history sector for orientation/chirality only until a source-derived A_2^(hist)$\otimes$$E_2$^(int) coupling and charged readout are returned.

D-RT16: K7 electromagnetic / PFDMI same-mark bridge. The source-provenance audit has already located the K7 electromagnetic admissibility structure at the primitive Fold boundary. The remaining question is no longer which event grain carries the K7 source gate. The unresolved same-source identification is

```
**p_EM =? h_Fold^(PFDMI).**
```

Derive or refute that the K7 electromagnetic admissibility effect and the native PFDMI accepted-current mark are the same primitive Fold-boundary physical event. The equality may not be inferred from their common Fold-boundary location, from K = 7, from numerical agreement, or from the fact that both are probabilities.

D-RT17: Later cover-readout application of the Fold-boundary gate. Independently determine whether a completed-history readout later applies the already Fold-boundary-typed K7 electromagnetic gate to cover opportunities. If it does, determine whether failed opportunities remain in the retained history or are operationally absent. This fixes whether p_EM M_cover is a per-opportunity throughput weight. This later readout use must not be confused with the primitive provenance of p_EM, which is already Fold-boundary typed.

D-RT18: Common K7 primitive Boolean carrier. Return one source-native set of seven binary closure variables that can be meaningfully compared across the PFDMI/K7 and Route-M branches without retyping them by hand.

D-RT19: Dual descendant descent. Derive both

$\Omega_7 \to 7^{+}+7^{-}$

for the oriented record-clock branch and

$\Omega_7 \to 10\_\triangle+4\_(cl)$

for the simplicial RG/coherence branch from the same primitive object.

D-RT20: Common-(ξ) theorem. Only after D-RT18 and D-RT19 pass, determine whether the PFDMI closure length and Route-M coherence length are the same metric representative. Retain the PFDMI vacuum-saturation and capacity-to-phase/action debts as additional required premises.

D-RT18 through D-RT20 form the common-ruler/PFDMI ancestry programme. It is a distinct provenance question from the Route-M operational-measure beta programme, and its failure would not by itself invalidate Route M's structural 10+4 census or the independent beta derivation.

27. Locked numerical execution contract after CRTF-EX3AN

Stage 0: Physical endpoint/current/hazard package

Required inputs:

- full 50D faithful endpoint carrier;
- unique GSJB void ray Ω;
- 49D projective tangent Ω^⊥;
- physical history/record kernel;
- same-event endpoint-update law;
- source-selected joint endpoint distribution or conditioned ensemble;
- faithful links U_e;
- PFDMI current channels;
- physical η prescription or admitted interval;
- native Fold hazard.

Required outputs:

- endpoint cross-coherence tensor;
- nonzero-relative-current certificate;
- current-state/ensemble law;
- seven central current populations;
- physical edge hazard;
- retained operational grain;
- regulator/branch drift.

Stage A: Full Schur activation

Required inputs:

- complete physical W_prim;
- all six defect Jacobians;
- all cross-defect blocks;
- quotient/null projectors;
- complete auxiliary census;
- physical E_2 birth tangent.

Required outputs:

- physical block matrices A,C,B;
- rank and conditioning of B on the quotient;
- pseudoinverse convention and null certificate;
- $Z\_birth=A-CB^{+}C^{\dagger}$;
- E_2 doublet isotropy/covariance;
- comparison with isolated J/T benchmark;
- regulator and branch stability.

Stage B: Native marked score

Required outputs:

- ∂_Aρ_J;
- ∂*AK*(e,a);
- ∂_AS_e;
- ∂_Aη_e where applicable;
- ∂*AC*(e,α);
- ∂*AE*(e,α,r);
- native probability derivatives;
- S_J;
- $M\_(JJ)=S\_J\Lambda S\_J^{T}$;
- both E_2 quadratures;
- rank, spectrum and common-mode precision;
- η dependence;

- history-conditioned versus mixed-state comparison.

Stage C: Action/event bridge

If the physical hazard is claimed to descend from the master action, additionally return:

- raw transfer or trajectory law before conditional normalisation;
- reference measure/action currency;
- trajectory-to-terminal-effect coarse-graining;
- completely positive instrument completeness;
- derived survival/hazard law;
- comparison with the independently native PFDMI Fold compensator.

Hard pass

Promote M_(JJ)^phys only if:

1. the current state/ensemble is source derived;
2. the physical hazard is source selected;
3. the operational ensemble/mixture grain is fixed;
4. the native factor score has rank three;
5. both E_2 quadratures agree as required by D_6;
6. regulator/branch stability passes;
7. no arbitrary η endpoint is doing physical work;
8. the result is frozen before Abelian or charged-flavour comparison.

Hard stop

```
Do not issue physical κ_(E₂) if:
```

- same-event birth/current attachment remains assumed rather than derived at the claimed grade;
- the physical endpoint/hazard law is replaced by a generic witness;
- a D_J-only hazard is used;
- a pre-Schur fixed-current cost is promoted;
- the isolated J/T Schur coefficient is substituted for the full six-defect residue;
- an action-to-hazard formula is declared without a marked/path-law derivation;
- MBCI and primitive PFDMI intensities are equated by convention;
- downstream Standard Model data enter any upstream selection.

Stage 0A: Completed-cover operational grain

Required outputs:

- canonical first completed-cover stopping rule;
- ($\mathbb{E}$

  $N_{(cover)}$

);

- state and transition occupation Green functions;
- score-martingale certificate;
- ($M_{(cover)}$);
- E_2 cover isotropy certificate.

Hard pass:

```
M_cover = 𝔼[N_cover] M_Fold^(stat)
```

with no inserted cover coefficient.

Stage 0B: K7 electromagnetic / PFDMI primitive-mark bridge

The K7 electromagnetic source gate is already typed to primitive Fold-boundary admissibility.

Required outputs:

- the primitive electromagnetic Fold-boundary effect;
- the native PFDMI one-Fold accepted-current effect;
- a same-source comparison of the two effects;
- a proof or refutation of $p_{EM} = h_{Fold}^{(PFDMI)}$;
- any later rule applying the primitive electromagnetic gate to a completed-cover/readout opportunity;
- retained/unretained semantics for failed later opportunities, if such a cover-level application exists.

Hard stop if:

- $p_{EM} = h_{Fold}^{(PFDMI)}$ is inferred merely from common event grain;
- the completed-cover law is presented as the primitive source of p_{EM};
- p_{EM} M_{cover} is called the Fisher matrix conditioned on successful admission;
- a later cover-readout use is allowed to overwrite the primitive Fold-boundary provenance.

Stage 0C: Route-M operational-measure / beta programme

Required outputs:

- physical pre-connection admission typing for the Route-M direct-face carrier;
- Φ_op;
- μ_op;
- B_op;
- Δ_T;
- P_cl^op;
- I_cl^op;
- N_info^(phys);
- the same coherent-block probability at two physical regulators;
- the direct physical beta coefficient.

Hard stop if:

- the $6\oplus8$ readout architecture is reused as a physical curvature Hessian;
- the original K7 face bits are reused as fresh tetrahedral entropy;
- M = 128 is inserted because it recovers fourteen;
- raw exact U(1) equality or an arbitrary ε-tolerance substitutes for the source-derived operational quotient;
- 14/16 is inserted into the direct running calculation.

Stage 0D: Common-K7 / common-ruler programme

This is a distinct provenance question from the Route-M beta derivation.

Required outputs:

- one source-native K7 primitive closure carrier;
- the PFDMI $7^{+}+7^{-}$ descendant map;
- the Route-M 10_△+4_cl descendant map, if it exists;
- proof of compatibility or an exact no-go;
- only after a pass, a common-ξ test.

Failure of this common-ancestry programme does not by itself invalidate Route M's structural 10+4 census or its independent operational-measure beta programme.

28. Main theorem package

Theorem A: Canonical scalar-factor radial lift

The unique local, gauge-equivariant, support-preserving, internally non-rotating logarithmic radial lift of one scalar amplitude per C/W/Y factor is generated by P_C,P_W,P_Y.

Theorem B: E_2-modulated C/W/Y tangent field

$\mathcal{T}$_A(u)_e=q_e(u)P_Aj_e.

Theorem C: Global versus relative projective visibility

Common total-current scaling has zero ray derivative. A factor-radial scaling has zero ray derivative only on a factor eigenray.

Theorem D: Support-Gram centring

$\mathcal{C}$=G_(CWY)-ππᵀ.

Theorem E: Common flavour mode non-globality

$$P_C+P_W+P_Y = 2(E_2+E_3+E_4+E_5)+3E_6+E_7,$$

so equal C/W/Y scaling is generically projectively visible.

Theorem F: Existing PFDMI orbit response

δ_AK_a=q{P_A-π_AI,K_a}.

Theorem G: Existing-instrument score lock

The missing S_J is the total derivative of the existing PFDMI marked probabilities along the derived factor-radial tangents, evaluated only after the physical current state/ensemble is returned.

Theorem H: Static MASD continuity obstruction

For the literal static endpoint-difference embedding on the connected wheel, the continuity defect is a weighted graph Laplacian and only the constant endpoint field is static.

Theorem I: Generic-witness / physical-background separation

The five EX2E prime-chirp states are robustness/genericity witnesses, not automatically physical static vacua.

Theorem J: Refinement-generator interpretation

Once the physical history transfer is supplied,

$\partial\_\sigma\rho = \mathcal{G}\_(\mathrm{hist})\rho$

rather than an independently chosen compensator.

Theorem K: Canonical Dirichlet generator matching

On the canonical K=7 reversible wheel,

$L\_J = BCB^T = Q_7 = \Pi(I-T_0) = (1/31)L\_(W_7)$

Theorem L: Dynamic continuity theorem

In stationary-measure coordinates,

$\Pi\rho+BJ=0$

for the canonical HMGBC heat flow and stationary-conductance MASD current. The five EX2E witnesses satisfy this relation to machine precision.

Theorem M: Cycle/gradient orthogonality

The source-derived irreversible A_2 history current is divergence free and orthogonal to the full E_2 incidence-gradient flavour-current plane:

$\omega\_C\perp D\_J(E_2)$.

Theorem N: Orientation / magnitude separation

The irreversible history current cannot linearly supply the radial E_2 flavour magnitude through a scalar equivariant pushforward, but it remains naturally typed to orientation/chirality.

Theorem O: Marked/tensor escape condition

A nonzero linear orientation-to-E_2 bridge requires additional internal type, for example

$A_2\hat{}(\mathrm{hist})\otimes E_2\hat{}(\mathrm{int})\cong E_2$.

Such a route must be source derived and cannot be replaced by direct current identification.

Theorem P: Ensemble/mixture firewall

If the physical source returns a current ensemble, the physical C/W/Y information object depends on the retained operational grain. In general,

$\mathcal{C}(\mathbb{E}\rho\_J) \neq \mathbb{E}[\mathcal{C}(\rho\_J)]$.

The theory must derive whether the physical instrument acts on the mixture or on history-conditioned states.

Theorem Q: Central-support current no-go

A central-block-preserving endpoint update acting on a single occupied central atom produces a current supported on that atom and hence zero C/W/Y covariance.

Theorem R: Signature-affine rank theorem

The C/W/Y covariance rank equals the affine dimension of the occupied factor-signature set. Full rank three requires N_R together with at least three affinely independent non-neutral signature classes.

Theorem S: Conditional Haar birth-capacity theorem

Under the GSJB unresolved Fubini--Study law on $\Omega^\perp \cong \mathbb{C}^{49}$, all five factor-signature classes are occupied almost surely and $\mathrm{rank}\,\mathcal{C}=3$ almost surely.

Theorem T: Relative-birth current theorem

At the faithful neutral void, $\delta J\_e = \kappa\_e(\delta\rho\_t-\delta\rho\_s)$.

The spatial common mode is current-invisible.

Theorem U: Joint-isotropy/Haar current theorem

Every jointly U(49)-invariant endpoint-birth law satisfying $P(d = 0) = 0$, with $d = z\_t - U\_e z\_s$, induces the Fubini-Study law on the relative-current projective direction.

Theorem V: 49↔50 carrier reconciliation

The 49-complex primitive innovation carrier is exactly the projective tangent $\Omega^\perp$ of the full 50-dimensional endpoint carrier.

Theorem W: Tensor-product incidence theorem

$\text{On } K=7,\ \mathrm{rank}(B^T \otimes I_{49})=294,$

with 49-dimensional spatial common-mode kernel and a $294\oplus294$ gradient/cycle edge decomposition.

Theorem X: $E_2 \times$ C/W/Y factorisation theorem

```
For factorised birth δψ_v=u_vz, G_total = K_E₂⊗𝓒_CWY.
```

The background current ray loses the spatial E_2 coefficient, while the radial score retains it through K_E_2.

Theorem Y: PFDMI neutral dark-source theorem

The pure equal-copy N_R void is annihilated by every nontrivial current channel for every tangent current ray. Its native C/W/Y factor score is exactly zero.

Theorem Z: Finite-occupation activation theorem

Finite active-source occupation β activates the genuine PFDMI factor Fisher at $O(\beta)$, with full factor rank three on the executed Haar law-level benchmark.

Theorem AA: Fold-hazard / occupation theorem

```
At η=sη_max, h_e=sβ_e.
```

```
At saturation, h_e=β_e.
```

Theorem AB: First-birth / MBCI intensity separation

On the primitive birth chart the PFDMI Fold intensity is $O(\delta^2)$, while the MBCI same-orbit raw-current intensity is $O(\delta^6)$. They are not the same primitive observable absent a same-action theorem.

Theorem AC: D_J-only hazard no-go

No hazard depending solely on $\|D\_J\|^2$ can distinguish a nonzero on-shell current from the currentless void.

Theorem AD: Finite-E_2 J/T Schur theorem

For the isolated constitutive/continuity block, $K\_JT(\lambda) = ab\kappa^2\lambda^2/(a+b\lambda)$.

At $\lambda\_E_2=4$ the Schur-relaxed finite-E_2 action cost is nonzero for positive a,b,κ.

Theorem AE: Full-action activation gate

Within MASD the only admissible physical quadratic birth-cost candidate is the completely quotiented full-auxiliary Schur complement

$$Z\_birth = A - CB^{+}C^{\dagger}.$$

Theorem AF: Action/hazard type separation

A conservative or Euclidean quadratic action cost is not by itself a stochastic hazard. A native transfer/path/Kraus descent or equivalent event-law construction is required.

Theorem AG: Fold/Fact/K7 closure-grain theorem

Given the inherited One-Fold typing of P-RT8, the primitive Fold is the elementary committed Fact/record event. K=7 is the minimum admissibility/closure geometry supporting that event. A seven-Fold Hamiltonian cover is therefore a higher-order history of Fold/Facts, not the primitive production of one Fact. Accordingly, the PFDMI attaching relation

$$7 \text{ Folds} \leftrightarrow 14 \text{ oriented incidences}$$

cannot by itself determine the event grain of the K7 electromagnetic admission probability.

Theorem AH: Stopped-score martingale theorem

At stationary D36 start the one-Fold native factor scores form a martingale-difference sequence, so all distinct-Fold cross terms vanish and

$$\mathbf{M\_cover = \mathbb{E}[\Sigma\_(n=1)^{(N\_cover)} I\_n].}$$

This clause is exact.

Theorem AH′: Executed D36 occupation identity

On the executed augmented-state D36 cover construction with stationary initial wheel state, the state and directed-transition occupation proportions satisfy

$$\mathbb{E}[\text{visits to } x \text{ before completion}] = \mathbb{E}[N\_cover]\ \pi\_x, \quad \mathbb{E}[\text{directed } i \to j \text{ transitions}] = \mathbb{E}[N\_cover]\ \pi\_i\ P\_ij,$$

whence

$$M\_cover = \mathbb{E}[N\_cover]\ M\_Fold^{(stat)} = 21.277682950916294\ M\_Fold^{(stat)}.$$

This second clause is graded as an executed numerical D36 identity, not as a generic theorem. Occupation proportions are not preserved by arbitrary stopping times: for a finite irreducible D36 chain with finite expected stopping time, the identity holds exactly when the stopping rule returns the chain to its initial distribution, and fails for stopping rules whose terminal state is non-stationary. Upgrading Theorem AH′ to exact status therefore requires the augmented-state linear system or an equivalent rational certificate establishing that return property for the specific D36 cover rule.

Theorem AI: Cover-level admission-thinning theorem

If, and only if, failed K7 cover opportunities are absent from the retained flavour readout and the gate is C/W/Y-independent, information per eligible opportunity is

$$M_{opportunity} = p_{EM} M_{cover}.$$

Conditioned on a successful admitted cover, the Fisher shape remains ($M_{(cover)}$).

Theorem AJ: Route-M/PFDMI (ξ)-identity boundary

The current source corpus supports strong K=7 structural compatibility between the PFDMI ruler programme and Route M, but it does not yet prove a common source-native (ξ). The outstanding content includes cross-carrier descent, vacuum saturation and capacity-to-phase/action typing.

Theorem AK: Fourteen-channel carrier-separation theorem

At the current native grains,

$$14_{(PFDMI)}=7^{+}+7^{-},$$

with rank-13 attaching image, whereas

$$14_{(RM)}=10_{\Delta}+4_{(cl)}$$

is a fourteen-dimensional effective loop module. A direct bijective same-carrier identification is excluded.

Theorem AL: Common K7 Boolean-layer theorem

The strongest common object presently supported by both branches is the abstract seven-bit satisfaction carrier

$$\Omega_7=\{0,1\}^7.$$

Equality of this upstream Boolean capacity does not imply equality of the two fourteen-channel descendants or their physical length scales.

Theorem RM-A: Route-M connection-curvature carrier theorem

For one 4-simplex, rank $d_1 = 6$, rank $d_2 = 4$, and simplicial exactness gives

$\mathrm{im}\ d_1 = \ker d_2$.

Hence source-native connection-generated curvature occupies only the six-dimensional Bianchi-compatible face sector. The complementary four-dimensional direct-face sector is an integrability-violation sector, not an additional MASD curvature tangent carrier.

Theorem RM-B: Route-M joint-information theorem

Let T be simultaneous K7 coherence of all ten triangular faces and G the four independent tetrahedral closure conditions. Then

```
**I_RM = 70 ln 2 + Δ_T + I_cl,**
```

with $\Delta\_T = -\ln[P(T)/2^{-70}]$ and $I\_cl = -\ln P(G|T)$. Thus fourteen structural constraints do not imply fourteen equal information units.

Theorem RM-C: Fresh-residual theorem

Conditional on all ten K7 face-coherence events, the seventy primitive K7 pass/fail variables are fixed:

```
**H(X|T) = 0.**
```

Therefore any nontrivial additional tetrahedral admission information must be carried by variables surviving face coherence and cannot be obtained by reusing the K7 Boolean bits.

Theorem RM-D: Conditional operational-quotient closure theorem

If the Route-M tetrahedral functionals are source-identified as a physical pre-connection admission layer (Stage 0C-1), then finite distinguishability requires their physical closure event to be evaluated on the operational phase quotient:

```
**r_Φ(C_i) = r_Φ(1).**
```

The physical closure probability is therefore

```
**P_cl^op = μ_op(G_op | T),**
```

on the source-derived operational carrier. Raw exact equality on continuous U(1), an arbitrary tolerance and an assumed finite residual alphabet are not substitutes for this operational measure. If Stage 0C-1 fails, there is no physical Route-M tetrahedral admission probability to calculate at that grain.

29. Formal verdict

Object	Grade
Exact $E_2 \rightarrow D\_J$ edge profile	**INHERITED EXACT**

Object	Grade
Exact C/W/Y factor supports	**INHERITED EXACT**
Scalar-factor radial tangent law	**EXACT**
Relative-radial ray covariance	**EXACT**
Generic-witness C/W/Y rank	**EXECUTED PASS / NOT PHYSICAL SELECTION**
Static prime-chirp MASD admission	**EXECUTED FAIL**
Canonical MASD/HMGBC Dirichlet match	**EXACT PASS**
Direct A_2 history-current → E_2 magnitude	**EXACT ZERO**
Retained A_2 orientation/CP role	**STRUCTURALLY COMPATIBLE / PHYSICAL LIFT OPEN**
Record → conditioned density/populations	**EXACT AT RECORD-DENSITY GRAIN**
Endpoint density → unique current amplitude	**NO-GO**
Same-carrier physical V_e from prior corpus	**NOT RETURNED**
Single-central-atom C/W/Y capacity	**EXACT ZERO**
Full-rank signature requirement	**EXACT: N_R + ≥3 AFFINELY INDEPENDENT NON-NEUTRAL CLASSES**
GSJB unresolved Haar birth capacity	**CONDITIONAL LAW-LEVEL PASS / RANK 3 ALMOST SURE**
Realised post-record birth direction	**OPEN**
Birth mark → MASD current tangent	**CONDITIONAL SAME-EVENT IDENTITY**
Linearised relative-birth current	**EXACT**
Common-mode birth current	**EXACT ZERO**
Joint-isotropic relative-current direction	**HAAR ALMOST SURE**
Physical endpoint coherence γ_e	**NOT RETURNED**
Canonical HMGBC finite-s relative-current benchmark	**CONDITIONAL NONZERO**
49↔50 carrier reconciliation	**EXACT KINEMATIC PASS**
K=7 × 49 incidence-current rank	**294 COMPLEX / EXACT**
Gradient/cycle edge split	**294⊕294 COMPLEX / EXACT**
E_2 × internal C/W/Y factorisation	**EXACT**

Object	Grade
History-weighted E_2 Gram	**0.2970460026009425 I_2 / SOURCE-WEIGHTED STRUCTURAL RETURN**
Haar law-level factor-capacity matrix	**RANK 3 / CONDITIONAL**
Full E_2×C/W/Y capacity	**RANK 6 / CONDITIONAL**
PFDMI score chain-rule factorisation	**EXACT**
Pure GSJB void native factor score	**EXACT ZERO**
Finite-source native factor score	**FULL RANK AT $O(\delta^2)$**
Saturated Haar native internal Fisher	**EXECUTED LAW-LEVEL BENCHMARK / RANK 3**
η-interval factor rank	**ROBUST ON TESTED INTERVAL**
η-interval numerical metric	**NOT UNIQUE**
Fold hazard ↔ occupied fraction	**EXACT: h=sβ**
Saturated Fold hazard	**EXACT: h=β**
Physical numerical hazard	**NOT SELECTED**
MBCI raw intensity = primitive PFDMI hazard	**EXACTLY NOT IDENTIFIED / SCALING MISMATCH**
D_J-only action hazard	**EXACT NO-GO**
Pre-Schur fixed-current activation cost	**NOT PHYSICAL UNDER MASD REDUCTION RULE**
Isolated J/T finite-E_2 Schur cost	**EXACT NONZERO**
Scalar CFB1/EPMD E_2 cost 2/3	**DIAGNOSTIC ONLY**
Full physical Z_birth	**OPEN: COMPLETE SIX-DEFECT SCHUR REQUIRED**
Action → stochastic hazard map	**OPEN**
Physical S_J	**OPEN**
Physical M_(JJ)	**OPEN**
Abelian closure shorting	**STRUCTURE INHERITED / NUMBERS OPEN**
Physical κ_(E_2)	**NOT ISSUED**
Successor physical CKM	**NOT ISSUED**
PFDMI Fold → 14-incidence attaching map	**PASS AT DECLARED PFDMI GRADE**
One Fold = one primitive committed Fact/record	**INHERITED STRUCTURAL TYPING**
K=7 role	**MINIMUM FOLD-CLOSURE / ADMISSIBILITY GEOMETRY**
Minimal completed history cover	**7 FOLDS ↔ 14 ORIENTED INCIDENCES / EXACT**
Mean stochastic completed cover	**21.277682950916294 FOLDS / EXACT D36 RETURN**

Object	Grade
Completed-cover score martingale	**EXACT PASS**
D36 occupation identity under the cover stopping rule	**EXECUTED NUMERICAL D36 IDENTITY / CERTIFICATE OWED**
Completed-cover Fisher	**21.277682950916294 M_Fold^(stat) / MARTINGALE CLAUSE EXACT, OCCUPATION CLAUSE EXECUTED NUMERICAL**
Completed-cover E_2 Gram	**6.32045066518 I_2 / EXECUTED D36 RETURN; EXACT CONDITIONAL ON THE AH′ CERTIFICATE**
p_EM M_cover	**CONDITIONAL PER-OPPORTUNITY THINNING LAW**
p_EM as conditional Fisher-shape rescaling	**NO**
Route-M/PFDMI ξ numerical compatibility	**STRONG / NOT IDENTITY**
PFDMI $7^+ + 7^-$ carrier = Route-M 10 + 4 carrier	**EXACT DIRECT-CARRIER FAIL**
PFDMI native attaching dimension	**13**
Route-M effective loop-channel dimension	**14**
Type-preserving full S_7/D_6 carrier identity	**NO-GO AT CURRENT TYPED GRADE**
Common K=7 Boolean satisfaction carrier	**PASS / COMMON ABSTRACT CAPACITY SURVIVES**
Common K7 → dual descendants	**OPEN / SEPARATE COMMON-RULER PROGRAMME**
Common source-native ξ	**NOT DERIVED**
Local 49D quadratic endpoint-handshake form	**EXACT FORM-CLASS THEOREM: Q_(e,±) = a‖z_t ± U_e z_s‖²**
Preferred internal direction required by handshake	**NO: EXCLUDED BY COMMON U(49) COVARIANCE**
Gate-2 oriented-gluing sign inherited by matter tangent	**OPEN PHYSICAL CARRIER ATTACHMENT**
Hard oriented-handshake zero set	**EXACT CONDITIONAL: z_t = −U_e z_s**
Hard-handshake endpoint coherence	**EXACT CONDITIONAL: γ_e = −1**
Hard-handshake relative-current second moment	**EXACT CONDITIONAL: $4I_{49}/49$**

Object	Grade
Hard-handshake current direction	**FUBINI-STUDY / HAAR CONDITIONAL ON THE INHERITED UNRESOLVED FS ENDPOINT MARGINAL**
Handshake cost = extension information	**NOT DERIVED**
$e^{(-Q_{hs})}$ physical joint endpoint law	**NOT ADMITTED WITHOUT SAME-SOURCE DESCENT**
Physical numerical γ_e	**NOT RETURNED UNTIL CARRIER ATTACHMENT PASSES**
K7 electromagnetic source carrier	**PRIMITIVE FOLD-BOUNDARY TYPED**
Mandatory completed-cover placement of p_{EM}	**FAIL / EXCLUDED AS PRIMITIVE PROVENANCE**
$p_{EM} = h_{Fold}^{(PFDMI)}$	**OPEN SAME-MARK BRIDGE**
Later cover-readout application of p_{EM}	**CONDITIONAL / READOUT SEMANTICS OPEN**
Common Ω_7 Boolean capacity	**PASS**
$\Omega_7 \to 10_\triangle + 4_{cl}$ source descent	**NOT RETURNED**
Physical space dimension used by Route M	**3D EFFECTIVE SPACE; HISTORY ORDERING SEPARATE**
$\partial\Delta^4$ as fourth spatial dimension	**NO**
Route-M coarse 10 + 4 = 14 under finite refinement	**STRONG STRUCTURAL PASS**
Fourteen independent continuous Fisher directions	**FAIL; DIRECT-FACE READOUT MAP RANK 10**
Route-M face split 10 = 6 + 4	**EXACT READOUT GEOMETRY**
Route-M labelled split 14 = 6 + 4 + 4 = 6 + 8	**EXACT READOUT GEOMETRY**
Closure-sensitive 4 ↔ closure-readout 4 partial isometry	**EXACT**
BCB 6 + 8 dimensional match	**STRONG STRUCTURAL COMPATIBILITY / NOT SAME CARRIER**
MASD edge → face curvature rank	**6 / EXACT**
$\mathrm{im}\, d_1 = \ker d_2$	**EXACT**
MASD physical curvature occupies Route-M V_4 sector	**NO**
$6\oplus8$ as physical MASD beta-Hessian carrier	**WITHDRAWN / MISTYPED**

Object	Grade
Equal fourteen-readout quadratic cost gives $A^\dagger A = P_6 + 2P_4$	**EXACT DIAGNOSTIC / NOT PHYSICAL SELECTION**
Local DEC mean V_6/V_4 normalisation ratio	**1 / EXACT**
One K7 triangle admission information	**7 ln 2 / DECLARED K7 GRAIN**
Exact Route-M information identity	**$I\_RM = 70 \ln 2 + \Delta\_T + I\_cl$ / EXACT**
K7 face bits reusable as four fresh closure costs	**EXACT NO-GO**
Tetrahedral closure Smith rank	**4 / SNF(1,1,1,1,0)**
Post-connection tetrahedral Bianchi cost	**ZERO AT THAT GRAIN**
Route-M closure as upstream admission cost	**STRUCTURALLY POSSIBLE / PHYSICAL IDENTIFICATION OPEN**
Finite-distinguishability phase quotient	**REQUIRED BY EXISTING VERSF OPERATIONAL ARCHITECTURE**
Physical operational phase carrier Φ_op	**NOT RETURNED**
Physical operational phase measure μ_op	**NOT RETURNED**
Physical P_cl^op	**NOT RETURNED**
Uniform finite quotient diagnostic $P\_cl = M^{-4}$	**EXACT CONDITIONAL ON UNIFORM SURJECTIVE FINITE-ABELIAN MODEL**
M = 128 from Route-M physical source	**NOT DERIVED**
Equal physical information weight N_info = 14	**NOT DERIVED**
Spatial doubling microcell count	**8**
Route-M N_micro = 16	**CONDITIONAL ON z = 1 UV/HISTORY BLOCKING**
Direct two-regulator Route-M p_n	**NOT RETURNED**
b = 14/16 as arithmetic under adopted Route-M scheme	**EXACT CONDITIONAL PRESCRIPTION**
b = 7/8 as physical beta coefficient	**NOT DERIVED**

OVERALL VERDICT: THE C/W/Y RADIAL TANGENT, 49↔50 PROJECTIVE CARRIER RELATION, RELATIVE-ENDPOINT CURRENT LAW, E_2×INTERNAL FACTORISATION, FINITE-OCCUPATION NATIVE PFDMI SCORE, FOLD/FACT GRAIN TYPING AND THE STOPPED-COVER MARTINGALE THEOREM REMAIN

CLOSED AT THEIR DECLARED GRADES, THE OCCUPATION CLAUSE BEING AN EXECUTED NUMERICAL D36 IDENTITY. THE K7 ELECTROMAGNETIC SOURCE GATE IS NOW TYPED TO PRIMITIVE FOLD-BOUNDARY ADMISSIBILITY. ITS IDENTIFICATION WITH THE NATIVE PFDMI ONE-FOLD ACCEPTED-CURRENT EVENT REMAINS OPEN; A COMPLETED COVER IS A LATER HISTORY/READOUT OBJECT AND IS NOT THE PRIMITIVE SOURCE OF p_EM. THE ROUTE-M 10+4 = 14 CENSUS IS A REFINEMENT-STABLE STRUCTURAL RESULT, AND ITS 6+4+4 = 6⊕8 READOUT DECOMPOSITION IS EXACT. HOWEVER, SOURCE-NATIVE CONNECTION CURVATURE HAS RANK SIX AND SATISFIES im d_1 = ker d_2. THE COMPLEMENTARY FOUR DIRECT-FACE DIRECTIONS ARE INTEGRABILITY-VIOLATION DIRECTIONS, SO THE PREVIOUS 6⊕8 PHYSICAL-HESSIAN BETA INTERPRETATION IS WITHDRAWN. THE PHYSICAL ROUTE-M WEIGHTING PROBLEM IS INSTEAD AN ADMISSION-INFORMATION PROBLEM. THE EXACT IDENTITY I_RM = 70 ln 2 + Δ_T + I_cl HOLDS, THE ORIGINAL K7 FACE BITS CANNOT BE REUSED AS FOUR FRESH SEVEN-BIT CLOSURE COSTS, AND, IF THE TETRAHEDRAL FUNCTIONALS ARE SOURCE-IDENTIFIED AS A PHYSICAL PRE-CONNECTION ADMISSION LAYER, THEIR PHYSICAL CLOSURE MUST BE EVALUATED ON THE FINITE-DISTINGUISHABILITY OPERATIONAL PHASE QUOTIENT. THE REMAINING ROUTE-M PROGRAMME IS THEREFORE THE ADMISSION-LAYER IDENTIFICATION FOLLOWED BY (Φ_op, μ_op, B_op). UNTIL THAT IDENTIFICATION PASSES AND ITS SOURCE-DERIVED MEASURE RETURNS P_cl^op, THE PHYSICAL INFORMATION NUMERATOR FOURTEEN AND b_RM = 7/8 REMAIN UNDERIVED. THE DIRECT TWO-REGULATOR COHERENCE RUNNING REMAINS THE FINAL INDEPENDENT BETA TEST. THE COMMON-K7 / COMMON-ξ PROGRAMME REMAINS A SEPARATE UPSTREAM PROVENANCE QUESTION. THE FULL SIX-DEFECT SCHUR ACTIVATION, PHYSICAL ENDPOINT/CURRENT LAW, NATIVE PHYSICAL M_JJ AND FINAL ACTION-TO-EVENT DESCENT ALSO REMAIN OPEN. NO PHYSICAL κ_E_2 OR SUCCESSOR CKM MATRIX IS ISSUED.

30. Conclusion

The charged-flavour normalisation problem has now passed through another important change of grain.

The early part of the paper established that the missing C/W/Y directions are not arbitrary fixed vectors. The exact support projectors generate the correct scalar-factor radial tangent field once a representation-valued current exists. Projectivisation removes common total-current scaling but preserves relative factor geometry, and the resulting visible source geometry is the covariance-centred C/W/Y support Gram.

The primitive-birth chain then resolved the internal carrier problem. The full endpoint carrier is 50-dimensional, the selected neutral GSJB ray leaves a 49-complex-dimensional projective innovation tangent, and the unresolved Haar/Fubini--Study law has full C/W/Y capacity almost surely. MASD turns this into a relative-current statement: a common endpoint innovation produces no current, while a nondegenerate isotropic relative innovation produces a Haar current direction.

The spatial problem separates cleanly from the internal problem. The E_2 coefficient cancels from the normalized background current ray but remains in the radial score, giving an exact E_2×C/W/Y tensor-product structure. Under the source-history weights the E_2 doublet is isotropic.

The native PFDMI execution then identifies the actual activation boundary. The pure neutral source is dark to every nontrivial current channel, so current-ray capacity alone does not produce native Fisher information. Finite active-source occupation activates a full-rank native factor score, and the birth occupation can be retyped as an actual one-Fold accepted-current probability through

```
h=sβ.
```

Neither the MBCI raw-current intensity nor the MASD constitutive-defect norm supplies that primitive hazard.

CRTF-EX2R fixes the ontological typing of the grain question. The foundational unit is one Fold: one primitive committed distinction and one structural Fact/record. K=7 supplies the minimum closure/admissibility geometry on which that Fold can be stably realised.

The seven-Fold, fourteen-incidence Hamiltonian cover therefore does not create one Fact. It is a higher-order history composed of already realised Fold/Facts. The exact stochastic first-cover value

```
𝔼[N_cover] = 21.277682950916294
```

remains unchanged, as does the stopped-score result

```
M_cover = 21.277682950916294 M_Fold^(stat),
```

whose martingale clause is exact and whose scalar multiplier is an executed D36 numerical identity pending the Theorem AH′ certificate.

They quantify accumulated history information, not the elementary cost or information content of one Fact.

CRTF-EX2V resolves the primitive provenance part of this question. The K7 electromagnetic admissibility structure belongs to the primitive Fold boundary and contains no completed-cover stopping variable. The completed D36 cover is therefore not the primitive source carrier of p_EM.

What remains unresolved is narrower. The Fold-boundary electromagnetic effect has not yet been shown to be the same marked physical event as the native PFDMI one-Fold accepted-current event,

p_EM =? h_Fold^(PFDMI).

Nor has it been established whether a later completed-history readout reapplies the primitive electromagnetic gate to cover opportunities. Those are same-mark and later-readout questions, respectively; they no longer constitute an ambiguity about the source grain itself.

This typing simplifies the primitive flavour-normalisation logic. The elementary physical current score is first a one-Fold/one-Fact object. Completed-cover Fisher information is a derived downstream accumulation and is used only if the source-selected observable operates at that grain.

The attempt to use Route M to provide the remaining absolute ruler then exposes an important distinction. PFDMI and Route M both contain a K=7 primitive motif, but their fourteen-channel descendants are not the same object. PFDMI's fourteen are the two orientations of seven closure constraints,

$7^{+}+7^{-}$,

and their attaching image has rank thirteen because total arrival and departure incidence must balance. Route M's fourteen are ten triangular holonomy channels plus four independent tetrahedral closure channels,

$10_\triangle+4_{(cl)}$,

with the fifth tetrahedral closure removed by the discrete Bianchi relation.

The direct 14↔14 same-carrier identification therefore fails. The symmetry typing gives the same conclusion: PFDMI's committed wheel has D_6 symmetry on six rim roles, whereas Route M's seven coherence conditions are semantically partitioned as (3+1+2+1). The matching of the number fourteen is real but occurs in two different descendants.

The common structure that survives lies upstream:

$\Omega_7 = \{0,1\}^7$.

Both programmes can therefore share a seven-bit primitive closure/satisfaction capacity, including the recurring (2^(-7)) counting factor, while generating different fourteen-channel structures for different physical jobs. The record-clock branch may be (2K) reversible orientations, while the Route-M branch may be (10+4) simplicial RG channels.

That is now the correct common-source question.

The Stage-0A endpoint problem has also changed character. The source no longer faces an arbitrary search over possible 49-dimensional joint kernels. Once the existing VERSF relational boundary requirements are imposed, the two-endpoint quadratic compatibility law is forced, within the declared form class, to

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

The remaining freedom is therefore not an internal matter direction but one physical attachment question: does the Gate-2 orientation primitive actually act on the matter innovation tangent? If it does, oriented gluing selects the sum-square branch and hard completion gives

$$z_t = -U_e z_s, \qquad \gamma_e = -1,$$

while preserving the unresolved Fubini-Study current direction and full C/W/Y capacity. If it does not, the handshake route is retired rather than repaired by choosing another 49-dimensional kernel. A soft probabilistic handshake remains separately possible, but it requires a source-derived identification of the compatibility functional with extension information or a raw marked transfer law before any Gibbs weighting can be used.

The Route-M branch has now moved beyond the question of why the integer fourteen appears.

The four-simplex construction gives ten local triangular coherence tests and four independent tetrahedral closure tests. Arbitrary finite refinement increases the raw microscopic census but descends back to the same coarse 10+4 = 14 constraint-family count. The fourteen is therefore structurally robust at the declared Route-M grain.

The canonical incidence calculation remains equally strong. The ten direct face directions split into a six-dimensional closure-blind kernel and a four-dimensional closure-sensitive complement; the latter is canonically paired with the four independent closure readouts. Hence the labelled Route-M carrier has the exact structural decomposition

$14 = 6 + 4 + 4 = 6 + 8.$

The independent BCB closure programme also returns a six-plus-eight architecture. This remains a striking structural compatibility.

The later source-native carrier audit, however, changes its physical interpretation. MASD does not take the ten face values as ten independent microscopic curvature coordinates. Its curvature is generated from underlying edge transports. On a 4-simplex the edge-to-face coboundary has rank six, the tetrahedral closure map has rank four, and

$\mathrm{im}\ d_1 = \ker d_2.$

Thus every infinitesimal curvature generated by one underlying connection lies in the six-dimensional Bianchi-compatible sector. The complementary four direct-face directions measure failure of integrability. They are legitimate off-shell constraint/readout directions, but they are not additional physical MASD curvature tangents.

The previous proposal to obtain a physical beta numerator by assigning a reduced-Hessian ratio to the Route-M 6⊕8 decomposition is therefore retired. The six-plus-eight remains a readout architecture rather than a fourteen-mode physical Hessian carrier.

This does not remove the possible physical role of the four tetrahedral tests. It changes the type of the problem. If Route M describes a direct-face candidate layer before connection compatibility is imposed, the four closures may carry a genuine admission cost even though every final connection-compatible state later satisfies Bianchi identically. VERSF already contains the general architecture in which commitment/admission can remove possibilities before later transport and connection structure is constructed. What is not yet returned is the theorem identifying the four Route-M tetrahedral functionals with that primitive admission step.

The correct quantitative object is therefore information rather than Hessian dimension. A single K7 coherent triangle carries the declared neutral admission cost

$$I_{triangle} = 7 \ln 2.$$

For all ten triangles define

$$\Delta_T = -\ln[\ P(T) \ /\ 2^{-70}\ ].$$

If G denotes the four independent tetrahedral admission conditions, then exactly

$$I_{RM} = 70 \ln 2 + \Delta_T - \ln P(G|T).$$

This expression makes clear why the integer fourteen is not yet an information theorem.

The original K7 Boolean variables cannot provide the missing four units a second time. Conditional on all ten triangles being coherent, the seventy K7 pass/fail variables are already fixed and have zero remaining conditional entropy. Any additional tetrahedral information must therefore reside in the actual holonomy/gluing data that survive inside the coherent class.

A raw continuous U(1) treatment is also not the final VERSF probability grain. Finite distinguishability supplies an operational quotient of the phase carrier. The correct physical closure statement is consequently

$$r_\Phi(C_i) = r_\Phi(1),$$

not the requirement that two raw continuous phase representatives be mathematically identical.

The decisive remaining Route-M object is now

$$(\Phi_{op},\ \mu_{op},\ B_{op}):$$

the operational phase carrier, its source-derived physical measure and the induced tetrahedral closure map.

Once these are returned, the physical closure probability P_{cl}^{op} can be calculated directly, followed by $I_{cl}^{op} = -\ln P_{cl}^{op}$ and

$$N_{info}^{(phys)} = 10 + [\Delta_T + I_{cl}^{op}]/(7 \ln 2).$$

A uniform finite Abelian operational residual alphabet would provide the diagnostic law $P_{cl} = M^{-4}$; in that restricted model, negligible triangle correlations and $M = 128$ would reproduce four additional K7-sized information units. Neither uniformity nor $M = 128$ is presently derived, and neither may be inserted because it recovers fourteen.

This paper therefore closes the Route-M audit at a cleaner boundary than the earlier Hessian proposal. The integer fourteen is a real and refinement-stable geometric constraint/readout result. It is not fourteen independent curvature modes, and it is not yet fourteen equal physical information units. The remaining Route-M problem is first to establish whether the tetrahedral constraints constitute a physical pre-connection admission layer and, if they do, to perform the source-derived operational-measure calculation. It is in either case no longer a mode-counting argument.

Only after that measure is returned should the direct two-regulator coherence-running calculation be retried:

$$b_{(n\to n+1)}^{(phys)} = (1/2)\ [p_{(n+1)}^{-1} - p_n^{-1}] / \ln(\mu_{(n+1)}/\mu_n).$$

The denominator-sixteen prescription remains separately conditional on the Route-M $z = 1$ UV/history blocking choice.

In parallel, the action-side flavour programme remains unchanged in one essential respect: the physical finite-E_2 activation cost still requires the complete six-defect Schur residue

$$Z_{birth} = A - CB^+C^\dagger,$$

and a source-native marked/path/Kraus descent is still required before an action cost can become an event hazard.

No physical κ_{E_2} or successor CKM matrix is issued here. The advance is instead that several previously conflated layers are now cleanly separated: structural constraints, connection-generated curvature, pre-connection admission information, operationally resolved phase, and physical RG running are no longer being treated as interchangeable meanings of the same integer fourteen.