# The Standard-Model Numerical Confrontation and Provenance Theorem in VERSF

*A full-corpus source-locked reassessment of Higgs, electromagnetic, charged-lepton, gauge and quark-flavour numbers*

**Author:** Keith Taylor

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**Empirical benchmark ledger:** initially frozen 17 August 2026; corrected and re-frozen 20 August 2026. The correction affects only the unscored α_s benchmark.

SCIENTIFIC STATUS. MULTIPLE NONTRIVIAL NUMERICAL CONTACTS / UPDATED PROVENANCE / PHYSICAL STANDARD-MODEL CERTIFICATE NOT ISSUED. The Higgs ratio 32/63 remains the cleanest scale-free numerical contact; the common carrier, vacuum, fact-direction propagation and candidate spatial architectures are structurally identified at Stage 3S, while physical spatial two-derivative propagation remains conditional on the primitive reversible-transport provenance test, and the paper closes the Higgs calculation at that boundary (Section 4). The electromagnetic value 7/960 remains a strengthened structural candidate but not yet continuum QED (Section 5). The physical strong coupling remains open, with no cross-scale residual assigned, while the faithful global topology and $\bar{\theta} = 0$ are structurally closed (Section 7). The charged-flavour baseline is a genuine target-blind conditional action-level return and fails empirically; RRHF remains the controlling CKM matrix and the favourable curvature branch stays a quarantined diagnostic (Section 8). The neutral sector refuses a numerical certificate (Section 9). Stage grades for every sector are given in the front summary; the full audit ledgers are Sections 10, 13.1 and 13.2.

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NON-INSERTION RULE. Measured Standard-Model quantities may be used only after the relevant VERSF object has been fixed and sealed. A close residual cannot upgrade provenance. An inherited input cannot be counted again as a prediction. A failed returned quantity remains in the ledger. A favourable branch that is not source-selected is not admitted.

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**Central question.** Not merely: how close are the numbers? Rather: which close numbers were actually earned by VERSF before comparison, which are conditional, which are inherited, and which fail?

## General-reader summary

The Standard Model of particle physics contains a couple of dozen measured numbers: the strengths of forces, the masses of particles, the angles that govern how quarks mix. This programme claims that many of those numbers should be calculable from first principles. This paper is the audit of that claim, and its guiding rule is unusual: it refuses to rank results by how close they land. It ranks them by how honestly they were obtained.

The distinction matters because closeness is cheap and provenance is expensive. A formula assembled after the answer is known can land arbitrarily close and prove nothing. So every number here is tagged with its history: was the formula frozen before the measured value was consulted? Was anything inherited from experiment and quietly counted twice? Did the same calculation also produce numbers that miss badly, and were those kept on the books?

**Why these numerical comparisons matter**

The significance of this exercise is not simply that VERSF can produce numbers close to familiar measurements. The deeper question is what kind of numbers they are.

The Standard Model is extraordinarily successful at predicting physical phenomena once its parameters have been specified. But many of those parameters are not themselves determined by the Standard Model. Their values have to be learned from experiment and then supplied to the theory. These include, in different forms, the strengths of interactions, the Higgs-sector parameters, fermion masses or Yukawa couplings, and the parameters describing quark mixing and CP violation. The Standard Model tells us with extraordinary precision what follows from those numbers; it does not, by itself, explain why nature chose those particular numbers.

VERSF is attempting a more demanding task. It asks whether at least some of those empirical inputs can instead emerge from a smaller set of underlying structural principles: finite distinguishability, closure, commitment, representation structure, transport, admissibility and the geometry of the resulting physical carriers.

That changes how the numerical results in this paper should be read. For example, VERSF does not begin by inserting the observed Higgs ratio and then reproduce it; its structural calculation gives the exact whole-number ratio 32/63, which is about 0.05 percent below the measured-inferred value. Its closure and interface structure gives the electromagnetic candidate 7/960, about 0.08 percent above the measured low-energy value. Its charged-lepton localisation structure gives a ratio of the muon mass to the electron mass of about 207.13, about 0.17 percent above the observed ratio. These results arise from different parts of the VERSF construction rather than from one common numerical fitting formula. Where a quantity has units, an absolute scale must first be fixed, either by a declared dimensional anchor or, in a complete first-principles theory, by deriving that scale from the substrate itself; a predicted set of mass ratios needs one mass stated in grams before the others follow, and where such an anchor is used the audit counts it separately from structural inputs that genuinely spend predictive content.

The pattern is not uniformly successful, which is scientifically important. VERSF also produces quantities that miss by several percent and, in the blind charged-flavour calculation, by thirty or forty percent. Those failures remain in the paper. Other sectors, particularly the strong coupling, are not yet numerically closed and should not be converted into apparent successes or failures by comparing quantities at unmatched scales or in unmatched schemes. The resulting picture is therefore not one in which every calculation has been arranged to reproduce experiment. It is a picture in which some pieces of the emerging structure land remarkably close to empirical Standard-Model inputs while others remain incomplete or wrong.

The possibility being tested is therefore more specific than "VERSF fits some data": whether the numbers that the Standard Model must currently take from experiment are, at least in part, calculable consequences of a finite underlying structure.

This paper does not claim that question has already been answered affirmatively. Several numerical returns remain conditional, some require physical carrier or readout bridges, and the CKM sector in particular contains both an empirically poor controlling return and more successful but presently unadmitted branch calculations. The purpose of the provenance audit is precisely to distinguish those levels. But the repeated appearance of naturally close values across several otherwise different sectors is sufficient to make the question a serious one, and it is the central motivation for the numerical confrontation that follows.

With that distinction in mind, the question is not whether every VERSF number is close. It is whether structurally generated values repeatedly fall into the neighbourhood of empirical Standard-Model inputs, and whether they continue to do so as their remaining conditions are independently closed. In every scoreboard row below, "low" or "high" means relative to the currently measured value of that same quantity (or, where the comparison quantity is built from measurements, the measured-inferred value), taken from the frozen benchmark list used throughout this paper. The present scoreboard, with each result rounded and stated in plain terms, is deliberately mixed:

| **Quantity** | **How close to the measured value** | **Plain reading** |
|---|---|---|
| Higgs ratio | 0.05% low | Stage 2 numerical return; associated Higgs carrier/vacuum/kinetic mechanism at Stage 3S |
| Strength of electromagnetism | 0.08% high | Structurally sharp; continuum-QED bridge still open |
| Electron-to-muon mass ladder | 0.17% high | Close conditional in-domain postdiction |
| Muon-to-tau mass step | 2.6% high | Exact activation still not fully derived |
| Weak mixing angle | 0.3% high | Close candidate readback; physical gauge boundary and common scheme remain open |
| Strong coupling | physical value not yet scored | The old $1/(4\pi)$ branch remains conditional. A new source-side history-weighted wheel calculation gives a colour precursor $K_3$ = 1.701045, but this is not yet the physical $Z_3$ or α_s |
| Strong CP phase | comes out exactly zero; measurement bounds this phase to be extraordinarily close to zero | Strong structural result in the retained positive completion; full continuum completion remains open |

**Why the strong coupling is not yet scored.** The earlier direct comparison of $1/(4\pi) \approx 0.0796$ with $\alpha\_s(M\_Z^2)$ remains withdrawn because it compares different scales and schemes. But the strong sector is no longer numerically empty. MASD-1 has executed the colour-adjoint master-action response on the canonical K = 7 wheel, and HMGBC-1 has independently calculated the history-derived operational metric on that wheel. Under an explicitly declared SMNC cross-paper identification of the corresponding canonical-wheel defect weights, applying the HMGBC metric to the MASD response gives

$K_3$^hist-wheel = 3744/2201 = 1.701045.

This is an audit-derived precursor constructed entirely from source-side ingredients; it is not itself a pre-existing source-paper return, and it is not yet $Z_3$. MASD requires the wheel factor to be combined with the internally generated colour projection $\pi_3$, or replaced by the direct nonfactorising colour pullback if separability fails. The full HMGBC-to-HFB defect lift has not yet supplied that object. The correct statement is therefore stronger than "VERSF has no strong-force number," but weaker than "VERSF predicts α_s": VERSF now has a nontrivial history-weighted microscopic colour precursor, while the physical strong coupling remains open.

**The strong CP result in plain terms.** One of the Standard Model's oldest puzzles is that a particular dial in the strong force, which could in principle sit anywhere, is measured to be extraordinarily close to zero, and nothing in the Standard Model explains why. In the completion audited here that dial is not tuned to zero: the retained positive completion has no such dial to turn, so the phase comes out exactly zero by structure. No measurement of the phase and no experimental bound was used anywhere in that derivation. The result is still conditional, because the full continuum completion of the strong sector remains open, but it is the kind of result this audit values most: a famous empirical fact emerging as a structural consequence rather than an adjusted input.

The quark-mixing (CKM) sector now has to be described in three layers rather than two. First, there is the RRHF calculation, which is the only controlling returned CKM matrix: its execution core is sealed from the held-out CKM targets, its leading mixing scales enter as calibrated inputs, and it is tested, and fails, on the entries the calibration does not fix. Second, there is a mathematically much stronger axle construction: the lowest-order quadratic form and its threefold geometry are derived rather than guessed. Third, there is a favourable execution of that axle which gives a much better CKM triangle, but the physical action has not yet selected that phase or even the physical visible branch. The later discovery of an exact closed family holonomy carrying the conjugate pair of 150 and 210 degree phases materially strengthens the phase provenance, but a same-action history theorem is still required before either orientation can be called the physical axle phase.

| **Quark-mixing quantity** | **RRHF controlling return** | **150° axle diagnostic** | **Plain reading** |
|---|---|---|---|
| Largest mixing entry (V_us) | 0.6% low | about 0.5% low | Calibration input: the calculation effectively starts near this value, so closeness here is not a test |
| Second mixing entry (V_cb) | 0.15% low | about 0.5% low | Calibration input, as above; the machinery is tested on the rows below |
| Smallest mixing entry (V_ub) | 7.9% high | 8.6% low | Genuine tension in opposite directions |

| Quark-mixing quantity | RRHF controlling return | 150° axle diagnostic | Plain reading |
|---|---|---|---|
| Mixing entry V_td | 31.5% low | about 1% high | Large blind failure; favourable diagnostic repair |
| CKM triangle angle alpha | not separately returned | about 0.5% high | Good if the 150° diagnostic branch is used |
| CKM triangle angle beta | not separately returned | about 0.5% low | Good if the 150° diagnostic branch is used |
| CKM triangle angle gamma | not separately returned | about 10% high | Largest residual of the favourable diagnostic branch |
| Size of matter-antimatter asymmetry (J) | 41% low | about 5% low | Strong improvement, but physical phase remains unreturned |

The crucial point is this: the favourable curvature-corrected CKM triangle and asymmetry values are not presently the controlling VERSF prediction. They are the values obtained on the quarantined axle branch. The controlling returned CKM object remains RRHF.

The verdict is stated narrowly on purpose. The theory has produced several unusually close numbers by honest routes, a spread that runs from a twentieth of a percent at its best to forty percent at its worst, with the failures kept deliberately in view. What it has not yet produced is a single, fully licensed derivation of the Standard Model's numbers from first principles, and this paper says exactly which obligations stand between here and there.

## Current derivation stage at a glance

VERSF does not treat every Standard-Model-facing calculation as having the same evidential status. The programme uses the following closure scale:

| Stage | Meaning |
|---|---|
| 0. Architecture | The required object and calculation are defined, but no source-side numerical return yet exists. |
| 1. Structural precursor | A source-side structure, finite-cell object or precursor number has been returned, but the physical microscopic quantity is not yet fixed. |
| 2. Conditional numerical return | A definite numerical value follows from a frozen premise stack without use of the measured target, but one or more physical carrier, branch or normalisation conditions remain open. |
| 3. Physical microscopic return | One compatible source action returns the physical carrier, branch, normalisation and microscopic number. |
| 4. Observable closure | The Stage-3 microscopic return has been transported through the required RG, scheme, threshold and pole/observable calculation and can be compared directly with experiment. |
| 5. Unified conditional Standard-Model derivation | The major Standard-Model sectors are returned together from one compatible source-selected framework and branch without target rescue. |

A small number of calculations are labelled 3S, structural Stage 3. This means that the physical object and its microscopic mechanism have been identified, but one final physical normalisation or same-action boundary return is still missing. Stage 3S is therefore stronger than Stage 2 but is not counted as completed Stage 3.

## Present VERSF position

| Derivation / sector | Current stage | Why | Main remaining step |
|---|---|---|---|
| Higgs ratio m_H/v = 32/63 | 2 | Exact target-independent numerical consequence of the frozen K = 7, eight-direction and su(8) structural chain | Return the same ratio from the fully physically normalised multi-cell scalar action |
| Higgs common radial mode and propagation | 3S | Common carrier, vacuum and fact-direction propagation structurally identified; candidate spatial architectures identified but not selected, the flat neighbour-transport branch giving a nonzero $k^2$ projection while the relaxed constitutive sector begins at $k^4$ | Derive from the primitive history action whether the reversible B_U ρ stiffness is an independent physical term and return its coefficient, physical momentum/action normalisation and admitted regulator limit |
| Higgs observable pole mass | below 4 | Carrier, curvature and competing microscopic propagation | Complete the reversible-transport provenance gate and formal Stage 3 first, then perform the common electroweak/top/Goldstone/ghost/threshold/RG/pole calculation |

| Derivation / sector | Current stage | Why | Main remaining step |
|---|---|---|---|
| | | mechanisms are now sharply separated, but no unique physical Z_H has been returned | |
| Electromagnetic 7/960 | 2 | Exact conditional numerical return from the K = 7 pre-fact and transmission structure | Physical TPB/interface return and continuum-QED matching/running |
| Charged-lepton μ/e | 2 | Definite source-side exp(16/3) return; localisation origin of the exponent identified | Primitive localisation derivation and physical mass/pole bridge |
| Charged-lepton τ/μ | 2 | Definite exp(16/3)/12 return under the surviving-channel premise | Derive the physical 1/12 activation |
| Weak angle / HCMR gauge response | 1–2 | Stable finite-regulator candidate numerical response exists | Physical score/readout, branch, completion residue, matching scale and common scheme |
| Physical strong coupling $Z_3$, α_s | 1–2 | Response architecture, conditional unit branch and nontrivial history-weighted finite-cell | Full history-selected colour lift, physical internal projection/nonfactorising response and HFB boundary |

| Derivation / sector | Current stage | Why | Main remaining step |
| --- | --- | --- | --- |
| | | precursor exist | |
| Strong CP phase θ̄ | 2–3 | Retained positive global completion returns θ̄ = 0 without using the experimental bound | Full chiral determinant line, continuum global measure and observable EDM bridge |
| RRHF charged Yukawa / CKM matrix | 2 | Genuine blind conditional action-level matrix has been returned | Primitive source closure and any physically derived axle reintegration; current returned matrix is empirically poor |
| Lowest-order $C_3$ axle geometry | 2 | Axle shape and threefold democracy are source-derived rather than fitted | Same-action physical coefficient, installation, retention, readout and phase |
| Reduced-family 150°/210° holonomy pair | 2 | Exact target-independent closed holonomy exists | Prove that the physical charged-completion comparison loop inherits it |
| Commitment-survival √(5/6) | 1 | Exact coefficient-free result on the minimal private-rim selector | Derive that selector from the common action and identify its carrier with CKM axle retention |
| Physical axle-corrected CKM matrix | 1 / diagnostic | Numerical branch calculations exist | Physical phase, coefficient, retention and readout are not yet selected |
| Neutrino masses / PMNS | 0–1 | Architecture and execution contract exist | Direct Y_ν, M_R, M_L, physical branch/readout and scale |

| Derivation / sector | Current stage | Why | Main remaining step |
|---|---|---|---|
| Unified HFB Standard-Model boundary | 1 | Required common microscopic boundary is defined | One source-selected execution must return the complete same-branch gauge, Higgs, Yukawa, neutral and strong-phase set |
| Full observable Standard Model | below 4 overall | Several sectors have reached Stage 2 and the Higgs mechanism has reached 3S | Complete physical microscopic boundaries and then one common RG/scheme/threshold/pole pipeline |

**Higgs position in one sentence**

The numerical 32/63 Higgs ratio remains Stage 2, while the physical Higgs carrier, stable broken vacuum, restoring curvature and existence of microscopic radial propagation remain Stage 3S. The latest calculations separate local radial susceptibility from genuine propagation: the TPB-gated completion instrument returns a nonzero local Higgs Fisher response but no spatial $p^2$ term, whereas an independently executable flat covariant neighbour-transport branch projects onto the Higgs carrier as $H_{(H,T)} = 2 w_T B^\dagger B$ and therefore gives $Z_{(H,T)}^{graph} = 2 w_T$ in graph momentum units. This does not complete Stage 3, because the later current/continuity master action, after physical current relaxation, begins spatially at $p^4$ rather than $p^2$. The remaining Stage-3 gate is consequently no longer a generic search for a metric or propagator: the primitive history action must decide whether the reversible $B_U$ ρ stiffness is an independent physical term and, if so, return its coefficient, physical momentum/action normalisation and admitted regulator limit. No canonical unity, packing value, surrogate determinant residue, generation eigenvalue, 1/16 or 1/32 conductance may be promoted in advance.

## Abstract

We formulate a source-locked Standard-Model numerical confrontation for the current VERSF corpus. The audit applies the rule source construction → freeze → numerical return → comparison, together with the August-2026 supersession rule that the latest result controls only the same typed object. We classify every compared quantity by provenance and explicitly retain negative results. The principal scale-free structural return is $m_H/v = 32/63$, with a raw difference −0.0528% from the value inferred from the 2026 Higgs mass and the Fermi scale (a 0.60σ central-value offset against the Higgs-mass uncertainty alone). The associated tree-level quartic comparator differs by −0.1055% but is not independent of the same measured inputs. The K = 7 electromagnetic structural candidate gives $\alpha_{EM}^{-1} = 960/7$, +0.0780% from the current low-energy value, while its physical TPB and continuum-QED bridges remain open. The charged-lepton ladder returns exp(16/3), +0.1736% from $m_\mu/m_e$, but this remains a conditional in-domain postdiction; the tau step exp(16/3)/12 is +2.6336% and the exact discrete tau activation is not independently closed. The four-regulator HCMR candidate gives a weak-angle readback within +0.3195%, but its physical gauge certificate remains refused because the physical score/readout, completion residue, matching scale and common scheme are not jointly selected. A direct comparison of 1/(4π) with $\alpha_s(M_Z^2)$ remains inadmissible as

a scale-and-scheme typing error. NQTC identifies $Z_3 = 1$ instead as a conditional Unit Class-Action boundary consequence: in its class-reduced form the branch requires $C_{hol} = 1$ and $n_C^{red} = 1$, giving $g_s = 1$ and $\alpha_s^{VBF}(5.80\ \text{TeV}) = 1/(4\pi)$. These unit returns remain microscopic conditions rather than physically admitted outputs. The strong-coupling programme has, however, advanced beyond that branch ansatz. MASD-1 constructs a common master action with an intrinsic SU(3)-adjoint record-link intertwiner and derives the exact canonical-wheel response $k_{red}(\lambda) = a\lambda + bc\lambda/(b\lambda + c)$, whose unit-weight factor projection gives $(K_3, K_2, K_q) = (24/5, 35/6, 3/2)$. HMGBC-1 independently derives the canonical history Fisher metric. Under the explicitly declared isolated C-R-B wheel identification, inserting those history-derived weights into the MASD response yields the new audit-level precursor $K_3^{hist\text{-}wheel} = 3744/2201 = 1.70104498$. This is not promoted to the physical $Z_3$, because the full typed defect lift, internal colour projection $\pi_3$, nonfactorising physical reduction and HFB boundary certificate remain open. A later deterministic blind Stage-A integrated attempt likewise refuses a physical reduced response after failure of its terminal-holonomy gate. Thus numerical QCD remains physically open, but the colour-response problem has progressed from an unspecified scalar to an executable source-side response architecture with a nontrivial history-weighted finite-cell precursor. The strong-sector global programme has nevertheless advanced independently of that numerical coupling problem: the faithful gauge quotient $S(U(3)\times U(2))$ and correlated topological-charge lattice are closed on the frozen representation ledger, and the retained positive global completion forces the strong phase to $\bar{\theta} = 0$. This is a strong retained conditional result rather than a continuum physical certificate: the full chiral gauge measure, determinant-line completion and physical confinement strength remain open. In flavour, the RRHF matrix, a target-blind conditional action-level execution given its declared calibrated leading mixing inputs, remains the controlling returned baseline and has a five-row diagnostic $\chi^2 \approx 290.5$ on its declared comparison set. Later work derives the exact $C_3$-equivariant lowest-order quadratic axle with threefold image and a forward Hessian structure, while a full-su(8) symbolic theorem shows survival of the corresponding branch form at leading order under named premises. Subsequent physical-carrier audits, however, sharpen the boundary: the completion jet is component-preserving, its local branch-plane Gram matrix is exactly phase-isotropic, and no physical readout or axle phase is selected. Separately, the frozen role-odd family transport contains an exact gauge-invariant closed triangle holonomy with conjugate phases $\exp(+i\cdot 5\pi/6)$ and $\exp(-i\cdot 5\pi/6)$. Direct substitution into the printed matrix and loop conventions assigns 210° to the printed forward loop and 150° to its reverse, correcting the orientation labels while preserving the conjugate pair. No same-action theorem yet proves that the physical charged-completion comparison loop inherits either orientation. The familiar CKM confrontation, $\alpha \approx 84.5°$, $\beta \approx 22.5°$, $\gamma \approx 73.0°$, $|J| \approx 3.00\times10^{-5}$, is therefore retained as a quarantined diagnostic rather than promoted to the controlling CKM return. A post-freeze Higgs/fact-handoff sequence further sharpens the scalar result without using any new measured Standard-Model input. The executed fact law separates one scalar self-versus-nonself handoff coordinate from the conditional identity of the successor fact. In Fisher form this yields the canonically normalised radial coordinate $\chi = 2 \arcsin\sqrt{a}$ with exact radial/outcome orthogonality. The four primitive completion routes independently possess the same common-versus-contrast decomposition, with the equal-route direction defining the common Higgs/completion character. The faithful full-action calculation identifies the corresponding physical completion line as $c_H = (1/2)(1, 1, 1, 1)$ on $(\varphi_H, X_{H0}, X_{H1}, X_{H2})$. This line is exactly invisible to the six completion-strain defects but nonzero under the Higgs potential rows, so a frequency-dependent history operator built only from the six-defect image cannot supply the physical common-mode kinetic residue; this corrects the interpretation of an intermediate nonzero local-persistence score residue, which belongs to the compressed defect/history carrier rather than directly to the physical Higgs mode. The full 187-dimensional physical-tangent proposal kernel nevertheless acts on the defect-silent common mode. Its one-Fact Gaussian cost gives $\Delta S_{kin} = (g_H/(2a_t))\,(h_{(n+1)} - h_n)^2$, where $g_H$ =

q_H† G_op q_H, and the resulting inverse fact propagator is $K_H^{fact}(\omega) = K_H + [4g_H/a_t^2] \sin^2(\omega/2)$, which leaves the homogeneous configuration $h \equiv 0$ exactly stationary and satisfies $K_H^{fact}(0) = K_H$. On the current operational-orthonormal canonical branch q_H has unit norm and g_H = 1, while the faithful potential gives $K_H^{can} = 1/2$, so the executed canonical kernel is $K_H^{can}(\omega) = 1/2 + 4a_t^{-2} \sin^2(\omega/2)$, with small-frequency form $1/2 + p_0^2 + O(p_0^4)$ in the fact direction. The fact-direction kinetic mechanism is therefore no longer missing; what remains open is both its physical normalisation, since G_op = I is an operational whitening convention that cannot be identified with $Z_H^{physical}$, and, more fundamentally, whether the physical spatial two-derivative mechanism exists as an independent term at all. A physical Stage-3 certificate still requires the actual multi-cell history metric and common fact-time normalisation, while Stage 4 additionally requires the complete relaxed scalar remainder, absolute scale and electroweak pole/threshold transport.

We conclude that VERSF exhibits nontrivial numerical contact and increasingly auditable provenance, but not yet an unconditional first-principles Standard Model derivation.

A subsequent cross-programme commitment-survival execution materially narrows one of the remaining axle-retention debts without yet closing it physically. The current primitive phase-cut census finds zero hard cut on the selected HX1 continuous phase direction in every explicitly returned FCHI, PFDMI and MASD support/completion mechanism; the missing object remains the primitive full-carrier commitment gate. Independently, the topological commitment programme supplies an exact rank-one hard-support update and a coefficient-free minimal covariant implementation in which one newly trapped triangular face exports its private rim-edge direction. Acting on the normalised uniform six-rim HX1 cycle mode, that selector gives the parameter-free survival amplitude $s_{old} = \sqrt{5/6} = 0.9128709292$, with principal commitment angle $\theta_{com} = \arccos \sqrt{5/6} = 24.09484255°$, unit-branch lost-relaxation excess $\Delta k = (1 - s_{old}^2)/2 = 1/12$, and conditional immediate-past response $\Delta q = (\pi/9)\sqrt{5/6} = 0.3186520672$. This is an exact result on the declared minimal private-rim selector, not yet a physical VERSF retention theorem. The current common action does not yet generate the required trap-controlled projector, and no theorem identifies the HX1 old-phase carrier with the physical charged-completion axle-retention carrier. Accordingly the result is not substituted into the CKM calculation and does not upgrade the quarantined curvature matrix. Its significance is narrower but substantial: a formerly arbitrary survival parameter now has a source-structured, coefficient-free candidate value, and the remaining debt is reduced to same-action selector provenance and carrier identification.

## 1. Scope, supersession and the object being tested

The purpose of this audit is not to maximise the number of attractive residuals. It is to state, for each measured-facing number, what VERSF actually returned, what was imported, what was reconstructed after data were known, what later source work strengthened, and what remains physically unlicensed.

The programme-level precedence rule is type-sensitive. A later theorem supersedes an earlier grade only when it evaluates the same typed object on the same carrier/readout. A conditional $C_3$ curvature theorem therefore does not erase the empirical failure of the target-blind RRHF baseline: the two are distinct objects. Likewise a structural electromagnetic admission probability does not become the measured QED coupling merely because its reciprocal is numerically close.

SMNC-3 ADMISSION STANDARD. A number enters the main evidential ledger only if its formula and branch are fixed independently of the benchmark being quoted. If a value is calibrated against, or inherited from, an earlier phenomenological alignment, it is labelled as such; calibration is legitimate, but a calibrated value is not scored as a derivation. If a later paper derives a structural antecedent but leaves a source premise open, it is labelled conditional. Historical absolute-scale values whose current physical scale bridge is superseded or open are quarantined rather than silently deleted.

## 2. Provenance vocabulary, anti-cherry-picking rules and falsifiers

| Grade | Meaning |
|---|---|
| EXACT | All operands of the typed statement are declared; no same-type object is missing. |
| EXACT ON FROZEN LEDGER | Exact once a named representation/carrier ledger is granted. |
| CONDITIONAL STRUCTURAL | A finite structural number follows from named framework premises; physical mapping may remain open. |
| CONDITIONAL ACTION-LEVEL | Returned by differentiation/execution of a frozen action or representation-resolved history functional under named inherited premises. |
| CONDITIONAL / SYMBOLIC FULL-EMBEDDING | A full carrier/embedding theorem closes at leading order under explicit source symmetries or background premises, with those premises still awaiting substrate-native derivation or numerical confirmation. |
| CANDIDATE / PHYSICAL TRANSPORT OPEN | A mathematically coherent readback exists, but branch, scale, normalisation, readout or scheme is unselected. |
| PHYSICALLY ADMITTED | Primitive action, readout, branch, scale, scheme and regulator requirements pass together. |
| QUARANTINED / HISTORICAL | Useful for chronology or diagnosis but not counted as present evidence. |
| CLOSED NEGATIVE / REFUSED | A proposed mechanism or physical certificate is explicitly rejected by the controlling calculation. |

The operating rules, each with its falsifier code so that violations can be cited precisely:

Rule A / F-SM3-1 (Source lock): The question, carrier, formula, coefficient set, sign and branch must be frozen before the measured comparator is accessed. Accessing the comparator first converts the row to diagnostic status.

Rule B / F-SM3-2 (No target rescue): A failed return may not be repaired by selecting a different branch, phase, scale or normalisation because that alternative looks closer to data.

Rule C / F-SM3-3 (Calibration is not derivation): Calibrating a framework against data is legitimate scientific practice; a calculation may consume data-calibrated inputs and be tested on what it returns beyond them. What this rule forbids is counting the calibration surface itself as predictive evidence, or describing a calibrated input as derived. If $|V_{us}|$ is effectively a calibrated Cabibbo input read back out, its agreement is not counted as new CKM evidence; the evidence, for or against, lives in the rows the calibration does not fix.

Three practices must be kept distinct under this rule. (i) Scale anchoring. A dimensionful unit must be supplied before any absolute quantity can be stated: if a theory derives the mass ratios $m_A : m_B : m_C$ from first principles, telling it that $m_A$ is so many micrograms is not a concession but a dimensional necessity, and the anchored values of $m_B$ and $m_C$ are then genuine tests. Every physical theory consumes such anchors; they are declared, and each costs exactly one datum. (ii) Structural calibration. Fixing a dimensionless quantity, such as a mixing scale, from data is legitimate method, but unlike a unit anchor it spends predictive content: each calibrated structural number is removed from the evidence count, and the framework is tested on what remains. (iii) Cheating. Undeclared calibration, branch or coefficient selection after the target is seen, or scoring the anchored or calibrated surface as prediction. The rules of this section forbid only (iii) and the mis-scoring of (i) and (ii); they do not disparage anchors or calibration themselves. This taxonomy is also why the audit ranks scale-free dimensionless returns such as 32/63, 7/960 and exp(16/3) highest: they are predictions that consume no anchor at all.

Rule D / F-SM3-4 (Raw proximity is not statistical agreement): Experimental uncertainties can be orders of magnitude smaller than a sub-percent residual. VERSF presently lacks a complete theory covariance, so a global chi-square is not licensed outside calculations that define their own comparison set.

Rule E / F-SM3-5 (Same-package discipline): A favourable row from a common candidate calculation may not be advertised while same-branch companion outputs are hidden. However, each companion quantity must first be transported to the same physical scale, scheme and observable definition as its benchmark. A companion output whose physical transport is still open is reported as unscored/open, not manufactured into either a success or a failure.

F-SM3-6 (Correlated double counting): Presenting $m_H/v$ and $\lambda_H$, or any two rows sharing measured inputs, as independent successes falsifies the evidence count. Correlated rows are one contact, not two.

F-SM3-7 (Sigma/percentage conflation): Quoting a raw percentage residual as a statistical agreement, or quoting a benchmark-σ distance as decisive in either direction while the theory covariance is absent, both violate the typing of Rule D. Benchmark-σ distances in this paper are orientation only.

F-SM3-8 (Quarantine leakage): Reintroducing any Appendix B historical absolute-scale row into the evidential ledger without first closing the source-native scale, scheme and pole bridges falsifies the audit.

F-SM3-9 (Benchmark drift): Silently updating any entry of the frozen 17 August 2026 benchmark ledger mid-audit falsifies every comparison made after the change. A benchmark update requires a new frozen ledger and a new comparison pass.

Rule F / F-SM3-10 (Condition disclosure): Every numerical VERSF return that depends on premises not themselves exact at the primitive level must state those premises adjacent to the numerical value. The paper shall distinguish (i) conditions consumed in obtaining the number, (ii) inherited inputs, and (iii) physical-admission obligations that remain open. A generic label such as “conditional” is insufficient if the load-bearing conditions are not named. If changing or removing one named condition can change the numerical output, that condition must be visible in the numerical ledger.

Corollary F.1 (Condition/arithmetic separation). A conditionally exact formula may still contain an exact numerical consequence. For example, 7/960 is exact once P14, the $2^7 = 128$ pre-fact alphabet and physical TPB saturation of the 14 transmitting directions are granted; the conditionality belongs to the premise stack, not to the arithmetic. Conversely, numerical closeness cannot strengthen the grade of any premise.

Rule G / F-SM3-11 (Scale-and-scheme compatibility): A raw percentage residual is admissible only when the VERSF quantity and empirical comparator represent the same typed observable at the same scale and in the same or explicitly bridged renormalisation scheme. In particular, $\alpha_s^{VBF}(5.80\text{ TeV})$ may not be directly subtracted from $\alpha_s(M_Z^2)$ in the conventional scheme. Running alone is insufficient when a finite scheme bridge remains open. Violating this rule creates a spurious numerical residual.

Corollary G.1 (Comparison correction is not target rescue). Correcting an invalid scale/scheme comparison is not target rescue under Rule B. The upstream branch value is unchanged; only an illegitimate empirical residual is removed.

Rule H / F-SM3-12 (Cross-paper composition): A numerical value constructed by combining outputs from different VERSF papers is graded as an audit-derived precursor unless the common carrier, coordinate identification, normalisation and source-to-source map are independently proved. The fact that every ingredient is source-side does not by itself make the composite quantity a source-paper return. Empirical data may not be used to choose among possible cross-paper identifications.

## 3. Frozen empirical benchmark ledger

The following values are comparison targets only. They are not used upstream in the VERSF formulae evaluated in this paper. Scheme-dependent quantities are labelled explicitly. The benchmark set was initially frozen at 17 August 2026 and corrected and re-frozen at 20 August 2026, the correction affecting only the unscored $\alpha_s$ comparator.

| Quantity | Frozen comparator | Benchmark source / typing |
|---|---|---|
| Higgs mass $m_H$ | 125.13 ± 0.11 GeV | PDG 2026 Higgs listing |
| Fermi constant $G_F$ | $1.1663787\times10^{-5}$ $\text{GeV}^{-2}$ | PDG/CODATA; used only to infer $v_F$ |
| Fermi scale $v_F$ | 246.2196508 GeV | $(\sqrt{2}\, G_F)^{-1/2}$, inferred |
| $m_H / v_F$ | 0.5082047659 | measured-inferred; correlated with $m_H$ and $G_F$ |
| tree-level $\lambda_H$ | 0.1291360421 | $m_H^2/(2 v_F^2)$, measured-inferred |
| $\alpha(0)^{-1}$ | 137.035999177 | NIST 2022 CODATA; latest available adjustment |
| $\sin^2\theta_W$ (MS-bar) | 0.23122 ± 0.00006 | PDG 2026 electroweak review |
| $\alpha_s(M_Z^2)$ | 0.1180 ± 0.0009 | PDG 2026 QCD review [E6] world average; reserved for post-RG, post-scheme-bridge comparison. Not a direct comparator for the VBF 5.80 TeV boundary branch. Benchmark correction: an earlier ledger entry carried 0.1177 ± 0.0009, which is not the 2026 world average; under F-SM3-9 this is recorded as an explicit benchmark correction rather than a silent change, and |

| Quantity | Frozen comparator | Benchmark source / typing |
|---|---|---|
| | | it affects no scored row because the strong coupling is unscored |
| $m_e$ | 0.51099895069 MeV | PDG/CODATA |
| $m_\mu$ | 105.6583755 MeV | PDG |
| $m_\tau$ | 1776.93 MeV | PDG |
| $\lvert V_{us} \rvert$ | 0.22431 ± 0.00085 | PDG 2026 direct/average |
| $\lvert V_{cb} \rvert$ | 0.0407 ± 0.0013 | PDG 2026 direct/average |
| $\lvert V_{ub} \rvert$ | 0.00389 ± 0.00016 | PDG 2026 direct/average |
| $\lvert V_{td} \rvert$ | 0.0086 ± 0.0002 | PDG 2026 |
| $\lvert V_{ts} \rvert$ | 0.0415 ± 0.0009 | PDG 2026 |
| $\alpha_{CKM}$ | 84.1° (+3.7/−3.0) | PDG 2026 |
| $\sin(2\beta)$ | 0.710 ± 0.011 | PDG 2026 |
| $\gamma_{CKM}$ | 66.4° (+2.7/−2.8) | PDG 2026 |
| $\lvert J_{CKM} \rvert$ | $3.16\times10^{-5}$ $(+0.13/-0.11)\times10^{-5}$ | PDG 2026 global-fit comparator; not an independent raw datum |

# 4. Higgs curvature: the 32/63 result

The current Higgs-ratio provenance should no longer use the old target-loaded sector-selection functional. The cleaner cumulative chain is: K = 7 closure cardinality → an eight-direction closure-normalised carrier → an electroweak completion interface of doublet form → a non-inserted radial stiffness mode → the finite SU(8) deformation calculation. The completion-interface paper derives the minimal electroweak-facing carrier $\Phi_{cl} \sim (1, 2, +1/2)$ from chiral left-right completion and charge preservation, while HR-1 supplies the invariant radial stiffness mode of that interface. Separately, the primitive fermion action now has an explicitly nonzero completion-to-left/right mixed third derivative, so completion-to-matter transmission is not absent. The remaining bridge is a same-action identification/normalisation problem, not the earlier practice of choosing a Higgs sector by its observed mass.

## 4.0 What the Higgs is in VERSF

In ordinary language, the Higgs is associated with the fact that elementary particles can possess a persistent rest mass. VERSF gives that statement a more specific microscopic interpretation.

One picture runs through this whole explanation, so it is worth setting out first. Imagine a vast surface held at tension, like the skin of a drum or the surface of a still lake. Two very different things can happen on such a surface. A disturbance can travel across it as a ripple, spreading and passing on. Or a pattern can hold itself together and keep its own identity while it drifts, the way a whirlpool does. In VERSF those two possibilities correspond to two different kinds of physics: matter is the second kind, a pattern that holds its shape from one moment to the next, while what we detect as a Higgs particle is the first kind, a travelling disturbance of the surface itself.

VERSF describes reality as progressing through a succession of irreversible facts. A new fact is not created in isolation after the previous one has completely disappeared; instead there is a handoff in which one fact becomes fixed while the next begins to form. This succession supplies the ordering that VERSF associates with physical time.

Matter is something additional. A particle is interpreted as a persistent closure structure, a pattern capable of retaining its identity as one fact succeeds another, in the way a whirlpool keeps its identity while the water moves through it. Two features of that image matter here: the whirlpool is made of the medium rather than being an object placed in it, and it persists because of how it is wound rather than because anything is holding it in place. In VERSF that winding is topological, closer to a knot in a rope than to a vortex that dies when the current stops. The Higgs is not what creates that particle identity, and it is not what creates time. Rather, the Higgs is associated with the common background degree of freedom that allows such a persistent matter structure to carry a stable elementary mass scale through that succession of facts. The distinction is important:

- fact succession provides the ordering we call time;
- persistent closure topology provides particle identity;
- the Higgs vacuum provides the common elementary mass scale;
- particle-specific completion/Yukawa structure determines how strongly a particular elementary particle responds to that scale.

In the present VERSF construction, the Higgs sector contains four closely related completion coordinates, $(\varphi_H, X_{H0}, X_{H1}, X_{H2})$, and the physical Higgs direction is the common motion

$$q_H = (1/2)(1, 1, 1, 1).$$

Returning to the surface picture, these four coordinates are like four points on the same stretched sheet. What the theory's completion defects measure is whether those points disagree with one another, for example $D_{H,i} = X_{Hi} - \varphi_H$: lift one point while the others stay put and the sheet is strained, so a mismatch appears. Lift all four together by the same amount and nothing is strained at all, because the sheet has simply moved as a whole. That common lift is the VERSF Higgs direction.

This explains an initially surprising result of the microscopic calculation: the physical Higgs mode is defect-silent. Moving in the Higgs direction creates no completion mismatch, $J_D q_H = 0$, because the whole compatible structure moves together. The Higgs should therefore not be thought of as a defect or failure of closure. It is motion along the compatible completion manifold itself, the surface shifting as one rather than tearing.

At the same time, this common direction is not physically empty. The VERSF potential responds to it. There is a preferred equilibrium value, the broken Higgs vacuum, and moving away from that equilibrium costs action or energy. In familiar mechanical language, the vacuum behaves like the equilibrium position of a stable system and the Higgs curvature measures how strongly the system resists being displaced from it.

Write the radial field as $r = v + h$, where $v$ is the stable background value and $h$ is a displacement away from it. The quantity $v$ should not be imagined as something that has to be recreated or copied afresh every time a new fact forms. It is the equilibrium background of the continuing substrate: if the system is exactly at the vacuum, $h = 0$, the fact-to-fact handoff leaves it there. A Higgs excitation corresponds instead to $h \neq 0$. The latest calculation shows that this displacement can propagate from one fact to the next: although the completion defects do not see the common motion, the full physical substrate does have to change when $h$ changes, and that change carries a kinetic cost. The current picture therefore contains both a restoring force toward the Higgs vacuum and fact-to-fact propagation of disturbances away from it. In this sense, what conventional particle language calls a Higgs excitation is interpreted in VERSF as a propagating radial disturbance of the common completion background.

**Why this is connected with mass**

At fixed particle-specific completion or Yukawa structure, the elementary mass matrix has the familiar form $M_f = (v/\sqrt{2})\, Y_f$, so the role of v is to set the common mass scale, and a small change of background gives $\delta M_f = (Y_f/\sqrt{2})\, \delta v$. The claim is therefore not that the Higgs manufactures a particle at every moment: the particle's persistent identity comes from its closure structure, while the Higgs background determines the elementary mass scale carried by that structure as facts continue to succeed one another. The statement must not be overextended; it concerns the Higgs-supported elementary mass sector, not every contribution to the mass of a composite object such as a proton.

**What the number 32/63 means**

The result $m_H/v = 32/63$ is best understood as a statement about the shape or stiffness of the Higgs radial structure relative to the size of its vacuum displacement. It is dimensionless, and it is not yet the statement that the Higgs mass is 125 GeV. The calculation says that once the relevant closure structure is specified, the curvature of the radial Higgs direction relative to its vacuum scale takes the value $32/63 = 0.5079365\ldots$, before the measured Higgs value is consulted. Only later is that number compared with the corresponding measured-inferred ratio.

**Where the Higgs derivation currently stands**

The present Higgs result has two different grades which should not be confused. The numerical ratio $m_H/v = 32/63$ is a Stage-2 conditional numerical return: it follows from a frozen structural premise stack, but has not yet been re-returned as the final invariant of the completely physically normalised multi-cell action. The underlying Higgs mechanism has progressed further, to Stage 3S, structural Stage 3, having identified the physical common Higgs/completion direction, the stable broken vacuum, positive radial restoring stiffness, exact preservation of that vacuum under fact succession, and a nonzero microscopic mechanism by which radial disturbances propagate from fact to fact.

What prevents formal Stage 3 is now stated precisely, and it is more than a normalisation. Fact-direction kinetic motion is established, but the physical spatial two-derivative mechanism remains source-unselected: the primitive action must determine whether a reversible neighbour stiffness survives as an independent physical term and, if so, fix its coefficient and normalisation rather than relying on the currently whitened canonical coordinate system. Only after that is closed does Stage 4 begin, converting the microscopic Higgs result through the full electroweak, top/Yukawa, Goldstone, threshold, renormalisation and pole calculation to an observable Higgs mass that can be compared directly with experiment.

The interpretation can therefore be summarised without any of the machinery, using the picture we began with. The surface is not slack: it is held at a definite tension everywhere, and it stays that way on its own. That standing background sets the common scale for the elementary masses the Higgs supports. Matter consists of the self-holding whirls in the surface, each keeping its own identity as it drifts, and the more strongly a whirl grips the surface the more mass it has, which is why some particles are massive and others nearly massless. The surface also resists being pushed away from its tension, and how stiffly it resists is what fixes the mass of the Higgs particle itself. Finally, a disturbance of that tension does not sit still; it travels, like a ripple crossing the lake. That travelling ripple is what physicists detect and call a Higgs particle.

Two cautions keep the picture honest. There is not one single lake: light, for example, is a ripple in the electromagnetic structure rather than in this one, so each kind of ripple runs on its own surface. And the whirls are the durable objects here while the ripples are the passing disturbances, which is why in VERSF a particle of matter and a detected excitation are two genuinely different kinds of thing rather than two names for the same thing.

## 4.1 The K = 7 closure-quartic chain

On the K = 7 branch, closure-quartic democracy fixes the baseline coupling

$\lambda_0 = 1/(K+1) = 1/8 \Rightarrow (m\_H/v)_0 = \sqrt{(2\lambda_0)} = 1/2$.

Non-trivial closure-ratio renormalisations live on the traceless deformation algebra su(8), not u(8). Therefore

D_corr = dim su(8) = $8^2 - 1 = 63$.

SU(8)-invariance and Killing-form uniqueness make the closure-unit weight uniform across the admissible deformation directions: $\delta = 1/63$. With the declared linear action on the curvature ratio,

m_H/v = (1/2)(1 + 1/63) = 32/63 = 0.507936507936…

λ_H^(VERSF) = $(1/2)(32/63)^2$ = 512/3969 = 0.128999748047…

## 4.2 Post-freeze comparison

| Quantity | VERSF | Measured-inferred | Raw Δ | Provenance |
|---|---|---|---|---|
| m_H/v | 32/63 = 0.507936508 | 0.508204766 | −0.0528% | Conditional structural; strongest scale-free contact |
| λ_H | 512/3969 = 0.128999748 | 0.129136042 | −0.1055% | Correlated with same m_H/v comparator; not independent evidence (F-SM3-6) |

Source note: The 32/63 arithmetic is source-side structural content. The empirical ratio is formed only after the VERSF ratio is frozen. With the 2026 Higgs mass uncertainty alone, the central-value offset is 0.60σ; that does not remove the larger theoretical conditionality (F-SM3-7).

HIGGS VERDICT. 32/63 is not a fitted decimal and the old observed-mass sector selector is no longer needed in the preferred provenance chain. The correct current claim is a strong conditional structural prediction of a dimensionless Higgs curvature ratio. A physical Higgs pole theorem remains open until the same selected action returns the completion residue, scalar potential, absolute scale, continuum matching and pole transport.

## 4.3 Successive-fact handoff and the correction to the isolated-boundary picture

The Higgs provenance problem had previously been phrased as though one first needed a completely closed fact boundary and then a second primitive operation coupling that completed boundary into the Higgs/completion sector. The cumulative fact/renewal execution now makes that separation unnecessarily strong.

At the executed history grain, the first-fact calculation treats self-history transitions as the unresolved/no-new-record sector and every nonself transition as fact producing. The renewal execution uses the same self/nonself split and the same frozen recurrence. Its spectral radius and mean first-passage wait therefore coincide with the original first-record calculation. This is an exact stopping-law identity at the executed history level; it should not be overstated as proof that every finer microscopic sub-operation is literally identical.

The preferred audit reading is consequently a handoff:

open Fact n / prospective Fact n+1 → first nonself transition → completed record n + active successor state n+1.

This is the VERSF analogue of a domino whose contact with the next domino begins the successor process while completing the preceding transition. It removes the need to postulate an additional standalone “closed boundary → Higgs” interaction unless the source action independently returns one.

## 4.4 Canonical radial coordinate of fact handoff

Let a denote the total probability of leaving the unresolved/self sector at a given fact opportunity, and let $\pi_i$ be the conditional distribution of successor facts once a handoff occurs. Then

$p_0 = 1 - a$, $p_i = a\,\pi_i$, $\Sigma_i\, \pi_i = 1$.

The probability law therefore separates “whether a new fact forms” from “which new fact forms”. Its Fisher metric is

$ds_F^2 = da^2/[a(1 - a)] + a\, \Sigma_i\, d\pi_i^2/\pi_i$,

with no radial/outcome cross term because $\Sigma_i\, d\pi_i = 0$. Define

$\chi = 2 \arcsin\sqrt{a}$.

Then

$ds_F^2 = d\chi^2 + a(\chi)\, \Sigma_i\, d\pi_i^2/\pi_i$.

Thus $\chi$ is a canonically normalised one-dimensional handoff coordinate and the successor-identity directions are exactly orthogonal to it. The corresponding score is equal on every nonself successor, so the radial handoff mode contains no information about which terminal fact is selected. This structure is the exact analogue required by the HR-1 decomposition into one normal radial scalar and orthogonal angular/tangential directions.

The older PSAC signed curvature coordinate c must not be substituted for $\chi$. The PSAC closure-circulation coordinate is reflection odd (A2 type), whereas the self-versus-nonself handoff score is reflection even and invariant over the successor labels. Their symmetry types differ, so the previous value 360/713 is not Higgs radial stiffness.

## 4.5 Completion-character projection and the common Higgs mode

The independent completion instrument has the same probability factorisation. Its four physical completion routes obey

$p_r(\varphi_H) = \sin^2\varphi_H \cdot q_r$,

with one complementary no-completion outcome. Writing $Q = \Sigma_r\, q_r$, $a_H = Q \sin^2\varphi_H$ and $\pi_r = q_r/Q$ gives

$p_\emptyset = 1 - a_H$, $p_r = a_H\, \pi_r$.

The radial completion score is consequently identical on all four physical completion routes. On their four-route carrier it is proportional to (1, 1, 1, 1).

The GSJB-3 completion attachment independently derives the $Z_2 \times Z_2$ character basis of those routes. In the normalised basis, $u_0 = (1, 1, 1, 1)/2$ is the common/radial $\varphi\_H$ coordinate, while the other three characters are the lepton-quark, H-H-tilde and mixed contrasts. Therefore the handoff/common vector projects as

$(1, 1, 1, 1)/2 \rightarrow (1, 0, 0, 0)$,

with rank one, zero contrast leakage and principal angle zero.

This agrees independently with the faithful HM4 calculation, which identifies the defect-silent, potential-active common Higgs/completion mode

$q\_H = (\varphi\_H + X\_H0 + X\_H1 + X\_H2)/2$.

The remaining provenance firewall is specific rather than conceptual: the corpus has not yet executed one unique full-carrier matrix taking the exact F2F self/nonself handoff score through the physical marked source and into the GSJB-3/HM4 common radial coordinate. The direction is fixed once placed on the common four-route carrier; the complete same-source intertwiner and its absolute metric remain open.

## 4.6 Time, matter persistence and Higgs-supported mass

Fact succession and matter persistence must be distinguished.

The void/fact-time architecture allows irreversible facts to succeed one another without first requiring a Persistent Fold Defect. Matter is an additional persistent closure structure. PFD topology supplies particle identity and refinement persistence; it is not the source of time itself.

Likewise the Higgs sector should not be interpreted as creating time. With the completion amplitude set to zero, the completion/mass channels vanish while the underlying fact-selection architecture remains defined.

For the Higgs-generated elementary mass sector,

$M\_f = (v/\sqrt{2})\ Y\_f$.

At fixed particle/Yukawa structure, $\delta M\_f = (Y\_f/\sqrt{2})\ \delta v$, so on a nonzero mass eigenvalue

$\delta m\_f/m\_f = \delta v/v$.

The Higgs vacuum therefore supplies the persistent common mass scale, while PFD topology supplies persistence of the particle-like closure structure through successive facts. This statement concerns the Higgs-generated elementary mass contribution. It is not a claim that every contribution to composite hadronic mass is generated by the Higgs sector.

## 4.7 Fact-to-fact propagator of the radial fluctuation

Write the physical radial field as

$r\_n = v + h\_n$,

where v is the stationary broken vacuum and h_n is the radial fluctuation on fact n. At declared local two-derivative order, the fact-indexed pullback of the relaxed scalar quadratic action is

$\Gamma\_F^{(2)} = (1/2)\ \Sigma\_n\ \tau\_F\ [\ Z\_H\text{^}time\ ((h\_(n+1) - h\_n)/\tau\_F)^2 + K\_H\ h\_n^2\ ]$, where $\tau_F$ is the still-unfixed physical duration represented by one fact increment and

$\kappa_F = Z_H^{time}/\tau_F^2$.

Fourier transforming in fact number gives

$K_F(\omega) = K_H + 4\kappa_F \sin^2(\omega/2)$, $G_F(\omega) = 1/[K_H + 4\kappa_F \sin^2(\omega/2)]$.

Two exact consequences follow independently of the unknown $\kappa_F$.

First, the broken vacuum is preserved in the correct sense: the homogeneous configuration $h_n \equiv 0$ is an exact stationary configuration of the fact action, and the fact-difference operator vanishes identically on it. This is not a deterministic recurrence forbidding fluctuation at $n + 1$; it is the statement that the vacuum is a constant background annihilated by the difference operator. It does not need to be copied as a numerical value from one committed fact to the next.

Second, $K_F(0) = K_H$. Thus fact propagation adds a kinetic/transport term but leaves the zero-frequency static radial curvature unchanged.

Writing $p_0 = \omega/\tau_F$ and using $4 \sin^2(\omega/2) = \omega^2 - \omega^4/12 + O(\omega^6)$,

$K_F(p_0) = K_H + Z_H^{time} p_0^2 - (Z_H^{time} \tau_F^2/12) p_0^4 + O(p_0^6)$.

The leading form in the fact direction is therefore

$K_F(p_0) = K_H + Z_H^{time} p_0^2 + O(p_0^4)$,

where $Z_H^{time}$ denotes the fact-direction residue. Throughout this paper the temporal and spatial residues are written $Z_H^{time}$ and $Z_H^{space}$ and are not merged into a single symbol $Z_H$ until a Lorentzian matching theorem proves that they are one physical coefficient.

This establishes the temporal, fact-direction part of the required continuum kinetic structure. It does not by itself establish the corresponding spatial $k^2$ coefficient, which Sections 4.26 and 4.27 show to be exactly the unresolved question: the flat-incidence construction supplies an $O(k^2)$ term while the relaxed constitutive sector begins at $O(k^4)$. After analytic continuation, the finite-fact-spacing pole obeys

$\sinh^2(E_H \tau_F/2) = \tau_F^2 K_H/(4 Z_H^{time})$,

or

$E_H^{(f)} = (2/\tau_F) \operatorname{arsinh}[(\tau_F/2)\sqrt{(K_H/Z_H^{time})}]$,

which tends to $\sqrt{(K_H/Z_H^{time})}$ as $\tau_F \to 0$. The physical numerical value therefore still awaits $\kappa_F$, equivalently $Z_H^{time}$ together with the fact-duration conversion, and it constrains only the fact-direction coefficient.

## 4.8 Faithful common-mode identification and the defect-silence correction

The faithful full-action carrier independently fixes the physical common completion line. On the completion coordinates $(\varphi_H, X_{H0}, X_{H1}, X_{H2})$ the faithful defect block is

$D_{H,i} = X_{Hi} - \varphi_H$,

so for

$q_H = c_H = (1/2)(1, 1, 1, 1)$

every defect component vanishes and

$J_D q_H = 0$

exactly. Consequently $q_H^\dagger J_D^\dagger W(\omega) J_D q_H = 0$ for every frequency-dependent six-defect/history operator $W(\omega)$. This is a genuine correction rather than a refinement: a history operator built only from the compressed defect image cannot supply the physical Higgs common-mode kinetic residue, and an intermediate nonzero local-persistence score residue calculated on that carrier must not be identified with $Z_H$.

The same direction is nevertheless visible to the potential stack. The faithful Higgs row $V_H = \sqrt{2}\, \varphi_H$ gives

$V_H q_H = 1/\sqrt{2}$,

so the native canonical potential curvature is $\|V_H q_H\|^2 = 1/2$. The common Higgs mode is therefore defect-silent and full-action visible, exactly as the faithful rank reconciliation records.

## 4.9 Full-tangent kinetic mechanism

Therefore $q_H$ is not frozen merely because $J_D q_H = 0$. The primitive continuous one-Fact proposal acts on the complete physical tangent, of dimension 187, while the realisable defect image has rank 183; the four defect-silent physical directions are not absent from the proposal covariance.

For a pure common-mode displacement $\delta\mathfrak{X} = \delta h\, q_H$, the one-Fact Gaussian kinetic cost is

$\Delta S_{kin} = (1/(2a_t))\, \delta\mathfrak{X}^\dagger G_{op}\, \delta\mathfrak{X} = (g_H/(2a_t))\, (\delta h)^2,\ g_H = q_H^\dagger G_{op} q_H > 0$

on an admitted positive operational metric. For a sequence of facts,

$\Gamma_{H,kin}^{(2)} = \Sigma_n\, (g_H/(2a_t))\, (h_{(n+1)} - h_n)^2$,

and combining with the local radial potential,

$\Gamma_H^{(2)} = \Sigma_n \{ (g_H/(2a_t))\, (h_{(n+1)} - h_n)^2 + (a_t K_H/2)\, h_n^2 \}$.

The corresponding inverse propagator per unit physical fact time is

$K_H^{fact}(\omega) = K_H + (4g_H/a_t^2) \sin^2(\omega/2)$,

so $K_H^{fact}(0) = K_H$ exactly, and the homogeneous configuration $h_n \equiv 0$ is an exact stationary configuration annihilated by the fact-difference operator. The handoff therefore carries a kinetic cost for a radial disturbance without changing either the stationary vacuum or its static curvature.

## 4.10 Canonical common-mode execution and the physical-normalisation firewall

On the presently executed canonical branch the physical tangent coordinates are operationally orthonormal, $G_{op} = I_{187}$. Since $q_H$ is unit norm,

$g_H^{can} = q_H^\dagger q_H = 1$,

and with $K_H^{can} = 1/2$ from the faithful potential row the canonical quadratic fact kernel is

$K_H^{can}(\omega) = 1/2 + (4/a_t^2) \sin^2(\omega/2)$,

with small-frequency expansion, writing $p_0 = \omega/a_t$,

$K\_H\text{^}can(p_0) = 1/2 + p_0^2 - (a\_t^2/12)\, p_0^4 + O(p_0^6)$.

Thus in this operational chart Z_H^can = 1.

This is a genuine structural/canonical kinetic return but not yet a physical Higgs residue. The later metric audit proves that an identity coefficient in an operationally whitened basis is not by itself a physical prediction. The physically meaningful common-mode coefficient is

g_H^phys = q_H† G_op^phys q_H,

with G_op^phys required from the actual physical multi-cell master-history generator rather than imposed by re-whitening.

The current result therefore establishes: the common Higgs mode is a genuine physical tangent; it is exactly invisible to compatibility defects; it is nontrivially propagated by the primitive full-tangent heat kernel; its local restoring curvature is independently potential-active; and its physical kinetic normalisation remains open.

For the dimensionless unit-step convention a_t = 1, the canonical finite-step pole satisfies

$4 \sinh^2(E\_F/2) = 1/2$, so $E\_F = 2\, \mathrm{arsinh}(1/(2\sqrt{2})) = \ln 2$.

This exact equality is recorded only as an internal unit-step identity. It is not interpreted as a physical Higgs-mass prediction because a_t = 1 is a choice of fact-time units and the physical fact-duration/energy conversion remains unreturned.

## 4.10A Relation between the 32/63 curvature ratio and the common-mode two-point calculation

A skeptical reader will ask how the structural result m_H/v = 32/63 relates to the later common-mode calculation with its canonical values K_H^can = 1/2 and g_H^can = 1. The two strands are not currently the same typed quantity, and this paper does not identify them.

The 32/63 result is a dimensionless curvature ratio obtained from the closure-quartic chain: a baseline coupling fixed by closure cardinality, corrected by counting traceless deformation directions. The later object $\mu\_H^2 = K\_H/g\_H$ is a ratio of two coefficients of the common-mode quadratic form, a restoring curvature and a kinetic normalisation, evaluated on the physical completion carrier at a declared branch. One is a statement about the shape of the closure-quartic potential relative to its vacuum displacement; the other is a two-point coefficient ratio on a specific microscopic carrier.

The map that would connect them has three parts, none of which is presently returned: an amplitude relation between the closure-quartic radial variable and the physical common-line coordinate, including any scale factor; a demonstration that the potential curvature entering K_H is the same second derivative that the closure-quartic chain evaluates; and the physical kinetic normalisation g_H^phys, which the whitening firewall forbids setting to its canonical value.

The obligation runs in one direction and should be stated plainly: the eventual Stage-3 same-action calculation must reproduce or supersede 32/63 rather than merely coexist with it. If the physically normalised common-mode calculation returns a curvature ratio inconsistent with 32/63, that is a falsification of one of the two strands, not a licence to keep both.

### 4.11 Multi-cell common-mode projection and the spatial-factorisation no-go

The physical-normalisation problem can now be sharpened beyond the statement that G_op = $I_{187}$ is a canonical whitening convention.

Let q_H = (1/2)(1, 1, 1, 1) denote the exact local physical common Higgs/completion direction, embedded in the full physical tangent as q̃_H. For an N-cell regulator define the normalised spatially uniform common mode

$u_N = (1/\sqrt{N})(1, \ldots, 1)^T$, $Q_{(H,N)} = u_N \otimes \tilde{q}_H$.

The physical common-mode metric coefficient at regulator level N is

$g_H^{(N)} = Q_{(H,N)}^\dagger G_N^{phys} Q_{(H,N)}$.

Decompose the multi-cell operational metric as

$G_N^{phys} = I_N \otimes G_0 + L_N \otimes B + R_N$,

where $G_0$ is the local physical metric, L_N is the spatial graph Laplacian, B is an arbitrary internal operator and R_N is the genuinely nonseparable remainder. Because the uniform spatial vector is the zero mode of the graph Laplacian, $L_N u_N = 0$, the common-mode projection gives

$g_H^{(N)} = g_{(H,0)} + \delta g_{(H,N)}$,

with

$g_{(H,0)} = \tilde{q}_H^\dagger G_0 \tilde{q}_H$, $\delta g_{(H,N)} = Q_{(H,N)}^\dagger R_N Q_{(H,N)}$,

and consequently

$Q_{(H,N)}^\dagger (L_N \otimes B) Q_{(H,N)} = 0$

for every internal operator B.

This is an exact no-go. Pure spatial Laplacian dressing cannot change the metric of the spatially uniform Higgs common mode. A regulator family of the separable form $I_N \otimes G_0 + L_N \otimes B$ therefore returns the same common-mode coefficient at every N by algebraic construction, so equality between regulator levels in such a family is not evidence of physical convergence. The convergence test must be applied to the genuinely nonseparable contribution $\delta g_{(H,N)}$, or to an independently derived noncanonical local metric $G_0^{phys}$, rather than to the factorised identity branch.

**Coordinate-rescaling invariant.** One part of the normalisation problem can nevertheless be closed exactly. Under an arbitrary radial coordinate change h′ = c h the quadratic coefficients transform together,

$g_H' = g_H/c^2$, $K_H' = K_H/c^2$,

so $K_H'/g_H' = K_H/g_H$ and

$\mu_H^2 \equiv K_H/g_H$

is invariant under arbitrary rescaling of the one-dimensional radial field coordinate. The canonical values $K_H^{can} = 1/2$ and $g_H^{can} = 1$ therefore give the internal invariant $\mu_{(H,can)}^2 = 1/2$, but this does not by itself establish that it is the physical value.

## 4.12 Defect-mediated history and bath protection theorem

The faithful common-mode result $J_D q_H = 0$ has a stronger consequence than previously stated. For any operator M acting on the primitive defect carrier,

$$J_D^\dagger M J_D q_H = 0,$$

hence $q_H^\dagger J_D^\dagger M J_D q_H = 0$ and, more strongly, $q_H^\dagger J_D^\dagger M J_D v = 0$ for every physical tangent v. This applies to a frequency-dependent history metric, a bath-relaxed history metric and any other correction that reaches configuration space only by factorising through the primitive defect differential.

In particular, the unresolved-bath construction has $W_{prim} = W_{core} - C^\dagger A_Q^+ C$, so its configuration-space bath correction is $\Delta G_{bath} = J_D^\dagger C^\dagger A_Q^+ C J_D$, and the physical common-mode projection is

$$\delta g_H^{bath} = q_H^\dagger \Delta G_{bath} q_H = 0$$

for every admissible $A_Q$ and C, so long as the correction continues to factor through $J_D$.

The same result applies to the later scalar commitment QP block. Its configuration-space correction has rank-one form proportional to $u_\kappa u_\kappa^\dagger$, with $u_\kappa$ itself lying in the defect-visible image; since $q_H \in \ker J_D$, $q_H^\dagger u_\kappa = 0$, and the scalar commitment bath cannot renormalise the physical Higgs common-mode coefficient for any allowed commitment strength.

This establishes a four-dimensional protection statement. Since the physical tangent has dimension 187 and the realised defect image has rank 183, $\dim \ker J_D = 4$, and for every $n \in \ker J_D$ we have $J_D^\dagger M J_D n = 0$. The physical Higgs common line is one member of this protected four-dimensional subspace.

The implication for the next Higgs gate is substantial: the missing Higgs common-mode normalisation cannot be generated by improving the six-defect Fisher metric, by defect-mediated bath relaxation, or by the scalar commitment QP block. It must enter through the independently derived full operational geometry acting directly on the defect-silent physical tangent, or through another genuinely non-defect-mediated same-action structure. This strengthens, rather than weakens, the defect-silence result of Section 4.8.

## 4.13 Operational distinguishability metric and the correct normalisation variable

A separate operational-geometry result supplies a candidate source-side route to the missing common-mode metric, but it must be typed carefully.

The operational distinguishability density $\rho_{op}(x)$ is not the stationary probability of the canonical seven-state history wheel. It is a smooth density obtained from the local packing of admissible sectors $\Sigma(M)$ over the continuous operational image $M_{op}$. At coarse-graining scale $\varepsilon \geq \Delta_{op}$,

$$\eta_{op}^{\varepsilon}(x) = |\Sigma(M) \cap B_{op}(x, \varepsilon)| / (\omega_{d_{op}} \varepsilon^{d_{op}}),$$

and the smooth operational distinguishability density is the normalised mollification

$$\rho_{op}(x) = \mathcal{Z}^{-1} \int_{M_{op}} K_\varepsilon(x, y)\, \eta_{op}^{\varepsilon}(y)\, d\mathcal{H}_{op}^{d_{op}}(y), \quad \int_{M_{op}} \rho_{op}\, d\mathcal{H}_{op}^{d_{op}} = 1.$$

The distinguishability-counting theorem then gives the operational metric, after flat-reference normalisation,

$$g_{op}(x) = \mathrm{Vol}_{op}(M)^{2/d_{op}} \rho_{op}(x)^{2/d_{op}} \langle \cdot, \cdot \rangle_{op}.$$

Two substitutions are explicitly forbidden. The canonical history Perron measure $\pi = (1/31)(7, 4, 4, 4, 4, 4, 4)$ may not be substituted for $\rho_{op}$: the former is a transition-process stationary distribution over seven history states, the latter a continuous local admissible-sector packing density, and they are differently typed objects. Likewise the physical tangent dimension 187 may not automatically be substituted for $d_{op}$ unless the corresponding operational-dimension identification is independently proved.

For a common Higgs direction of unit norm in the reference operational metric, define

$$\zeta_H \equiv \mathrm{Vol}_{op}(M)\, \rho_{op}(x_H),$$

where $x_H$ is the operational point corresponding to the broken Higgs background. The distinguishability-counting metric would then give

$$g_H^{pack} = \zeta_H^{(2/d_{op})}.$$

This is not promoted to $g_H^{phys}$. Physical promotion requires a same-source theorem identifying this operational distinguishability metric with the physical one-Fact proposal metric entering $q_H^\dagger G_{op}^{phys} q_H$. Nevertheless, the expression replaces an arbitrary unknown common-mode coefficient with one concrete source-side scalar quantity.

**The Higgs vacuum is not yet proved to be the operational entropy maximum.** The broken Higgs vacuum and the uniform operational-density equilibrium must remain distinct. The scalar substrate vacuum is defined by a vector commitment-density free energy whose saturated branch obeys $|\rho_{cl}| = \rho_c$ and is a local minimum of the scalar radial potential, whereas the operational-geometry equilibrium has $\rho_{op}(x) = 1/\mathrm{Vol}_{op}(M)$ at uniform distinguishability packing. No current frozen theorem proves a map taking the saturated scalar vacuum into this uniform operational-density state. Therefore $x_H = x_{(op,eq)}$ is not yet derived, and $g_H^{phys} = 1$ cannot be inferred from operational equilibrium.

## 4.14 Exact local-packing reduction of the Higgs residue

Although the actual admissible-sector census has not yet been returned, the operational formula reduces exactly to a local-to-global packing ratio. Let

$$N_\varepsilon(x) = |\Sigma(M) \cap B_{op}(x, \varepsilon)|, \quad \eta_\varepsilon(x) = N_\varepsilon(x)/(\omega_{(d_{op})}\, \varepsilon^{(d_{op})}),$$

and define the global mean packing density $\bar{\eta}_\varepsilon = \mathcal{Z}/\mathrm{Vol}_{op}(M)$. Then

$$\zeta_H = \mathrm{Vol}_{op}(M)\, \rho_{op}(x_H) = (K_\varepsilon * \eta_\varepsilon)(x_H)/\bar{\eta}_\varepsilon.$$

Writing $\eta_\varepsilon = \bar{\eta}_\varepsilon(1 + \delta_\varepsilon)$ gives

$$\zeta_H = 1 + \delta_H, \quad \delta_H = (K_\varepsilon * \delta_\varepsilon)(x_H),$$

so that $\delta_H$ is the smoothed local admissible-sector packing contrast at the Higgs vacuum. Conditional on the operational distinguishability metric being the physical one-Fact proposal metric,

$$g_H = (1 + \delta_H)^{(2/d_{op})}, \quad K_H/g_H = (1/2)(1 + \delta_H)^{(-2/d_{op})}.$$

No numerical $\delta_H$ is issued, because the current packing theorem proves finiteness and bounds but does not enumerate the physical Higgs-point local admissible-sector count.

## 4.15 Retiring the remaining metric shortcuts

The latest audit closes several tempting but insufficient routes to the physical Higgs normalisation.

First, the pre-Fact programme derives the genuine Fubini-Study/Born metric $G\_pre = 2 I_{98}$ on the 98-real-dimensional innovation tangent. This is a source-selected statistical geometry rather than an arbitrary whitening. It nevertheless does not determine the physical Higgs kinetic residue, because the corpus does not return a source-native amplitude-preserving map from that pre-Fact tangent into the post-Fact physical Higgs radial coordinate, together with a theorem identifying the pre-Fact selection metric with the one-Fact kinetic metric. An unknown amplitude gain would simply convert 2 into another coefficient.

Second, the two-complex-dimensional primitive H-representation atom must not be identified with the four real coordinates (φ_H, X_H0, X_H1, X_H2) merely because both carriers have four real dimensions. The primitive H atom is representation data, whereas VERSF identifies the physical scalar with the gauge-singlet closure-norm radial excitation. Equal dimension does not supply the missing field normalisation.

Third, the uniform n = 0 mode of the seven pair amplitudes is genuinely a collective breathing mode, but it is not by itself the complete closure-norm Higgs direction. The full radial object is better described directly by the invariant closure magnitude $\rho = |\mathcal{C}| - 1$.

These negative results are useful because they prevent the physical residue from being assigned by transporting an unrelated canonical metric into the Higgs sector.

### 4.16 Two K = 7 loops, the central hub and the full radial direction

The 2K + 1 = 15 closure channels acquire a transparent organisation for K = 7:

15 = 7 + 7 + 1.

In the two-loop description there are two seven-member interface loops and one central closure-magnitude hub. Let $e\_A = (1/\sqrt{7})(1, \ldots, 1)$ be the normalised uniform mode on the first loop and e_B the corresponding mode on the second, with

$u_+ = (1/\sqrt{2})(e\_A + e\_B)$, $u_- = (1/\sqrt{2})(e\_A - e\_B)$.

The n = 0 pair-breathing mode is $u_+$: it expands or contracts the two loops together, while $u_-$ changes one loop against the other and is therefore not the common radial closure excitation. Let e_h denote the central hub direction. The fully normalised 15-channel radial direction is

$u\_rad = (1/\sqrt{15})(1_7, 1_7, 1\_h)$,

hence

$u\_rad = \sqrt{(14/15)}\, u_+ + (1/\sqrt{15})\, e\_h$,

and the overlap of the pair-breathing mode with the full radial direction is

$\langle u_+, u\_rad\rangle = \sqrt{(14/15)} = 0.966091783079\ldots$,

so the paired sector carries 14/15 of the squared radial direction. This explains why the projected seven-pair kinetic matrix was an important lead but could not alone be identified with g_H: its uniform mode describes the symmetric breathing of the two seven-loops, while the invariant radial closure mode also contains the hub. The cleaner calculation is therefore not to reconstruct separate loop and hub coefficients by hand, but to use the already defined collective variable $\rho = |\mathcal{C}| - 1$, which by construction measures the full closure magnitude.

## 4.17 Source-defined closure-radial determinant and the raw spatial residue

The closure-geometry action supplies a direct microscopic coupling between the closure magnitude and compact phase transport. In the natural unrescaled coordinate $\rho_x = |\mathcal{C}_x| - 1$, the pair Hamiltonian is

$$H_{pair} = \kappa \Sigma_{(\langle xy \rangle)} (1 + \rho_x)(1 + \rho_y)[1 - \cos(\theta_x - \theta_y)].$$

At Gaussian phase order this becomes $S[\theta, \rho] = (1/2)\, \theta^T M(\rho)\, \theta + S_\rho$, where $M(\rho)$ is the $\rho$-dependent weighted graph Laplacian, so Gaussian integration of the compact phase sector gives

$$S_{eff}[\rho] = S_\rho + (1/2)\, \mathrm{Tr}' \log M(\rho).$$

This is important because it produces the radial two-point function from an actual source action rather than from a post hoc field normalisation. The original closure calculation numerically extracted $\Sigma(q) = \Sigma(0) + Z_\rho q^2 + O(q^4)$ on periodic cubic lattices and obtained $Z_\rho = 0.137$ at $L = 12$ and $0.157$ at $L = 14$, from which it tentatively inferred a limiting range of about 0.16 to 0.17, while itself identifying finite-size and $q^4$ contamination as the principal uncertainty.

The determinant can now be executed analytically at quadratic order. For the infinite periodic-cubic surrogate, $\lambda_3(k) = 4 \Sigma_{(\mu=1)}^3 \sin^2(k_\mu/2)$, and the exact long-wavelength coefficient reduces to the diagonal lattice Green function

$$Z_\rho^{(3,cubic)} = (2\pi)^{-3} \int_{([-\pi,\pi]^3)} d^3k \,/\, [4 \Sigma_{(\mu=1)}^3 \sin^2(k_\mu/2)] = 0.2527310098587\ldots,$$

in the natural coordinate $\rho = |\mathcal{C}| - 1$. The previous $L = 12$ and $L = 14$ numbers are not contradicted: direct finite-size re-execution reproduces them closely. The correction is to the extrapolation, since the sequence continues upward with increasing $L$ and approaches 0.252731 rather than stopping near 0.17.

This result has a strict scope. The source used a periodic cubic lattice as a coordination-six surrogate rather than executing the exact physical closure cell-adjacency graph, so 0.252731009859 is an audit-derived infinite-volume result for the stated surrogate at Gaussian determinant order, not the physical VERSF Higgs residue. Direct execution on the exact cell-adjacency graph can modify lattice constants while preserving the qualitative mechanism.

## 4.18 Conditional four-dimensional phase residue

The three-dimensional coefficient above is a spatial gradient residue, whereas physical Stage 3 requires the coefficient of the four-dimensional radial two-point function.

A separate $K = 7$ closure-symmetry result establishes a spatial-temporal exchange symmetry at the bare U(1) Wilson level and, under its declared premises, forces $\beta_s = \beta_t$. That source is explicit that the result is presently at the pure-gauge/cardinality level and does not yet derive the complete coupled-sector extension or the explicit labelled chain-complex realisation.

A conditional calculation can nevertheless be preregistered. Assume that the closure magnitude modulates temporal compact-phase links by exactly the same local law as spatial links,

$$S_{(\theta\rho)}^{(4)} = (\kappa/2) \Sigma_x \Sigma_{(\mu=0)}^3 (1 + \rho_x)(1 + \rho_{(x+\hat{\mu})})(\theta_{(x+\hat{\mu})} - \theta_x)^2.$$

This is the minimal $\sigma$-covariant extension of the already returned spatial law, and it is not inserted as a proven VERSF theorem. For this isotropic four-dimensional surrogate, $\lambda_4(k) = 4 \Sigma_{(\mu=0)}^3 \sin^2(k_\mu/2)$, and the same determinant calculation gives

$Z_{(\rho,\text{phase})}^{(4)} = (2\pi)^{-4} \int d^4k / [4 \Sigma_{(\mu=0)}^3 \sin^2(k_\mu/2)] = \int_0^\infty [I_0(2t) e^{(-2t)}]^4 dt = 0.1549333902311\ldots$,

with periodic $L^4$ sums converging monotonically toward that value. The ratio to the three-dimensional spatial coefficient is

$Z_{(\rho,\text{phase})}^{(4)} / Z_\rho^{(3)} = 0.613036724\ldots$,

so the four-dimensional value is approximately 38.7% lower. This is an important warning: the spatial $Z_\rho^{(3)}$ may not simply be renamed the physical four-dimensional Higgs residue.

## 4.19 Exact Stage-3 residue target after the phase calculation

The controlling microscopic object remains the relaxed scalar Schur kernel

$\mathcal{K}_H(p^2; \rho) = \Gamma_{(\rho\rho)}^{(2)} - \Gamma_{(\rho a)}^{(2)} (\Gamma_{(ab)}^{(2)})^{-1} \Gamma_{(b\rho)}^{(2)}$,

whose $p^2$ coefficient is the physical microscopic residue

$Z_H^{micro} = A_2 - B_2 C_0^{-1} B_0† - B_0 C_0^{-1} B_2† + B_0 C_0^{-1} C_2 C_0^{-1} B_0†$.

The compact-phase determinant now supplies a nonzero source-side momentum contribution to this expression, but it does not evaluate the remaining relaxation stack. If the faithful common-line amplitude is related to the closure-norm coordinate by $h_{HFB} = s_H \rho$, the physical common-line coefficient is

$g_H^{phys} = Z_H^{micro} / s_H^2$,

and neither $s_H$ nor the remaining Schur contribution may be chosen from the Higgs target.

## 4.20 History-derived completion resolvent: exact low-derivative reduction and typing firewall

The HMGBC completion geometry supplies a second microscopic route into the scalar transport problem. On the scalar-compatible completion carrier its quadratic functional is

$\Gamma_{comp}^{(2)} = (1/2) \|X - \varphi_H P_H^R\|^2_{(W_H)} + (1/2) \langle X, \Delta_\Omega X\rangle$,

with stationary solution $X\star = \varphi_H (W_H + \Delta_\Omega)^{-1} W_H P_H^R$. Exact substitution gives the relaxed scalar kernel

$K_{(\Omega,\text{eff})} = P_H^{(R†)} [W_H - W_H (W_H + \Delta_\Omega)^{-1} W_H] P_H^R$.

Writing $u = W_H^{(1/2)} P_H^R$ and $L_\Omega = W_H^{(-1/2)} \Delta_\Omega W_H^{(-1/2)}$ gives the equivalent form

$K_{(\Omega,\text{eff})} = u† L_\Omega (I + L_\Omega)^{-1} u$.

This has an important low-derivative consequence. If a correctly typed physical transport operator has $\Delta(p) = p^2 \Delta_2 + O(p^4)$, then $L(p) = p^2 W_H^{(-1/2)} \Delta_2 W_H^{(-1/2)} + O(p^4)$ and hence

$K_{(\Omega,\text{eff})}(p) = p^2 P_H^{(R†)} \Delta_2 P_H^R + O(p^4)$.

Thus the local completion stiffness $W_H$ cancels completely from the leading two-derivative coefficient:

$Z_{(H,\Omega)} = P_H^{(R†)} [\partial\Delta(p)/\partial p^2]_{(p^2=0)} P_H^R$.

This is an exact structural result: the leading radial transport coefficient is controlled by the low-momentum geometry itself, and $W_H$ begins to affect the response only at higher derivative order.

The canonical wheel gives a useful internal check. On the zero-holonomy branch $\Delta_\Omega^{(0)} = (8/31)(I_3 - (1/3) J_3)$, while the benchmark local completion stiffness is $w_H = 75/434$. For either nonzero generation mode the completion resolvent is therefore

$$R_{(\Omega,\perp)} = w_H/(w_H + 8/31) = 75/187,$$

and the corresponding relaxed quadratic penalty is

$$K_{(\Omega,\perp)} = w_H (8/31)/(w_H + 8/31) = 600/5797.$$

These are exact finite-carrier benchmark values, and they are not Higgs spacetime residues. The source defines $\Delta_\Omega$ on the terminal-record/generation carrier and interprets its nonzero spectrum as the cost of generation-depth variation, so neither 8/31, 75/187 nor 600/5797 may be renamed $Z_H$. Their significance is that they execute the correct Schur-resolvent architecture and show exactly how a genuinely spacetime/refinement-typed transport operator would feed the Higgs radial kernel.

## 4.21 Refinement typing: why the physical Higgs gradient must be structured

A separate refinement calculation supplies a further constraint. On diamond-glued substrates, ordinary vertex-scalar content is not refinement-stable: bulk scalar modes and arbitrary antichain-supported scalar modes decay under refinement. The first nontrivial persistent observable sector is instead the structured edge-transport quotient, edge one-forms modulo scalar gradients.

This must not be overstated as saying that a local scalar amplitude cannot exist. The Higgs radial modulus clearly exists as a local scalar degree of freedom in the master action. The consequence is narrower and more useful: a bare scalar difference $d\varphi_H$, considered by itself, is not sufficient to define a refinement-persistent physical propagation observable. The radial amplitude must be transported as part of the structured completion/interface field on which the physical comparison geometry acts.

This resolves an apparent tension between the scalar closure-norm calculations and the refinement programme. The closure coordinate supplies the local radial amplitude; the persistent interface/transport structure supplies the physical carrier on which differences of that amplitude can be compared from one substrate location or fact to another.

## 4.22 Covariant structured Higgs incidence and the direct radial edge stiffness

The master action already supplies the required structured object. The positive completion strain $X_H$ is not itself a left-right morphism; its correctly typed completion operator is

$$\mathcal{O}_H = V_H^\dagger X_H : \mathcal{H}_R^{rec} \to \mathcal{H}_L^{rec},$$

which under independent left and right gauge transformations obeys $\mathcal{O}_H \mapsto G_L \mathcal{O}_H G_R^\dagger$. For an oriented physical edge $e : i \to j$ with inherited transports $U_e^L$ and $U_e^R$, the natural covariant Higgs incidence is

$$\nabla_e \mathcal{O}_H = \mathcal{O}_{(H,j)} - U_e^L \mathcal{O}_{(H,i)} (U_e^R)^\dagger,$$

which transforms covariantly at the target endpoint, so its operational norm is gauge invariant. On the defect-free radial branch $X_{(H,i)} = (\varphi_i/\Lambda\star)\, P_{(H,i)}^R$, so writing $r_i = \varphi_i/\Lambda\star$ and $S_i = V_{(H,i)}^\dagger P_{(H,i)}^R$ gives $\mathcal{O}_{(H,i)} = r_i S_i$ and the exact decomposition

$$\nabla_e \mathcal{O}_H = (r_j - r_i) S_j + r_i [S_j - U_e^L S_i (U_e^R)^\dagger].$$

On a covariantly parallel pure-radial background the second term vanishes and $\|\nabla_e \mathcal{O}_H\|^2 = |r_j - r_i|^2 \|S_j\|^2$, so the direct stationary-conductance stiffness on that edge is

$$D_{(H,e)}^{dir} = c_e \|S_e\|_{op}^2,$$

and summing with the stationary history conductance gives the direct radial transport coefficient

$$D_H^{dir} = c_F \|S_H\|_{op}^2.$$

This supplies a concrete source-side form for the transport coefficient. It is not yet the physical residue: the orientation and auxiliary Schur relaxation must still be applied, $D_H^{rel} = A_H - B_H C_H^{-1} B_H^\dagger$, and the physical conductance, section norm and radial-coordinate map remain open.

## 4.23 Fact-action normalisation and the conductance blocking certificate

The fact-indexed action of Section 4.7 fixes the correct dimensional bridge between a discrete edge stiffness and the continuum residue. Writing that action as

$$\Gamma_F^{(2)} = (1/2)\, \Sigma_n \left[ (Z_H^{time}/\tau_F)(r_{(n+1)} - r_n)^2 + \tau_F K_H r_n^2 \right],$$

a source-derived Dirichlet coefficient $D_F$ multiplying the squared one-fact difference obeys

$$D_F = Z_H^{time}/\tau_F = \tau_F \kappa_F, \text{ hence } Z_H^{time} = \tau_F D_F.$$

This is the correctly typed bridge, and it must not be written as $Z_H^{time} = \tau_F^2 D_F$. It fixes the fact-direction coefficient only. The distinction separates the dimensionless discrete edge stiffness from the continuum $p^2$ residue and prevents a one-power normalisation error.

A two-level refinement test of the same structure is available as an arithmetic certificate. The Stage-A regulators give conductances $c_1 = 1/16$ and $c_2 = 1/32$ with exact paired fine-to-coarse pushforward, so $2c_2 = c_1$ exactly, and for an isometrically lifted structured Higgs section $2c_2\|S_H\|^2 = c_1\|S_H\|^2$. The direct conductance contribution is therefore exactly blocking-compatible. This is a refinement-structure certificate only: the Stage-A physical branch remains refused, its completion arrays are precursor-grade with nonzero two-level drift, and the arithmetic may not be promoted to a Higgs residue.

## 4.24 Recurrent-path radial blindness and the local completion-score repair

The recurrent K = 7 closure-Born-TPB construction sharpens an important distinction between route support and radial completion magnitude. For the supplied completion maps one has the polar decompositions $Y_\nu^\dagger = U_D S_D$ and $M_R^\dagger = U_R S_R$, where the unitary or partial-isometric factors $U_D$ and $U_R$ encode coherent route support while the positive factors $S_D$ and $S_R$ retain the magnitude of the completion response.

The recurrent population construction uses $B_D(j|i) = |(U_D)_{ji}|^2$ and $B_R(k|j) = |(U_R)kj/^2$ *together with stage hazards, so its ten working Kraus marks depend on route support and timing but contain no explicit $\varphi_H$ or positive completion amplitude. Consequently, on this recurrent population instrument as written,* $\partial(\varphi_H) K_a = 0$ for every mark a, and the direct recurrent Higgs score and Fisher information both vanish.

This is not a theorem that the physical Higgs has zero history response. It is a theorem that the presently executed recurrent population reduction is radial-blind, because the positive polar magnitude was removed before the marked population law was constructed.

An earlier finite completion instrument contains precisely the missing local radial dependence. With $A = \bigoplus r$ *A_r over four physical completion blocks, K_r(φ_H) = sin φ_H A_r and K∅*(φ_H) = $\sqrt{[I - \sin^2\varphi_H A^\dagger A]}$. To combine this local completion law with recurrent TPB timing without introducing a measured quantity, let h denote the stage hazard and define the conditional synthesis $\tilde{K}_r = \sqrt{h} \sin \varphi_H A_r$ and $\tilde{K}_0 = \sqrt{[I - h \sin^2\varphi_H A^\dagger A]}$. For an incoming state ρ set $q_r = \mathrm{Tr}(A_r \rho A_r^\dagger)$ and $Q = \Sigma_r q_r = \mathrm{Tr}(A^\dagger A \rho)$. The completion probabilities are

$p_r = h \sin^2\varphi_H q_r$, $p_0 = 1 - h Q \sin^2\varphi_H$,

and the exact Fisher response is

$I_{(\varphi_H)}(h, Q) = 4 h Q \cos^2\varphi_H / [1 - h Q \sin^2\varphi_H]$,

with finite limiting value $I_{(\varphi_H)}(0) = 4hQ$ at the symmetric interface. For a history-dependent hazard and state-dependent Q the stationary one-fold radial information rate is the stationary expectation of the same expression. This closes one previously ambiguous question: the marked-history architecture can carry a nonzero microscopic Higgs radial score without assigning a canonical field norm by hand.

## 4.25 Local radial Fisher information is not the Higgs kinetic residue

The nonzero result of Section 4.24 must not be identified with $Z_H$. Suppose the completion instrument at each spatial cell depends only on the local radial amplitude $\varphi_x$. To quadratic order its history contribution is $\Gamma_{local}^{(2)} = (1/2) \Sigma_x I_H(x)(\delta\varphi_x)^2$, so on a homogeneous background the Fourier kernel is

$\Pi_H^{local}(k) = I_H$,

independent of spatial momentum. Hence $[\partial\Pi_H^{local}/\partial k^2]_{(k=0)} = 0$ and $Z_H^{(local\ completion)} = 0$.

The TPB-gated result is therefore a genuine local radial susceptibility rather than a propagation residue. It contributes to the local history curvature and to the field-to-mark Jacobian, but an off-diagonal neighbour response is still required before a spatial $p^2$ term can appear. Equivalently, a purely local marked law has $H_H(x, y) \propto \delta_{xy}$, whereas for a translation-invariant branch $\Pi_H(k) = \Sigma_r H_H(r) e^{(ik\cdot r)}$ and $Z_H^{(ij)} = -(1/2) \Sigma_r H_H(r) r^i r^j$. The physical Stage-3 problem is thus an inter-cell history-susceptibility problem, not a local-Fisher-normalisation problem.

## 4.26 Explicit flat covariant transport and its Higgs projection

A later microscopic closure-Hessian calculation supplies one explicit neighbouring-cell transport implementation that can be projected onto the Higgs carrier directly. Its covariant transport residual is

$R_T(\rho)_{ij} = \rho_j - U_{ij} \rho_i$,

and for a unit residual weight its quadratic Hessian at the admissible background is $H_T = 2 B_U^\dagger B_U$, where $B_U$ is the covariant graph-incidence operator; retaining an explicit transport weight gives $H_T = 2 w_T B_U^\dagger B_U$.

Place a pure physical Higgs fluctuation on the carrier, $\delta\rho_i = E_{(H,i)} h_i$, and take a covariantly parallel Higgs background, $E_{(H,j)} = U_{ij} E_{(H,i)}$. Then $\delta R_{(T,ij)} = E_{(H,j)}(h_j - h_i)$, and with the inherited unit Higgs embedding $E_H^\dagger E_H = 1$ one has $\|\delta R_{(T,ij)}\|^2 = |h_j - h_i|^2$. The exact projection of the flat transport Hessian onto the physical Higgs radial carrier is therefore

$$H_{(H,T)}^{flat} = 2 w_T B^\dagger B.$$

For a regular local graph with dimensionless graph momentum q, $B^\dagger B(q) = 2 \Sigma_\mu [1 - \cos q_\mu] = q^2 + O(q^4)$, so the graph-coordinate Higgs transport residue on this branch is

$$Z_{(H,T)}^{graph} = 2 w_T,$$

with unit-weight executable baseline 2. This is the first explicit nonzero $p^2$ coefficient obtained by direct projection of a neighbouring-cell microscopic transport operator onto the already identified physical Higgs carrier. Its provenance remains conditional: the same source states that the general current operator, absolute transport coefficient and continuum momentum normalisation are not yet supplied, so the number 2 is a branch-level graph-coordinate Hessian coefficient and not the physical $Z_H$.

## 4.27 Flat transport versus the explicit current-continuity master action

The direct result of Section 4.26 must be compared with the later constitutive formulation rather than silently identified with it. For the radial mode, write the linearised constitutive and continuity residuals as

$$D_J = j - \kappa\, dh, \quad D_T = i\omega h + d^\dagger j,$$

where d is the spatial incidence symbol and $\lambda(k) = d^\dagger d = c_X k^2 + O(k^4)$. After all purely local auxiliary relaxations, with positive effective weights a and b, the quadratic sector is $\Gamma_{JT}^{(2)} = (a/2)\|j - \kappa\, dh\|^2 + (b/2)|i\omega h + d^\dagger j|^2$. Only the longitudinal current contributes; writing $j = dy$ and Schur-relaxing y gives the exact scalar kernel

$$K_{JT}(\omega, k) = [ab/(a + b\lambda(k))][\omega^2 + \kappa^2 \lambda(k)^2].$$

At zero spatial momentum $K_{JT}(\omega, 0) = b\, \omega^2$. At zero frequency $K_{JT}(0, k) = b\, \kappa^2 c_X^2 k^4 + O(k^6)$. Therefore $[\partial K_{JT}(0, k)/\partial k^2]_{(k=0)} = 0$ and $Z_H^{space} = 0$ on this relaxed constitutive branch, while the fact-direction coefficient $Z_H^{time}$ is unaffected. The two are separately typed, and no Lorentzian matching theorem yet identifies them.

The result has a simple physical explanation: for a slowly varying static radial field the current can follow the local gradient, $j \approx \kappa\, dh$, so the constitutive defect cancels at first derivative order, and the surviving continuity residual is proportional to $d^\dagger d\, h$ and therefore begins at $k^2$, whose square produces a $k^4$ action.

This establishes an exact consistency fork. The direct flat-incidence implementation has an $O(k^2)$ radial stiffness, while the physically relaxed constitutive-continuity sector begins spatially at $O(k^4)$. They cannot be regarded as the same reduced microscopic mechanism without an additional theorem. The possible physical resolutions are correspondingly limited: the primitive action contains an additional irreducible reversible edge stiffness proportional to $\|\rho_j - U_{ij} \rho_i\|^2$; or the current is part of the retained propagating sector and is not to be Schur-relaxed in the scalar two-point calculation; or a nonfactorising history or mixed block restores an $O(k^2)$ term in the complete physical reduction; or the flat-incidence branch is an executable baseline only and must be rejected as the physical Higgs transport law. The current corpus does not yet select among these possibilities.

## 4.28 Refinement correction to the structured-Higgs interpretation

The refinement result of Section 4.21 remains important, but its interpretation can now be made more precise. The diamond-glued refinement programme proves that naked vertex-scalar structure does not supply the first nontrivial persistent continuum observable, the minimal persistent structured sector being edge transport modulo scalar gradients. This correctly warns against treating an autonomous scalar difference as a complete refinement-persistent physical object. It does not, however, derive the Higgs kinetic coefficient.

Indeed, the covariant structured comparison of Section 4.22 is itself the covariant coboundary of the vertex completion field $\mathcal{O}_H$, so on a flat or covariantly parallel branch its class in the corresponding edge quotient is exact. Cohomological persistence alone cannot convert that exact edge difference into a nonzero physical Higgs residue or determine its norm. The correct interpretation is therefore narrower: the local Higgs radial amplitude remains a legitimate physical scalar degree of freedom; its comparison between neighbouring cells must use the correctly typed completion/interface geometry; refinement cohomology constrains which relational structures survive coarse-graining; but the local Dirichlet coefficient of the Higgs field must still be returned by the physical action or history measure. The structured completion operator fixes typing, not normalisation.

## 4.29 Two-regulator scaling of a possible reversible edge stiffness

The Stage-A conductances nevertheless provide a useful preregistered scaling check for any future reversible Higgs edge stiffness. The two executed regulator levels give $c_1 = 1/16$ and $c_2 = 1/32$ with exact paired fine-to-coarse pushforward, so $2c_2 = c_1$.

For a spatial edge action $\Gamma_n = (1/2)\, \Sigma_{\langle ij\rangle}\, c_n\, (h_j - h_i)^2$ in d dimensions with lattice spacing $a_n$, the continuum gradient coefficient scales as $c_n\, a_n^{(2-d)}$, so for a three-dimensional spatial slice $Z_{spatial}^{(n)} \propto c_n/a_n$. Under midpoint refinement $a_2 = a_1/2$, so continuum stability requires $c_2 = c_1/2$, and the executed values satisfy this exactly: $(1/32)/(a_1/2) = (1/16)/a_1$.

Thus the 1/16 to 1/32 sequence has exactly the engineering scaling expected of a three-dimensional nearest-neighbour gradient stiffness under midpoint refinement. This remains only a structural scaling certificate: the Stage-A physical branch fails its terminal-holonomy admission gate, so neither value may be promoted to the physical Higgs coefficient, and the result is retained as a preregistered check that any future source-derived reversible stiffness must reproduce or explain.

## 4.30 Final Stage-3 obstruction and closure of the Higgs calculation in this paper

The cumulative Higgs calculation has reached a natural stopping point. The following items are closed or sharply identified: the physical common Higgs/completion carrier is fixed; the broken vacuum is stable and the common radial mode is potential-active; the mode is exactly defect-silent, so no operator factoring only through the six-defect differential can generate its physical kinetic residue; pure separable spatial dressing of the uniform common mode cannot fix its local physical norm; the full physical proposal architecture admits radial fact-to-fact motion; the source-defined closure-radial determinant supplies a genuine noncanonical momentum precursor; the TPB-gated finite completion instrument supplies a genuine local Higgs history susceptibility but no spatial $p^2$ coefficient; an independently executable flat covariant transport branch supplies a genuine neighbouring-cell $p^2$ operator with $Z_{(H,T)}^{graph} = 2\, w_T$; the later physically relaxed constitutive-continuity mechanism instead begins spatially at $p^4$; and the Stage-A conductance pair has the correct midpoint-refinement scaling for a three-dimensional edge stiffness but belongs to a physically refused branch.

The remaining issue is therefore not another normalisation trick and not another candidate metric. Formal Stage 3 is equivalent to the following primitive provenance test: does the source-selected history action contain an independently derived reversible term

$$A_T^{rev} = w_T \Sigma_{(\langle ij \rangle)} \|\rho_j - U_{ij} \rho_i\|^2$$

on the physical Higgs-compatible carrier? If yes, the action must return $w_T$, the physical regulator measure, the Higgs embedding and the temporal/spatial conversion from the same admitted branch, after which the physical $p^2$ residue can be evaluated directly. If no, the flat-incidence branch is excluded as the Higgs kinetic mechanism and the physical $p^2$ coefficient must arise from the complete nonlocal, nonfactorising history Schur response. No result presently contained in the corpus decides that fork.

Accordingly, the Higgs carrier, vacuum and fact-direction propagation stand at Stage 3S, while the candidate spatial propagation architectures are structurally identified but not yet source-selected. The unified physical microscopic residue is therefore not issued; formal Stage 3 is not claimed; and observable Stage 4 has not begun. This paper therefore closes the Higgs calculation at Stage 3S, and the reversible-transport provenance problem is promoted to a separate upstream calculation, because it concerns the primitive structure of the action itself rather than another downstream Higgs manipulation.

HIGGS STRUCTURAL STATUS. The Higgs sector closes in this paper at STAGE 3S, not formal Stage 3. The physical common line $q_H = (1/2)(1, 1, 1, 1)$ is exactly identified, defect-silent and potential-active, and its broken vacuum is stable. Defect-mediated Fisher and bath corrections vanish on this line, while pure separable spatial dressing cannot determine its local physical norm. The source-defined closure-radial determinant gives a genuine noncanonical momentum precursor, and the TPB-gated completion instrument gives a nonzero local radial Fisher response $I_\varphi = 4hQ \cos^2\varphi_H/[1 - hQ \sin^2\varphi_H]$, but the latter is local and therefore contributes no spatial $p^2$ term. A separate executable flat covariant transport branch has $R_T(\rho)$*ij = ρ_j − U_ij ρ_i and projects onto the Higgs carrier as H*(H,T) = 2 $w_T B^\dagger B$, giving the explicit graph-coordinate residue $Z_{(H,T)}^{graph} = 2 w_T$. However, the later constitutive current/continuity sector, after physical current relaxation, begins spatially at $p^4$ and gives zero $p^2$ residue, so the two transport descriptions are not yet proved to be the same microscopic object. The final Stage-3 gate is now exact: derive from the primitive source-selected history action whether an independent reversible neighbour stiffness $w_T \|\rho_j - U_{ij} \rho_i\|^2$ exists, and return its physical coefficient, action/momentum normalisation and admitted regulator limit. The Stage-A conductances 1/16 and 1/32 have the correct three-dimensional midpoint-refinement scaling but occur on a physically refused branch and remain diagnostics only. No further Higgs-side algebra is required in this paper; the unresolved problem is promoted to a separate primitive-transport provenance calculation.

## 5. Electromagnetic admission: 7/960

The electromagnetic chain has also been retyped. The 1/128 factor is no longer justified by a post hoc equal-rank decomposition. Under Premise P14 (Pre-Fact Indifference), the unresolved $K = 7$ closure alphabet contains $2^7 = 128$ raw configurations and no pre-fact datum distinguishes one by prior weight. Normalisation therefore fixes

$p_{closure} = 1/128$.

Independently, the attaching/interface audit identifies thirteen canonical transport directions plus one sharp committed-record direction, with the global mode non-transmitting. Under physical TPB saturation the support-rigidity theorem fixes

$\eta$_gate = 14/15.

Hence the strict structural electromagnetic candidate is

p_EM = (1/128)(14/15) = 7/960, p_EM$^{-1}$ = 960/7 = 137.142857142857…

| Quantity | VERSF | Low-energy benchmark | Raw Δ | Grade |
|---|---|---|---|---|
| $\alpha$_EM$^{-1}$ structural candidate | 137.142857143 | 137.035999177 | +0.0780% | Conditional structural; physical TPB and continuum QED bridge open |

ELECTROMAGNETIC VERDICT. The numerical closeness is real but does not license the sentence "VERSF has derived $\alpha(0)$". The outstanding physical obligations are the same-source TPB saturation, a faithful microscopic implementation/consistency bridge, and interface-to-continuum QED matching and running at a declared scale. For this row in particular, Rule D is decisive: the benchmark uncertainty is parts in $10^{10}$, so the entire residual is theoretical, and no $\sigma$-distance is meaningful before a theory covariance exists (F-SM3-7).

## 6. Charged leptons: what was actually earned

The earlier provenance concern about the factor of two in exp(2κ) is resolved: it comes from inverse-area localisation. If L_g = $L_0$ exp(−κg) and the mass magnitude scales as L_g$^{-2}$, then one refinement step produces exp(2κ). With κ = 8/3 the electron-muon ladder is therefore exp(16/3), not an arbitrary doubling chosen to approach 207.

m_μ/m_e = exp(16/3) = 207.1272488898…

The tau extension uses an additional $W_7$/maintenance factor 1/12, giving

m_τ/m_μ = exp(16/3)/12 = 17.2606040742…

The current corpus nevertheless requires a strict downgrade from "parameter-free prediction". The charged-lepton absolute-scale theorem itself calls the electron-muon relation an in-domain mass-independent postdiction, and keeps the discrete one-surviving-channel tau activation open. Later maintenance work strengthens the tau-last ordering and fixes a positive tau-minus-muon demand increment without mass input, but it still does not derive the physical branch-covariant Gram operator or the exact 1/12 mass activation.

| Ratio | VERSF | Observed | Raw Δ | Current grade |
|---|---|---|---|---|
| m_μ/m_e | 207.127248890 | 206.768282708 | +0.1736% | Conditional in-domain postdiction; factor 2 structurally sourced |
| m_τ/m_μ | 17.260604074 | 16.817691845 | +2.6336% | Conditional; exact one-step 1/12 activation still exposed |

CHARGED-LEPTON VERDICT. The electron-muon closeness is a useful structural consistency check, not an out-of-sample validation. The tau number remains more conditional. Absolute electron/muon/tau masses are excluded from the principal evidence table because α_int, v_cl, the projection kernel, the physical branch and running-to-pole bridge are not jointly source-native.

## 7. Gauge and strong-sector response: candidate electroweak readbacks, QCD boundary retyping and global strong-sector progress

The gauge sector requires an especially strict separation between four objects: the HCMR candidate electroweak readbacks, the physical colour response $Z_3$, the conditional Unit Class-Action VBF boundary branch, and the audit-derived history-weighted canonical-wheel precursor. They are related downstream, but they are not the same numerical calculation and none may inherit the provenance grade of another.

### 7.1 The retained HCMR electroweak readbacks

The four-regulator HCMR calculation remains useful as a candidate-response and negative-admission control. It executes a 102-dimensional parent and an 87-dimensional reduced response at four nested regulators, with positivity and second-order convergence, returning reduced D35 gauge weights (1, 5/2, 298) and a stable scalar response $v/\Lambda \approx 0.07496984$. But its physical certificate is refused: the physical readout/score structure, completion residue, common matching scale and continuum scheme are not jointly returned. P_Y is effectively the identity, the original independent CY3′ route fails in the universal candidate, the oriented nonzero branch remains a conjugate pair, and Z_comp is absent. A later representation-resolved ordered transfer conditionally repairs the charged-flavour CY3′ discrepancy to approximately $1.9\times10^{-14}$, a genuine charged-flavour provenance advance that does not retroactively admit the gauge/scalar candidate.

Its two useful measured-facing readbacks are therefore retained at candidate grade:

| Quantity | Candidate return | Benchmark | Raw Δ | Current reading |
|---|---|---|---|---|
| $\sin^2\theta\_W$ | 45/194 = 0.231958763 | 0.23122 (MS-bar) | +0.3195% | Candidate proximity only; physical scale/scheme boundary open |
| $\alpha^{-1}$ | $388\pi/9$ = 135.437549955 | 137.035999177 | −1.1664% | Distinct candidate from the K7 electromagnetic construction |

[Audit note, orientation only under F-SM3-7: against the quoted benchmark uncertainty the weak-angle central-value distance is +12.3 benchmark-σ, so the 0.32% raw proximity does not survive contact with the benchmark precision even before the theory covariance is addressed.]

The HCMR-adjacent value $1/(4\pi)$ is not scored here as a strong-coupling residual. The QCD typing of Sections 7.2 and 7.3 identifies that number differently.

### 7.2 The current colour-response object

The controlling physical quantity remains the colour stiffness $Z_3$, with

$g\_s = Z_3^{-1/2}$, $\alpha\_s = 1/(4\pi Z_3)$.

In the QCD response decomposition this can be written schematically as

$Z_3 = \chi\_dir - \sigma\_aux$,

where the direct colour susceptibility and exact same-order auxiliary Schur relaxation are separately typed microscopic objects. The class-reduced NQTC formulation equivalently writes

$Z_3 = C\_hol \cdot n\_C\hat{}red$.

Later master-action work gives a more microscopic realisation of the same problem. MASD-1 treats U, J and the record/completion morphism Φ as independent variables and introduces the polar bond-compatibility defect

$\mathcal{D}\_B = \Pi\_j\ U\_ij\ \Pi\_i - Pol(\Pi\_j\ \Phi\_ij\hat{}tr\ \Pi\_i)$.

Its mixed Hessian is precisely where a physical gauge/record intertwiner can arise. On the canonical wheel in one adjoint-generator channel MASD executes

$H\_uy = -c\ I_{12}$,

with exact gauge nullity and

$k\_red(\lambda) = a\lambda + bc\lambda/(b\lambda + c)$.

Projecting the unit branch through the frozen gauge isotypes gives

$(K_3, K_2, K\_q)\_unit = (24/5, 35/6, 3/2)$.

MASD is explicit that these unit-weight values certify the mechanism, not the physical coupling. The physical colour response must be obtained from the history-derived common metric, the complete auxiliary reduction and the physical gauge embedding.

MASD also defines, when the factorised separation certificate passes,

$Z\_A = K\_A\hat{}wheel \cdot n\_A$, with $n\_A = (1/d\_A)\ Tr(\mathcal{E}\_A\dagger\ W\_int\hat{}red\ \mathcal{E}\_A)$.

If factor separability does not pass, the direct nonfactorising Z_A must be used instead. Thus the physical strong-coupling problem is no longer “guess one number”: it is a specified common-Hessian execution problem.

### 7.3 The Unit Class-Action branch

A separately preregistered Unit Class-Action branch asks whether the microscopic colour calculation returns

$C\_hol = 1$ and $n\_C\hat{}red = 1$,

together with adjoint isotropy. If so,

$Z_3 = C\_hol \cdot n\_C\hat{}red = 1$,

and therefore

$g\_s = 1$, $\alpha\_s\hat{}VBF(5.80\ TeV) = 1/(4\pi)$.

In the direct-response notation the same branch requires

$\chi\_dir - \sigma\_aux = 1$;

it does not require the stronger separate assertion $\chi\_dir = 1$ with $\sigma\_aux = 0$. The latter would amount to imposing a no-screening subcase that the Unit Class-Action condition itself does not require. The branch fixes its native boundary as $\mu\_R = 5.80$ TeV in the VERSF background-field scheme, VBF, and the number $\alpha\_s$^VBF(5.80 TeV) = $1/(4\pi)$ is therefore a conditional VBF boundary value, not a prediction of $\alpha\_s(M\_Z^2)$.

Its conditions must be displayed explicitly:

| Branch output | Value | Conditions consumed | Open before physical admission |
|---|---|---|---|
| $Z_3$ | 1 | C_hol = 1; n_C^red = 1; adjoint isotropy | Microscopic action-return certificates |
| g_s | 1 | Same | Same |
| $\alpha$_s^VBF | $1/(4\pi)$ | Same, plus canonical field normalisation | RG transport and finite VBF-to-standard-scheme bridge |
| $\mu$_R | 5.80 TeV | Frozen Route-R boundary | Primitive validation of the boundary assignment |
| $\Lambda$_QCD^VBF | ≈ 225.9 MeV | Unit branch, frozen VBF thresholds, one-loop threshold cascade | Physical $Z_3$, higher-order thresholds and finite scheme bridge |

Accordingly, $\alpha$_s^VBF(5.80 TeV) − $\alpha\_s(M\_Z^2)$ is not a physically meaningful VERSF residual. The two operands live at different scales and in different schemes (Rule G).

As transport diagnostics only, the same frozen Unit Class-Action boundary gives

$\alpha$_s^VBF(M_Z) ≈ 0.127935

at one loop. Including the source-provided two-loop beta coefficient while keeping the same sharp frozen top-threshold treatment moves the internal VBF value to

$\alpha$_s^VBF(M_Z) ≈ 0.130598.

The two-loop refinement therefore moves the branch away from, not toward, the conventional 0.1180 comparator. Neither result is scored because the finite VBF-to-standard-scheme bridge remains open. This is useful negative discipline: adding a theoretically required correction was allowed to worsen the apparent proximity rather than being adjusted to improve it.

## 7.4 History-derived canonical-wheel colour precursor

HMGBC-1 independently evaluates the canonical K = 7 history Fisher-Onsager metric. In the defect ordering (C, J, T, R, B, H), its diagonal entries relevant to the isolated colour link-record restriction are

W_CC = W_RR = 12/31, W_BB = 21/124,

while the C-R-B cross pairings vanish on the canonical wheel.

MASD's unit response $k\_red(\lambda) = \lambda + \lambda/(\lambda + 1)$, together with its ordered factor return (24/5, 35/6, 3/2), fixes the corresponding wheel eigenmodes uniquely as

$\lambda_3 = 4$, $\lambda_2 = 5$, $\lambda\_q = 1$.

SMNC can therefore perform a new cross-paper precursor calculation. Under the explicitly declared identification of the isolated MASD C-R-B coefficients with the corresponding HMGBC wheel metric entries,

$a = 12/31$, $b = 12/31$, $c = 21/124$.

For colour,

$K_3$^hist-wheel = $4\cdot(12/31) + (12/31)(21/124)(4) / ((12/31)(4) + 21/124)$,

hence

$K_3$^hist-wheel = 3744/2201 = 1.7010449796.

The same calculation gives

$K_2$^hist-wheel = 1880/899 = 2.0912124583,

and

K_q^hist-wheel = 360/713 = 0.5049088359.

Thus

($K_3$, $K_2$, K_q)_hist-wheel = (1.701045, 2.091212, 0.504909).

Grade: audit-derived finite-regulator precursor, not a physical gauge boundary.

This calculation is deliberately weaker than an HFB return. The identification of the MASD coefficients with the corresponding HMGBC canonical-wheel defect weights is a cross-paper same-carrier inference made by SMNC; HMGBC itself warns that the wheel magnitudes are model-specific and must be recalculated on the full typed carrier. Moreover,

$Z_3$ = $K_3$^hist-wheel · $\pi_3$

only if the separability certificate passes. The physical $\pi_3$, full defect lift and direct nonfactorising HFB response have not yet been returned. No measured strong-sector number is used anywhere in this precursor calculation.

A later deterministic blind integrated attempt does not supersede this with a physical result. Its canonical history branch gives an exact no-screening reduced response, while a conditional seven-source branch gives a stable two-level response only under declared susceptibility inputs; the terminal-holonomy gate subsequently fails, so G_red and the HFB boundary are not issued.

The scientific significance of 1.701045 is therefore not that VERSF has predicted α_s. It is that the colour-response calculation has acquired a nontrivial history-derived finite-cell magnitude without using α_s as an input.

## 7.5 Global strong topology and the strong phase

The global strong sector has advanced independently of the numerical colour-coupling problem.

FGQT-1 closes, on the frozen representation ledger, the faithful gauge group

G_faith = $[SU(3) \times SU(2) \times U(1)_q]/\mathbb{Z}_6 \cong S(U(3) \times U(2))$, together with the complete four-dimensional bundle census and correlated topological-charge lattice.

GQSC-1R then constructs the canonical retained positive transfer and combines it with the faithful topological lattice. Under the ordinary positive full-support completion, the topological character is forced to be trivial and the frozen quark determinant is positive. Consequently,

$\bar{\theta} = 0$

in that retained positive completion. This is not a fitted small number. No measured strong-CP phase or neutron-EDM bound is used to select it.

Its conditions and debts are nevertheless explicit:

| Object | Return | Conditions consumed | Still open |
|---|---|---|---|
| Faithful gauge quotient | S(U(3)×U(2)), exact quotient | Frozen representation ledger | Deeper primitive derivation of the ledger |
| Topological charge lattice | Exact on frozen ledger | FGQT bundle classification | Full continuum chiral gauge measure |
| Retained strong phase | $\bar{\theta} = 0$ | Ordinary positive full-support pushforward; retained positive transfer; positive frozen quark determinant | Full chiral determinant line, continuum global measure, bordism/quantum completion |
| Physical confinement strength | Not identified | Not applicable | Centre-sensitive physical coefficient, transport bridge, global colour execution |
| Physical branch orientation | Not identified | Not applicable | New orientation-odd charged coupling/readout |

The important scientific distinction is therefore: GQSC proves that the current retained ingredients cannot determine the physical triality gap or string-breaking strength. This is an exact non-identifiability result, not an unfinished arithmetic exercise.

## 7.6 Gauge/strong-sector verdict

GAUGE/STRONG VERDICT. The 32 percent strong-coupling residual remains withdrawn as an invalid cross-scale/cross-scheme comparison. The Unit Class-Action value $Z_3 = 1$ remains a conditional branch requiring C_hol = 1 and n_C^red = 1; it is not the physical colour return. The programme has nevertheless progressed beyond a purely formal response object. MASD-1 derives and executes an intrinsic colour-adjoint link-record response, HMGBC-1 independently supplies a history-derived canonical-wheel metric, and, under the explicitly declared SMNC canonical-wheel defect-weight identification, their combination gives the new audit precursor $K_3$^hist-wheel = 3744/2201 = 1.701045. That number is not yet $Z_3$: the full typed defect lift, physical internal colour projection, nonfactorising HFB reduction and common scheme remain open. The latest blind integrated execution likewise issues no physical HFB certificate. Separately, the faithful global topology is substantially closed on the frozen ledger and the retained positive completion returns $\bar{\theta} = 0$, while physical confinement strength and continuum chiral completion remain open.

# 8. Quark flavour: baseline failure, forward $C_3$ return and full-su(8) upgrade

The flavour sector now contains three historically distinct layers. They must not be collapsed into one story.

## 8.1 Layer I: the RRHF target-blind conditional action-level baseline

Under the frozen RRHF premise package, the representation-resolved history functional is differentiated and returns the charged Yukawa tensor at two regulators through independent bosonic and CAR/Fock routes. Measured CKM entries, angles and CP quantities are unavailable to the execution core. This is a genuine conditional action-level derivation. Its CKM output is:

|V_RRHF| = [[0.974818, 0.222964, 0.004198], [0.222926, 0.973988, 0.040639], [0.005895, 0.040427, 0.999165]]

|J_RRHF| = $1.86032934918\times10^{-5}$.

The empirical verdict is bad. The controlling five-row comparison set {│V_us│, │V_ub│, │V_td│, │V_ts│, │J│} gives a diagnostic $\chi^2 \approx 290.5$, dominated by the │V_td│ contribution (≈ 183) and the │J│ contribution (≈ 100). This is the value reproduced by the printed frozen inputs of Section 3, with the │J│ uncertainty taken at its upper value; it is quoted consistently throughout the paper so that a reader re-executing from those inputs obtains the same number. The subscript is deliberately omitted: │V_us│ is calibration-dominated, so the five rows are not five independent predictive degrees of freedom. Restricting to the strictly non-calibration-dominated set {│V_ub│, │V_td│, │V_ts│, │J│} gives $\chi^2 \approx 288.0$ on the same frozen uncertainties, so the failure is essentially unchanged by the cleaner presentation. A returned failure is scientifically more informative than a post-selected success, so SMNC-3 retains it as a principal control result.

| **Quantity** | **RRHF** | **Benchmark** | **Raw Δ** | **Reading** |
|---|---|---|---|---|
| │V_us│ | 0.222964 | 0.22431 | −0.6001% | Calibration-dominated row; not a test of the machinery |
| │V_cb│ | 0.040639 | 0.0407 | −0.1499% | Calibration-dominated row; not a test of the machinery |
| │V_ub│ | 0.004198 | 0.00389 | +7.9177% | Genuine multi-entry output; high |
| │V_td│ | 0.005895 | 0.0086 | −31.4535% | Severe shortfall |
| │V_ts│ | 0.040427 | 0.0415 | −2.5855% | Moderate shortfall |
| │J│ | $1.860329\times10^{-5}$ | $3.16\times10^{-5}$ | −41.1288% | Severe CP shortfall |

Why the calibration-dominated rows are close but not exact: the calibration fixes the leading scales of the input generator, not the output matrix elements. Each CKM entry is re-derived through both Yukawa sectors, their diagonalisation and unitarity, so the returned │V_us│ lands near, rather than exactly on, the calibrated scale. The sub-percent residuals on those rows are the footprint of that processing. An exact match would itself be suspicious, since it would indicate a verbatim readback rather than a calculation.

## 8.2 Layer II: exact axle geometry, but not yet a physical axle

The curvature investigation has established more than a phenomenological ansatz. On the selected sixfold source carrier, parity forbids every odd-power descent into the three-family target. At the lowest admissible even order the descent is quadratic in the source mode, with the unique $C_3$-equivariant lowest-order quadratic representative, whose threefold image projects onto the three-family target. For the normalised source mode the three descended component magnitudes are equal, and the normalised branch magnitude is exactly $1/\sqrt{3}$. This is a real derivational advance: the lowest-order axle shape and its threefold democracy are no longer reconstructed from CKM data.

It does not follow that the physical action installs that axle with the diagnostic coefficient, retains its norm unchanged, selects a particular visible component or assigns it the favourable phase. Those are different typed questions.

## 8.2A Commitment-survival precursor: a parameter-free retention candidate

The physical axle-installation problem contains a retention question which should be kept separate from phase selection and from the magnitude of the axle source itself. Recent commitment-handoff work sharpens that question considerably.

The selected old continuous phase direction is the normalised uniform circulation around the six rim edges of the canonical wheel,

$v_{HX1} = (1/\sqrt{6}) \Sigma_{(a=1)}^6 e_a, \|v_{HX1}\| = 1.$

It lies wholly in the HX1 cycle sector rather than the incidence/coboundary sector. The current explicit primitive phase-cut census is strikingly negative. The FCHI product instrument carries the retained continuous field through an identity factor; the PFDMI phase enters as a left-unitary factor without changing effects or support; the EX2B support projectors are phase independent; and on a rank-stable MASD branch a pure phase variation changes neither the occupied-support projector nor the completion stretch. The record-composition and bond-compatibility defects do generate a nonzero soft Hessian on this phase, but soft dynamical stiffness is not a hard post-commitment tangent cut.

Thus every explicit hard-cut component presently returned by those mechanisms is zero. If these were the complete physical commitment constraints, one would obtain $s_{old} = 1$. That conclusion is still not licensed, because the primitive full-carrier commitment selector remains unreturned.

The topological commitment line supplies a nontrivial candidate for precisely that missing selector. A minimal newly trapped continuation changes the admissible support by a rank-one projector. On the canonical wheel, impose the additional minimality condition that one newly trapped triangular face exports exactly one direction while preserving the wheel covariance. Each triangular face has one private rim edge, and the minimal covariant selector is then

$Q_{exp} = |e_j\rangle\langle e_j|,$

for the private rim direction of the newly trapped face. The surviving tangent projector is

$P_{surv} = I - Q_{exp}.$

Applying it to the uniform HX1 mode gives

$P_{surv} v_{HX1} = (1/\sqrt{6}) \Sigma_{(a\neq j)} e_a, \|P_{surv} v_{HX1}\|^2 = 5/6.$

The survival amplitude is consequently

$s_{old} = \sqrt{(5/6)} = 0.912870929175\ldots,$

and the equivalent principal-angle statement is

$\theta_{com} = \arccos s_{old} = 24.0948425521°.$

This explicitly realises the previously open strictly intermediate case $0 < s_{old} < 1$ without introducing a continuous fitting coefficient.

**Same-action stiffness consequence.** The existing master-action HX1 calculation gives, on the canonical unit branch, $\Delta k = (1 - s_{old}^2)/2$. For the minimal one-face selector,

$$\Delta k = \tfrac{1}{2}(1 - 5/6) = 1/12.$$

The fully relaxed pre-commitment stiffness is 5/2, so the corresponding partially locked unit-branch stiffness is

$$k_{post} = 5/2 + 1/12 = 31/12 = 2.583333333\ldots$$

The result is physically suggestive: commitment need not erase the old continuous phase direction completely. A hard topological cut can remove a definite fraction of its accessible support while leaving a coherent residue.

**Immediate-past response.** The previously derived conditional same-action response is $\Delta q = (\pi/9)\, s_{old}$. The minimal selector therefore gives

$$\Delta q = (\pi/9)\sqrt{5/6} = 0.318652067197\ldots,$$

compared with the uncut value $\pi/9 = 0.349065850399\ldots$ Thus the one-face selector preserves $\sqrt{5/6} = 91.2870929\%$ of the amplitude-level old/present response.

In the canonical normalised two-mode representation, the corresponding surviving mixed overlap is $H_{old,present} = -\sqrt{5/6}$, so the projected unit diagnostic block may be written

$$H_{post} = [\, 3, -\sqrt{5/6}\ ;\ -\sqrt{5/6}, 2\, ].$$

Its determinant is $\det H_{post} = 6 - 5/6 = 31/6 > 0$, and its eigenvalues are

$$\lambda_\pm = (5 \pm \sqrt{13/3})/2 = 1.4591670003\ldots, 3.5408329997\ldots$$

The candidate old/present coupling therefore remains nonzero without destabilising the canonical quadratic block.

**Multi-trap law.** The same construction generalises without introducing a coefficient. If r mutually orthogonal private rim directions are hard-exported, with $0 \le r \le 6$, then $Q_r = \Sigma_{a=1}^{r} |e_a\rangle\langle e_a|$ and the uniform-rim mode gives

$$s_{old}^2(r) = 1 - r/6,\quad s_{old}(r) = \sqrt{1 - r/6},$$

with associated unit-branch stiffness excess and conditional present response

$$\Delta k(r) = r/12,\quad \Delta q(r) = (\pi/9)\sqrt{1 - r/6}.$$

The six-rim carrier therefore gives a discrete commitment-survival staircase rather than a free continuous attenuation parameter.

| r | s_old | Δk |
|---|---|---|
| 0 | 1 | 0 |
| 1 | $\sqrt{5/6} = 0.912871$ | 1/12 |
| 2 | $\sqrt{2/3} = 0.816497$ | 1/6 |
| 3 | $1/\sqrt{2} = 0.707107$ | 1/4 |
| 4 | $1/\sqrt{3} = 0.577350$ | 1/3 |
| 5 | $1/\sqrt{6} = 0.408248$ | 5/12 |

| r | s_old | Δk |
|---|---|---|
| 6 | 0 | 1/2 |

**Provenance firewall.** This calculation does not yet determine the physical CKM axle retention. Two independent identifications remain unproved. First, the private-rim hard selector is presently an exact topological/construction-level realization; the existing common PFDMI/MASD action does not yet generate the required trap-controlled projector as its physical commitment Kraus control. Second, the selected HX1 old-phase direction is a commitment/record-phase carrier, while the physical CKM axle lives in the charged-completion/family carrier, and no same-action theorem presently proves that the axle-retention degree of freedom descends from, is isometric to, or inherits the survival projector of the HX1 uniform-rim phase.

Accordingly s_old = √(5/6) is a parameter-free commitment-survival precursor, not a CKM input. It may not be substituted for the retention factor of the favourable 150° axle execution, and none of the CKM matrix elements, triangle angles or J values in this paper is changed by the present calculation.

COMMITMENT-SURVIVAL PRECURSOR VERDICT. The arbitrary interval 0 ≤ s_old ≤ 1 has been narrowed by an exact coefficient-free candidate mechanism. A minimal covariant one-face hard commitment selector on the six-rim HX1 carrier gives s_old = √(5/6), Δk = 1/12 and a nonzero surviving old/present response. Physical promotion now requires two source-native bridges: generation of the trap-controlled selector by the common action, and identification of the resulting survival carrier with the physical charged-completion axle-retention carrier.

## 8.3 Local phase-selection audit: the favourable branch is not returned

The later completion-jet calculation resolves a previously ambiguous point. The generation-sensitive charged-completion jet is component-preserving. On the relevant branch plane its Gram matrix is proportional to the identity, with equal quadrature strength and zero overlap. The local completion attachment therefore supplies no preferred phase.

This matters directly for the earlier execution. The descended image contains component phases differing by 2π/3. A component-preserving readout can therefore expose 150°, 30° or 270°, depending on which component and orientation are physically selected. But the 150° candidate was not derived, and the later local-metric audit shows that no local phase is preferred. The current physical statement is therefore:

The 150°, 30° and 270° executions are all physically unreturned. The 150° case remains scientifically useful because it demonstrates what the derived axle form is capable of producing, but its empirical success cannot select it.

## 8.4 Reduced-family closed holonomy and the orientation correction

A separate phase result survives the local no-go. The frozen role-odd quark generator, as printed in the flavour source, defines the reduced-family comparison between the direct route 1→3 and the indirect route 1→2→3. The resulting object is a closed, family-rephasing-invariant holonomy: endpoint phases cancel exactly around the triangle.

There is, however, an orientation-label correction. Direct substitution of the printed generator entries into the printed loop definition gives arg W_forward = 7π/6, so

arg W_Δ(forward) = 210°,

while the reversed/conjugate loop gives

arg $W_\Delta$(reverse) = $5\pi/6 = 150°$.

Thus the substantive exact result is the conjugate pair

{ $\exp(+i\cdot5\pi/6)$, $\exp(-i\cdot5\pi/6)$ }, equivalently { 150°, 210° }.

The source paper prints the same conjugate pair but attaches the forward/reverse labels oppositely. With the matrix, transition indices and loop definition printed there, the algebra fixes the labels as 210° forward and 150° reverse. If 150° was intended to denote the forward loop, one of those orientation conventions must instead be reversed explicitly.

**Corrected D32 grade:** exact reduced-family closed holonomy conjugate pair; forward/reverse orientation label corrected.

## 8.5 The physical D33 axle-loop problem remains open

The physical axle phase is not the phase of an arbitrary family triangle. HCFC defines the axle phase Lax through two admissible charged-completion histories $\gamma_0$ and $\gamma_{ax}$ having the same preparation and the same final charged record, where $\gamma_{ax}$ contains the role-even axle transport.

The required same-action theorem must establish a physical carrier/history map such that

$\mathrm{Hol}(\gamma_{ax}\,\gamma_0^{-1}) = \exp(+i\cdot5\pi/6)$, or $\mathrm{Hol}(\gamma_{ax}\,\gamma_0^{-1}) = \exp(-i\cdot5\pi/6)$,

or return a different holonomy or no realised comparison loop at all.

No current theorem supplies that identification. In particular, RRHF-AX1 cannot be used to prove it because AX1 conditionally inserts the very axle whose physical realisation is under test. That would be circular. The general holonomy-assignment theorem strengthens the logic once a physical comparison loop is supplied, since physically distinct closed-loop holonomies cannot float freely over fixed distinguishability data, but its constructive route still requires comparison-loop realisability.

The current result is therefore: there is now a source-frozen closed holonomy with exactly the phenomenologically interesting phase magnitude, but VERSF has not yet proved that the physical charged-completion axle loop inherits it.

## 8.6 CKM numerical confrontation: controlling return versus branch diagnostics

The one-matrix rule now becomes especially important. The RRHF matrix remains the controlling conditional action-level CKM return. The curvature executions are diagnostic until the physical axle coefficient, retention, readout and phase carrier are returned by the action.

| **Execution** | **$\lvert V_{ub}\rvert$** | **$\lvert V_{td}\rvert$** | **Diagnostic $\chi^2$ (five rows)** | **Grade** |
|---|---|---|---|---|
| RRHF, no axle | 0.004198 | 0.005895 | 290.5 (five-row diagnostic) | Controlling conditional action-level return |
| Axle, 150° | 0.003557 | 0.008690 | about 5.3 | Quarantined diagnostic; physical phase not returned |
| Axle, 30° | 0.006541 | 0.004859 | about 539 | Unreturned branch diagnostic |
| Axle, 270° | 0.003372 | 0.005763 | about 1032 | Unreturned branch diagnostic |

These branch results show why phase provenance is load-bearing: the same derived axle geometry can improve the fit dramatically or make it substantially worse depending on a phase/readout which the physical action has not yet selected.

For the 150° diagnostic branch alone, the previously quoted values $\alpha \approx 84.5°$, $\beta \approx 22.5°$, $\gamma \approx 73.0°$ and $|J| \approx 3.00\times10^{-5}$ remain valid branch consequences. They are not the current VERSF CKM prediction. In particular, the roughly 10% high value of $\gamma$ is a tension of the favourable diagnostic branch, not of the controlling RRHF return.

The full-su(8) symbolic theorem remains useful, but its meaning must be stated carefully: it shows that a specified branch form can survive the full embedding at leading order under its named premises. It does not override the later physical-carrier result that the readout and phase are unselected.

The new commitment-survival calculation does not alter the one-matrix rule. It supplies a coefficient-free candidate $s_{old} = \sqrt{5/6}$ for a different but potentially upstream continuous phase carrier under a specific minimal topological selector. No same-action theorem yet identifies that HX1 survival amplitude with the physical $C_3$ axle-retention coefficient. SMNC therefore performs no retrospective rescaling of the 150°, 30° or 270° branch calculations. Doing so would violate both the typed-object precedence rule and the no-target-rescue rule. The significance of the calculation is instead that the retention debt in physical axle installation is no longer an unconstrained scalar question: there is now a parameter-free source-structured candidate which the physical charged-completion calculation can either reproduce or reject.

CURRENT CKM PROVENANCE BOUNDARY. RRHF remains the only controlling returned CKM matrix. The programme has derived the unique lowest-order quadratic axle geometry, its exact threefold democracy and a source-side generation-character descent; a full-su(8) theorem conditionally preserves the specified branch structure. Later physical-carrier execution nevertheless shows that the completion jet is component-preserving and locally phase-isotropic, so no physical visible component or phase has been returned. An exact reduced-family closed holonomy with conjugate phases 150°/210° exists independently of CKM data, with the forward/reverse labels corrected under the printed matrix convention, but the physical loop inheritance remains open. The commitment-survival programme now adds a parameter-free precursor: on the minimal one-face private-rim selector the six-rim HX1 phase survives with amplitude $\sqrt{5/6}$. This does not yet supply the CKM axle-retention factor because neither the physical trap-control provenance nor the HX1-to-charged-completion carrier bridge is established. Therefore no CKM branch is rescaled by $\sqrt{5/6}$, and the curvature-corrected CKM matrix remains a quarantined diagnostic rather than the controlling VERSF prediction.

## 9. Neutral sector and PMNS: numerical comparison intentionally withheld

The current NSTC execution contract proves that the neutral sector is not ready for an evidential PMNS comparison. Direct same-action $Y_\nu$, $M_R$ and $M_L$ arrays are absent; the physical readout and branch are unselected; the absolute scale is non-identifiable; and an inverse-construction theorem shows that target spectra and mixing matrices can be reproduced by families of supplied inputs. The physical neutral certificate is therefore refused.

NEUTRAL-SECTOR RULE. No PMNS angle, neutrino mass hierarchy or leptonic CP number is counted in SMNC-3. A comparison before the source-complete neutral operator is returned would be mathematically non-evidential and would violate the same anti-forgery standard used in the charged sectors.

## 10. Consolidated numerical confrontation ledger

This is the controlling status ledger of the paper. Every other status surface, the opening status box, the general-reader scoreboard, the front stage table, the abstract, the derivation ledger of Section 13.1, the sector ledger of Section 13.2 and the final status box, is a summary of this table and must be updated from it rather than independently. Where any of them appears to disagree with a row here, this table governs. The table ranks numerical contacts only after provenance has been attached, and, per Rule F, states beside every number the conditions consumed in obtaining it and the physical-admission debts still open. It deliberately mixes close and bad rows because omitting failed rows would make the audit scientifically weaker. A skeptical reader can take any single row and see what VERSF has derived, what it has assumed, and what still has to be proved.

| Quantity | VERSF | Benchmark | Raw Δ | Grade | Conditions consumed | Open physical debts |
|---|---|---|---|---|---|---|
| Higgs m_H/v | 0.507936508 | 0.508204766 | −0.0528% | Conditional numerical return; associated Higgs mechanism now Stage-3S structural | K = 7 closure cardinality; eight-direction completion carrier; traceless su(8) deformation; Killing-uniform weighting; linear curvature action; common completion character; stable broken vacuum; exact physical common line c_H = (1/2)(1, 1, 1, 1); full-187 one-Fact kinetic mechanism | Physical operational metric g_H = q_H† G_op^phys q_H; actual multi-cell history generator; absolute fact-time/scale conversion; full relaxed higher radial response; electroweak pole/threshold bridge |
| K7 $\alpha^{-1}$ candidate | 137.142857143 | 137.035999177 | +0.0780% | Conditional structural | P14 Pre-Fact Indifference; $2^7 = 128$ pre-fact alternatives; physical TPB saturation of 13 transport + 1 record direction; global mode annihilated | Microscopic interface implementation; continuum-QED matching and running |
| Higgs λ_H | 0.128999748 | 0.129136042 | −0.1055% | Conditional numerical return; correlated with m_H/v (F-SM3-6) | Same 32/63 structural stack; completion contribution $K_{4,\text{comp}} = 0$ at declared quadratic completion order; physical common radial | Complete source-native relaxed $K_4$; physical G_op and fact-time normalisation; absolute scale and pole transport |

| Quantity | VERSF | Benchmark | Raw Δ | Grade | Conditions consumed | Open physical debts |
|---|---|---|---|---|---|---|
| | | | | | carrier and kinetic mechanism structurally identified | |
| Higgs common-mode physical-normalisation structure | q_H = (1/2)(1, 1, 1, 1); J_D q_H = 0; defect/bath correction = 0; spatial-Laplacian no-go; g_H^pack = (1 + δ_H)^(2/d_op) conditionally | No empirical comparator | not scored | Stage-3S structural; physical normalisation and source-selection of the spatial two-derivative mechanism open | Faithful common line; rank-183 defect image in the 187-dimensional physical tangent; multi-cell uniform-mode projection; defect/bath Schur structure; operational distinguishability-counting metric | Same-source proof that the distinguishability metric is the physical one-Fact G_op^phys; physical d_op; Higgs-point admissible-sector census; physical a_t; two-level regulator stability |
| Closure-radial spatial residue (cubic surrogate) | Z_ρ^(3,cubic) = 0.252731009859 | No empirical comparator | not scored | Audit-derived infinite-volume surrogate precursor | Source-defined closure-norm action for ρ (closure magnitude minus one); Gaussian compact-phase integration; periodic-cubic coordination-six surrogate; Gaussian determinant order | Exact physical closure cell-adjacency graph; four-dimensional completion; remaining Schur blocks |
| Conditional four-dimensional phase residue | Z_(ρ,phase)^(4) = 0.154933390231 | No empirical comparator | not scored | Conditional bridge precursor | Minimal σ-covariant temporal extension of the same ρ-dependent link law; isotropic four-dimensional surrogate | Source-native derivation of the ρ-dependent temporal law; physical carrier; remaining relaxation stack; ρ-to-common-line amplitude s_H |
| Recurrent population direct Higgs score | 0 on the presently executed population instrument | No empirical comparator | not scored | Closed negative on that reduced instrument | Recurrent Kraus law uses route-support factors and hazards but not φ_H or the positive polar completion magnitude | Does not imply physical Higgs blindness; a full radial mark must retain the positive completion amplitude |

| Quantity | VERSF | Benchmark | Raw Δ | Grade | Conditions consumed | Open physical debts |
|---|---|---|---|---|---|---|
| TPB-gated local Higgs Fisher response | I_φ = 4hQ $\cos^2$φ_H/[1 − hQ $\sin^2$φ_H]; I_φ(0) = 4hQ | No empirical comparator | not scored | Conditional action-level radial susceptibility | Finite nonlinear completion instrument plus TPB stage hazard; Q = Tr(A†Aρ) | Local only: no inter-cell Hessian and therefore no spatial $p^2$ residue |
| Flat-incidence Higgs transport | Z_(H,T)^graph = 2 w_T; unit-weight baseline 2 | No empirical comparator | not scored | Conditional transport baseline / Stage-3S mechanism | R_T(ρ)_ij = ρ_j − U_ij ρ_i; covariantly parallel Higgs embedding; residual-Hessian convention | Physical w_T, regulator measure, continuum momentum/action normalisation and compatibility with the constitutive sector unresolved |
| Relaxed constitutive spatial residue | Z_H^space = 0 at $k^2$; leading static term at $k^4$ | No empirical comparator | not scored | Exact reduction of the declared constitutive-continuity sector | Positive local weights; physical Schur relaxation of the longitudinal current | Full nonfactorising history sector could still modify the result; relation to the flat-incidence baseline unresolved |
| Reversible-edge refinement scaling | $c_1$ = 1/16, $c_2$ = 1/32 with $c_2 = c_1/2$ | No empirical comparator | not scored | Exact structural scaling check | Midpoint refinement; three-dimensional spatial gradient interpretation | Stage-A physical branch fails terminal holonomy; values may not be promoted to Z_H |
| Higgs common-mode canonical kernel | K_H^can(ω) = 1/2 + 4a_t$^{-2}$ $\sin^2$(ω/2); g_H^can = 1; unit-step E_H = ln 2 | No empirical comparator | not scored | Canonical diagnostic within Stage 3S | Canonically whitened G_op = I; faithful K_H = 1/2; exact full-tangent proposal | Canonical unity must not be promoted; physical local packing contrast, operational-metric bridge and fact clock still required |
| μ/e | 207.127248890 | 206.768282708 | +0.1736% | Conditional postdiction | Localisation L_g = $L_0$ exp(−κg) with κ = 8/3; mass magnitude ∝ L_g$^{-2}$; same localisation law across generations | Primitive derivation of the localisation law; absolute mass scale and pole bridge |
| HCMR $\sin^2$θ_W | 0.231958763 | 0.23122 | +0.3195% | Candidate readback | Four-regulator HCMR candidate; declared gauge | Physical P_Y, branch/score law, |

| Quantity | VERSF | Benchmark | Raw Δ | Grade | Conditions consumed | Open physical debts |
|---|---|---|---|---|---|---|
| | | | | | readout; candidate branch and score architecture | Z_comp, matching scale, common scheme and continuum transport remain open |
| $C_3$ CKM α | 84.5° | 84.1° | +0.4756% | QUARANTINED 150° BRANCH DIAGNOSTIC | Physical axle installed at the diagnostic coefficient; 150° axle phase; favourable orientation and readout; adopted magnitude b/√3; multiplicity retention fixed. These conditions are not presently returned | Lax inheritance (D33); physical branch/readout; axle coefficient |
| $C_3$ CKM β | 22.5° | 22.617° | −0.5193% | QUARANTINED 150° BRANCH DIAGNOSTIC; comparator inferred from sin 2β | Physical axle installed at the diagnostic coefficient; 150° axle phase; favourable orientation and readout; adopted magnitude b/√3; multiplicity retention fixed. These conditions are not presently returned | Lax inheritance (D33); physical branch/readout; axle coefficient |
| HCMR $\alpha^{-1}$ | 135.437549955 | 137.035999177 | −1.1664% | Candidate readback | Four-regulator HCMR candidate; declared gauge readout; candidate branch and score architecture | Physical P_Y, branch/score law, Z_comp, matching scale, common scheme and continuum transport remain open |
| τ/μ | 17.260604074 | 16.817691845 | +2.6336% | Conditional consistency | Localisation $L_g = L_0 \exp(-\kappa g)$ with κ = 8/3; mass magnitude $\propto L_g^{-2}$; same localisation law | Exact physical Gram/projector derivation of the activation |

| Quantity | VERSF | Benchmark | Raw Δ | Grade | Conditions consumed | Open physical debts |
|---|---|---|---|---|---|---|
| | | | | | across generations; plus one-surviving-channel 1/12 activation | |
| RRHF V_ub | 0.004198 | 0.00389 | +7.9177% | Target-blind action-level | Frozen representation ledger; RCMO maintenance operators; FRGM quark transport; exterior-algebra lift; regulator premise package | Primitive uniqueness of the inherited objects; physical absolute scale; continuum flavour bridge |
| $C_3$ V_ub | 0.003557 | 0.00389 | −8.5604% | QUARANTINED 150° BRANCH DIAGNOSTIC | Physical axle installed at the diagnostic coefficient; 150° axle phase; favourable orientation and readout; adopted magnitude b/√3; multiplicity retention fixed. These conditions are not presently returned | Lax inheritance (D33); physical branch/readout; axle coefficient |
| $C_3$ γ | 73.0° | 66.4° | +9.9398% | QUARANTINED 150° BRANCH DIAGNOSTIC; main tension of the favourable branch | Physical axle installed at the diagnostic coefficient; 150° axle phase; favourable orientation and readout; adopted magnitude b/√3; multiplicity retention fixed. These conditions are not presently returned | Lax inheritance (D33); physical branch/readout; axle coefficient |
| RRHF V_td | 0.005895 | 0.0086 | −31.4535% | Target-blind action-level; severe returned failure | Frozen representation ledger; RCMO maintenance operators; FRGM quark transport; | Primitive uniqueness of the inherited objects; physical absolute scale; |

| Quantity | VERSF | Benchmark | Raw Δ | Grade | Conditions consumed | Open physical debts |
|---|---|---|---|---|---|---|
| | | | | | exterior-algebra lift; regulator premise package | continuum flavour bridge |
| RRHF J | $1.860329\times10^{-5}$ | $3.16\times10^{-5}$ | −41.1288% | Target-blind action-level; severe CP failure | Frozen representation ledger; RCMO maintenance operators; FRGM quark transport; exterior-algebra lift; regulator premise package | Primitive uniqueness of the inherited objects; physical absolute scale; continuum flavour bridge |
| $C_3$ J | $3.00\times10^{-5}$ | $3.16\times10^{-5}$ | −5.0633% | QUARANTINED 150° BRANCH DIAGNOSTIC | Physical axle installed at the diagnostic coefficient; 150° axle phase; favourable orientation and readout; adopted magnitude $b/\sqrt{3}$; multiplicity retention fixed. These conditions are not presently returned | Lax inheritance (D33); physical branch/readout; axle coefficient |
| Axle/phase-retention precursor | $s_{old} = \sqrt{(5/6)} = 0.9128709292$; $\Delta k = 1/12$ | No empirical comparator; not itself an SM observable | not scored | Exact on constructed minimal selector / cross-programme precursor | Uniform six-rim HX1 cycle; one newly trapped face; one-direction private-rim hard export; minimality and wheel covariance; inherited unit-branch survival law | Same-action trap-controlled projector; proof that physical charged-completion axle retention uses the same carrier/projector; no substitution into CKM before those bridges close |
| History-weighted wheel colour precursor $K_3$ | $3744/2201 = 1.70104498$ | No empirical comparator; not $Z_3$ | not scored | Audit-derived finite-regulator precursor | MASD isolated adjoint C-R-B response; SMNC mode identification $\lambda_3 = 4$ inferred uniquely from the MASD exact unit | Full defect lift; physical $W_{int}^{red}$; $\pi_3$ or direct nonfactorising $Z_3$; HFB certificate; scale/scheme transport |

| Quantity | VERSF | Benchmark | Raw Δ | Grade | Conditions consumed | Open physical debts |
|---|---|---|---|---|---|---|
| | | | | | formula, wheel spectrum and ordered factor triple; HMGBC canonical history metric; SMNC audit identification a = W_CC, b = W_RR, c = W_BB on that restriction | |
| Unit-branch α_s^VBF | 1/(4π) at 5.80 TeV | Not directly compared with α_s(M_Z²) | not scored | Conditional VBF boundary branch | C_hol = 1; n_C^red = 1; adjoint isotropy; Route-R boundary; canonical normalisation | Microscopic unit certificates; RG transport; finite scheme bridge |
| Unit-branch Λ_QCD | ≈ 225.9 MeV | No conventional comparison admitted yet | not scored | Conditional native-scheme branch output | Unit branch; 5.80 TeV boundary; frozen VBF thresholds; one-loop decoupling | Physical $Z_3$; common-scheme threshold masses; finite scheme bridge |
| Retained strong phase θ̄ | exactly 0 | Consistent with null strong-CP observation; no EDM comparison executed | not scored | Strong retained conditional zero | FGQT lattice; ordinary positive full-support pushforward; retained positive transfer; positive frozen quark determinant | Full continuum chiral measure; determinant-line/bordism completion; observable EDM calculation |

Source note: Raw percentage error is reported for orientation only. It is not a likelihood, p-value or global evidence score. Rows sharing measured inputs (notably m_H/v and λ_H) are correlated (F-SM3-6).

CKM diagnostic firewall. The CKM rows are retained because they quantify the consequences of the derived axle geometry on its historically favourable branch. They are excluded from the evidential count until the physical charged-completion loop, axle coefficient, retention and readout are returned by the source action. RRHF remains the only controlling CKM matrix.

Retention-precursor firewall. The √(5/6) row is included because physical axle retention is already a named debt in the CKM provenance chain. It is not a measured-facing Standard-Model prediction and contributes no independent numerical-contact evidence. Its role is analogous to the history-weighted colour precursor: it converts an open scalar degree of freedom into a concrete source-structured finite-carrier calculation whose physical lift can now be tested.

Strong-coupling comparison firewall. Neither the Unit Class-Action boundary nor the history-weighted wheel precursor is scored against α_s(M_Z²). The former is a conditional VBF boundary branch; the latter is not yet $Z_3$ at all. A measured-facing residual becomes admissible only after one history-selected HFB execution returns the physical $Z_3$, followed by frozen RG, thresholds and finite scheme conversion.

## 11. The source-locked confrontation theorem

**Theorem SMNC-3.1 (Source-Locked Confrontation Admissibility).** Let O_V be a VERSF observable candidate, and let D be a measured Standard-Model benchmark. A numerical comparison is evidentially admissible only if:

(i) the carrier, branch, normalisation and formula defining O_V are frozen before D is used;

(ii) any calibrated or inherited experimental alignment is declared and not counted as a new prediction;

(iii) all same-branch companion outputs, including failures, are retained;

(iv) no alternative branch or coefficient is selected because it reduces |O_V − D|; and

(v) physical language is limited to the grade actually achieved by the source chain.

Under these conditions a small residual is a numerical contact, not automatically a validation; violation of any condition converts the row to diagnostic or quarantined status. ■

Corollary 11.1 (Historical knowledge is different from numerical insertion). A formula developed after an experimental result is known can still be a legitimate postdiction if the final derivation does not use the target as a coefficient or selector. It cannot be described as a historically blind prospective prediction.

Corollary 11.2 (Source progress can upgrade a former diagnostic). If a later forward calculation returns a previously reconstructed object from independent source premises, the object may be regraded prospectively from that later calculation onward. That upgrade does not retroactively make the original discovery historically blind, and it is severable: the geometric antecedent can be regraded while the phase remains diagnostic. The $C_3$ axle geometry is the principal example in the present corpus; its phase is the principal counterexample.

Corollary 11.3 (Different typed objects coexist). A conditional full-su(8) curvature theorem does not supersede the RRHF baseline matrix unless the same physical action actually installs that curvature and the programme-level admission rules select the resulting branch. Therefore SMNC-3 retains both the poor RRHF baseline and the improved conditional $C_3$ confrontation.

## 12. What is strongest now?

| Rank | Object | Correct current reading |
|---|---|---|
| 1 | m_H/v = 32/63 | Strongest scale-free structural numerical contact |
| 2 | p_EM = 7/960 | Sharp structural candidate; physical TPB/QED bridge open |
| 3 | Quark axle geometry and closed-family holonomy pair | Major structural flavour advance; not yet a physical CKM correction |
| 4 | RRHF target-blind charged tensor | Only controlling returned CKM matrix; empirically poor but genuinely blind |
| 5 | exp(16/3) lepton step | Close conditional/postdictive structural contact |
| 6 | Faithful global gauge topology / retained strong phase | Exact S(U(3)×U(2)) quotient and charge lattice on the frozen ledger; retained positive completion gives $\bar{\theta} = 0$; continuum completion open |

| Rank | Object | Correct current reading |
|---|---|---|
| 7 | QCD colour-response architecture and history-weighted wheel precursor | Physical α_s remains open, but MASD/HMGBC now yield a nontrivial source-side finite-cell precursor $K_3$ = 3744/2201 = 1.701045; full $\mathfrak{n}_3$/HFB reduction still required |

The new commitment-survival precursor is deliberately not ranked as Standard-Model numerical evidence, because s_old is not itself a measured Standard-Model parameter and its carrier has not yet been identified with the CKM axle. Its importance is methodological: under the minimal private-rim selector the formerly free survival parameter becomes the exact structural value √(5/6). It therefore supplies a sharp check for the physical axle-installation calculation without being allowed to influence the CKM comparison in advance.

## 13. What would have to be closed before VERSF could claim a conditional numerical derivation of the Standard Model?

The numerical contacts established in this paper do not by themselves constitute a derivation of the Standard Model parameter set. A stronger claim becomes legitimate only when the relevant Standard-Model quantities are returned from source-side VERSF structures, their load-bearing premises are explicit, physical carriers and branches are selected without empirical target access, and scale/scheme transport is performed only after the microscopic values have been frozen.

Distance from that destination is graded on a transparent five-stage closure scale rather than an invented percentage:

| Stage | Meaning |
|---|---|
| 0. Architecture | Formula/object defined, but no source-side number. |
| 1. Structural precursor | Source-side structure or finite-cell number exists. |
| 2. Conditional numerical return | A numerical value follows from a named premise stack without using the target. |
| 3. Physical microscopic return | The same action returns the carrier, branch, normalisation and number. |
| 4. Observable closure | RG/scheme/threshold/pole transport completed and compared with experiment. |
| 5. Unified conditional Standard-Model derivation | All major sectors are returned from one compatible source-selected framework/branch with no target rescue. |

### 13.1 Derivation-by-derivation stage ledger

The sector table below can hide important differences between objects within the same sector. The following ledger therefore grades the principal individual VERSF derivations themselves. “3S” denotes structural Stage 3 as defined above; it is not counted as formally physically admitted Stage 3.

| Derivation / returned object | Current stage | Why it is at this stage | What prevents the next stage |
|---|---|---|---|
| Higgs ratio m_H/v = 32/63 | 2 | Exact numerical value follows from the declared K = 7 / eight- | The ratio has not yet been returned as the final invariant |

| Derivation / returned object | Current stage | Why it is at this stage | What prevents the next stage |
|---|---|---|---|
| | | direction / su(8) premise stack without use of the measured Higgs target | of one physically normalised multi-cell master action |
| Higgs quartic λ_H = 512/3969 | 2 | Exact conditional numerical consequence of the same 32/63 scalar branch | Correlated with the Higgs ratio; complete relaxed $K_4$ and physical normalisation still open |
| Fact-handoff radial coordinate χ = 2 arcsin√a | 2 / structural | Exact source-side Fisher coordinate with unit radial metric and exact orthogonality to successor identity | Same-source physical identification with the full continuum scalar normalisation is not by itself an observable closure |
| Common Higgs/completion carrier q_H = (1/2)(1, 1, 1, 1) | 3S | Exact physical direction; defect-silent, potential-active and contained in the full physical tangent | Physical metric and fact-clock normalisation remain open |
| Defect/bath protection and multi-cell common-mode no-go | 3S structural | J_D q_H = 0 implies J_D† M J_D q_H = 0 for every defect-space operator; pure L_N ⊗ B spatial dressing also annihilates the uniform common mode | Does not itself return the direct full-tangent physical metric |
| Operational-packing common-mode metric | 2 / 3S bridge | Distinguishability counting gives g_H^pack = [V_op ρ_op(x_H)]^(2/d_op) = (1 + δ_H)^(2/d_op) and reduces the debt to one local packing contrast | Actual Higgs-point admissible-sector census, d_op, same-source identification with the physical one-Fact metric, a_t and regulator convergence are not returned |
| Closure-radial spatial residue Z_ρ^(3) = 0.252731009859 | 2 / 3S precursor | Directly calculated from the source-defined phase determinant before canonical rescaling; infinite-volume cubic-surrogate value | Physical closure graph and four-dimensional temporal completion |
| Conditional 4D phase residue Z_(ρ,phase)^(4) = 0.154933390231 | 2 / 3S bridge | Unique value on the minimal isotropic σ-covariant extension, with clean regulator convergence on the surrogate | The source has not yet proved that the ρ-dependent temporal law follows from σ; other Schur sectors remain |
| HMGBC relaxed completion- | 2 / 3S structural bridge | Exact elimination gives K_(Ω,eff) = P_H$^{(R\dagger)[W_H - W_H(W_H + \Delta)^{-1}W_H]P_H}$R; for a | The published Δ_Ω is generation-depth geometry, |

| Derivation / returned object | Current stage | Why it is at this stage | What prevents the next stage |
|---|---|---|---|
| resolvent derivative | | correctly typed $\Delta(p) = p^2\Delta_2 + O(p^4)$ the leading coefficient is $P\_H^{(R\dagger)\Delta_2 P\_H}R$, independent of W_H | not the physical spacetime momentum operator |
| Covariant structured Higgs edge transport | 2 / 3S bridge | $\mathcal{O}$_H = V_H†X_H = r S_H is the typed completion field; on a covariantly parallel radial background the history Dirichlet form gives D_H^dir = c_F‖S_H‖_op$^2$ | Fixes typing rather than normalisation; physical conductance and section norm remain open |
| Recurrent population Higgs score | 1 / closed negative on the reduced instrument | The executed recurrent population Kraus law contains route support and hazards but no φ_H-dependent positive completion magnitude, so its direct radial score is exactly zero | A full radial marked law must retain the positive completion response; zero on this reduction is not a physical Z_H result |
| TPB-gated radial history susceptibility | 2 / 3S precursor | Exact nonlinear marked completion law gives I_φ = 4hQ $\cos^2$φ_H/[1 − hQ $\sin^2$φ_H] with limit 4hQ | Local in cell position, therefore no spatial $p^2$ coefficient |
| Flat covariant Higgs incidence transport | 2 / 3S bridge | R_T(ρ)*ij = ρ_j − U_ij ρ_i gives H_T = 2 w_T B_U†B_U, projecting onto the Higgs carrier as* $Z$(H,T)^graph = 2 w_T | w_T, physical momentum/action normalisation and compatibility with the constitutive sector unresolved |
| Relaxed constitutive derivative order | 2 / exact negative | Longitudinal reduction and exact Schur elimination give K_JT(0, k) ∝ $k^4$, so the spatial $p^2$ coefficient vanishes | Whether the retained physical sector should relax the current at all remains open |
| Two-level conductance refinement scaling | 1–2 precursor | $c_1 = 1/16$ and $c_2 = 1/32$ satisfy the exact three-dimensional midpoint-refinement condition $c_2 = c_1/2$ | Stage-A branch fails physical admission; values are preregistered checks only |
| Complete physical radial residue Z_H^micro | 3S / open numerical boundary | Exact momentum Schur formula known; closure determinant supplies one nonzero contribution; flat transport supplies an explicit $p^2$ projection while the relaxed | The reversible-stiffness provenance fork is undecided; physical coefficient, normalisation, fact clock and regulator limit all remain owed |

| Derivation / returned object | Current stage | Why it is at this stage | What prevents the next stage |
|---|---|---|---|
| | | constitutive sector supplies none | |
| Canonical Higgs kernel $K\_H^{can}(\omega) = 1/2 + 4a\_t^{-2} \sin^2(\omega/2)$ | 2 / 3S diagnostic | Exact on the operationally whitened canonical branch | G_op = I is not a physical residue theorem; E_H = ln 2 at a_t = 1 remains an internal identity only |
| K7 electromagnetic 7/960 | 2 | Exact target-independent numerical consequence of P14 plus the 14/15 transmitting-support premise | Physical TPB saturation, microscopic interface implementation and continuum-QED matching/running |
| Charged-lepton μ/e = exp(16/3) | 2 | Conditional source-side numerical return with the factor of two structurally traced to inverse-area localisation | Primitive derivation of localisation law and physical mass/pole bridge |
| Charged-lepton τ/μ = exp(16/3)/12 | 2 | Numerical return exists on the named one-surviving-channel activation premise | Exact physical Gram/projector derivation of the 1/12 activation |
| HCMR weak-angle 45/194 | 2 candidate | Frozen finite-regulator numerical return with convergence | Physical score/readout, completion residue, common scale and scheme are refused/open |
| HCMR inverse-α 388π/9 | 2 candidate | Same finite-regulator candidate branch returns a definite value | Same physical-admission failures as the weak-angle return |
| History-weighted colour precursor $K_3$ = 3744/2201 | 1 | Nontrivial source-side finite-cell number obtained by SMNC cross-paper composition | Common-carrier identification is an audit inference; full typed lift and physical colour projection are absent |
| Unit Class-Action $Z_3$ = 1 / α_s^VBF = 1/(4π) | 2 | Exact numerical consequence of named conditions C_hol = 1 and n_C^red = 1 | Those microscopic unit conditions have not been physically selected; scheme/RG bridge remains open |
| Retained strong phase $\bar{\theta} = 0$ | 2–3 | Same retained positive global completion fixes the phase structurally without EDM input | Full chiral determinant line, continuum global measure and observable EDM bridge remain open |
| RRHF charged Yukawa / CKM matrix | 2 | Genuine target-blind conditional action-level numerical return given declared calibrated inputs; failures retained | Primitive uniqueness of inherited source objects and physical reintegration remain open; empirical output is poor |

| Derivation / returned object | Current stage | Why it is at this stage | What prevents the next stage |
|---|---|---|---|
| Lowest-order $C_3$ axle geometry | 2 | Shape and threefold democracy are source-derived rather than fitted | Physical axle coefficient, installation, readout and phase are not returned |
| Reduced-family holonomy pair {150°, 210°} | 2 | Exact source-frozen closed holonomy on the reduced family carrier | No same-action theorem identifies the physical charged-completion comparison loop with this family loop |
| Commitment-survival $\sqrt{(5/6)}$ | 1 | Exact coefficient-free value on the constructed minimal private-rim selector | Common action has not generated the selector and the HX1 carrier is not yet identified with CKM axle retention |
| Physical CKM axle-corrected matrix | 1 diagnostic | Numerical branch executions exist and can be compared | Physical phase, magnitude, retention and readout remain unselected, so no branch is controlling |
| Neutrino masses / PMNS | 0–1 | Carrier architecture and execution contract exist | Direct Y_ν, M_R, M_L, physical branch/readout and scale are absent |
| Physical QCD $Z_3$ | 1 | Response architecture and finite-cell precursors exist | Full history-selected colour lift, internal projection/nonfactorising reduction and HFB certificate absent |
| Physical Λ_QCD / confinement observable | 1–2 | Conditional unit-branch running calculation exists | Starting $Z_3$ is not physical and the finite scheme/confinement bridge is missing |
| Unified HFB Standard-Model boundary | 1 | Full architecture and required output set are specified | No single admitted execution has returned the full same-branch set |
| Complete Standard-Model observable closure | below 4 overall | Several Stage-2 and Stage-3S ingredients now exist | No common RG/scheme/threshold/pole pipeline has yet been completed from an admitted microscopic boundary |

## 13.2 Sector-level closure ledger

The following table states the destination explicitly, sector by sector, and records the present distance from it.

| Sector / parameter class | What VERSF would need to conditionally derive | Current strongest return | Current stage | What still prevents the claim |
|---|---|---|---|---|
| Higgs sector | One source-selected radial/completion carrier, stable vacuum, complete physical kinetic residue and fact clock, scalar stiffness and propagator giving m_H/v, λ, Z_H and ultimately the physical pole | m_H/v = 32/63; exact common line q_H = (1/2)(1, 1, 1, 1); stable broken vacuum; exact defect/bath protection; spatial-factorisation no-go; closure-radial determinant precursors; nonzero local radial Fisher response with no $p^2$ term; explicit flat-transport projection Z_(H,T)^graph = 2 w_T; exact $p^4$ onset of the relaxed constitutive sector; conductance | 3S / 5 | Formal Stage 3 is withheld because the primitive history action has not decided whether an independent reversible neighbour stiffness exists, nor returned its coefficient, physical momentum/action normalisation, fact clock and admitted regulator limit. Stage 4 then requires the complete electroweak/top/Goldstone/ghost/threshold/RG/pole calculation. |

| Sector / parameter class | What VERSF would need to conditionally derive | Current strongest return | Current stage | What still prevents the claim |
|---|---|---|---|---|
| | | scaling certificate | | |
| Electromagnetic coupling | Physical microscopic electromagnetic response giving a frozen coupling which transports to $\alpha(0)$ | p_EM = 7/960, so $\alpha^{-1}$ = 960/7, 0.0780% high | 2 / 5 | Physical TPB saturation, microscopic interface, QED matching/running and common scheme |
| Weak coupling / weak angle | Physical $Z_2$, Z_q from the common gauge Hessian and hence g, g′ and $\sin^2\theta$_W | HCMR candidate $\sin^2\theta$_W = 45/194, 0.3195% high | 1–2 / 5 | HCMR is not physically admitted; history-selected metric, readout, branch, complete auxiliary reduction and common scheme remain open |
| Strong coupling | Physical colour stiffness $Z_3$, source-derived scale, RG/threshold flow and finite VERSF-to-standard scheme bridge | Unit branch $Z_3$ = 1 remains conditional; new audit precursor $K_3$^hist-wheel = 3744/2201 = 1.701045 | 1–2 / 5 | Full history-to-colour lift, physical $\pi_3$ or direct nonfactorising $Z_3$, HFB certificate, scale and scheme bridge |
| Strong CP phase | Same physical global gauge measure returning $\bar{\theta}$ without inserting the experimental bound | $\bar{\theta}$ = 0 exactly in the retained positive completion | 2–3 / 5 | Full chiral determinant line, continuum global measure/bordism and observable EDM bridge |
| Charged-lepton ratios | Source-derived generation/localisation law returning m_μ/m_e and m_τ/m_μ | exp(16/3), 0.1736% high; exp(16/3)/12, 2.6336% high | 2 / 5 | Primitive localisation derivation and exact physical 1/12 tau activation |
| Absolute charged- | Either a source-derived absolute mass scale, or one | Historical absolute-scale | 1 / 5 | Physical scale, branch, projection kernel, running and pole map |

| Sector / parameter class | What VERSF would need to conditionally derive | Current strongest return | Current stage | What still prevents the claim |
|---|---|---|---|---|
| lepton masses | explicitly declared dimensional anchor combined with independently derived ratios and pole transport | candidates quarantined | | |
| Quark mixing magnitudes | Same-action Y_u, Y_d producing one source-selected CKM matrix without CKM calibration beyond declared inputs | RRHF is the controlling action-level return; V_ub +7.9%, V_td −31.5% | 2 / 5 | Current returned matrix is empirically poor; physical axle installation and reintegration remain open |
| Quark CP phase / CKM triangle | Physical charged-completion loop and axle coefficient selecting the CKM phase from the source | Exact family holonomy pair 150°/210°; favourable 150° CKM branch diagnostic only | 1–2 / 5 | D33 same-action loop inheritance, visible component, axle magnitude, retention and physical phase selection |
| Neutrino masses / PMNS | Same-action Y_ν, M_R, M_L, physical branch and absolute scale, followed by Takagi/PMNS execution | Numerical comparison intentionally refused | 0–1 / 5 | Fundamental neutral mass blocks and physical readout are still absent |
| QCD confinement scale | Physical $Z_3$ followed by derived RG/threshold flow into a source-typed Λ_QCD and confinement observable | Conditional Unit-branch Λ_QCD^VBF ≈ 225.9 MeV | 1–2 / 5 | Starting $Z_3$ is not physical; finite scheme bridge and physical confinement coefficient remain open |

| Sector / parameter class | What VERSF would need to conditionally derive | Current strongest return | Current stage | What still prevents the claim |
|---|---|---|---|---|
| Unified scale and scheme | One source-derived microscopic boundary and one immutable RG/threshold/scheme/pole pipeline for all sectors | Architecture explicitly specified | 1 / 5 | No passing HFB physical boundary certificate; finite scheme bridge remains open |
| Single compatible Standard-Model boundary | g_s, g, g′, μ_H², λ, Y_u, Y_d, Y_e, $\mathcal{B}$_ν, θ̄ from one admitted source-selected execution | Not yet issued | 1 / 5 overall | HFB execution/branch selection has not supplied the complete same-branch boundary |

Here "3S" means structural Stage 3. The physical microscopic object and mechanism have been identified: the common Higgs mode is a genuine physical tangent, the vacuum is stable, the potential supplies radial stiffness and the primitive full-tangent proposal supplies fact-to-fact kinetic motion. What remains open is both the physical normalisation of the established fact-direction mechanism and the primitive source-selection of the physical spatial two-derivative mechanism. Thus 3S is stronger than Stage 2 but deliberately stops short of formal Stage 3, whose definition requires the same physical action to return the final carrier normalisation and numerical microscopic boundary.

The last row is the crucial one. MASD and HMGBC themselves define the desired microscopic boundary as a single set containing the gauge couplings, Higgs parameters, Yukawas, neutral block and strong phase; HMGBC states that the physical HFB certificate remains pending rather than pretending the constituent precursor calculations already form such a boundary.

How close is VERSF? The programme is no longer predominantly at Stage 0. Several sectors have reached Stage 2: they contain source-side conditional numerical returns, and in the Higgs, electromagnetic and charged-lepton sectors those returns already lie unusually close to observed Standard-Model inputs. Strong CP also has a substantial conditional structural return. The quark sector contains a genuine action-level numerical calculation, although its controlling CKM output is presently poor. The strong-coupling sector has progressed from architecture to a nontrivial finite-cell precursor but has not yet returned physical $Z_3$. The neutral sector remains the least numerically closed.

The largest remaining gap is therefore not primarily the invention of more suggestive formulas. It is the promotion of existing structural and finite-regulator results through the same sequence:

source structure → physical carrier/branch → microscopic numerical boundary → common RG/scheme transport → measurement.

VERSF could fairly claim a conditional derivation of the numerical architecture of the Standard Model once the major dimensionless sectors reach at least Stage 3 and their transported predictions survive comparison without post-selection. A stronger claim of a complete first-principles numerical derivation would additionally require the absolute scale, common scheme, regulator limit and physical pole/observable maps to be returned rather than anchored or supplied externally.

Two different finishing lines must therefore be kept distinct:

Conditional numerical Standard-Model derivation. VERSF returns the dimensionless interaction strengths, mass/Yukawa ratios, mixing matrices and CP structures from a frozen premise stack and one physically compatible source execution. One declared dimensional scale anchor may be permitted where only units, rather than dimensionless structure, are missing, provided that anchor is counted explicitly and is not represented as a prediction.

Complete first-principles Standard-Model derivation. In addition to the above, VERSF derives the physical absolute scale, matching scale, renormalisation scheme bridge, thresholds and pole observables from the substrate itself. No measured Standard-Model quantity is needed except for the final comparison.

The distinction protects the claim in both directions. Deriving the ratios $m_e : m_\mu : m_\tau$ and then requiring one dimensional unit to express them in MeV is conceptually different from importing a dimensionless Yukawa ratio; the anchor taxonomy of Section 2 recognises exactly that difference.

## 14. Decisive next calculations

The previous Higgs transport-existence gate has now been executed through the handoff, faithful-defect and full-187 physical-tangent sequence. Its outcome is asymmetric but decisive: the six-defect history carrier gives zero on the physical common Higgs mode, while the full physical proposal carrier gives nonzero common-mode kinetic motion. The next Higgs calculation is therefore no longer “find a propagator”; it is “resolve the primitive reversible-transport fork and, on the returned physical branch, derive its coefficient and normalisation”.

| ID | Calculation | Pass/fail content |
|---|---|---|
| SMNC-EX1 | Primitive reversible-transport provenance for the Higgs radial mode | Decide, from the source-selected primitive history action alone and without Higgs-benchmark access, whether it contains an independent reversible neighbour stiffness $w_T \Sigma_{\langle ij \rangle} \|\rho_j - U_{ij} \rho_i\|^2$ on the physical Higgs-compatible carrier. If it does, return $w_T$, the physical regulator measure, the Higgs embedding and the temporal/spatial conversion from the same admitted branch, then evaluate the physical $p^2$ residue directly. If it does not, exclude the flat-incidence branch as the Higgs kinetic mechanism and obtain the $p^2$ coefficient from the complete nonfactorising history Schur response. The flat-incidence and constitutive descriptions must not be assumed equivalent: if equivalence is claimed, derive it before auxiliary relaxation and show how the $O(k^2)$ flat-incidence term survives the exact Schur reduction; otherwise retain both as inequivalent and reject whichever the primitive action does not return. Preregistered checks that may not be promoted in advance: canonical unity, the packing metric, the cubic determinant residue, the conditional four-dimensional residue, the generation |

| ID | Calculation | Pass/fail content |
|---|---|---|
| | | eigenvalues, the conductances 1/16 and 1/32, and the unit-weight flat-transport factor 2. |
| SMNC-EX1A | Independent operational-metric cross-check | Execute the Higgs-point admissible-sector packing census and operational dimension of Sections 4.13 and 4.14. Compare the resulting g_H^pack with the independently derived Schur residue only after both are frozen. Equality would be evidence for the same-source metric bridge; disagreement must be retained rather than removed by field rescaling. |
| SMNC-EX1B | Physical Higgs Stage-3 and pole completion | Only after EX1 returns the physical $p^2$ residue, freeze the physical Higgs field normalisation, fact clock and temporal/spatial conversion. Evaluate the complete relaxed scalar $K_2$, $K_3$ and $K_4$ blocks from the same action, then construct the full broken-phase two-point matrix including scalar, gauge, Yukawa/top, Goldstone/ghost, completion and threshold effects. Solve the complex pole before benchmark access and perform the common RG/scheme comparison. |
| SMNC-EX2 | Electromagnetic TPB/QED bridge | Return the physical inter-layer TPB saturation on the canonical 14 transmitting directions, then match the frozen 7/960 structural coupling to continuum QED and run it to $\alpha(0)$ without target access. |
| SMNC-EX3 | Physical axle-loop inheritance / D33 | Construct $\gamma_0$ and $\gamma$_ax from the primitive source stack with no AX1 insertion and no CKM access; verify identical preparation and terminal charged record; compute Hol($\gamma$_ax $\gamma_0^{-1}$); return whether it equals $\exp(+i\cdot5\pi/6)$, $\exp(-i\cdot5\pi/6)$, another value, or no realised loop. |
| SMNC-EX4 | Same-action axle installation and retention | Return a nonzero physical axle coefficient, complete internal lift, retention and readout from the generation-sensitive charged-completion mixed jet. Separately derive the physical axle-retention projector rather than inserting a scalar retention factor. Test the new source-structured commitment precursor without using CKM data: determine whether the physical axle retention carrier is the HX1-derived six-rim cycle carrier, whether the common action generates the minimal private-rim trap selector, and, only if both identifications pass, whether the physical retention amplitude is s_ax = $\sqrt{(5/6)}$. The value $\sqrt{(5/6)}$ is a preregistered check, not an input; a different returned value or a failure of the carrier identification must be retained. No coefficient may be set to the diagnostic axle magnitude, unity, $\sqrt{(5/6)}$, or the favourable branch in advance. |
| SMNC-EX4A | Commitment-survival carrier bridge | Construct the same-action map from the primitive topological commitment selector into the physical charged-completion/family carrier. Verify or reject: (i) the one-face commitment event produces a rank-one hard cut on the relevant physical carrier; (ii) the covariant removed direction is the private-rim direction; (iii) the physical |

| ID | Calculation | Pass/fail content |
|---|---|---|
| | | axle-retention tangent is the image of the uniform HX1 six-rim cycle; and (iv) the resulting principal angle is arccos √(5/6). If any identification fails, √(5/6) remains a separate commitment-phase precursor and may not enter RRHF reintegration. |
| SMNC-EX5 | Primitive quark-generator provenance | Derive the frozen role-odd quark generator and the typed orientation map from the marked source without CKM-data contact. |
| SMNC-EX6 | Sealed RRHF reintegration | Once EX3-EX5 return a physical axle, insert exactly that returned object into RRHF, redifferentiate, freeze one matrix, and only then compare with CKM data. |
| SMNC-EX7 | Physical H_CMR selection | Return event preparation, copy/maintenance dynamics, score weights, endpoint frame, nontrivial readout, oriented branch and completion residue from one action. |
| SMNC-EX8 | Charged-lepton source closure | Derive the physical branch projectors, $\kappa = 8/3$ bridge, exact tau activation/Gram operator, α_int, v_cl, projection kernel and running-to-pole map before claiming absolute masses. |
| SMNC-EX9 | Neutral direct blocks | Differentiate Y_ν, M_R and M_L (or prove M_L = 0) from the same action and only then execute the frozen NSTC Takagi/PMNS certificate. |
| SMNC-EX10 | Native-to-continuum scheme and poles | Define one VERSF scheme, RG/threshold/covariance map and pole bridge shared by gauge, Higgs and fermion sectors; no sector-specific refit. |
| SMNC-EX11A | Full history-to-colour defect lift | Lift the HMGBC history metric from the canonical wheel into the full MASD colour/record/completion carrier. Verify the C-R-B precursor as a restriction rather than an assumed identification, classify all adjoint auxiliary copies and publish the full colour Schur block. The 3744/2201 precursor is a check, not an input. |
| SMNC-EX11B | Physical $\pi_3$ / direct $Z_3$ return | Evaluate W_int^red and $\mathcal{E}_3$. If the separability certificate passes, compute $\pi_3 = (1/8)\,\mathrm{Tr}(\mathcal{E}_3{}^\dagger\, W_{int}^{red}\, \mathcal{E}_3)$ and $Z_3 = K_3\, \pi_3$. If it fails, use the direct nonfactorising colour pullback. Freeze the returned $Z_3$ even if it disagrees with the Unit Class-Action branch. |
| SMNC-EX12 | QCD transport and comparison surface | Starting only from the sealed physical $Z_3$, derive the VERSF boundary scale, RG evolution, threshold matching and finite VBF-to-standard-scheme bridge; only then compare $\alpha_s(M_Z^2)$ and any derived Λ_QCD with experiment. |
| SMNC-EX13 | Continuum strong-sector global completion | Promote the retained positive global measure to the full faithful chiral gauge measure/determinant-line object, test the $\bar{\theta} = 0$ selection, and separately return or obstruct the physical centre-sensitive confinement coefficient. |

#### Closure rule for the present paper

This paper does not attempt EX1. The Higgs calculation has reached the point at which further manipulation of already-defined kernels would no longer improve the provenance grade, and

EX1 is an upstream primitive-action theorem rather than another downstream Higgs calculation. The Higgs ledger is therefore frozen here at Stage 3S and will move only if a later source calculation resolves the reversible-transport fork without use of the Higgs benchmark.

## 15. Scientific verdict

The updated provenance audit changes the meaning of the VERSF numerical landscape without turning it into an across-the-board success. The best structural values are genuinely close. The Higgs ratio differs from the present measured-inferred value by only about five parts in ten thousand. The K = 7 electromagnetic reciprocal differs from $\alpha(0)^{-1}$ by about eight parts in ten thousand. The electron-muon ladder is within about two parts in a thousand. Those are numerically interesting facts.

But the corpus also contains hard negative and open facts. The frozen RRHF baseline is a genuine action-level calculation and its CKM fit is poor. The HCMR gauge candidate is regulator-stable but its physical gauge certificate is refused. The neutral sector correctly refuses a numerical certificate. The strong sector supplies a different kind of warning: its physical numerical coupling has not yet been returned, and its confinement strength is provably non-identifiable from the retained ingredients currently available. These negatives and open returns are not hidden; they are what prevent the close structural numbers from being presented as an already completed Standard Model derivation.

The strong sector has now advanced one further step in numerical provenance. The 32 percent α_s comparison remains invalid because it set a conditional 5.80-TeV VBF boundary directly against an M_Z conventional-scheme benchmark. But "physical $Z_3$ open" no longer means that the substrate programme has produced no numerical colour structure. MASD-1 has executed the required adjoint record-link mechanism, and HMGBC-1 has independently returned a non-fitted canonical history metric. Under the explicitly declared SMNC canonical-wheel defect-weight identification, their combination gives $K_3$^hist-wheel = 3744/2201 = 1.701045. This number is not promoted to $Z_3$, because the physical internal projection and full nonfactorising HFB lift remain unreturned. Its value is nevertheless significant as a provenance milestone: a nontrivial colour magnitude has emerged from two upstream VERSF constructions without using the measured strong coupling.

The result also illustrates why the audit must continue to distinguish precursor from prediction. HMGBC explicitly warns that canonical-wheel magnitudes are not automatically the physical full-carrier magnitudes, and the later blind integrated attempt fails its terminal-holonomy gate and therefore issues no physical G_red or HFB boundary. The correct status is consequently neither "VERSF predicts α_s" nor "VERSF has nothing numerical for QCD." It is: VERSF has an increasingly constrained and now numerically nontrivial source-side colour-response calculation, while the physical strong coupling remains open. At the same time, the faithful quotient/topological lattice and the retained positive strong-phase-zero result provide substantial structural progress that does not depend on fitting the strong coupling.

The most important recent change in the CKM programme is a split upgrade rather than a blanket upgrade. The geometry has advanced substantially: the lowest-order quadratic axle is symmetry-derived, its threefold branch structure is exact, the generation-character descent is source-side, and a full-su(8) symbolic theorem shows that a specified branch form can survive the embedding at leading order. But the physical phase has not advanced to the same grade. The later component-preserving completion-jet calculation and exact local phase-isotropy result show that the present action does not select a visible phase locally.

At the same time, the phase problem is no longer empty. The frozen family transport contains an exact closed, gauge-invariant conjugate pair of holonomies at 150° and 210°. Independent arithmetic of the printed matrix and loop definition reverses the forward/reverse labels in the source: the printed forward product is 210°, with 150° on the reverse loop. This does not destroy the phase contact; it makes the remaining physical question sharper. VERSF must now prove, from the same action, which orientation, if either, is inherited by the co-terminal charged-completion loop.

Accordingly, the current VERSF claim should be stated narrowly and strongly: VERSF contains several source-locked structural numerical contacts with measured Standard-Model quantities and one genuine but empirically poor blind charged-flavour action-level return. It also contains a substantially derived quark-axle geometry and an exact closed-family holonomy pair. It does not yet contain a physically selected CKM curvature correction. The attractive curvature matrix remains a quarantined diagnostic until its physical coefficient, readout, retention and comparison-loop inheritance are returned by the action.

The Higgs investigation now provides a particularly clear example of why the provenance rules matter. Several superficially plausible quantities could have been declared to be Z_H: canonical unity, a packing metric, a generation Laplacian eigenvalue, a local completion Fisher curvature, a cubic determinant residue, a four-dimensional surrogate residue, the Stage-A conductances, or the explicit factor 2 of the flat transport Hessian. The cumulative calculation instead shows that these are differently typed objects.

The latest result isolates the actual unresolved fork. A direct neighbouring-cell covariant residual produces the required $p^2$ structure on the physical Higgs carrier, while the later current/continuity formulation produces $p^4$ after physical current relaxation. Until the primitive history action decides whether the direct reversible stiffness is an independent term, there is no licensed unique microscopic Z_H. That is a cleaner stopping point than choosing whichever candidate gives the most convenient normalisation.

For that reason this paper closes the Higgs programme at Stage 3S. The next advance must come from the primitive action itself, not from additional downstream scalar algebra.

FINAL STATUS. NONTRIVIAL NUMERICAL CONTACT: YES. NUMERICAL FIT BY CONSTRUCTION: NOT SUPPORTED BY THE CURRENT AUDIT. STRONG CONDITIONAL SCALE-FREE HIGGS PREDICTION: YES, m_H/v = 32/63. HIGGS COMMON RADIAL CARRIER: STRUCTURALLY IDENTIFIED. HIGGS VACUUM AND STATIC RADIAL STIFFNESS: STRUCTURALLY CLOSED. LOCAL HIGGS HISTORY SUSCEPTIBILITY: NONZERO ON THE TPB-GATED COMPLETION INSTRUMENT BUT NOT A SPATIAL KINETIC RESIDUE. EXPLICIT NEIGHBOUR TRANSPORT: CONDITIONAL PASS ON THE FLAT COVARIANT BRANCH, WITH H_(H,T) = 2 w_T B†B AND Z_(H,T)^graph = 2 w_T. RELAXED CONSTITUTIVE SECTOR: ZERO SPATIAL $p^2$ RESIDUE, LEADING $p^4$. TWO TRANSPORT DESCRIPTIONS NOT YET PROVED EQUIVALENT. PHYSICAL Z_H: OPEN. SINGLE REMAINING STAGE-3 GATE: DERIVE FROM THE PRIMITIVE HISTORY ACTION WHETHER AN INDEPENDENT REVERSIBLE NEIGHBOUR STIFFNESS EXISTS AND RETURN ITS PHYSICAL COEFFICIENT AND NORMALISATION. HIGGS MECHANISM/CARRIER GRADE: STAGE 3S. NUMERICAL m_H/v = 32/63 RETURN: STAGE 2. FORMAL PHYSICAL MICROSCOPIC STAGE 3: NOT YET CLAIMED. THIS PAPER CLOSES THE HIGGS CALCULATION AT THAT BOUNDARY. ELECTROMAGNETIC STRUCTURAL CANDIDATE: YES, 7/960. PHYSICAL NUMERICAL STRONG COUPLING: OPEN. HISTORY-WEIGHTED COLOUR PRECURSOR: YES, $K_3$ = 3744/2201. RETAINED POSITIVE-COMPLETION STRONG PHASE $\bar{\theta}$ = 0: YES, CONTINUUM CHIRAL COMPLETION OPEN. EXACT LOWEST-ORDER QUARK AXLE GEOMETRY: YES. PHYSICAL CKM AXLE PHASE: NOT YET RETURNED. CONTROLLING CKM MATRIX: RRHF. NEUTRAL NUMERICAL CERTIFICATE: REFUSED. COMPLETE FIRST-PRINCIPLES STANDARD-MODEL DERIVATION: NO.

## Appendix A: numerical arithmetic used in this paper

| Object | Expression | Value |
|---|---|---|
| v_F | (√2 G_F)^(−1/2) | 246.219650794 GeV |
| measured-inferred m_H/v_F | 125.13 / 246.219650794 | 0.508204765933 |
| VERSF m_H/v | 32/63 | 0.507936507937 |
| VERSF λ_H | 512/3969 | 0.128999748047 |
| measured-inferred λ_H | $m\_H^2/(2\ v\_F^2)$ | 0.129136042059 |
| K7 inverse EM candidate | 960/7 | 137.142857142857 |
| lepton step | exp(16/3) | 207.127248889835 |
| tau step | exp(16/3)/12 | 17.260604074153 |
| HCMR weak angle | 45/194 | 0.231958762887 |
| HCMR inverse α candidate | 388π/9 | 135.437549954760 |
| Unit Class-Action VBF boundary | μ_R | 5.80 TeV |
| Unit Class-Action C_hol | conditional microscopic return | 1 |
| Unit Class-Action n_C^red | conditional microscopic return | 1 |
| Unit Class-Action $Z_3$ | C_hol · n_C^red | 1 |
| Unit Class-Action g_s | $Z_3^{-1/2}$ | 1 |
| Unit Class-Action α_s^VBF | $g\_s^2/(4\pi)$ | 0.079577471546 |
| Unit Class-Action Λ_QCD | threshold cascade from α_s^VBF(5.80 TeV) | ≈ 225.9 MeV |
| SMNC precursor mapping for a | a ← W_CC^HMGBC | 12/31 |

| Object | Expression | Value |
|---|---|---|
| SMNC precursor mapping for b | $b \leftarrow W\_RR$^HMGBC | 12/31 |
| SMNC precursor mapping for c | $c \leftarrow W\_BB$^HMGBC | 21/124 |
| MASD colour wheel mode | $\lambda_3$ | 4 |
| History-weighted colour precursor | $K_3$^hist-wheel | 3744/2201 = 1.7010449796 |
| History-weighted weak precursor | $K_2$^hist-wheel | 1880/899 = 2.0912124583 |
| History-weighted Abelian precursor | K_q^hist-wheel | 360/713 = 0.5049088359 |
| $C_3$ $\lvert\zeta\rvert$ | $(81/2000)/\sqrt{3}$ | 0.023382685903 |
| $C_3$ base amplitude b | $\sqrt{3}\cdot\lvert\zeta\rvert = 81/2000$ | 0.040500000000 |
| $C_3$ base amplitude a | $2\lvert\Delta_{13}\rvert/\lvert\zeta\rvert = 9/40$ | 0.225000000000 |
| $C_3$ residue magnitude | $(1/2)(9/40)\lvert\zeta\rvert$ | 0.002630552164 |
| β comparator | (1/2) arcsin(0.710) | 22.617457664° |
| Minimal one-face survival amplitude | $\sqrt{(1 - 1/6)}$ | $\sqrt{(5/6)}$ = 0.912870929175 |
| Commitment principal angle | arccos $\sqrt{(5/6)}$ | 24.0948425521° |
| One-face unit Schur excess | (1 − 5/6)/2 | 1/12 = 0.0833333333333 |
| One-face conditional present response | $(\pi/9)\sqrt{(5/6)}$ | 0.318652067197 |
| General r-trap survival | $\sqrt{(1 - r/6)}$ | $0 \le r \le 6$ |
| General r-trap unit excess | r/12 | $0 \le r \le 6$ |

The survival arithmetic is exact on the declared orthonormal six-rim/private-edge carrier. It does not establish that the physical CKM axle uses that carrier. The physical-axle bridge is deliberately deferred to SMNC-EX4/EX4A.

The Unit Class-Action values are conditional microscopic branch consequences. The mappings $a \leftarrow W\_CC$, $b \leftarrow W\_RR$, $c \leftarrow W\_BB$ are SMNC audit identifications on the isolated canonical-wheel restriction, not statements made explicitly by HMGBC or MASD; their numerical consequence is therefore precursor-grade until the full typed lift proves the identification. In particular $K_3$^hist-wheel ≠ $Z_3$ until the physical internal colour projection or direct nonfactorising HFB pullback is returned.

## Appendix B: quarantined historical absolute-scale comparisons

Earlier VERSF numerical papers printed several approximately one-percent absolute-scale contacts, including Route-A electron/electroweak/Higgs values and weak-boson roots. SMNC-3 does not score those rows as current evidence (F-SM3-8). The August audit and later action-normalisation papers leave the source-native ruler, completion residue, matching scale, common scheme and pole bridge open. In addition, newer charged-lepton work uses a different explicit candidate common scale and itself labels the absolute-mass audit a consistency probe. Retaining one historical branch in the main table would therefore create a false impression of a unique controlling absolute-scale prediction. Under the anchor/calibration distinction of Section 2, a declared measured unit anchor combined with derived ratios would be a legitimate route to absolute values; these rows are quarantined for a different reason: their absolute scales were claimed as source-native while the ruler, scheme and pole bridges remain open.

| Historical object | Printed value | Raw proximity | Current reason not scored |
|---|---|---|---|
| Historical Route-A electron scale | ~0.5156 MeV | ~+0.9% vs electron pole mass | Quarantined: source-native scale/scheme not admitted |
| Historical Route-A v | ~243.7 GeV | ~−1.0% vs Fermi scale | Quarantined: absolute ruler/completion scale open |
| Historical Route-A Higgs mass | ~123.8 GeV | ~−1.1% vs 125.13 GeV | Quarantined: physical potential/pole bridge open |
| Historical W/Z roots | ~79.3 / 89.6 GeV | ~1-2% low | Quarantined: branch selector/gauge matching open |
| CLAS explicit lepton scale | 0.521691, 108.056, 1865.12 MeV | +2.09%, +2.27%, +4.96% | Consistency audit only; α_int and v_cl imported |

## Appendix C: source registry

Internal VERSF sources are listed by the role they play in this audit. The latest controlling result is used only for the same typed object; different objects remain side by side when scientifically necessary.

Bibliographic provenance requirement. A document calling itself a provenance audit must allow a reader to reconstruct the chronology independently, and the ID/title/role listing below does not yet do that. Before external circulation, every internal source in this registry must additionally carry four fields: exact title as issued, version identifier with issue date, archive location or URL, and a document hash of the frozen file. Those fields are owed rather than omitted by choice; they are what would permit another person to confirm that a claimed upstream quantity existed in the stated form before the downstream comparison that consumes it, which is the entire content of the source-lock rule. The external benchmark entries likewise require full bibliographic references, including the specific review or adjustment and its publication date, rather than an abbreviated year label. Until those fields are populated, the chronology claims in this paper rest on the internal freeze discipline alone and are not externally auditable.

| ID | Source | Role in SMNC-3 |
|---|---|---|
| [V1] | VERSF Standard Model Derivation Audit, August 2026 | Programme-level supersession rules, grade vocabulary, critical path and physical-admission boundary. |
| [V2] | Substrate Dynamics and the Higgs Ratio | Baseline 1/2, su(8) dimension 63, Killing-form weighting and 32/63 curvature result. |
| [V3] | The Electroweak Completion-Interface Theorem in VERSF | Conditional representation theorem Φ_cl ~ (1, 2, +1/2); removes need for observed-mass sector selection in preferred carrier chain. |

| ID | Source | Role in SMNC-3 |
|---|---|---|
| [V4] | The Closure-Interface Potential Necessity and Higgs-Radial Theorem in VERSF | Non-inserted invariant radial stiffness mode; numerical Higgs mass/potential explicitly open. |
| [V5] | The Post-Commitment Atomic-Operation, Retention and Renewal Theorem | P14 → 1/128; 14/15 support-rigidity line; mixed third-jet completion-to-fermion transmission; later representation-resolved CY3′ attribution. |
| [V6] | The Charged-Lepton Absolute Scale Theorem in VERSF | Explicit lepton magnitude operator; exp(16/3) and exp(16/3)/12 ratios; non-insertion and absolute-scale debt ledger. |
| [V7] | The Saturated-Maintenance Projection and Tau-Maintenance-Suppression Theorem in VERSF | Tau-last sign theorem and explicit statement that the numerical suppression magnitude/mass bridge is not derived. |
| [V8] | The Four-Regulator Commitment-Maintenance Execution and Physical-Admission No-Go Theorem in VERSF | HCMR candidate convergence, gauge/scalar readbacks and exact physical-certificate refusal. |
| [V9] | The Conditional Derivation of Charged Flavour and the Unique Lowest-Order Quadratic CP Axle in VERSF | Blind RRHF charged tensor and baseline CKM; exact low-order axle form; historical diagnostic phase boundary. |
| [V10] | The Projected $C_3$ Hessian Return in VERSF | Forward six-coordinate minimal-cell Hessian return and $C_3$ curvature construction. |
| [V11] | The Full su(8) Weak-Doublet Hessian Return in VERSF | Full-embedding/isotype survival theorem; SM-2 closed conditional/symbolic at leading order under P-phase, P-role, P-bg, role gap and inherited support. |
| [V12] | The Quark-Sector Closure Ledger in VERSF | Downstream $C_3$ CKM empirical ledger, phase/amplitude firewalls and residual $\gamma$/V_ub tensions. |
| [V13] | NSTC-1, The Same-Branch Neutral-Sector Return | Neutral execution contract, inverse-forgery theorem, and physical neutral certificate refusal. |
| [V14] | The Neutral-Fermion Branch and Carrier-Census Completion Theorem in VERSF | Typed neutral completion routes and common electroweak radial interface, with explicit conditional carrier premise. |
| [V15] | The Gauge-Response and Coupling Evaluation Theorem in VERSF | Explicit gauge-response functional and coupling-evaluation architecture; demonstrates that the physical $Z_3$, scale and finite scheme bridge require separate closure. |
| [V16] | QCD Running and Confinement in VERSF | Canonical colour-holonomy response; $Z_3 = \chi\_dir - \sigma\_aux$; $K_3 = Z_3 I_8$; $\alpha\_s = 1/(4\pi Z_3)$; derived running |

| ID | Source | Role in SMNC-3 |
|---|---|---|
| | | architecture; explicitly closes no physical numerical QCD value. |
| [V17] | The Non-Perturbative QCD Scale and Triality-Gap Completion Theorem in VERSF (NQTC) | Unit Class-Action branch $g_s^2 = 1$, $\alpha_s$^VBF(5.80 TeV) = $1/(4\pi)$, conditional $\Lambda$_QCD ≈ 225.9 MeV; the physical $Z_3$ remains owed. |
| [V18] | FGQT-1, Faithful Gauge Quotient, Bundle Census and Topological-Charge Lattice | Exact faithful S(U(3)×U(2)) quotient, complete four-dimensional bundle census and correlated topological-charge/period lattice on the frozen ledger. |
| [V19] | GQSC-1R, Faithful-Quotient Retained Global Measure and Strong-Phase Confinement Theorem | Canonical retained positive transfer; positive-completion $\bar{\theta} = 0$; exact branch degeneracy; physical confinement/triality gap non-identifiability. |
| [V20] | The Strong CP and Global θ-Sector Theorem in VERSF | Strong/weak CP separation, determinant-line reduction and conditional architecture for $\bar{\theta}$. |
| [V21] | The VERSF Master Substrate Action and Constitutive-Descent Theorem (MASD-1) | Common master action; independent U, J, Φ; polar bond defect; executed adjoint link-record Hessian; exact k_red(λ); wheel triple (24/5, 35/6, 3/2); physical $Z_3$ boundary explicitly not issued. |
| [V22] | The VERSF History-Measure, Generation-Geometry and Branch-Closure Theorem (HMGBC-1) | History-derived Fisher/Onsager metric; canonical wheel W_CC = W_RR = 12/31, W_BB = 21/124; full typed-lift/magnitude firewall; HFB execution rulebook and pending physical certificate. |
| [V23] | VERSF Nine-Requirement Integrated Standard Model Derivation Attempt (SMC-9A) | Deterministic blind Stage-A attempt; exact canonical no-screening result; conditional seven-source response; terminal-holonomy failure; G_red and HFB boundary not issued. |
| [V24] | The Primitive Selection, History-to-Curvature and Standard-Model Attaching-Map Closure Theorem in VERSF, PSAC-1-R19 | Primitive phase-cut census; explicit zero hard cuts on currently returned FCHI/PFDMI/MASD phase-support mechanisms; rank-one topological admissibility change; history-controlled renewal construction; minimal covariant private-rim hard-export selector; common-action selector provenance boundary. |
| [V25] | The Refined Line-to-Loop, Commitment-Handoff and Axle-Loop Theorem in VERSF | Separates Fold closure, K7 hub lifting, immutable fact, continuous phase residue and renewal; defines the full commitment-survival projector problem; gives the conditional immediate-past response $\Delta q = (\pi/9)$ s_old, the same-action unit survival law and the physical axle-loop non-circularity firewall. |
| [V26] | Primitive Matter Selection in VERSF: Cumulative Executed Theorems on Fact Commitment, Record Retention and Renewal | Executed F2F first-entry/record law and renewal architecture; self/nonself stopping support, first-passage statistics and fact-indexed continuation used in the handoff audit. |

| ID | Source | Role in SMNC-3 |
|---|---|---|
| [V27] | GSJB-3, Primitive Native Score-Metric and Completion-Attachment Selection | Exact $Z_2 \times Z_2$ four-route character attachment; common/radial φ_H character separated from sector, conjugation and mixed contrasts. |
| [V28] | GSJB-6, Void-Relative Tick-Race Fact-Selection and Renewal Theorem | Fact-indexed time, zero-entropy reopened ray, dimensionless renewal selection and first-passage/Born compatibility; explicitly leaves the absolute hazard and unique full typed lift open. |
| [V29] | SGPL-1, Six-Gate Primitive Path-Law Attempt | One-Fold event-resolved Doob-Kraus architecture and common proto-time proposal clock; full continuous-carrier numerical move kernel explicitly open. |
| [V30] | EWHPC-1 / HR-1 microscopic two-point and scalar completion calculations | Exact relaxed scalar Schur kernel $K\_H(p^2) = K\_H + Z\_H\ p^2 + O(p^4)$, stable broken vacuum and conditional scalar potential; microscopic Z_H transport blocks explicitly open. |
| [V31] | HM4-EX2A/EX2B faithful common-mode execution | Independent identification of the defect-silent, potential-active common Higgs/completion mode (φ_H + X_H0 + X_H1 + X_H2)/2. |
| [V32] | The Multi-Regulator Full-Faithful Source Assembly / HM4-EX4B | Confirms the exact physical completion line c_H = (1/2)(1, 1, 1, 1); proves that it is invisible to the six-defect quotient but passes the full action stack; supplies the full-action completion-leg provenance used in the Higgs common-mode audit. |
| [V33] | Continuous proposal kernel / canonical master-history generator executions | Derives the continuous full-physical-tangent proposal on the 187 physical tangent directions as distinct from the rank-183 defect image; supplies the canonical one-Fact kinetic geometry and the separable K = 7 history generator. |
| [V34] | The Renormalised Standard-Model Parameter Closure Theorem in VERSF, later metric audit | Supplies the canonical $G\_op = I_{187}$ branch together with the negative theorem that unit pullbacks in a whitened operational frame are normalisation identities rather than physical coupling/residue predictions; therefore prevents Z_H^can = 1 from being misgraded as Z_H^physical. |
| [V35] | Operational Curvature and Geodesic Structure in the VERSF Framework | Derives the operational distinguishability density from the mollified local packing of admissible sectors on the continuous operational image, and the conformal metric g_op = Vol_op^(2/d_op) ρ_op^(2/d_op) ⟨·, ·⟩_op; distinguishes the continuous packing density from discrete history probabilities; supplies the source-side local-packing route used in the Higgs normalisation audit. |
| [V36] | A Unified Derivation of Closure Geometry | Supplies the natural closure-norm field ρ (closure magnitude minus one), the pair Hamiltonian with ρ-dependent compact-phase links, and the original unrescaled finite-lattice radial-residue extraction. |
| [V37] | Full Projected Closure Operator / Exact | Supplies the nonorthogonal projected kinetic matrix and exact projection coordinates; identifies the uniform |

| ID | Source | Role in SMNC-3 |
|---|---|---|
| | Projection Coordinates / Pair-Resolved Closure Spectrum | $n = 0$ pair mode as collective breathing and motivates the two-loop projection audit. |
| [V38] | The K = 7 Closure Symmetry | Supplies the spatial-temporal exchange structure and conditional equality of bare spatial and temporal U(1) Wilson couplings, together with the firewall that its explicit chain-complex realisation and coupled-sector extension remain open. |
| [V39] | Post-freeze radial-residue executions | Analytic infinite-volume evaluation of the source-defined cubic-surrogate closure-radial residue; finite-size reproduction; conditional four-dimensional σ-covariant extension; updated Stage-3 Schur-residue gate. |
| [V40] | Refinement Stability on Diamond-Glued Substrates in VERSF | Exact scalar-refinement-triviality result and identification of the persistent structured edge/cohomological transport sector; supplies the typing firewall motivating propagation of the Higgs radial amplitude through the full completion section rather than a naked scalar difference. |
| [V41] | The K = 7 Closure-Born-TPB Renewal Construction in VERSF | Recurrent record-preserving population instrument; separates Born route support, TPB event timing and positive completion strain; supplies the exact radial-blindness audit of the reduced recurrent population law. |
| [V42] | HCMR-XI-4 remaining-work execution report | Finite nonlinear four-channel $\varphi_H$-dependent completion Kraus instrument; supplies the exact local radial completion score used in the TPB-gated Fisher calculation. |
| [V43] | The Microscopic Closure-Hessian and Full Yukawa Evaluation Theorem in VERSF | Supplies the explicit flat covariant transport residual $R_T(\rho)_{ij} = \rho_j - U_{ij}\, \rho_i$, $H_T = 2\, B_U^\dagger B_U$ and the exact symmetric-diamond flat-transport spectrum; also states the remaining transport-coefficient and continuum-normalisation debt. |
| [V44] | Refinement Cohomology and the Spectrum of Γ⋆ on Admissible Substrates | Proves canonical persistence of the edge-transport sector under refinement and clarifies that its factor 2 is combinatorial bookkeeping rather than a physical kinetic normalisation. |
| [E1] | Particle Data Group, Review of Particle Physics 2026, Higgs listing | $m_H = 125.13 \pm 0.11$ GeV. |
| [E2] | Particle Data Group, Review of Particle Physics 2026, CKM review | Direct/averaged CKM magnitudes and unitarity-triangle benchmark values used in Section 8. |
| [E3] | Particle Data Group, Review of Particle Physics 2026, Electroweak review | MS-bar weak mixing angle used in Section 7. |

| ID | Source | Role in SMNC-3 |
|---|---|---|
| [E4] | NIST 2022 CODATA recommended constants (latest available adjustment as of this paper date) | $\alpha(0)^{-1}$ = 137.035999177 and precision-constant context. |
| [E5] | PDG/CODATA charged-lepton mass tables | Electron, muon and tau pole masses used only in the post-freeze ratio audit. |
| [E6] | Particle Data Group, Review of Particle Physics 2026, QCD review | $\alpha_s(M_Z^2)$ world average used as the reserved, unscored strong-coupling comparator in Section 7. |

Registry note. The older entropic-confinement quark-mass and string-tension estimates are not used in the principal evidence ledger: that work explicitly consumes external $\alpha_s$, gluon-condensate and pion-mass inputs. The Yang-Mills mass-gap companion is likewise kept outside this Standard-Model numerical ledger because its result remains conditional on explicit analytic assumptions and is not a derivation of the QCD coupling.

## Appendix D: internal secondary re-execution and verification notes

[This appendix re-executes and verifies the numerical and exact statements used in the paper by a secondary internal route. It is internal to the programme and is not a claim of external independent replication. Work was carried out in exact arithmetic where fractions are shown and in double precision otherwise. The arithmetic checks pass except for one newly identified orientation-label inconsistency in the reduced-family triangle holonomy, documented in item 11; the conjugate holonomy pair itself is unchanged. The single reproduction subtlety in the numerical checks is item 6.]

1. Higgs chain. $v_F = (\sqrt{2}\, G_F)^{-1/2}$ = 246.219650794 GeV; $m_H/v_F$ = 0.508204765933; (1/2)(1 + 1/63) = 32/63 exactly, with dim su(8) = $8^2 - 1 = 63$; $\lambda_H = (1/2)(32/63)^2 = 512/3969$ exactly; raw deltas −0.05279% and −0.10554%, matching the quoted −0.0528% and −0.1055%. The central-value offset against the Higgs-mass uncertainty alone is 0.6005σ, matching the quoted 0.60σ.

2. Electromagnetic chain. (1/128)(14/15) = 7/960 exactly, with $2^7 = 128$; 960/7 = 137.142857142857; raw delta +0.07798%, matching +0.0780%.

3. Lepton ladders. exp(16/3) = 207.127248890 against $m_\mu/m_e$ = 206.768282708, delta +0.17361%; exp(16/3)/12 = 17.260604074 against $m_\tau/m_\mu$ = 16.817691845, delta +2.63361%. Both match the quoted values to all printed digits.

4. HCMR electroweak readbacks. 45/194 = 0.231958762887, raw difference +0.31951% from the frozen weak-angle comparator; 388π/9 = 135.437549955, raw difference −1.16644% from the frozen electromagnetic comparator. These arithmetic checks reproduce. No $\alpha_s$ residual is assigned in this table because the QCD typing places the 1/(4π) branch value on a different scale and in the native VBF scheme. The orientation-only benchmark-σ distance quoted in Section 7.1 evaluates to +12.31σ. 4A. Strong-coupling scale/scheme audit. The Unit Class-Action branch gives $\alpha_s^{VBF}(5.80\ \mathrm{TeV}) = 1/(4\pi)$ = 0.079577471546 exactly, conditional on $C_{hol} = 1$, $n_C^{red} = 1$ and adjoint isotropy, hence $Z_3 = 1$. In the direct-response decomposition this corresponds to the single condition $\chi_{dir} - \sigma_{aux} = 1$; neither $\chi_{dir} = 1$ nor $\sigma_{aux} = 0$ is separately required

by the Unit Class-Action branch. A figure near −32.6% (−32.39% against the superseded 0.1177 ledger entry) is merely the arithmetic result of directly subtracting this VBF boundary value from the conventional benchmark; it is not a valid physical residual and is not scored under Rule G. As an internal transport diagnostic, using only the branch's frozen VBF threshold ledger (branch inputs, not pole or measured masses), one-loop running from 5.80 TeV gives $\alpha_s^{VBF}(M_Z) \approx 0.127935$ before the finite VBF-to-standard-scheme conversion, the source-provided two-loop coefficient moves this to $\alpha_s^{VBF}(M_Z) \approx 0.130598$ (away from, not toward, the conventional comparator), and continuing the one-loop cascade through the frozen thresholds reproduces $\Lambda_{QCD} \approx$ 225.9 MeV. Neither number is scored against experiment here. This calculation is solely an internal consistency check demonstrating that RG transport materially changes the boundary coupling and that a direct 5.80-TeV-to-$M_Z$ subtraction is incorrectly typed. 4B. History-weighted canonical-wheel colour audit. MASD gives $k_{red}(\lambda) = a\lambda + bc\lambda/(b\lambda + c)$ and, at $a = b = c = 1$, the ordered factor triple (24/5, 35/6, 3/2). Solving $k_{red}(\lambda) = \lambda + \lambda/(\lambda + 1)$ against the wheel spectrum {1, 2, 2, 4, 4, 5} fixes $\lambda_3 = 4$, $\lambda_2 = 5$, $\lambda_q = 1$, uniquely and exactly. HMGBC independently gives, on the canonical wheel, $W_{CC} = W_{RR} = 12/31$ and $W_{BB} = 21/124$. Under the explicitly declared isolated C-R-B identification $a = W_{CC}$, $b = W_{RR}$, $c = W_{BB}$, the colour value is $K_3 = 48/31 + 336/2201 = 3744/2201 = 1.701044979555$, and likewise $K_2 = 1880/899 = 2.091212458287$ and $K_q = 360/713 = 0.504908835905$. All arithmetic reproduces exactly, in exact rational form, and was re-executed independently for this appendix. 4C. Provenance audit of the wheel precursor. The preceding result is not promoted to physical $Z_3$. MASD's (a, b, c) wheel branch was originally executed with placeholder unit weights, while HMGBC's rational wheel metric magnitudes are explicitly finite-cell/model-specific. Their combination is therefore a new SMNC cross-paper precursor calculation conditional on the stated defect-weight identification. The physical calculation must reproduce or revise it on the full typed carrier. No strong-sector benchmark entered the calculation.

5. RRHF row deltas. All six percentage residuals in the Layer I table reproduce to the printed precision from the frozen matrix and benchmark ledger.

6. RRHF diagnostic chi-square reproduction. With the five-row set {$|V_{us}|$, $|V_{ub}|$, $|V_{td}|$, $|V_{ts}|$, $|J|$} and the frozen benchmark uncertainties (taking the $|J|$ uncertainty at its upper value $0.13\times10^{-5}$), the diagnostic chi-square evaluates to ≈ 290.5, which is the value quoted in the main text, and is dominated by $|V_{td}|$ (≈ 183) and $|J|$ (≈ 100). No five-row combination containing $|V_{cb}|$ reproduces the quoted value as closely. Because $|V_{us}|$ is calibration-dominated, these rows are not five independent predictive degrees of freedom; the strictly non-calibration-dominated set {$|V_{ub}|$, $|V_{td}|$, $|V_{ts}|$, $|J|$} gives ≈ 288.0 on the same frozen uncertainties, verified here, so the presentation can be made statistically cleaner at negligible cost.

7. $C_3$ exact fractions. $(81/2000)/\sqrt{3} = 0.023382685903$; the components of $\zeta_{C3}$ evaluate to $-81/4000 = -0.020250000$ and $27\sqrt{3}/4000 = 0.011691343$ exactly as printed (using $81/\sqrt{3} = 27\sqrt{3}$); $\Delta_{13} = (9/80)\zeta_{C3}$ has components $-729/320000 = -0.002278125$ and $243\sqrt{3}/320000 = 0.001315276$, magnitude 0.002630552. The implied base amplitudes are exact: $b = 81/2000$, $a = 9/40$ (Appendix A).

8. $C_3$ branch-diagnostic deltas. The α, β, γ and $|J|$ branch consequences quoted in Section 8.6 and the five quarantined ledger rows reproduce, including the β comparator: (1/2) arcsin(0.710) = 22.6175°, so 22.5° is −0.5193% as quoted, and the precise $V_{ub}$ execution value 0.003557 gives −8.5604% against the frozen benchmark, with $V_{td}$ at 0.008690 giving +1.05% and the branch chi-square approximately 5.3.

9. Identity cross-checks. $32/63 = (1/2)(64/63)$; $512/3969 = 2\cdot(32/63)^2/2$ confirmed as $(1/2)(32/63)^2$; $7/960$ has reciprocal $960/7 = 137 + 1/7$; the HCMR $\alpha^{-1}$ candidate $388\pi/9$ and the K7 candidate $960/7$ are numerically and structurally distinct objects, differing by 1.26%, which supports the paper's typed-object separation rather than undermining it.

10. Ledger consistency. Every scored row of the Section 10 consolidated ledger agrees with the corresponding sectional table; no value changed between its sectional appearance and the ledger, and the ordering by raw delta is internally consistent among scored rows. The four strong-sector rows carry no raw delta by construction, per Rule G and the strong-coupling comparison firewall.

11. Reduced-family holonomy orientation audit. With the frozen role-odd quark generator as printed in the flavour source, direct substitution of its transition entries into the printed forward-loop definition (direct route $1\to3$ against indirect route $1\to2\to3$) evaluates to arg W_forward = $7\pi/6$, that is 210°, while the conjugate/reverse loop evaluates to $5\pi/6$, that is 150°. The source prints these forward/reverse labels oppositely. The exact invariant content is the conjugate pair $\{\exp(+i\cdot5\pi/6), \exp(-i\cdot5\pi/6)\}$; the orientation assignment must be corrected, or the underlying transition/index convention explicitly changed. The entry-level substitution follows the correcting audit's printed generator, which this paper adopts; the conjugate-pair content, the rephasing invariance and the phase spacings 150° − 120° = 30° and 150° + 120° = 270° used in Section 8.3 were verified here independently.

12. CKM grade audit. The orientation correction does not promote either loop to the physical axle phase. The same-action equality $\mathrm{Hol}(\gamma\_ax\, \gamma_0^{-1}) = \exp(\pm i\cdot5\pi/6)$ remains unproved, and the completion jet/local metric does not select a physical phase. Consequently every axle/curvature-corrected CKM number in this paper remains diagnostic until D33 and the physical axle-installation gate close. This does not apply to the RRHF matrix, which remains the controlling conditional action-level CKM return. The four-execution table of Section 8.6 was checked arithmetically: the axle-150° entries give V_ub −8.56% and V_td +1.05% against the frozen benchmarks, matching the general-reader and ledger values.

13. Condition-disclosure audit. Every row of the Section 10 ledger was checked against Rule F. Rows in common provenance families carry the corresponding common premise stack: both Higgs rows; both HCMR electroweak rows; the three RRHF control rows; the five quarantined axle/CKM rows; and the four separately typed strong-sector rows. The condition columns disclose dependencies and do not themselves constitute new derivations.

14. Minimal commitment-survival precursor audit. Let $v = (1/\sqrt{6})(1, 1, 1, 1, 1, 1)^T$ be the normalised uniform-rim HX1 cycle and let the minimal one-face private-rim selector be $Q = |e_1\rangle\langle e_1|$, $P = I - Q$. Then $v^\dagger Qv = 1/6$ and $v^\dagger Pv = 5/6$, so s_old = $\|Pv\| = \sqrt{(5/6)}$ = 0.9128709291752769 and the principal angle is arccos s_old = 24.0948425521107°. Using the inherited canonical unit-branch law, $\Delta k = (1 - \text{s\_old}^2)/2 = 1/12$ exactly, while $\Delta q = (\pi/9)$ s_old = 0.318652067196971. The projected two-mode block $[3, -\sqrt{(5/6)}; -\sqrt{(5/6)}, 2]$ has determinant 31/6 and eigenvalues $(5 \pm \sqrt{(13/3)})/2$ = 1.4591670003 and 3.5408329997, both positive, so the candidate coupling does not destabilise the block. For r mutually orthogonal private-rim cuts, $v^\dagger Q\_r\, v = r/6$, $\text{s\_old}(r) = \sqrt{(1 - r/6)}$ and $\Delta k(r) = r/12$; the full staircase reproduces. All arithmetic is exact before the displayed decimals and was re-executed independently for this appendix. The physical grade remains construction/precursor because the current common action has not

returned the trap-controlled projector and no same-action carrier theorem identifies this HX1 survival mode with the CKM axle-retention degree of freedom.

15. Higgs fact-handoff and fact-propagator audit. Let a be the total nonself/fact-producing probability and $\pi_i$ the conditional successor distribution. Then $p = (1 - a, a\pi_i)$ gives $ds_F^2 = da^2/[a(1 - a)] + a \Sigma_i d\pi_i^2/\pi_i$ with vanishing radial/outcome cross term. With $\chi = 2 \arcsin\sqrt{a}$, the radial metric is exactly $d\chi^2$, verified symbolically here. The corresponding completion common vector is (1, 1, 1, 1)/2, of unit norm, and projects onto the trivial/common $Z_2 \times Z_2$ character with unit overlap and zero overlap with the three contrasts. At local two-derivative fact order, $\Gamma_F^{(2)} = (1/2) \Sigma_n \tau_F[Z_H^{time}((h_{n+1}) - h_n)/\tau_F)^2 + K_H h_n^2]$ gives $K_F(\omega) = K_H + 4\kappa_F \sin^2(\omega/2)$ with $\kappa_F = Z_H^{time}/\tau_F^2$. The exact checks are $K_F(0) = K_H$ and the exact stationarity of the homogeneous configuration $h_n \equiv 0$, on which the fact-difference operator vanishes identically (this is stationarity, not a deterministic recurrence). Expanding with $p_0 = \omega/\tau_F$ gives $K_F = K_H + Z_H^{time} p_0^2 - (Z_H^{time} \tau_F^2/12) p_0^4 + O(p_0^6)$, establishing the fact-direction part of the required kinetic structure, $K_H + Z_H^{time} p_0^2 + O(p_0^4)$; the series coefficients were re-derived symbolically. This is a temporal $p_0^2$ result and is not promoted to the spatial $k^2$ coefficient, which remains the open primitive-action question of Sections 4.26 and 4.27. Analytic continuation gives $E_H^{(f)} = (2/\tau_F) \operatorname{arsinh}[(\tau_F/2)\sqrt{(K_H/Z_H^{time})}]$, with limit $\sqrt{(K_H/Z_H^{time})}$ as $\tau_F \to 0$, also verified symbolically. No numerical $\kappa_F$ is claimed because the full-carrier field-to-mark lift and microscopic momentum blocks remain unreturned.

16. Faithful common-Higgs projection audit. On the completion coordinates ($\varphi_H$, $X_{H0}$, $X_{H1}$, $X_{H2}$), the faithful defect block is $D_{H,i} = X_{Hi} - \varphi_H$. For $q_H = (1/2)(1, 1, 1, 1)$ every component is therefore $1/2 - 1/2 = 0$ and $J_D q_H = 0$ exactly, verified symbolically here. Consequently $q_H^\dagger J_D^\dagger W(\omega) J_D q_H = 0$ for every frequency-dependent six-defect/history operator $W(\omega)$, so a previously calculated local-persistence frequency slope on that carrier is not $Z_H$ for the physical common Higgs mode. The faithful potential row $V_H = \sqrt{2}\, \varphi_H$ instead gives $V_H q_H = 1/\sqrt{2}$ and hence native canonical curvature $\|V_H q_H\|^2 = 1/2$, also verified. These statements reproduce the stored faithful rank-reconciliation result: $q_H$ is defect-silent but full-action visible.

17. Full-187 common-mode kinetic audit. The continuous primitive proposal has covariance $a_t G_{op}^{-1}$ on the complete 187-dimensional physical tangent, while the realisable defect image has rank 183, so the four defect-silent physical directions (187 − 183 = 4) are not absent from the proposal covariance. For $\delta\mathfrak{X} = \delta h\, q_H$, the Gaussian increment cost is $\Delta S_{kin} = (q_H^\dagger G_{op} q_H)(\delta h)^2/(2a_t)$. Writing $g_H = q_H^\dagger G_{op} q_H$ gives $\Gamma_{kin} = \Sigma_n (g_H/(2a_t)) (h_{n+1} - h_n)^2$ and inverse fact kernel $K_H(\omega) = K_H + (4g_H/a_t^2) \sin^2(\omega/2)$. On the operationally orthonormal canonical execution $G_{op} = I_{187}$ and $\|q_H\| = 1$, so $g_H^{can} = 1$. Combining with the faithful canonical potential curvature $K_H^{can} = 1/2$ gives $K_H^{can}(\omega) = 1/2 + (4/a_t^2) \sin^2(\omega/2)$, with small-frequency expansion $1/2 + p_0^2 - (a_t^2/12) p_0^4 + O(p_0^6)$. The homogeneous configuration $h \equiv 0$ is exactly stationary and $K_H(0) = 1/2$ is preserved exactly.

18. Higgs normalisation firewall and unit-step identity. The canonical result $g_H^{can} = 1$ is not promoted to $Z_H^{physical}$, because the later metric audit proves that identity responses in the operationally whitened construction are coordinate-normalisation statements unless the physical metric is independently selected; the physical object is $g_H^{phys} = q_H^\dagger G_{op}^{phys} q_H$. Under the dimensionless unit-step convention $a_t = 1$ only, the canonical pole equation $4 \sinh^2(E_F/2) = 1/2$ gives $E_F = 2 \operatorname{arsinh}(1/(2\sqrt{2})) = \ln 2$ exactly, verified symbolically and numerically here (both sides 0.6931471805599453). This equality is retained as an internal unit-step algebraic

identity and is not compared with the Higgs mass or interpreted as an absolute energy prediction.

19. Multi-cell Higgs common-mode projection audit. Let $Q_{(H,N)} = u_N \otimes \tilde{q}_H$ with $u_N = N^{-1/2}(1, \ldots, 1)^T$. For $G_N = I_N \otimes G_0 + L_N \otimes B + R_N$, the identity $L_N u_N = 0$ gives $Q_{(H,N)}^\dagger G_N Q_{(H,N)} = \tilde{q}_H^\dagger G_0 \tilde{q}_H + Q_{(H,N)}^\dagger R_N Q_{(H,N)}$. Therefore every pure spatial Laplacian correction vanishes exactly on the uniform common mode; this was re-executed numerically here on cycle graphs at two cell counts with random symmetric internal operators, returning projections at the $10^{-17}$ level and multi-cell coefficients equal to the local value to machine precision. Equality of $g_H$ across regulator levels in a separable $I \otimes G_0 + L \otimes B$ family is consequently algebraic and may not be counted as physical convergence.

20. Defect/bath protection audit. From the exact faithful result $J_D q_H = 0$, for arbitrary defect-carrier operator $M$ we have $J_D^\dagger M J_D q_H = 0$ and $q_H^\dagger J_D^\dagger M J_D v = 0$ for every physical tangent $v$. In particular the bath correction $-J_D^\dagger C^\dagger A_Q^+ C J_D$ gives exactly zero common-mode projection, independently of the numerical bath spectrum or coupling strength. Because $\dim \mathcal{T}_{phys} = 187$ and $\operatorname{rank} J_D = 183$, the theorem applies to the complete four-dimensional defect-silent physical subspace.

21. Radial-coordinate invariance audit. Under $h' = c\,h$, $g_H' = g_H/c^2$ and $K_H' = K_H/c^2$, so $K_H'/g_H' = K_H/g_H$ exactly. The physical scalar normalisation test should therefore be phrased in terms of the invariant ratio $K_H/g_H$ together with the independently defined physical field/readout, rather than requiring either coefficient separately to equal its canonical value. On the canonical branch this invariant is 1/2.

22. Operational-packing Higgs metric audit. With $\eta_\varepsilon(x) = |\Sigma(M) \cap B(x, \varepsilon)|/(\omega_d \varepsilon^d)$, $\rho_{op}(x) = \mathcal{Z}^{-1}(K_\varepsilon * \eta_\varepsilon)(x)$ and $\bar{\eta}_\varepsilon = \mathcal{Z}/\mathrm{Vol}_{op}$, one obtains $\zeta_H = \mathrm{Vol}_{op}\, \rho_{op}(x_H) = (K_\varepsilon * \eta_\varepsilon)(x_H)/\bar{\eta}_\varepsilon$. Writing $\eta_\varepsilon = \bar{\eta}_\varepsilon(1 + \delta_\varepsilon)$ gives $\zeta_H = 1 + \delta_H$ with $\delta_H = (K_\varepsilon * \delta_\varepsilon)(x_H)$. Conditional on the operational distinguishability metric being the physical one-Fact proposal metric, $g_H = (1 + \delta_H)^{2/d_{op}}$ and $K_H/g_H = (1/2)(1 + \delta_H)^{-2/d_{op}}$. No numerical $\delta_H$ is issued because the current packing theorem proves finiteness and bounds but does not enumerate the physical Higgs-point local admissible-sector count. The canonical history Perron law is explicitly rejected as a substitute because it is a differently typed object.

23. Two-loop/hub radial audit. For two seven-member loops and one central hub, $u_+ = (1/\sqrt{14})(1_7, 1_7, 0)$ and $u_{rad} = (1/\sqrt{15})(1_7, 1_7, 1)$, so $u_{rad} = \sqrt{14/15}\, u_+ + (1/\sqrt{15})\, e_h$ with overlap $\sqrt{14/15} = 0.966091783079\ldots$ and squared overlap 14/15, verified here. The pair $n = 0$ breathing mode is therefore the normalised paired-sector projection of the full radial mode, not the complete radial mode.

24. Cubic-surrogate radial-residue audit. For $\lambda_3(k) = 4 \sum_{\mu=1}^{3} \sin^2(k_\mu/2)$, the determinant-derived long-wavelength coefficient is $Z_\rho^{(3)} = (2\pi)^{-3} \int d^3k/\lambda_3(k)$, evaluated independently here by two methods, high-resolution Gauss-Legendre quadrature and the Bessel representation $\int_0^\infty [I_0(2t)e^{-2t}]^3\, dt$, giving 0.2527310110 and 0.2527310099 respectively, agreeing with the quoted 0.2527310098587 to nine and eleven digits. Finite-L evaluation reproduces the strong finite-size suppression reported at $L = 12$ and $L = 14$ and then rises through larger $L$ toward the analytic value, so the earlier 0.16 to 0.17 estimate is retyped as an undersized-lattice extrapolation rather than a continuum result.

25. Conditional four-dimensional phase-residue audit. Under the declared minimal spatial-temporal symmetric extension, $\lambda_4(k) = 4 \sum_{\mu=0}^{3} \sin^2(k_\mu/2)$ and $Z_{(\rho,phase)}^{(4)} =$

$(2\pi)^{-4} \int d^4k/\lambda_4(k) = \int_0^\infty [I_0(2t)e^{-2t}]^4\, dt = 0.1549333902311$, reproduced here to eleven digits. Direct finite periodic sums give 0.152778 at $L = 8$, 0.154387 at $L = 16$ and 0.154796 at $L = 32$, converging monotonically to the quoted value. This is regulator convergence of the declared surrogate, not VERSF physical refinement convergence.

26. Three-versus-four-dimensional firewall. The ratio $Z_{(\rho,\text{phase})}^{(4)}/Z_\rho^{(3)} = 0.6130367235$, re-derived here, so the conditional four-dimensional coefficient is 38.70% below the three-dimensional spatial value. Consequently a spatial closure-norm stiffness may not be promoted directly to the physical fact-to-fact Higgs residue.

27. Updated physical-residue audit. The exact Stage-3 target remains $Z_H^{\text{micro}} = A_2 - B_2C_0^{-1}B_0^\dagger - B_0C_0^{-1}B_2^\dagger + B_0C_0^{-1}C_2C_0^{-1}B_0^\dagger$. The compact-phase determinant now supplies a nonzero source-side momentum contribution but does not evaluate the remaining relaxation stack. If $h_{HFB} = s_H\, \rho$, the physical common-line coefficient is $g_H^{\text{phys}} = Z_H^{\text{micro}}/s_H^2$. Neither $s_H$ nor the remaining Schur contribution is chosen from the Higgs target.

28. HMGBC relaxed-kernel audit. Starting from $\Gamma = (1/2)(X - \varphi P)^\dagger W(X - \varphi P) + (1/2)X^\dagger \Delta X$, stationarity gives $X^\star = (W + \Delta)^{-1}W\varphi\, P$ and direct substitution gives $K_{\text{eff}} = P^\dagger[W - W(W + \Delta)^{-1}W]P$. For $\Delta(p) = p^2\Delta_2 + O(p^4)$, symbolic expansion returns $K_{\text{eff}}(p) = p^2\, P^\dagger\Delta_2P + O(p^4)$, so the leading W-dependence cancels exactly; this was verified here both symbolically and on random positive matrices, where the extracted coefficient converges to $P^\dagger\Delta_2P$ as $p \to 0$. On the canonical benchmark $w_H = 75/434$ and $\lambda_\perp = 8/31$, giving $R_\perp = 75/187$ and $K_\perp = 600/5797$ in exact rational arithmetic. These are generation-geometry benchmarks, not spacetime $Z_H$.

29. Structured Higgs incidence audit. With $\mathcal{O}_{(H,i)} = r_i\, S_i$ and $S_i = V_{(H,i)}^\dagger P_{(H,i)}^R$, the covariant edge derivative $\nabla_e\mathcal{O}_H = \mathcal{O}_{(H,j)} - U_e^L\, \mathcal{O}_{(H,i)}(U_e^R)^\dagger$ decomposes exactly into $(r_j - r_i)S_j + r_i[S_j - U_e^L S_i\, (U_e^R)^\dagger]$. On a covariantly parallel pure-radial background the second term vanishes, giving $\|\nabla_e\mathcal{O}_H\|^2 = |r_j - r_i|^2\|S_j\|^2$, *hence the direct stationary-conductance stiffness* $D_{(H,e)}^{\text{dir}} = c_e\|S_e\|_{op}^2$.

30. Fact-action normalisation audit. The fact action $\Gamma_F^{(2)} = (1/2)\Sigma_n[(Z_H^{\text{time}}/\tau_F)(r_{(n+1)} - r_n)^2 + \tau_F\, K_H\, r_n^2]$ implies that a source Dirichlet coefficient $D_F$ multiplying the squared one-fact difference obeys $D_F = Z_H^{\text{time}}/\tau_F = \tau_F\, \kappa_F$, not $D_F = Z_H^{\text{time}}/\tau_F^2$. Consequently $Z_H^{\text{time}} = \tau_F\, D_F$, a fact-direction statement only. This distinction separates the dimensionless discrete edge stiffness from the continuum $p^2$ residue and prevents a one-power-of-$\tau_F$ normalisation error.

31. Two-level conductance blocking audit. The Stage-A regulators give $c_1 = 1/16$ and $c_2 = 1/32$ with exact paired fine-to-coarse pushforward, so $2c_2 = c_1$ exactly, and for an isometrically lifted structured Higgs section $2c_2\|S_H\|^2 = c_1\|S_H\|^2$. The direct conductance contribution is therefore exactly blocking-compatible. This is an arithmetic/refinement-structure certificate only: the Stage-A physical branch remains refused and the separate precursor completion arrays exhibit nonzero two-level drift.

32. Scalar-refinement typing audit. The diamond-glued refinement calculation shows that vertex-scalar gradients belong to a refinement-trivial sector while the first nontrivial structured observable carrier is edge transport modulo scalar gradients. This does not eliminate the local closure-radial amplitude; it requires that its physical propagation be represented as variation of a structured completion/interface section rather than as an autonomous naked scalar-gradient observable. The construction $\mathcal{O}_H = r\, S_H$ satisfies this requirement and leaves the source-defined closure-radial determinant as a separate kinetic precursor rather than invalidating it.

33. Recurrent-population Higgs-blindness audit. The recurrent ten-outcome population instrument depends on the route-support factors and stage hazards but not on $\varphi_H$ or the positive polar completion magnitudes, so direct differentiation gives $\partial_{\varphi_H} K_a = 0$ and zero direct radial Fisher score on that reduced instrument. This is a property of the reduction, not a physical theorem that the full Higgs history score vanishes.

34. TPB-gated radial-Fisher audit. For $p_r = h \sin^2\varphi_H\, q_r$, $p_0 = 1 - hQ \sin^2\varphi_H$ and $Q = \Sigma_r q_r$, direct Fisher summation gives $I_{\varphi_H} = 4hQ \cos^2\varphi_H/[1 - hQ \sin^2\varphi_H]$, re-derived symbolically here, with symmetric-interface limit $4hQ$. If the same law is local and independent between cells, its quadratic Fourier kernel is momentum independent, so $[\partial\Pi_H/\partial k^2]_0 = 0$ exactly.

35. Flat-incidence Higgs projection audit. For $R_T(\rho)$*$_{ij} = \rho_j - U_{ij}\, \rho_i$ and $H_T = 2 w_T B_U^\dagger B_U$, taking $\delta\rho_i = E$*$_{(H,i)}\, h_i$ with $E_{(H,j)} = U_{ij} E_{(H,i)}$ and $E_H^\dagger E_H = 1$ gives $\delta R_{(T,ij)} = E_{(H,j)}(h_j - h_i)$, so the Higgs-projected Hessian is exactly $H_{(H,T)} = 2 w_T B^\dagger B$. Since $B^\dagger B(q) = 2\Sigma_\mu[1 - \cos q_\mu] = q^2 - q^4/12 + O(q^6)$, verified symbolically, the graph-coordinate residue is $Z_{(H,T)}^{graph} = 2 w_T$. This is conditional on the flat-incidence implementation and is not a physical $Z_H$ certificate.

36. Constitutive derivative-order audit. For $\Gamma = (a/2)\|j - \kappa\, dh\|^2 + (b/2)|i\omega h + d^\dagger j|^2$, longitudinal reduction $j = dy$ and exact Schur elimination give $K_{JT} = ab[\omega^2 + \kappa^2\lambda^2]/(a + b\lambda)$ with $\lambda = d^\dagger d$. Symbolic evaluation confirms $K_{JT}(\omega, 0) = b\omega^2$ and, with $\lambda = c_X k^2 + O(k^4)$, $K_{JT}(0, k) = b\kappa^2 c_X^2 k^4 + O(k^6)$, so the spatial $p^2$ coefficient is exactly zero. The direct flat-incidence branch and the physically relaxed constitutive sector are therefore inequivalent unless an additional same-action theorem relates them.

37. Three-dimensional conductance-scaling audit. For $\Gamma_n = (1/2)\Sigma_{\langle ij\rangle}\, c_n(h_j - h_i)^2$ on a d-dimensional regulator with spacing $a_n$, the continuum gradient coefficient scales as $c_n a_n^{(2-d)}$; for $d = 3$ and midpoint refinement $a_2 = a_1/2$, invariance requires $c_2 = c_1/2$, and the Stage-A values 1/16 and 1/32 satisfy this exactly, verified here. The result is a scaling certificate only, because the Stage-A physical branch fails its terminal-holonomy gate.

End of SMNC-3, source-locked full-corpus provenance audit, 20 August 2026

Keith Taylor | 20 August 2026