The Standard Model Derivation Master Ledger in VERSF

What Has Been Achieved, What Remains, and the Order of Attack

Keith Taylor · *VERSF Theoretical Physics Programme — canonical control document*

The Standard Model of particle physics is extraordinarily successful — but it leaves many of its deepest inputs unexplained. Roughly nineteen numbers must be fed in by hand: the masses of the quarks and leptons, the strengths of the forces, the angles that mix the particle families. The theory tells us, with exquisite precision, what happens once those numbers are supplied. It is silent on why those numbers, why those forces, why three families, why left-handed weakness. Every one of those questions is treated, in standard physics, as a brute fact.

The VERSF programme takes the opposite position: none of it is a brute fact. The gauge groups, the particle roster, the mass hierarchy, the mixing matrices — all of it is forced by the architecture of irreversible commitment on a discrete substrate. The programme has now produced a genuine Standard Model spine: a fermionic field theory built from commitment loops, a chiral matter skeleton, an anomaly-forced hypercharge ledger, the gauge forces derived from shared conservation baths, and a Higgs doublet that exists for a derived reason rather than by insertion.

A claim of that size is only worth making if it can be audited, and that is what this document is for. It is the programme's single control ledger. It records what has been achieved and at what epistemic grade; it names what remains as thirty concrete gates, each with a pass condition and a failure meaning; it registers every known way the programme could fail; and it fixes the order of attack. It is deliberately honest in both directions — it does not undersell the architecture that now exists, and it does not allow a single number to be claimed before it has been earned.

1. The Programme at a Glance

Everything a reader needs before the detail: where the programme stands, what gets written next, and what could still bring it down.

Overall position	Roughly 62% ± 10 of the derivation programme — a planning estimate, not a proof state. It falls sharply if a Tier A gate fails; it rises materially if Tier A closes, and toward 75–80% only if Tier A is followed by successful convention/census closure and the first Tier D numerical gates.
Strongest layers	The structural spine: gauge architecture, electroweak representation and breaking, matter skeleton, charged-lepton ratios — around 75–85% complete at the conditional-theorem level.
Weakest layers	The numbers: exact masses and Yukawas, QCD dynamics, coupling values, quantum completion — around 40–50%.
Distance to completion	Thirty named gates in six tiers — a finite, ordered, falsifiable programme.
Next paper	**The Weak-Orientation Admissibility Theorem** — prove P_W = P_L: the weak force is left-handed because the substrate forces it to be.
Then	The Full su(8) Weak-Doublet Hessian Return, and the Projected Leakage Support Trace.
Biggest kill risks	Chirality not forced (R1) · the full su(8) calculation contradicting the minimal cell (R4) · the χ readout collapsing to zero (R10) · the κ exponent never reconciling (R11).

Standing rule	No new κ-dependent mass-sector number enters a derivation manuscript before SM-8 closes. κ-free anchor audits, including SM-23, may be recorded only with their proof gates and scheme firewalls attached.

2. How the Ledger Works

The programme's honesty lives in five words. Every claim in the corpus carries exactly one of these grades, and the difference between them is the difference between a derivation and a wish:

Exact — derived from named premises with no free parameters, and numerically verified. **Conditional** — genuinely derived, but resting on named premises not yet themselves proven; every such premise carries an explicit falsifier. **Inherited** — imported from measurement or standard theory, and firewalled: it may calibrate a comparison, never premise a derivation. **Owed** — identified as required, not yet delivered, and assigned to a named gate. **Downstream** — follows automatically once its upstream gate closes.

Four rules keep the ledger honest. It records grades and never upgrades them. Inherited quantities never become silent premises. Work advances only through named gates — a paper that discharges no gate advances nothing, however elegant. And there is exactly one control document: this one. Its predecessors — the Requirements Ledger and the batch-review Master Ledger — are superseded by replacement, because two ledgers giving different marching orders is worse than none.

3. What Has Been Achieved

The story runs from the bottom up. Irreversible commitment events build a fermionic field theory; the field theory carries a one-generation chiral matter skeleton; the skeleton forces the hypercharge assignments through anomaly admissibility; indistinguishable sectors, forbidden from keeping private ledgers, share conservation baths — and shared baths generate the gauge forces themselves. A completion interface with exactly the Higgs doublet's quantum numbers then emerges for a derived reason, and its condensation breaks the electroweak phase, delivering the photon, the W and Z, and their tree-level mass relations.

Above that spine sit the flavour and mass results: the Yukawa operator architecture in which masses are eigenvalues and mixing is a frame mismatch between sectors; the charged-lepton ratio law, whose electron–muon prediction lands within 0.17% of measurement; the strange/down ratio of 20 carried by a confinement operator; and the quark χ-halving signal, where the measured ratio 0.503 ± 0.023 sits squarely on the predicted ½. Each module below is graded under the rules of §2.

Module	Achieved	Grade
1. Fermionic QFT layer	Commitment loops → Fock space, full CAR, number/charge operators	Conditional (strong)
2. Matter skeleton	One-generation chiral slots (L_L, e_R, Q_L, u_R, d_R); fractional charge confined; repetition finite	Conditional (canonical)
3. Hypercharge / anomalies	Quark hypercharges rigid; anomaly cancellation reinterpreted as record-current admissibility	Conditional (strong)
4. Electroweak representation	$su(2)_L \oplus u(1)_Y$ with $Q = T_3 + Y$; the W/B connection	Conditional (strong)
5. Electroweak gauge dynamics	Curvature, kinetic terms, source equations at classical leading level	Conditional (strong)
6. Completion interface	$\Phi_{cl} \sim (1, 2, +½)$ derived as the minimal completion object — the Higgs form has a forward reason	Conditional (near canonical)

Module	Achieved	Grade
7. Broken electroweak phase	Photon, W±, Z directions; tree-level masses; $m_A = 0$	Conditional (tree-level)
8. Non-abelian gauge origin	No-private-ledger → shared bath → U(k), SU(k); the bath premise now selected, not assumed	Conditional (strong)
9. Global gauge group	$[SU(3)_C \times SU(2)_L \times U(1)_Y]/\mathbb{Z}_6$; congruence $2t + 3d + q \equiv 0 \pmod 6$	Conditional (strong)
10. CKM	Minimal-cell C_3 Hessian return; residue $\Delta_{13} = ½\cdot a\cdot\zeta_{C_3}$ improves J and $\lvert V_{td}\rvert$	Conditional (minimal cell)
11. PMNS	Kernel: $\rho_\odot = \sqrt{3/2}$, $B/A = 6/5$, $\delta = 0$, $\psi = 3\pi/4$, $\beta = \sqrt{3}/20$; the octant–phase lock	Conditional (sharp candidate)
12. Masses / Yukawas	$\mathcal{Y}_S = U_S \Lambda_S^2 U_S^\dagger$; stiffness $S = S_H\cdot S_L\cdot S_P\cdot S_I$; lepton law $1 : e^{16/3} : (1/12)e^{32/3}$; $m_s/m_d = 20$; χ ratio 0.503 ± 0.023 vs ½; candidate interface-projected anchor $m_d = 9\alpha^2 v/(8\pi)$, +0.54%	Architecture canonical; numbers Owed
13. QCD / hadrons	Colour gauge origin and current structure only	Early architectural

4. What Remains: The Thirty Gates

Thirty gates stand between the present position and a full derivation, and they are ordered by a single principle: **proof debts first**. Some of these gates can fail — genuinely fail, in ways that would bring down whole sectors of the programme — and a failure discovered early costs a paper, while a failure discovered late costs years of numerical work built on the collapsed structure. So the gates that carry falsification risk run first, before any computation they could invalidate. Each gate below states what must be proven, what passing looks like, and what failure would mean.

A gate is not a paper. A paper is the working unit that closes, partially closes, or falsifies a gate, and each gate below corresponds to one named manuscript. Adjacent gates may be combined into a single manuscript only if that manuscript explicitly closes every gate it absorbs — a paper that half-closes two gates has closed neither.

Tier A — The gates that can kill

These run now, in this order. Each one is a live theorem risk: if the weak force turns out not to be forced left-handed, if the full su(8) calculation contradicts the minimal cell that produced the CKM results, if the χ readout provably sees only the final record, whole branches of the programme fall. Better to know immediately.

SM-1 · The Weak-Orientation Admissibility Theorem in VERSF

Builds directly on the chiral-locking result in the Electroweak Representation and Connection Closure paper and the spinorial source-carrier machinery beneath it. The manuscript casts weak-attachment orientation as an admissibility problem: it enumerates the orientation assignments the closure transport could in principle carry — left-chiral, right-chiral, vector-like — and eliminates each rival by a named admissibility condition rather than by fiat, leaving $P_W = P_L$ as the only survivor. The core difficulty, and the thing a referee will probe first, is that the elimination must be forced by substrate premises alone, with the observed V−A structure never entering as an input. Structure: named premises with falsifiers, the transport lemma, the elimination argument, and a closing section stating exactly what discovery would break the theorem (R1).

SM-2 · The Full su(8) Weak-Doublet Hessian Return in VERSF

Extends the Projected C_3 Hessian Return from the minimal cell to the full weak-doublet embedding. The manuscript constructs the su(8) embedding basis explicitly, assembles the closure Hessian block by block, and computes the projected return $P_W H_{cl} P_W$ exactly — with every load-bearing matrix element verified numerically before any interpretation is placed on it. It then compares the full-projection survivor and residue against the minimal-cell values, $\Delta_{13} = ½·a·\zeta_{C_3}$ included, and propagates any difference through the CKM ledger. Deliverables: the block tables and a numerical appendix. The question the paper exists to answer: was the minimal cell representative, or lucky (R4).

SM-3 · The Projected Leakage Support Trace in the Weak-Commitment Block

Works inside the weak-commitment block defined by the Leakage Trace and Closure Kernel papers. The manuscript constructs the leakage projector Π_{leak} explicitly, fixes the unit-slot Killing normalisation up front, and computes the support trace by direct enumeration of the contributing slots — the counting argument that must yield exactly 20. A short paper by design: conventions first, projector construction second, the trace computation with an independent numerical check third. Success turns $\beta = \sqrt{3}/20$ from benchmark into prediction; any other derived value kills the candidate on the spot (R5).

SM-4 · The Ordered-Commitment χ Readout Theorem in VERSF

Grows out of the W_7 Fold Carrier and Readout Domain paper, whose warning it exists to answer. The manuscript characterises the physical readout functional — what a measurement of the χ observable actually accesses on the substrate — and proves it acts on ordered commitment history H rather than only the final standing record F. The technical core is a coarse-graining argument: showing that the reversal-odd residue survives every admissible projection down to physical observables. The paper must also state, honestly, the conditions under which the readout would collapse to F — because if those conditions hold, $\chi = 0$ is forced and the halving programme (SM-15, SM-17) ends here (R10).

SM-5 · The Gauge-Census Closure Theorem in VERSF

Adds the census layer missing from the Non-Abelian Bath-Transport and Gauge-Closure Selection theorems. Where those papers derive SU(k) from a shared bath of unspecified dimension, this manuscript counts the bath classes themselves: it enumerates the admissible indistinguishability classes from substrate premises and proves that exactly a $k = 3$ class and a $k = 2$ class are realised and occupied. The hard constraint on the writing is that the exclusion of $k = 4, 5, …$ must follow from a stated capacity or admissibility bound — the moment the observed groups are used to steer the count, the paper has proven nothing (R3).

SM-6 · The Weak-Attachment Octant Sign in VERSF

A short, sharp computation paper in the PMNS stack. It takes the projected weak block from the Weak-Doublet Projection work, computes the two attachment norms $\|P_e H_W P_\tau\|^2$ and $\|P_e H_W P_\mu\|^2$, and reads off σ_W as their sign difference. Most of the manuscript's care goes into fixing frames and normalisations tightly enough (SM-9 material) that the sign is unambiguous; it closes by restating the octant–phase lock as a prediction table set against current oscillation data — the PMNS sector's sharpest standing falsifier.

SM-7 · Adjoint-Removal, Positivity, and Microcausality in VERSF

Completes the Fermionic Fock-Space Reconstruction. That paper built creation by wedge insertion and annihilation by Hilbert adjoint; this one derives the adjoint structure itself — showing that substrate transport induces the inner product whose positivity the CAR algebra requires — and establishes local microcausality at the level the corpus needs. The three debts should be stated as three separate theorems with separate premises, because a referee will attack them separately; a single blended argument would let one weak link taint all three.

Tier B — Fixing the measuring stick

Before a single mass number is computed, the programme's ruler must stop changing length. The localization exponent κ currently has three candidate values living in three different sectors, and every mass computed before they reconcile is a number that may have to be recomputed. These two gates open alongside Tier A and block everything in Tier D.

SM-8 · The Localization-Exponent Convention and κ-Reconciliation Theorem in VERSF

A forensic paper before a constructive one. Its first half traces each κ appearance to its defining context — 8/3 in the charged-lepton ratio law, ln 14 and 3/8 in the localization and stiffness contexts — and determines whether the three are one quantity in different conventions, different quantities sharing a symbol, or a genuine contradiction. Its second half derives the localization-exponent convention once from the substrate definition, proves the origin of $R_0 = e^{(16/3)}$, closes the factor-of-two ambiguity, and republishes every affected formula in the unified convention. Deliverable: the conversion table every Tier D paper will cite (R11).

SM-9 · The Standard Model Convention and Normalisation Audit in VERSF

The companion sweep: a systematic pass through the corpus collecting every convention choice — hypercharge normalisation, phase and sign conventions, Killing norms, support traces, current-mass schemes — and resolving each to a single stated choice with a conversion rule. Deliberately written as mostly tables. Its ambition is to be the most-cited and least-read paper in the programme: the place where agreement with data can be checked against the possibility that it is secretly a convention artefact.

Tier C — Closing the structure

These gates complete the architecture: why exactly three generations, how the observed particles map onto the framework's classes, why the CP phase is honest rather than circular, why the strange quark resolves while the down quark does not, and what forces the Higgs potential rather than assuming its shape. They run in parallel with Tier B.

SM-10 · The Substrate Anomaly-Descent Theorem in VERSF

Replaces the imported anomaly machinery with substrate-native descent. Starting from the record-current reinterpretation established in the anomaly-inadmissibility work, the manuscript derives the descent structure from commitment and source geometry, then re-derives every cancellation in the Standard Model anomaly audit table natively, and classifies the global anomalies against the $\mathbb{Z}_6$ quotient. The writing discipline: any cancellation that still needs the inherited QFT machinery must be flagged as such, not smoothed over — a partially native paper is publishable, a disguised one is not.

SM-11 · The Generation and Species Census Theorem in VERSF

Extends the Generation Theorem by discharging its three live premises — REF-DIM, REF-BIN, and REF-OCC — each in its own section with its own derivation and falsifier, then runs the D7/refinement count to closure. The template is the charged-lepton PFD enumeration, which already reaches the target standard and carries the clean falsifier that a fourth charged lepton at any mass breaks closure-exhaustion; the manuscript's work is to bring quarks and neutrinos to that same standard.

SM-12 · The World-to-Framework Occupancy Map for Standard Model Matter

The dictionary paper. It takes the census from SM-11 and the Matter Skeleton classes and assigns every observed particle — e, μ, τ; u, c, t; d, s, b; ν_1, ν_2, ν_3 — to a VERSF class with its full quantum-number row: colour, weak representation, hypercharge, generation level, PFD class. Largely one large table plus the no-orphans proof on each side. Its value is infrastructural: every later numerical paper cites one canonical identification instead of re-deriving its own, and any orphan discovered on either side falsifies the census claim publicly.

SM-13 · The Minimal Hermitian Lift and Frame-Rotation Firewall

An anti-circularity theorem, short and disproportionately valuable. The manuscript reconstructs the CKM phase branch and the +i frame rotation from closure geometry alone, then devotes its second half to the firewall: an explicit demonstration that no CKM datum enters the derivation chain at any point — ideally by exhibiting the whole construction as a function of substrate inputs only. Circularity is the first attack a referee mounts against any successful postdiction; this paper is the pre-built defence.

SM-14 · The Strange Confinement Dynamics Theorem

Turns the Strange Confinement Operator from candidate into consequence. Starting from the boundary-capacity functional of the existing operator paper, the manuscript derives the confinement dynamics that select the balanced 3+3 support shell, the complement breaking, and the unit self-weight — and then devotes a full section to the down-sector exemption: a proof that the same dynamics do not resolve the down sector. That section is not optional; a mechanism that predicts resolution in both sectors brings down $m_s/m_d = 20$ as currently derived, and a selection principle that cannot state its own non-selection condition is not yet a selection principle.

SM-15 · **The Physical Half-Lazy χ Gate Audit**

Works through the Half-Lazy Closure Operator's six halving conditions one at a time — genuine two-fold sector, image-even closure, binary one-step history, equal primitive weights, no branch-cost asymmetry, log-access intertwining — deriving each from substrate physics or replacing it with something derivable. Each condition gets its own subsection with premise, derivation, and falsifier; a closing section assembles the six into the exact-halving theorem and sets it against $\rho_{obs} = 0.503 \pm 0.023$ from the Single-Scheme Audit, at which point $\rho = ½$ graduates from postdiction to derivation.

SM-16 · **The Closure-Interface Potential and Higgs-Radial Theorem**

The scalar-sector paper. It first derives CI-4 — the completion requirement that the Completion-Interface Theorem currently takes as given — then constructs the closure-interface potential from it, minimises to obtain the electroweak scale v, and extracts the Higgs radial mass and self-coupling λ with a stability analysis. Builds from the Completion-Interface and Closure-Norm Condensation papers. The central difficulty is that the potential's shape must emerge from the closure functional itself; reaching into the Landau catalogue for a quartic and fitting it would fail the gate by construction (R6). Its priority has risen: since the SM-23 conversion, the value of v_{cl} sits upstream of both absolute mass anchors — the quark and lepton scale formulas are linear in it.

Tier D — Computing the numbers

This is where the programme earns its keep or fails in public: the actual masses, the actual matrices, the actual scales — no gate in this tier opens until the conventions of Tier B have closed. The centre of gravity is SM-22, the full Yukawa construction, the single largest missing block in the entire programme. One gate conversion has already landed ahead of schedule: the interface-projected down anchor (see SM-23) — admissible under the κ rule because the anchor formula contains no localization exponent, and consequential for the critical path, since both absolute anchors now lean on SM-16 (v_{cl}) and SM-26 (α) rather than on κ, which retains its monopoly over the ratios only.

SM-17 · **The First χ-Increment Magnitude and Charm-Hinge Theorem**

Re-opens the first-increment construction with the readout (SM-4) and gate audit (SM-15) in hand. The manuscript states the current $w_\chi = 2/3$ route — the 77/3 construction — with its premises exposed, quantifies the tension against the data preference near 0.64, and then commits to one of two publishable outcomes: derive 2/3 with a computed correction that accounts for the residue, or replace the construction and propagate the change. What it may not do is keep 2/3 because it is tidy.

SM-18 · **The Coloured Participation Fraction Beyond 3/12**

The heavy-sector companion. It re-derives the coloured participation structure beyond the 3/12 fraction, targeting the bottom/strange factor $e^{(16/3)}/4$ that currently carries the bottom-step tension in the one-anchor quark grid. The manuscript ends by re-printing the affected grid rows under whichever outcome it reaches — derived correction or honest revision — so the quark ledger stays synchronised.

SM-19 · **The Saturated-Maintenance Projection and Tau Suppression Theorem**

Constructs the maintenance projection P_{maint} explicitly, counts the anchor and survivor modes to prove $N_{anchor} = 12$ and $N_{survive} = 1$, and computes the residual correction that moves 1/12 = 0.0833 to the working value 0.0812. Written as the counting half of a pair with SM-20: this paper establishes the participation route to the tau suppression as a theorem rather than a count.

SM-20 · **The Variational–Closure Suppression Identity**

The two-routes-one-object theorem. It places the Role-4 variational calculation and the closure participation count in a common framework and proves that $\tilde{E}_2/\tilde{E}_1 \approx 0.0846$ and $1/12 \approx 0.0833$ are the same object at two levels of description — or derives the correction that separates them, or proves them distinct. The manuscript should be structured so that every one of those outcomes is publishable: identity closes the tau story, a derived link closes it with a residual explained, and proven distinctness forces the programme to choose its route in print.

SM-21 · The Charged-Lepton Absolute Scale Theorem

The scale paper for leptons — now with two competing routes the manuscript must adjudicate. Route one is the substrate conversion: derive the ε_bit/ε_ref ratio and the substrate-to-MeV map. Route two is the shared projection kernel inherited from the SM-23 conversion: $m_e = \alpha^2 v_{cl}/(8\pi)$, the colourless N = 1 case of the down-anchor formula, currently landing +2.1% high. The discriminator between the routes is parameter-free: the shared kernel forces $m_d/m_e = 9$ exactly — v and α cancel — against a measured 9.14 ± 0.18 (FLAG 2+1) to 9.20 ± 0.10 (FLAG 2+1+1) under the per-sector readout P6, and the round-2 projection paper hands this manuscript a joint target tighter than either residual alone: the sector corrections must satisfy $\kappa_d/\kappa_e = 1.015 \pm 0.020$ (1.022 ± 0.011 under 2+1+1), so no lepton-readout correction may close the electron residual without moving the down residual coherently. The paper must still prove κ generation-uniformity so the ratio law $1 : e^{16/3} : (1/12)e^{32/3}$ lifts to absolute masses: κ owns the ratios even where the anchor proves κ-free. Deliverable: m_e derived rather than anchored, with m_μ and m_τ automatic and every deviation quantified.

SM-22 · The Closure-Mode Spectrum and Full Yukawa Matrix Construction

The programme's centrepiece manuscript, and probably its longest — this single paper is worth over a fifth of the remaining gap. It assembles the closure-mode spectrum: constructing the sector frames U_S and spectra Λ_S for all four sectors from closure geometry, drawing on the census (SM-11, SM-12), the convention layer (SM-8, SM-9), and the sector results of SM-14 through SM-21 as inputs. Deliverables: the explicit matrices $\mathcal{Y}_u$, $\mathcal{Y}_d$, $\mathcal{Y}_e$, $\mathcal{Y}_\nu$, and a numerical appendix that diagonalises them and compares every eigenvalue and mixing element to data. Because mixing is a frame mismatch between sectors, the CKM and PMNS numbers fall out of this construction rather than being computed separately (R8).

SM-23 · The Quark Current-Mass Projection Theorem

Removes the last anchor — and this gate has now been partially delivered (round-2 manuscript), by a different route than originally planned: direct interface projection, $m_d^{proj} = 9\alpha_{int}^2 v_{cl}/(8\pi) = 4.6952$ MeV, +0.54% against FLAG $N_f = 2+1$ (all values independently verified, including the paper's own two-loop RG code). The menu scan is quantified honestly: 144 discrete combinations, unique hit at the 1% and 2.5% levels, none within 2.5% of m_u or m_s, chance-hit ≈ 18% — the match motivates the structure, it does not certify it. Status: Conditional candidate, at the price of five named sub-gates — SM-23a, the Two-Gate Current-Readout Theorem (α^2, one/three gates excluded ×137; now also owns premise P2′, charge-blind gate weight, whose failure costs ×81, F2b); SM-23b, the Projection-Kernel Theorem ($1/(8\pi)$ as a density reading, not an average); SM-23c, the Colour–Triality Composition Lemma ($N_d = 9$ as forced product); SM-23d, the Fermion RG Matching Theorem — now owning premise P6 (per-sector IR-observable readout), the scheme-invariant $\hat{m}_d$ identification, and a hard quantitative target: the derived readout scale must land at $\mu\star = 2.13$ GeV, band 1.97–2.30 (2+1) or 2.18 ± 0.10 GeV (2+1+1); the boundary reading is excluded at +84% (two-loop, computed); and SM-23e, the Anchor Ground-State Lemma — prove the down cell is the physically undressed grid identity, $\kappa_{P5} = 1$, measured 0.995 ± 0.019 / 1.001 ± 0.011. Headline falsifier F0: $m_d/m_e = 9$ exactly, parameter-free; measured 9.14 ± 0.18 (0.8σ, FLAG 2+1) to 9.20 ± 0.10 (2.0σ, FLAG 2+1+1) under P6 — and 9.43 (2.4–4.8σ) under uniform $\overline{\text{MS}}$, so P6 is load-bearing (F11). The κ-contaminated grid rows (b at $5e^{16/3}$; top) remain suspended pending SM-8.

SM-24 · The PMNS Closure-Hamiltonian Theorem

Constructs the full weak-commitment closure Hamiltonian and derives the kernel rules from it — or shows that they do not follow. The five kernel values ($\rho_\odot = \sqrt{3/2}$, $B/A = 6/5$, $\delta = 0$, $\psi = 3\pi/4$, $\beta = \sqrt{3/20}$) become theorem outputs compared against oscillation data, with the octant–phase lock retained throughout as the standing falsifier. Uses SM-3's trace and SM-6's sign as fixed inputs; a kernel that survives this paper is a computed output, and one that does not is rejected in print rather than quietly dropped.

SM-25 · The Neutrino Mass and Charge-Conjugation Completion

Settles the neutrino branch. The manuscript states the Dirac, Majorana, and weak-commitment options as competing premise sets, derives which survives substrate admissibility — with the rejected branches excluded by named premises rather than preference — and constructs the mass mechanism for the survivor, so that $\mathcal{Y}\_\nu$ enters the SM-22 framework on the same footing as the charged sectors.

Tier E — From architecture to physics

A derived gauge group is not yet a force. These gates turn structure into dynamics — the coupling strengths and their running, real QCD with confinement and Λ_QCD, the strong CP question, and finally the proof that the whole construction is a consistent quantum theory. They run in parallel once the anomaly-descent gate lands.

SM-26 · The Gauge Action and Coupling Theorem in VERSF

Derives the Yang–Mills action from the curvature-norm principle the gauge-dynamics stack currently owes, then extracts the coupling values and running — g_s, g, g′, e, α, sin²θ_W — from VERSF boundary conditions, so the strengths of the forces become outputs. The manuscript should be staged so partial success is publishable: each coupling gets its own derivation section with a quantified deviation, and one coupling landed honestly is worth more than six sketched. Like SM-16, this gate has risen in priority: the SM-23 conversion makes the absolute anchors second order in α_int, so every fractional error in the coupling is doubled in the mass.

SM-27 · QCD Confinement and Running in the SU(3)_C Bath-Transport Sector

The QCD manuscript, and likely the longest haul in Tier E. It derives the β-function and asymptotic freedom within the colour bath-transport sector, then Λ_QCD, confinement, and chiral symmetry breaking — the sequence that turns the derived SU(3)_C structure into the physics of actual protons and hadrons. It should be written in stages, so that the running result can stand alone and publish early if confinement takes longer, rather than holding the whole sector hostage to its hardest theorem (R7).

SM-28 · The Strong CP and Global θ-Sector Theorem

The honesty paper. It works out what the $\mathbb{Z}_6$ quotient and the instanton sectors imply for the θ-angle, and commits in advance to one of two publishable endings: θ constrained by substrate premises, or its smallness registered as an open debt with an explicit falsifier. The scope statement matters — 'registered open with a falsifier' is an acceptable published outcome, because the failure mode this paper exists to prevent is the one most derivation programmes choose: silence.

SM-29 · The Quantum Gauge Completion of the VERSF Standard Model

The consistency capstone: gauge fixing, a BRST/ghost equivalent, Ward identities, unitarity, loop and renormalisation structure, and observable reconstruction through to the S-matrix — demonstrated at one loop with a stated route to all orders. It takes SM-10's native anomaly descent as input, and its unitarity section carries programme-level stakes: a unitarity failure at any order falsifies not just this gate but the completion claim itself (R9).

Tier F — The closing table

Last by construction: the audit that assembles every Standard Model object into one final table. This gate cannot be passed by prose — only by the table itself.

SM-30 · The Final Standard Model Derivation Audit

Written last, and written to be attacked. The manuscript is one table and its defence: every Standard Model object and parameter listed as SM object → VERSF theorem → grade → empirical comparison → remaining deviation, together with the finite-tests compendium collecting every pass/fail test in the programme — Hessian blocks, leakage trace, octant sign, k-census, no-fourth, the full mass and mixing spectrum — in one referee-facing place. The compendium is the page a hostile reviewer should be sent to first. Pass condition: no row graded Owed, and any surviving Inherited row a units convention, not a physical input.

The dependency logic, in full: Tier A runs first and nothing blocks it. SM-8 and SM-9 must close before any Tier D gate opens. Tier E opens once SM-10 lands, and SM-30 is last by construction. A plain-language public overview remains a book and website deliverable, but it advances no gate.

The full writing order

The next work is not another synthesis paper — the synthesis is now good enough. The complete queue below sequences all thirty manuscripts. The first ten are proof-debt and convention papers and should be written in strict order unless a gate fails and forces re-planning; within the later tiers, parallel work is allowed, but this is the default sequence. Note that writing order departs from gate numbering in one place: the neutrino branch (SM-25) must be written before the full Yukawa construction (SM-22), because $\mathcal{Y}\_\nu$ cannot be built until the branch is selected — and the current-mass projection (SM-23) and PMNS closure (SM-24) consume SM-22's output, so they follow it.

Order	Manuscript	Gate
1	The Weak-Orientation Admissibility Theorem in VERSF	SM-1
2	The Full su(8) Weak-Doublet Hessian Return in VERSF	SM-2
3	The Projected Leakage Support Trace in the Weak-Commitment Block	SM-3
4	The Ordered-Commitment χ Readout Theorem in VERSF	SM-4
5	The Gauge-Census Closure Theorem in VERSF	SM-5
6	The Weak-Attachment Octant Sign in VERSF	SM-6
7	Adjoint-Removal, Positivity, and Microcausality in VERSF	SM-7
8	The Localization-Exponent Convention and κ-Reconciliation Theorem in VERSF	SM-8
9	The Standard Model Convention and Normalisation Audit in VERSF	SM-9
10	The Substrate Anomaly-Descent Theorem in VERSF	SM-10
11	The Generation and Species Census Theorem in VERSF	SM-11
12	The World-to-Framework Occupancy Map for Standard Model Matter	SM-12
13	The Minimal Hermitian Lift and Frame-Rotation Firewall	SM-13
14	The Strange Confinement Dynamics Theorem	SM-14
15	The Physical Half-Lazy χ Gate Audit	SM-15
16	The Closure-Interface Potential and Higgs-Radial Theorem	SM-16
17	The First χ-Increment Magnitude and Charm-Hinge Theorem	SM-17
18	The Coloured Participation Fraction Beyond 3/12	SM-18
19	The Saturated-Maintenance Projection and Tau Suppression Theorem	SM-19

Order	Manuscript	Gate
20	The Variational–Closure Suppression Identity	SM-20
21	The Charged-Lepton Absolute Scale Theorem	SM-21
22	The Neutrino Mass and Charge-Conjugation Completion	SM-25
23	The Closure-Mode Spectrum and Full Yukawa Matrix Construction	SM-22
24	The Quark Current-Mass Projection Theorem	SM-23
25	The PMNS Closure-Hamiltonian Theorem	SM-24
26	The Gauge Action and Coupling Theorem in VERSF	SM-26
27	QCD Confinement and Running in the SU(3)_C Bath-Transport Sector	SM-27
28	The Strong CP and Global θ-Sector Theorem	SM-28
29	The Quantum Gauge Completion of the VERSF Standard Model	SM-29
30	The Final Standard Model Derivation Audit	SM-30

Queue note: SM-23 has been partially delivered out of order as a candidate conversion (the interface-projected down anchor). Its five sub-gates — SM-23a Two-Gate Readout (incl. charge-blindness P2′), SM-23b Projection Kernel, SM-23c Colour–Triality Composition, SM-23d RG Matching (incl. P6, $\hat{m}_d$, and the $\mu_\star \approx 2.1–2.2$ GeV target), SM-23e Anchor Ground-State Lemma — join the queue immediately behind SM-16 and SM-26, whose outputs (v_{cl} and α_{int}) they consume. The SM-23a–e items are sub-gates of SM-23 and do not change the thirty-gate top-level count. The final full-spectrum use of SM-23 belongs after SM-22, but the κ-free anchor-conversion component was admissible out of order because it does not depend on the full Yukawa construction.

5. How the Programme Could Fail

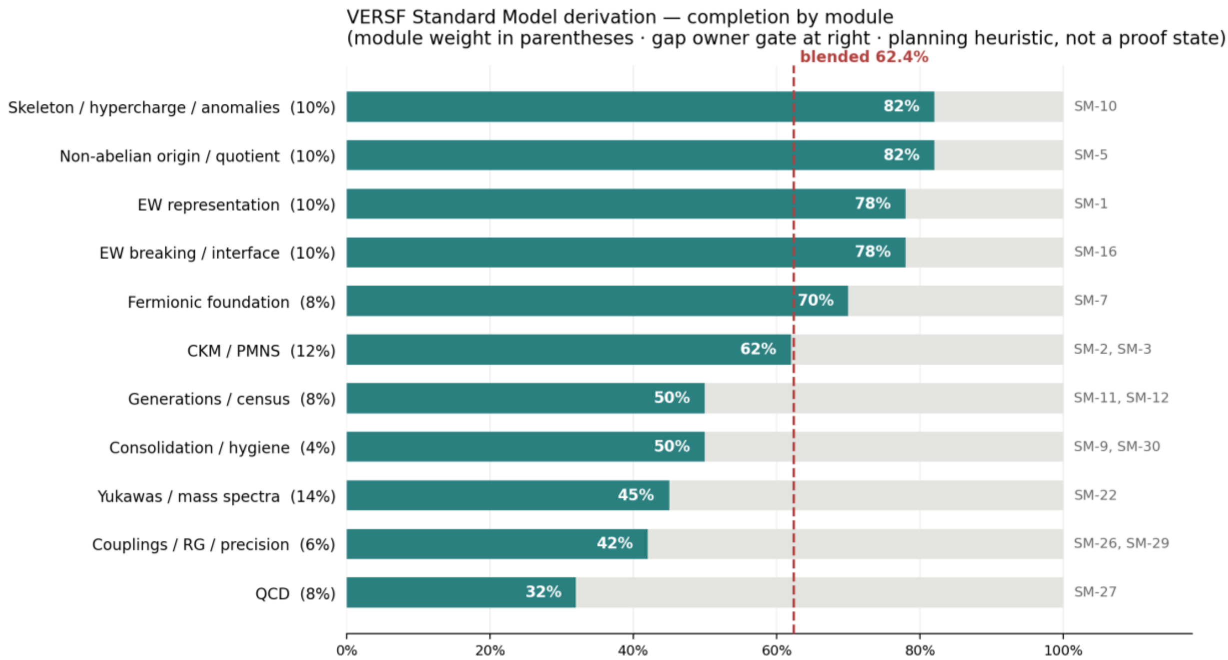
A derivation programme that cannot name its own failure modes is not a derivation programme — it is a belief system with equations. The register below is the complete list of known ways VERSF's Standard Model claim could fall, each matched to the gate whose job is to answer it. The two most dangerous entries, R10 and R11, share a telling property: neither lives inside any single paper. They are cross-cutting risks, visible only when the corpus is read as a whole — which is exactly why batch-by-batch review missed them, and why this register admits risks by rule rather than waiting to discover them by ingestion. R12 has now joined them: it couples the quark and lepton sectors through a shared projection kernel and lives fully in neither. Its cheapest test is the parameter-free ratio $m_d/m_e = 9$ — measured 9.14 ± 0.18 to 9.20 ± 0.10 under the per-sector readout, but 9.43 (2.4–4.8σ) under uniform $\overline{MS}$ conventions, so the risk now includes the readout premise P6 itself: if the correct lepton readout is the common-scale $\overline{MS}$ mass, the naive shared kernel already fails on current data.

Risk	Failure mode	Severity	Answered by
R1	Chirality not forced	High	SM-1
R2	No-private-ledger selection fails	Medium	Audits under SM-5, SM-9
R3	k = 3 / k = 2 not derived	High	SM-5
R4	Full su(8) contradicts the C_3 cell	High	SM-2

Risk	Failure mode	Severity	Answered by
R5	Leakage denominator 20 not derived	High	SM-3
R6	Higgs potential not derived	Medium	SM-16
R7	QCD dynamics not recovered	High	SM-27
R8	Mass/Yukawa computations miss data	Very high	SM-17–SM-23
R9	Renormalisation layer not derived	Medium-high	SM-29
R10	χ readout reduces to final record → χ = 0	Very high	SM-4
R11	κ candidates never reconcile	Very high	SM-8
R12	Shared projection kernel fails: the electron relation collapses under proper lepton readout	High	SM-21, SM-23

6. How Far Along Is the Programme?

The honest answer is a picture, not a number. The chart below shows every module of the programme, sorted from most to least complete, and the shape tells the story at a glance: a strong band of structural modules sitting at 70–82%, a visible cliff, and then the numerical modules below it. The dashed line is the weighted blend — about 62% — and the gate responsible for closing each module's gap is named at the right of its bar. The figure is a planning heuristic, never an epistemic claim: it treats the remaining work as commensurable when part of it is falsification-exposed. If Tier A fails, this picture gets much worse; if Tier A closes, it improves materially — and reaches the 75–80% band only after convention/census closure and the first Tier D numerical gates. The arithmetic behind it has been independently verified — contributions sum to 62.4 points, leaving a gap of 37.6.



Each bar: solid = complete, grey = missing; module weight in parentheses; the gate that owns the gap sits at the right of each bar; the dashed line is the blended 62.4%.

Module	Weight	Score	Missing	Biggest gap
Fermionic foundation	8%	70%	2.4 pp	SM-7

Module	Weight	Score	Missing	Biggest gap
Skeleton / hypercharge / anomalies	10%	82%	1.8 pp	SM-10
EW representation	10%	78%	2.2 pp	SM-1
Non-abelian origin / quotient	10%	82%	1.8 pp	SM-5
EW breaking / interface	10%	78%	2.2 pp	SM-16
CKM / PMNS	12%	62%	4.6 pp	SM-2, SM-3
Generations / census	8%	50%	4.0 pp	SM-11, SM-12
Yukawas / mass spectra	14%	45%	7.7 pp	SM-22
QCD	8%	32%	5.4 pp	SM-27
Couplings / RG / precision	6%	42%	3.5 pp	SM-26, SM-29
Consolidation / hygiene	4%	50%	2.0 pp	SM-9, SM-30

Where the remaining gap actually sits. Expressed as shares of the 37.6 missing points, the concentration is stark: over a fifth of everything left in the programme lives in a single gate — SM-22, the full Yukawa construction — and the top five blocks together account for two thirds of the distance to completion.

Rank	Largest missing block	Missing	Share of gap	Main gates
1	Yukawas / mass spectra	7.7 pp	20.5%	SM-22, SM-23, SM-17–SM-21
2	QCD	5.4 pp	14.4%	SM-27
3	CKM / PMNS	4.6 pp	12.2%	SM-2, SM-3, SM-6, SM-13, SM-24
4	Generations / census	4.0 pp	10.6%	SM-11, SM-12
5	Couplings / RG / precision	3.5 pp	9.3%	SM-26, SM-29

7. Where the Results Live

The canonical stack by module — not every paper in the corpus, but the current best source for each layer of the derivation.

Module	Canonical papers
Fermion/Fock	Fermionic Fock-Space Reconstruction; Spinorial Source-Carriers to Fermionic Quantization; Microscopic Origin of the Record Current
Matter representation	Chiral Matter Representation Theorem; Particle Species as PFD Classes; Matter from Persistent Fold Closure; Matter Skeleton Theorem
EW representation	Electroweak Representation and Connection Closure; Substrate Anomaly-Inadmissibility Theorem
Gauge dynamics	Electroweak Gauge-Curvature Dynamics; Non-Abelian Bath-Transport Theorem; Gauge-Closure Selection Theorem

Module	Canonical papers
EW breaking	Broken Electroweak Phase; Electroweak Completion-Interface Theorem; Closure-Norm Condensation
Global closure	Gauge-Closure Selection Theorem; $\mathbb{Z}_6$ quotient / charge-triality audit
CKM / flavour	Yukawa Operator from Completion-Channel Misalignment; Flavour-Frame Operator; CKM Curvature Residue; Weak-Doublet Projection; Projected C_3 Hessian Return; Quark-Sector Closure Ledger
PMNS	Weak-Commitment Neutrino Operator; Closure Kernel; Leakage Trace; Weak-Doublet Projection
Quark masses	Quark Masses from One Anchor; Strange Baseline / Current-Mass / Confinement Operators; Conditional Quark Mass-Ratio Grid; Single-Scheme χ Audit; Half-Lazy Closure Operator; W_7 Fold Carrier
Charged leptons	Charged-Lepton Ratio Law; Threshold Compression; Participation Gating; PFD Enumeration; Substrate Stiffness Hierarchy; Role-4 Completeness
Generations	Generation Theorem; Stable-Spectrum Gap Functional; Closure-Operator Realization; D7 Census papers
Quantum foundation	Probability as Admissible Measure; Operational Hilbert Geometry; ODG/UMP; Bath/ledger, RC/ALP papers

8. Where the Programme Stands

VERSF has built a credible Standard Model spine. The representation, gauge, anomaly, and breaking architecture has been reduced to explicit theorem chains, and the flavour and mass sector has been reduced to finite audits rather than open fitting. That is a rarer position than it sounds: most attempts at a deeper theory never convert their ambition into a finite list of things that must be proven, each of which could fail. This programme has.

It is not a completed derivation, and this ledger fixes the distance exactly: thirty gates, ordered so that the gates capable of killing the programme run before the work they could invalidate, and so that no number is computed before the ruler that measures it stops changing length. The final proof now depends on exact microscopic calculations and numerical closure — not on more high-level synthesis, of which there is already enough.

The next paper is fixed by Tier A: ***The Weak-Orientation Admissibility Theorem in VERSF*** — prove that the weak force is left-handed because the substrate leaves it no other choice. Then the su(8) Hessian Return, then the Leakage Support Trace.

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