

Questions a Standard Model Derivation Must Answer

Technical and general-reader answers from the VERSF programme, October 2026

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Abstract

A derivation of the Standard Model must account for its particles, interactions, quantum consistency and observable predictions. This paper sets out twenty six questions, each with a technical VERSF answer and a general-reader explanation that is held to the same claim boundary. Earlier VERSF papers give conditional derivations of gauge origin, weak orientation, quantum and fermionic structure, the generation census, electroweak symmetry breaking and parameter transport, each under declared premises that are kept visible here. The October results add quantitative and structural results on specified constructions: a neutrino mass-spacing ratio, a relative gauge relation with an evaluated residual, and exact baryon and lepton selection rules. Every result is graded as established conditionally, numerically evaluated on a branch, or physically open, and the remaining calculations are stated in the order in which they depend on one another. The programme has substantial completed conditional work; it has not yet certified one complete physical Standard Model derivation.

Why these questions matter

The central question is how the familiar particles and their interactions could emerge from the underlying structure proposed by VERSF. Answering it requires more than a resemblance between a geometric pattern and a particle diagram. The same physical construction must carry the particles, determine how they move and interact, and produce quantities that can be compared with experiments. The sections below follow that chain from the starting assumptions to the final comparison.

One problem stands behind all twenty six questions and should be read into each answer. Many of the results below are proved on a specified construction, and several of them agree reasonably with measurement. What has not been shown is that one physically selected VERSF construction produces all of these structures and numbers together: the same source, branch and normalisation yielding the gauge coefficients, J and T , the particle masses, the CKM and PMNS matrices and the quantum consistency conditions at once. That single demonstration is the difference between a collection of successful conditional results and a completed physical theory, and the fourth section at the end of the paper is organised around it.

Reading the paper

A specialist can read the technical answer and follow its references. A general reader can read the second answer under every question and still follow the argument. Both routes share the same evidence status. The paper accompanies the October derivation ledger and reorganises its results by the physical questions they answer.

At a glance: the three evidence states

Status	Meaning in this paper
Established conditionally	A specified theorem or calculation follows from named premises. Example: gauge-census closure and electroweak mass relations. Whether the premises are physically realised is a separate question.
Numerically evaluated on a branch	A definite number or relationship has been computed, with its inputs stated. Examples: a neutrino mass-spacing ratio and a two-input gauge relation. Neither is automatically a complete physical prediction.
Physically open	The required source, branch, response, masses, currents or quantum/observable matching has not been closed on one physical construction. A promising conditional calculation does not erase this obligation.

These are evidence labels, not measures of independent experimental validation or an estimate of how likely VERSF is to be correct.

Summary of the twenty six answers

The table gives, for each question, what VERSF has established, what is still assumed, the principal remaining calculation and the evidence state. It is a map of the paper, not a substitute for the graded answers.

Question	Established	Still assumed	Principal remaining calculation	State
1 Target and inputs	Accounting rules for inputs and outputs	The complete admitted input set	Close the list of foundational inputs	Open
2 Particles and fields	Fold attachment, order-seven wheel, presence, commitment and record distinguished; seven history addresses, sharp-marginal preservation and the three-channel information-loss theorem	Declared attachment class; physical preparation and event grain	Physical dynamics and numerical response of the construction	Conditional
3 Gauge symmetries	SU(3), SU(2), U(1) selected from distinguishability rules plus three empirical anchors; connection necessity; census completeness; faithful Z6 quotient	The three empirical anchors; commuting sectors; minimal census	Reduced-input substrate derivation; coupling strengths (Q10 to Q12)	Conditional
4 Particles and charges	Minimal census Q, u, d, L, e and the familiar hypercharges from closure and anomaly conditions	Census and completion premises	Derive or state the attachment rules as foundational inputs	Conditional
5 Three generations	Exact six-to-three antipodal quotient with S3 action; three complete families under the census premises	Rank-three premise C9 (inherited from QN-3); family-to-record identification B1	Physical selection of the premises; a working same-action family-to-record test	Conditional; bridge open
6 Left and right	Conditional weak-orientation theorem $P_W = P_U$ selecting the left-handed branch	Chiral-locking layer; mirror-sector conditions	Audit of chiral locking; installation on one admitted action	Conditional
7 Fermions and statistics	Hilbert/Born reconstruction; full CAR/Fock construction with Pauli exclusion	Antisymmetric sector FF-2a/b; adjointness FF-4; operational route assumptions	Realise the premises in the full interacting theory	Conditional
8 Relativity and causality	Infrared Dirac/Weyl symbol; local Lorentzian time attachment; quotient positivity and microcausality descent; exact admissibility criterion for finite history laws, wheel non-embeddable, heat construction admissible	QC-7 causal antecedent; static backgrounds; physical selection of the law	Dynamical positivity and causal locality on a changing background	Conditional

Question	Established	Still assumed	Principal remaining calculation	State
9 Interactions	Gauge-action theorem (leading Yang–Mills form); common-action and history-metric construction; sequential transfer; exact 3×6 sector-to-factor map of rank three with two independent contrasts	Local stable response; analytic auxiliary reduction; state-counting convention	Attach and evaluate the coupled kernel on one carrier	Conditional
10 Force strengths	Relative geometric structure; one kinetic coefficient per simple factor	Normalised physical response	Absolute coefficients from the calibrated response	Open
11 Relative gauge relation	Exact one-loop relation $466g_s^{-2} - 687g^{-2} + 159g'^{-2} = 0$; $\sin^2\theta_W = 0.22737$ with corrections	α_s and α as inputs; frozen PCN branch	Account for the 1.67% residual from a specified source term	Numerical
12 J and T	Exact sector-to-factor map and kernel; J and T the only two independent contrasts; three-moment formulas; exact constrained update with relaxation modes and frozen-direction invariance; $B_q = 4C + 9W$ is the algebraic condition for $J = 0$, not an established physical value	Attached, normalised 47-state response	Evaluate the physical coupled response or prove a cancellation	Open
13 Higgs	Effective (1,2,+1/2) completion carrier; full tensor descent; Route-A benchmark $m_H \approx 123.8$ GeV	Completion-necessity premise; frozen Route-A scale	Physical Higgs-line metric, background and corrections	Conditional; numerical benchmark
14 W, Z and photon	Tree-level mass matrix with Q unbroken; $m_W, m_Z, m_\gamma = 0$ pattern	Common physical v and gauge coefficients	Simultaneous normalised W, Z, Higgs values	Conditional
15 Charged masses	Ratios $\exp(16/3)$ and $\exp(16/3)/12$; electron scale $\alpha^2 v/(8\pi) \approx 0.522$ MeV	Imported α and v; declared constructions	Physical spectrum, scheme and independent scale	Numerical; scale open
16 Quark mixing and CP	Axle and curvature mechanism; permitted CP phase; full tensor descent	Physical coefficient, phase and current frame	Physically selected CKM matrix (the retained conditional return is a poor match)	Open
17 Neutrino masses	$R_v = 0.0282$ and mass ratios $1 : 1.047 : 2.097$ on the frozen projected parent	Projection hypothesis P; source amplitude; kinetic form	Physical projection, amplitude and absolute scale	Numerical; physical open
18 Neutrino mixing	Takagi, active-state and closure-kernel diagnostics	Same-construction identification of masses and currents	One PMNS and mass calculation from one admitted construction	Open
19 Confinement	Triality projectors, wall/gap framework, conditional scale benchmark; non-identifiability proof	Colour stiffness and threshold pipeline	Physical colour dynamics: gap, string tension or breaking	Conditional; physical open
20 Strong CP	$\bar{\theta} = 0$ on the retained positive completion	Positive full-support measure; faithful lattice	Continuum chiral measure; electric-dipole bridge	Conditional
21 Quantum consistency	Anomaly cancellation; BRST/BV machinery; conditional renormalisation; executed retained global measure	Index-to-measure premise	Full interacting chiral and continuum measure	Conditional
22 Baryon and lepton number	Exact indices; lattice $(3n, 3n + 2m)$; ΔB in multiples of three; dimension-15 threshold; minimum-index classification	Census, chiral symbol, index-normalised measure; no extra baryon-breaking vertices	Branch selection; rates for allowed processes	Conditional (exact on branch)
23 Laboratory matching	RPC-1 structural transport certificate; reduction of six missing ingredients to H_{CMR} and ξ ; conditional $\xi = 88 \mu m$ by two routes within 4.46%; two-loop transport; finite matching	Two named RPC-1 assumptions; a common physical boundary	Numerical certificate from physically selected inputs; physical uniqueness of ξ	Conditional
24 Substrate adjustment	Circulation tilt leaves the reversible class with exact affinity, spectral and entropy-production certificates; exact constrained response; classical energy-sourced relaxation enters at fourth order; isolated current block blind	Zero-curvature regular branch; fixed ingredients	Evaluate each remaining channel at its order	Conditional

Question	Established	Still assumed	Principal remaining calculation	State
25 Testing	Frozen-input discipline; residuals retained	None	Apply to each frozen result	Established
26 Completion	Definition of recovery, explanation and extension	None	One consistent physical construction across Q1 to Q24	Open

Numerical results and their inputs

The table separates the measured inputs each calculation consumes from the quantity it returns, and shows the comparison value and the residual. Structural results that return no number are not listed. A row marked parameter-free within the specified conditional construction uses no measured numerical input, but it does rest on the theoretical assumptions of that construction, which are listed in the summary table above; a row with measured inputs is a relationship among measured quantities, which is a weaker but still testable claim.

Quantity	Measured inputs used	VERSF value on its construction	Comparison value	Residual	Q
Weak mixing $\sin^2\theta_W(M_Z)$	$\alpha_s(M_Z) = 0.1180$, $\alpha^{-1}(M_Z) = 127.95$; $y_t(M_Z) = 0.94$ for the top term	0.22443 (one loop); 0.22733 (two loop); 0.22737 (with top)	0.23122	-1.67%	11
Neutrino mass-spacing ratio R_ν	None; parameter-free within the specified conditional construction	0.028221	0.029805 (NuFIT 6.0)	-5.3%, about -2σ	17
Neutrino masses (illustration)	One observed splitting sets the scale	27.2, 28.5, 57.0 meV	No independent comparator	Not a prediction of absolute masses	17
Electron mass from $\alpha^2 v / (8\pi)$	α ; $v = 246.22$ GeV	0.522 MeV	0.511 MeV	+2.1%	15
$m_\mu/m_e = \exp(16/3)$	None; parameter-free within the specified conditional construction	207.13	206.77	+0.17%	15
$m_\tau/m_\mu = \exp(16/3)/12$	None; parameter-free within the specified conditional construction	17.26	16.82	+2.6%	15
Higgs mass, Route-A benchmark	Frozen scale premises giving $v_d = 243.72$ GeV	123.80 GeV ($m_H/v = 32/63$)	125.20 GeV	-1.1%	13
Three-flavour colour scale benchmark	Colour stiffness and threshold pipeline of F16	225.9 MeV in the F16 scheme	Not compared here; conversion required	Not claimed	19
Strong phase $\bar{\theta}$	None; parameter-free within the retained positive completion	0 exactly on the retained completion	$ \bar{\theta} $ below about 10^{-10}	Consistent; observable bridge open	20
Baryon-number changes	None; parameter-free within the specified branch and census	Multiples of three on the specified branch	No observed proton decay	Consistent; no rate given	22
Quark mixing (retained RRHF return)	None (target blind)	Conditional matrix	Measured CKM	Poor match; no physical selection	16
Coherence length ξ (RPC-1)	None; parameter-free within the specified conditional construction (two named assumptions)	88 μm (Route A); second route within 4.46%	No independent comparator	Two routes agree to 4.46%; physical uniqueness unresolved	23

Comparison values are the PDG 2025 and NuFIT 6.0 figures used in the cited papers. The lepton ratios and the Route-A Higgs benchmark are inherited conditional results carried from the September audit; they are listed with their residuals so that the two kinds of numerical claim, ratios that are parameter-free within their conditional construction and relations that use measured inputs, can be told apart at a glance.

Scope and reading conventions

There are three distinct tasks. Recovery means obtaining the Standard Model as an effective quantum field theory, with a declared set of input parameters. Explanation means deriving some or all of those inputs from fewer independent assumptions. Extension means describing phenomena outside the minimal renormalisable Standard Model, including neutrino masses. VERSF pursues all three, but a success in one does not automatically complete the others. [P1–P4]

The questions are organised around physical requirements, with the thirty SM audit gates cross-referenced at the end. Exact means proved under named hypotheses. Conditional identifies those hypotheses; it does not by itself mean the calculation or proof is unfinished. A premise may be a declared foundational rule, an empirical input, an earlier derived result or an unresolved physical identification. These have different statuses. An open result names the remaining calculation or identification without withdrawing completed work upstream. [L0]

Each numbered question gives the technical VERSF explanation first and the general reader explanation second. The short status line applies equally to both. The simpler explanation is not allowed to make a stronger claim than the technical one. References identify controlling editions; inherited results retain the qualifications of the papers that originally established them.

Throughout, ordinary hypercharge Y is defined by electric charge $Q = T_3 + Y$, and the primitive integer charge is $q = 6Y$. The census paper also uses a doubled hypercharge convention. Translating between those conventions changes labels and coupling normalisation together; it does not change a physical prediction. The Higgs symbol denotes the effective doublet of the VERSF completion sector, not a separately added primitive substrate field. [V8; V10, §§54–56; V12, §2]

The route through the questions

No.	Subject	What is being tested
1–2	Starting points	The target, inputs and substrate description
3–6	Particles and symmetries	Gauge structure, charges, generations and handedness
7–8	Quantum dynamics	Fermions, relativity and causal propagation
9–12	Interactions and strengths	The common interaction law, gauge prediction and J and T
13–16	Mass and flavour	Completion, electroweak masses and charged flavour
17–18	Neutral matter	Neutrino masses and oscillations
19–22	Strong interactions and consistency	Confinement, CP, anomalies and allowed charge changes
23–26	Physical prediction	Matching, substrate adjustment, testing and completion

The question list is an operational specification for this programme, not a claim that there is one universally prescribed proof checklist. Standard Model recovery, parameter explanation and broader unification are kept distinct.

Starting points

1 What is being derived and which inputs are allowed?

Technical VERSF explanation

The target is an effective action, its physical state space and its observable interpretation, all obtained from declared VERSF inputs. The substrate law, admissible carrier class, record rules, boundary conditions and numerical constants must therefore be identified as inputs until independently derived. A measured quantity used to normalise a calculation remains an input to that calculation. For example, the SGRI gauge test uses the electromagnetic and strong couplings to predict a third quantity; the illustrative absolute neutrino masses use an observed splitting to set their scale. Neither is a prediction of every quantity involved. [L0, §§1, 5–6]

A reduction to a few constants such as α , the cosmological constant, the speed of light and a Planck scale cannot be inferred merely from dimensional analysis. The dimensionless response and the physical branch must still be supplied by the law. The Fold scale work itself distinguishes conditional scale relations from an independently fixed absolute ruler. [V10, Parts V–VI]

General reader explanation

Think of the theory as a recipe. The test of a recipe is not only whether the dish comes out right but how much of it was bought ready-made. This paper keeps a strict shopping list: every measured quantity a calculation uses is written down as something bought, not something made. So when two measured force strengths are used to work out a third, that is a test of one relationship between them, not three separate results. In the same way, when a measured neutrino quantity is used to turn calculated proportions into actual masses, the proportions are the theory's own work and the scale is bought.

The rules for keeping that list are settled. The list itself, the full set of things the theory is allowed to assume about the underlying structure, is not yet final.

Current status. The accounting rules are established. The complete physically admitted input set is not yet closed.

Ledger cross-reference: SM-8, SM-9, SM-12, SM-30.

2 What are particles and fields in VERSF?

Technical VERSF explanation

VERSF starts from the Fold as a minimal distinguishable structure and studies how it attaches to its surroundings. Within the declared six-port attachment class, the Fold construction selects an order-seven attachment and relates six continuation sectors to a seven-site wheel. Here K7 names the admissibility structure; it is not the complete graph on seven vertices. Stable structural presence is characterised by invariant support orthogonal to a source-defined absence sector. Structural presence, a commitment event and a retained record are separately defined. [V10, Parts I–IV]

Matter and field variables describe different roles on this structure. The represented link transports internal states, the completion coordinate supplies the effective Higgs role, and the fermion construction supplies propagating matter modes. The conditional census assigns the Standard Model matter multiplets; the gauge and completion papers identify their corresponding carriers. The Fold attachment theorem alone does not determine all physical scales or interaction coefficients. [F4; F6; F12; V7; V10, §§19–22, 52–56]

The record structure is also explicit. Marked instruments recover seven history addresses on the canonical wheel, sharp-marginal preservation controls which joint records survive coarse-graining, and ordered-history readouts have specified ranks. An information-loss theorem for the tested three-channel attachment identifies exactly which record channel is lost. These are exact results on their constructions; the physical marked preparation and event grain remain to be identified. [V1, §§23–23G; V2; V7, §§17.83–17.85]

General reader explanation

You can picture the VERSF universe as a vast network, and a particle as a knot in it that lasts: a pattern that stays recognisable while the network around it keeps changing. A field is the way the network near a knot bends and springs back. The smallest possible knot is called the Fold, and the papers have made parts of the picture exact: how a Fold hooks onto its neighbours through a hub with six spokes, what keeps it in place, and how something can travel from knot to knot along the spokes.

The knot is an illustration. The papers distinguish the enduring structure, the event that commits a change, and its retained record. They already assign the familiar matter families and gauge roles within a declared construction. The remaining task is to establish the physical dynamics and numerical response of that construction, rather than to start the particle census again.

The record-keeping side is already precise: the papers can say which seven kinds of history the basic wheel can register, which summaries of a record survive when detail is discarded, and, for one tested arrangement, exactly which piece of information is lost. What is not yet fixed is which physical preparation and which grain of events the real substrate uses.

Current status. A substantial finite construction exists within a declared attachment class. Complete physical installation remains open.

Ledger cross-reference: SM-4, SM-5, SM-11, SM-12.

Particles and symmetries

3 Why are the gauge symmetries $SU(3)$, $SU(2)$ and $U(1)$?

Technical VERSF explanation

VERSF contains a structural selection derivation for the gauge group. Within BCB's projective-state classification and capacity bound, the three-constituent antisymmetric singlet anchor selects the fundamental $SU(3)$ sector; a continuously mixed two-state internal sector selects the $SU(2)$ action on two-component amplitudes; and quantum phase redundancy, local comparison and minimality supply one $U(1)$ direction. Closing the Interfaces states this selection as Theorem 3.4, using explicit empirical anchors rather than taking the group names as inputs. The phase $U(1)$ is not the symmetry of the one-point space CP^0 . [F1, §§5–9; F3, §3]

Distinguishability Conservation and Gauge Structure supplies the no-caustics, connection-necessity and single-phase-sector results used by that argument. Gauge-Census Closure then proves completeness on its declared matter and completion census: anomaly and mass-pairing conditions fix the hypercharge line, while connected family mixing removes the remaining generation-dependent Abelian alternatives. Its boundary includes the minimal census, one Higgs access slot, connected flavour-continuation graph and quotient convention. This is a proved exclusion result within that boundary, not a universal exclusion of every enlarged matter theory. [F2, §§3–5; F4, §§0–9]

The product structure uses commuting sector actions; the faithful global quotient $(SU(3) \times SU(2) \times U(1))/Z_6$ is a further representation and bundle result. The empirical anchors remain declared inputs, while the mathematical and physical premises retain their source grades. Using those inputs does not make the selection derivation unfinished. Deriving them from fewer substrate assumptions, and evaluating physical coupling strengths, are additional claims. [F3, §3.5; F4; V10, §56; V12, §§1–2]

General reader explanation

Every particle carries internal markings, rather like the colour coding on the wires inside a cable, and the three symmetries in the question are the rules for which consistent relabellings of those markings leave every measurement unchanged. VERSF has an answer to why there are exactly these three sets of markings. It starts from rules about what can be told apart, together with three stated facts about matter: that three constituents can combine into something neutral, that one kind of matter carries an active two-way label, and that quantum descriptions have a free overall phase. Within the geometry the rules allow, those three facts pick out the three familiar symmetry types, and comparing markings from place to place then forces the corresponding connections to exist. A later paper checks that, once the particle list is fixed, no extra symmetry channel survives the admission rules.

So the symmetry structure is an existing result, obtained from declared inputs. Three things are kept separate: taking an observed fact as an input, which is what the three anchors are; leaving a calculation undone, which this is not; and working out how strongly each force acts, which is a different question answered later in the paper. The technical papers define the scope more precisely than the reader companion, *Why Nature Chose the Standard Model*. [F23]

Current status. Gauge-group selection, connection necessity and census completeness are derived under declared inputs, with the faithful quotient separately established. A reduced-input substrate derivation and the physical coupling coefficients retain their own obligations.

Ledger cross-reference: SM-5, SM-9, SM-26.

4 Why these particles and these electric charges?

Technical VERSF explanation

Under the census premises, colour-triplet weak-doublet matter requires charged singlet closure partners. The three coloured weak doublets have odd global weak-anomaly parity; the minimal repair adds one colourless lepton doublet and its charged closure partner. This gives the five multiplet roles Q , u , d , L and e , with fifteen Weyl components per generation. The one-doublet ordered closure conditions together with anomaly cancellation reproduce the familiar hypercharges. This charge-quantisation algebra is an established Standard Model result reproduced within the VERSF census, not a new theorem unique to VERSF. [V10, §§52–56]

In an all-left-handed notation the primitive charges are $q(Q)=1$, $q(u \text{ conjugate})=-4$, $q(d \text{ conjugate})=2$, $q(L)=-3$ and $q(e \text{ conjugate})=6$, while $q(H)=3$. Gauge-singlet neutrinos are optional extensions, not required by the minimal charged census. Adding them changes the charge-uniqueness problem and must be declared. [V12, §2; V10, §54]

General reader explanation

Start with the quarks alone, the building blocks of protons and neutrons, and ask whether the rules allow them to exist by themselves. They do not. On their own the quarks leave a hidden imbalance that would make the theory contradict itself, like a set of accounts that does not add up. The smallest way to balance the books is to add the electron and its neutrino partner. Once they are in, requiring the interactions that give particles mass to respect the same markings fixes the electric charges: the quarks come out with charges of one third and two thirds of the electron's, and the electron with a whole charge.

The charge calculation is established particle physics reproduced within VERSF. The programme's contribution here is the surrounding derivation of admissible matter and closure roles, followed by their consistency check. That work is already present. Its declared census and completion premises remain visible; recovering the familiar charge values does not also determine particle masses.

Current status. The minimal census and charge solution are derived under named premises; those premises retain their independent status.

Ledger cross-reference: SM-5, SM-10, SM-11, SM-22.

Generations and handedness

5 Why are there three generations?

Technical VERSF explanation

The programme has a conditional three-generation derivation. SC-1 proves that rank-three support-return completion, layer-local completeness and exclusive attachment require exactly three complete matter packages. HMGB-1 traces that premise chain and uniquely selects the antipodal equal-layer quotient on the canonical wheel. On the six-site wheel $j = 0, \dots, 5$, the antipodal map $j \mapsto j + 3$ identifies the pairs (0,3), (1,4) and (2,5). Thus the quotient has three classes; the quadratic family map $Q(z) = z^2$ is unchanged by $z \mapsto -z$ and descends to them, with the $D_6/C_2 \cong S_3$ action. These are exact geometric statements within the construction, not by themselves an independent proof that three physical generations are selected. [F6; F7, §32A; V10, §§55–60]

The limits must also be traced upstream: QN-3 §5.3 explicitly inherits rank three as AD-3, so moving C9 to that source does not make it premise-free. HMGB-1 supplies nondegenerate three-level geometry for nonzero admitted holonomy and canonical holonomy descent, not physical masses. The further family-to-terminal identification B1 remains distinct; EX2E fails one proposed second-order implementation, not every possible physical realisation. The separate refinement and replication routes retain their own conditions. [F7, §§32A.5–7; F20–F22; V10, §§60–62]

General reader explanation

Matter comes in three generations. The electron has two heavier counterparts, the muon and the tau; each kind of quark has three versions; and the three neutrinos form their own trio, whose ordering by mass is still being settled by experiment. Picture six attachment positions spaced evenly around the rim of a Fold's wheel. In the construction studied, setting out from one position is identified with returning from the position directly opposite, so the six positions pair off into three opposite pairs and six positions give three distinct return classes. That pairing is made exact by the mathematics rather than left as a visual impression. A separate rule says that an admitted class must return as a complete matter package and not as a fragment, and when the three counting conditions used in the cited papers hold, the result is exactly three complete families.

There are therefore two distinct claims. The six-to-three pairing is established on the canonical wheel. The count of three complete families follows under further premises, including one about the rank of the underlying support that is itself inherited from an earlier paper rather than proved there. Neither step shows that the evolving physical Fold selects those premises, or that the three geometric classes are the three family identities written into the physical record. One tested version of that last link failed, which rules out that version and not the pairing or the conditional count. The physical selection remains the open test.

Current status. Conditional generation census, canonical quotient selection and three-level geometry are established. Upstream physical premises and the further same-action family-to-record identification remain open.

Ledger cross-reference: SM-4, SM-11, SM-12.

6 Why does the weak interaction distinguish left from right?

Technical VERSF explanation

Two source layers address handedness. Closing the Interfaces gives a conditional restriction of weak transport to a single Weyl sector, while retaining an orientation identification. The later Weak-Orientation Admissibility Theorem derives $P_W = P_U$: weak transport acts on the orientation carrying unresolved two-branch support; with the inherited naming $P_U = P_L$, it selects P_L . The later result uses chiral locking, Lorentz-stable projectors and completion/mirror-sector premises, and explicitly excludes observed V–A as a direct input. [F3, §5; F5, Theorem 7]

This does not independently prove the inherited chiral-locking layer. The source retains an upstream derivation audit and residual mirror/completion-scope obligations; some exclusions rest on minimality. CLSN supplies chiral transfer machinery, while physical installation of orientation, gauge, completion and matter on one branch remains open. A family-angle calculation neither replaces nor invalidates the orientation theorem. [F5, §§13–14, Appendix C; V7; L0, SM-1]

General reader explanation

Matter particles carry an inner twist, which you can picture as a screw thread that can run one way or the other. The part of the weak force that changes one particle into another acts on only one of the two threads; the part that leaves particles as they are can touch both. VERSF gives a reason for the one-sidedness: its rules attach that weak transport to the side where two alternatives are still unresolved, while the other side carries records that have already been committed.

That selection is a conditional theorem, supported by earlier work on why only one thread can carry weak transport. The papers themselves still ask for an audit of the earlier step that separates the two threads, and of the conditions on any mirror-image sector. Those named checks, and the installation of the chosen thread consistently across the force, the mass-giving sector and the matter on one physical construction, are the remaining tasks; the selection calculation itself is not absent.

Current status. Conditional weak-orientation selection is derived. Chiral-locking provenance, the stated mirror-sector conditions and common-action physical admission remain open.

Ledger cross-reference: SM-1, SM-7, SM-13, SM-29.

Quantum dynamics

7 How do quantum particles and fermion statistics emerge?

Technical VERSF explanation

The corpus contains reconstruction arguments for Hilbert structure and Born probabilities, as well as a full fermionic Fock construction. The Hilbert/Born synthesis distinguishes its operational route assumptions from a weaker minimal kernel, which it explicitly proves insufficient alone. The Fock theorem obtains the full canonical anticommutation relations (CAR) from an alternating exterior sector, a positive one-particle inner product and removal as the adjoint of creation. It inherits the spinorial-loop exchange argument and relies on FF-2a/b to identify the relevant multi-loop sector with the full antisymmetric exterior space; FF-4 adjointness is load-bearing. Consequently, the CAR algebra is a conditional reconstruction, not an independent derivation from no prior antisymmetry assumption. Physical selection of that sector and of its adjointness structure remains a separate substrate obligation. [F8; F9]

The resulting operators, together with the infrared Dirac/Weyl and gauged-transfer constructions, support explicit field and response calculations. They do not yet supply every physical premise of a global interacting chiral measure. Born probabilities, retained histories and fluctuation determinants also remain distinct objects; one cannot replace the Fold's changing-field dynamics by a probability formula alone. [F9; V7; F17–F18]

General reader explanation

The particles that make up matter, electrons and quarks among them, belong to the class physicists call fermions, and fermions obey a strict rule: no two identical ones can occupy the same state. It is the reason atoms have their shell structure and, together with the electrical repulsion between atoms, the reason that solid matter holds its shape and resists being compressed. Earlier VERSF papers reconstruct, from stated operational assumptions, the quantum rules for states and probabilities, and they give an argument that swapping two of the relevant loop-like structures reverses the sign of their combined state. Starting from that sign-reversing sector, a positive notion of probability, and a rule that removing a particle is the mirror operation of adding one, a later paper builds the complete bookkeeping for adding and removing identical matter particles. The no-two-alike rule then follows inside that construction.

This is more than assuming the rules at the outset, but each of the three starting points is a premise the evolving physical substrate has to be shown to satisfy. The remaining task is to realise those premises and the resulting operators together in the full interacting theory, which is a more specific job than saying that quantum behaviour has been built into a small model.

Current status. Conditional Hilbert/Born and full CAR/Fock reconstructions exist, alongside finite transfer and infrared kinetic results. Full physical quantum admission remains open.

Ledger cross-reference: SM-7, SM-9, SM-29.

8 Can a discrete substrate reproduce relativistic and causal propagation?

Technical VERSF explanation

The corpus reconstructs a normalised spatial Dirac/Weyl principal symbol and local attachment of sequential opportunities to Lorentzian time. The Adjoint-Removal theorem also proves positivity and microcausality descent to a physical quotient. Its causal conclusion requires QC-7: spacelike kinematic commutators must already be terminally null. It proves that quotienting preserves the required causal property, not the missing antecedent for every substrate dynamics. [F10, §11.2; B0; V7, §17.15]

CLSN adds free spectral and fixed-static link-reflection positivity. Its explicit non-Abelian example defeats a general nonnegative one-step-transfer claim; conditional refinement bounds suppress the negative contribution. These branch-specific tests do not erase the earlier quotient theorem, and that theorem does not automatically certify this transfer. Dynamical positivity, causal locality and a common physical space-time calibration remain required. [V7, §§17.33–17.50; L0, SM-7–SM-9]

SGW-3 settles the admissibility question exactly for finite history laws. An irreducible finite Markov law is the Doob normalisation of a nonnegative, operator-positive, self-adjoint transfer if and only if it satisfies detailed balance and has strictly positive spectrum, and the transfer is then unique up to a positive scalar multiplier. The designated heat construction passes on every finite connected Dirichlet branch. The original seven-state wheel is reversible but has zero determinant and simple negative eigenvalues, so it has no continuous-time embedding, while its heat kernel is given in closed form for every clock value. These are theorems, with the physical selection of the law as their remaining condition. [V11, §§2–6]

General reader explanation

Seen from across a room, a tightly woven fabric looks like a smooth sheet. VERSF proposes that space and time are like that: a fine network that looks continuous at everyday scales. It has conditional results showing the right kind of motion through the network over long distances, and a theorem that hidden bookkeeping states can be removed from the description without spoiling either the probabilities or the rule that influences do not travel faster than they should. That theorem assumes the rule already holds before the removal; it does not supply it.

In one test with a fixed, twisted background, one of the numbers that characterise a single step of the evolution comes out negative. That is not a negative probability; it obstructs one proposed way of reading the step as a positive transfer. Its contribution fades as the network is made finer, under stated conditions. Extending all of this to a background that changes in time, with matter and fields interacting, remains open.

One part of this is now settled exactly. There is a test that decides whether a step-by-step law of change can be read as a smooth, time-reversible evolution at all. The simplest seven-position model fails it, in a way no rescaling can repair, while the smoothed construction the programme designates passes it on every finite model. That is a proved result; what remains is to show that the physical substrate uses the construction that passes.

Current status. Conditional quotient positivity and causal descent, plus strong free/static transfer results, are retained. Full interacting relativistic and causal completion remains open.

Ledger cross-reference: SM-7, SM-8, SM-16, SM-29.

Interactions and strengths

9 How do interactions arise from the same substrate?

Technical VERSF explanation

The connection and Gauge Action and Coupling theorems already derive the leading Yang–Mills form under local stable response, gauge covariance and an analytic auxiliary reduction. Schur elimination includes the surroundings' response; adjoint invariance gives one kinetic coefficient per simple factor, and canonical normalisation relates matter and gauge self-couplings. MASD/HMGBC then provide a conditional common-action and history-metric construction. The interaction architecture is therefore an existing result. [F2; F11; F7]

The changing-link work supplies a sequential transfer $A_n = \Omega_n \exp(-a_t K_n[U_n])$ and the closed-history response mechanism. Its derivatives must include the actual projectors, contact terms, completion and record insertions. Physical attachment and evaluation of the coupled kernel remain necessary; zero-field eigenvalues and formal covariance do not determine every response coefficient. [V7; V11, §§34–44; L0, §8]

The representation side of the gauge response is also complete. SGW-2 gives an exact 3×6 integer map from the six sector prices (Q, u, d, L, e, H) to the three gauge factors, of rank three with a three-dimensional kernel, and shows that the response modulo the common direction is governed by exactly two independent contrasts, J and T. It evaluates the native H4 parent in full and shows how protected-record reductions change the alternating stiffness, from 35/6 to 6 when the link variable is retained and by a relative 1/245 when the current variable is retained, while the uniform mode is unchanged. These are exact in the stated state-counting convention; they are not physical gauge-coupling values. [F24, Theorems 4, 5, 9, 13]

General reader explanation

The papers already explain how shared substrate structure lets matter and fields affect one another, and derive the leading form of that interaction under explicit conditions. They also show how adjustment of the surroundings enters the calculation.

A good deal of the bookkeeping is finished. There is an exact table that converts the costs of the six kinds of matter into effects on the three forces, and it shows that, once the part common to all three forces is set aside, only two independent differences can appear; those are the two numbers J and T of Question 12. Worked examples on the programme's own model show how retaining one record or another changes the stiffness of the response by definite fractions.

What remains is to identify and evaluate the actual coupled response on the selected physical branch: to make the fabric respond and calculate by how much. That completes an existing dynamical construction rather than starting from the shared-substrate idea alone.

Current status. Conditional interaction and gauge-action theorems exist. Their complete physical source attachment and numerical evaluation remain open.

Ledger cross-reference: SM-2, SM-12, SM-16, SM-26, SM-29.

10 Why do the forces have different strengths?

Technical VERSF explanation

In a fixed generator convention, gauge strengths are determined by the coefficients of the physical gauge kinetic response after field normalisation and matching. VERSF seeks those coefficients from the coupled source response. Geometric factor assignments and representation traces constrain relative patterns, while record relaxation, completion and interacting propagation can affect the physical coefficients. The conversion from a static metric or a current cost into a gauge kinetic coefficient requires a demonstrated identity. [V8; V11, §§20–21, 41–44]

There need not be a separately postulated substance called force strength. Even if the substrate fixes every response geometrically, scattering and propagation still have definite quantitative coefficients. A distinction between kinds or degrees of twist must therefore be translated into a normalised, gauge-consistent response. The current source record does not permit those coefficients to be chosen from analogy or numerical proximity. [L0, SM-26]

General reader explanation

Different kinds of twist in one fabric can respond differently without requiring a separate substance for each force. VERSF already gives numerical relative-strength predictions on declared constructions, as Question 11 explains. The remaining task is to obtain all three physical strengths from the fully calibrated response, including any relevant adjustment of the surrounding substrate and completion sector. A relative prediction is existing progress; it is not yet a derivation of every absolute strength.

Calling two forces two different twists is not yet a value for either, and the paper does not allow a value to be picked because it looks close to the measured one.

Current status. Relative geometric structure is substantial. The complete physical strength coefficients remain unevaluated.

Ledger cross-reference: SM-9, SM-18, SM-26.

Gauge predictions and remaining response

11 Does VERSF already predict a relationship between force strengths?

Technical VERSF explanation

Yes, on the declared PCN branch. SGRI uses the coefficient vector $Z = (6, 13/2, 21/2)$ and the one-loop beta vector $b = (-7, -19/6, 41/6)$, in colour, weak, ordinary-hypercharge order. The inverse-coupling vector lies in their span. Contracting with the primitive normal $(466, -687, 159)$ removes both the common boundary coefficient and the one-loop matching-scale coordinate. This gives a relative relation, not three absolute predictions. The primitive normal is the same vector as the T contrast of Question 12 once the two are written in one normalisation. With $q = 6Y$ and the sector traces normalised as in V11, a sector-constant price with moments C , W and B_q shifts the inverse couplings by $\Delta A_3 = C/6$, $\Delta A_2 = W/4$ and $\Delta A_1 = B_q/36$, so that $n \cdot \Delta A = (932C - 2061W + 53B_q)/12 = T$ and $j \cdot \Delta A = (B_q - 4C - 9W)/12 = J$ with $j = (-2, -3, 3)$; equivalently $12T = 466(2C) - 687(3W) + 159(B_q/3)$. The transverse one-loop residual $n \cdot \Delta$ is therefore exactly ΔT in the normalisation in which the SGRI relation itself is stated, and J is the in-plane coordinate that this relative test cannot see. [V9, §§2–7; V11, §§20–21]

With the paper's electromagnetic and strong inputs, the predicted weak mixing quantity is 0.2244264903 at one loop, 0.2273330516 after gauge-only two-loop transport, and 0.2273673795 with the later leading-top correction. Against the frozen comparator 0.23122, the last result is lower by 0.0038526205 (approximately 1.67%). This is a definite residual, not a precision agreement. A statistical significance or explanatory correction requires matched observable conventions, a controlled theoretical uncertainty and physical selection of the response branch; alternative readings cannot be chosen merely for a better fit. [V9, §§10–11; V11, §43; P1]

$$466 \text{ g}_s^{-2} - 687 \text{ g}^{-2} + 159 \text{ g}'^{-2} = 0$$

General reader explanation

Here is a concrete test. On one specified construction, feed in the measured strengths of two forces, and VERSF works out a related third quantity that describes how the weak and electromagnetic forces mix. With the stated corrections, it obtains about 0.2274, compared with the frozen laboratory reference of 0.23122. That is roughly 1.67% low: a definite mismatch, not a precision match. The relationship is an achievement on its specified construction, but the physical calculation must still account for the discrepancy without choosing new settings only because they fit better.

So the theory has a real relationship between the force strengths, valid on that construction. It does not yet predict the three strengths one by one, and it does not yet say which way of reading the substrate's response is the physical one.

Current status. An exact conditional one-loop relation and evaluated corrections exist; absolute normalisation and the residual remain unresolved.

Ledger cross-reference: SM-9, SM-26, SM-27.

12 What are J and T and why have they been difficult to derive?

Technical VERSF explanation

J and T are programme-specific contractions of a response, not additional Standard Model forces. For the correctly attached normalised 47-state response K, define $C = \text{Tr}(P_C K)$, $W = \text{Tr}(P_W K)$ and $B_q = \text{Tr}(q^2 K)$. The exact contractions are $J = (B_q - 4C - 9W)/12$ and $T = (53B_q + 932C - 2061W)/12$. These formulas reduce what must be evaluated; they do not determine K. [V11, §§20–21]

An isolated shifted-current block is blind to the connection at tree and Gaussian order. Its reduced current price and Casimir denominators therefore do not automatically supply the matter-dependent gauge response. The surviving task is the admitted coupled response, with its propagation, vertices, measure and matching, or a proof that a specified contribution cancels. If the source returns physical gauge coefficients directly, the appropriate contractions can be taken without an extra price conversion. [V11, §§41–44; L0, §5]

What is already in hand for J and T is therefore substantial: the exact sector-to-factor map and its kernel, the proof that J and T are the only two independent contrasts, their trace forms on the 47-state carrier, the three-moment reduction, the exact constrained update for any returned change of the history metric with its direct and relaxation modes separated, the frozen-direction invariance, and the evenness of the contrasts in the circulation tilt under the stated assumptions. What is not in hand is the physical price itself. [F24, §§6–7, 12, 18; V11, §§12–17, 20–21]

General reader explanation

J and T are two bookkeeping numbers. They summarise how a calculated response is shared out between the force sectors: roughly, J measures how differently quarks and leptons are treated, and T measures how the mass-giving sector enters as well. The recipe for combining the right ingredients into J and T is exact and simple.

The hard part is obtaining the ingredients from the physical substrate. Some earlier attempts measured the cost of adjusting a flow inside one fixed arrangement, which turns out to be the wrong quantity; what is needed is how the whole interacting system responds while the fields move. Keeping that distinction clear stops an existing calculation from being relabelled as a prediction.

It is worth being clear how much of the route is already built. The conversion from matter costs to J and T is exact, the machinery for carrying any change in the record law through to J and T is exact, and several things that cannot change them have been proved. What is missing is the physical cost itself, correctly selected on one physical setting, scaled to the right units and matched to what is measured; none of those three steps is supplied by the bookkeeping.

Current status. The contraction formulas and failed shortcuts are settled. Physical numerical J and T remain open.

Ledger cross-reference: SM-9, SM-18, SM-20, SM-26.

Mass and flavour

13 What is the Higgs if it is not a separate primitive field?

Technical VERSF explanation

The Electroweak Completion-Interface theorem derives an effective (1,2,+1/2) carrier from its completion premises, rather than adding a new primitive substance. The corpus supplies potential and radial-mode constructions, spatial and temporal kinetics, and the full displayed $c_H \otimes B_f$ tensor descent. The completion-necessity premise retains the source's explicit qualification. [F12; F14; B0, §5.3; V4, §6.2]

Numerical work also exists: the earlier conditional Route-A construction gives $v_{cl} \approx 243.723$ GeV and leading $m_H \approx 123.796$ GeV under its frozen scale and coupling premises. The ratios $m_H/v = 32/63$ and $\lambda = 512/3969$ belong to that construction. These are evaluated benchmarks, not a certified Higgs pole prediction on the later physical branch. The physical metric, background, gauge/Yukawa corrections and matching remain required. [F14, Theorems 2, 8–9; V11, §§18–19, 34–41]

General reader explanation

The Higgs gives elementary particles mass through its couplings; most of a proton's mass comes from strong-interaction energy. In VERSF the Higgs role comes from the substrate's own completion structure. Earlier papers have derived its effective form and worked out a conditional numerical mass benchmark.

That is more than a possible analogy. The unfinished step is to show that the physical construction selects the benchmark's premises and gives the measured ripple after the required corrections and calibration.

Current status. Conditional completion, potential and numerical Higgs results are retained. A common physical Higgs boundary and observable prediction are not closed.

Ledger cross-reference: SM-2, SM-16, SM-22.

14 Why are W and Z massive while the photon remains massless?

Technical VERSF explanation

The Broken Electroweak Phase paper explicitly derives the gauge-boson mass matrix on the completion background $\Phi = (0, v/\sqrt{2})$, with $Q = T_3 + Y$ unbroken. For canonically normalised fields it gives $m_W = gv/2$, $m_Z = v\sqrt{(g^2 + g'^2)}/2$ and $m_\gamma = 0$. These are the established electroweak relations realised within the declared VERSF completion construction. [F13; F12; P1]

The calculation is stronger than saying that a doublet could support this mechanism. It does not independently fix the common physical v , gauge coefficients, kinetic normalisation or loop-corrected masses. Those inputs must be selected and matched on the same admitted branch before W, Z and Higgs values are simultaneous physical predictions. [F13; F14; L0, SM-1, SM-2, SM-16, SM-26]

General reader explanation

The calculation already shows the required pattern: the completion background resists the disturbances carried by W and Z, while one electromagnetic combination stays massless. A massless photon introduces no intrinsic finite electromagnetic range, although light can still be absorbed.

The remaining issue is the numerical size of that resistance on the physical branch: the actual background, the physical scale and the calibrated response worked out together. The pattern of two heavy carriers and one massless one is a derived result on the declared construction, not only a mechanism that might work.

Current status. The broken-phase mass pattern and tree-level relations are derived conditionally. Their common physical normalisation and observable values remain open.

Ledger cross-reference: SM-1, SM-2, SM-8, SM-16, SM-26.

Charged masses and mixing

15 What determines the masses of charged leptons and quarks?

Technical VERSF explanation

The charged programme supplies conditional mass matrices, hierarchy relations and scale evaluations. The retained ratios include $m_\mu/m_e = \exp(16/3)$ and $m_\tau/m_\mu = \exp(16/3)/12$ in their declared constructions. The Charged-Lepton Absolute Scale paper also evaluates $m_e = \alpha^2 v/(8\pi)$ at about 0.522 MeV, using the imported fine-structure constant and the imported electroweak scale $v \approx 246$ GeV; the measured value is 0.511 MeV, so the relation is about 2% high, a visible residual on a two-input relation rather than a fit. An evaluated scale relation exists; it is not a derivation of the imported quantities, and the residual is carried, not absorbed. [F15; B0, §§5–6; L0, SM-17, SM-19, SM-21–SM-23]

Physical masses require the selected propagating excitation, kinetic form and mass definition. Primitive activation, localisation, the common ruler, matrix coefficients and threshold or pole matching remain separately graded. For quarks the scheme is essential. Later failed or diagnostic parents do not erase earlier conditional results, but neither may their favourable numbers replace the controlling charged-flavour return without physical selection. [V4, §12; L0, §6]

General reader explanation

Different lasting patterns cost different amounts of energy to hold together and to move, and in this picture that cost is what mass is. VERSF has calculated mass proportions on particular constructions, and has also evaluated a candidate overall scale for the electron from two measured inputs; that value comes out about two percent above the measured electron mass, and the gap is left visible. These calculations still have to be connected to the way the actual particles travel and to a consistent laboratory definition of mass.

Quarks add a further issue because they are never observed alone: their quoted masses depend on the specified measurement convention, so like must be compared with like. The existing conditional numbers are retained while the full physical spectrum and an independently derived scale remain open.

Current status. Conditional charged architecture, ratios and scale evaluations exist. The complete physical spectrum and independent absolute normalisation remain open.

Ledger cross-reference: SM-8, SM-17, SM-19, SM-21, SM-22, SM-23.

16 Why do quark flavours mix and why is CP violated?

Technical VERSF explanation

Mixing compares the bases selected by masses with the bases selected by interactions. In VERSF the family axle and full-carrier curvature construction provide a mechanism for nontrivial charged-flavour structure, with restricted holonomy and phase possibilities. The full specified completion-tensor descent is now established. These results sharpen the source of the matrix but do not select its complete physical coefficient, phase, retained readout and current frame. [B0, §5.4; V4, §6.2; V10, §§61–62]

The controlling target-blind RRHF CKM return remains empirically poor in the October audit. More attractive curvature diagnostics do not supersede it until their physical selection is derived. Three generations permit a physical charged-current CP phase, but permission for a phase does not determine its value. Mass diagonalisation alone is insufficient when the physical current map has not been identified. [L0, SM-13, SM-17, SM-22–SM-23; V10, §56]

General reader explanation

A quark can have one identity when you ask how heavy it is and a slightly different one when you ask how it takes part in the weak force, like a person whose legal name and everyday name differ. The mismatch between the two sets of names is what quark mixing is, and with three families the mismatch can carry a twist that makes matter and antimatter behave slightly differently. VERSF has machinery that produces such mismatches and twists.

The physically selected version has not been derived. The retained calculation is conditional on its construction, and it gives a poor match to the measured mixing. Alternatives that match better exist, but they are diagnostics on settings the theory has not admitted, so they do not replace it. Until the theory itself selects a setting, the poor result stands as the controlling one.

Current status. The flavour mechanism has advanced. A successful physically selected CKM matrix and CP phase are not yet derived.

Ledger cross-reference: SM-2, SM-13, SM-17, SM-22, SM-23.

Neutral matter

17 How does VERSF give neutrinos mass?

Technical VERSF explanation

Neutrino masses require an extension of the minimal renormalisable Standard Model. VERSF has assembled explicit neutral parents from its source, history and completion constructions. The frozen projected D-free candidate yields $R_v = \Delta m_{21}^2 / \Delta m_{31}^2 = 0.02822142937$ and mass ratios $1 : 1.0468248785 : 2.0966838931$. Sixth-order angular anisotropy selects discrete source orientations on the tested branch; it does not fix the physical source radius. [P3; V3–V5]

The candidate retains a projection-before-nonlinear-response hypothesis and a source-amplitude identification that are not yet physically derived. Its illustrative masses, about 27.2, 28.5 and 57.0 meV, use an observed splitting to set scale. The reported comparison residuals remain visible; they are not repaired by reinterpreting a calibration as a prediction. The correct next object is a physically selected neutral parent with its amplitude or replacement map and kinetic form. [V5, §§10–15; L0, §6]

General reader explanation

Neutrinos are almost massless but not quite, and the basic Standard Model does not explain this. VERSF now has a definite calculation rather than only a mechanism: on one specified construction it gives three neutrino masses in fixed proportions, roughly 1 to 1.05 to 2.1. The proportions are the theory's own work. Turning them into masses in ordinary units borrows one measured number, so the absolute values, about 27, 28 and 57 thousandths of an electron-volt, are an illustration and not three predictions.

The construction also rests on an assumption about how the evolving Fold feeds into it, adopted after an earlier version had failed, and the papers say so. The comparison with measurement is about five percent off and has been left visible.

Current status. A conditional numerical mass ratio exists. Physical projection, amplitude, kinetic identification and absolute scale remain open.

Ledger cross-reference: SM-3, SM-21, SM-22, SM-25.

18 Why do neutrinos change flavour as they travel?

Technical VERSF explanation

The relevant calculation must return masses and the charged-current map in one kinetic normalisation. Their mismatch determines the physical PMNS matrix and its phases. The VERSF neutral work contains Takagi decompositions, active-state diagnostics and a separate closure-kernel mixing calculation. Those operations are executable, but a mixing result from one parent cannot be assigned to the mass spectrum of another without a proved identification. [V4–V5; L0, SM-24]

The source-fixed mass candidate has active weights near unity in its declared diagnostic, yet these do not establish the physical weak current or complete unitarity bounds. The remaining assembly must select the current frame, determine any leakage into additional states, and return the mixing angles, octant and CP phase together. The source's equivariance requirements also survive small numerical sensitivity tests. [V5, §§10–15; V7, §12; P3]

General reader explanation

A neutrino made in one flavour is really a blend of three travelling waves with slightly different masses. The waves drift out of step as they travel, so the blend changes, and a detector can register a different flavour from the one that set out. To explain this, VERSF needs two things from one and the same construction: the travelling waves with their masses, and the way the weak force creates and detects them.

The evaluated mass candidate and the separate mixing calculation cannot be combined without proving that they describe the same physical construction. The wave-interference mechanism is already understood; a unified numerical VERSF prediction for the masses and oscillations remains open.

Current status. Mass and mixing diagnostics exist. A single physically admitted PMNS and mass calculation is not closed.

Ledger cross-reference: SM-3, SM-6, SM-13, SM-24, SM-25.

Strong interactions and consistency

19 Why are quarks confined and how do hadrons emerge?

Technical VERSF explanation

The corpus goes beyond the colour algebra and perturbative running. NQTC constructs triality projectors, a nonperturbative wall/gap framework and a conditional three-flavour scale benchmark of 225.923 MeV on its pre-registered branch. The benchmark assumes a particular colour stiffness and threshold pipeline; it is not a microscopic physical return. Its scheme and its comparator are those defined in F16, and no agreement with the quoted three-flavour $\Lambda_{\overline{MS}}$ of about 0.33 GeV is claimed or implied here; any comparison requires the paper's own conversion. Its penalty-free route requires the physical colour response and wall coefficient. [F16, principal claim, §20' and §§30–33; P2]

GQSC-1R executes a retained positive transfer and reference strong-sector models, but proves that the imported retained data do not identify a physical triality gap or string-breaking spectrum. Its candidate wall and orientation constructions remain quarantined pending typed-carrier and dynamical bridges. This is a precise boundary on those inputs, not a no-go for all possible complete VERSF dynamics. [F17, Theorem A, Theorems 14–16, §§34–37; L0, SM-14, SM-27]

General reader explanation

No one has ever seen a quark on its own. They come bound in colour-neutral groups, in threes as in the proton and neutron, in quark and antiquark pairs, and in more complicated combinations, and the colour force must explain why. VERSF has built mathematical models of that binding and worked through conditional examples, including one candidate energy scale on a declared setting.

The source papers also show why those examples do not yet fix the physical binding strength: the information retained in the models is compatible with different gaps and different ways for the binding to break. The remaining task is to derive the missing physical colour dynamics, including the energy and the behaviour of the colour fabric in the regime where the force becomes strong.

Current status. Nonperturbative architecture, conditional scale and reference executions exist. The physical confinement and hadronic observable certificate remains open.

Ledger cross-reference: SM-14, SM-23, SM-27.

20 Why is strong CP violation so small?

Technical VERSF explanation

GQSC-1R proves strong-phase zero on its retained positive completion. The frozen HCMR quark determinants are positive, and a positive full-support measure on the faithful topological lattice admits only the trivial character. These combine to give $\bar{\theta} = 0$ on that construction. The theorem is executed at its retained grade; it is not merely a suggested cancellation. [F17, Theorems 9–11 and §37]

Promotion to the full physical theory still requires the chiral determinant-line/global audit and observable matching. The weak CKM phase is a different invariant, and the new baryon/lepton index calculation addresses a different question again. Neither automatically supplies the physical neutron electric-dipole prediction. [F17; F18; V12, §1; L0, SM-28]

General reader explanation

Some processes occur with different probabilities when particles are exchanged for antiparticles and the experiment is mirrored. The strong force could show such a difference through a strong phase, but measurements constrain it tightly. VERSF's retained construction gives that phase exactly zero for stated mathematical reasons.

What remains is to prove that the complete physical quantum theory has the required positive completion, and to connect the result to the measured limit on the neutron's electrical lopsidedness.

Current status. The retained positive-completion strong-phase-zero theorem is established. Full physical quantum and observable promotion remains open.

Ledger cross-reference: SM-13, SM-28, SM-29.

Quantum consistency and selection rules

21 Are the gauge symmetries consistent after quantisation?

Technical VERSF explanation

The quantum-gauge corpus already constructs local quotient, ghost-Jacobian, BRST and BV machinery, proves the Standard Model anomaly cancellations on the inherited census, and gives conditional renormalisation and perturbative unitarity theorems. GQSC-1R goes further than an architecture-only proposal: it executes a reflection-positive retained transfer and a positive measure on the faithful charge lattice. CLSN contributes separate finite Ward and transfer tests. [F18, Theorems 1–28; F17, Theorem A; V7]

These results must not be conflated. A local BRST theorem, a retained global positive measure and the full continuum chiral gauge measure have different hypotheses. The latter's determinant-line/bordism and physical reconstruction obligations remain open. The baryon/lepton selection calculation explicitly retains its index-to-measure premise. Thus there is substantial conditional quantum consistency already derived, with a specific remaining physical completion. [F17, §37; F18, debt register; V12, §1]

General reader explanation

The internal markings on particles are a matter of convention, like the choice of which colour to call the live wire, and a sound theory must give the same measurable results whatever convention is chosen. Quantum effects can spoil this unless the particle charges satisfy certain cancellation conditions. The VERSF particle set passes those conditions. The papers also build the machinery for discounting descriptions that differ only by relabelling, establish conditional consistency of the resulting quantum theory, and carry out one fully positive global construction for a retained model.

The remaining check is whether all of that applies together to the complete evolving physical theory, including its one-sided matter. Note that an allowed change in a global count such as baryon number is a different thing from an inconsistency in the symmetry rules.

Current status. Conditional local quantum completion and an executed retained global measure exist. The full physical chiral and continuum measure remains open.

Ledger cross-reference: SM-5, SM-7, SM-10, SM-29.

22 Which changes of baryon and lepton number are allowed?

Technical VERSF explanation

The faithful-bundle calculation gives integrated anomaly indices $A_B = -N_g c$ and $A_L = -N_g c - (N_g - N_s)\gamma$. Here N_g counts generations, N_s counts singlet conjugate neutrinos, c is the integrated weak-bundle second Chern class, and γ is the integrated tangent-bundle first Pontryagin class divided by 24. On the periodic four-torus γ vanishes. For three generations, combining the admitted gauge-topological process with the Weinberg interaction gives $(\Delta B, \Delta L) = (3n, 3n + 2m)$, for integers n and m . Fractional covering-factor windings preserve this integer result. [V12, §§2–9]

Within that interaction branch, symmetry-preserving quantum composition retains baryon number modulo three. The first compatible local baryon-changing structure has dimension fifteen, with an explicit nonzero witness. This establishes permission, not a nonzero transition rate or lifetime. The all-charge minimum-index classification is also complete, but neither result proves that the full substrate action excludes every additional baryon-breaking vertex. [V12, §§7–10 and Appendix B]

General reader explanation

Baryon number counts quarks minus antiquarks, divided by three; a proton or a neutron, made of three quarks, therefore counts as one. Lepton number counts electrons and neutrinos, with antiparticles counting minus one. On the specified VERSF branch the calculation shows that baryon number can change only in steps of three, even once the interaction that gives neutrinos their mass is included; changes of one or two are ruled out there.

On that branch this excludes ordinary proton decay, in which baryon number would change by one. It is a rule about what is permitted, not about how often it happens, so it gives no rate for the processes that are allowed, in which baryon number changes by three. Two things remain open: whether the full theory selects this branch, and whether the full physical law contains further interactions beyond those considered, which could change the rule.

Current status. Exact charge-selection and classification results under explicit premises; no decay rate or unconditional proton-stability theorem is claimed.

Ledger cross-reference: SM-5, SM-10, SM-22, SM-25, SM-29.

Physical prediction

23 How do microscopic calculations become laboratory predictions?

Technical VERSF explanation

RPC-1 already supplies a conditional renormalised-parameter closure theorem: one frozen microscopic boundary is transported through a common scheme, coupled running, thresholds, electroweak breaking, flavour reconstruction and pole extraction. Its structural certificate is issued, and its audit sections record executed tests. Its numerical certificate is explicitly withheld pending an admitted common physical boundary. [F19, opening scope and Part IX]

RPC-1 also narrows the problem. Under two named assumptions it reduces six apparent missing ingredients, the bath structure, the commitment dynamics, the generation-occupancy law, the absolute scale, the boundary operators and the resolution ladder, to two primitive objects the action must produce: a commitment-maintenance operator H_{CMR} and one absolute length ξ . It reports a conditional Route-A coherence length $\xi = 88 \mu\text{m}$ and a second independent conditional construction agreeing within 4.46% (about $84 \mu\text{m}$). The physical uniqueness of those constructions is unresolved, so the length is a conditional benchmark; the reduction of six unknowns to two is the established part. [F19, §§77–78 and status table]

The later finite-transfer and gauge papers add concrete transport and response calculations, including higher-order corrections. They strengthen that existing pipeline rather than invent the need for matching. A physical prediction requires the appropriate normalisation, controlled approximation and stable observable map on the selected branch; a finite regulator does not remove these requirements. [V7–V9; V11, §§37–43; L0, SM-8, SM-9, SM-23, SM-29]

General reader explanation

The programme already has a detailed set of rules for turning microscopic starting values into laboratory quantities. It fixes how to change energy scale, cross particle thresholds and read out masses and mixing, and has run several tests of that machinery.

What is still missing is the complete, physically selected set of starting values that this machinery must consume, and one calibration applied consistently across all the sectors at once. The transport theorem is an established conditional result; its numerical certificate waits on those inputs.

The list of missing starting values has also been shortened. Under two stated assumptions, six apparently separate gaps collapse into two objects the theory must produce: one rule for how a committed pattern is maintained, and one absolute length. Two independent conditional constructions of that length agree with each other to within about four and a half percent, at roughly a tenth of a millimetre, though neither has yet been shown to be the physical one.

Current status. A conditional transport and observable-extraction theorem, with audited executions, is established. Its common physical input boundary and complete numerical certificate remain open.

Ledger cross-reference: SM-7, SM-8, SM-9, SM-21, SM-23, SM-27, SM-29.

24 Must the surroundings change every calculated strength or mass?

Technical VERSF explanation

Allowing the substrate to adjust is physical, but its effect depends on the coupling and order. For visible variables x and relaxing variables y , elimination gives the Schur complement of the y block in the quadratic parent, on the appropriate nonsingular subspace. This depends explicitly on the cross-coupling between x and y . If the first source for y is itself quadratic in field curvature, elimination can begin at fourth order rather than modify the quadratic gauge coefficient. [V11, §§41–43]

The executed classical stress-energy relaxation test has that fourth-order behaviour about zero curvature. The isolated shifted-current block is also blind in its stated setting. Neither result licenses dropping all record, completion, quantum or interacting corrections. Each channel must be evaluated or shown to vanish in the actual background and order, with the full response kept when mixing is present. [V11, §§42–44]

SGW-3 also gives the irreversible side of the adjustment exactly. The inherited closure-circulation tilt takes the wheel out of the reversible class for every nonzero value, certified by cycle affinities, a complex spectrum and a positive entropy production, with the information it returns computed on the wheel and on the heat baseline. Any such return enters the response through an exact constrained update whose direct and relaxation modes are separated, which is blind to changes confined to a frozen fact direction, and in which a universal direct coupling can still generate contrasts through unequal relaxation. [V11, §§7–17]

General reader explanation

Press on one part of a structure and nearby parts shift; the response you feel includes their shifting. The question is whether that shifting alters every calculated strength and mass. The answer found so far is: not necessarily. In the cases tested the surroundings do adjust, but their effect appears only at a higher power of the disturbance, so the leading quantities are left exactly as they were; one test of this kind, with the surroundings adjusting in the simplest classical way, showed just that.

The lesson is to calculate each adjustment rather than assuming either that it will fix a mismatch or that it can be ignored.

The machinery for doing that calculation is already exact for one important case: a steady drift round the rim of the basic model, which takes it out of the balanced class, has its effect on the response worked out in closed form, including the adjustment of the surrounding variables and the proof that a change confined to a direction already fixed by a committed fact produces no response at all.

Current status. Specific cancellation and order results are established. The complete coupled physical response still requires evaluation.

Ledger cross-reference: SM-12, SM-16, SM-20, SM-26.

Testing and completion

25 What would count as a successful prediction or a failed test?

Technical VERSF explanation

A predictive calculation freezes its inputs, branch, approximation order and observable definition before the comparison. Its uncertainty must include numerical, truncation, matching and experimental contributions where relevant. The October gauge result retains its residual to the frozen weak-angle comparator. The neutral candidate retains its deficits against the two reported NuFIT comparisons; those local residuals are not a full likelihood analysis or an automatic exclusion of all VERSF constructions. [L0, §§5–6]

Failure must be attached to the proposition tested. The unsuccessful EX2E family-key response rejects that implementation of the bridge, not the exact antipodal quotient. Conversely, discovering another branch with a better match does not repair the physical prediction until the theory selects it independently. A valid negative result narrows the programme; repeated bookkeeping does not add a new empirical prediction. [V10, §§60–67; V11, §44]

General reader explanation

A useful test fixes the rules and inputs without tuning them to the quantity being tested. It can concern a future measurement or independently reproduce one already known. If it misses, the miss must stay visible, with the precise version of the theory identified. Changing the interpretation after each mismatch does not create a successful prediction.

By that standard the present results are conditional successes with visible gaps, not a confirmed fit of the whole model.

Current status. The testing discipline is explicit. The current conditional results do not yet amount to a successful whole-model fit.

Ledger cross-reference: SM-9, SM-11, SM-24, SM-25, SM-26, SM-30.

26 What would make the Standard Model derivation complete?

Technical VERSF explanation

Recovery requires a single admitted effective quantum theory with the required particle content, gauge action, chiral interactions, completion sector, physical state space and controlled observable map. A claim to explain its parameters additionally requires each claimed mass, coupling and mixing parameter to follow from the declared smaller input set. The neutrino extension must be stated separately and must use a common neutral mass, kinetic and current construction. [L0, SM-30]

The remaining physical gauge response, mass and current matrices, normalisation, quantum consistency and confinement results must coexist on compatible branches. Gravity, dark matter and the cosmological matter asymmetry are broader questions outside the definition of recovering the Standard Model. This paper specifies and explains the task; it does not claim a new theorem closing those remaining requirements. [P4; L0, §8]

General reader explanation

Recovery is complete when one consistent construction delivers the observed particle and interaction theory, with its input parameters declared. Explaining those parameters requires deriving the claimed numbers from fewer inputs. VERSF already has structural derivations, assembled conditional models and numerical tests. The remaining goal is a complete physical certificate connecting the relevant results and their laboratory predictions.

The point of this list is that each future result should change the answer to one specific question, where its evidence can be seen.

Current status. The October interim audit is complete. A full physical Standard Model derivation is not yet certified.

Ledger cross-reference: SM-30 and the sector obligations above.

What the answers establish together

The programme's existing answers include conditional gauge-origin and weak-orientation derivations, Hilbert/Born and fermionic reconstruction, a three-generation census and exact canonical geometry, gauge-action and electroweak mass-pattern theorems, retained global positivity and strong-phase zero, and a fixed observable-transport framework. The October results add a conditional neutrino ratio, a relative gauge prediction with an evaluated residual and exact charge-selection calculations. These results stand at their source grades even where the complete physical source remains unselected.

The remaining questions are equally specific. They concern which source construction is physically realised, how its coupled response is normalised, how masses and currents are identified together, and how the finite theory reaches the required quantum and observable description. Those are not reasons to repeat the completed geometric and algebraic work. They identify the physical returns the next derivation must consume and supply.

A general reader can therefore understand the present position without a completion percentage: VERSF has an increasingly explicit candidate account of the structure and some quantitative relationships of particle physics. It has not yet derived the entire physical Standard Model. The value of the question-by-question format is that each future advance can change a particular answer, with its evidence and consequences visible.

The central unresolved problem is therefore not any one of the open numbers. It is the demonstration that one physically selected construction produces all the relevant structures and predictions consistently. Until that is done, each conditional success is evidence that the construction can carry the physics, not that the substrate must.

An external reader will keep returning to one question: why must the physical universe adopt the particular VERSF premises that produce the Standard Model, rather than those premises having been selected because they produce it? The paper's answer is to make every such premise visible and to grade it. The gauge selection uses three empirical anchors; the generation count inherits a rank-three premise and an unresolved family-to-record identification; the neutrino candidate adopted its projection hypothesis after an earlier version failed; the Higgs benchmark freezes its scale premises. None of these is hidden. Whether any of them was shaped by knowledge of the target is a question for the development record of each source paper, which this paper does not audit; the neutrino projection hypothesis is recorded above as adopted after a failure was known. What this paper establishes is that each premise is stated with its unresolved status, and that each is a place where the construction has so far been chosen to fit rather than shown to be forced. A premise is discharged only when it is derived from fewer substrate assumptions or when every admitted alternative is proved to give the same observable. That is the standard the next calculations are held to, and it is the principal vulnerability of the programme as it stands.

Immediate next calculations and proof obligations

1. Select one physical source and branch. Specify the admissible Fold history, carrier, boundary conditions and interaction action together, including the inherited three-rank and family-to-record premises. Explain why this branch is physically selected rather than chosen to improve a fit. (Questions 1–2, 5, 9, 26; SM-12, SM-30.)

2. Evaluate the complete coupled response. On that same source, include changing links, matter propagation and currents, records, completion, contact terms, vertices and measure effects. Return physical Z_3 , Z_2 and Z_q and their J and T contractions, or demonstrate a channel's cancellation, with canonical normalisation. (Questions 9–12, 24; SM-9, SM-26.)

3. Return masses and currents in one normalisation. From the selected action, obtain the Higgs and electroweak scale, charged mass matrices and CKM frame, plus neutrino masses and the PMNS charged-current map; apply a common threshold and pole convention and preserve unsuccessful comparator results. (Questions 13–18, 23; SM-17, SM-21–SM-25.)

4. Close quantum and strong-sector physical tests. Establish the interacting chiral/global measure and relativistic continuum behaviour on the same theory, identify physical confinement dynamics and compare frozen observables with controlled numerical, scheme and truncation errors. (Questions 8, 19–21, 23, 25; SM-14, SM-27–SM-29.)

These tasks share a common physical-source dependency; they are not four independent results that can be completed by assembling unrelated benchmark branches.

A short vocabulary for the general reader

Action. The rulebook that scores every possible arrangement and every possible history of the network; the scores decide what happens.

Carrier. The set of positions and states on which a calculation is done; the board the game is played on.

Branch. One of several allowed ways of realising the rules. Numbers calculated on a branch become predictions only when the theory itself selects that branch.

Completion. The part of the substrate that finishes patterns around matter. In VERSF it plays the role of the Higgs.

Current. The handle by which matter takes hold of an interaction. It need not be a flow of anything through space.

Gauge symmetry. The freedom to relabel internal markings without changing anything measurable.

Physical admission. Showing that a mathematical setting describes the actual physical situation claimed, and not only a model that resembles it.

Matching. Translating a result from the substrate's units and conventions into the units and definitions that experiments use.

Appendix A Connection to the October ledger

The SM identifiers retain their historical meaning. The question numbers below show where each obligation is explained. Retired entries are tracked for continuity and are not reinstated as independent requirements.

Gate	Subject	Questions
SM-1	Weak orientation	6, 14
SM-2	Weak doublet and family response	9, 13–16
SM-3	Neutral support and leakage	17–18
SM-4	Record and preparation	2, 5
SM-5	Gauge and matter census	2–4, 21–22
SM-6	Neutral octant and CP	18
SM-7	Chiral propagation and positivity	6–8, 21, 23
SM-8	Time and physical scale	1, 8, 14–15, 23
SM-9	Normalisation and conventions	1, 3, 7–8, 10–12, 23, 25
SM-10	Anomaly descent and measure	4, 21–22
SM-11	Species and generations	2, 4–5, 25
SM-12	Physical source and occupancy	1–2, 5, 9, 24
SM-13	Phase and physical frame	6, 16, 18, 20
SM-14	Confinement dynamics	19
SM-15	Half-lazy route retired	26; retained only where a source uses it
SM-16	Higgs completion and kinetics	8–9, 13–14, 24
SM-17	Charged-flavour return	15–16
SM-18	Participation shortcut retired	10, 12
SM-19	Tau shortcut superseded	15
SM-20	Suppression shortcut retired	12, 24
SM-21	Absolute mass scale	15, 17, 23
SM-22	Charged and neutral matrices	4, 13, 15–17, 22
SM-23	Quark masses and transport	15–16, 19, 23
SM-24	Physical PMNS matrix	18, 25
SM-25	Neutral masses and conjugation	17–18, 22, 25
SM-26	Physical gauge coefficients	3, 9–12, 14, 24–25
SM-27	Colour running and confinement	11, 19, 23
SM-28	Strong CP	20
SM-29	Quantum and continuum theory	6–9, 20–23
SM-30	Whole physical derivation	1, 25–26

Appendix B Earlier results relied on and their stated conditions

The results below are relied on in Questions 3 to 23. Each entry names what the cited paper establishes and the conditions it attaches, so that a reader can see which premises travel with the result. The F register in the references gives the primary papers; catalogue coverage of the public archive is not a claim to have independently verified every proof in it.

Gauge origin and action, Questions 3 and 9. The BCB sector-selection argument, connection necessity, census completeness and the gauge-action theorem. The empirical anchors and the commuting-sector premise are distinguished from unresolved physical calculations; the product-group and faithful-quotient statements are separate results, as are the phase $U(1)$ and the trivial $CP0$ base. [F1–F4; F11; F23]

Generations, Question 5. The complete-family census, the canonical equal-layer quotient selection and the nondegenerate three-level geometry. The rank-three premise C9 is traced to QN-3's explicit AD-3 premise. The EX2E failure is scoped to its tested implementation. The separate refinement and replication route is acknowledged without merging its unresolved identifications into the canonical-wheel result. [F6–F7; F20–F22]

Weak orientation and quantum structure, Questions 6 to 8. The single-Weyl restriction, the $P_W = P_U$ selection, the Hilbert/Born reconstruction, the full CAR/Fock construction and the quotient microcausality descent. The sources' chiral-locking audit, adjointness, operational and kinematic-locality premises are named with each. [F3; F5; F8–F10]

Higgs and charged masses, Questions 13 to 15. The completion representation, the W, Z and photon mass matrix and the conditional numerical benchmarks, with their external inputs, their residuals and their physical normalisation limits stated. [F12–F15]

Confinement and global quantum theory, Questions 19 to 21. The nonperturbative framework, the reference executions, the retained positive global transfer and the exact strong-phase-zero result, together with the sources' confinement non-identifiability and continuum chiral-measure obligations. [F16–F18]

Observable transport, Question 23. The issued structural RPC-1 certificate and its audited executions, with its numerical certificate unissued. [F19]

Gauge response, irreversible dynamics and parameter closure, Questions 8, 9, 12, 23 and 24. The exact sector-to-factor map, its kernel and the two-contrast theorem with the protected-record stiffness evaluations; the finite admissibility criterion, the wheel and heat results, the circulation certificates and the exact constrained response; and the reduction of six missing ingredients to a commitment-maintenance operator and one absolute length, with two conditional constructions of that length. Each is exact on its construction; the physical price, the physical selection of the history law and the uniqueness of the length remain open. [F24; V11; F19]

No new J and T evaluation, selected PMNS or CKM fit or complete physical spectrum is supplied in this paper. The earlier results are credited at their source grades and are not counted as October advances; the ledger's planning assessment is unchanged by them.

References

The V numbers preserve the October source-register positions. V6 is superseded on overlapping claims by V7. F1–F22 are the earlier technical papers relied on in Questions 3 to 23, compiled from the public VERSF paper archive; F23 is their gauge-sector reader companion. Their stated conditions remain in force. Titles and theorem or section references identify the consulted editions, accessed 19 October 2026. External references define the established physics target and do not independently validate VERSF.

Access note. Each F-series entry links to its Website PDF, and links are given for the ledger and V-series source copies on the public VERSF site. The controlling-edition qualifications govern each citation; a web link is not independent verification of its proof. The paper catalogue may also be browsed at [VERSF Quantum Physics archive](#).

[L0] Taylor K. VERSF Standard Model Derivation Ledger October 2026. SMA-4, Interim SM-30 Audit, 19 October 2026. Controlling programme-level status and gate identifiers. [Source PDF](#)

[B0] Taylor K. VERSF Standard Model Derivation Audit September 2026. SMA-3, 6 September 2026. Earlier primary results are inherited through its cited source register and retain their original grades. [Source PDF](#)

[V1] Taylor K. The Fold-to-K7 Physical Stitching and Marked-Anchor Reduction in VERSF. 5 September 2026; scale and coherence revision 7 September 2026. Much of this work is integrated into V10. [Source PDF](#)

[V2] Taylor K. Native Current Response, Hypercharge Visibility and Full-Configuration Source Reconstruction in VERSF. September 2026. [Source PDF](#)

[V3] Taylor K. Configuration Dynamics, Refinement Geometry and Record-Conditioned Curvature Response in VERSF. 22 September 2026. [Source PDF](#)

[V4] Taylor K. Physical Bath Selection and Neutrino Mixing in VERSF. 25 September 2026. Especially §6.2 and §§12–14. [Source PDF](#)

[V5] Taylor K. The First Source-Fixed Neutrino Mass-Ratio Prediction Attempt in VERSF. September 2026. Especially §§4–5 and §§10–15. No public copy at the time of writing; cited from the author's edition.

[V7] Taylor K. The Physical Changing Link Source Representation Resolved History Metric and Gauge Normalisation Closure Attempt in VERSF. CLSN-1, controlling 6 October 2026 edition through §17.85. This controls overlapping claims in the 2 October edition. [Source PDF](#)

[V8] Taylor K. The Universal Gauge Conversion Factor, D41 Representation Typing, and Source-Response Release in VERSF. CLSN-2, 9 October 2026. [Source PDF](#)

[V9] Taylor K. The Scale- and Common-Normalisation-Free Gauge Relation in VERSF. SGRI-1, 9 October 2026. [Source PDF](#)

[V10] Taylor K. From Fold to Three Generations in VERSF. 12 October 2026. Especially §§52–62; this edition integrates earlier Fold work without counting it as a second advance. [Source PDF](#)

[V11] Taylor K. Physical Applicability and Irreversible Response in VERSF. SGW-3, 17 October 2026. Especially §§20–21 and §§40–44. [Source PDF](#)

[V12] Taylor K. Global Baryon and Lepton Selection in VERSF. 19 October 2026, current Word edition. Especially §§1–10 and Appendix B. Classical anomaly and index antecedents are credited in that paper. No public copy at the time of writing; cited from the author's edition.

[P1] de Blas J, Dittmaier S and Kogler R. Electroweak Model and Constraints on New Physics. Particle Data Group, 2025 update, revised November 2025. §§10.1–10.2. <https://pdg.lbl.gov/2025/reviews/rpp2025-rev-standard-model.pdf>

[P2] Huston J, Rabbertz K and Zanderighi G. Quantum Chromodynamics. Particle Data Group, 2025 update, revised August 2025. §9.1. <https://pdg.lbl.gov/2025/reviews/rpp2025-rev-qcd.pdf>

[P3] Particle Data Group. Neutrino Masses, Mixing, and Oscillations. 2025 update, §14. <https://pdg.lbl.gov/2025/reviews/rpp2025-rev-neutrino-mixing.pdf>

[P4] CERN. The Standard Model. Public overview, consulted 19 October 2026. <https://home.cern/science/physics/standard-model>

Earlier source papers checked

[F1] Taylor K. The Three Gauge Symmetries from BCB. Minimal internal symmetry and the capacity and anchor premises; 143-page website edition. [Website PDF](#)

[F2] Taylor K. Distinguishability Conservation and Gauge Structure. Connection necessity and covariant transport; §6.3 states the dynamical limits. [Website PDF](#)

[F3] Taylor K. Closing the Interfaces. §§3–5: capacity, anchors, Abelian uniqueness and chiral-interface premises. [Website PDF](#)

[F4] Taylor K. The Gauge-Census Closure Theorem in VERSF. Conditional exclusion of additional connected internal gauge channels; inherited carrier, mixing and minimality assumptions. [Website PDF](#)

- [F5] Taylor K. The Weak-Orientation Admissibility Theorem in VERSF. Theorem 7, §§13–14 and Appendix C: $P_W = P_U$; chiral-locking and mirror-sector conditions. [Website PDF](#)
- [F6] Taylor K. The Generation and Species Census Theorem in VERSF. SC-1, C9–C15, §9 and Theorem 1: conditional three-generation census. [Website PDF](#)
- [F7] Taylor K. The VERSF History-Measure, Generation-Geometry and Branch-Closure Theorem. HMGB-1, §§31–32A, especially 32A.0–32A.7: provenance, lumpability, spectra and canonical holonomy descent. [Website PDF](#)
- [F8] Taylor K. Why Both Hilbert Structure and the Born Rule Are Structurally Forced in VERSF. Proposition 1 and Theorems 1–5: route-dependent reconstruction; the minimal kernel alone is insufficient. [Website PDF](#)
- [F9] Taylor K. The Fermionic Fock-Space Reconstruction in VERSF. Full CAR and Fock reconstruction under FF-1, FF-2a/b and FF-4; leading vertex retains current matching. [Website PDF](#)
- [F10] Taylor K. The Adjoint-Removal Positivity and Microcausality Theorem in VERSF. Theorem 1, §11.2: positive quotient and microcausality descent; QC-7 retains the kinematic antecedent. [Website PDF](#)
- [F11] Taylor K. The Gauge Action and Coupling Theorem in VERSF. Theorems 1–15: Schur reduction, local quadratic gauge action, universal coupling and matching conditions. [Website PDF](#)
- [F12] Taylor K. The Electroweak Completion-Interface Theorem in VERSF. Effective (1,2,+1/2) completion carrier; §15 retains the completion-necessity premise. [Website PDF](#)
- [F13] Taylor K. The Broken Electroweak Phase in VERSF. Explicit weak-vector mass matrix and electromagnetic stabiliser on the declared completion background. [Website PDF](#)
- [F14] Taylor K. The Electroweak Vacuum and Higgs-Potential Completion Theorem in VERSF. Route-A conditional scale and Higgs benchmark; scope box and Theorems 2, 8 and 9. [Website PDF](#)
- [F15] Taylor K. The Charged-Lepton Absolute Scale Theorem in VERSF. Conditional scale-locking and numerical benchmarks; imported electromagnetic and electroweak inputs are explicit. [Website PDF](#)
- [F16] Taylor K. The Non-Perturbative QCD Scale and Triality-Gap Completion Theorem in VERSF. Principal claim, §20' and §§30–33: reference scale, penalty-free gap architecture and open physical coefficients. [Website PDF](#)
- [F17] Taylor K. GQSC-1R The Faithful-Quotient Retained Global Measure. Theorem A, Theorems 8–16 and §§34–37: executed retained positive transfer, strong-phase zero and confinement non-identifiability. [Website PDF](#)
- [F18] Taylor K. The Quantum Gauge Completion of the VERSF Standard Model. Theorems 1–28 and debt register: local BRST/BV, anomaly and renormalisation results; global and physical conditions. [Website PDF](#)
- [F19] Taylor K. The Renormalised Standard Model Parameter-Closure Theorem in VERSF. RPC-1: structural transport certificate, frozen boundary contract and audited executions; numerical certificate not issued. [Website PDF](#)
- [F20] Taylor K. The Substrate Anomaly-Descent Theorem in VERSF. QN-3, AD-3 and §5.3 explicitly inherit physical support rank three rather than prove it there. [Website PDF](#)
- [F21] Taylor K. The Replication Theorem. §§4–8 and status table: charge-blind replication; complete-family and spectral-index identifications remain conditional. [Website PDF](#)
- [F22] Taylor K. The Generation Theorem. §§7–9 and §8A: finite refinement census; REF-DIM, REF-BIN and the interface-dimension route retain stated conditions. [Website PDF](#)
- [F23] Taylor K. Why Nature Chose the Standard Model. General-reader companion to the BCB gauge papers. Technical scope and conventions are controlled by F1–F4; this guide uses $Q = T_3 + Y$ throughout. [Website PDF](#)
- [F24] Taylor K. Physical Matter–Higgs Record Weighting and the Gauge-Coupling Closure Gate in VERSF. SGW-2, 13 October 2026. Theorems 4, 5, 9 and 13: the 3×6 sector-to-factor map, its rank and kernel, the two-contrast theorem and the native H4 protected-record evaluations; numerical gauge strengths explicitly unreturned. [Source PDF](#)