Canon Update / Recent Derivations: Record Reconstruction, the Monitored Service Rate, and the Current Frontier of the Finite-QEC Substrate

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Abstract

This note records a set of recent canon changes in the finite-QEC substrate programme before the older papers and book are rewritten. The developments are important enough to cite as a separate update: the reconstruction layer has been sharpened into a record-reconstruction ladder; the minimal balanced record cell is forced to be the self-dual doubly-even $[8, 4, 4]$ byte under explicit finite-record hypotheses; the bare monitored service rate $\alpha_0 = 1/137$ is no longer a free convention but the Born weight of one firing projector in a 137-label record-pair service register; the service-history measure has been narrowed to a conditionally closed record-action skeleton, with one-record-per-event factorization now closed at finite-instrument grade, the one-clock universalisation attempt rejected, and recovery holonomy reduced to a sign-pointer bridge problem; and the late cosmological selector has been reduced to a single completed-burn episode per physical cell inside the current homogeneous service instrument. Several previous "free coefficient" entries in the native cosmological/QEC core have also been reclassified as sector-native conditional invariants or closed-negative artefacts. The result is not a claim that the programme is finished. It is a cleaner public status: the native record-action core is substantially tighter than in the existing paper set, while the hard remaining walls are now explicitly named—the EW second scale (now a $\sim$10%-predicted radiative byte-power scale $v/M_P = \alpha_0^8/\sqrt{\lambda}$ modulo named premises, no longer an irreducible anchor; nuclear physics a QCD residual rather than a separate scale), the recovery-holonomy/CP sector, dressed-α endpoint-contact normalization, external Boltzmann/halo tests, and ordinary precision phenomenology for the framed causal-set high-energy layer.

Contents

1 Purpose of this Update

The existing paper series [2–8] was written before several canon changes that materially alter how the programme should be described. Some earlier statements are too weak: they continue to list Born weights, the bare α_0 service rate, or the HBC (Holographic Boundary Crystallization) scalar amplitude as open in the same broad sense. Later June updates sharpen that point: the amplitude candidate is not free, but it still needs channel-lock/critical-latch and spatial-whitening. Some are too strong: they can imply that a sector is Locked when it remains conditional on a named premise. This update is meant to timestamp the new state before a paper-by-paper and chapter-by-chapter refresh.

The intended reader is a numerate graduate student or physicist. The main text gives the conceptual and mathematical structure without reproducing every finite enumeration. The reproducibility trail is in the public code repository [10], the canon snapshot [9], and the scripts named in the tables below. The status labels are the same as in the companion papers: Locked, Computed, Conditional, Retired, and Open frontier.

1.1 Notation and terminology

For readers meeting the programme through this note, the recurring terms are:

Service / monitor. The finite substrate continuously measures its own error syndromes to keep records stable. Each such measurement is a non-unitary *service* (syndrome-extraction) event; the *monitored service rate* is how often, per lattice tick, the substrate fires one. α_0 is that rate in units of the clock scale Λ (so $\Gamma = \alpha_0\Lambda$).

Record / syndrome. A stable, copyable classical fact written by the code—operationally, an error syndrome. Records, unlike matter excitations, can be cloned and broadcast; this distinction is load-bearing in §4.

Burn ledger / selector. In late cosmology a finite per-cell "stock" is consumed (*burned*); the *selector* is the rule fixing the completion endpoint, and the integrated consumption is the burn ledger (§6).

Traffic clock. The normalisation mapping the abstract service-history measure onto physical time; universalising it across all sectors is one of the two open R13 legs.

Recovery holonomy Φ_{rec}. The complex phase accumulated around an error-recovery cycle—the candidate carrier of CP violation (§5, R15).

HBC (Holographic Boundary Crystallization). The boundary-printing mechanism: new low-entropy substrate cells are crystallized at the cosmological horizon/boundary, keeping the holographic/QEC ledger saturated. The "HBC scalar amplitude" $A_\nu = (3/4)\alpha_0^4$ is the primordial scalar perturbation candidate that printing imprints if the channel-lock and spatial-whitening identities hold.

Label scheme. R0–R15 are reconstruction-ladder rungs; A1/D1/D2 are cosmological-completion items; Q_3 is the 3-cube (the byte's coordinate geometry); Λ is the QCD/clock scale.

2 The New High-Level Picture

The recent work changes the framework's centre of gravity. The older picture was often summarised as a finite code plus many thermodynamic ledgers. The newer picture is more constrained:

> A stable-record substrate forces a minimal record cell; the record cell supports a monitored service alphabet; the service alphabet gives a record-action measure; and physical coefficients must be read as sector-native invariants of this monitored service history.

This is a stronger statement than "the universe computes" and weaker than "all physics has been derived". It says that the framework has found a specific place where counts, rates, histories, and amplitudes meet. It also says exactly where counting stops: at the second absolute scale, at complex holonomy, and at precision continuum phenomenology.

3 Record Reconstruction

The reconstruction problem is now stated as a ladder rather than a slogan:

$$\begin{array}{c}\text{stable records}\\ \Downarrow \\ \text{projectors and isometries}\\ \Downarrow \\ \text{complex locally tomographic QEC}\\ \Downarrow \\ \text{Born weights and service records}\end{array}$$

This connects the programme to standard quantum-reconstruction work [1, 11] and to the ordinary coding theory of the $[8,4,4]$ extended Hamming code [12]. The philosophical floor remains: one cannot derive the existence of stable records from inside a theory that already uses records to state observations. But conditional on stable local records and compatible tests, the formal burden is now much sharper.

3.1 The Minimal Balanced Record Cell

The new theorem is:

> Among finite binary local record systems with repeatable readout, commuting read/write stabilisers, balanced CSS (Calderbank–Shor–Steane) structure, closure under the local complex phase, and distance-4 erasure protection, the unique minimal cell is the self-dual doubly-even $[8,4,4]$ code.

The assumptions are explicit. The conclusion is not "choose a byte" but "the byte is forced once these finite-record hypotheses are admitted". The logic is:

$$\begin{aligned}
\text{repeatable non-disturbing reads} &\Rightarrow \text{commuting stabilisers},\\
\text{read/write split} &\Rightarrow \text{CSS structure},\\
\text{balanced read/write} &\Rightarrow \text{self-duality},\\
\text{local complex phase closure} &\Rightarrow \text{doubly-even Type-II code},\\
\text{distance-4 protection} &\Rightarrow \text{no smaller binary cell.}
\end{aligned}$$

The enumeration in `minimal\_balanced\_record\_cell\_theorem.py` verifies that there is no $n=2,4,6$ Type-II self-dual distance-4 cell, and that at $n=8$ all labelled solutions form one coordinate-permutation class, represented by the first-order Reed–Muller code $\mathrm{RM}(1,3)$. This also explains why the cube Q_3 enters so deeply: the byte is not merely eight bits; it is the minimal phase-stable balanced record cell, and its coordinate geometry is the cube.

3.2 Born Weights and the Closed Record Pair

The Born rule is no longer treated as a live R13 measure problem. It is conditionally closed inside the accepted complex-QEC substrate by two routes. First, stabiliser non-contextuality plus Gleason-type uniqueness gives $p_i = \mathrm{Tr}(\rho P_i)$. Second, the Naimark/Stinespring record map

$$V = \sum_s \Pi_s \otimes |s\rangle_R, \qquad V^\dagger V = I$$

turns the measurement into isometric syndrome recording. Orthogonal record states kill unmatched forward/backward histories, leaving the diagonal $AA^* = |A|^2$. This is the rigorous form of the slogan "Born is the closed record-action pair." The supporting scripts are `substrate\_born\_rule.py` and `born\_closed\_record\_pair.py`.

The residual is not "why $|\cdot|^2$ once the substrate is accepted." It is the deeper reconstruction floor: why nature is a complex, locally tomographic QEC record system at all. That is the same class of question addressed by operational reconstructions of quantum theory, not a missing coefficient in the finite code.

4 The Monitored Service Rate $\alpha_0 = 1/137$

The previous canon treated the bare $\alpha_0 = 1/137$ rate as a strong but conditional service assumption. The new R14 result splits the issue into two questions and closes both at foundationally grounded grade.

4.1 Rate Given the Count

The monitored service register is a one-hot projective observable with 137 mutually exclusive labels. In the unital connected monitor, the stationary state is $I/137$. One non-unitary firing label has Born weight

$$p_{\text{fire}} = \text{Tr}(P_{\text{fire}} I/137) = 1/137.$$

One elementary monitor interrogation per lattice tick then gives

$$\Gamma = \alpha_0 \Lambda, \qquad \alpha_0 = \frac{1}{137}.$$

This is verified in `alpha0\_count\_rate\_theorem.py`.

4.2 Why the Count is 137

The live alternative was not a strawman. A fermionic or Grassmann-consistent antisymmetric pair space would give $120 + 1 = 121$, not 137. The record-pair argument closes the fork. Records are clonable pointer states: orthogonal records can be copied and broadcast, unlike Pauli-excluded matter excitations. Therefore the service alphabet is the symmetric record-pair space

$$\text{Sym}^2(16) = \frac{16 \cdot 17}{2} = 136, \qquad 136 + 1_{\text{idle}} = 137.$$

The script `alpha0\_record\_pair\_symmetry\_theorem.py` verifies the record-vs-matter distinction: §5.9 bills syndrome records, not fermionic matter pairs.

The conditionality must be stated plainly, because this is a fork and the selected branch is the one that matches the observed 1/137. The closure rests on a single load-bearing premise: that the service ledger bills *records* (clonable syndrome facts), not *matter* (Pauli-excluded excitations). Granting that premise, the symmetric count $136 + 1$ is forced and the antisymmetric $120 + 1$ is excluded; the premise is independently motivated by the copyability of pointer records (R1/R7/R11), but it remains an admitted premise, not a theorem. Hence the honest grade is *foundationally grounded*, not *derived from nothing*: $\alpha_0 = 1/137$ is forced *once records-not-matter billing is accepted.* Bare α_0 is therefore no longer a free continuous rate, but neither is it unconditional. Dressed $\alpha^{-1} = 137.035999\ldots$ remains a separate electromagnetic renormalisation problem; it should not be confused with the bare service probability.

The latest alpha-escape audits sharpen that separation. The direct Ward/Kubo/LSZ route remains a no-go for the strongest claim: physical low-energy QED is a retarded current-current or photon-self-energy response, while the service ledger is a pointer/record observable. The historical $N_1 = 31$ coefficient is therefore not a charge-weighted self-energy kernel.

The current positive route is weaker and better typed. Closed record-pair counting selects a finite local Maxwell-contact subtraction,

$$N_{\text{contact}} = 2 \sum Q^2 - 1 = 31,$$

which gives the observed $137 \to 137.036\ldots$ shift if it is the normal-ordering constant for the endpoint F^2 contact. The endpoint-map audit shows exactly what remains: endpoint covariance lives naturally in the Keldysh/noise block, while the Maxwell contact is a retarded/local normal-ordering term. Thus dressed α is no longer just a vague near-hit or a plain no-go; it is a conditional finite-contact theorem target, not a Locked QED prediction.

4.3 Downstream Billing Maps

The downstream audit in `alpha0\_downstream\_billing\_map\_audit.py` replaces the old question "is α_0 assumed?" with a stricter one:

> Does this sector actually bill the R14 monitored service observable, and with what multiplicity?

The answer is sector-specific. The mass-sector bit weight bills one active syndrome/gauge-bridge erasure. The CMB/sterile source bills one singlet release port plus a uniform Q-address. HBC bills weight-4 topology commits inside the scalar-printer ledger. Gravity bills one monitored $P \to Q$ jump in the live α^1 erasure route. These are still conditional maps in their own sectors, but the common bare-rate seed is no longer free.

5 R13: Service-History Measure as Record Action

The R13 proposal is the history measure

$$\mathbb{P}[\gamma] \propto e^{-\mathcal{A}_{\rm rec}[\gamma]}, \qquad \mathcal{A}_{\rm rec} = \mathcal{A}_{\rm traffic} - \frac{1}{2}\Delta S_{\rm rec} + i\Phi_{\rm rec} + \sum_a \lambda_a Q_a.$$

The important recent change is status, not formula. The old bundle "traffic clock + holonomy + Born + α_0" was too coarse. The current state, checked by `r13\_record\_action\_measure\_status.py`, is:

Term	Status	Meaning
Record unit $s_1 = \ln(8 \times 137)$	Computed	Forced by the record alphabet and R14 service count.
Crooks/KMS split	Computed	Entropy fixes the antisymmetric part; traffic cancels in forward/reverse ratios.
Born square	Conditional	Closed inside the complex-QEC record substrate.
Bare α_0	Conditional	Closed at the record-pair/equipartition rung; dressed-α separate.
Native traffic coefficients	Conditional / Computed	Converted to sector-native invariants or closed-negative; no ordinary fitted native coefficient remains.
Traffic clock	Computed (rule, not rate)	Native selector clock is real — realised concretely as the lepton-recovery frame-transport increment (the per-tick $\exp(\delta K_{\text{or}}/3)$ step that bills the PMNS holonomy). A universal clock *rate* stays rejected (two saturated anchors fix two scales; Crooks/KMS forbids a preferred absolute rate), but universalisation survives one level down as a dimensionless billing *rule*: every native sector clock is the one service event billed at the mean cycle. Being a dimensionless ratio, the rule is scale-invariant and anchor-independent — exactly what those objections leave untouched — and the whole service-rate family ($\alpha_0/208$, $10/27$, $q = 1/3$, $K_{\text{or}}/3$, $2/9{=}d/N$) instantiates it: *one rule, many native rates.*
Recovery holonomy Φ_{rec}	Conditional sign-carrier identified	The sign-pointer is the global orientation line ω (a pseudoscalar), but the latest R1 audit separates two objects that earlier shorthand conflated. The two Hasse covers of the R1 order ideal give the CP-even path covariance used for δ. The CP-odd object is the *closed* oriented R1 boundary cochain Ω_{R1}, including the endpoint–endpoint edge, which transforms in the S_3 sign representation; $\omega\Omega_{R1}$ is therefore a scalar Stinespring pointer. This conditionally fixes the lepton CP *sign* relative to the same handedness used by the CKM sign. However $\Phi = 2\pi/3$ is a CP zero in the baryogenesis invariant $\sin(3\sigma\Phi)$, not a closure. Nonzero candidates such as $\Phi = 1/3$ or $2\pi/9$ still require the $\Delta L = 2$ portal and phase-magnitude theorem.

So R13 is best described as a conditionally closed measure skeleton with one closed finite-instrument gate, one rejected overextension, and a sharply localized holonomy bridge: one-record-per-event factorization is closed for the admitted pointer inventory; a single universal traffic clock *rate* is rejected, but the universal billing *rule* (one service event at the mean cycle) survives and is realised concretely as the lepton frame-transport increment; and the recovery-holonomy sign representation is now supplied as $\omega\Omega_{R1}$. The remaining work is not a vague phase search but the specific $\Delta L = 2$ portal and phase-magnitude theorem needed for a nonzero baryogenesis CP invariant. This is considerably sharper than "the action principle is open," but it is not a closed CP derivation.

6 A1/D2: The Cosmological Completion Premise

The Planck hierarchy, the late R4 branch, and inflation exit all use the same cosmological completion endpoint. The old problem was whether $a = 1$ was merely a convention. The new D2/A1 chain reduces this to a finite stock and burn question.

The D2 consumption channel supplies the form:

$$B(N) = B_0 - N r_6, \qquad \chi(N) = \frac{N r_6}{B_0}, \qquad N_{\text{exhaust}} = \frac{B_0}{r_6}.$$

The selector lock requires

$$B_0 = 9\alpha_0, \qquad N_{\text{lock}} = \frac{9\alpha_0}{r_6}.$$

The recent scripts show the following:

1. Static $K04$ surviving-density readings are closed negative: D1, D1', and winding-relic censuses overproduce after the deep escalation.
2. The live object is not surviving defect density but the integrated burn ledger.
3. One closed §5.2 service sweep bills

$$(8 \text{ repairs} + 1 \text{ latch/readout} + 0 \text{ complement})\alpha_0 = 9\alpha_0.$$

4. Repeated sweeps are idempotent after the latch closes.
5. Hidden stock is outside the monitored algebra unless a new source sector is added.
6. Inside the current homogeneous R4 service instrument, covariance under the affine group $\mathrm{AGL}(3,2)$ (the symmetry group of the byte's coordinate space $\mathbb{F}_2^3$, which is 2-transitive, so its only invariant masks are empty and full) permits only empty or full support masks. Completion is the non-empty endpoint, hence every in-instrument physical cell opens exactly one service episode.

The result is not an unconditional cosmological proof. It is a major reduction:

$$\text{inside current homogeneous service instrument:} \qquad \int dN_{\text{burn}} = 9\alpha_0 \quad \text{per physical cell.}$$

The remaining caveat is outside-sector completeness: a hidden register, invalid-state cosmological channel, or non-R4 coupling would be new physics, not a free sweep count.

7 Native Coefficient Ledger

The traffic-multiplier audit originally looked pessimistic. Subsequent per-coefficient checking overturned that. The native cosmological/QEC core now has zero ordinary fitted free coefficients. This claim needs its scope stated precisely, or it overclaims: "no fitted free coefficient" means each entry is either a *conditional invariant* (forced *given* a named sector premise) or a *closed-negative* artefact—it does *not* mean the core is derived unconditionally from first principles. The arbitrariness has moved out of tunable numbers and into a small set of explicit, named sector premises; that is a genuine tightening, not a from-nothing derivation, and each row below should be read with its premise attached. The corrected ledger is:

Object	Current status	Reason
$w_4/w_6 = 2$	Conditional	Q3 loop-orbit edge-incidence ratio; no longer a raw fit.
CC coefficient	Conditional	Generation-vertex Brillouin-zone loop, not the rejected $\sqrt{3/2}$ handoff determinant.
HBC scalar amplitude	Conditional	Local single-clock saturated-printer premise gives the candidate $A_\nu = (3/4)\alpha_0^4$; live identities are channel-lock/critical-latch and spatial-whitening.
BH 10/27 scheduler	Conditional	Moore-stencil/all-contact horizon severing premise; still a horizon-sector map, not a free number.
Gravity α^2/K_{eff}	Retired / closed-negative	The $K_{\text{eff}} = 205$ trace is not a finite-service invariant and is superseded by the live α^1 erasure route.

The danger has moved. It is no longer a scattered set of native cosmological/QEC coefficients. It is concentrated in:

- the EW second scale (now a $\sim$10%-predicted radiative scale $v/M_P = \alpha_0^8/\sqrt{\lambda}$ modulo named premises, no longer irreducible; nuclear physics a QCD residual of $\{\Lambda, v\}$, not a third scale);
- recovery holonomy and CP sign;
- dressed-α precision: the Ward/Kubo self-energy is not the service projector, but closed record-pair counting now selects the finite Maxwell-contact count $2\sum Q^2 - 1 = 31$; the open theorem is the endpoint-covariance $\to F^2$ normal-ordering map;
- external/observational closure of CMB and halo phenomenology, plus the conserved-dust premise behind the zero-mode reservoir.

8 Current Frontier After the Update

The framework is now mature enough to correct the older papers, but not so finished that the papers should be rewritten as a victory lap. The open frontier is cleanly divided.

8.1 Foundational

The deepest remaining question is still reconstruction:

Why nature is a complex, locally tomographic, record-writing QEC Hilbert system?

The byte theorem, Born closure, and R14 service rate narrow this dramatically, but they do not remove the axiom floor. This is the programme's analogue of the starting postulates in any physical theory. Its virtue is now clarity: the floor is explicit.

8.2 Second Scale

The electroweak scale was the largest ordinary-physics gap, and the history of the attempt is instructive. Read as a *static* ratio—a clean low-complexity function of a sharp substrate scale—it fails the accident grade: $v/M_P = \alpha_0^{7.81}$, with no clean M_P form within 5% (nor of the soft Λ), and for a time $v \equiv m_{\rm top}$ (the top-Yukawa quasi-fixed point, $y_t \simeq 0.99$) was accepted as an irreducible second mass anchor (`ew\_nuclear\_second\_scale\_resolution.py`). That reading is now *superseded*. The failure was of the static-ratio search, not of the scale: a dimensionless substrate has no tree Higgs mass-squared, so v *must* be radiative (Coleman–Weinberg), and a transmutation scale is not a low-order ratio. Read radiatively,

$$\frac{v}{M_P} = \frac{\alpha_0^8}{\sqrt{\lambda}},$$

and the once-damning "non-integer" exponent 7.81 is exactly the integer 8—the $[8, 4, 4]$ byte—shifted by the quartic prefactor $1/\sqrt{\lambda}$. The diagnostic is reversed: the exponent *is* a count.

The power α_0^8 is the per-bit non-unitary $\mathcal{W}$-projection $\alpha_0 = 1/137$ (the same single-link object that supplies the fine-structure constant) applied across the eight cell bits. The electroweak vacuum is the *filled* matter cell (R4's complete generation, all eight modes occupied), whose formation amplitude is the all-eight coincidence α_0^8; the one-bit sum of the *same* projection is the electromagnetic self-energy—one object, two channels, each landing on its measured scale. An explicit non-unitary channel evolution reproduces the binomial ladder and fits the all-eight power to 8.000, robust to the unital walk; the eight-fold channel is selected over the one-fold one because partial fillings are orthogonal states, and the operator (rather than state-transition) reading of the R4 projector is excluded as the hierarchy disaster (`v\_phase2\_perbit\_alpha\_derivation.py`, `v\_phase2\_walk\_condensate.py`, `v\_phase2\_higgs\_operator\_id.py`). The quartic is forced the same way: no bare λ, so $\lambda(M_P) = 0$, and the Standard Model's near-criticality (the one-loop running of the measured $\lambda(\mathrm{EW}) = 0.129$ reaches ≈ 0 at M_P) is the empirical confirmation (`v\_phase3\_quartic.py`). With $\lambda(v)$ RG-fixed, $v/M_P = \alpha_0^8/\sqrt{\lambda}$ predicts the observed value to $\sim$10%.

This is a proposition, not a closed theorem: it rests on identifying the electroweak condensate with the filled-cell transition, on the per-mode amplitude α_0, on the precise two–three-loop $\lambda(v)$ (the metastability debate sets the sign of $\lambda(M_P)$), and on an uncomputed $O(1)$ Coleman–Weinberg prefactor. But the sector's status is now "a $\sim$10%-predicted radiative scale," not "an irreducible second anchor." The Standard-Model-side reading remains true and supplies *why* the count was ever two: the two infrared-saturating couplings are g_3 (asymptotically free, $\to \Lambda_{\rm QCD}$, hence M_P) and the top Yukawa (IR quasi-fixed point, $\to v$); no other coupling saturates (`ew\_two\_saturation\_anchors.py`). What has changed is that this second saturation scale is no longer an opaque input but the byte-power radiative scale above. The nuclear ($\sim$MeV) scale is still *not* a third anchor: by the Gell-Mann–Oakes–Renner relation it is a QCD residual of $\{\Lambda, v\}$. The genuinely-open residual in this sector is therefore no longer "v" itself but the named premises and the loop/prefactor precision behind the $\sim$10%.

The later Z-map audit narrows the electroweak vector-boson side further. The running $\alpha(M_Z)$ is not a new framework input: it is the dressed $\alpha(0)$ run through the standard SM vacuum-polarisation correction. The post-EWSB pole ledger then supplies the endpoint quotient as an LSZ projector trace 2/9, not as the retired UV Weinberg-angle claim. This gives W/Z pole masses at the few-per-mille to percent level once the V-map scale is supplied. The residual is fixed-scheme pole/RGE matching, not an unbuilt endpoint quotient.

8.3 Holonomy and CP

The $\Delta L = 2$ K_3 Majorana portal gives an iff target:

$$M_H = M_0 \left[I + r e^{i\sigma\Phi} A_{K_3} \right].$$

It supplies the right kind of CP sign carrier if present. The R1 update adds one important refinement: the sign itself can be carried by the closed oriented R1 boundary cochain, made scalar by the global orientation line. What remains open is deriving the portal and a nonzero phase magnitude from QEC/boot mechanics. In particular, the faithful C_3 value $2\pi/3$ gives $\sin(3\sigma\Phi) = 0$ and cannot be the baryogenesis phase.

8.4 External Tests

Some questions are no longer purely canon-internal. The CMB route needs a conserved massive dust charge, Boltzmann-code likelihoods, and halo non-double-counting; dark-halo claims need structure and lensing phenomenology; high-energy null-chain QED needs standard finite-density and Lorentz-violation phenomenology. These are not failures of the finite-code derivations. They are the point at which the theory must meet ordinary observational pipelines.

9 What This Means for the Paper Refresh

The older papers should be corrected against this update rather than patched piecemeal. The minimal editorial changes are:

1. Treat the record-reconstruction ladder as the conceptual opening of the framework.
2. Replace broad "conditional on α_0" language with the R14 split: bare service rate closed; dressed-α and sector billing maps separate.
3. Replace broad "Born open" language with the new status: Born closed inside the complex-QEC record substrate; reconstruction floor remains.
4. Replace static $K04$ stock interpretations with the D2 burn-ledger reading.
5. Remove or quarantine $K_{\text{eff}} = 205$ as a live gravity derivation; use the α^1 erasure route and the selector/horizon status.
6. Keep the EW/nuclear second-scale problem explicit.
7. Keep holonomy/CP as a true open frontier, not a decorative phase.

10 Reproducibility Map

The following scripts are the minimal execution trail for this update. They are not all independent theorem proofs; some are status audits. That is intentional. All are in the public reproducibility repository [10] at tag `canon-scripts-2026-06-20` (commit `07f922cb`), permanently archived at Software Heritage as `swh:1:rev:07f922cbd2d20ce292100ecc68d82f8ecd208133`; the files sit under `scripts/foundations_methodology/` and `scripts/legacy_misc/`, and are listed below by file name.

Script	Role	Expected status
minimal_balanced_record_cell_theorem.py	byte theorem	No smaller Type-II self-dual $d \geq 4$ cell; unique $n = 8$ class.
born_closed_record_pair.py	Born square	Naimark isometry and closed record-pair diagonal.
alpha0_count_rate_theorem.py	rate given count	$p_{\text{fire}} = 1/137$.
alpha0_record_pair_symmetry_theorem.py	count selection	Symmetric record-pair count $136 + 1 = 137$, not fermionic $120 + 1$.
alpha0_downstream_billing_map_audit.py	sector maps	Common bare rate closed; downstream uses split into billing maps and dressed-α.
dressed_alpha_monitor_web_continuum_dos.py	dressed-alpha escape	Continuum service-occupation route lands at 0.9956 of the observed dressed shift.
dressed_alpha_sector_billing_no_go.py	dressed-alpha billing	Shows the service projector is not yet the physical Ward/Kubo QED billing slot.
dressed_alpha_service_kubo_moment_no_go.py	dressed-alpha precision	Shows the charge-weighted Kubo moment is not the monitored service occupation; the present axioms do not derive CODATA dressed α.
dressed_alpha_maxwell_contact_selector_theorem.py	dressed-alpha contact	Selects the finite local Maxwell-contact count $2\sum Q^2 - 1 = 31$, giving the right 137.036 magnitude under a contact-normalisation reading.
dressed_alpha_endpoint_contact_map_attempt.py	dressed-alpha contact	Shows the endpoint covariance is still in the Keldysh/noise block; the retarded/local F^2 normal-ordering map remains the open theorem.
heavy_quark_targetb_audit.py	second-anchor spectroscopy	Quantifies dense-alphabet competitors for c, b, t and (as a static ratio) v; heavy quarks stay Target-B, but v is now the radiative byte-power prediction $\alpha_0^8/\sqrt{\lambda}$ (see the Second Scale section).
item55_higgs_z_finite_invariant_barrier.py	electroweak ratio	Shows finite A_{1g}, strain-orbit, Casimir, and one-loop service invariants do not close m_H/m_Z.
ew_alpha_mz_from_framework_dressed_alpha.py	electroweak Z-map	Runs dressed $\alpha(0)$ to $\alpha(M_Z)$ with standard vacuum polarisation, removing $\alpha(M_Z)$ as an independent input.
v_program_wz_pole_exposure_operator.py	electroweak Z-map	Supplies the post-EWSB W/Z LSZ endpoint-exposure quotient 2/9 while preserving the UV charge-trace value 3/8.
v_program_wz_zmap_lock_audit.py	electroweak Z-map	Audits the W/Z pole-mass map; residuals are fixed-scheme pole matching and V-map precision.
item113_t1_t2_local_map_theorems.py	nuclear residuals	Grounds nuclear volume/surface sign structure in TCH/QEC contact maps while leaving the absolute many-body residual scale open.

11 Conclusion

The recent canon update does not close the entire framework. It does something more useful for publication: it sharply separates what is now structure-grounded from what remains genuinely open. The record/action sector is no longer a loose thermodynamic metaphor. It has a forced record unit, a Crooks/KMS split, a closed-record-pair Born square, a derived bare service rate, one-record-per-event factorization for the admitted instrument, and an audited coefficient ledger. The remaining holes are not hidden in that ledger. They are visible: the rejected one-clock lift, the electroweak second-scale premises (v now $\sim$10%-predicted; the residual is the filled-cell transition premise and the loop/prefactor precision), the nuclear many-body residual scale, the dressed-α Ward/Kubo no-go, the recovery-holonomy/CP sign-pointer bridge, and ordinary external phenomenology.

That is a sufficiently advanced state to publish this update before revising the older papers and book. It gives the new results a citable timestamp and gives the later corrections a stable reference point.

References

[1] Giulio Chiribella, Giacomo Mauro D'Ariano, and Paolo Perinotti. Informational derivation of quantum theory. *Phys. Rev. A*, 84:012311, 2011.

[2] D. G. Elliman. Cosmology, dark energy, and inflation in the finite-QEC substrate. Zenodo preprint, `https://doi.org/10.5281/zenodo.20671860`, 2026.

[3] D. G. Elliman. Dark matter, MOND, and K04 debris in the finite-QEC substrate. Zenodo preprint, `https://doi.org/10.5281/zenodo.20671862`, 2026.

[4] D. G. Elliman. Foundations and methodology for a finite-QEC substrate: code, crystallisation, ledgers, and audit protocol. Zenodo preprint v3.0, `https://doi.org/10.5281/zenodo.20682178`, 2026.

[5] D. G. Elliman. Gravity, horizons, and black holes in the finite-QEC substrate. Zenodo preprint, `https://doi.org/10.5281/zenodo.20671864`, 2026.

[6] D. G. Elliman. Matter, gauge structure, and spectroscopy in the finite-QEC substrate. Zenodo preprint, `https://doi.org/10.5281/zenodo.20671858`, 2026.

[7] D. G. Elliman. A finite-QEC substrate program for particle physics and cosmology: current canon and audit methodology. Zenodo preprint v5.0, `https://doi.org/10.5281/zenodo.20682177`, 2026.

[8] D. G. Elliman. Special and general relativity from the finite-QEC substrate: the propagation clock, the equivalence principle, and the horizon ledger. Zenodo preprint v3.0, `https://doi.org/10.5281/zenodo.20682176`, 2026.

[9] David Elliman. It-from-bit canon snapshot. `https://github.com/dgedge/itfrombit/tree/canon-scripts-2026-06-20`, 2026. Tag `canon-scripts-2026-06-20` (commit `07f922cb`); permanently archived at Software Heritage, `swh:1:rev:07f922cbd2d20ce292100ecc68d82f8ecd208133`.

[10] David Elliman. It-from-bit: Reproducibility repository. `https://github.com/dgedge/itfrombit`, 2026. Code and reproducibility repository for the canon snapshot series.

[11] Lucien Hardy. Quantum theory from five reasonable axioms. *arXiv preprint quant-ph/0101012*, 2001.

[12] F. Jessie MacWilliams and Neil J. A. Sloane. *The Theory of Error-Correcting Codes*. North-Holland, 1977.