TFPT — Changelog

All changes and new results, by date

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This file is the canonical, dated record of every change to the TFPT theory development: new verification modules (vN), status changes, editorial passes and infrastructure. It is maintained *in the same change* as the work it records, and it is also imported at the end of the `introduction` document. Module numbers vN refer to `verification/vN_*.py`; claim IDs refer to rows of `verification/status_ledger.csv`.

2026-06-12 (Zenodo version label: semantic + git rev)

- **Release version string.** `build.sh` now writes `tex-artefacts/release-version.txt` as `{TFPTversion} (rev {git count})` (matches `\TFPTdatestamp` without the date). `scripts/zenodo_upload.py` and `build.sh zenodo`/`zenodo-publish` use this label on Zenodo; cursor rules extended for when `zenodo_description.html` must move with deposit-facing changes.

2026-06-12 (Zenodo API upload workflow)

- **Automated Zenodo versioning.** Added `scripts/zenodo_upload.py` and `.github/workflows/zenodo-release.yml`: creates a new draft version of record `20579275` (DOI `10.5281/zenodo.20579275`), uploads the ten active paper PDFs, refreshes `zenodo_description.html`, bumps the version from `tex-artefacts/version.tex`, and optionally publishes via GitHub Actions (`ZENODO_TOKEN` secret).

2026-06-12 (Overleaf shadow mirror: tfpt5-shadow)

- **One-way GitHub mirror for Overleaf sync.** Added `scripts/export-shadow.sh` and `.github/workflows/shadow-sync.yml`: on every push to `main`, a filtered copy is pushed to `sthamann/tfpt5-shadow` (papers, `tex-artefacts/`, `figures/`, `verification/`, `experiments/`; excludes `_archive/`, `website/`, all `*.pdf`, `.cursor/`). ∼270 files / ∼3 MB — within Overleaf GitHub-sync limits.

2026-06-12 (origin_theory style alignment + box reduction)

- **Fewer boxes, embedded in text.** `origin_theory` from 22 to 16 boxes: the narrative/interpretation callouts ("Why the interpretation is internally consistent", "Dependency chain of the birefringence test", "The precise reformulation", "The three theses honestly graded", "The whole story", "One-line summary") become run-in bold prose; the boxed reformulation becomes a `keyeq`. The exact result keyboxes (`v53`–`v56`, `v101`, `v105`, `v113`, ...) and the master-principle / Seam–Horizon target boxes are kept.
- **Colour-marked module references + marker hygiene.** `\vref` applied to the inline `vN` references; stale literal `[A]`/`[I]`/`[L]` markers in running text replaced by the 4-class **[O]**/**[E]**.

2026-06-12 (tfpt_5 / horizon / research-contracts pass + build hardening)

- **Forked document-set box removed (horizon).** `tfpt_horizon_readouts` carried a hand-written, *stale* copy of the document-set card ("five short documents", missing `tfpt_5`) *and* the canonical `\input{tex-artefacts/tfpt_docset}`; the fork is deleted so the single-source card (all five papers + three companions) appears once.
- **Fewer boxes, embedded in text.** Narrative/result callouts converted to run-in bold prose (with the `\veri{}` citation moved out of the bold title into the body): `tfpt_horizon_readouts` from 22 to 7 boxes (the ten-box "clock" wall becomes prose); `tfpt_research_contracts` from 19 to 10 (the nine progress/result winboxes become prose, the named-theorem keyboxes kept); `tfpt_5_redteam` from 10 to 9 (the outcome summary; the per-target verdict boxes are kept as the structured red-team output).
- **Colour-marked module references + marker hygiene.** `\vref` applied to the inline `vN` references in all three documents; the horizon "Scope/typing" marker line and a stale literal `[A]` in the research contracts updated to the 4-class markers.
- **Build hardening.** `build.sh` now removes a document's `.aux`/`.toc`/`.out` *on failure*, so a half-written cross-reference file from a crashed compile cannot poison the next build; artefacts are still kept on success.

2026-06-12 (R1–R5 second round: every class at its floor, v145–v148)

- **R4′: the pairing values are atom identities (v145).** Reading the `v139` lift structurally ($n = w_0(\sigma) + |\mu_4| e_3$, w_0 = the A_3 exponent duality), all three pairings become atom arithmetic — including the *new* closure $|\mu_4| + g_{\mathrm{car}} = N_{\mathrm{fam}}^2$ (4+5=9, $\sigma \perp w_0(a)$) and $\|\sigma\|^2 = 110 = |\mathbb{Z}_2|g_{\mathrm{car}}\|\mathrm{Pl}(K)\|_1$. R4′ = derive *one* map (ledger `GATE.UWALL.13`).
- **R5: the Möbius D_4 realisation (v146).** The *full* dihedral symmetry $\langle z\mapsto iz,\ z\mapsto 1/z\rangle$ of the seam curve acts on H^1 exactly as the integer model: ι^* is the exponent duality with parity $+1$ on the self-conjugate line ($= T_A$ in the cusp basis, glue-swap parity), and Σ is the $\delta\iota$ class — the premise reduces to the module identification itself (ledger `FLAV.QGEO.07`).
- **R1: the clock is a Gaussian zero-mode integral, and the bend is det′-clean (v147).** Variance ratio $(1-\alpha)$ (forced by norm = area) gives the Born-squared ratio $(1-\alpha)^{p_2}$, the ln series *is* the `v127` ring sum; the two quantum weights share *one* Nariai geometry, so the bend $\log_{3/2} 3$ carries no determinant correction — the `v144` obstruction is localised to the $\alpha = 0$ reference (ledger `HOR.CLOCK.13`).
- **R2: the NS/R sector census (v148).** The untwisted (Neveu–Schwarz) module carries only the *even* discriminant classes (integer weights), so the odd μ_4 simple currents have zero NS support — they are Ramond modules; the R zero-mode module (256) splits 128+128 into the odd sectors of the *two* Lagrangian glues: choosing the glue *is* choosing the R-projection ($248 = 120_{\mathrm{NS}} + 128_{\mathrm{R}}$); the one remaining net statement is irreducibly twisted-sector (ledger `GATE.METRIC.10`). *Correction note (same day):* the first version of `v148` graded the Ramond labels by the sum $q_D + q_A$ (not the glue label) and called that module untwisted; the census was rewritten as above — conclusion unchanged, support corrected, the R-sector sheet split is new.
- **Bookkeeping.** Suite at 148 modules, all green; Wolfram extension 215/215 (README + `GATE.WOLFRAM.02` + website counter in lock-step); status surfaces (intro card, `tfpt_1`, `origin_theory` third update, `next.txt`) moved together.

2026-06-12 (external review integrated: Λ typing, marker migration, website parity)

- Λ **normalisation made unambiguous.** The external review flagged the adjacent reduced/unreduced displays in `origin_theory` as a type trap (the formulas were individually correct — $\bar{M}_{\rm Pl}$ vs $M_{\rm Pl}$ — but easy to misread). Both normalisations are now shown explicitly side by side with their order counts ($3/(4\pi^2) \Rightarrow 120.147$ reduced; $3/(256\pi^4) \Rightarrow 122.948 = 119.028 + 3.920$ unreduced) plus a typing note.
- **Stale references cleaned.** "How each of the seven papers simplifies" → "How the legacy layers simplify (bridge map)" with the lead-in "(Paper 6)" reference replaced by the scalaron-reheating chain (`v86`); "(Paper~6/7)" in the `tfpt_3` bridge table reworded; the `tfpt_1` "single remaining geometric input (H2)" passage and the `tfpt_2` "single remaining input (U)" passage carry dated status updates pointing at the current decomposition (`v118`–`v122`, `v139`, `v141`, `v142`, `v75`).
- **Marker migration completed in the shared figures.** The claim stack, anchor cockpit, E_8 glue, 2/3 motif and K_5 figures (`tex-artefacts/tfpt_figures.tex`) now show the four public classes **[E]**/**[C]**/**[O]** instead of the legacy $[A]$/$[I]$/$[L]$/$[B]$/$[P]$/$[R]$ badges.
- **Red-team front table pulled to the final state.** The Target-A residual column now states the one remaining statement (boundary-net holomorphy + c=8 $\Leftrightarrow$ index-4 inclusion; `v83`/`v87`/`v89`, Lie-level realisation `v143`); the historical three-residual form is kept below, dated.
- **Website parity.** The Red Team document is now a first-class entry (`papers.ts` number 5, slug `redteam`) and the changelog PDF a download row; Appendix H / Origin Theory / Research Contracts are labelled *companions* (never "Paper 5–7"); the marker system on every website surface migrated to $[E]$/$[C]$/$[O]$/$[X]$ (fine types named in prose; the script index keeps quoting the scripts' internal fine-grained typing); the verification page counters are live (144 checks generated from the registry via `lib/suite.ts`, Wolfram 116/116 + 211/211 — now guarded by the sync audit) and the reproduce block matches the current pipeline. The `papers.ts` section bodies of the affected papers carry the `v141`–`v144` outcomes (sheet question: deck derived; G_{net}: Lie-level realisation; resummed clock: in-family det-ratio cancellation; selector triangle: two line pairings).
- **Not adopted** (recorded for transparency): the review's narrative reframings (anchor-algebra trilogy, "one seam clock" framing, one-page structure) and the front-matter/status-card layout changes are editorial decisions left to the authors; the claimed Λ *error* was in fact a correct-but-treacherous notation switch (see above).

2026-06-12 (R1–R5 attack round: four residual classes sharpened, `v141`–`v144`)

- **R5 closed at the discrete level (`v141`, deck selection theorem).** The `v140` $\mathbb{Z}_3$ choice is *derived*: the established integer deck $G = T_A\Sigma$ (`v97`/`v98`) pairs the Q_+=1 cusp line with the self-conjugate character 2, so only the sheet-twisted assignment $(2,3,1) = \mathrm{chars}(-U)$ survives; the cusp exponential i^{Q_+} is excluded (same spectrum, wrong grading pairing). Explicit conjugacy constructed; under $k \to -k$ only the established sheet $\mathbb{Z}_2$ flips. Consequence: Euler grading $= Q_+ \circ \rho$. `GATE.QGEO` keeps only its realisation premise — no discrete freedom left (ledger `FLAV.QGEO.06`).
- **R4′ narrowed: three pairings → two (`v142`, frame integrality).** Integer covectors in the $(\mathbf{1}, a, \sigma)$ dual frame form an index-11 sublattice ($x-3y+z \equiv 0 \bmod 11$; the index *is* $\|\mathrm{Pl}(K)\|_1$); with $(x,y) = (|\mathbb{Z}_2|, \mathrm{rank}\, E_8)$ the σ-pairing is forced $\equiv 0 \bmod 11$, and primitivity forces the line parameter even. Cramer reductions for both line pairings recorded as restructuring (ledger `GATE.UWALL.12`).

- **R2 realised at the finite Lie level (v143, graded Frobenius).** The $\mathbb{Z}_4$-graded hull carries exact coset duality ($-C_1 = C_3$; Killing pairing nondegenerate per $g_k \times g_{-k}$), the glue average is exactly the carrier projector (index 4), and each glue sector is one Weyl orbit (simple currents, fusion = $\mathbb{C}[\mathbb{Z}_4]$) — the v125 Q-system realised by the hull; residue = one conformal-net statement (ledger GATE.METRIC.09).
- **R1's det-ratio step derived in-family (v144).** e_2-rigidity of the traceless SdS cubic gives $r_b r_c = 1 - \Delta^2/3$ exactly; with the v132 anomaly the non-zero-mode determinant ratio is $(1 - \Delta^2/3)^{4/3}$ — no first-order term in the horizon split (the v131 cancellation derived, not assumed); deficit coefficient $\frac{32}{27} = |\mu_4|(\frac{2}{3})^3$ (audit). Finite-weight absorption stays **[C]** with the $6 \to \frac{14}{3}$ obstruction stated sharply (ledger HOR.CLOCK.12).
- **R3 attempted, honestly unchanged.** No defensible computation landed for the seam-determinant→EH step (SEAM.THEOREM.01); the gate keeps its **[O]** typing untouched.
- **Wolfram mirror extended** to v141–v144: extension file now 211/211 (GATE.WOLFRAM.02 and the wolfram README updated in lock-step); Python suite at 144 modules, all green.

2026-06-12 (sync infrastructure: single-source script index, content maps, one audit)

- **Single-source script index.** The master script→check table (tex-artefacts/verification.tex) and the website ScriptIndex.tsx are now *generated* from one registry (script_registry.csv + script_clusters.csv in verification/) by make_script_index.py; both targets carry a generated-file header and are never edited by hand.
- **Content maps without splitting the papers.** verification/make_docs_map.py generates docs_map.csv (every paper section with line range, the vN scripts cited there, a content hash and a last-changed date) and website_map.csv (which website file mentions which scripts/documents) — the machine-readable enumeration of all sync surfaces.
- **One sync audit.** verification/audit_sync.py bundles and extends the previous loose shell checks, now in *both* directions: suite ↔ run_all.py ↔ registry ↔ ledger; every script cited in a paper *body* (the master index alone no longer counts); no stale \veri/\vref targets; every new module mentioned in this changelog; website mirror byte-identical (PDFs, scripts, release.ts hashes, version stamps); wolfram counts; overfull boxes. Frozen exceptions live in audit_baseline.json (remove-only).
- **Build pipeline.** build.sh gains gen / website / audit / release steps; notes now regenerates the single-source surfaces first; website copies all active PDFs (now incl. tfpt_5_redteam.pdf and changelog.pdf, with new release.ts entries) and the vN scripts, and stamps version, date and git revision into website/lib/version.ts (shown in the site header) and release.ts.
- **Citation gaps closed.** The audit immediately found three scripts cited only in the master index: v17 and v85 are now cited in their tfpt_2 sections (hexagonal resolvent; master cover), and two short \veri{v19} citations were expanded to the full script name. v91 (spine tetrahedron) had no paper section at all — it is now integrated: a keybox in tfpt_3 ("Three views of one spine": anchor closure, edge/face products, volume 120, K_6 negative control, the tautology/sub-grammar caveats) and a closing note in the tfpt_1 Spine Quotient Lemma; the ARCH.SPINE.01 ledger location is corrected to tfpt_1;tfpt_3 and the baseline exception list is empty again.
- **Rules.** .cursor/rules updated (tfpt-workflow, website-sync) and a new sync-maps rule added describing the agentic procedure: *regenerate* the maps first, enumerate the affected surfaces from them, audit as the exit gate. The mirror map (website_map.csv) also covers the root README.md and next.txt (bare vN ids resolved to full script names), and both files are named explicitly as status surfaces that move with every finding.

2026-06-12 (tfpt_3 / tfpt_4 style alignment + box reduction)

- **Shared header/footer on tfpt_3.** `tfpt_3_e8_audit_bootstrap` dropped its custom `\footmarkers` footer (the post-collapse four-[**E**] artefact) and inherits the shared `tfpt_style` header/footer with the version stamp; the box-orphan `needspace` guards are kept.
- **Fewer boxes, embedded in text.** Narrative/commentary callouts converted to run-in bold paragraphs (boxed one-line formulas to `keyeq`): tfpt_3 from 39 to 27 boxes (e.g. "Purpose and discipline", the five "(i)–(v)" audit-lemma boxes, "Net", "The connection in one sentence", "The unification", "The question and the honest answer", "Net: two axioms"); tfpt_4 from 18 to 7 (the seven-box Koide stack and the two dark-matter conjecture boxes become prose). The per-item "Honest status of . . . " keyboxes are kept — tfpt_4 is the status authority for the frontier.
- **Colour-marked module references.** `\vref` applied to the inline `vN` references in tfpt_3 and tfpt_4 (TikZ node names excluded).
- **Marker hygiene.** A stale literal `[P]` in tfpt_4 (Koide flow-time) replaced by the 4-class [**C**]; status tables checked against the ledger.

2026-06-12 (tfpt_1 / tfpt_2 style alignment + box reduction)

- **Shared header/footer everywhere.** `tfpt_1_architecture_e8` dropped its custom `\footmarkers` footer (which after the marker collapse showed four redundant [**E**]) and now inherits the shared `tfpt_style` header/footer with the version stamp, identical to every other document.
- **Fewer boxes, embedded in text.** The narrative/commentary callouts of both documents are converted to run-in bold paragraphs (and the boxed one-line formulas to the colour-marked `keyeq`): tfpt_1 from 21 to 14 loud boxes (+3 `keyeq`); tfpt_2 from 52 to 43 (e.g. "In one sentence", "The one-paragraph version", the four "Sharpening" notes, "What the simplification means net", "The disciplined main statement", "What improves. . . ", "Scope and honesty"). Only genuine results / theorems / gates keep a box.
- **Colour-marked module references.** `\vref` now also colours the inline `vN` references throughout tfpt_1 and tfpt_2 (TikZ node names accidentally matching the pattern were excluded).
- **Status currency.** tfpt_2's inflation-pivot table gains the `v86` scalaron-reheating point ($N_\star$=51.4 $\Rightarrow$ n_s=0.9611, r=0.0045, A_s-disfavoured) and states the band-of-record explicitly, matching `COSMO.NSTAR.01` and the introduction; the box is re-typed [**C**]. The other status tables were checked against the ledger and are current under the 4-class markers.

2026-06-12 (marker simplification to 4 classes + status reconciliation)

- **Four-class display markers.** The reader-facing marker system is collapsed from eleven symbols to four: [**E**] exact / machine-proven (identity, Lie/lattice, formalised, numerical FP), [**C**] conditional (physical / bridge / readout under named hypotheses), [**O**] open / axiom, and [**X**] kill test. `tex-artefacts/tfpt_style.tex` defines `\mE/\mC/\mO/\mX` and keeps the legacy `\tI ...\tX` names as aliases that render their class. All marker call-sites across the nine documents and the shared fragments were rewritten, collapsing same-class combinations (e.g. `[I]/[L]` $\rightarrow$ [**E**], `[N]/[P]` $\rightarrow$ [**E**]/[**C**]). The fine-grained per-claim type (Axiom / Formal / Lattice / Numerical / Identity / Physical) is unchanged in `status_ledger.csv` — the single source of truth — so no fidelity is lost. The marker key, badge bar, README marker table and the workflow rule were updated to match.
- **Status tables reconciled against the ledger.** The introduction's inflation/$N_\star$ rows are made consistent with `v86`/`COSMO.NSTAR.01`: r and n_s are shown as the frozen *bands* over

$N_\star \in [50, 60]$ with the scalaron-reheating conditional point $N_\star$=51.4 (n_s=0.9611, r=0.0045), replacing the stale point values $N_\star$=55 (predictions table) and $N_\star \simeq 57$ (residual card); the closure-ledger inflation row is re-typed **[E]** → **[C]**(conditional on $M_{\rm Star}$=$M_{\rm scal}$ + reheating), matching the other two tables and the ledger `[P]` typing.

2026-06-12 (version system, predictions/K5, readability pass B3)

- **Authors, auto-date and auto-version on every paper.** New single source `tex-artefacts/version.tex` defines `\TFPTauthors` (Stefan Hamann, Alessandro Rizzo), a curated `\TFPTversion`, and a title/footer date stamp (`\today` + version + revision). `build.sh` writes the auto build revision (git commit count) into the gitignored `tex-artefacts/version-auto.tex`, so every document's title page and page footer carry author, date and `v5.1 (rev N)` automatically. All nine active documents and `changelog.tex` now set `\author{\TFPTauthors}`.
- **Builder keeps build artefacts.** `build.sh` no longer deletes the `.aux/.log/.out/.toc` after a successful build (the `.log` is needed for the overfull-box audit and the `.aux/.toc` for correct cross-references on the next incremental build).
- **Predictions table outsourced.** The running/upcoming-experiment predictions table is moved from `introduction.tex` into the shared fragment `tex-artefacts/predictions.tex` (`\input` in the predictions section).
- **K5 figure fixed.** The `\TFPTactionkfive` mnemonic (K_5 on the five carrier slots) is redrawn so the complete graph and the Pascal-row reading list sit side by side instead of overlapping.
- **Colour-marked script references.** New `\vref` macro colours inline module references (e.g. `v108`–`v113`, `v49`/`v71`) in the introduction, predictions and verification fragments, matching the blue of the `\veri` citation, so machine-checked references are visible at a glance.
- **Lighter, non-breaking, embedded boxes.** The `tcolorbox` families are restyled to a light tint + thin frame + light title band with dark coloured title (no heavy white-on-saturated bars); a neutral `navbox` carries the document map and a colour-marked `keyeq` sets off load-bearing display formulas. The introduction's callouts use the non-breaking variants (`keyboxnb`/`winboxnb`/`gapboxnb`) so no box splits across a page, and the shared status card is non-breaking.
- **Readability / sectioning.** The dense run-in prose of the introduction is broken into `\subsection*` headings (In plain words; one anchor and E_8 as a compiler hull; the companion documents; the compact status formula; the hard reduction; the Pascal action grammar; the closure ledger) with added whitespace.
- **Orphan results linked to scripts.** The Glue theorem, the "Reduction in one line" and the fermion-spectrum callouts now carry inline `\veri{}` citations (`v1`, `v6`/`v14`/`v23`, `v18`/`v20`/`v46`).

2026-06-12 (tex-artefacts refactor + introduction visual pass B2)

- **Shared imports moved to `tex-artefacts/`.** The shared, imported-only TeX fragments (`tfpt_style.tex`, `tfpt_figures.tex`, `tfpt_docset.tex`, `tfpt_status.tex`) now live in a dedicated `tex-artefacts/` folder; all nine active documents `\input` them via `tex-artefacts/<name>` (and `tfpt_style` loads `tex-artefacts/tfpt_figures`). `changelog.tex` stays at the repo root because it is also a standalone `build.sh notes` deliverable. The `make_manifest.py` `TEX` list and the workflow rule were updated to the new paths.
- **Master script index outsourced (`tex-artefacts/verification.tex`).** The long `vN`→check table is moved out of `introduction.tex` into the shared fragment

`tex-artefacts/verification.tex` (`\input` in the verification appendix); the paper-consistency audit now also reads that file, so every registered script stays cited exactly once.

- **Introduction box reduction (B2).** The introduction's eleven `keybox`es are reduced to the single headline "In one sentence" card; the explanatory keyboxes (*In plain words*, *Sharper still*, *compact status formula*, *hard reduction*, *Cosmology Pascal*, $E_6 \times A_2$, *closure ledger*, *Plausibility balance*) are converted to inline run-in paragraphs, the *Glue theorem* is re-typed as a `winbox` (a result, not a claim), and the explanatory *plausible/follows next* `winbox`es become prose. The loud boxes now carry only genuinely load-bearing callouts (one `keybox`, five `winbox`es, one `gapbox`) plus the two shared orientation cards.
- **Document-count consistency.** The introduction's document map gained the missing `tfpt_5_redteam` row; "seven/eight companion documents" and the ledger "six documents" wording are corrected to the true count (nine active documents); `README.md` ("10 ok", 140 scripts) and the workflow rule ("9 docs") are reconciled.

2026-06-12 (visual pass: box reduction B1)

- **Box reduction (B1).** The 26 non-load-bearing aside boxes (audit / recorded / interpretation: `auditbox/audbox/intbox/resbox/roadbox`) across tfpt_1, tfpt_2, tfpt_3 and `origin_theory` are converted to inline bold run-in paragraphs — the reviewer's prescription that an audit fingerprint must not carry the same visual volume as a theorem. The loud box families are now only `keybox` (claim), `winbox` (result) and `gapbox` (open/caveat).

2026-06-12 (visual pass: shared figures, badges, marker typology)

- **Shared figure library `tfpt_figures.tex`** (`\input` by `tfpt_style`): reusable TikZ macros for the architecture *claim stack* (`\TFPTclaimstack[zone]`, B3), the *anchor cockpit* $a = (1, 1, 2)$ (B4), the E_8 *glue* diagram (B5), the 2/3 *motif map* (B6) and the K_5 *action lattice* (B7). The claim stack and a marker *badge bar* are now shown near the front of *every* document, each highlighting that document's layer; the topical figures are placed in their natural homes (cockpit + K_5 in the introduction, cockpit + glue in tfpt_1, motif in the horizon note).
- **Marker typology (A2).** `tfpt_style` adds the sharper sub-types **[E]** (exact algebra), **[E]** (exact number), **[C]** (readout / standard physics in TFPT units) to the existing **[C]** (bridge) and **[X]** (kill test); the marker key and the new `\TFPTbadges` bar show the full typology. (Inline body markers retain **[E]** where they are genuine exact identities.)

2026-06-12 (review pass on list.txt)

- **Claim hygiene (review section A).** The introduction's one-sentence claim is softened from "derives all constants" to "constructs a discrete compiler; physical readouts run through named, status-typed bridges"; the ledger zombie in `FLAV.QRATIO.01` is removed (the statement no longer says "stays [P]" — ratios are **[E]** closed on the derived stratum, only the absolute scale stays **[O]**, with an explicit forbidden-wording note); the seam misalignment is written explicitly as $\varepsilon = \frac{3}{4}\varphi_0^{\mathrm{ret}} = c_3 + 36c_3^4$ (leading c_3, fourth-order puncture correction exact); θ_{12} has a single prediction of record 0.306747 with the seam/non-linear values typed as scheme diagnostics; JUNO's first 59.1-day result (0.3092 ± 0.0087, compatible, precision pending) is recorded and NuFIT 6.0 is marked the pre-JUNO baseline; the ACT DR6 birefringence hint carries a systematics caveat (not a validation target); CODATA-2022 is dated; the null-model figure is moved out of the main text and typed as a grammar-internal bound. "Complete solutions of the five open questions" becomes "Closure status of the five former open questions".

- **Interface language unified (review sections A5/C2/C3/C6/C7/C8).** The live residual is stated everywhere as $v_{\text{geo}} \oplus G_{\text{net}} \oplus F_{\text{transfer}}$ (historical $U_{\text{wall}}/G_{\text{metric}}/F_{\text{frontier}}$ kept only for ledger continuity); `tfpt_research_contracts` is retitled and its recommended order rewritten (selector-triangle pairings $\to v_{\text{geo}} \to G_{\text{net}}$); F_{transfer} is named as one missing functor with Koide/η_B/axion/m_p/m_e as its four instances; full QG closure is framed as a certification layer, not a prerequisite. Document numbering aligned with file names (the Red Team paper is now in the canonical set; document $N \equiv$ `tfpt_N`). Website mirrored throughout (`papers.ts`, `predictions.ts`, `faq.ts`, `glossary.ts`, `OpenGates`, `Hero`, orientation components).

2026-06-12 (later)

- **Shared style and central status artifact.** Two new single-source fragments: `tfpt_style.tex` (the canonical palette, status markers, marker key, `\veri` reference, the four tcolorbox families with back-compat aliases, and one running header/footer) is now `\input` by all eight documents — the per-paper duplicated preambles are gone; and `tfpt_status.tex` ("TFPT status at a glance") gives one canonical overall-status card imported near the front of every document, replacing the divergent per-paper status statements. Both registered in `build.sh` and the manifest `TEX` list.

2026-06-12

- **Margin theorem (v122).** The established frozen selectors (D_4 annihilator $n = (5, -9, 6)$, $\det R = 8$, $\det K = 4$) pin R uniquely among hexagon matrices ($64 \to 12 \to 1$); the atom margins become theorems — H2 introduces no new residual class.
- **Inventory update (v123).** Residual table re-pinned post v110–v122: exactly five structural classes (R1 clock, R2 index-4 net, R3 EH step, R4′ selector establishment — replacing the discharged H2 dictionary — and R5 Q realisation); R2 carries three loads (metric + carrier + QBL: one theorem, three doors).
- **Resummed clock + glue Q-system (v124/v125).** R1's bend in closed form: $\text{rate}(n) = -p_2 \ln(1 - n/N_{\text{fam}})$ (pole at N_{fam} forces the three-level spectrum); the index-4 μ_4 extension exists explicitly as a Longo Q-system on $\mathbb{C}[\mathbb{Z}_4]$ (all Frobenius axioms exact) — R2 sharpens from "find" to "identify".
- **Clock–wall bridge (v126) and ring resummation (v127).** The resummed-clock weights are the Mehta–Seshadri parabolic weights (spec $A_0^\star$); $\det(\mathbf{1} - A_0^\star) = \frac{2}{9}$ = the entropy curvature; the clock is a log-determinant (RPA rings, one tower per hexagon site, coupling = parabolic weight).
- **Graded hull (v128).** E_8 is a $\mathbb{Z}_4$-graded Lie algebra over the carrier (grading = glue Q-system; exact on all 6720 root-pair sums); ring multiplicity 6 = sheet-doubled Ginsparg–Perry zero modes. *Notation fix in the same round:* the clock factor 6 is $p_2(a)$, not $2p_2$ — labels corrected across modules, ledger, papers, website (numbers unchanged).
- **Entropy power law → zeta budget (v129–v133).** The clock is $\Gamma_n \propto (S_n/S_{dS})^{p_2}$ (Gibbons–Hawking form); $p_2 = 2h$ with $h = N_{\text{fam}}$ from mode counting + the Born rule (v130); the zero-mode norm is the area, $\|Y_{1m}\|^2 = A/(4\pi)$ exactly (v131); the det-ratio anomaly is the Koide constant, $\zeta(0)|_{\det'} = -\frac{2}{3}$ (v132); both $\zeta(0)$ budget routes computed exactly — the reduced seam route carries pure anchor ratios ($-\frac{4}{3}$ = minus the seed gain), the naive 4d route ($-\frac{109}{45}$) carries no atom (v133).
- **Dual anchor + determinant surface (v134/v135).** $d := a^\top R^{-1} = a^\top L^{-1} = (-\frac{1}{2}, -\frac{1}{2}, 1)$ with $(1, 1, -2) = -2d$ — the inverse flavor response is the Nariai root, invariance exact via Sherman–Morrison (third algebraic flavor–horizon bridge leg); $\det M(s,t) = 3s(t{+}1)(t{+}2) + t^2 + 5t + 8$ with iso-volume walls at the $\mathbb{Z}_2/\mu_4$ atoms, winding line $(8, 14, 20)$, $\det F = 32$, row-budget axes with $\text{rowsum}(V) = \text{Spec}(Q_+)$; micro-identities $41 = 16 + 25$, $52 = 16 + 36$.

- **Dual-normal selector, Q_+ cohomology, Volkov–Wipf firewall (v136–v138).** (d, n) pins R *columnwise* (each column the unique lattice point of the address box; kernel $(6, 8, 7)$); the $A_0^\star$ zero mode carries the spectral normal $\sigma = (2, -9, 5)$ with a $W(A_3)$ orbit control excluding the naive lift; $H^1(\mathbb{P}^1 \setminus \mu_4) = \chi_1 \oplus \chi_2 \oplus \chi_3$ with degrees $(1, 2, 3) = \mathrm{Spec}(Q_+) =$ the A_3 exponents and cusp weights $= \mathrm{spec}\, A_0^\star$; the external full-4d graviton/ghost value $-\frac{98}{45}$ is pinned (arXiv:2506.02142 = Volkov–Wipf hep-th/0003081) and its *edge* part is exactly two copies of the reduced seam budget — R1 typed closed as an edge-sector object.
- **Selector triangle + canonical map (v139/v140).** $d = \frac{3}{2}a - 2 \cdot \mathbf{1}$ is pure anchor data (first selector *derived*); the frame $(\mathbf{1}, a, \sigma)$ has volume 11 and n is the unique covector with atom pairings $(2, 8, 121)$ — the R4′ residue is three pairings; the $H^1 \to$ generation equivariant map exists and is Schur-rigid (only sign-twisted μ_4 actions match), so the `GATE.QGEO` residue collapses to one $\mathbb{Z}_3$ choice.
- **Editorial and consistency passes.** Content-currency sweep (superseded "single remaining input" claims retired across contracts, paper 3, intro, website); introduction: self-explanatory title (spells out Topological Fixed-Point Theory), the old-version comparison removed throughout, redundant diagrams dropped, the unreadable status heatmap removed, the script-index master table converted to a page-breaking `xltabular` (it had silently truncated ∼110 rows), status card extended with the v134–v140 reductions, predictions table completed (CP phase, cosmic birefringence); the canonical document-set box extracted into the shared `tfpt_docset.tex`; paper 1 cleaned of all 35 old-series references, every section now opens with its machine-check script references; smaller box fonts across all eight documents; this `changelog.tex` introduced as a dual-mode (standalone + imported) document.

2026-06-11

- **External-review integration (v83) and release hygiene.** Manifest `-check` mode and the release rule; holomorphy pins $(E_8)_1$ (the unique even unimodular rank-8 lattice theory).
- **Sheet diamond and centered form (v94/v95).** All four flavor operators are points of one two-parameter surface $M(s, t)$; centered cross $R, L = C \mp U$, $K, F = C \mp V$ with the cofactor seam normal $n = (5, -9, 6)$; documentation pass ("The Sheet Diamond and the Winding Line" in paper 3).
- **Horizon/anchor round (v101–v103).** The maximal (Nariai) black hole is the anchor: roots $(1, 1, -2)$, entropy bound $\frac{2}{3} = |\mathbb{Z}_2|/N_{\mathrm{fam}}$; one repeller/attractor orientation in both sectors; trisection normal form (the canonical cosine coordinate).
- **Clock/ladder round (v104–v108) + Lean hardening.** The classical Nariai clock speaks anchor ($\chi_{\mathrm{clock}} = (\lambda - 1)(\lambda + 2)$); machine-pinned residual inventory; first review validation; quantum-clock target made quantitative; Pascal Ladder Theorem ($g = 2K + 1 \Leftrightarrow$ the closure).
- **QBL theorem chain (v109–v113).** Sheet-Pairing Lemma; Calderón-sheet selection (a scalar seam datum exists iff the involution is sheet-odd); Quadratic-Transport Theorem (degree exactly 2); Self-Counting Channel (the Pascal closure as an identity); quasi-free kernel (one 2-point kernel determines the whole net, rank $= c$) — the QBL input merges with the R2/holomorphy premise; communicated across all status surfaces.
- **U_{wall} made exact (v114–v118).** Torsion normal form and $\delta = \frac{1}{2}$ theorem; exact anchor residue $A_0^\star$ (diag $= a/|\mu_4|$, off-weights $(8, 0, 5)/144$); resonance theorem ($M_\infty = \mathbf{1} \iff a_{13} = 0$, one gauge orbit); the holonomy is the exact 24-element $W(A_3) = S_4$; the hypercharge hexagon is the sign-twisted family spectrum with the lepton coefficients as resolvent determinants.
- **Second review validation + address pinning (v119–v121).** Anchor ratio triad $(\frac{2}{3}, \frac{4}{3}, \frac{5}{3})$; the 121 audit lemma; the lepton words are the compiler atoms $(8, 5, 3)$ with divmod-hexagon

addresses; R is the unique hexagon matrix with atom margins and $\det 8$ — the address table carries zero residual information.

2026-06-10

- **B/C/D round closed.** Koide attractor toy model (v93), glue uniqueness (v92), the Wolfram extension as the independent second verification path, Lean hardening; papers and website synced with the round.
- **Content rounds v96–v100.** Sheet conjugation bridge, discriminant dictionary, Koide flow time, and the look-elsewhere-corrected numerology null test (v100: joint null probability $\leq 10^{-30.7}$, conditional on the declared grammar).

2026-06-09

- **Blind registry frozen (v84).** Machine-enforced prediction registry (`predictions_frozen.json`): exactly one θ_{12} number of record before JUNO; conditional entries carry their hypotheses by name. Research-contracts document added to the set.

2026-06-07 / 2026-06-08

- **Compiler-closure consolidation.** The TFPT development is consolidated into the current document set with the verification suite (modules v1–v82: E_8 glue, carrier Pascal, EM fixed point, flavor matrix, cascade, bootstrap, gravity/cosmology, transport, masses, registry and gate audits) as the single proof layer; manifests (`manifest.sha256`, `lean_manifest.sha256`) as content identity; website mirrors the suite (interactive DAG, in-browser script reproducer, script index).

2026-04-27

- **Initial commit.** TFPT papers and website baseline: electromagnetic closure and flavor transport (UFE bridge, birefringence seed, dyonic intercept), PDF-download tracking, accessibility and metadata passes.