THE MASTER MAP — Audit Experiments Report

Mechanical Audit Experiments and Reproducibility Appendix for the 2602-Series Programme on 4D $SU(N)$ Yang–Mills

— v3: test claims aligned with the audited ledger; three test defects corrected —*

Lluis Eriksson
Independent Researcher
lluiseriksson@gmail.com

February 2026 (v1–v2); July 2026 (v3)

Abstract

This is the experiment-first audit report for the 2602-series programme: a runnable mechanical suite (repository `ym-audit`) with declared pass/fail criteria, a 2D Yang–Mills benchmark, gauge/infrastructure/UV-flow proxy layers, and a reproducibility manifest. Version 3 aligns the report with the fully audited programme and corrects three defects in the harness itself. *Scope statement (sharpened):* the 29 tests adjudicate exact identities, toy models, and group-theoretic facts; they cross-validate the per-paper suites of THE-ERIKSSON-PROGRAMME (`verification/2602-*`, 15 papers, independent implementations agreeing where they overlap, e.g. the triangular-lock dimension counts); they do *not* discharge any entry of the programme ledger — a 29/29 run leaves the hypothesis set {(H1), (H2)+β_{LF}, (H3), (H2′), (H-LOC), L6.2-import, (H-Rβ), (H-P0′), structural+window, $\lambda \neq 0$-traceable, ...} exactly as it was. Corrections: the $d = 4$ harmonic coefficient is $1/2$ (harness had $3/2$, a dropped-term bug; the paper chain had $3/5$, the $d = 3$ value — three-way inconsistency now settled and machine-adjudicated); the non-triviality test is rescoped (Haar kurtosis $\neq 3$ is a single-link fact — exactly 2 for $SU(2)$ — present even at strong coupling; what it verifies is $C_4(N) > 0$); the super-polynomial large-field test is restated under the audited log-power profile. The 2D YM benchmark (transfer-matrix gap $\Delta = g^2N/2$ to 10^{-14}) and the dependency DAG survive; "Papers 86–90" are pinned to 2602.0088 v3 / 0087 v3 / 0092 v2 / 0091 v2 / 0096 v2.

*__Version 3.__ Audited replacement of v2 within the programme-wide verification pass (2602.0041 v3, 0051–0057 v2, 0063 v3, 0069–0077 v2, 0087 v3, 0088 v3, 0089 v2, 0091 v2, 0092 v2, 0096 v2). Principal changes: (i) **F-LAP** (bug in the harness): test `ANISO.h_aniso.Harmonicity` reported harmonic coefficient $3/2$ in $d = 4$; the correct value is $1/2$ ($\Delta(\Sigma x^4) = 12\Sigma x^2$, $\Delta((\Sigma x^2)^2) = (4d + 8)\Sigma x^2$; $3/2$ arises exactly from dropping the $4d$ term). This settles a three-way inconsistency in the programme ($3/5$ in 2602.0096 v1 [the $d = 3$ value], $3/2$ in this report's v2, $1/2$ correct per 2602.0087 v3). (ii) **F-KURT** (mis-scoped test): `P86.Thm8.7.NonTriviality_S4c` measured Haar kurtosis of $|\mathrm{tr}\, U|$ — a single-link group fact (exactly 2 for $SU(2)$: Catalan moments), true even at strong coupling, carrying no information about the interacting S_4^c; rescoped as a $C_4(N) > 0$ verification; non-triviality itself is conditional (2602.0088 v3, Thm 8.7). (iii) **F-SUPERPOLY**: `P90.Lem6.4.Superpoly` verified $e^{-c/g^2} \leq g^m$ under the inflated power-law profile struck by 2602.0096 v2; rescoped to the audited log-power (H2′)(m) trichotomy. (iv) **F-STALE**: "Papers 86–90" pinned to identifiers and audited versions; the "load-bearing claims" lists carry their conditional statuses; the abstract's "mechanically verifying the load-bearing theorems" is corrected to "mechanically verifying their exact/toy/group-theoretic content" — *no test discharges any ledger hypothesis.* The framework itself (Def. 1, Rmk 3 "passing $\neq$ proof", §10.2, the 2D YM benchmark, the reproducibility manifest) survives audit and is cross-validated against the per-paper suites of THE-ERIKSSON-PROGRAMME. Meta-suite: `verification/2602-0117/`, 6/6 PASS.

1 Role and scope

Two verification layers now exist and are cross-linked: **(A)** the per-paper deterministic suites of THE-ERIKSSON-PROGRAMME (`verification/2602-XXXX/`, one per audited paper, exit-0 conventions); **(B)** this report's programme-wide harness (`ym-audit`: 29 tests, `results.json`, provenance manifest). Where they overlap they must agree; v3 records one disagreement found and fixed (F-LAP) and two scope corrections (F-KURT, F-SUPERPOLY). The definitions (Def. 1: audit experiment; Rmk 3: "passing does not constitute proof"), the threat model T-EXP1–10, and §10.2 ("what a reviewer should *not* conclude") of v2 were already correct and are retained verbatim.

2 Paper map (F-STALE corrected)

P86 = ai.viXra:2602.0088 **v3** (clustering/mass gap — conditional; OS0/2/3 unconditional). P87 = 2602.0087 **v3** (Symanzik/anisotropy — windowed/conditional). P88 = 2602.0092 **v2** (OS1 Ward — conditional). P89 = 2602.0091 **v2** (KP block — source-mapped). P90 = 2602.0096 **v2** (Master Map — audited-ledger edition). The v2 tables of "load-bearing claims" are re-read accordingly: each claim carries the loads of its audited version; the dependency DAG of v2 §7.6 is correct as a graph and now carries statuses on its arrows.

3 Corrections to the harness

3.1 F-LAP: the harmonic coefficient

$\Delta(\Sigma_\mu x_\mu^4) = 12\,\Sigma x^2$; $\Delta((\Sigma x^2)^2) = (4d+8)\,\Sigma x^2$. Harmonicity of $\Sigma x^4 - c\,(\Sigma x^2)^2$ forces $c = 12/(4d+8) = 3/(d+2)$: $c(4) = \frac{1}{2}$, $c(3) = \frac{3}{5}$. The harness value 3/2 solves $12 - 8c = 0$, i.e. it drops the $4d$ term. The three-way inconsistency (3/5 / 3/2 / 1/2) is adjudicated exactly [meta-suite check 1]; the fix is applied in `ym-audit`.

3.2 F-KURT: what the non-triviality test measures

For a single Haar link, $\langle|\mathrm{tr}\,U|^{2k}\rangle$ are Catalan numbers for $SU(2)$: $m_2 = 1$, $m_4 = 2$, kurtosis exactly 2 [check 2] — matching v2's Monte Carlo (1.9948). This holds at *any* coupling including $g = \infty$ (single-site strong coupling), so kurtosis $\neq 3$ cannot distinguish the interacting continuum theory from anything. What the test does verify is the group-theoretic positivity $C_4(N) > 0$ entering the tree-level lower bound of 2602.0088 v3, Thm 8.7 — a real but small input; the theorem itself is conditional on the KP block. Test renamed `P86.Thm8.7.C4N_positivity`.

3.3 F-SUPERPOLY: the large-field profile

v2's test verified $e^{-c/g^2} \leq g^m$ — correct arithmetic for a hypothesis (power-law p_0) that 2602.0096 v2 struck as appearing in no source. Under the audited profile $p_0 = (A_0 \log \bar{g}^{-2})^{p_*}$ the correct statement is the (H2′)(m) trichotomy with thresholds $A_0 \geq m/2$ at $p_* = 1$ and onsets for $p_* > 1$ [check 3]. Test rescoped accordingly.

4 What survives (and is cross-validated)

The 2D YM benchmark: $\lambda_j = e^{-g^2 C_2(j)/2}$, $\Delta = \frac{g^2}{2}(C_2(1) - C_2(0)) = g^2 = g^2 N/2$ for $SU(2)$, replicated to machine precision, plus clustering slope $= \Delta$ [check 4]. The KP margin and δ arithmetic of the core-chain table (v2 §7.7: $\delta = 0.021$, margin 2.262, -10%: 1.412) is independently recomputed and confirmed [check 5]. The triangular-lock test agrees with 2602.0096 v2's independent implementation (dim of W_4-invariant bilinear forms; quotient 0 at $d = 4$). Telescoping, coupling recursion, UV scale sums, $\eta^2 \log$ vanishing, Ricci $N/4$, discretisation slopes: all double-covered by layer (A) suites.

5 Scope table (corrected §10)

What 29/29 establishes: the harness runs; the exact/toy/group content of the audited chain is mechanically consistent across two independent implementations; the framework recovers a solved model exactly. What it does not establish: any entry of the ledger; any uniformity in volume beyond the toys; any part of the Clay problem. The ledger before and after a 29/29 run is *identical* [check 6]. This is not a weakness of the harness — it is what mechanical audit *is*; v2's own Rmk 3 said so, and v3 makes the abstract say it too.

Note added in v3

Findings F-LAP (harness bug, $3/2 \to 1/2$; three-way inconsistency settled), F-KURT (test rescoped to $C_4(N) > 0$), F-SUPERPOLY (profile aligned with (H2′)), F-STALE (paper map pinned to audited versions; abstract's "verifying the load-bearing theorems" corrected). Retained verbatim: Def. 1, Rmk 3, threat model T-EXP1–10, §10.2, 2D YM benchmark, gauge/infrastructure/UV-flow layers, reproducibility protocol and manifest. Repository fixes mirrored in `ym-audit`; meta-suite `verify_2602_0117.py` in THE-ERIKSSON-PROGRAMME, 6 deterministic checks, exit 0 iff 6/6.

References

[1] L. Eriksson, ai.viXra:2602.0088 **v3**.

[2] L. Eriksson, ai.viXra:2602.0087 **v3**.

[3] L. Eriksson, ai.viXra:2602.0092 **v2**.

[4] L. Eriksson, ai.viXra:2602.0091 **v2**.

[5] L. Eriksson, ai.viXra:2602.0096 **v2**.

[6] L. Eriksson, ai.viXra:2602.0069 **v2**.

[7] `github.com/lluiseriksson/ym-audit` (programme-wide harness) and `github.com/lluiseriksson/THE-ERIKSSON-PROGRAMME`, `verification/` (per-paper suites).

[8] R. Kotecký, D. Preiss, Comm. Math. Phys. 103 (1986) 491.

[9] K. Osterwalder, R. Schrader, Comm. Math. Phys. 42 (1975) 281.

[10] K. Osterwalder, E. Seiler, Ann. Phys. 110 (1978) 440.

[11] A. Jaffe, E. Witten, Clay Math. Inst., 2006.

[12] M. Lüscher, JHEP 2010:08, 071.