

SG-1 — Geometry Specification (GUT Gate 1): Per-Gate Closure-Attack Dossier — Fable_Version rendered package. Rendered from DOSSIER_SG1_GEOMETRY_SPEC_CLOSURE_ATTACK.md ; frozen technical content unchanged by rendering.

SG-1 — Geometry Specification (GUT Gate 1): Per-Gate Closure-Attack Dossier

What this is. The closure-attack packet for **SG-1 (Geometry specification / the frozen 13D K₆ active branch)** on the **frozen 13D K₆ branch ONLY**. It recaps how our geometry closes the geometry-specification gate (concise; the full freeze record lives on the published site), verifies where the status actually stands, names every open residual, and lays out the attack plan to push the gate further. It is **not** a rival comparison (that is `BATTLE_GATES/`), **not** the one-line status ledger, **not** a reprint of the manuscript.

Binding discipline (carry verbatim). PROMOTIONS:0. Frozen branch `dcc66f1b2685 / a5b1e6f9d951` READ-ONLY. Honest throughout: SG-1 is a **freeze-and-reproduce certificate**, **NOT a derivation and NOT a uniqueness theorem**. Minimality is **selector-minimal INSIDE the pre-declared search category** — SHAPE is **selected, not forced absolutely** (Kolmogorov/MDL-shortest only over the declared grammar + dimension ladder + named rivals). The honest charged cost is **≈4 anchors + 9–10 injected reals**, NOT the "4-in" / "4→22" headline. Carrier-uniqueness is **mixed**: $K_6 = \text{SU}(3)/T^2$ is the unique *purely-abelian* clean $\text{SU}(3)$ carrier (abelian-isotropy uniqueness; the $\text{CP}^2 = \text{SU}(3)/\text{U}(2)$ swap was **built and BREAKS at Gate 2** by over-producing gauge); S^2 is **FORCED within the grammar by F₁**, S^1_Y/Z_2 by **F₂**; but the gauge-group **outcome** is a **TIE** shared by string/M/F/NCG/lattice, and the search-category / metric choice is **SHARED-OPEN** across frameworks. Closure paths must be **non-target-loaded** (the κ^3/π kill-test). **given-E ≠ derivation of E; selection ≠ derivation; dissolved ≠ solved; AXIOM-CLOSED ≠ proven; category-relative ≠ absolute.**

0. Header & Verdict

Field	Value
Gate id	SG-1 — Geometry specification (the frozen 13D active branch)
GUT manuscript gate	Gate 1 (§6.1; narrative §§2–2B + §5.0 row 1; certificate Appendices A0/A1/A2/A3/B2 + C1–C10; reproducer Appendix R0)
Status label (binding)	DECLARED-FROZEN
Target anchor(s)	The observed spectrum E (the SHAPE shape-anchor) — SG-1 is <i>measured-but-irreducible</i> on E (given-E ≠ derivation of E); the reproducibility leg terminates on the frozen hashes (DERIVED self-witness). Absolute minimality has no witness — it would need a new MDL/simplicity-metric invariant that does not exist → OPEN (R5 metric = SCHEME-ANCHORED). See §A.
Manuscript card status	<i>Claimed certificate pass</i> (the gate card's own label, §6.1; DECLARED-FROZEN is the honest scoped-GUT roll-up of it)
Frozen hashes it rides	Branch content hash <code>dcc66f1b2685</code> ; manifest meta-hash <code>a5b1e6f9d951</code> (A0, 33 rows). Stage primitives $K_6 = SU(3)/T^2, S^2, S_Y^1/\mathbb{Z}_2$ (R1.2); orbifold freeze R1.3 <code>ac4d2df3e708</code> ; F^+ chamber + projectors (R1.4 + R1.6); UV boundary package $M_U \sim 10^{16}$ GeV, $R_0 = 1.592 \times 10^{-17} \text{ GeV}^{-1}$, threshold $\delta = (+4.8424, -3.1112, -1.7313) \pm 1.6 \times 10^{-3}$ (gut.md:1792, 2009); family index $\chi(K_6, E) = -3$ (gut.md:3596).

0.1 Abstract — established / open / what would close it

Established (given the declared search category, the four anchors, and the freeze). SG-1 certifies three — and *only* three — things: (1) **specificity** — the active branch $\mathfrak{B}\{\textit{rm active}\} = [\mathcal{M}_4 \times K_6 \times S^2 \times S^1_Y / \mathbb{Z}_2] \times \oplus [F^+ \{\textit{rm finite}\} \oplus C] \oplus \otimes [E\{\textit{rm matter}\} \oplus E_{\{\textit{rm gauge}\}} \oplus E_{\{\textit{rm Higgs}\}} \oplus E_{\{\textit{rm proton}\}}] \otimes$ is a fully specified, layer-complete three-layer object, committed **before** any downstream gate is evaluated; (2) **no-layer-smuggling** — no gate is closed by content that was not declared in its proper layer (the $\times/\oplus/\otimes$ discipline, B2); (3) **reproducibility** — every primitive (A0) and every derived object (A1/A2/A3) is content-addressed by SHA-256, and the R0 reproducer regenerates each hash, so the object a reviewer attacks is byte-identical to the object the gates were evaluated on. The technical witness is a **freeze-and-reproduce certificate, not a derivation**: it pins the object; it closes no physics.

Open (the honest deductions). (1) The gate is **DECLARED-FROZEN** and **category-relative, not a uniqueness theorem**. Minimality is **selector-minimal inside the pre-declared search category** (R2.5: forces = isometries, compact, classified structures, admissible bundles), not architecture-neutral forcing. (2) **Absolute irreducibility is OPEN** — the universal negative "no competitor *anywhere* is shorter" is uncomputable (Kolmogorov); the gate bottoms on **E** (the SM chiral content presupposed on both sides). (3) The **dimension-ladder lower-bound matrix is OPEN** — under the MDL metric the 13D branch wins every considered rung (10 LOSES_TO_13D, 1 structural FAILS, 0 REFUTED), but the matrix is a *first-pass survey*, not a *certified classification* (SHAPE Certificate 3 / Lemma 5). (4) The **search-category completeness is OPEN** — the named-shelf elimination of cheaper SU(3) carriers (the K6/CP² rung) and the fairness of R2.5 itself are flagged by the manuscript as **intended first review targets**

(GUT.md:382). (5) The honest charged cost is ≈ 4 **anchors** + **9–10 injected reals**, NOT the public "4-in" headline — several "outputs" are themselves fitted injections. (6) The **MDL metric** under which the ladder is scored is itself **unproven** against the dimension-first alternative (under which a 4D EFT wins and the whole ladder folds).

What would close it (the ladder). DERIVED-CLOSED would require an architecture-neutral proof that the 13D branch is the unique minimum over a broad competitor class $\mathfrak{B}_{\text{abs}}$ — i.e. the completed role-mechanism normal-form theorem (SHAPE Certificate 3) *plus* the architecture-neutral metric-selection theorem (granularity $\Rightarrow$ MDL). Both are **OPEN** and one (the universal negative, Lemma 5) is **uncomputable in full**. The realistic ceiling per residual is **AXIOM-CLOSED**: name one explicit, target-blind posit (the granularity-MDL bridge axiom; the abelian-isotropy carrier-uniqueness rule, already a *theorem* not an axiom for color; the role-mechanism taxonomy as a declared grammar) that pays the debt in plain sight. The most likely honest outcome on the headline residual (absolute irreducibility) is **sharper-OPEN** — converting an uncomputable universal negative into a *grammar-relative forcing* certificate, which is a real epistemic gain, **not** a promotion.

0.2 Website source-of-truth (link, don't duplicate)

The full construction, the three-layer rule, the selector machinery, the term-by-term dossiers, and the freeze records are the **published manuscript**, Paper I:

- **GUT.html §6.1** (Gate-1 card) — <https://physics.magflowmeters.com/articles/GUT.html>
- **§2 / §2B** (the active branch + the binding three-layer rule, authority chain $A_0 \rightarrow A_1 \rightarrow A_2 \rightarrow A_3 \rightarrow B_2 \rightarrow L$); **§4** (selector machinery: §4.3 two species, §4.5 selector, §4.6 Occam/completeness > minimality, §4.9 data-use); **§5.0** (the six-row geometric dictionary, row 1); **§6.12** (falsification map, Gate-1 row); **§2.6 / line 382 / B2.0.3.3–B2.0.3.5** (category-relativity, the standing review targets).
- **Appendices A0** (frozen manifest, 33 rows, meta-hash `a5b1e6f9d951`); **A1** (≥ 16 -sig-fig reconstruction across all three layers); **A2** (tensor/bundle/Hilbert ledger); **A3** (old $\rightarrow$ new migration ledger); **B1** (selector formalism); **B2** (three-layer necessity, proper-subset null-space); **C1–C10** (per-term necessity dossiers); **Ro** (freeze certificate / reproducer); **GS** (candidate datasheets + elimination funnel, F1–F3 facts, coset verdicts); **N.4** (branch-elimination archive, the SU(3)-carrier shelf).
- Downstream Λ / TOE cross-reference (does not touch this gate): Paper IV, TOE.html — <https://physics.magflowmeters.com/articles/TOE.html>.

This dossier recaps only what is needed to attack; the site controls all common material.

1. How OUR geometry closes the geometry-specification gate — the closure claim (concise)

Full construction: **GUT.html §2 + §2B + §4 + Appendices A0/A1/A2/A3/B2 + C1–C10 + Ro**.
This section is the attack-grade recap, not the construction. The canonical anti-drift anchor for the

exact object is `.../rendered/TOE/00_EXACT_GEOMETRY_ANCHOR.md`.

1.1 The object end-to-end

SG-1 is the *gate that commits the object*. Everything downstream (SG-2 through SG-10) is evaluated *against* this frozen branch; SG-1 is the load-bearing precondition for the entire program. The object is a **three-layer active branch** with **only the $\times$ -layer carrying metric dimension** ($D = 4 + 6 + 2 + 1 = 13$):

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 $\mathfrak{B}_{\text{active}} = [ \mathcal{M}_4 \times K_6 \times S^2 \times S^1_Y/\mathbb{Z}_2 ]_{\times} \quad \leftarrow \text{STAGE} \quad (\text{metric geometry, 13 dims})$ 
 $\oplus [ F^+_{\text{finite}} \oplus C_{\text{admiss}} ]_{\oplus} \quad \leftarrow \text{RULEBOOK} \quad (\text{finite admissibility, 0 dims})$ 
 $\otimes [ E_{\text{matter}} \oplus E_{\text{gauge}} \oplus E_{\text{Higgs}} \oplus E_{\text{proton}} ]_{\otimes} \quad \leftarrow \text{ACTORS} \quad (\text{bundle/operator, 0 dims})$ 

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The load-bearing structure, named so a reader can attack each:

1. **The $\times$ -layer (STAGE) — the metric geometry.** $\mathcal{M}_4$ (observed spacetime, an **observational primitive**, not a selected rung); $K_6 = SU(3)/T^2$ (flag manifold, color source); S^2 (weak source); $S^1_Y/\mathbb{Z}_2$ (hypercharge source + orbifold chirality filter). **Gauge forces = isometries of the internal factors.** This is the rung whose forcedness is the whole SG-1 attack surface (§3). (Attack handle: the dimension ledger $D = 13$ is *selected inside R2.5*, not derived — the headline residual.)
2. **The $\oplus$ -layer (RULEBOOK) — finite admissibility, 0 dimensions.** F^+_{finite} (flavor chamber: modulus $\tau = \omega$, projectors, action ladders, operators — the SG-8 object); C_{admiss} (admissibility / anti-fitting firewall / selector / freeze / no-smuggling discipline). It constrains *which* configurations and deformations are legal. (Attack handle: SG-1 must count only the *physics* burden of the rulebook, not the *governance* burden — the F6 circularity hazard.)
3. **The $\otimes$ -layer (ACTORS) — bundle/operator content, 0 dimensions.** E_{matter} , $E_{\text{gauge}} = (P, \text{ad}(P), A, F, \rho_{\text{rep}}, \text{KK spectrum})$, E_{Higgs} (Wilson-line/Hosotani), E_{proton} . It constrains *which* fields/operators are admissible. (Attack handle: the $\mathbb{Z}_6$ center-kernel is *read off* the matter content, not posited — the SHAPE Lemma 3 / actor-minimality object.)
4. **The freeze.** Content hash `dcc66f1b2685`; manifest meta-hash `a5b1e6f9d951` (AO, 33 rows). **Every** primitive and derived object is content-addressed; the Ro reproducer regenerates each hash. This is the *only* certified mechanical witness of the gate.
5. **The four irreducible anchors.** $\{M_{\text{Pl}}, \alpha_i(M_Z), y_t, |V_{us}|\}$ — the declared free inputs. "Why these four *values*?" is a stated scope boundary (philosophical), not a physics gap. (Attack handle: the honest count adds **~9–10 injected reals** beyond these four — §3.)

1.2 What "closed" means here, and its conditionality

"Closed" for SG-1 is **specificity + no-layer-smuggling + reproducibility under declared assumptions** — strictly **not** a uniqueness theorem, **not** "the geometry is derived," **not** "13D is forced." Per §6.12 the gate is *Claimed certificate pass under declared search category*, and it downgrades to *Open / not claimed* (under-defined branch) or *Category-relative diagnostic* (search-category attack). It is conditional on:

- **given-the-declared-category** — minimality and the elimination of competitors are evaluated inside R2.5 (forces = isometries; compact; classified structures; admissible bundles); the category is

declared, not derived (§2.6).

- **given-E** — the SM chiral content (and the family index **−3**) is presupposed; SG-1 does not derive **E**. The target ledger **T** that scores the geometry against rivals has **E** on *both* sides; **E** cancels.
- **given-the-anchors** — four declared values, counted, plus (honestly) **~9–10 injected reals** (N_d, N_e, N_ν , the δ triple, θ_H^* , ...) that the public "4→22" headline omits.
- **given-the-metric** — the win over rivals holds under the **MDL / description-length** metric; under a **dimension-first** metric a 4D EFT wins and the ladder folds. Which metric is correct is itself open.

The genuine, defensible content (the part that survives the honest accounting):

Genuine SG-1 content	Mechanism / witness
Specificity — the branch is fully, unambiguously specified	A0 manifest (33 rows) + A1/A2/A3 reconstruction
Layer-completeness + no-smuggling	B2 proper-subset null-space ($\mathcal{N}_L = \emptyset$ for every proper $L \subsetneq \{\times, \oplus, \otimes\}$) inside the declared category
Reproducibility	R0 reproducer regenerates every SHA-256 hash + meta-hash <code>a5b1e6f9d951</code>
Term-level load-bearing	C1–C10 failure-if-removed ledger (each term breaks ≥ 1 Gate 1–10)
Architecture-neutral floor	$k_{\text{role}} \geq 3$ (Stage $\times$ Rulebook $\times$ Actors) — necessary, not sufficient (functional-role necessity theorem)
Weak/hyper carrier forcedness (within grammar)	S^2 by F1; S^1_Y/Z_2 by F2 — close their <i>cheaper</i> direction over whole shelves
Color carrier cleanness (architecture-neutral)	K_6 = unique purely-abelian SU(3) isotropy (abelian-isotropy uniqueness; CP ² built and BREAKS at Gate 2)

The conditional / non-genuine content (what SG-1 does NOT certify, despite the surface impression):

Apparent claim	Honest reality
"13D is the minimal/forced geometry"	selector-minimal, category-relative ONLY — not absolute, not architecture-neutral forced
"the geometry is derived"	declared + frozen — the gate is a freeze certificate, not a derivation
"4 inputs → 22 outputs"	overstated — honest cost ≈ 4 anchors + 9–10 injected reals (~13–14 reals total)
" K_6 is the unique SU(3) carrier"	unique <i>clean / purely-abelian</i> carrier (rep theory) — but completeness over all admissible SU(3) carriers stays N.4-uncertified
"the gauge-group outcome discriminates Fable"	TIE — string/M/F/NCG/lattice all recover the SM gauge group; this is a filter every framework passes

So the precise statement of closure: **SG-1 freezes a fully specified, layer-complete, reproducible three-layer object and certifies it is the selector-minimal survivor inside the declared category — it does NOT prove the object is unique, forced, or derived, and the honest input cost is ~13–14 reals, not 4.**

2. Verify the status — is DECLARED-FROZEN real?

This is the verification a skeptic would run. Each witness gets a grade — **hand-checkable** / **symbolic** / **machine-lane** — and an honest **reproduces?** flag.

2.1 The witness ledger

#	Witness	What it asserts	Grade	Reproduces?
W1	Content hash dcc66f1b2685	the active branch is content-addressed; one object, frozen before comparison	machine-lane	Yes in principle (R0 reproducer regenerates it); not independently re-run in this audit
W2	Manifest meta-hash a5b1e6f9d951 (A0, 33 rows)	every primitive object is hashed; the manifest meta-hash is the roll-up	machine-lane	Yes in principle (re-hash A0 rows + recompute meta-hash); not re-run here
W3	A1 reconstruction (≥16 sig figs, all three layers)	the branch is reconstructible directly ($\times$), indexed ($\oplus$), domain-routed ($\otimes$)	symbolic	Yes — A1 carries the values; the reconstruction is in-manuscript
W4	B2 three-layer necessity ($\mathcal{N}_{\mathcal{L}} = \emptyset$ for proper $\mathcal{L}$)	no proper layer subset closes the scoped-GUT gates <i>inside the declared category</i>	symbolic	Yes within category — B2 is an in-category null-space result, explicitly not a universal no-go (B2.0.3.4)
W5	C1–C10 failure-if-removed ledger	each named term is load-bearing for ≥1 Gate 1–10	hand-checkable	Yes (conditional) — conditional on the declared term-construction + failure ledgers; an auditable claim, not a theorem
W6	R0 reproducer	the only certified mechanical witness: regenerates every hash with no manual steps	machine-lane	Declared; not independently re-run here — the reproducer is referenced, not executed in this audit (see §2.3)
W7	S² forced by F1	no abelian/torus carrier of any dimension has non-abelian SU(2) among its isometries	hand-checkable	Yes — general theorem; closes the <i>cheaper</i> direction for all carriers
W8	S¹_Y/Z: forced by F2	a closed odd-dim factor keeps both handednesses → mirror fermions → LEP Z-width excluded	hand-checkable	Yes — general theorem; closes the <i>cheaper</i> direction for all carriers
W9	Abelian-isotropy uniqueness (color)	T^2 is the unique purely-abelian SU(3) isotropy; CP ² 's U(2) over-produces gauge at Gate 2 (built end-to-end, wsmnjvt55)	symbolic	Yes — rep theory ($C_{SU(3)}(T^2) = T^2$, Cartan only) + the CSDR centralizer rule; independently checked
W10	MDL ladder verdict (CATEGORY_RELATIVE)	13D wins every considered rung under MDL (10 LOSES, 1 FAILS, 0 REFUTED)	symbolic	Yes as a survey; NOT as a certified classification — first-pass matrix, not Certificate 3/4 closed
W11	Honest input-count caveat	charged cost ≈ 4 anchors + 9–10 injected reals (~13–14), not "4-in"	hand-checkable	Yes — the SHAPE packet carries this correction verbatim; it is the authoritative figure

2.2 What reproduces, plainly

- **The freeze structure is sound by construction.** Content-addressing + a reproducer that regenerates every hash is the strongest, most defensible leg: it makes the object a reviewer attacks **byte-identical** to the object the gates ran on. The discipline (freeze-before-compare, no-smuggling) is genuinely strong and is the whole point of the gate.
- **The weak and hypercharge carriers are forced within the grammar, by hand-checkable general theorems.** F1 (abelian $\Rightarrow$ no non-abelian SU(2)) and F2 (closed odd-dim $\Rightarrow$ mirrors $\Rightarrow$ LEP exclusion) close the *cheaper* direction over **whole shelves**, not named candidates. These are the strongly-forced rungs.
- **The color carrier is clean by an architecture-neutral argument** (abelian-isotropy uniqueness), and the one concrete cheaper competitor (the $K_6 \rightarrow CP^2$ swap) was **built end-to-end and BREAKS** at Gate 2 — a real structural exclusion, not a "tunable family count" hand-wave.
- **The honest input count is ~13–14 reals**, and the SHAPE packet states it plainly: the "4 $\rightarrow$ 22" headline is **overstated** and must be corrected. This is not a defect of the gate — it is the gate's own honesty.

2.3 What does NOT yet reproduce (honest gaps in the status)

- **The Ro reproducer is referenced, not independently re-run in this audit.** "The reproducer regenerates every hash" is the load-bearing mechanical claim; like SG-7's absent δ -harness and SG-8's J.6/K.5 CSV mount, the executable check is **declared-not-independently-verified here**. Until Ro is mounted and run target-blind, W1/W2/W6 are asserted, not machine-confirmed in this dossier. (This is the cheapest residual to close — §4.)
- **"13D is minimal" does NOT reproduce as an absolute or forced claim.** It reproduces *only* as **selector-minimal, category-relative** (W4/W10). The absolute statement is **uncomputable** (Kolmogorov), and the manuscript itself declines to claim it (§2.6, B2.O.3.4, line 382). Any reading of SG-1 as "the geometry is forced / derived / unique" is an overclaim the gate does not support.
- **The dimension-ladder lower-bound matrix does NOT reproduce as a certified classification.** It reproduces as a *first-pass survey* (W10): every considered competitor loses under MDL. The closing object — the role-mechanism normal-form / exhaustion theorem (SHAPE Certificate 3) — is **OPEN**, so "no competitor below 13D is shorter" is *surveyed, not proven*.
- **The named SU(3)-carrier shelf is NOT certified complete.** K_6 is the cheapest *clean* SU(3) carrier on a named shelf $\{K_6, CP^2\}$; N.4 completeness over **all** admissible SU(3) carriers is uncertified (GS.12), and the manuscript flags this as the **intended first review target** (line 382).

2.4 Why DECLARED-FROZEN (not higher, not lower)

- **Not DERIVED-GIVEN-E** (the SG-2/SG-3 tier): SG-1 derives nothing — it *declares and freezes* an object. SG-2 (gauge recovery) and SG-3 (family index —3) are rigid recoveries *given* this frozen branch; SG-1 is the precondition, not a recovery. There is no "given-E" computation here; there is a freeze.
- **Not OPEN/DISCLOSED:** the gate genuinely closes its three certified claims (specificity, no-smuggling, reproducibility) — these are real, mechanical, and non-trivial. The branch is not under-defined and no layer is missing. It is more than a disclosure.

- **DECLARED-FROZEN is exactly right:** a fully specified, frozen, reproducible object whose **uniqueness is explicitly NOT claimed** — category-relative selector-minimality, with the absolute/forcing question openly open. This matches the SCOPED_GUT ledger SG-1 line verbatim: *"Frozen and reproducible, not proven unique."*
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3. The attack surface — what to attack (ranked by leverage)

Every open residual as a named object with its precise obstruction. **Leverage** = how much closing it moves the gate (and how much it strengthens the program's foundation, since SG-1 is the precondition for all downstream gates).

3.1 The residual register

ID	Residual (named object)	Precise obstruction	Status	Leverage
R1	Absolute irreducibility OPEN (the Kolmogorov wall + bottoms-on-E)	"No competitor <i>anywhere</i> is shorter" is a universal negative over all conceivable architectures → uncomputable ($K(T)$, Kolmogorov complexity of the constant set). And T presupposes E on both sides, so the strongest possible claim is "shortest-recipe generator <i>given</i> E ," never "geometry from nothing." This is the headline residual: it caps the <i>entire</i> forcedness claim.	OPEN (the meta-residual; provably unreachable in full)	HIGHEST — it is the ceiling on every minimality statement SG-1 makes
R2	The dimension-ladder lower-bound matrix / grammar exhaustiveness (SHAPE Certificate 3 / Lemma 5)	Under MDL the 13D branch wins every <i>considered</i> rung (10 LOSES_TO_13D, 1 FAILS, 0 REFUTED), but this is a first-pass survey , not a certified classification. The closing object is the role-mechanism normal-form / exhaustion theorem — prove every $B \models T$ reduces <i>without cost increase</i> to a finite mechanism normal form, then lower-bound each class. OPEN .	OPEN (finite, bounded, tractable-in-principle — the whole remaining job)	HIGH — closing it upgrades CATEGORY_RELATIVE → grammar-relative LADDER_FORCED
R3	The ~9–10 injected reals beyond the 4 anchors	The public "4-in" / "4→22" headline is overstated . Honest charged cost ≈ 4 anchors + ~9–10 fitted reals (N_d, N_e, N_ν from SG-8; the δ triple from SG-7; θ_H^* from SG-6) → ~13–14 reals total. SG-1's economy is real but modest , not the advertised ~18.	DISCLOSED (correction known, staged; must propagate to the public headline)	MEDIUM — honesty/claim-boundary; moves no input count but is the public-facing overclaim
R4	Search-category completeness (R2.5 fairness + the named SU(3)-carrier shelf / N.4)	Minimality is <i>meaningful only inside the declared category</i> (§2.6). Two sub-residuals: (a) is R2.5 (forces=isometries, admissible bundles) a <i>fair</i> category, or does it exclude natural competitors (string bundle-sourced gauge, NCG spectral triples, 4D chiral-gauge EFT)? (b) is the named SU(3)-carrier shelf $\{K_6, CP^2\}$ complete (N.4)? The manuscript flags both as intended first review targets (line 382, B.12 condition 7).	OPEN (the corpus's own declared weak link)	HIGH — a natural excluded competitor that beats the branch under $\mathcal{R}$ is the standing reopen → downgrade to <i>category-relative diagnostic</i>
R5	The MDL-vs-dimension-first metric-selection question	Every "13D wins" verdict holds under the MDL/description-length metric . Under a dimension-first lex order, a clean 4D chiral-gauge EFT beats 13D ($k_{\text{dim}} = 4 < 13$) <i>irrespective of injected reals</i> , and SHAPE-minimality folds for everyone . Which metric is correct must be decided by an architecture-neutral principle (candidate: granularity $\Rightarrow$ MDL), and that theorem (sub-claims A/B/C, guard G1) is UNPROVEN .	OPEN (the decisive seam — decides forced-given-E vs merely-selected)	HIGH — a single theorem flips the entire ladder; tied with R4 for the most decisive open object
R6	The R0 reproducer is AUDIT (not independently re-run here)	"The reproducer regenerates every hash" is the gate's only certified mechanical witness, but it is <i>referenced, not executed</i> in this audit — same class as SG-7's absent δ -harness and SG-8's J.6/K.5 mount.	AUDIT	MEDIUM — cheapest to close (owner artifact); makes "certificate pass" machine-real

ID	Residual (named object)	Precise obstruction	Status	Leverage
R7	B2 / C1–C10 are category-relative + conditional, not theorems	B2 (three-layer necessity) is an in-category null-space result, <i>explicitly not</i> a universal no-go (B2.0.3.4). C1–C10 (term necessity) are conditional on the declared term-construction + failure ledgers — auditable claims, not proofs.	OPEN (category-relative; honestly labeled)	MEDIUM — strengthening to architecture-neutral is the functional-role necessity bridge
R8	Actor-layer minimality (SHAPE Lemma 3) + E un-forced	Is $E_{\text{matter}} \oplus E_{\text{gauge}} \oplus E_{\text{Higgs}} \oplus E_{\text{proton}}$ the <i>minimal</i> actor realization? The closure campaign DEMOTED the attacker's AXIOM_CLOSED to OPEN : the success criterion is a universal negative (no competitor supplies lower k_{actor}), UNMET (competitor matrix all "Unknown"; NCG un-scored), and a second residual (E un-forced) stays open.	OPEN (demoted on skeptic-verify)	MEDIUM — narrowest layer; if it fails, realization-minimality fails fast
R9	$\mathcal{M}_4$ is a declared axiom, not a forced rung	The 4D Lorentzian stage is an observational primitive , not an output of the funnel. It is the comparison surface, declared.	DISCLOSED (correctly labeled axiom)	LOW — honest by design; not a defect, but a counted posit
R10	Rulebook (C_admiss) physics-vs-governance separation (F6 hazard)	Several C_{admiss} requirements (freeze-before-compare, gate-status discipline) are <i>governance</i> rules, not architecture-neutral physics. Counting them in the minimality burden risks F6 circularity (the constraint set presupposing the submitted architecture).	OPEN (must separate physics burden from method)	LOW-MEDIUM — needed for any architecture-neutral upgrade; not a physics gap

3.2 Leverage ranking (attack order)

1. **R5** (metric-selection) + **R4** (category/shelf completeness) — the two decisive seams; either one, if it goes the wrong way, collapses the minimality claim. R5 is a single theorem; R4 is a completeness obligation.
2. **R2** (lower-bound matrix / Certificate 3) — the bounded, tractable "whole remaining job"; closing it upgrades the ladder verdict.
3. **R1** (absolute irreducibility) — highest *conceptual* leverage but **provably unreachable in full**; the realistic move is to convert it to grammar-relative forcing (a sharper-OPEN, not a closure).
4. **R6** (reproducer AUDIT) — cheapest to close (owner artifact); makes the certificate machine-real.
5. **R3 / R9** (input-count headline + $\mathcal{M}_4$ axiom) — honesty corrections, already staged/labeled.
6. **R7 / R8 / R10** — category-relative bridges (functional-role necessity), actor-minimality (demoted-OPEN), physics-vs-governance separation.

The cardinal honest point. R1, R4, R5 are where "DECLARED-FROZEN, not forced" lives. If a closure path *narrows the category* (R4) or *reverse-engineers the metric* (R5) to manufacture a 13D win, it has **relocated** the problem, not closed it — the κ^3/π kill-test and the F6-circularity guard apply in full force here (a minimality metric counts only if it would be written WITHOUT knowing that 13D should win — guard G1). R3/R6/R9 are the *non-physics* residuals (honesty + reproducibility + a declared axiom); closing them improves the gate's honesty and machine-reality but **moves no minimality claim**.

4. THE ATTACK PLAN — closure paths (the core)

For each residual: the **technique** (closure playbook T1 axiom-floor / T4 no-go / T5 firewall / T6 all-operator-conditional / T7 eliminative / T10 selector), the **named axiom it could reduce to** (stated so it would be written WITHOUT knowing that 13D should win — the κ^3/π kill-test + the G1 metric-not-target-loaded guard), the **specialist target** (theorem to hand off) or the **owner artifact** (reproducer/CSV/ruling) needed, the **math to attempt**, and the **success ladder** (DERIVED-CLOSED rare $\rightarrow$ AXIOM-CLOSED likely $\rightarrow$ sharper-OPEN $\rightarrow$ REFUTED).

4.1 R1 — Absolute irreducibility (the Kolmogorov wall + bottoms-on-E)

Why first. R1 is the *ceiling* on every minimality statement SG-1 makes. The honest first move is to recognize that "13D is the absolute minimum over all conceivable architectures" is **not a theorem to be proven — it is a wrong target**. This is the Einstein audit move: the catastrophe is not a math problem, it is a misframed demand.

Technique: T1 (axiom-floor) — name the ceiling honestly; the closure is a reframe, not a proof. The forcing question "no competitor *anywhere* is shorter" is a universal negative over all architectures, hence **uncomputable** (it is $K(T)$, the Kolmogorov complexity of the constant set, which is not computable). The deep move — already made in the SHAPE packet — is to **declare a finite role-mechanism grammar $\mathcal{G}$** , which converts the uncomputable universal negative into a **finite, decidable** problem (a lower-bound matrix over finitely many normal-form classes). **That conversion is the achievement; it does not close the matrix (that is R2).**

Named axiom it could reduce to (κ^3/π -clean).

AXIOM-GRAMMAR-RELATIVE-FORCING (target-blind form): *"Minimality is asserted only relative to the declared finite role-mechanism grammar $\mathcal{G}$ (the five mechanism axes); a competitor using a mechanism not in $\mathcal{G}$ is unconsidered and forces $\mathcal{G}$ to be extended, not the claim to be refuted."*

This is writable with no reference to 13D winning — it is a statement about the *scope* of the claim, not its content. It passes the kill-test by construction. **It is also TRUE** (the grammar is finite and the certificate is living/extensible). The honest endpoint:

R1 reduces to: "absolute irreducibility is uncomputable; the achievable claim is grammar-relative forcing, living and extensible, and it bottoms on E." This is a *sharper-OPEN*, not a closure — it correctly retires the wrong target (absolute minimality) and names the right one (grammar-relative forcing = R2).

Specialist target (to hand off). None for R1 itself (it is a framing result). The work it licenses is R2.

Math to attempt. None new for R1 — it is the recognition that R1 is *defined away* by declaring $\mathcal{G}$, leaving R2 (close the matrix) and R4 (is $\mathcal{G}$ /the category fair) as the real objects.

Success ladder. - DERIVED-CLOSED: **impossible** — absolute MDL over arbitrary programs is uncomputable. Do not promise it. - **AXIOM-CLOSED / sharper-OPEN (the honest ceiling):** AXIOM-

GRAMMAR-RELATIVE-FORCING named; the wrong target (absolute minimality) retired; the right target (close the grammar-relative matrix) handed to R2. **This is essentially already where the corrected SHAPE packet stands.** - REFUTED: a competitor outside $\mathcal{G}$ is exhibited that is shorter $\rightarrow \mathcal{G}$ extends (the certificate works as designed), not a refutation.

Honest disposition: sharper-OPEN, reduced to AXIOM-GRAMMAR-RELATIVE-FORCING + bottoms-on-E. Absolute irreducibility is **provably unreachable**; the closure is to *stop demanding it* and certify grammar-relative forcing instead. **given-E $\neq$ derivation of E** binds here permanently: even the best outcome is "shortest generator of the flavor/coupling data, GIVEN E."

4.2 R2 — The dimension-ladder lower-bound matrix / grammar exhaustiveness (the whole remaining job)

The target without loading. Under MDL the 13D branch wins every *considered* rung; close the survey into a *certified classification* so the win holds over **every** $B \models T$ in the grammar, not just the named ones. The number it must reproduce **without a new knob**: the boxed inequality

$\forall D = 4..12$ (+non-dim), $\forall j: I_{\text{gen},13} + n_{13}b + I_{\text{struct},13} < I_{\text{gen}}(B_{D,j}) + n_{D,j}b + I_{\text{extra}}(B_{D,j}) + I_{\text{struct}}(B_{D,j})$, with the ****honest**** $n_{13} \approx 13-14$ (NOT 4).

Technique: T7 (eliminative classification) + T4 (no-go per class). This is the SHAPE Certificate 3 (normal-form/exhaustion theorem) + Certificate 4 (lower-bound matrix). It is a *classification theorem* in the spirit of the classification of simple Lie groups: tractable **iff** the right invariants (the five role-mechanism axes) cut the space into finitely many classes, and T does the pruning (only SM-generating architectures enter).

The two proof obligations (the bottleneck):

- **(O1) Normal-form / exhaustion, relative to the declared taxonomy.** Show every $B \models T$ reduces *without increasing* I (the no-smuggling / Lemma-4 metric — a role hidden in notation is charged after unfolding) to a mechanism normal form $N_{D,j}$ over the finite axes {gauge-origin, chirality-origin, family-count, flavor-origin, scale-origin}, then bound $I(B_D) \geq L_{D,j}$ via one of {(A) fails T , (B) anchor floor, (C) hidden-rule floor, (D) generator floor}. **This subsumes R4's SU(3)-carrier seam** — the sub-shelf must be *exhausted* (N.4 completeness), not enumerated.
- **(O2) Metric selection, architecture-neutral** — handled as R5 (§4.5); (O1) is conditional on it.

Named axiom it could reduce to (κ^3/π -clean).

AXIOM-ROLE-MECHANISM-GRAMMAR (target-blind): "Every SM-generating architecture realizes each functional role (gauge, chirality, family count, flavor, scale) by one of the finitely many declared mechanisms; the normal-form classes are the product of these axes."

Writable with no flavor/coupling number and no reference to 13D winning (it references only mechanism types). The 13D branch is itself a tuple (gauge = isometry/coset; chirality = index; family = index; flavor = geometric overlap + fitted normalization; scale = posited anchors) and gets **no privileged row** — scored by the same codebook (Certificate 2). **PASSES** the kill-test.

Specialist target (to hand off). "Prove the normal-form theorem (O1): every $B \models T$ reduces cost-non-increasingly to a role-mechanism tuple, and prove the lower bound $I(B_D) \geq L_{D,j}$ for each class." A bounded, hard classification theorem — the single highest-value SG-1 hand-off.

Math to attempt. (1) Compress the 13D generator into pseudocode normal form and *measure* S_{13} honestly (uses the prior ladder audit; $n_{13} \approx 13\text{--}14$). (2) For each $D = 4..12 + \text{non-dim}$, prove (A)/(B)/(C)/(D). (3) Publish the completed lower-bound matrix. The first-pass rows already exist (the MDL ladder verdict); the job is to turn the *survey* into a *classification* with the no-smuggling charge enforced.

Success ladder. - DERIVED-CLOSED: O1 + O2 both proven $\rightarrow$ grammar-relative LADDER_FORCED (still grammar-relative, still bottoms on E — **not** absolute). The honest ceiling of the whole SG-1 forcedness program. - **AXIOM-CLOSED (likely):** AXIOM-ROLE-MECHANISM-GRAMMAR named + the first-pass matrix carried as a *survey* $\rightarrow$ "13D wins the considered class under MDL." **Essentially where the packet already stands.** - sharper-OPEN: O1 partially proven (some classes lower-bounded, others surveyed) $\rightarrow$ the matrix is partially closed. - REFUTED: a class is found with a strictly shorter MDL recipe $\rightarrow$ 13D is not minimal even in-grammar (valuable negative).

Honest disposition: OPEN, tractable-in-principle, reduced to AXIOM-ROLE-MECHANISM-GRAMMAR. Conditional on R5 (the metric). The realistic near-term outcome is AXIOM-CLOSED-as-survey; DERIVED-CLOSED requires the full classification theorem, which is hard but bounded.

4.3 R3 — The ~9–10 injected reals beyond the 4 anchors (the public overclaim)

This is an honesty/claim-boundary residual, not physics. No closure path "solves" it; the task is to **state the correct count** and bind it.

Technique: T2-guarded restatement (no relocation). The authoritative figure is **~4 anchors + 9–10 injected reals $\approx$ 13–14 reals total**, not "4-in." The injected reals are concrete and named: the fitted normalizations N_d, N_e, N_ν (SG-8), the δ threshold triple (SG-7), θ_H^* (SG-6). The public "4 $\rightarrow$ 22" / "2-in / 19-out" headline pretends only the anchors are inputs.

- **The over-correction is also wrong.** A "~14-in / ~1.6 $\times$ " reading that treats frozen *within-sector ratios* as independently injected is **forbidden** by the family-level-normalization ban (SG-8 I.4) — over-correcting is as dishonest as overclaiming. The honest figure is the middle one: ~9–10 injected reals beyond the 4 anchors.

Named principle (κ^3/π -clean).

AXIOM-HONEST-CHARGED-COST — *"the charged cost of the branch is the count of independent measured reals it must inject at the operational resolution (4 anchors + the fitted normalizations + the threshold triple), not the anchor count alone."*

Carries no target value; it is a counting discipline.

Action (countersign-gated; nothing applied here, PROMOTIONS:o): restate the economy headline as "**~22 outputs from ~13–14 effective inputs (4 anchors + 9–10 injected reals)**" wherever the "4 $\rightarrow$ 22" headline appears. The SHAPE packet's honest-caveat block + the compact-generator

audit **already carry this** — so the residual is "propagate the corrected number to the public site/headline," an owner edit, not a derivation.

Success ladder. AXIOM-CLOSED is not applicable (no physics axiom). The endpoint is **DISCLOSED-CORRECTED**: the ~13–14 figure stated, both wrong numbers (the ~18-economy overclaim and the ~1.6× over-correction) explicitly retired. **The cleanest, lowest-risk honesty win in the gate**; requires only an owner countersign.

4.4 R4 — Search-category completeness (R2.5 fairness + the SU(3)-carrier shelf / N.4)

The target without loading. Two sub-residuals, both the corpus's own declared review targets: (a) is R2.5 a *fair* category? (b) is the named SU(3)-carrier shelf $\{K_6, CP^2\}$ complete (N.4)?

Technique: T7 (eliminative) for the shelf; T5 (firewall) for category fairness.

Route A (the SU(3)-carrier shelf — the one with a real result). The color rung was the historically-flagged weak link. The session result: **the $K_6 \rightarrow CP^2$ swap was built end-to-end (wsmnjvt55) and BREAKS at Gate 2.** The exclusion principle is **architecture-neutral and not reverse-engineered**:

Abelian-isotropy uniqueness. Among SU(3) cosets $SU(3)/R$, the maximal torus T^2 is the *unique* isotropy that is purely abelian ($C_{SU(3)}(T^2) = T^2$, Cartan only) — injecting no spurious non-abelian factor. CP^2 's isotropy $U(2) = (SU(2) \times U(1))/\mathbb{Z}_2$ is non-abelian and a subgroup of color SU(3); by the CSDR centralizer rule it is gauge-active, forcing a lose-lose fork (over-produce $SU(2)+U(1)$ at Gate 2, or isotropy-lock $SU(2)_L/U(1)_Y$ inside SU(3) violating binding A1.4). **So $K_6 = SU(3)/T^2$ is the unique clean SU(3) color carrier — from rep theory + the centralizer rule alone.**

- **κ^3/π kill-test: PASS.** This is derived from $\text{Rep}(T^2)$ vs $\text{Rep}(U(2))$ + the centralizer rule, with no flavor/coupling number in sight; it is **stronger** than the corpus's original "tunable family count" reason (which was asymmetric and unsound — CP^2 's 3-family count is a *discrete* Spin_c index $r(r+1)/2 = 3$, not a continuous dial).
- **The residual that survives:** abelian-isotropy uniqueness closes the *named-shelf*; the **full-shelf N.4 completeness** (no OTHER admissible SU(3) carrier below 6D with a clean abelian isotropy) is the cleaner statement to certify. The classification (§1 of the CP^2 refutation) shows $\dim H \leq 4 \Rightarrow \dim M \geq 4$, with S^5/Wu killed by odd-dimensionality — so the shelf $\{CP^2, K_6\}$ is *plausibly* the whole sub-6D SU(3) story, but the certification is the work.

Route B (category fairness — R2.5). Is "forces = isometries, admissible bundles" fair, or does it exclude natural competitors? The standing reopen (B.12 condition 7): supply a natural in-category competitor strictly preferred under $\mathcal{R} \rightarrow$ documented downgrade to *category-relative diagnostic*. The honest move is **not** to defend R2.5 as the unique fair category, but to **state the claim as category-relative** and route the fairness question to the metric (R5) — because enlarging the category (string-style bundle-sourced gauge) re-opens the scale problem, and the manuscript claims nothing there beyond the portability of the discipline (§4.2).

Named axiom it could reduce to (κ^3/π -clean).

AXIOM-ABELIAN-ISOTROPY-COLOR (target-blind): *"the color carrier is the $SU(3)$ coset whose isotropy is purely abelian (the maximal torus), so the CSDR centralizer survives no spurious gauge factor."* — Already a **theorem** (W9), not just an axiom, for the named shelf; the residual is the full-shelf N.4 certification.

Specialist target. "Certify N.4 completeness: enumerate all admissible compact $SU(3)$ -homogeneous carriers and prove none below 6D has a clean (centralizer-surviving) abelian isotropy other than the K_6/CP^2 pair, and that CP^2 breaks at Gate 2." A bounded coset-classification + CSDR check.

Success ladder. - DERIVED-CLOSED: N.4 certified complete + abelian-isotropy uniqueness proven over the full shelf $\rightarrow$ the color rung is *forced within the grammar* (not just clean on a named shelf). **Reachable** — the classification is small. - **AXIOM-CLOSED (already standing):** AXIOM-ABELIAN-ISOTROPY-COLOR as a theorem on the named shelf + CP^2 built-and- broken. This is **stronger than the original corpus position** and is the current honest state. - sharper-OPEN: N.4 stays uncertified $\rightarrow K_6$ is the cheapest *clean* carrier on a named shelf only. - REFUTED: a cheaper admissible $SU(3)$ carrier with a clean abelian isotropy is exhibited $\rightarrow$ the color rung folds.

Honest disposition: AXIOM-CLOSED on the color shelf (a genuine session win — abelian-isotropy uniqueness + CP^2 -built-and-broken), with N.4 full-shelf completeness sharper-OPEN; category-fairness (R2.5) routed to R5.

4.5 R5 — The MDL-vs-dimension-first metric-selection question (the decisive seam)

Why this is decisive. Every "13D wins" verdict holds *under MDL*. Under dimension-first lex order a 4D EFT wins ($k_{\text{dim}} = 4 < 13$) and SHAPE folds **for everyone**. A single theorem — which metric is correct — flips the entire ladder. This is the seam that decides **forced-given-E vs merely-selected**.

Technique: T1 (axiom-floor) under the G1 metric-not-target-loaded guard. Granularity must enter **NOT** as "the shape must geometrize / chirality must come from an internal index" (that is the **F6 circularity** — it renames the answer by narrowing the class to KK architectures). It enters as a **metric-selection principle**, which is architecture-neutral:

AXIOM-GRANULARITY-MDL-BRIDGE (target-blind, κ^3/π -clean): *"The cost-floor / Finite Operational Cell Law makes the universe a finite-record system; the natural simplicity measure for a finite-record system is minimal injected information (description length / MDL), evaluated at the operational resolution. Therefore an independently-measured real anchor costs $\Theta(\log(1/\Delta_0))$ bits (large) and a discrete structural choice (a coset, a $\mathbb{Z}_6$, an integer index) costs $O(1)$ bits (small) — so anchor-burden dominates dimension-burden."*

This is the architecture-neutral justification the analysis flagged as missing. It is writable from granularity alone, with no clause inserted because it makes 13D win (guard **G1** — if the metric is reverse-engineered to favor low anchor count, that is the κ^3/π failure $\rightarrow$ REJECT). **Critically, it does NOT presuppose 13D wins** — a faithful REFUTED-ECONOMY (the 4D EFT is genuinely simpler under a fair MDL once the generator map is charged) is an acceptable, valuable outcome.

The three sub-claims to prove (the theorem target). - **(A) Granularity $\Rightarrow$ MDL.** *Derive* the description-length functional from the cost-floor/recordability — do not assume it. (A finite-record universe cannot specify infinite-precision continuum data; its admissible descriptions are finite bit-strings; "simplest" = shortest such string = MDL.) - **(B) Anchors dominate dimension under $\mathcal{I}$.** A measured real to cell resolution costs $\Theta(\log(1/\Delta_0))$ bits; a discrete structural choice costs $O(1)$. (Contrast: dimension-first put k_{dim} first *by fiat*.) - **(C) Economy-win, quantitative + symmetric (guards G2, G5).** Build *both* ledgers $I(B_{13})$ and $I(B_{\text{EFT}})$ against the ***same*** pre-declared target set T . **Charge the EFT** only for reals it must inject as independent facts; **free-for-both-and-cancel** anything that is an automatic consequence of $E + 4D$ renormalizable gauge invariance (anomaly cancellation, written-spectrum chirality, the $\mathbb{Z}_6$ center-kernel, accidental proton stability) — charging the EFT for these is *reverse* target-loading; and **counter-charge the 13D branch** for its extra-D machinery (E_{proton} , the δ triple, R_0 , M_U , S^2/S^1 specs). **Crucially (guard G2): the geometry $\rightarrow$ observables generator map must be charged** — if it is a large injected object, the 13D win evaporates and the EFT wins.

Specialist target. "Prove or refute granularity $\Rightarrow$ MDL (sub-claims A/B/C under guards G1/G2/G5), with the generator map fully charged." This is the single theorem that decides the whole SG-1 forcedness question.

Math to attempt. Derive $\mathcal{I}$ from recordability (A); establish the bit-cost ordering (B); compute the two symmetric ledgers quantitatively with the generator map charged (C), using the honest $n_{13} \approx 13-14$.

Success ladder. - DERIVED-CLOSED (PROVEN): A + B + C hold with the generator charged $\rightarrow$ SHAPE upgrades from FOLDED to "realization-minimal under the granularity-induced information metric, GIVEN E" — the 4D EFT is excluded on a principled basis. **Decisive if it holds.** - AXIOM-CLOSED (CONDITIONAL): A holds but C needs one named, plausibly-cheap fact about the generator map $\rightarrow$ AXIOM-GRANULARITY-MDL-BRIDGE named, with one residual. - sharper-OPEN (REFUTED-METRIC): granularity does not *uniquely* select MDL $\rightarrow$ the fork is undecided $\rightarrow$ SHAPE stays selected. - REFUTED (REFUTED-ECONOMY): under a fair $\mathcal{I}$ the generator map is *not* cheaper than the ~ 16 reals $\rightarrow$ the 4D EFT wins $\rightarrow$ **the simpler 4D realization is the correct one; the 13D geometry is selected, not minimal.** An honest, equally valuable discovery.

Honest disposition: OPEN, the decisive seam, reduced to AXIOM-GRANULARITY-MDL-BRIDGE under guard G1. This is the single most important SG-1 theorem. A REFUTED-ECONOMY outcome (the 4D EFT genuinely wins) is **not** to be feared or suppressed — it is the honest other-possibility, and reporting it as such is a successful run. The closure campaign's SCALE-firewall verdict (the cell μ_{cell} has no v-independent readout; anchoring it at $dV/d\sigma=0$ is circular) is the **cautionary precedent**: a root posit that *looks* derivable can be confirmed circular — so the G1/G2 guards must be enforced before banking any 13D win.

4.6 R6 — The R0 reproducer is AUDIT (the cheapest mechanical close)

The obstruction. "The R0 reproducer regenerates every hash" is the gate's **only** certified mechanical witness, but it is *referenced, not executed* in this audit — the same class as SG-7's absent δ -harness and SG-8's J.6/K.5 CSV mount.

Technique: owner artifact (machine-lane), not an axiom. A **fail-closed reproducibility task**, not a physics closure.

Owner artifact needed. (1) Mount the RO reproducer + the AO manifest (33 rows). (2) Run it target-blind. (3) Confirm it regenerates the content hash `dcc66f1b2685` and the meta-hash `a5b1e6f9d951` byte-equal. (4) Confirm A1's ≥ 16 -sig-fig reconstruction recomputes from the frozen primitives.

Math to attempt. None new — execution + verification. The check is mechanical and fail-closed: if any hash cannot be regenerated, the gate downgrades from *Claimed certificate pass* to *Open / not claimed* (under-defined branch), per §6.12.

Success ladder. BLOCKED_INPUTS until the reproducer is mounted → then either **VERIFIED** (hashes regenerate; "Claimed certificate pass" becomes machine-real) or **REFUTED** (a hash fails → downgrade). **Highest value-per-effort closeable item** — it converts an asserted certificate into a machine-checked one with no new physics.

Honest disposition: AUDIT → **mount the reproducer; expected VERIFIED.** This is the one residual that, closed, makes the *certified* part of SG-1 (specificity + reproducibility) genuinely machine-real rather than declared.

4.7 R7 — B2 / C1–C10 are category-relative + conditional (the functional-role bridge)

The obstruction. B2 (three-layer necessity) is an in-category null-space result, *explicitly not* a universal no-go (B2.0.3.4). C1–C10 (term necessity) are conditional on the declared term-construction + failure ledgers.

Technique: T1 (axiom-floor) via the functional-role necessity theorem. The bridge from category-relative to architecture-neutral is already drafted: the **functional-role necessity theorem** proves $\mathcal{C}_{\text{phys}} \Rightarrow \text{Stage} + \text{Rulebook} + \text{Actors}$ — any admissible architecture must carry functional equivalents of the three roles, whether or not it uses the $\times / \oplus / \otimes$ notation (proven by contradiction on each role).

Named axiom it could reduce to (κ^3/π -clean).

AXIOM-FUNCTIONAL-ROLE-FLOOR (target-blind): "*any architecture satisfying the architecture-neutral physical constraint set must contain functional equivalents of a Stage, a Rulebook, and Actors ($k_{\text{role}} \geq 3$).*"

Writable with no geometry names; it is the **architecture-neutral floor** the corpus *does* earn (necessary, not sufficient). PASSES the kill-test.

Specialist target (the next theorem). Upgrade B2 from "three-layer necessity inside the declared category" to "functional three-role necessity for any admissible architecture" (the functional-role necessity theorem, already PARTIAL), then attempt the *realization*-minimality theorem

Unfold(B) $\succeq$ Unfold(B_{active}) — which is R2/R8 territory.

Math to attempt. Defeat the F6 circularity per role (Gate o): state each role-requirement architecture-neutrally with no hidden reference to the submitted factor set; then the contradiction proof (a role-free

admissible competitor is impossible) gives the floor.

Success ladder. - DERIVED-CLOSED: realization-minimality proven (R2/R8) → the *exact* realization is minimal. **Hard** (needs the competitor audit, Lemma 5). - **AXIOM-CLOSED (essentially standing):** AXIOM-FUNCTIONAL-ROLE-FLOOR named; B2 upgraded to architecture-neutral role-necessity. A real strengthening over category-relative B2. - sharper-OPEN: role-necessity holds but realization-minimality stays open (the likely state). - REFUTED: a role-free admissible competitor is exhibited → the floor fails (the F1 falsifier of the theorem).

Honest disposition: AXIOM-CLOSED at the functional-role floor; realization-minimality (the exact factor set) sharper-OPEN. The floor is necessary-not-sufficient; it does **not** prove the 13D realization is the unique minimum.

4.8 R8 — Actor-layer minimality (SHAPE Lemma 3) + E un-forced (the demoted-OPEN)

The obstruction. Is $E_{\text{matter}} \oplus E_{\text{gauge}} \oplus E_{\text{Higgs}} \oplus E_{\text{proton}}$ the *minimal* actor realization? The closure campaign **DEMOTED** the attacker's AXIOM_CLOSED to **OPEN** under the overclaim test: Lemma 3's success criterion is a **universal negative** ("no admissible competitor supplies lower k_{actor} ") that is UNMET (competitor matrix all Tier-1 "Unknown"; NCG flagged as a serious un-scored role-equivalent), plus a second residual (E un-forced; the corpus T3 was REFUTED) stays open.

Technique: T10 (selector) under T2 relabel guard. The narrowest layer — attack first (if actor-minimality fails, realization-minimality fails fast).

Named axiom it could reduce to (κ^3/π -clean).

AXIOM-ACTOR-MDL-MINIMALITY-GIVEN-E (target-blind): *"the actor layer is the minimal-MDL bundle/operator realization of the matter/gauge/Higgs/proton + observable-algebra + center-kernel content, given E."* — Carries no target value; the $\mathbb{Z}_6$ kernel is **COMPUTED** ($q \equiv 3z_2 - 2z_3 \pmod{6}$), not posited.

The honest blocker (why it stays OPEN, not AXIOM_CLOSED): even granting the named axiom, the success criterion is a universal negative that is undischarged, **and** E is un-forced (a second residual, left OPEN not axiomatized). Reduction-to-(axiom)+(un-forced E)+(undischarged universal-negative) = **OPEN**. Folding two open obligations into one axiom would be overclaiming.

Specialist target. "Score the actor-layer competitor matrix target-blind (especially NCG's finite Dirac operator as a role-equivalent), and prove no competitor supplies lower k_{actor} given E." The $\mathbb{Z}_6$ center-kernel computation is the partial support already in hand.

Success ladder. - DERIVED-CLOSED: competitor matrix scored + no-alternative proven → actor-minimality given E. **Unlikely** (universal negative). - AXIOM-CLOSED: would require discharging the universal negative — currently UNMET. - **sharper-OPEN (the honest standing):** reduced to AXIOM-ACTOR-MDL-MINIMALITY-GIVEN-E + un-forced E + the undischarged competitor audit. **This is the demoted-OPEN disposition.** - REFUTED: a lower- k_{actor} competitor (e.g. NCG) is scored cheaper → actor-minimality folds.

Honest disposition: OPEN (demoted on skeptic-verify). The actor layer is a strong candidate with the $\mathbb{Z}_6$ kernel computed, but the no-alternative obligation is undischarged and E is un-forced. Do **not** bank AXIOM_CLOSED here — the campaign already corrected that.

4.9 R9 — $\mathcal{M}_4$ is a declared axiom, not a forced rung

The obstruction. The 4D Lorentzian stage is an **observational primitive** — the comparison surface KK reduction lands on, declared, not an output of the funnel. No cheaper-carrier competition is run for it.

Technique: T1 (axiom-floor) — name it as a declared axiom. There is nothing to derive; the honest move is the clean statement.

Named axiom (κ^3/π -clean).

AXIOM-M4-OBSERVATIONAL-PRIMITIVE — *"the observed 4D Lorentzian sector is a declared observational primitive, the external comparison surface, not a selected or forced rung."*

Carries no target value; it is a scope declaration.

Action. Keep $\mathcal{M}_4$ labeled as a declared axiom in the ladder accounting (it already is — the SHAPE ladder context labels it "axiom, not selected"). It should **not** be counted as a forced rung in any forcedness claim, and **not** be cited as a derivation.

Success ladder. DISCLOSED-CONSISTENT — already in place. No AXIOM-CLOSED-as-derivation is applicable (it is a primitive by design). The residual is a labeling consistency sweep, not a closure.

Honest disposition: DISCLOSED (correctly labeled). Not a defect — it is the gate's honesty about what is observed vs derived.

4.10 R10 — Rulebook physics-vs-governance separation (the F6 hazard)

The obstruction. Several C_{admiss} requirements (freeze-before-compare, gate-status discipline) are *governance* rules, not architecture-neutral physics. Counting them in the minimality burden risks F6 circularity (the constraint set presupposing the submitted architecture).

Technique: T5 (firewall) — separate physics burden from method burden. To avoid F6, the rulebook minimality (SHAPE Lemma 2) must separate the **physics** the rulebook enforces (flavor closure, anomaly cancellation, admissibility) from the **method** discipline (freeze, gate-status), and **count only the physics burden**.

Named axiom (κ^3/π -clean).

AXIOM-RULEBOOK-PHYSICS-ONLY — *"only the physics the rulebook enforces (anomaly admissibility, flavor closure, chamber constraints) is charged in the minimality burden; freeze/gate-status discipline is method, charged to no candidate."*

Carries no target value; it is the no-smuggling/F6 guard for the rulebook layer.

Specialist target. "Restate $\mathcal{C}_{\text{phys}}$ architecture-neutrally (Gate 0), separating physics from governance, so the rulebook-minimality lemma (Lemma 2) is non-circular." Note: Lemma 2 is flagged **highest-risk** (F^+ is the program's weakest link — see SG-8 R1).

Success ladder. - AXIOM-CLOSED: AXIOM-RULEBOOK-PHYSICS-ONLY named + the physics/governance split made formal → the rulebook burden is countable non-circularly. **The realistic outcome.** - sharper-OPEN: the split is partial; some requirements resist clean classification. - REFUTED: the rulebook's physics burden is shown reducible by a cheaper competitor → Lemma 2 folds.

Honest disposition: OPEN, reduced to AXIOM-RULEBOOK-PHYSICS-ONLY (the F6 guard). A prerequisite for any architecture-neutral minimality upgrade; not a physics gap, a methodology guard. Tied to SG-8's R1 (F^+ weakest link) since $F^+ \subset \mathcal{C}_{\text{admiss}}$.

4.11 Attack-plan roll-up

Residual	Technique	Named axiom (κ^3/π -clean)	Specialist target / owner artifact	Realistic endpoint
R1 absolute irreducibility	T1	AXIOM-GRAMMAR-RELATIVE-FORCING	(framing; licenses R2)	sharper-OPEN (absolute is uncomputable; bottoms-on-E)
R2 lower-bound matrix	T7 + T4	AXIOM-ROLE-MECHANISM-GRAMMAR	normal-form / exhaustion theorem (Cert 3)	OPEN → AXIOM-CLOSED-as-survey; DERIVED if classification proven (conditional on R5)
R3 ~9–10 injected reals	T2 restatement	AXIOM-HONEST-CHARGED-COST	owner countersign	DISCLOSED-CORRECTED (cleanest honesty win)
R4 category/shelf completeness	T7 + T5	AXIOM-ABELIAN-ISOTROPY-COLOR	N.4 full-shelf certification	AXIOM-CLOSED on color shelf (session win); N.4 sharper-OPEN
R5 MDL metric selection	T1 (guard G1)	AXIOM-GRANULARITY-MDL-BRIDGE	granularity ⇒ MDL (A/B/C, generator charged)	OPEN → DERIVED if proven; REFUTED-ECONOMY is the honest other-possibility
R6 reproducer AUDIT	machine-lane	(none)	mount + run R0 reproducer	BLOCKED_INPUTS → VERIFIED (best value/effort)
R7 B2/C category-relative	T1	AXIOM-FUNCTIONAL-ROLE-FLOOR	functional-role necessity → realization-minimality	AXIOM-CLOSED at the floor; exact realization sharper-OPEN
R8 actor-minimality	T10 + T2-guard	AXIOM-ACTOR-MDL-MINIMALITY-GIVEN-E	competitor matrix (NCG); no-alternative proof	OPEN (demoted; universal negative unmet + E un-forced)
R9 M ₄ axiom	T1	AXIOM-M4-OBSERVATIONAL-PRIMITIVE	labeling sweep	DISCLOSED-CONSISTENT (already in place)
R10 rulebook F6 guard	T5	AXIOM-RULEBOOK-PHYSICS-ONLY	architecture-neutral $\mathcal{C}_{\text{phys}}$ (Gate 0)	OPEN → AXIOM-CLOSED if physics/governance split made formal

REDUCE-vs-RELOCATE verdict on the plan. The plan does **not** turn one hard problem into three harder ones. Run the explicit harder-subproblem check:

- **R1** is *defined down*, not relocated: declaring the grammar $\mathcal{G}$ converts an uncomputable universal negative into the bounded R2 — strictly easier, and honestly labeled "absolute is unreachable."
- **R4 (color)** is a genuine **REDUCE**: abelian-isotropy uniqueness + CP²-built-and-broken replaced an asymmetric "tunable family count" hand-wave with an architecture-neutral theorem — the subproblem (N.4 full-shelf) is *smaller* than the original.
- **R2, R5** are the two hard objects, but each is a **single bounded theorem** (a classification; a metric-selection derivation), not a fan-out into harder pieces — and both carry explicit $\kappa^3/\pi + G1/G2$ **guards** so a target-loaded or reverse-engineered closure cannot be banked.
- **R3, R6, R9** are mechanical (owner edit / reproducer run / labeling) — strictly easier.
- **R7, R8, R10** are category-relative bridges, each reduced to a single named floor axiom.

The two genuine-physics theorems (R2, R5) are **the same size or smaller** than the original gate (one classification, one metric derivation), and both can land at **REFUTED** (the matrix has a shorter recipe; the 4D EFT genuinely wins) — which would be **honest, valuable discoveries**, not failures. The honest expected outcome of a full campaign: **1 sharper-OPEN reframe (R1), 1 AXIOM-CLOSED-as-survey + open classification (R2), 1 DISCLOSED-CORRECTED (R3), 1 AXIOM-CLOSED on the color shelf (R4, a session win), 1 OPEN decisive theorem (R5), 1 VERIFIED (R6, the reproducer), 1 AXIOM-CLOSED at the role floor (R7), 1 demoted-OPEN (R8), 1 DISCLOSED (R9), 1 OPEN-with-F6-guard (R10)**. No DERIVED-CLOSED is promised on the forcedness question; the gate would move from DECLARED-FROZEN-with-asserted- reproducibility to **DECLARED-FROZEN-with-machine-verified-reproducibility + a named axiom floor + an architecture-neutral color-carrier theorem** — a real honesty/reproducibility/forcedness gain, **not** a promotion.

A. Anchoring & Hardening Map

This is SG-1's §3 residual register run through our internal honesty methodology: for each residual, **classify it gap-vs-wall** (a *gap* has a known route — what is missing is a computation, a written certificate, or a measured input; a *wall* is where the route itself is the problem — no known method, or the only escape secretly assumes the answer), **hunt the implicit assumption** it rides on, and then ask the decisive terminate-on question: **what measured invariant must this residual ultimately terminate on** — does it reduce to an *existing* anchor, need a *new named* invariant, hinge on a *scheme*-anchor, sit as a *computation-debt*, or have *no witness* ($\rightarrow$ OPEN)? The disposition vocabulary follows the live **Gaps & Walls Register** (/articles/GAPS_AND_WALLS_REGISTER.html): the core eight labels are the Register's — **DERIVED** (connected to an already-measured fact, no new assumption) / **DERIVED-GIVEN-E** (rigid once the SM content *E* is supplied) / **AXIOM-CLOSED** (reduced to one named, value-free, unproven posit) / **DISSOLVED** (a false premise dropped) / **SCHEME-ANCHORED** (a number reachable only after one named technical choice) / **OPEN** (genuinely unsolved, or the only escape assumes the answer) / **BLOCKED** (route exists, required file/input missing) / **measured-but-irreducible**. A handful of finer per-residual labels used below (**AUDIT** / **DISCLOSED** / **DISCLOSED-CORRECTED** / **sharper-OPEN**) are strictly-weaker refinements of those eight — narrowings of OPEN/BLOCKED for bookkeeping clarity, **never** promotions above them. SG-1's existing anchor set is $\{h \text{ (granularity residue)}, M_Pl, \text{spectrum-E}, \alpha_i(M_Z), y_t, |V_us|\}$; the honest charged cost adds **~9–10 injected reals** on top of the four headline anchors.

A.1 Per-residual anchoring & hardening table

Residual	GAP or WALL (+kind)	Measured-invariant truth it must terminate on	Honest disposition	What would HARDEN it (concrete next step)
R1 Absolute irreducibility (Kolmogorov wall + bottoms-on-E)	WALL — uncomputability wall (universal negative over all architectures = $K(T)$; the route itself is provably unreachable)	NO existing anchor; bottoms on spectrum-E. It cannot terminate on a measured invariant at all — "shortest recipe over every conceivable architecture" is not a measurable quantity; the strongest reachable claim is "shortest generator <i>given E</i> ."	OPEN → sharper-OPEN . Reduced to AXIOM-GRAMMAR-RELATIVE-FORCING: retire the absolute target, certify grammar-relative forcing instead. <i>given-E</i> ≠ derivation of <i>E</i> .	Declare the finite role-mechanism grammar $\mathcal{G}$ explicitly and state minimality as $\mathcal{G}$ -relative + living/extensible — converting the uncomputable wall into the bounded R2 (a <i>reframe</i> , not a closure).
R2 Dimension-ladder lower-bound matrix / grammar exhaustiveness (SHAPE Cert 3)	GAP — computation-debt (finite, bounded classification; first-pass survey not yet a certified theorem)	Terminates on spectrum-E (the target ledger <i>T</i> has <i>E</i> on both sides and cancels) under the MDL metric set by R5 . No <i>new</i> measured invariant needed; it is a classification given <i>E</i> .	OPEN (tractable-in-principle), reduced to AXIOM-ROLE-MECHANISM-GRAMMAR . Realistic near-term: AXIOM-CLOSED-as-survey. Conditional on R5.	Prove the normal-form / exhaustion theorem (O1): every $B \models T$ reduces cost-non-increasingly to a role-mechanism tuple; lower-bound each class with the honest $n_{13} \approx 13-14$. Single highest-value SG-1 hand-off.
R3 ~9–10 injected reals beyond the 4 anchors	GAP — honesty / claim-boundary debt (no physics route to "solve"; the task is to state the count)	Terminates on the EXISTING anchors themselves — it is the honest count of measured reals injected (4 anchors $\{M_Pl, \alpha_i, y_t, V_us \}$ + the fitted N_d, N_e, N_v , the δ -triple, θ_H^*).	DISCLOSED-CORRECTED . AXIOM-HONEST-CHARGED-COST: the charged cost is ~13–14 reals, not "4-in." Both wrong figures (the ~18× economy overclaim and the ~1.6× over-correction) retired.	Owner-countersign: propagate "~22 outputs from ~13–14 effective inputs (4 anchors + 9–10 injected reals)" to the public headline wherever "4→22" appears. Cleanest, lowest-risk honesty win.
R4 Search-category completeness (R2.5 fairness + SU(3)-carrier shelf N.4)	WALL → reduced to GAP for the color rung . Category fairness is a wall (no canonical fair-category principle); the SU(3) sub-shelf is now a bounded coset-classification gap	Terminates on spectrum-E + an architecture-neutral rep-theory invariant (the centralizer $C_{SU(3)}(T^2) = T^2$, Cartan-only) — <i>not</i> a new measured number; the color rung's cleanness is a representation-theory fact.	AXIOM-CLOSED on the color shelf (abelian-isotropy uniqueness is a <i>theorem</i> ; CP^2 built end-to-end and BREAKS at Gate 2), with N.4 full-shelf completeness sharper-OPEN ; category-fairness (R2.5) routed to R5.	Certify N.4: enumerate all admissible compact SU(3)-homogeneous carriers, prove none below 6D has a clean centralizer-surviving abelian isotropy beyond the K/CP^2 pair. Bounded coset-classification + CSDR check.

Residual	GAP or WALL (+kind)	Measured-invariant truth it must terminate on	Honest disposition	What would HARDEN it (concrete next step)
R5 MDL-vs-dimension-first metric-selection	WALL — the decisive seam; the route requires a genuinely new architecture-neutral principle (which metric is correct cannot be read off any current measurement)	Must terminate on the GRANULARITY root (its residue h — the smallest real action step) as a <i>new named bridge invariant</i> : granularity $\Rightarrow$ a finite-record system $\Rightarrow$ MDL is the natural simplicity measure. Anchor-burden $\Theta(\log 1/\Delta_0)$ dominates dimension-burden $O(1)$.	OPEN, the decisive seam , reduced to AXIOM-GRANULARITY-MDL-BRIDGE under guard G1. A REFUTED-ECONOMY (the 4D EFT genuinely wins once the generator map is charged) is the honest, equally-valuable other-possibility.	Prove or refute granularity $\Rightarrow$ MDL (sub-claims A/B/C) with the geometry $\rightarrow$ observables generator map fully charged (guard G2) and the ledgers built symmetrically against the same T (G5). The single theorem that flips the entire ladder.
R6 R0 reproducer is AUDIT (not independently re-run here)	GAP — computation/owner-artifact debt (route is mechanical; the executable check is merely referenced)	Terminates on the frozen-object hashes (content <code>dcc66f1b2685</code> , meta <code>a5b1e6f9d951</code>) — a content-addressed self-witness, the reproducibility leg the Register grades DERIVED . No physics invariant; a byte-identity check.	AUDIT $\rightarrow$ expected VERIFIED . This is the leg that is genuinely DERIVED (a mechanical reproducibility check) once mounted.	Mount the R0 reproducer + A0 manifest (33 rows), run target-blind, confirm both hashes regenerate byte-equal and A1's ≥ 16 -sig-fig reconstruction recomputes. Highest value-per-effort; makes "certificate pass" machine-real.
R7 B2 / C1–C10 are category-relative + conditional (not theorems)	GAP — the functional-role bridge (route drafted: the functional-role necessity theorem, already PARTIAL)	Terminates on an architecture-neutral structural floor ($k_{\text{role}} \geq 3$), bottoming on spectrum-E — necessary-not-sufficient; no new measured number, a role-necessity invariant.	AXIOM-CLOSED at the functional-role floor (AXIOM-FUNCTIONAL-ROLE-FLOOR); the <i>exact</i> realization (realization-minimality) is sharper-OPEN (R2/R8 territory).	Upgrade B2 from in-category null-space to "functional three-role necessity for any admissible architecture" (defeat F6 per role, Gate 0), then attempt realization-minimality.
R8 Actor-layer minimality (SHAPE Lemma 3) + E un-forced	GAP (with a WALL residue) . Actor-minimality has a route (competitor matrix); the residue "E un-forced" is the spectrum-E wall	Bottoms on spectrum-E twice : the $\mathbb{Z}_6$ center-kernel is <i>COMPUTED</i> ($q \equiv 3z_2 - 2z_3 \pmod{6}$, a discrete index given E), but E itself is un-forced and the no-competitor obligation is a universal negative.	OPEN (demoted on skeptic-verify) . AXIOM-ACTOR-MDL-MINIMALITY-GIVEN-E names the floor, but the undischarged universal-negative + un-forced E keep it OPEN, not AXIOM-CLOSED.	Score the actor-layer competitor matrix target-blind (esp. NCG's finite Dirac operator as a role-equivalent) and prove no competitor supplies lower k_{actor} given E. Do not bank AXIOM_CLOSED — the campaign already corrected that.

Residual	GAP or WALL (+kind)	Measured-invariant truth it must terminate on	Honest disposition	What would HARDEN it (concrete next step)
R9 $\mathcal{M}_4$ is a declared axiom, not a forced rung	GAP — a labeling/disclosure debt (nothing to derive; $\mathcal{M}_4$ is observed)	Terminates on the observed 4D Lorentzian sector itself — an observational primitive (the external comparison surface), correctly <i>measured-but-not-derived-here-by-design</i> .	DISCLOSED (correctly labeled) . AXIOM-M4-OBSERVATIONAL-PRIMITIVE. Not a defect — the gate's honesty about observed-vs-derived.	Labeling consistency sweep: keep $\mathcal{M}_4$ as a declared axiom in the ladder accounting; never count it as a forced rung or cite it as a derivation.
R10 Rulebook (C_admiss) physics-vs-governance separation (F6 hazard)	GAP — a methodology guard, not a physics gap (route: separate physics burden from method burden)	Terminates on the physics the rulebook enforces (anomaly admissibility, flavor closure, chamber constraints), bottoming on spectrum-E — <i>not</i> a new invariant; the governance discipline (freeze/gate-status) is charged to no candidate.	OPEN, reduced to AXIOM-RULEBOOK-PHYSICS-ONLY (the F6 guard). A prerequisite for any architecture-neutral minimality upgrade. Tied to SG-8's R1 (F^+ weakest link, since $F^+ \subset C_admiss$).	Restate $\mathcal{C}_{phys}$ architecture-neutrally (Gate 0), separating physics from governance, so the rulebook-minimality lemma (Lemma 2) is non-circular.

A.2 Gate-level rollout

Overall disposition. SG-1 stays **DECLARED-FROZEN** — a serious candidate, **NOT validated**, exactly as the live Register records it. Its one genuinely **DERIVED** leg is **reproducibility** (R6, once the Ro reproducer is mounted — a mechanical content-hash check that lowers no assumption floor). Everything that touches *forcedness* is weaker than derivation: two residuals reduce to a named **AXIOM-CLOSED** floor (R4 color-shelf, R7 functional-role), one is **DISCLOSED-CORRECTED** (R3), two are clean **DISCLOSED/AXIOM-CLOSED** scope items (R9, R10), and the load-bearing forcedness residuals stay **OPEN** — R1 (uncomputable wall $\rightarrow$ sharper-OPEN), R2 (bounded computation-debt), R5 (the decisive metric wall), R8 (demoted-OPEN with E un-forced). No residual terminates on a measured invariant in a way that *derives* the geometry; every chain bottoms on **spectrum-E** (given-E, never from-nothing), and the deepest forcedness chain (R5) bottoms on the **GRANULARITY** root (residue h), which is itself only AXIOM-CLOSED. **No new measured invariant is created and no anchor floor is lowered: PROMOTIONS:o.**

Anchors it depends on. SG-1 *charges* the four headline anchors $\{\mathbf{M_Pl}, \alpha_i(\mathbf{M_Z}), \mathbf{y_t}, |\mathbf{V_us}|\}$ plus the honest **~9–10 injected reals** (N_d, N_e, N_v , the δ -triple, θ_H^*) — ~13–14 reals total. It *witnesses* itself on the **frozen-object hashes** (`dcc66f1b2685 / a5b1e6f9d951`, the DERIVED reproducibility leg). The forcedness question additionally depends on the un-anchored **GRANULARITY** root (R5) and bottoms permanently on **spectrum-E** (R1/R2/R7/R8/R10). It anchors on **no new measured number** — that is precisely why the forcedness claim is selected-not-forced.

Single highest-leverage hardening move. R5 — prove or refute the granularity $\Rightarrow$ MDL metric-selection theorem (AXIOM-GRANULARITY-MDL-BRIDGE) with the geometry $\rightarrow$ observables generator map fully charged (guards G1/G2/G5). It is the one object that flips the entire ladder: it decides *forced-given-E vs merely-selected*, it resolves R4's category-fairness sub-residual and gates R2's matrix, and its honest **REFUTED-ECONOMY** outcome (the simpler 4D EFT genuinely wins) is an equally valuable discovery — never to be feared or suppressed. The **cheapest** hardening move (R6, mount the reproducer) makes the *certified* leg machine-real; the **most decisive** is R5.

Target anchor(s) for this gate

In the terminate-on (anchoring) sense, SG-1 reduces to **the observed spectrum E (the SHAPE shape-anchor)** — and to nothing else measurable. Every forcedness chain (R1/R2/R4/R7/R8/R10) bottoms on **spectrum-E**, which sits on *both* sides of the target ledger T and therefore **cancels**: SG-1 is **measured-but-irreducible** on E, never a derivation of E (**given-E $\neq$ derivation of E**). The one genuinely **DERIVED** leg, reproducibility, instead terminates on the **frozen-object hashes** (`dcc66f1b2685 / a5b1e6f9d951`) as a content-addressed self-witness, not a physics invariant. **Absolute minimality has NO witness**: it would require a *new* MDL / simplicity-metric invariant (the granularity $\Rightarrow$ MDL bridge, R5, whose deepest chain bottoms on the un-anchored **GRANULARITY** root, residue *h*) — that invariant **does not exist today and is uncomputable in its absolute form**, so the absolute- forcedness target stays **OPEN** (sharper-OPEN at best, reframed as grammar-relative forcing). The MDL-vs-dimension- first metric is **SCHEME-ANCHORED** (a number reachable only after one named, currently-unproven metric choice, R5). **No new measured invariant is created and no anchor floor is lowered: PROMOTIONS:o.**

5. References & source map

5.1 Website source-of-truth (common material — link, don't duplicate)

- **Paper I, GUT.html** — <https://physics.magflowmeters.com/articles/GUT.html>
- **§6.1** Gate-1 card (binding status: *Claimed certificate pass*); **§6.12** falsification map (Gate-1 row: *Claimed certificate pass under declared search category $\rightarrow$ Open/not claimed or Category-relative diagnostic*); **§6.13** certificate-status summary.
- **§2 / §2B** the active branch + the binding three-layer rule (authority chain $A0 \rightarrow A1 \rightarrow A2 \rightarrow A3 \rightarrow B2 \rightarrow L$); **§4** selector machinery (§4.3 two species; §4.5 selector; §4.6 Occam / completeness>minimality / "the selector pays dimensions for forcedness"; §4.9 data-use firewall); **§5.o** the six-row geometric dictionary, row 1.
- **§2.6 / line 382 / B.12 condition 7 / B2.o.3.3–B2.o.3.5** category-relativity + the standing reopen (the intended first review targets).
- **Appendix A0** frozen manifest (33 rows, meta-hash `a5b1e6f9d951`); **A1** ≥ 16 -sig-fig three-layer reconstruction; **A2** tensor/bundle/Hilbert ledger; **A3** old $\rightarrow$ new migration ledger; **B1** selector formalism; **B2** three-layer necessity (proper-subset null-space); **C1–C10** per-term necessity dossiers (failure-if-removed); **Ro** freeze certificate / reproducer; **GS** candidate datasheets + elimination

funnel (GS.2 facts F1–F3, GS.5 coset verdicts, GS.10 funnel, GS.12 N.4-completeness disclaimer);
N.4 branch-elimination archive (the SU(3)-carrier shelf).

- **Paper IV, TOE.html** — <https://physics.magflowmeters.com/articles/TOE.html> (Λ / TOE cross-reference only; does not touch SG-1).

This dossier recaps only what is needed to attack; the site controls all common material.

5.2 Corpus locations (authoritative inputs to this dossier)

Source	Path	Role
Per-gate dossier spec	.../rendered/TOE/PER_GATE_DOSSIER_SPEC.md	structure (sections 0–5)
Exact geometry anchor (anti-drift)	.../rendered/TOE/00_EXACT_GEOMETRY_ANCHOR.md	the frozen 13D object, hashes, four anchors, UV package, the discriminator
SG-1 status line	.../rendered/TOE/SCOPED_GUT_PER_GATE_STATUS_LEDGER.md	the DECLARED-FROZEN label + honest caveats (carried verbatim)
SHAPE final status (split result)	.../rendered/TOE/SHAPE_REALIZATION_RESEED_PACKET/SHAPE_FINAL_STATUS_SPLIT_RESULT.md	selected-not-forced-absolute; forcedness gradient; abelian-isotropy uniqueness; ~9–10 injected reals
SHAPE ladder + selector context	.../SHAPE_REALIZATION_RESEED_PACKET/SHAPE_LADDER_CONTEXT_WITH_SELECTOR.md	per-rung forcedness (M_4 axiom; K_6 weak link; $S^2 F_1$; $S^1 F_2$); ALL-vs-NAMED; anti-fitting↔MDL bridge
SHAPE ladder MDL verdict	.../SHAPE_REALIZATION_RESEED_PACKET/SHAPE_LADDER_MDL_VERDICT.md	CATEGORY_RELATIVE (10 LOSES / 1 FAILS / 0 REFUTED); the boxed inequality; (O1)/(O2) seams
Dimension-ladder MDL audit certificate	.../SHAPE_REALIZATION_RESEED_PACKET/DIMENSION_LADDER_MDL_AUDIT_CERTIFICATE.md	Cert 1 target ledger T (~25 reals); Cert 2 codebook; Cert 3 normal-form theorem; Cert 4 lower-bound matrix
Role-mechanism taxonomy	.../SHAPE_REALIZATION_RESEED_PACKET/ROLE_MECHANISM_TAXONOMY_POSITS.md	the declared grammar $\mathcal{G}$ (5 axes); the 13D branch as a tuple
Granularity-MDL metric target	.../SHAPE_REALIZATION_RESEED_PACKET/SHAPE_REALIZATION_GRANULARITY_METRIC_TARGET.md	the decisive R5 theorem (A/B/C, guards G1/G2/G5); REFUTED-ECONOMY as honest other-possibility
Color rung CP^2 refutation	.../SHAPE_REALIZATION_RESEED_PACKET/SHAPE_COLOR_RUNG_CP2_REFUTATION.md	CP^2 classification + $\mathbf{r}(\mathbf{r} + 1)/2$ Spin_c index; the bundle-admissibility one-move
5 sub-lemma derivation targets	.../SHAPE_REALIZATION_RESEED_PACKET/SHAPE_REALIZATION_DERIVATION_TARGETS.md	Lemmas 1–5 (Stage/Rulebook/Actors/No-Compression/No-Competitor); Gate 0 (defeat F6)

Source	Path	Role
Absolute irreducibility fork theorem	.../SHAPE_R2_CERTIFICATE_SUITE/T_SHAPE_ABSOLUTE_IRREDUCIBILITY_FORK_THEOREM.md	R1: the fork; the six missing objects; CERTIFIED-SCOPED $\neq$ CERTIFIED-ABSOLUTE
Functional-role necessity theorem	.../SHAPE_R2_CERTIFICATE_SUITE/T_SHAPE_FUNCTIONAL_ROLE_NECESSITY_THEOREM.md	R7: $\mathcal{C}_{\text{phys}} \Rightarrow$ Stage+Rulebook+Actors; the architecture-neutral floor
Closure campaign result (round 1)	.../rendered/TOE/CLOSURE_CAMPAIGN_RESULT_2026-06-24.md	A5-actor demoted to OPEN (R8); κ^3/π kill-test; AXIOM-CLOSED $\neq$ proven; the SCALE-firewall circularity precedent
Closure campaign round 2	.../rendered/TOE/CLOSURE_CAMPAIGN_ROUND2_2026-06-24.md	demotion discipline; RELABEL_FAIL examples; default-to-conservative rule
GUT manuscript	.../rendered/GUT/GUT.md	§6.1 (Gate-1 card, ~L1961); §2/§2B (active branch + three-layer rule); §4 (selector); A0/A1/A2/A3/B2/C/R0; §2.6 + line 382 (category-relativity)

5.3 Frozen-object hash index (load-bearing; READ-ONLY)

Branch content dcc66f1b2685 · manifest meta a5b1e6f9d951 (AO, 33 rows) · stage primitives

$K_6 = SU(3)/T^2, S^2, S_Y^1/Z_2$ (R1.2) · orbifold freeze R1.3 ac4d2df3e708 · F^+ chamber + projectors (R1.4 + R1.6) · UV package $M_U \sim 10^{16}$ GeV, $R_0 = 1.592 \times 10^{-17} \text{ GeV}^{-1}$, threshold

$\delta = (+4.8424, -3.1112, -1.7313) \pm 1.6 \times 10^{-3}$ · family index $\chi(K_6, E) = -3$. **The four anchors**

$\{M_{\text{PI}}, \alpha_i(M_Z), y_t, |V_{us}|\}$ are DECLARED (free inputs), not frozen-derived; the ~9–10 injected reals ($N_d, N_e, N_\nu, \delta\text{-triple}, \theta_H^*, \dots$) are the honest additional charged cost.

Closing honest statement

SG-1 is **DECLARED-FROZEN**. Its genuine, defensible content is real and strong: a **fully specified, layer-complete, reproducible three-layer object** — $\mathfrak{B}_{\text{active}}$ frozen as content hash dcc66f1b2685 / meta-hash a5b1e6f9d951, with no-layer-smuggling (B2), term-level load-bearing (C1–C10), and an RO reproducer regenerating every hash; the weak ($S^2, F1$) and hypercharge ($S_Y^1/Z_2, F2$) carriers **forced within the grammar**; the color carrier **clean by an architecture-neutral theorem** (abelian-isotropy uniqueness — and the one cheaper competitor, CP^2 , was *built end-to-end and BREAKS* at Gate 2). Its honest open surface is equally clear: the gate is a **freeze certificate, NOT a derivation and NOT a uniqueness theorem**; minimality is **selector-minimal, category-relative ONLY**; **absolute irreducibility is OPEN** (Kolmogorov-uncomputable) and the gate **bottoms on E**; the **dimension-ladder lower-bound matrix** is a survey, not a certified classification; the **search category + the**

SU(3)-shelf completeness (N.4) are the corpus's own intended review targets; the honest charged cost is **~13–14 reals (4 anchors + 9–10 injected)**, not the "4-in" headline; and the **MDL metric** under which 13D wins is itself **unproven** against the dimension-first alternative (under which a 4D EFT wins and the ladder folds). The attack plan reduces these to named, target-blind axioms and two bounded falsifiable theorems — the role-mechanism normal-form classification (R2) and the granularity $\Rightarrow$ MDL metric-selection theorem (R5) — with the κ^3/π kill-test and the G1/G2 metric-not-target-loaded guards in force so a target-loaded or reverse-engineered 13D win cannot be banked. The realistic ceiling is a machine-verified reproducer over a named axiom floor + an architecture-neutral color-carrier theorem, with absolute forcedness reframed as grammar-relative forcing — **not** a promotion; a **REFUTED-ECONOMY** (the simpler 4D realization is the correct one) remains a live, honest, equally valuable outcome. **PROMOTIONS: o; frozen branch** `dcc66f1b2685 / a5b1e6f9d951` **READ-ONLY; given-E $\neq$ derivation of E; selection $\neq$ derivation; category-relative $\neq$ absolute; nothing applied, nothing deployed.**

Dossier built 2026-06-24. Our geometry (13D K6 branch) only. Common material referenced to the published website source-of-truth, not duplicated.