DATED HISTORY

Where We Are · July 5, 2026: A Status Assessment of the QATNU/SRQID Program

Original title · Where We Are: A Status Assessment of the QATNU SRQID Program

July 5 status assessment. Its chronology predates the July tensor obstructions and the November repaired clock holdout.

Manuscript · p. 1, July 5 status date

Restricted five-soft-mode theorem

Evidence · QATNU/SRQID dated scientific review / Finite-range symplectic-axis audit

Where We Are:
A Status Assessment of the QATNU/SRQID Program

QATNU/SRQID Working Notes

Status date: 5 July 2026

(repo evidence through 8 June 2026 branch head; indexed sibling-branch evidence through 13 June; curated artifacts through 3 July; local audit probes 4 July)

Abstract

This is an internal status assessment, not a discovery announcement. It answers one question: after roughly a year of construction, numerics, exact algebra, and no-go results, what does the QATNU/SRQID program actually establish, and what does it not? We separate results by evidentiary status — exact operator identities, reproducible finite-register numerics, structural theorems, negative/no-go results, and open targets — so that claim-era language does not collapse into one over-strong story. The honest one-line summary: *QATNU-compatible finite registers realize exact quantum-link algebras, autonomous bosonic boundary dynamics, and several exact tensor-gauge kinematic structures, but they do not yet establish spontaneous emergence of electromagnetism or gravity from the minimal QATNU Hamiltonian.* The most externally visible product of the program to date — the autonomous quantum shutter manuscript, now posted to the viXra preprint archive — is a clean instance of exactly this pattern: a fully reproducible, strong finite model of controlled vacuum boundary physics that is honest about being Dynamical-Casimir-like rather than a derivation of emergent fields.

1 Purpose and framing

The QATNU (Quantum Autonomous Tensor-Network Universe) / SRQID (Self-Referential Quantum Information Dynamics) program set out to test a specific, ambitious hypothesis: that geometry, and eventually gauge and gravitational fields, can *emerge* from a measurement-free promotion ladder acting on a finite register of matter and bond degrees of freedom. The organizing kinematic statement is Postulate 1, a constitutive law for local clock rates,

$$\omega_{\text{eff}}^{(i)} \;=\; \frac{\omega}{1+\alpha\,\Lambda_i}, \tag{1}$$

with Λ_i an entanglement proxy read from the logarithmic bond-depth profile of the SRQID Hamiltonian and α a linear-response susceptibility. The program's stated self-assessment from the outset was modest in the right way: SRQID/QATNU is presented "not as a completed theory of quantum gravity but as a concrete, falsifiable testbed that sits at the intersection of quantum information, tensor-network-inspired dynamics, and emergent geometry."

This document takes that framing seriously and audits it. The value here is not a new result; it is an honest ledger. Every quantitative claim below is tagged with its evidentiary status using the legend the program itself adopted (Table 1).

Status	Meaning
Exact algebra	Verified symbolic or finite-dimensional operator identity.
Theorem	Paper-level analytic result within stated hypotheses.
Strong finite model	Reproducible finite-regulator physics; not a continuum/emergence theorem.
Construction	Valid compatibility or embedding; mechanism supplied by assumptions.
Negative/no-go	Refutes a specific mechanism or class, not all routes.
Imposed scaling	Numerics reproduce scaling put into the ansatz.
Open target	Mechanism is coherent but not demonstrated in a full native model.

Table 1: Claim-strength legend, carried verbatim from the program's theory status map.

2 The executive baseline

The single most important sentence in the program right now is the corrected baseline. It is worth stating without hedging or inflation:

> *QATNU-compatible finite registers can realize exact quantum-link algebras, autonomous bosonic boundary dynamics, and several exact tensor-gauge kinematic structures. They do not yet establish spontaneous emergence of electromagnetism or gravity from the original minimal QATNU Hamiltonian. The strongest tensor result is structural: exact local linear tensor gauge symmetry forbids a mass and admits a two-polarization Einstein tangent kernel, but the tested fixed-dimensional compact 3D clock/CSS realization generically gives higher-derivative dynamics rather than a relativistic helicity-2 phase. A constrained noncompact auxiliary parent gives the clean $z = 1$ target; a bounded deconfined finite-register realization remains open.*

Everything else in this assessment is commentary on how each clause of that baseline is earned.

3 The evidentiary ledger

Table 2 is the core of this document: the program's active research lines, each with what currently survives scrutiny and what does not. It is deliberately symmetric — the right-hand column is as important as the middle one.

Table 2: Research-line ledger. Middle column: what survives. Right column: what does not yet survive.

Line	Status	What survives	What does not yet survive
Autonomous shutter	Strong finite model + exact identities	Exact open/closed quadratic Hamiltonian identity; autonomous controller/backreaction simulations; local/global separation; archived submission manuscript + reproducibility code.	It is scalar/bosonic Dynamical-Casimir-like boundary physics, *not* a derivation of EM or gravity.

Table 2, continued

Line	Status	What survives	What does not yet survive
Paired-ladder U(1) quantum link	Exact construction / compatibility	Schwinger/rishon quantum-link algebra, Gauss sectors, plaquette controller, Maxwell-kernel diagnostics, Coulomb Green function.	Maxwell modes and Coulomb response are built in at harmonic-rotor level; the novelty is embedding/compatibility, not unexpected photon emergence.
Exact tensor no-mass theorem	Exact structural result	Analytic local quadratic tensor kernel with exact linearized gauge invariance forbids a local mass; degree-two ansatz yields the linearized Einstein tangent kernel.	Requires a scalar constraint for stability; not yet a bounded finite-register dynamical phase.
Compact CSS/clock 3D tensor code	Negative/no-go (tested class)	Corrected local logicals have cubic symplectic pairing.	Generic positive compact centralizer dynamics gives $\omega \sim k^3$, not relativistic $z = 1$; does not exclude non-CSS algebras, first-order/Berry, normalizer, or Floquet/QCA routes.
Auxiliary Schur/Palatini parent	Exact constrained success; generic 3D still obstructed	Noncompact constrained auxiliary parent yields the Einstein kernel as a Schur complement and two $z = 1$ TT branches after a scalar constraint; bounded/Villain axis reduction is positive.	Positive smooth compact-character Hamiltonians revert to higher-derivative dynamics; a generic 3D bounded realization is not established. Radius-2 logicals show deficient pairing (Z/X dims 12/14, quotient rank 9, radicals 3/5).
v4.1 compact spin-2 carrier	Mixed: harmonic target positive, finite-spin scaling not closed	Full compact tensor/matter harmonic symbol positive: W=16, two low TT branches at every sampled k, $z_1/z_2 \approx 0.9999995$, $\chi \approx k^{-1.997}$.	Reduced finite-spin ED/Lanczos is not a thermodynamic proof: J=1, L=3–5 fits give matter-pole exponent 0.354 and a χ^2-proxy exponent -0.681, not clean z=1, $\chi \sim k^{-2}$.

Table 2, continued

Line	Status	What survives	What does not yet survive
Dressed-sector / band projector	Bounded-positive mechanism, not full gauge phase	Exact-symmetry parent + independent local perturbation yields a separated defect-band projector with volume-uniform exponential tails: parent commutator 0, defect gap ≈ 0.363, localization length ≈ 0.489; bare defect weight 1.1×10^{-2} driven to dressed 7×10^{-18}; Ward residual 8.6×10^{-2} to 6×10^{-16}.	Supports a dressed band-projector in a low-excitation parent, *not* a full set of independently conserved dressed local generators, a non-Abelian gauge phase, covariant spin-2 gravity, or emergence from the minimal substrate.
Normalizer first-order carrier	Exact carrier + sampled activity; denominator gate interval-certified, rest sampled	Exact first-order antisymmetric Laurent/masslessness carrier E (4838×498, rank 461, nullity 37), $E \cdot N = 0$ exact; sampled directions all linear-like (power ≈ 0.99994); min $\lvert\lambda\rvert/\lvert k\rvert \approx 0.110$ over 5000 samples. *Update (5 Jul):* parallel-transport and a fixed 12D ambient projector $P(k)(-iA(k))P(k)$ now close all 6/6 sampled Weyl boxes at every scale (min ambient lower bound 0.0887; four nonzero physical eigenlines at box centers).	Still sampled floating-point, *not* interval arithmetic or a formal proof: does not prove all-k positivity, source visibility, a microscopic symplectic Hamiltonian, spin-2 emergence, or QATNU. *Later 5 Jul:* the Gram *denominator* is now interval-certified nonzero on all 36 boxes (min certified bound 4.30×10^{-6}, Python interval not Lean); a follow-up radius audit then found the naive global projector-norm bound too loose (47.6× the sampled motion) — a measured dead end. Remaining enclosures ($G^{-1}C$, P, PHP, Weyl radius) need cancellation-aware bounds and are still open.
Postulate 1 robustness / k_0 / transfer	Mixed: conditional clock signal, global robustness fails	Locked $N4$ path holdout passes; all 30 March path-control rows pass; refined $N{=}5$ star-window drift bounded (0.15 for κ, 0.05 for δB); compact $k_0{=}2$–6 keeps $N4$ path pass-stable.	Global robustness blocked: hotspot variation gives λ_{revival} span 0.911; broad grid spans $\lambda_{c1}{=}0.625$, mean residual 0.223; star topology fails 0 of 5, and all 30 March star variants fail the scenario gate.

Table 2, continued

Line	Status	What survives	What does not yet survive
Finite-penalty bare constraint restoration	Negative (generic bare restoration)	Establishes that generic local breaking leaves finite bare leakage floors — a real constraint on naive finite-penalty emergence.	Does not rule out a quasi-local *dressed* constraint phase (see dressed-projector line).
Phase-2G/P hardware-QMC campaign	Negative/no-go (tested bond-ladder mechanisms)	Scalar-neutral source tooling, Ward/channel diagnostics, transverse-pair replacement, minimal constraint-route test.	Instruments consistently find TT decoration or flat equipartition, not infrared TT organization; does not rule out nonlocal collective terms or the scalar/timing sector.

Two structural reads of this ledger matter. First, **the exact-algebra and theorem-status lines are genuinely solid** — the quantum-link algebra, the tensor no-mass theorem, the auxiliary-parent Schur reduction, and the normalizer carrier are real, checkable mathematics. Second, **every line that reaches toward *emergence* — dynamical $z = 1$ gravity, spontaneous gauge fields — currently sits at "open target" or "no-go for the tested class."** The gap between exact kinematics and emergent dynamics is the whole open problem, and the ledger names it precisely rather than papering over it.

4 The autonomous shutter: the program's clean public instance

The autonomous quantum shutter manuscript is the program's most complete, most externally legible artifact, and it is worth understanding *why* it is the piece that reached a public preprint while the gravity claims did not. The shutter is a finite register that autonomously gates one local edge–edge bilinear in a truncated-boson lattice. Opening the gate changes the positive-frequency structure; old and new mode operators are related by a Bogoliubov transformation with an anomalous (pairing) block. That block converts vacuum into real excitations — the same mechanism as the Dynamical Casimir Effect (DCE) and analogue Hawking radiation, but driven here by an *internal quantum controller* rather than a classically prescribed boundary motion.

4.1 What it establishes (verified, reproducible)

- **Exact identity.** The open/closed quadratic Hamiltonian identity is exact algebra, not a fit.
- **Controller–field entanglement.** An incident packet produces strong controller–field entanglement (0.697 nats) where the vacuum produces essentially none (0.0059 nats) — a $\sim$118$\times$ separation.
- **Autonomy is real.** Packet-minus-vacuum occupation cleanly separates static-closed, autonomous, and static-open cases; conditioning the field on the controller sector resolves reflected and transmitted branches.
- **Quantum-to-classical limit.** Excess vacuum excitation above the prescribed switch scales as $\langle N \rangle \propto M^{-1.005}$ ($R^2 = 0.99995$): the autonomous controller recovers the classical switch as its size M grows.

- **Numerics validated.** The symmetric TEBD transmission error is proportional to Δt^2 ($R^2 = 0.9999996$), and a separate sparse-vs-TEBD calculation shows the same second-order scaling.

4.2 What it does not establish

The shutter is scalar/bosonic DCE-like boundary physics. It is not a derivation of electromagnetism or gravity, and the manuscript's own baseline says so: finite registers "do not yet establish spontaneous emergence of EM or gravity." This calibration is exactly right against the analogue-gravity literature, which has repeatedly had to separate genuine emission from analog artifacts (e.g. phonon-background vs. analogue-Hawking discrimination in Bose–Einstein condensates).

4.3 Where it sits in the literature

The shutter's defensible novelty is a *combination*, not a new effect: an autonomous internal quantum controller driving a Bogoliubov opening on a truncated-boson lattice, with a matter-clock embedding, validated by standard TEBD numerics. Its natural citations are the DCE line (superconducting-circuit DCE; DCE-entangled artificial atoms), the autonomous-clock line (thermodynamic limits on autonomous quantum clocks), and the Bogoliubov-vacuum entanglement result that is the theoretical root of its entanglement panel. The QFT-simulation methodology (Schwinger-model pair production on quantum hardware) grounds its numerics lineage.

4.4 Reproducibility status — an honest caveat

The shutter reproducibility bundle regenerates *every data panel and every headline number* from raw inputs (verified by re-execution). It does *not* contain the last-mile script that assembles those loose panels into the six multi-panel composite figures the manuscript actually embeds, and Figure 1 is a hand-drawn schematic with no data behind it. The claim "run `make_figures.py` and you get the manuscript's figures" is therefore true at the level of *panels and data* but not at the level of *composite assembly*. This gap is documented and is straightforward to close; it does not affect any scientific claim, only turnkey figure regeneration.

4.5 Publication status

The manuscript has been posted to the viXra preprint archive (Quantum Physics). viXra is an open, non-refereed archive; posting establishes a timestamped public record, not peer review. The document is internally consistent, correctly formatted, and self-contained (the PDF embeds all figures independently of the code bundle).

5 What would move the needle

The program's open problems are sharp and, encouragingly, *testable*. In rough order of leverage:

1. **A bounded deconfined finite-register realization of the $z = 1$ tensor phase.** The auxiliary noncompact parent already gives the clean Einstein kernel and two $z = 1$ TT branches; the missing step is a *bounded* finite-register Hamiltonian that keeps those branches without reverting to $\omega \sim k^3$. This is the single highest-value target.
2. **A thermodynamic (not fixed-L) demonstration of the compact spin-2 carrier.** The harmonic symbol is positive with the right two TT branches; the finite-spin ED fits (z-exponent 0.354 rather than 1) are not yet a continuum proof. A transfer-matrix or QMC dynamic structure factor, or a larger hard-constraint finite-spin simulation, would settle it.

3. **Promoting the normalizer first-order carrier from sampled to certified.** The carrier is exact ($E \cdot N = 0$); all-k positivity and source visibility are currently only sampled. *Progress (5 Jul 2026):* the parallel-transport fork this document recommended has now been executed on a sibling branch — a polar/Procrustes transport and, more cleanly, a fixed 12D ambient projector $P(k)(-iA(k))P(k)$ both close all six sampled Weyl boxes at every scale, reducing the whole problem to a single fixed-coordinate object (emitted as `qatnu.ambient_projector_obligation.v0`, 36 obligations). Later the same day the first interval sub-step landed: the Gram *denominator* $G(k)=C(k)C(k)^*$ is now interval-certified nonzero on all 36 boxes (min bound 4.30×10^{-6}), closing the gate that must hold before G^{-1} can be formed. A third audit then ruled out the naive shortcut: a global projector-norm/radius bound is finite but 47.6× too loose for the Weyl margin, so it is a measured dead end rather than a viable route. The remaining steps are genuinely narrow and named, and now must be *cancellation-aware*: interval-enclose $G^{-1}C$ with box-adaptive denominator tracking, then $P = I - C^*G^{-1}C$, then the projected generator $P(k)(-iA(k))P(k)$, and only then prove the Weyl operator radius sits below each box's required radius (finally replaying the block bound in Lean). That last stretch — carrying sharp interval arithmetic all the way through PHP rather than only the denominator — is what would upgrade this line from "proof-obligation artifact" to "theorem." *Update (later 5 Jul, snapshot `9ca23ed`):* the cancellation-aware route was carried through — a composed named-box certificate now interval-certifies an operator eigen-floor ($\min|\lambda| \geq 8.89 \times 10^{-4}$), a source rank-4 bound ($q_\perp \geq 9.02 \times 10^{-5}$), and a residue lower bound of exactly 1 on all 36 boxes, and a first Lean 4 project replays a partial arithmetic slice (779/179006 cells) while formally recording `leanChecked = false`. See the Addendum for the full reading; the line remains an open target, with the two remaining rungs (a real Lean replay of the eight frozen obligations, and all-k coverage beyond the named boxes) now the entire distance to "theorem."
4. **A dressed local Gauss/tensor generator set.** The dressed band-projector shows a low-excitation parent can carry an exponentially localized defect band; the open question is whether a *complete, independently conserved* set of dressed local generators exists — the difference between a suggestive mechanism and a genuine emergent gauge phase.
5. **Closing the Postulate 1 robustness gap.** The clock-slowing signal is real on the locked $N4$ path but fails global robustness (star topology 0/5; large hotspot-driven λ_{revival} spread). Either a mechanism that stabilizes the signal across topologies, or an honest restriction of the claim to the path class, is needed.

6 What this program is, and is not

Is: a disciplined testbed that has produced real exact algebra (quantum-link constructions, the tensor no-mass theorem, the auxiliary-parent Schur reduction), a genuinely reproducible strong finite model of autonomous vacuum boundary physics (the shutter), and an unusually honest ledger of no-go results that constrain the naive versions of its own ambitions.

Is not: a derivation of emergent electromagnetism or gravity. No line in the ledger currently reaches dynamical $z = 1$ gravity or spontaneous gauge-field emergence from the minimal QATNU substrate. The compact CSS realization is a no-go for its tested class; the positive results are either exact-but-kinematic or numerically-suggestive-but-not-thermodynamic.

The distance between those two paragraphs is the program. Naming it precisely — rather than collapsing it into a single triumphant or dismissive story — is the point of this assessment, and it is the same discipline that kept the shutter manuscript's claims defensible enough to stand as a public preprint.

Addendum — 5 July 2026: normalizer certificate progress

After this assessment was first drafted, a sibling working branch advanced the normalizer first-order carrier line (open target #3 above) through five commits, all on the certificate-construction problem this document had flagged as the next fork. The substantive result: the naive moving-basis Weyl/operator-norm certificate that previously closed only 2/6 sampled k-boxes (and did not improve under uniform refinement) was correctly diagnosed as a *coordinate* artifact. Two sharper coordinate objects now close all sampled obligations:

- A polar/Procrustes **parallel-transport** alignment of each point's physical basis to the box-center basis: 6/6 boxes positive at all six scales, minimum transported lower bound 0.0910, minimum overlap singular value 0.998.
- A **fixed 12D ambient projector** $P(k)(-iA(k))P(k)$: 6/6 boxes positive at all scales, minimum ambient lower bound 0.0887, maximum projector radius 0.0611, four nonzero physical eigenlines at box centers.

Both are recorded as formal pipeline targets (`qatnu.parallel_transport_obligation.v0` and `qatnu.ambient_projector_obligation.v0`, 36 box/scale obligations each), with the exact Laurent projector input $C(z)$, $G(z)=C(z)C(z)^*$ emitted and a sampled Gram precondition (Gram rank 8, maximum projector-formula error 1.4×10^{-11}).

What this does and does not change. It does *not* move the line from "open target" to "certified." The branch's own verdict is explicit: `ambient_projector_sampled_weyl_obligations_close` is "sampled floating-point evidence for a fixed-ambient certificate object, not interval arithmetic or a formal proof," and it still does not establish all-k positivity, source visibility, a microscopic Hamiltonian realization, spin-2 emergence, or QATNU. What it *does* change is the shape of the remaining work: the open problem has narrowed from "find a coordinate object whose continuum certificate closes" to "interval-enclose one specific, already-identified fixed object." That is a real and welcome narrowing of open target #3 — and, fittingly, it is the three-step discipline of this whole program in miniature: imagine the certificate, find the most reasonable coordinate in which it could hold, then attack that coordinate honestly and report exactly how far the margin is still only sampled.

Later the same day (interval certificate lands). Within hours of the sampled result above, the branch produced the *first genuine interval-arithmetic* step in this chain: a denominator-only certificate for the Gram object $G(k)=C(k)C(k)^*$. Using the analytic bound $\lambda_{\min}(CC^*) \geq q_{\min}(\text{box})/21$ with $q(k)=\sum_j |1-e^{-ik_j}|^2$, it certifies a conservative *nonzero* lower bound on G over all 36 boxes — zero failed labels, minimum certified Gram lower bound 4.30×10^{-6} (certificate hash `40d07730...`). This is interval arithmetic, not sampling: it closes the "is the denominator provably nonzero" gate that must hold before G^{-1} can even be formed. It is equally explicit about its own ceiling — the recorded status is `python_interval_certificate_not_lean`, and it certifies *only* the denominator: not $P(k)$ entry enclosures, not $P(k)(-iA(k))P(k)$ positivity, not source residues, not a Lean proof, and nothing about spin-2 or QATNU. So the line still does not move to "certified" — but the leading sub-step of open target #3 has, for the first time, gone from sampled to interval-proven. The four remaining interval obligations are now named exactly: enclose $G^{-1}C$, enclose $P = I - C^*G^{-1}C$, enclose the projected generator PHP for the rational candidate, and prove the Weyl operator radius sits below each box's required radius (then replay the trace/divergence block bound in Lean).

And a clean negative (the naive radius route fails). The very next audit tested the most direct way to get the Weyl margin — a global projector-norm/radius bound built on the certified denominator — and honestly recorded that it does *not* work as a proof method. The enclosure exists and is finite on all 36 boxes, but it is far too loose: maximum certified projector radius 1.0 against a sampled projector motion of only 0.061, a worst-case certified/sampled ratio of 47.6 (audit hash `d82e38d1...`, verdict `projector_radius_enclosure_exists_but_is_too_loose_for_ambient_weyl_certificate`). This is worth stating plainly because it is the discipline working as intended: a plausible shortcut was tried, measured, and rejected rather than quietly dropped. The recorded consequence is a sharper next move, not a retreat — the global Lipschitz bound is abandoned in favor of cancellation-aware enclosures for $G^{-1}C$ and P with box-adaptive denominator tracking, and only *then* an attempt at the PHP operator radius against the Weyl margin. Net truth-state after three 5-July audits: the denominator gate is interval-passed, the naive radius gate is a measured dead end, and the line remains an open target with a correspondingly sharper — and honestly narrower — remaining problem.

Later still (the cancellation-aware certificates land, and a Lean project appears). The branch did not stop at the denominator gate. Over a further run of commits it built the cancellation-aware objects the radius audit had called for, and reached a *composed named-box certificate* that stands as the current frontier of open target #3. Read from the archived snapshot (tag `9ca23ed`, 5 July 18:35 UTC), the composed certificate (`FIRST_ORDER_BERRY_NAMED_BOX_CERTIFICATE`) records, over all 36 named boxes with zero failed labels:

- a reduced 4D **operator eigen-floor**, minimum certified $\min|\lambda|$ lower bound 8.8881×10^{-4} — obtained only after an exact 2×2 block cancellation collapsed the numerator ($3778 \to 48$ terms) that had made an earlier attempt conditioning-limited;
- a **source-chart rank-4** certificate, minimum $q_\perp$ lower bound 9.02×10^{-5}, establishing the source projector is full-rank on the four-dimensional physical kernel;
- a **source-residue** lower bound of exactly 1, which follows as a rank corollary (rank-4 in a 4D kernel ⇒ the source projector is the identity there), giving 2 positive source-visible physical eigenlines per box.

These are SHA-pinned and composed into one artifact whose verdict is `first_order_berry_named_boxes_certified`, status `python_composed_certificate_not_lean_named_boxes_only`. This is the strongest the normalizer line has ever been: genuine interval arithmetic (not sampling) for a floor, a rank, and a residue, tied together on the named box cover.

And — for the first time — a Lean 4 project. The snapshot ships an actual `lakefile.lean` with seven modules under `Qatnu/`. I audited every one: they compile with *zero* `sorry`, `axiom`, or `admit`. It would be easy, and wrong, to read that as "the certificate is now a formal theorem." What the Lean layer actually checks is three tiers, and it is scrupulous about the boundary between them. *(i) Real arithmetic, partially replayed:* `SparseRational.lean` defines exact $\mathbb{Q}$-valued sparse matrices with a genuine fold-based product, and the compressed carrier-product fixture proves specific product entries by `native_decide/rfl` and proves the compressed fixture equals the legacy one — but the replay is a *slice*: 779/179006 product cells (19/4366 reduced), row prefix $0 \ldots 20$, and the module has already tripped its own 20,000-line warning with recorded decision `switch_to_compressed_replay_before_more_row_dumping`. *(ii) Consistency theorems:* hash- and count-equalities binding the eigen-floor, source-rank, residue, and chart-determinant certificates together (e.g. `source_rank_fills_physical_kernel`: `certifiedSourceRank` = `physicalKernelDimension`, i.e. 4=4, and `residue_lower_bound_is_exactly_one`). *(iii) Boundary theorems that machine-check the project's own incompleteness:* `replay_not_checked_in_lean`: `leanChecked` = `false`, `replay_packet_status_is_unchecked`: status = `lean_replay_packet_not_checked`, `replay_boundary_not_qatnu_proof`, and `replay_boundary_not_spin2_emergence`. The eight substantive obligations of the named-box certificate — `carrier_rank_nullity`, `rational_generator_in_carrier`, `operator_floor_named_boxes`, `source_rank_named_boxes`, `source_residue_identity`, `named_box_two_visible_lines`, and the two boundary/denominator obligations — are each frozen in the replay packet as `not_checked`. So the honest state is: the Lean project is real, it checks a partial arithmetic slice plus the certificate's internal bookkeeping, and it *proves as theorems that it has not yet checked the mathematics the Python certificate asserts.* An agent manufacturing a proof narrative does not write `leanChecked = false` and check it.

Net truth-state, and where this is heading. Open target #3 has moved further in five days than in the preceding weeks, and every step is legible. The trajectory is one direction: *sampled floating-point* (2/6, then 6/6 boxes) → *interval denominator gate* (4.30×10^{-6}) → a measured *clean negative* that killed the naive global-radius shortcut → *cancellation-aware interval certificates* for a floor, a rank, and a residue, composed on 36 boxes → a *real Lean project* that replays a slice of the arithmetic and formally records what it has not yet done. Two rungs remain before "certified" could be written without an asterisk, and the program has already named both: *(a)* replay the eight frozen obligations in Lean for real — not their hashes, the mathematics (the packet's own next action is `replay_named_box_certificate_in_Lean`, and the compressed-fixture line is the chosen route to it); and *(b)* extend or refine the 36-box cover toward an angular-complete / all-k statement (`extend_or_refine_momentum_box_cover_before_global_claim`). Above those two sit the claims this document has flagged as untouched from the start — a microscopic source Hamiltonian, spin-2 emergence, QATNU — and nothing in this snapshot moves them. My read: the direction of travel is genuine and the discipline is holding under its own weight, precisely because the failures (the conditioning-limited numerator, the too-loose radius bound, the line-count wall) are recorded as artifacts rather than smoothed

over. But direction is not arrival. The line stays exactly where the ledger puts it: an *open target*, now with the narrowest and most explicitly named remaining gap it has ever had.

Provenance. Every quantitative value in this document is drawn from the program's own theory status map (status date 4 July 2026) and the archived audit `RESULTS` files, cross-checked against the shutter reproducibility bundle (all inner archives checksum-verified; `make_figures.py` re-executed to exit 0). The 5 July addendum values are read directly from the sibling-branch status-map diff, the ambient-projector audit, the `ambient_projector_gram_interval_certificate` certificate file, and the `ambient_projector_radius_bound_audit` record. This is an internal status assessment intended to be read alongside, not in place of, the primary manuscripts and audit records.