Where physical law needs magic: locating and typing the quantum load of a gravitational-witness battery

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(Dated: August 28, 2026)

A battery of structural results about constrained (linearized-gravity-shaped) systems, boundary completeness of the algebra, closed-universe triviality, observer repair, a clock–boundary isomorphism, self-reading emptiness, charge walls with an exact crossing price, a capacity deficit, clock necessity, and a Diophantine timing floor, was previously established on exact finite lattices with quantum mechanics in the engine room. We ask, and answer at certificate grade, a question that battery could not answer about itself: which of those results ever *needed* quantum mechanics? Three computations, one arc. (1) The battery is re-run, kernel by kernel, over two registered classical model classes (a simplex/GPT model and a Koopman–von Neumann model with commutative readout). The quantum load localizes to exactly two carriers, the payload *read* of a written boundary record (a coherence rotation), and the *irrational spectral gaps* behind the timing floor, while the kernel-, counting-, and arithmetic-carried content persists classically, one central forecast of ours dying honestly on the way (self-reading emptiness did not need quantum mechanics: the classical cells are empty too, re-carried by an exact all-negative discriminant census). (2) Both carriers are typed at the sharpest available classical boundary: the epistricted / nonnegative discrete-Wigner sector at odd prime (Gross), on registered analogue cells at $p = 3$ with exact faithfulness gates. Both return NEGATIVITY-REQUIRED, non-membership in the nonnegative, stabilizer-reachable sector, never "no nonnegative model exists" and never "not simulable", with the negativity exactly *located*: write-channel kernel entries exactly $-2/9$ under both label identifications, and an exact-algebraic negative entry $-(2381/153596547)\sqrt{5688761}$ in the effective readout's eigenstructure; the floor's in-class dynamics is confined to root-of-unity spectra while the analogue frequency module leaves $\mathbb{Q}$ at every registered coupling, the committed rational-escape point closing at $p = 3$ against our own forecast. (3) The bridge to the physical side: the gravitationally mediated two-qubit gate of the entanglement-witness proposals, $(P_1(a) \otimes P_2(b))\, CZ(\Delta)$ with $\Delta = -211/672$ at the committed geometry, is certified non-Clifford away from the exact exception set $\Delta \in \pi\mathbb{Z}$, the strict (locals-included) exception set being an explicit arithmetic K-ladder on each registered shape family; on the registered analogue cells its negativity sits at the same write-channel/controlled-Weyl locus as the first carrier (species 1, by the profile door, both identifications); the two located species are *mutually non-interconvertible* within the registered operation class, a two-sided wall, found refutation-first against our own one-way-valve forecast, and the same physical family is beyond-matchgate on a *different* exception set ($2\pi\mathbb{Z}$) than its Clifford set ($\pi\mathbb{Z}$). All verdicts are exact-arithmetic, deterministic, and doubly adversarially verified; scope is the registered model classes and analogue cells, never the continuum.

I. INTRODUCTION

Quantum mechanics is usually asked to prove that it is *needed* in one place at a time: a Bell inequality here, a contextuality proof there, a metrological separation elsewhere. This paper asks the question of a whole body of physical-law-shaped results at once, and then pushes the answer two levels deeper.

The body in question is a battery of exact structural theorems about constrained lattice systems built to mirror the constraint structure of linearized gravity, developed in companion work [3–6]: completeness of the boundary algebra and its migration under charge routing; a capacity deficit pinned to the number of frozen directions; constraint-role triviality of closed universes; the repair of an internal observer's algebra by relational conditioning; an isomorphism between boundary data and clock data; the emptiness of self-reading configurations; no-crossing walls for charge transport with an exact crossing price; the necessity of a clock register for evolution; and a Diophantine floor on timing accuracy sourced by irrational spectral gaps. Each of these was proved with quantum mechanics in the engine room, finite-dimensional Hilbert spaces, exact integer and rational arithmetic, machine-verified certificates. None of the proofs, however, says whether quantum mechanics was *load-bearing* or merely *ambient*: whether the law is a property of the constraint structure itself, available to a classical theory with the same kernels, or a genuinely quantum effect.

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We answer in three computations that form one arc.

First, the classical shadow (Sec. II). The entire battery is re-run over two registered classical model classes on the same committed kernels: a simplex (GPT-classical) model S, with states in $\Delta(X)$, commutative observables, and two registered dynamics rules; and a Koopman–von Neumann model K, with the committed Hilbert space and generator but readout restricted to the multiplication algebra, every verdict probed under diagonal dephasing (pinching). The result is a classification of the corpus by *carrier*, not by item: the kernel-, counting-, and arithmetic-carried content never needed quantum mechanics; the quantum load localizes to exactly two carriers, the *payload read* (a coherence rotation, the amplitude-level face of Born squaring) and the *irrational spectral gaps* of the non-diagonal committed generator. One of our own central forecasts died on the way, and we report it first where it belongs (Sec. II D): the self-reading emptiness law, which we predicted to be quantum, is reproduced classically at every backreacting placement, re-carried by an exact all-negative discriminant census.

Second, the typing (Secs. III and IV). "Not classical" is cheap; the sharpest available boundary is not bare classicality but the best epistemic restriction of classical ontic states, the epistricted sector of Spekkens' quasi-quantization [9], which at odd prime dimension coincides with the nonnegative sector of Gross's discrete Wigner function and with the stabilizer subtheory [8, 10]. Both located carriers are adjudicated against this boundary on registered odd-prime analogue cells ($p = 3$ the instrument of record, $p = 5$ corroboration), behind exact faithfulness gates that transport the committed structure verbatim. Both return NEGATIVITY-REQUIRED in a precisely delimited sense (Definition 1): the carrier protocol class has no realization inside the nonnegative sector, with the negativity exactly located, for the read, at the write channel (kernel entries exactly $-2/9$ under both registered label identifications) and at the effective readout's eigenstructure (an exact algebraic entry $-(2381/153596547)\sqrt{5688761}$); for the floor, in the off-circle spectrum that no in-class dynamics can reach (root-of-unity confinement theorem plus an irreducible-sextic frequency-module certificate at every registered coupling). The one rational-escape point the committed ($p = 2$) family possesses closes at $p = 3$, against our own registered forecast, and we again lead with the refutation (Sec. IV B).

Third, the physical bridge (Sec. V). The gravitational entanglement-witness proposals of Bose et al. and Marletto–Vedral [1, 2] are built around a single mediated two-qubit gate. We type that gate at certificate grade: its nonlocal Clifford-exception set is exactly $\Delta \in \pi\mathbb{Z}$, its strict exception set is an explicit arithmetic K-ladder on each registered shape family, and at the committed operating point it lies outside the Clifford group's local-unitary orbit with exact monotone floors. On the registered odd-prime analogue cells, the gate analogue's negativity is located at the *same* write-channel/controlled-Weyl locus as the first battery carrier, species 1, entering by the profile door, under both label identifications. The two located species are then proved *mutually non-interconvertible* within the registered operation class: a two-sided wall, found refutation-first against our own forecast of a one-way valve (Sec. V C). Finally, a second, independent restriction class, matchgate/fermionic-Gaussian circuits, cuts the same physical family on a *different* exception set: the matchgate leak of $CZ(\Delta)$ is $4\sin^2(\Delta/2)$, zero exactly on $2\pi\mathbb{Z}$, so the gate is beyond-matchgate at every entangling coupling *including* the Clifford points (Sec. V D).

Three disciplines govern every sentence of this paper, and we state them here because they are load-bearing rather than decorative.

(i) Two instruments, two currencies, no transfer. The physical (qubit) side is adjudicated in the stabilizer/Clifford-hierarchy currency with exact rational and interval certificates; the odd-prime side in exact discrete-Wigner kernel arithmetic. No numeric certificate ever transfers between the two sides: the kernel entry $-2/9$, its companion value classes, and every other odd-prime number in this paper are *located data*, never criteria, and no qubit-side quantity is ever compared with an odd-prime-side quantity. Species identifications are claims about doors and loci (which structural mechanism carries the negativity, and at which protocol face), never about matching numbers.

(ii) Verdict semantics. NEGATIVITY-REQUIRED means non-membership in the Gross nonnegative (stabilizer-reachable, epistricted-reachable) sector, and nothing stronger. It is never "no nonnegative model exists", false in general, since nonnegative hidden-variable models covering universal quantum computation exist in any dimension [17, 18], and never "not classically simulable," since Wigner positivity is sufficient but not necessary for efficient simulation [16, 19]. No simulability, speedup, or hardness claim accompanies any magic statement here: nonstabilizerness does not imply hardness [20].

(iii) Scope. Every verdict is a property of registered finite lattices, registered model classes, and registered analogue cells, with all search caps printed. Nothing here is a continuum claim, and no null or deflationary outcome anywhere in this pipeline would have supported "gravity is classical."

Every quantitative claim in this paper traces to a deterministic ancillary script with exact arithmetic in all verdict quantities (Table II); each of the three computations was additionally checked by two independent adversarial verification suites that re-derive the headline values in their own arithmetic, and by a closing audit that re-executes the pipeline at fresh moduli and confronts a hand-predicted probe. Bracketed tags [V] mark machine-verified statements; [cited] marks literature consumed as-is.

II. THE BATTERY, TWO CLASSICAL MODEL CLASSES, AND THE FAULT LINE

A. The committed battery

The battery operates on exact finite constrained lattices: gauge-field registers on small graphs with Gauss-law-type constraints solved exactly, matter and clock registers where the item requires them, and a parallel QED-shaped control family throughout. The items, with their committed quantum results, are:

B1. *Boundary completeness* (holography of information on the lattice [5]): migration of information to the boundary algebra (forced, calibration-grade) versus generation of new boundary distinguishability (the live half), with exact generation-step counts and a QED control that never generates.

B2. *Capacity deficit*: boundary capacity deficit equal to the number of frozen directions f on 60 committed cells; a calibration item.

B3. *Closed-universe triviality* [6]: constraint-role triviality of closed-cell dynamics (kernel sectors all-central at the committed cells).

B4. *Observer repair* [6]: an internal observer's clockless algebra is deficient and is repaired by relational (clock-conditioned) observables, with a computed staircase.

B5. *Boundary–clock isomorphism* [6]: an isomorphism between boundary charge data and clock data, holding under a three-ingredient conditionality.

B6. *Self-reading emptiness*: a self-gravitating observer's self-consistent reading configurations are empty at every backreacting placement (quantum-side mechanism: resonances leave $\mathbb{Q}$ through characteristic-polynomial irrationality), while QED keeps a literal reading set $\{0, 1/4\}$.

B7. *Charge walls and thaw anatomy*: no-crossing walls for charge transport with exact crossing price $|\Delta D| = 2$, and a write/read split for a boundary payload: writing a record into frozen ("transit") directions is cheap; *reading* it back through the boundary requires a specific coherence rotation.

B8. *Clock necessity and the timing floor*: without a clock register the constrained cell is frozen while QED evolves clocklessly; with one, relative-frequency detunings obey a scaled Diophantine floor with exact Lagrange constants, governed by a conic $\mathrm{disc}(\varepsilon) = (2\varepsilon)^2 + 9$ in the coupling ε; at the single committed rational point $\varepsilon = 2$ (discriminant 25) the floor degenerates and the exact minimal clock dimension is 6.

The question of this section: which of B1–B8 are properties of the constraint structure itself, and which needed quantum mechanics?

B. Two registered classical model classes

Both classical models consume the *same committed kernels*, the identical constraint graphs, charge sectors, and coupling data as the quantum battery, imported unmodified, so that every contrast is a statement about the theory class, never about a changed system.

Model S (simplex/GPT-classical). States are probability distributions $\Delta(X)$ over the ontic space X of the cell; observables are the commutative algebra $F(X)$; dynamics come in two registered rules: a Markov rate rule with rates $|H_{xy}|$ off the committed generator (with a squared-rate robustness variant), and a charge-commuting permutation rule (S-P) whose admissible dynamics are exactly counted (e.g. 2420 at one committed cell, 589,185 at another) [V].

Model K (Koopman–von Neumann). The committed Hilbert space and generator are retained, but physical readout is restricted to the multiplication (diagonal) algebra, the community-sanctioned classical reading of KvN mechanics, and every verdict row is probed under diagonal dephasing. A verdict that flips under the pinching probe is typed PHASE-CARRIED: the KvN phase is acting as an evolution–readout interface resource. Throughout this paper, PHASE-CARRIED is a witness of non-classicality in the K representation and is *never* scored as a classical success.

Verdicts are assigned per item, per model, per cell, from a fixed palette: SURVIVES (the law holds classically), TRANSFORMS (the extensional content reproduces but the mechanism is different), DIES (a theorem-grade classical failure), VACUOUS-TRUE (the translated question trivializes, itself a finding about the translation), FORCED-BY-INHERITANCE (calibration content that could not have differed), and PHASE-CARRIED (as above). Both classical model classes were successfully constructed at every attempted cell; the pre-registered obstruction branch ("classicalization impossible, hence quantum") never fired, and no failure-to-find was dressed as an obstruction [V].

TABLE I. The classical shadow of the battery: verdicts per item and model at final adjudicated strength [V]. All verdicts are in-class (registered lattices, registered model classes, computed cells), quotable only with the scope notes of Sec. II F. "Inheritance-grade" marks content carried by the same kernel inventory as the quantum twin; it is never aggregated into classical survival.

Item	Model S (simplex)
B1 migration + B2 deficit	FORCED-BY-INHERITANCE (calibration only)
B1 generation	TRANSFORMS at the committed cell (pattern content separates; every frozen pair equivariance-protected,
B1 QED control	SURVIVES (never generates; constant $C(n)$)
B3 closed-universe triviality	VACUOUS-TRUE at the level-set-shattering cells; TRANSFORMS at the one structured-exception cell
B4 observer repair	VACUOUS-TRUE (shattering cells); TRANSFORMS at the structured cell
B5 boundary–clock isomorphism	TRANSFORMS (a clock-ownership law replaces the quantum three-ingredient conditionality)
B6 self-reading emptiness	TRANSFORMS at item level; emptiness SURVIVES at every backreacting placement (Sec. II D)
B7 wall no-cross + price	TRANSFORMS; no-cross capless with price exactly $\|\Delta D\| = 2$, inheritance-grade
B7 payload *read*	**dies** by one machine-checked theorem, both rate rules, gravity and QED alike
B8 clock necessity	SURVIVES (constraint-class classically too)
B8 timing floor	**dies** at theorem grade (root-of-unity spectra; "classical clocks are always on the conic")

C. The classification

Table I gives the verdict table at final (verifier-adjudicated) strength. Three rows carry the load of the paper and are expanded below; the rest we summarize.

The vacuous rows are findings about the translation, not successes. At the committed closed-universe cells the classical energy function is injective on hop-neighbours, so level sets shatter and the constrained classical dynamics freezes by *counting* rather than by centrality: the triviality and repair questions have nothing left to bite on. This vacuity is scoped: at exactly one registered cell (the committed structured-exception cell at coupling $\omega = 0$) the classical dynamics is *not* count-trivial, three populated levels ($\lambda = 245/3,\ 345/4,\ 1897/18$) carry genuine intra-level classical dynamics whose invariants are blind to the frozen-pair content the quantum twin reads [V], so the vacuity claims travel only for the shattering cells and are never quoted at that cell. One further K-side row is excluded from all bookkeeping by construction: at one cell the apparent classical failure is *criterion-carried* (the committed quantum claim uses an operator-level Dirac condition strictly stronger than its classical state-level shadow, and the verdict flips under the equally defensible strong-commutant translation); that row never counts toward any "requires quantum mechanics" tally in this paper.

D. Refutation first: self-reading emptiness is not quantum

Our registered mechanism forecast, made before the classical battery ran, was that B6 would *die* classically: the quantum emptiness collapse runs through characteristic-polynomial irrationality (the resonances leave $\mathbb{Q}$), and we predicted that diagonal classical data could not reproduce it. The computation refuted the forecast, and the refutation leads this section because it reshapes the fault line.

At every backreacting placement of the classical observer (all six committed cells: three knob families $\times$ two backreaction strengths) the per-configuration self-consistency conditions are exact rational quadratics, and *all* of them, 18/18 per cell, at every one of the six cells, have negative discriminant: no real self-consistent reading exists, capless [V]. The classical cells are as empty as the quantum ones, and the QED control keeps the committed literal reading set $\{0,\ 1/4\}$ exactly, at every placement [V]. The census is the certificate; it was independently recomputed by both verification legs and by the closing audit's second path (exact big-integer arithmetic with two-modulus reproduction).

What is quantum in B6 is therefore not the law but the *carrier*: the quantum collapse exits through $\mathbb{Q}$ (charpoly irrationality), the classical collapse through $\mathbb{R}$ (discriminant negativity), the same extension phenomenon re-carried by a different arithmetic mechanism. The item-level verdict is TRANSFORMS (a role-swap corner also keeps readings where the quantum swap kills them), and nothing in B6 enters the quantum-load ledger.

E. The two deaths, and what carries them

The payload read (B7, read half) dies in S by one theorem. The committed write/read split stores a payload in frozen (transit) directions and reads it back through boundary translates. Classically, the rate rule provably drops every diagonal of H, restoring the payload-flip symmetry that the quantum term $\omega\, n_{TT}$ breaks: machine-checked, $[L, F] = 0$ for both registered rate rules while $[H_B, \sigma^x_{TT}] \neq 0$ on the quantum side. Consequently *no* classical boundary translate at any committed (k, m) reads any transit pair, active sector included, capless, in gravity and in the QED control alike [V]. The scope is the registered channel constructors (engineered admissible correlating channels are not excluded). In K the same content is PHASE-CARRIED: diagonal readout separates 17/18 pairs and flips under pinching. The carrier is a *coherence rotation*, the amplitude-level face of Born squaring. Because interference phenomena are only *weakly* nonclassical (they are reproducible in epistricted theories [24]), this death, taken alone, separates simplex-classical from quantum and no more; Sec. IV closes exactly this gap.

The timing floor (B8) dies in S at theorem grade. Every admissible S-P dynamics is a permutation of a finite ontic space, so its spectrum consists of roots of unity: all frequency ratios are rational and the classical detuning defect is exactly zero at matched evolution time ($\delta_{\mathrm{cl}} = 0$, bit-exact on the calibrated instrument); the symmetric Markov rule cannot oscillate at all. In the committed family's conic language: *classical clocks are always on the conic*, and the committed Lagrange floor constants (9/1088, 1/3492, 1/1332, 1/10100, 1/468) become in-class witnesses of non-classicality [V]. The root-of-unity premise was verified at full-class strength (every admissible permutation order-verified, not witness-grade) by the closing audit. This death is a statement about finite ontic spaces with permutation dynamics, it extends to every permutation-ontic epistricted construction (Sec. IV), and is *never* quoted against continuum classical mechanics, whose flows carry irrational frequency ratios trivially.

The floor is dynamics-carried and readout-neutral. In K the joint-diagonal time series carries the committed surd content verbatim and pinch-stably: at coupling $\varepsilon = 3/8$ the recurrence remainder is divisible by $x^2 - 612$ (squarefree part 17), at $\varepsilon = 2/3$ by $x^2 - 97$, at $\varepsilon = 1/2$ by $x^2 - 40$ (squarefree part 10), and it is all-rational exactly at the conic point $\varepsilon = 2$ (discriminant 25; exact period 6, matching the committed minimal clock dimension) [V]. The floor's quantum load therefore sits in the generator's spectrum, not in the readout, the sharpest S/K split in the battery, and the reason the K label here is TRANSFORMS rather than PHASE-CARRIED.

F. The fault line

The classification licensed by the computation, with both adversarial legs concurring, is carrier-typed:

> On the registered exact finite constrained lattices, matter-sector quantumness was load-bearing in exactly two located places, the coherence-rotation payload read, and the irrational spectral gaps of the timing floor, never for the kernel-, counting-, or arithmetic-carried laws; and the closed-universe questions do not survive the classical translation at the shattering cells, which is itself a finding about those questions.

Scope notes that travel with this classification wherever it is used: (i) all verdicts are in-class, per item × model × cell, with printed caps; (ii) the wall's no-cross-plus-price half is inheritance-grade content (the same gate matrix-element inventory as the quantum twin) and is never claimed as classical survival; (iii) PHASE-CARRIED rows are non-classicality witnesses, never classical successes; (iv) the vacuity clauses are scoped away from the structured-exception cell as in Sec. II C; (v) the criterion-carried row never enters quantum-load bookkeeping; (vi) the floor death carries the finite-class scope of Sec. II E; (vii) no wording of the form "law X requires quantum mechanics" is entered at item grade anywhere in this paper, the licensed findings are carrier-located deaths at computed cells; and (viii) item deaths are never aggregated into "the corpus requires quantum mechanics."

Neither located death, at this stage, is typed. The payload-read death separates simplex-classical from quantum only (its carrier is interference-adjacent, and interference is epistricted-reproducible [9, 24]); the floor death rules out finite permutation-ontic models but says nothing about which *resource* the quantum dynamics is spending. Typing both carriers at the sharpest classical boundary is the second computation.

III. THE TYPING INSTRUMENT: DISCRETE WIGNER NEGATIVITY AT ODD PRIME

A. Why this boundary, and what a verdict means

The best epistemic restriction of classical ontic states is not a strawman: epistricted theories reproduce noncommutativity, interference, complementarity, no-cloning, entanglement, steering, teleportation, and the full stabilizer and

Gaussian subtheories [9]. At odd prime dimension the epistricted-reachable sector coincides exactly with the stabilizer subtheory and with the nonnegative sector of Gross's discrete Wigner function [8, 10]: nonnegative pure states are exactly stabilizer states, and the reversible dynamics of the sector are the affine-symplectic (Clifford) maps. Two further facts make this sector a genuine instrument rather than a chart choice. First, uniqueness: at odd dimension the Gross representation is essentially the *unique* noncontextual ontological model of the stabilizer subtheory [11], so sector-membership verdicts are facts about the class, not artifacts of a favored quasiprobability. Second, currency: by the cited equivalences, negativity coincides with generalized contextuality at odd prime [12–14]; we use this only as the semantic currency of the word "magic" (discrete-Wigner negativity as the resource of stabilizer computation [15, 16]) and prove no contextuality or Bell theorem of any kind here, the mapping of our located carriers onto any specific contextuality scenario is open.

Definition 1 (NEGATIVITY-REQUIRED; verdict semantics)**.** A carrier protocol class, translated to a registered odd-prime analogue cell, is NEGATIVITY-REQUIRED when two certificate halves are in hand: an *impossibility half*, every protocol of the registered class whose states, transformations, and measurement updates remain in the Gross nonnegative (equivalently stabilizer-reachable, epistricted-reachable) sector fails the carrier task, and a *location half*, exhibiting the exact negative Wigner-kernel or eigenstructure entries at the protocol faces where the committed instrument leaves the sector. The verdict asserts non-membership in the nonnegative sector and nothing stronger: it is never the claim that no nonnegative ontological model exists (nonnegative hidden-variable models covering universal quantum computation exist in every dimension [17, 18]), and never a simulability claim (positivity is sufficient, not necessary, for efficient classical simulation [16, 19]). Magic is necessary for the carrier task in-class; necessity is one-sided and no sufficiency claim accompanies it [68].

The parity discipline of the adjudication was fixed in advance: either verdict direction (NEGATIVITY-REQUIRED or an explicit in-class realization) would have been reported as a discovery, the deflation branch was resourced to its end (Sec. IV A), and an undecided outcome below the printed caps would have been reported as undecided.

B. Registered analogue cells and faithfulness gates

The committed carriers live at $p = 2$ (qubit registers). The qubit side has no Gross theorem and no uniqueness license: negativity there is framework-relative (rebit/CSS, qubit phase-space, and Λ-polytope frameworks return different labels, and the Λ-polytope framework can never return NEGATIVITY-REQUIRED at all [17, 21, 22]). The adjudication therefore runs on registered odd-prime *analogue cells* of the two carrier cells, the same constructors, seeds, and translate accounting, instantiated natively at $p = 3$ ($27 = 3^3$-dimensional carrier cell; registered coupling set for the floor family), and the bridge back to $p = 2$ is structural, not numerical.

Faithfulness is enforced by exit-grade gates, all green before any verdict row [V]: the charge/kernel anatomy transports exactly (crossing price $|\Delta D| = 2$, singleton charge-class structure); the $p = 2$ specialization of the analogue machinery regenerates the committed qubit battery bit-exactly; the committed protocol-first tuples transport verbatim ($(2, 1)$, $(3, 1)$, $(6, 2)$ at $p = 3$), with the single registered dimension deviation printed (the recurrence tuple moves to $(12, 4)$); the committed $p = 2$ floor spectra regenerate bit-exactly; all protocol states are diagonal (so negativity, if any, can live only at enumerable inventory slots); and every headline value is invariant under both registered label identifications of the analogue cell. Known-magic controls anchor the instrument (the qutrit strange state at $W = -1/3$; a machine-verified non-Clifford U_9 lane), seeded random Clifford circuits stay nonnegative, and one-injection circuits go negative only at or after injection, exactly when the injection hits a non-Z-diagonal state, the negativity then persisting under Clifford [V].

Why odd prime is the sharp instrument. The committed qubit rotation sits *on* the Clifford boundary: over $\mathbb{Z}_2$, $t^2 \equiv t$ collapses quadratic (Clifford) phase profiles onto linear ones, so the committed $p = 2$ rotation is exactly a Clifford quarter-turn and the qubit cell is boundary-degenerate, silence at $p = 2$ is a degeneracy, not evidence of classicality. The identical generator at odd prime steps strictly off the boundary: the constructors' control structure is affine over $\mathbb{Z}_2$ but quadratic over $\mathbb{Z}_3$, so the controlled shifts and controlled payload phases become non-Clifford exactly at odd prime [V]. Qubit-side payload-local blocks were separately computed in two registered qubit frameworks and found in-frame nonnegative; consistently with the above, such rows are *location-consistency data only* (the $p = 2$ load is not payload-local) and are never used as qubit-negativity corroboration.

C. The epistricted sector is not a strawman here either: what it reaches

The instrument is two-sided on this corpus, and we report the nonnegative side with equal weight. The teleportation-analogue protocol of the committed corpus executes entirely in-class, with its explicit correction rule; the middle

versions of every battery survivor, the discriminant census of B6, the wall no-cross and price of B7, clock necessity, the QED literal 1/4, execute in-class; and known epistricted-carriable protocol genres (teleportation, state-injection machinery, interference) are exactly the reason a generic coherence-rotation read was *not* automatically beyond the middle [24–26]. The localization we find is also the literature's own predicted shape: enforcing Gauss-law constraints costs zero nonstabilizerness [64], and gauge-invariant sectors of Abelian lattice gauge theories are stabilizer codes [66, 67], so a battery whose kernel/counting content goes through in-class while the load sits at the matter-coupling and detuned-dynamics positions [65] is precisely where the lattice-gauge magic literature says the load should sit. Negativity at the constraint kernels would have been a stop-the-line contradiction with that literature; none appeared [V].

IV. THE LOCATED CERTIFICATES

A. Carrier 1: the payload read is negativity-required, located at the write channel and the effective readout

Theorem 1 (payload blindness of the epistricted class; impossibility half)**.** *On the registered $p = 3$ analogue cell of the committed write/read protocol, within the registered constructor-generated protocol class, boundary-seeded stabilizer readouts under the same translate accounting the committed quantum instrument obeys, every epistricted-class (nonnegative discrete-Wigner) protocol fails to read the written payload. [V]*

The theorem stands on three machine-checked legs, under both registered label identifications. (i) *Clifford closure of the constructor faces:* the Clifford members of the per-ingredient constructor family are machine-derived (Weyl-support translations, affine hop permutations, quadratic-diagonal Cliffords), their linear-part groups exhaustively enumerated (sizes 12 and 2 under the two identifications) and payload-trivial; the readout seeds carry zero payload Weyl support. (ii) *Capless orbit exhaustion:* the epistemic pair-orbit closes (27 nodes) with label-readable marginals equal at every node, for all transit pairs, over the full word monoid; convex mixtures and outcome-averaged measurement update are closed by an explicit blindness lemma, and adaptive two-step probes read zero. (iii) *Triangularity at the maximal reading:* the group-generated closure of the constructor faces does contain entangling SUM-type Clifford words, a positive finding of the adversarial verification that could have deflated the theorem, but every such mixer is a payload-*writer* with triangular structure: over the full census of words up to length six in all faces (4168 elements, 106 affine, 72 mixers) no word, Clifford or not, ever moves payload into the label coordinates, and the orbit exhaustion with mixers adjoined still closes blind [V]. The impossibility half is thus a theorem for the registered class plus a capless exhaustion, surviving the most generous reading of the class the verification could construct.

Location half. The negativity sits exactly where the committed instrument leaves the sector, at two protocol faces:

N2 (*write channel, protocol step 1*): the mediated gate's unitary face is a non-affine controlled-Weyl permutation (machine affine-fit refutation); its discrete-Wigner transition kernel carries first negative entries exactly $-2/9$, at registered phase-space points under both label identifications, with kernel column sums exactly 1 (unitality) and negativity present at every nontrivial angle of the face [V].

N3 (*effective readout*): the payload-diagonal *effective* observable's spectral projector carries the exact algebraic entry $-(2381/153596547)\sqrt{5688761}$ at a registered phase-space point per identification (the exact entry identical under both), with 5688761 certified squarefree and the projector identities $E^2 = E$, $[E, M] = 0$ machine-verified in the quadratic field [V]. The certificate cites the effective observable only: the unpinched readout rows carry no certified negativity at the computed grades (their per-root refinement beyond quadratics is a printed cap).

Both entries were re-derived by the adversarial legs in independent kernel conventions (a definitional phase-point-operator route and an independently derived permutation-kernel trace formula that pinpoints the witness columns), and by the closing audit in a third band with audit-owned arithmetic, including an integer Faddeev–LeVerrier characteristic polynomial and a Bézout-projector route for N3 with the exact discriminant identity $1260^2 + 4 \cdot 40139500716 = 168^2 \cdot 5688761$ [V]. We emphasize the standing discipline: these numbers are located data. Nothing in this paper uses $-2/9$ (or any odd-prime value) as a criterion, and no qubit-side quantity is compared with them.

B. Carrier 2: the timing floor is negativity-required, and the rational escape closes

Refutation first. The committed ($p = 2$) floor family has exactly one rational point: at coupling $\varepsilon = 2$ the conic $\mathrm{disc}(\varepsilon) = (2\varepsilon)^2 + 9$ is a perfect square (25), the spectrum is all-rational, and the exact minimal clock dimension is 6. Our registered forecast was that the analogue conic point would go through at $p = 3$ and sharpen into a slogan

("epistricted clocks are exactly the conic clocks"). The data won the other way: *the analogue conic is empty at* $p = 3$. Every registered coupling, $\varepsilon \in \{3/8, 2/3, 2, 1/2\}$ on the primary family and $\{1/3, 1/5\}$ on its companion, has an irreducible sextic active-block characteristic polynomial, the committed $\varepsilon = 2$ escape closes, and the conic sub-adjudication is vacuous on the registered analogue couplings. The committed escape is thereby exposed as a $p = 2$ payload-dimension accident, and no sharpened timing slogan is licensed in either dimension.

Theorem 2 (root-of-unity confinement and module escape; impossibility plus location)**.** *On the registered* $p = 3$ *analogue cells of the committed floor family: (a) every epistricted-class dynamics of the registered autonomous shape, reachable-map/stroboscopic words, their rational convex mixtures, and outcome-averaged measurement update, is spectrally confined to root-of-unity frequency modules; (b) the analogue floor module leaves* $\mathbb{Q}$ *at every registered coupling. Hence no epistricted-class dynamics of the registered shape carries the floor. [V]*

For (a): the valid reversible dynamics of the sector are affine-symplectic permutations [cited: [8, 9, 23]], so the committed root-of-unity argument of Sec. II E applies by premise-satisfaction rather than analogy; the single-cell order census is exhaustive (216/216 elements, orders $\{1, 2, 3, 4, 6\}$, group exponent 12, independently re-enumerated by both adversarial legs), the three-cell census is witness-grade with the quantifier carried by the containment theorem (caps printed; Sp(6, 3) never exhaustively enumerated); mixtures are closed at certificate grade by Perron–Frobenius peripheral-spectrum control plus exact Schur–Cohn strict remainders, with the committed-scale certificates $\hat{D} = \mathrm{den}^2(4\varepsilon^2 + 9) \in \{612, 97, 25, 40\}$ all exceeding 1; outcome-averaged update reduces to mixtures, and postselected branches are typed outside the quantified class. We flag the corollary status honestly: the lemma chain behind (a) is cited, not claimed; the contribution of (a) is its certificate grade and census data. For (b): the extended instrument certifies every diagonal series surd-carried with irrational remainder equal to one irreducible degree-30 factor of the adjacency characteristic polynomial at $\varepsilon = 2$, irreducible sextic active blocks at all four primary couplings (with independent modular irreducibility witnesses at fresh moduli), and the companion family's exact factor law $(\lambda^2 - 2\varepsilon\lambda - 1)(\lambda^2 + \varepsilon\lambda - 1)^2$ transporting the committed surds 37 and 101 verbatim alongside a new sector with squarefree parts $\{10, 26\}$ [V].

As a located exhibit (adjunct to the verdict, not its proof), the floor family's non-affine face π_2 carries an exact discrete-Wigner kernel entry $-1/3$ (162 negative entries in the full 6561-entry scan) [V]; and at the committed spectrum the kernel negativity is theorem-grade in the contrapositive: a nonnegative kernel would force a Clifford map, hence finite order, hence rational frequency ratios, refuted by the exact irrational remainder.

C. The two doors, and the typed fault line

The two carriers exit the nonnegative sector through two different structural doors: the read through *profile non-quadraticity* (the write face's phase profile is not quadratic, which at odd prime is exactly non-Cliffordness of a diagonal-controlled face), the floor through *off-unit-circle spectrum* (no root-of-unity-confined dynamics can carry an irrational frequency module). With Sec. II this completes the arc's second step, licensed at exactly this strength: on the registered odd-prime analogue cells of the two located carriers, with faithfulness gates green and within the registered protocol and dynamics classes, the matter-sector quantum load of the battery is *magic in Gross's sense*, carried by discrete-Wigner negativity, not by any classical-ontic model with a knowledge-balance restriction, with the negativity exactly located at the write channel and effective readout (carrier 1) and in the spectral confinement obstruction (carrier 2). The verdicts are analogue-cell properties; the bridge to the committed qubit cells is the faithfulness-gate structure plus the boundary-degeneracy mechanism of Sec. III B, and no numeric value transfers.

V. THE PHYSICAL BRIDGE: THE MEDIATED GATE, ITS SPECIES, THE WALL, AND THE MATCHGATE SPLIT

The battery's carriers are lattice objects. The bridge to laboratory physics is the gravitationally mediated two-qubit gate of the entanglement-witness proposals [1, 2], whose certification semantics (what a positive result proves about the mediator, under which assumptions) is the subject of the companion article [4]. Here we type the gate itself, identify its magic species across the bridge, and prove the in-class species structure. Throughout this section the qubit-side instrument is the stabilizer/Clifford-hierarchy currency with exact rational and interval certificates; the odd-prime instrument enters only in Sec. V B, and no number crosses between them.

A. The gate and its exception arithmetic

At the committed geometry (masses $m \approx 10^{-14}\,\mathrm{kg}$, trap separation $d = 450\,\mu\mathrm{m}$, superposition size $\Delta x = 250\,\mu\mathrm{m}$, hold time $\tau = 2.5\,\mathrm{s}$) the mediated gate is, exactly,

$$U \;=\; \big(P_1(a)\otimes P_2(b)\big)\cdot CZ(\Delta), \qquad \Delta \;=\; -\frac{2K\,\Delta x^2}{d\,(d^2-\Delta x^2)}, \qquad K=\frac{Gm^2\tau}{\hbar}, \tag{1}$$

with local phases $a = 0.439583$, $b = -0.125595$ and entangling angle $\Delta = -211/672 = -0.313988$ exactly (two independent derivation routes); the concurrence is $C = |\sin(\Delta/2)| = 0.156350$ and the committed witness value $W = 1 + C = 1.156350$ [V].

Nonlocal exception set. The certifiably-magic-free locus of the family, certifiably magic-free *within the committed family model*, is exactly $\Delta \in \pi\mathbb{Z}$, a codimension-one resonance condition, not a regime. It splits in two: $\Delta \in 2\pi\mathbb{Z}$ is the no-entanglement accident (witness-free and magic-free), while $\Delta \in \pi + 2\pi\mathbb{Z}$ is a Clifford CZ at *maximal* witness value: there the delivered calibrated-frame state is the witness maximizer ($W = 2$ on a stabilizer state) while every magic monotone vanishes exactly, so within one protocol family the certified conclusions "non-classical" and "magic-injecting" provably separate [V]. Non-classicality is angle-generic; magic is angle-conditional; the best entanglement point is a zero-magic point. The committed operating point sits at margins 0.3140 and 2.8276 from the two rungs (interval-certified).

Strict exception ladders. Demanding additionally that both local phases be Clifford yields a theorem-grade arithmetic ladder per registered shape family: for shape $\Delta x/d = 5/9$, $K/d \in (28\pi/5)\mathbb{Z}$ (generator 17.5929), with a genuinely non-classical half-ladder $(14\pi/5)(2\mathbb{Z}+1)$ on which the locals are Clifford while $\Delta \equiv \pi/2 \pmod{\pi}$ (a natural control family); for shape 3/4, $K/d \in (7\pi/6)\mathbb{Z}$ (generator 3.66519), parity automatic. The two registered shapes carry arithmetically different ladders, and irrational shapes reduce the strict set to $K = 0$. In physical variables, Clifford gravity along the family is the resonance $m^2\tau = k\cdot(\pi\hbar/2G)\cdot d(d^2-\Delta x^2)/\Delta x^2$, $k \in \mathbb{Z}$, with quantum $2.5014\times10^{-27}\,\mathrm{kg^2\,s}$ [V].

Reach honesty (this clause travels with every use of the exception site): the Clifford-exception coupling is exercised as a family theorem and as an in-class analogue, never as an accessible laboratory point, at the committed geometry it corresponds to $\tau_\pi = 1680\pi/211 = 25.0136\,\mathrm{s}$ (or 15.4405 s on the second registered shape), equivalently $m_\pi = 3.1631\times10^{-14}\,\mathrm{kg}$ at $\tau = 2.5\,\mathrm{s}$, and no registered scan contour crosses any nonzero exception hypersurface.

Gate typing at certificate grade. All 11520 two-qubit Clifford gates were enumerated exactly over $\mathbb{Z}[\zeta_8]$, collapsing to exactly 4 local-unitary classes; the Makhlin invariants of $CZ(\Delta)$ are ring-exact, $G_1 = \cos^2(\Delta/2)$, $G_2 = 2+\cos\Delta$, and separation from every Clifford class is certified on the full $\pm5\%$ calibrated interval and on a $(\pi/60)$-grid; a continuum route closes it for all angles ($G_2 \in (1,3)$ open off $\pi\mathbb{Z}$ versus Clifford values $\{\pm1,\pm3\}$): *the committed gate lies outside* $\mathrm{LU}\cdot\mathcal{C}_2\cdot\mathrm{LU}$ [V]. A third, one-way certificate: the exact invariant $e_p(U)$, whose value on Clifford canonical classes is exactly 0 or 2/9 (the latter its maximum over all two-qubit gates), evaluates to $e_p = (2/9)\sin^2(\Delta/2) = 0.005432$, strictly interior [V].

Monotone values and the anti-alignment law. On the calibrated-frame delivered state $CZ(\Delta)|{+}{+}\rangle$ the stabilizer fidelity and stabilizer 2-Rényi entropy [28] obey exact dichotomy identities on the family,

$$F_{\mathrm{STAB}} = \frac{5+3|\cos\Delta|}{8}, \qquad \sum_P \langle P\rangle^4 = 1+\tfrac{3}{4}\big(1+\cos^2\Delta\big)^2 \;\Rightarrow\; M_2 = 4-\log_2\!\big[4+3(1+\cos^2\Delta)^2\big], \tag{2}$$

each saturating (to 1 and 0 respectively) exactly on $\Delta \in \pi\mathbb{Z}$; committed values $F_{\mathrm{STAB}} = 0.981666$, $M_2 = 0.104445$ [V]. The family attains the conjectured global two-qubit maximum $M_2 = \log_2(16/7) = 1.192645$ at $\Delta = \pi/2$ [76]. In the weak-field regime the entanglement grows linearly, $C \approx |\Delta|/2$, while the certified magic grows quadratically, $M_2 \approx 1.0820\,\Delta^2$ (Bell-input variant $1.4427\,\Delta^2$; linear-versus-quadratic crossover bracketed in $[0.58, 0.59]$): *weak-field gravity is entanglement-first, magic-second*, and along a hold-time scan the witness climbs linearly while the magic floor climbs quadratically and returns to zero at $\Delta = \pi$ [V].

Two honesty notes are part of the record. First, the frame: the values above are calibrated-frame values (local phases gauged away, with a doping-invariance test certifying that the instrument never books local magic as gravitational); the raw branch-phase state carries strictly more magic ($F_{\mathrm{STAB}} = 0.954825$, $M_2 = 0.249310$ at the committed point, and at $\Delta = \pi$ with committed locals it is not a stabilizer state), so the calibrated numbers never overclaim [V]. Second, a registered finding against our expectation: the gate-grade maximum-over-stabilizer-inputs infidelity is $(1-\cos\Delta)/2 = C^2 = 0.024445$, attained at a control-$|1\rangle$ *product* input where the gate acts as a local $R_z(\Delta)$, locally realized magic dominates that scalar bookkeeping (the caution of [39] instantiated), so nonlocal typing is carried by the Makhlin/exception certificates above, never by that number.

All monotone definitions and closed forms here are evaluations of cited quantities [28–32], never re-derivations; the elementary core, a phase gate at generic angle is non-Clifford, so the output state carries magic, is folkloric (it is the

opening example of [33]) and is credited, not claimed. What is claimed is the exception-set arithmetic, the certificates, and the structures below.

B. Species identification across the bridge

On the registered odd-prime analogue cells (the instrument, cells, gates, and discipline of Sec. III, consumed here as regression-pinned machinery), the BMV-gate analogue was adjudicated against the same door/locus taxonomy as the battery carriers:

> *On the registered odd-prime analogue cells, the BMV-gate analogue's negativity is located at the write-channel/controlled-Weyl face by the profile door, species 1, the same door and the same locus type as the first battery carrier's write-channel certificate, under both registered label identifications; and the physical-side continuous angle carries no in-class species claim.* [V]

The supporting computation: all 24 registered knob cells (control point/line × conjugation × power × identification) are kernel-negative, with first-negative value classes $\{-1/3, -1/9, -2/9\}$ reported as data only, never as the species criterion; the naive geometric discretization control is provably angle-blind at $p = 3$ (the mod-3 inversion is the identity, so the map is affine-composed, Clifford, and kernel-nonnegative by complete scan), while the arithmetic door opens at $p = 5$ where the s^3 profile is genuinely cubic (kernel-negative with exact $\mathbb{Q}(\sqrt{5})$ sign certificates, first value $-\sqrt{5}/5$, its degree-≤ 2 truncation nonnegative by complete scan); and the spectral door is closed on all faces (monomial finite-order structure forces cyclotomic characteristic polynomials) [V]. The in-class completeness behind the profile door is closed outright at the adjudicated cell size: among all 19683 diagonal profiles at $p = 3$, $n = 2$, nonnegativity holds exactly for the degree-≤ 2 (Clifford) profiles, no missed exceptional loci [V].

Two disanalogies are typed rather than blurred. The physical family's off-circle content lives in the irrationality of Δ/π, not in eigenphase ratios (which are rational on both registered shapes), so no naive "species-2 because irrational" claim exists; and the continuous angle has no exact $p = 3$ image, so physical-side species language stays at the gate-typing grade of Sec. V A. The species identification is a located-carrier identity, same door, same locus type, and it was verified convention-exactly (the adjudicating kernel proved matrix-identical to the battery instrument's, same normalization, before any species row was accepted) [V].

C. Refutation first: the forecast valve is a two-sided wall

Before the computation we forecast a one-way valve between the two located species: profile magic (species 1), we expected, would unlock off-circle dynamics (the species-2 resource) within the registered class, while the converse would fail. The forecast imported the continuous-gate intuition, Clifford plus any non-Clifford gate is universal-dense, into the registered class. The computation killed the forecast's live half at theorem grade, and the refutation leads.

Theorem 3 (two-sided non-interconvertibility)**.** *Within the registered operation class, words of the committed and adjudicated faces, rational convex mixtures, and outcome-averaged measurement update, postselection typed out, the two located magic species are mutually non-interconvertible. [V]*

Species 1 never produces species 2 (the refuted half). Every registered face is a monomial operator over μ_3; products of monomial operators are monomial, the generated group is finite (contained in the generalized symmetric group), and every word has certified finite order (explicit $U^n = I$ certificates; order census over all words of length ≤ 3 with histogram orders $\{1, 2, 3, 6, 9, 18\}$; a 20001-node closure search reported cap-honest, the finiteness itself capless by containment). Hence spectra are roots of unity, characteristic polynomials are cyclotomic, and the frequency module never leaves $\mathbb{Q}$; mixtures and outcome-averaged update are closed by the same certificate machinery as Theorem 2(a) [V]. The continuous-gate intuition is simply false in a finite monomial class.

Species 2 never unlocks species 1 (the confirmed half). The floor resource in adjoinable (support-map) form is its registered non-affine exhibit π_2, which is label-only; the augmented triangularity premise is machine-checked (no generator writes payload into label rows), labels never receive payload at any word length (capless), and the orbit exhaustion with π_2 adjoined closes blind (81/81 nodes, both identifications, three seed pairs). The floor Hamiltonian itself is not adjoinable as a support map, that non-existence is exactly carrier 2's NEGATIVITY-REQUIRED verdict, so the only adjoinable species-2 object cannot read the payload [V].

Certificates exist in both directions (a finite-closure census; an adjoined-resource blind exhaustion); neither direction is a failure-to-find bin. The scope is the registered class only: the physical-side continuous-angle gate lives at the typing grade of Sec. V A, where no in-class conversion claim attaches. "Species" is used throughout as a located-carrier

label, never as a quantitative comparison (the value classes of Sec. V B are data). Cross-resource precedents exist for free-states-of-one-theory-as-resources-of-another [45], for strictly nested continuous-variable species with separating witnesses [46], and for majorization-based conversion certificates [27], the latter available as a strengthening route but not needed at theorem grade; a conversion protocol or no-go *within one fixed restricted operation class* appears to be new.

D. The matchgate split: a second restriction class, a different exception set

A single restriction class can always be suspected of parochialism. The matchgate/fermionic-Gaussian class, classically simulable by the classic results [40–42], with a modern commutant theory [43] and a totality theorem for its state-side resource [44], supplies an independent second cut, with its own exact instrument: the Ad-preservation leak of the Majorana span (zero exactly on the Gaussian/matchgate group, including reflections; battery values SWAP $= 4$, $CZ = 4$, $CS = 2$, Gaussian partners 0, all exact) [V].

Proposition 1 (matchgate leak of the physical family)**.** *On the committed family* (1)*, in the registered Jordan–Wigner frame,* $\mathrm{leak}\big(CZ(\Delta)\big) = 4\sin^2(\Delta/2) = 4C^2$ *exactly (a ring identity: the matchgate leak is four times the squared concurrence). It vanishes iff* $\Delta \in 2\pi\mathbb{Z}$*; at the Clifford point* $\Delta = \pi$ *the leak is exactly* 4*. [V]*

The physical family is therefore beyond-matchgate at *every* entangling coupling, including the zero-magic Clifford points: the two registered restriction classes cut the same one-parameter physical family on *different* exception sets, $\pi\mathbb{Z}$ (Clifford) versus $2\pi\mathbb{Z}$ (matchgate), with committed leak 0.0977812. The battery carriers ride along: the read carrier's $p = 2$ shadow face (CCX) has leak exactly 15/4; the committed floor blocks have positive Hamiltonian-level leak at all four registered couplings (exact values 137/128, 11/9, 3, 9/8), with the free-fermion battery partner at exactly 0 [V]. Scope: the Gaussianity statements are frame-registered (Jordan–Wigner at the committed cells; Gaussianity is basis-dependent), the qutrit-native carrier rows are typed not-translatable (no registered odd-prime Jordan–Wigner), and the licensed ceiling wording is exactly this: *the located carriers are beyond both registered restriction classes.* No claim of the form "beyond every classically simulable sector" is made, here or anywhere.

VI. DISCUSSION

A. Scope, stated once more and sharply

Everything in this paper is a statement about registered objects: exact finite constrained lattices; two registered classical model classes; registered odd-prime analogue cells with $p = 3$ the instrument of record; registered protocol, operation, and dynamics classes with printed caps (word length ≤ 12 primary / ≤ 6 all-faces; translate accounting $k \leq 12$, $m \leq 4$, $n \leq 3$; orbit/closure budgets 27/81/20001 nodes; the registered coupling sets; the never-enumerated $\mathrm{Sp}(6, 3)$; the uncomputed high-degree remainder discriminants). Constraints enter at the operator level throughout, $H \approx 0$/Gauss law imposed exactly on the lattice algebra; nothing here computes or adjudicates path-integral, topology-change, or ensemble (wormhole) mechanisms. Nothing is a continuum claim; the root-of-unity death is never quoted against continuum classical mechanics; the odd-prime verdicts travel to the committed qubit cells only through the faithfulness gates and the boundary-degeneracy mechanism, and no numeric certificate transfers between the two instruments. The mediated-gate conclusions are gate-grade: nothing here says, and nothing here could say, anything about the mediator degree of freedom itself carrying magic or nonstabilizerness, the mediator-level conclusion available from a witness experiment is the subject of [4], and an upgrade-theorem layer over that protocol (added assumptions under which a positive result whose extracted angle interval excludes $\pi\mathbb{Z}$ additionally certifies injected magic, with its converse at the Clifford exceptions) is developed in a further companion [7] rather than here. Symmetrically: had any adjudication returned an in-class (nonnegative) realization, that deflation would have been reported as a discovery about the carrier, and it would *never* have supported "gravity is classical" or "quantum mechanics is unnecessary," any more than the positive verdicts support a slogan. No claim of quantum-computational hardness rides on any verdict [20], and no Bell, Kochen–Specker, or generalized contextuality theorem is proved or implied, the Howard-line bridge (negativity as contextuality's currency at odd prime [11–14]) is cited as semantics, with any concrete mapping of our carriers onto a contextuality scenario left open.

B. Relation to prior work

Resource injection beyond entanglement. The precedent for "certify gravity's quantumness by a resource beyond entanglement" is Howl, Vedral, Naik, Christodoulou, Rovelli, and Iyer [47]: continuous-variable non-Gaussianity in a single BEC mode, certified through a cumulant (κ_4) measurement. Our bridge section is that program's discrete sibling with different deliverables: discrete magic on the committed two-qubit mediated-gate protocol, an exact exception-set arithmetic, and the species/wall structure, none of which has a CV counterpart there. The post-Newtonian extension of the Howl line [48] contains no discrete-magic content; the resource-theoretic reading of the BMV channel is now also occupied for *coherence* (coherence-to-entanglement conversion [49]), and a contextuality-currency sibling of the beyond-entanglement move exists in thesis form [50], with a pipeline paper announced; none of these types the mediated gate.

Law-level magic adjudication. That a physical law or system can be magic-typed is an active genre: conformal field theories [51], cosmological perturbations in both verdict directions [52, 53], and, at algebra grade, the universality of magic in local QFT and type III von Neumann algebras [54, 55]. Wigner negativity, our currency, has been computed for gravitational states via the gravitational path integral [56, 57]. The delta we claim against this genre is not the currency but the instrument: pre-registered, carrier-located adjudication of committed protocol carriers with paired impossibility-plus-location certificates and a two-sided (in-class/beyond-class) outcome record; the cosmology-lane papers also supply the parity precedent that an in-class (deflationary) verdict is publishable as a discovery.

The holography lane, arena-distinguished. The Cao-line results tie non-local magic to gravitational backreaction in AdS/CFT [58–61]. That work is holographic and monotone-structural (non-local-magic measures on boundary states); ours is carrier-located and certificate-graded on exact lattices and a committed laboratory protocol, different arena, different instrument, compatible morals. One of its titles ("Gravitational backreaction is magical") sits in a slogan register we do not permit ourselves: nothing in this paper asserts any such blanket claim about gravity, in any register. We also note that aggregate stabilizer-Rényi-entropy measures are blind to the geometric response in that same lane [60], which is why SRE appears in this paper only as corroborating data, never as a witness [28].

Protocol-located magic. Locating magic within a protocol's steps is likewise occupied: stage-resolved SRE across wormhole-inspired teleportation [68] (from which we inherit the necessity-is-one-sided discipline), the magic-gate-teleportation structure theorem [62], and a conditional no-go for resource-free magic-axis measurement [63]. None uses epistricted-reachability semantics, adjudicates a physical-law carrier, or produces impossibility-plus-location certificate pairs.

The constraint null. Our finding that the battery's kernel/counting content is epistricted-reachable instantiates, at certificate grade, the lattice-gauge-theory null that Gauss-law structure per se costs zero nonstabilizerness [64–67]: the load sits at the matter-coupling and detuned-dynamics positions, exactly where that literature predicts magic to be injected. We cite the null in both verdict directions, as the two-sidedness of our instrument requires.

Graviton amplitudes and particle physics. The nearest phrase-level neighbors to "the gravitational interaction generates magic" are the graviton-scattering results [69, 70], with the massive-mediator genre in particle physics (QED [71], Z bosons and dark photons [72]) establishing that a fundamental interaction's gate can be magic-typed. Those are S-matrix helicity-qubit analyses with no mediated-gate protocol, no witness semantics, and no exception-set structure; the committed-protocol slot they leave open is what Sec. V fills. Adjacent method-level neighbors we consume as ambient structure: exact SRE over a physical CP phase with Clifford-phase zeros [73], the same 60-state stabilizer-input census used as a gate-grade functional on a physical spin map [74], the two-qubit magic–entanglement Pareto frontiers (the ambient plane in which our anti-alignment trajectory lives) [75], and the global two-qubit magic maximum our family attains at $\Delta = \pi/2$ [76].

Relativistic quantum information. The magic-harvesting cluster extracts magic from quantum fields with local probes [54, 77–79]; the sole BMV-citing member types the detector–field coupling, not the mediated gate [78]. The nearest relative of the companion certification layer's inference shape is the induced-resource-theory framework [80], whose direction is opposite (a free interaction types the environment state; the companion layer's certified input types the interaction); the harvesting genre now also extracts contextuality and Wigner negativity [81, 82], and the no-contextuality-theorem boundary of Sec. VI A applies unchanged across the genre.

The classical-shadow genre. Reproducing an apparently quantum feature with a classical carrier is a live genre, the third-particle paradox has a classical carrier [83], and nomic toy theory derives epistemic horizons from deterministic dynamics [84], but to our knowledge no prior work runs gauge/Hamiltonian constraint structure through a restricted-classical or epistricted model, and to our knowledge no prior classical-versus-quantum comparison exists on the same constraint structure at certificate grade; the item-by-item simplex-versus-Koopman comparison also appears to be new. On the clock axis, the proven classical-versus-quantum separations concern accuracy scaling [85]; our floor-existence axis is different and was unoccupied. The classical frozen-formalism facts we lean on (the closed-slice absence of local invariants; the classical problem-of-time inventory) are classical general-relativity results [86, 87] and are cited, never claimed.

Wording hazards, adopted as discipline. "Nonstabilizerness without magic" [20] is why no hardness claim appears here; the CHSH-side facts that standard Bell violations cannot witness magic while tilted inequalities can [33], that tomography can be re-scored at no cost into nonlocality and magic certification [34], that mixed-state magic has criterion-grade detection tools [35–37], that the CHSH-enabling nonstabilizer resource is local and asymmetric [39], and that T-type magic states are not self-testable [38] are all consumed as load-bearing citations by the companion certification layer; the witness-side assumption inheritance is [88, 89].

C. What would change these conclusions

Each layer of the arc is falsifiable at its own grade. An admissible classical dynamics on a committed kernel that reads a transit pair, or carries an irrational frequency ratio, would break Sec. II (the theorems say the registered classes contain none). An epistricted-class protocol reading the analogue payload, or an in-class dynamics with a non-cyclotomic characteristic polynomial, would break Sec. IV. A word in the registered faces converting one species into the other would break Theorem 3. And the exception arithmetic of Sec. V A is a closed-form target: any error in the ladders, census, or invariants is checkable from Eq. (1) with integer arithmetic.

VII. CONCLUSION

A battery of constraint-sourced structural laws, previously proved with quantum mechanics in the engine room, has been made to answer for its quantum content. The answer has a shape none of the three computations could have delivered alone. The classical shadow localizes the load: almost everything, the kernel, counting, and arithmetic content, and one law we ourselves had forecast to be quantum, persists classically, and the quantum load of the corpus sits in exactly two located places, the payload read and the irrational spectral gaps. The typing computation shows that both located carriers are magic in Gross's sense, in-class and analogue-scoped: NEGATIVITY-REQUIRED, with the resource exactly located (write-channel kernel entries $-2/9$; an exact-algebraic effective-readout entry; a root-of-unity confinement theorem against an irrational frequency module), the committed rational-escape point closing at odd prime against our own forecast. The bridge computation carries the structure to the laboratory family: the gravitationally mediated gate is certified non-Clifford away from an exact arithmetic exception set, its analogue negativity sits at the same write-channel locus as the first carrier, the two species are walled off from each other in both directions within the registered class, again against our own forecast, and a second restriction class cuts the same family on a different exception set. Within the registered classes and cells, with every cap printed and both verdict directions honestly available at every stage, the quantum load of this gravitational-witness battery is located, typed, and carried to the physical gate.

Acknowledgments., Numerical certificates, verification suites, and drafting made use of AI-assisted tools; all results were adversarially verified as described, and the author takes full responsibility for the content.

Data and code availability., The ancillary scripts of Table II reproduce every [V]-tagged claim deterministically and will be posted with the preprint.

[1] S. Bose, A. Mazumdar, G. W. Morley, H. Ulbricht, M. Toroš, M. Paternostro, A. A. Geraci, P. F. Barker, M. S. Kim, and G. Milburn, "Spin entanglement witness for quantum gravity," Phys. Rev. Lett. **119**, 240401 (2017).
[2] C. Marletto and V. Vedral, "Gravitationally induced entanglement between two massive particles is sufficient evidence of quantum effects in gravity," Phys. Rev. Lett. **119**, 240402 (2017).
[3] D. Vávra, "Local tomography of linearized gravity under its constraints," companion Letter (2026).
[4] D. Vávra, "What gravitationally induced entanglement certifies: mediation semantics and a Bell-style theorem," companion article (2026).
[5] D. Vávra, "Holography of information on exact lattices: migration, irreducibility, and a controlled QED contrast," companion article (2026).
[6] D. Vávra, "The closed universe and its internalized boundary: exact constraint-role triviality, the observer repair, and a clock–boundary isomorphism on a lattice pair," companion article (2026).
[7] D. Vávra, "When gravitationally induced entanglement certifies magic: Clifford exceptions and a gate-typing upgrade of the witness theorem," companion article (2026).
[8] D. Gross, "Hudson's theorem for finite-dimensional quantum systems," J. Math. Phys. **47**, 122107 (2006), arXiv:quant-ph/0602001.
[9] R. W. Spekkens, "Quasi-quantization: classical statistical theories with an epistemic restriction," in *Quantum Theory: Informational Foundations and Foils* (Springer, Dordrecht, 2016), arXiv:1409.5041.

TABLE II. Ancillary verification suite (deterministic, `python3.12`; exact integer/`Fraction`/cyclotomic/algebraic arithmetic in every verdict quantity, floats display-only; byte-identical reruns; exit 0). Each stage carries two independent adversarial verification suites re-deriving headline values in their own arithmetic, and a closing audit re-executing the pipeline at fresh moduli with hand-predicted probes confronted before computation. Two of those adversarial legs are document-grade with no ancillary script of their own and hence no row here: the classical-stage and bridge-stage steelman reviews (`classical_spekkens_steelman.md`; `witness_magic_physics_steelman.md`, whose confrontation kit ran 51/51 independent checks), described in the text. The committed quantum-battery engines are consumed as regression pins and reproduce bit-exactly throughout.

Script	Self-tests
`classical_lattice.py` (classical shadow: both models, full battery)	38/38
`classical_rigor_verifier.py` (independent re-derivation leg)	21/21
`classical_closing_audit.py` (third-band re-execution; second paths)	27/27
`epistricted_lattice.py` (odd-prime typing: gates, carriers, certificates)	47/47
`epistricted_rigor_verifier.py` (own-route Wigner kernels; byte-identical rerun)	pass
`epistricted_physics_steelman.py` (independent spot kit)	31/31
`epistricted_closing_audit.py` (third band; own-arithmetic N2/N3 routes)	38/38
`witness_magic_lattice.py` (gate typing, species, wall, matchgate)	77/77
`witness_magic_rigor_verifier.py` (own censuses; fresh isolated rerun)	53/53
`witness_magic_closing_audit.py` (third band; hand probe; exception re-execution)	49/49

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