Information Retention and Coherent Preparation in Native Recognition Dynamics

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Abstract

We derive an explicit information-retaining evolution from full-current recorded recognition dynamics on the unrestricted square-summable field. Its adjoint recovers every input, and conjugation retains every bounded input action. An eight-posting Z-pattern reads less information: an infinite-dimensional family of normalized circulating states shares the entire window reading, including distinct orthogonal packets. Two commuting output families cannot both reproduce all native input actions. The contribution is a construction and separation result for these dynamics: the native coefficients satisfy the hypotheses of isometric recovery, while explicit witnesses distinguish full retention from a coarser reading and from coherent preparation. From a nonzero definite-counter input, recording alone preserves only one part in 512 of the squared norm in the uniform-reference sector and cannot prepare that sector. A finite native control word prepares it, up to one unit phase, for every source input. A finite rational-angle word attains any positive relative tolerance uniformly over all inputs and finite subsequent recording depths. This bound concerns preparation error followed by exact recording. The result establishes native reachability without a gate-count or synthesis-complexity bound. Physical implementation must supply the controls and resources used by the construction.

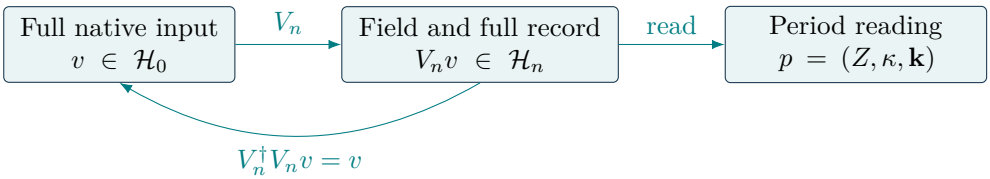

Figure 1: Two exact preservation statements with different information content. Recovery acts on the full evolved state. The period reading is a function of retained current labels.

1 Information retention depends on the physical record

What information survives a recorded physical evolution, and what must be prepared for coherent evolution to occur? These questions concern both the native operation and the part of its output that is read. The construction below retains the complete field and current history. Its eight-posting Z-pattern gives a specified reading of that history. Comparing them on the same carrier identifies exactly which preservation claim each supports.

Recognition Science begins with distinguishable occurrences and the information required to compare them. A retained comparison is itself part of the physical record. Accepted forcing results fix the native comparison cost for the specified reporting apparatus and fix golden scaling

under the recognizing-join conditions [8]. The present derivation follows the record-bearing dynamics below. Its conservation result comes from retaining the full current and deriving the resulting operator's isometry.

The distinction can be seen in a simple case. Two packets can occupy different integer field addresses while producing exactly the same eight-posting current word. Reading that word gives the same Z-pattern for both. Reversing the full recorded evolution returns the different original packets. The address distinction remained in the physical carrier even though the chosen reading omitted it.

Three information claims consequently need precise meanings. *Charge identity* compares the integer Z. *Pattern identity* compares the complete represented pattern. *Full-state identity* compares vectors in the native carrier, including relative amplitudes. A theorem about one of these readings retains that scope. The application to personal persistence is developed separately in the discussion, Section 10.

Z-pattern
: An integer charge, a stored natural-number complexity and eight integer period coordinates whose sum is the charge.

Current
: The three integer changes associated with one native occupation transition.

Posting
: One application of the recognition operation, retaining a new current coordinate.

Native carrier
: The full square-summable field and record space on which the specified recognition operation acts.

Window
: A specified group of eight retained postings, with its period reading.

Recovery
: An explicit map returning the full input from its evolved image.

1.1 Contribution and relation to quantum information

The central question is which information the specified native dynamics retains and which operations it can prepare. Reversible computation already shows how a sufficiently detailed history supports reversal [1]; dilation theory supplies representations of completely positive maps [2]. Once an isometry is given, adjoint recovery and the associated operator identities are standard consequences. Finite-dimensional gate universality and Lie-group reachability likewise provide established routes from suitable generators to a target unitary [3, 4]. These results set the mathematical background for the construction.

The contribution is to establish the required properties for the native operations and to exhibit two distinctions that the general results alone do not decide. First, the occupation-block amplitudes and current reconstruction give the full recorded Gram identity. Integer-translation reindexing then extends retention to the unrestricted square-summable field, including correlations with earlier records. This derives the actual V_n to which isometric recovery applies; Section 7.1 separates this step from the general recovery principle.

Second, the native circulating subspaces exhibit arbitrary square-summable field profiles that share every function of the specified window label. Orthogonal packets make the omitted information explicit. Thus full-record retention and completeness of the period reading can be assessed on the same carrier, with a concrete obstruction to inferring one from the other.

Third, the finite-counter construction proves that the recorder preserves a uniform-sector weight that prevents preparation from a nonzero definite-counter input. It then constructs a target counter unitary, verifies the native reachability hypotheses and lifts the resulting word to every source field. The rational-angle approximation is uniform in input and subsequent finite recording depth. Section 9.1 distinguishes this existence result from efficient compilation over a fixed finite gate set [5]. The contribution lies in the native hypotheses, obstruction and field-level connection; the isometry and control principles used in the proofs retain their established generality. Appendix A gives the source-pinned Lean account.

Operator quantum error correction supplies the established framework for protecting a subsystem under a noise channel [6]. Section 7.2 locates our full-record recovery relative to that problem. The no-broadcasting theorem characterizes when two density operators admit outputs with both marginals equal to the input [7]. Section 8.1 distinguishes that operational task from our obstruction to two commuting families reproducing every native action.

2 Exactly what a represented Z-pattern contains

Write a recognition pattern as

$$p = (Z, \kappa, k_0, \dots, k_7), \quad Z \in \mathbb{Z}, \quad \kappa \in \mathbb{N}, \quad k_t \in \mathbb{Z}, \quad \sum_{t=0}^{7} k_t = Z. \tag{1}$$

The stored κ is a separate coordinate in this carrier. Equation (1) constrains the period entries and Z; it imposes no additional relation on κ.

Theorem 2.1 (Exact represented information)**.** *The encoding* $\mathrm{enc}(p) = (Z, \kappa, k_0, \dots, k_6)$ *is a bijection onto* $\mathbb{Z} \times \mathbb{N} \times \mathbb{Z}^7$*. Its inverse keeps these coordinates and reconstructs*

$$k_7 = Z - \sum_{t=0}^{6} k_t. \tag{2}$$

Consequently a transformation of recognition patterns retains every pattern if and only if it retains these encoded coordinates for every pattern.

Proof. For any encoded coordinates, (2) makes the sum of the eight period entries equal Z, so reconstruction yields a pattern. Encoding the reconstruction returns the supplied coordinates. Conversely, the defining sum in (1) forces (2) for an existing pattern, so reconstruction after encoding returns that pattern. Applying this inverse to equality of encoded coordinates proves the retention equivalence. □

Physical reading. Full retention of this represented pattern has a concrete information test: retain its charge, stored complexity and independent period coordinates. This is an exact reconstruction statement. It does not assert a minimum number of physical bits.

A charge-only identity criterion records less of the represented object than pattern equality. A transition that copies the pattern preserves it by construction. The physical question is which actual transition enacts that retention and which input distinctions the retained pattern can recover.

3 A full-current recorded recognition step

We specify the native finite operation so the retention argument can be checked directly. An occupation is a pair $x = (a, b) \in \{0, 1\}^2$. Each occupation has an internal index $i \in I = \{0, 1, 2, 3\}^2$. The finite cell space has basis (x, i).

Let L be the cyclic matrix on four coordinates,

$$L_{ij} = \begin{cases} 1, & j = i+1 \pmod 4, \\ 0, & \text{otherwise}, \end{cases} \qquad D = \mathrm{diag}(1,-1,-1,1),$$

and put $S = \frac{1}{2}D(1-L)$ and $F = \frac{1}{2}D(1+L)$. The clock blocks are

$$C_{00} = S, \quad C_{10} = F, \quad C_{01} = -F, \quad C_{11} = -S,$$

where the first subscript denotes output and the second denotes input.

The complete native occupation block from x to $y = (c,d)$ is

$$A_{yx} = \begin{cases} -(C_{c0} \otimes C_{d1})(D \otimes D), & x = (1,0), \\ (C_{c1} \otimes C_{d0})(D \otimes D), & x = (0,1), \\ -(C_{ca} \otimes C_{db}), & x = (a,b) \in \{(0,0),(1,1)\}. \end{cases} \tag{3}$$

All occupations and internal coordinates are included.

Proposition 3.1 (The unrecorded Gram)**.** *The full matrix $M_{(y,i),(x,l)} = (A_{yx})_{il}$ obeys $M^\dagger M = 1$.*

Proof. Since $L^\dagger L = 1$ and $D^\dagger D = 1$,

$$S^\dagger S + F^\dagger F = 1, \qquad S^\dagger F + F^\dagger S = 0.$$

Expanding the clock columns gives

$$\sum_{c=0}^{1} C_{ca}^\dagger C_{cb} = \delta_{ab} 1.$$

Tensoring this equation twice gives the corresponding identity for the blocks $C_{cb} \otimes C_{da}$. Swapping the two input occupations permutes these columns. The odd-occupation right factor $D \otimes D$ is orthogonal, and the displayed signs preserve the column Gram. For different input occupations the column Gram remains zero; for equal occupations it remains the identity. This is $M^\dagger M = 1$. □

The full current of an occupation transition is

$$j(y,x) = (c-b,\ a-b,\ d-a) \in \mathbb{Z}^3. \tag{4}$$

Let $\mathcal{J}$ be the set of its realized values. For fixed y, the current determines x: its first entry gives $b = c - j_0$, and its third gives $a = d - j_2$. This reconstruction is why retaining the current preserves the full input Gram.

For a vector v on the finite cell, define

$$(Rv)(y,j,i) = \sum_{\substack{x,l \\ j(y,x)=j}} (A_{yx})_{il} v(x,l). \tag{5}$$

Equal realized currents have one common record coordinate. In particular, amplitudes with the same zero-current label remain coherent within that coordinate.

Proposition 3.2 (Recording retains the Gram)**.** *The operation in (5) satisfies $R^\dagger R = 1$.*

Proof. Compare input basis columns (x, l) and (x', l'). A product of their recorded coefficients is nonzero only if both currents agree at the same output occupation y. Current reconstruction then forces $x = x'$. For equal x, summing the unique current coordinate for each y leaves

$$\sum_{y,i} \overline{(A_{yx})_{il}}(A_{yx})_{il'} = \delta_{ll'}$$

by Proposition 3.1. For different x the recorded inner product is zero. These are all entries of the recorded Gram. □

Physical reading. The preserved object includes the complete current record and output cell. Coarse readings of that record may merge states; the recorded operation retains the distinctions established by its Gram.

4 The unrestricted field and its retained history

Let H_0 contain the empty history and define $H_{n+1} = \mathcal{J} \times H_n$, newest current first. At depth n use the full Hilbert space

$$\mathcal{H}_n = \ell^2\left(\mathbb{Z}; \mathbb{C}^{\mathrm{Cell} \times H_n}\right). \tag{6}$$

There is no integer-field cutoff and no finite-support restriction. The posting $T_n : \mathcal{H}_n \to \mathcal{H}_{n+1}$ is

$$(T_n v)(q, y, (j, h), i) = \sum_{\substack{x,l \\ j(y,x)=j}} (A_{yx})_{il}\, v(q - j_1, x, h, l). \tag{7}$$

The shift is the middle current entry of (4). Earlier histories are unchanged. Define $V_0 = 1$ and $V_{n+1} = T_n V_n$.

Theorem 4.1 (Full-field retention)**.** *Each T_n and V_n is a complex-linear isometry. For every $v, w \in \mathcal{H}_0$,*

$$\langle V_n v, V_n w\rangle = \langle v, w\rangle, \qquad \|V_n v - V_n w\| = \|v - w\|.$$

In particular $V_n v = V_n w$ exactly when $v = w$.

Proof. For each output current j, translating q to $q - j_1$ is a bijection of $\mathbb{Z}$. Sum the nonnegative squared coefficients of (7) over every integer field coordinate, output cell, fresh current and earlier history. Reindex each translated integer sum and apply Proposition 3.2 in every earlier-history fiber. The result is $\|v\|^2$. Nonnegative sums justify the rearrangement for every square-summable input and establish output summability. Complex linearity and norm preservation give inner-product preservation. Composition proves the claim for V_n. Applying the norm identity to $v - w$ gives distance preservation and injectivity. □

Earlier history may be correlated with the field and cell. The argument acts on the full coefficient array; no factorization is used.

The compatible tower has a minimal complete Hilbert realization $\mathcal{H}_\infty$, with isometries $\iota_n : \mathcal{H}_n \to \mathcal{H}_\infty$ satisfying

$$\iota_{n+1} T_n = \iota_n, \qquad \iota_n V_n = \iota_0. \tag{8}$$

Construct it by identifying compatible stage vectors, taking the induced inner product and completing. The union of stage images is dense. Any other complete realization with compatible isometries and dense stage images receives a unique unitary from this construction: define it on stage images using the other embeddings, then extend the inner-product-preserving map by density. Identifying compatible stage images represents the tower; it is not an additional time evolution on $\mathcal{H}_\infty$.

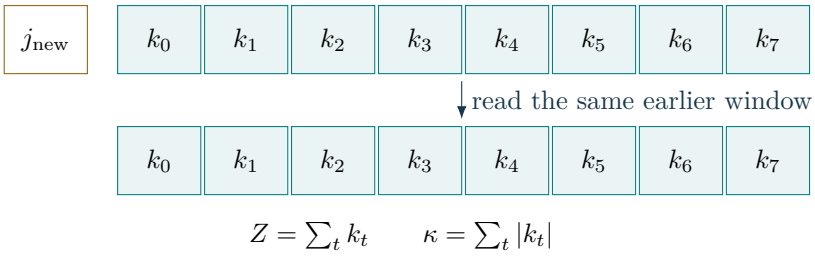

Figure 2: The archive retains a specified window while adding fresh labels. Alignment with an individual's physical clock is a separate identification.

5 A retained eight-posting pattern

For $h \in H_8$, read its eight middle-current entries, newest first:

$$k_t(h) = j_t(h)_1, \qquad Z(h) = \mathrm{acc}(h) = \sum_{t=0}^{7} k_t(h).$$

The specified archive reading is

$$p(h) = \left(Z(h),\ \sum_{t=0}^{7} |k_t(h)|,\ k_0(h), \dots, k_7(h) \right). \tag{9}$$

It is a recognition pattern because its period sum equals $Z(h)$. Here complexity is the displayed sum of absolute current entries.

After m additional postings, drop only those newest m labels and call the remaining history $o_m(h)$. Its retained pattern is $p(o_m(h))$. Adding a new posting obeys

$$p(o_{m+1}(j, h)) = p(o_m(h)).$$

The specified earlier window remains exactly available.

For every complex-valued function f of a pattern, the finite-history diagonal D_f multiplies by $f(p(h))$. It is bounded at a fixed finite depth because the history set is finite. The native archive represents these readings as bounded operators $\mathrm{Read}(f)$ on $\mathcal{H}_\infty$, retaining the same operator when later postings are added. They are faithful on the actual window range:

$$\mathrm{Read}(f) = \mathrm{Read}(g) \quad \Longleftrightarrow \quad f(p(h)) = g(p(h)) \text{ for every } h \in H_8. \tag{10}$$

No surjectivity onto all recognition patterns is used. The reading agrees with the native finite-time action:

$$\langle \iota_0 x, \mathrm{Read}(f) \iota_0 y \rangle = \langle V_8 x, D_f V_8 y \rangle. \tag{11}$$

These properties follow by tensoring an earlier history operator with the identity on each fresh current. The archive represents it faithfully at its birth stage and compatibly thereafter. Restricting operator equality to that stage recovers the diagonal entries, proving (10); compatibility gives (11). The same compatibility retains the earlier-window operator at every later depth.

6 A complete period reading can omit physical information

An actual circulating family makes the scope concrete. Let $e = (1, 1, 1, 1)/2$ and $w = (De) \otimes (De)$. It has norm one. For $\epsilon \in \{+1, -1\}$ place w at occupation $(1, 0)$ for $\epsilon = +1$ and $(0, 1)$ for $\epsilon = -1$, obtaining a normalized cell vector u_ϵ.

Substitution into (3) gives

$$R_j u_\epsilon = \begin{cases} \alpha_\epsilon u_\epsilon, & j = j_\epsilon, \\ 0, & j \neq j_\epsilon, \end{cases} \quad (j_\epsilon)_1 = \epsilon, \quad \alpha_{+1} = 1, \quad \alpha_{-1} = -1. \tag{12}$$

Here R_j is the current-j component of R. To check the substitution, $De = (1, -1, -1, 1)/2$ and $Le = e$, giving $Se = 0$ and $Fe = De$. The odd-occupation right factor sends w to $e \otimes e$; the clock blocks leave only the stated occupation, with the displayed sign.

For arbitrary $F \in \ell^2(\mathbb{Z})$ encode $E_\epsilon F(q, z) = F(q)u_\epsilon(z)$. Equation (12) and the recursion give

$$(V_n E_\epsilon F)(q, z, h) = \begin{cases} \alpha_\epsilon^n F(q - n\epsilon)u_\epsilon(z), & h = (j_\epsilon, \ldots, j_\epsilon), \\ 0, & \text{otherwise.} \end{cases} \tag{13}$$

Inductively the fresh current is j_ϵ, the field shifts by ϵ, and the old history remains. Every period coordinate of the eight-posting word is nonzero. All other histories have zero amplitude under the full operation.

Theorem 6.1 (Scope of a complete window)**.** *At fixed ϵ, every represented function of the eight-posting pattern acts as the same scalar on the entire subspace $E_\epsilon \ell^2(\mathbb{Z})$. For every f,*

$$\mathrm{Read}(f)\iota_0 E_\epsilon F = f(p(j_\epsilon, \ldots, j_\epsilon))\, \iota_0 E_\epsilon F.$$

For different integer addresses $q \neq r$, $E_\epsilon \delta_q$ and $E_\epsilon \delta_r$ have norm one and remain orthogonal under every V_n, while sharing this entire window reading.

Proof. Equation (13) fixes the sole nonzero history word for every F. A function of that word therefore multiplies by the displayed scalar, regardless of the field profile. Compatibility transfers the equality to $\mathcal{H}_\infty$. Since u_ϵ has norm one, E_ϵ preserves inner products. Distinct unit point profiles are orthogonal, and Theorem 4.1 preserves this at every depth. □

Physical reading. Every position in this window records a nonzero posting. Completeness in that sense does not make it a complete native-state description. The omitted field profile can contain arbitrary coherent amplitudes. The entire full state remains recoverable.

The theorem identifies the scope of the specified window reading on the full native carrier. A proposed restriction to a smaller physical sector must be assessed on that sector; Section 10.1 discusses this issue for personal persistence.

7 Recovery retains every full-state action

The recovery map is fixed by the actual iterate:

$$Q_n = V_n^\dagger : \mathcal{H}_n \longrightarrow \mathcal{H}_0. \tag{14}$$

It is the adjoint, rather than an unspecified decoder with a required recovery property.

Theorem 7.1 (Full native recovery)**.** *For every n and $v \in \mathcal{H}_0$, $Q_n V_n v = v$. For each bounded complex-linear input operator A, set $\Phi_n(A) = V_n A Q_n$. Then*

$$\Phi_n(A)V_n v = V_n A v, \tag{15}$$

$$\langle V_n v, \Phi_n(A)V_n w\rangle = \langle v, Aw\rangle, \tag{16}$$

$$\Phi_n(AB) = \Phi_n(A)\Phi_n(B), \tag{17}$$

$$\Phi_n(A^\dagger) = \Phi_n(A)^\dagger. \tag{18}$$

The map $A \mapsto \Phi_n(A)$ is injective. The complete-history decoder $\iota_0^\dagger$ also returns v from $\iota_n V_n v$.

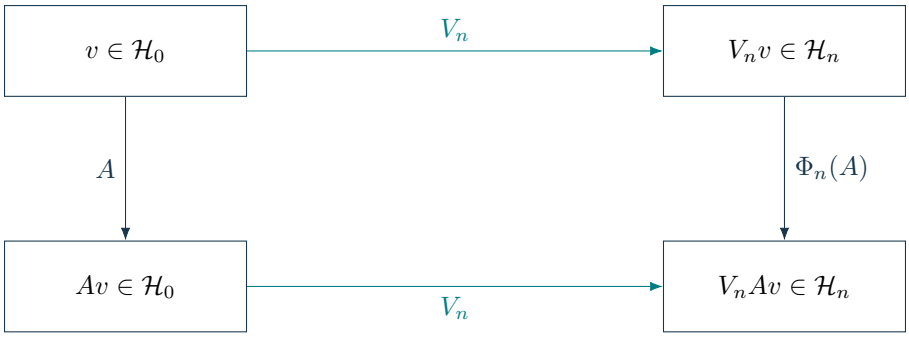

Figure 3: Both routes reproduce the same evolved action, including relative amplitudes.

Proof. Inner-product preservation gives

$$\langle V_n^\dagger V_n v, w\rangle = \langle V_n v, V_n w\rangle = \langle v, w\rangle$$

for every v, w. Hence $V_n^\dagger V_n = 1$, proving recovery. Substitution proves (15), and preservation of inner products gives the matrix-element equality. Inserting $V_n^\dagger V_n = 1$ between A and B proves the product identity. Taking adjoints proves the adjoint identity. If $\Phi_n(A) = \Phi_n(B)$, evaluation on $V_n v$ and injectivity of V_n give $Av = Bv$ for all v. Finally (8) reduces complete-history recovery to $\iota_0^\dagger \iota_0 v = v$. □

The unit of the retained operator image is $V_n V_n^\dagger$, the projection onto the evolved range. It need not be the identity on the whole output space. These full-carrier operators need not be functions of the eight-posting label or available local instruments.

There is also an explicit reversible representation of each event. For an isometry $T : \mathcal{H} \to \mathcal{K}$,

$$U_T(x, y) = (T^\dagger y,\ Tx + y - TT^\dagger y) \quad \text{on } \mathcal{H} \oplus \mathcal{K}.$$

Substitution of $T^\dagger T = 1$ gives $U_T^2 = 1$, and the adjoint identities give $U_T^\dagger = U_T$. Thus U_T is unitary and

$$U_T(x, 0) = (0, Tx), \qquad U_T(0, Tx) = (x, 0).$$

For T_n this returns the ready input from its posting output. A physical inverse actuator and its Hamiltonian remain part of enactment.

7.1 Reversible recording and dilation theory

Bennett's reversible simulation retains intermediate classical computation records, copies the desired classical output and runs the history backward to clear the workspace [1]. It establishes that preserving enough history can remove logical irreversibility. Our history construction instead keeps the record as part of the evolving carrier. Its additional task is to verify that the specified native amplitudes and current labels preserve inner products, including superpositions. The recorded Gram calculation performs that check; merely attaching a label would not replace it.

Stinespring's Theorem 1 represents a completely positive map from a unital C^*-algebra into bounded Hilbert-space operators through a representation on a larger space. For a unital map, the connecting operator can be taken isometric [2]. This general result explains why a larger carrier is a familiar mathematical setting for retaining information. Here the larger carrier and its coefficients are specified by the native current history, and their isometry is proved directly. The displayed U_T is an explicit direct-sum unitary extension of that isometry. It supplies a mathematical inverse, without specifying a tensor-product apparatus coupling or its actuator.

The substantive comparison is therefore at the level of the supplied dynamics and the available readout. The native construction verifies recovery with the entire record retained and identifies an infinite-dimensional family whose distinctions the window reading omits. Neither that restricted reading nor access after physical record loss is supplied by an abstract dilation. The corresponding recovery problem needs its own access condition, as in the comparison below.

7.2 Operator quantum error correction and access to the record

Kribs, Laflamme, Poulin and Lesosky formulate operator quantum error correction for finite-dimensional quantum channels. A recovery channel restores a protected subsystem while an auxiliary subsystem may change. Definition 3.1 and Theorem 3.2 express this as subsystem recovery and an equivalent fixed-algebra condition; Theorem 3.5 gives a necessary and sufficient condition on the channel's error operators [6].

Our recovery addresses a different access condition: $V_n^\dagger$ receives the entire field and retained record. Theorem 7.1 supplies an isometric encoding and its adjoint, together with the represented input algebra. It does not construct recovery after noise or after part of the record is discarded. Its value here is that the native transition itself yields this encoding on the unrestricted field. The window examples then identify information omitted by a particular reading of the output. Relating such a restricted readout to a correctable subsystem would require specifying the resulting channel and proving the corresponding recovery condition. The full-record adjoint alone does not discharge that requirement.

8 Full native action has an exact nonduplication property

Copying a classical label and reproducing every full-state action impose different demands. Let L and R assign an operator on $\mathcal{H}_n$ to every bounded input operator on $\mathcal{H}_0$. Say each retains full action when

$$L(A)V_n v = V_n A v, \qquad R(A)V_n v = V_n A v \quad \text{for every } A, v. \tag{19}$$

The actual Φ_n provides such a family. Define independence here by

$$L(A)R(B) = R(B)L(A) \quad \text{for every } A, B. \tag{20}$$

Theorem 8.1 (No two commuting full-action families)**.** *At every finite depth n, two families satisfying* (19) *cannot also satisfy* (20)*.*

Proof. If (20) held, then

$$V_n ABv = L(A)R(B)V_n v = R(B)L(A)V_n v = V_n BAv$$

for every A, B, v. Injectivity of V_n would force $AB = BA$ for every pair.

Inside this native carrier take the normalized orthogonal packets

$$u = E_{+1}\delta_0, \qquad w = E_{+1}\delta_1.$$

The bounded self-adjoint operators

$$P = |u\rangle\langle u|, \qquad X = |u\rangle\langle w| + |w\rangle\langle u|$$

satisfy $PXw = u$ and $XPw = 0$. Since $\|u\| = 1$, they do not commute. This contradicts forced commutativity. □

Product preservation and injectivity in Theorem 7.1 also give

$$\Phi_n(P)\Phi_n(X) \neq \Phi_n(X)\Phi_n(P).$$

The retained image keeps this same explicit noncommuting pair. Independence means exactly (20). No tensor factorization or available control is asserted. Classical Z labels and current words can be copied without meeting the theorem's full-action requirement.

8.1 Relation to state broadcasting

Barnum, Caves, Fuchs, Jozsa and Schumacher consider a physical operation that receives one of two density operators and a fixed auxiliary state. Broadcasting requires both output marginals to equal the input; the joint output may be correlated. They prove that such an operation exists for the pair exactly when the two density operators commute [7].

Theorem 8.1 instead concerns bounded actions on the native carrier. It requires exact intertwining of every input action by each of two output families, together with commutation between the families. Those are not marginal-state conditions for a selected pair of density operators. The proof uses injectivity of the actual V_n and an explicit native noncommuting pair, without positing a tensor decomposition or a broadcasting channel. Its role is to show that full native action cannot satisfy this precise independence requirement, even where a classical window reading is identical. It neither classifies broadcastable state families nor establishes a new general no-broadcasting theorem. This distinction keeps the physical meaning of independence attached to (20).

9 A coherent reference also requires preparation

The complete-current history above and a finite reversible counter retain different records. The latter uses three mod-eight cells,

$$C = (\mathbb{Z}/8\mathbb{Z})^3, \qquad |C| = 512,$$

and keeps every counter direction. Let $\omega(x) = a - b$ for the input cell $x = ((a, b), i)$. Its step S acts on $\ell^2(\mathbb{Z}; \mathbb{C}^{\mathrm{Cell}\times C})$ by

$$(S\psi)(q, y, r) = \sum_{\substack{x,s \\ r=s+j(y,x) \bmod 8}} M_{yx}\, \psi(q - \omega(x), x, s). \tag{21}$$

Here $j(y, x)$ reads the occupations in the two cell labels. Controlled counter translations surround the same full matrix M. The counter is finite; it does not store an arbitrarily long current word.

The coherent source step on $\mathcal{H}_0$ is

$$(Tv)(q, y) = \sum_x M_{yx} v(q - \omega(x), x).$$

Define the uniform-reference embedding and a definite-counter embedding by

$$(Jv)(q, x, s) = \frac{v(q, x)}{\sqrt{512}}, \qquad (E_r v)(q, x, s) = \mathbf{1}_{s=r}\, v(q, x). \tag{22}$$

Both embeddings are isometric on every square-summable input. The full counter step is isometric and satisfies $SJ = JT$. This exact recovery of coherent evolution on the embedded range presupposes that range as the input preparation.

Theorem 9.1 (Recorder preparation obstruction)**.** *For every natural recorder depth n, counter value r and $v \in \mathcal{H}_0$,*

$$\left\|J^\dagger S^n E_r v\right\|^2 = \frac{\|v\|^2}{512}. \tag{23}$$

If $v \neq 0$, there is no $w \in \mathcal{H}_0$ for which $S^n E_r v = Jw$.

Proof. The square finite matrix obeys $MM^\dagger = 1$ as well as $M^\dagger M = 1$. Together with inverse integer translations, this gives $TT^\dagger = 1$. Taking adjoints of $SJ = JT$ gives $J^\dagger S^\dagger = T^\dagger J^\dagger$. Hence

$$J^\dagger S = TT^\dagger J^\dagger S = TJ^\dagger S^\dagger S = TJ^\dagger.$$

Since T is isometric, induction shows that $\|J^\dagger S^n \psi\|$ is independent of n. The initial overlap is $J^\dagger E_r v = v/\sqrt{512}$, proving (23). If $S^n E_r v = Jw$, isometry gives $\|w\| = \|v\|$, whereas (23) and $J^\dagger J = 1$ give $\|w\|^2 = \|v\|^2/512$. A nonzero v makes these equalities incompatible. A unit packet at any integer address supplies an explicit nonzero input. □

This obstruction concerns finite iterates of the specified recorder. The native control language supplies an additional operation that prepares the uniform sector. Let U_w act as the identity on the source cell and as the matrix of a finite native three-channel control word w on the counter, at every integer field address. The control language permits real-valued parameters in its primitive gates.

Theorem 9.2 (Finite-word preparation and coherent trajectory)**.** *There are one finite native word w and one $c \in \mathbb{C}$ with $|c| = 1$ such that, for every $v \in \mathcal{H}_0$ and every $n \in \mathbb{N}$,*

$$U_w E_0 v = cJv, \tag{24}$$

$$S^n U_w E_0 v = cJT^n v, \tag{25}$$

$$\|S^n U_w E_0 v\| = \|v\|. \tag{26}$$

In particular, a unit input at any integer address and native cell has norm one at every finite depth after this preparation.

Proof. Identify each mod-eight counter cell with its eight register coordinates. On one such register, the product of Hadamards on its three binary coordinates is unitary and has constant zero column $(\sqrt{2}/2)^3$. Tensoring this matrix across the three counter cells gives a unitary with constant zero column

$$(\sqrt{2}/2)^9 = 1/\sqrt{512}.$$

The native finite-word reachability theorem represents this unitary by a finite three-channel word, up to one complex scalar of norm one. Its Lie-generation premise is proved for the native gate groups. Bijective reindexing retains every counter direction. Lifting the counter matrix together with the identity on the source cell gives (24) on the entire square-summable field. Iterating $SJ = JT$ proves (25); the norm preservation of T and J gives (26). The literal single-coordinate input supplies the normalized witness. □

The same word and phase precede both universal quantifiers; preparation does not depend on the input field or the subsequent depth. The recorder obstruction and the preparation theorem apply to different available operations, with their scopes stated explicitly.

Theorem 9.3 (Finite angle precision at every recording depth)**.** *For every $\varepsilon > 0$, there are one finite native word q with rational angle parameters and one $c \in \mathbb{C}$ with $|c| = 1$ such that*

$$\left\|S^n U_q E_0 v - cJT^n v\right\| \leq \varepsilon \|v\| \qquad (n \in \mathbb{N},\ v \in \mathcal{H}_0). \tag{27}$$

For a literal unit input at any integer address and native cell, the error is at most ε at every finite depth.

Proof. Each real-angle primitive has a rational-angle approximation within any positive matrix operator-norm tolerance. Rational density and the native braid bound $\|B(\theta') - B(\theta)\| \le 2|\theta' - \theta|$ give this for braids; entanglers are unchanged. The product-error bound for unitary factors then approximates every finite word by a rational-angle word of the same length.

The actual counter-matrix action defines a linear map from the finite register-matrix space into the bounded operators on the full field. Its finite-dimensional domain makes this map bounded. Write C for its finite operator norm. It follows that, for native words u, w and any full field vector z,

$$\|U_u z - U_w z\| \le C \, \|W_u - W_w\| \, \|z\|,$$

where W_w is the finite register matrix of w. Take the exact word and phase from Theorem 9.2, and approximate its register matrix within $\varepsilon/(C+1)$. Since E_0 is isometric, the preparation error is at most $\varepsilon\|v\|$. Linearity and isometry of S^n preserve this error, while (25) identifies the exact comparison trajectory. The norm-one input gives the last assertion. □

One word and phase work for every input and every finite depth once a tolerance is chosen. The approximation changes only the finite counter-control angles; it introduces no support restriction or cutoff on the integer field. The operator norm C is finite by the proved continuity argument, rather than a numerical engineering budget. Finite rational syntax removes ideal real-angle precision from the existence statement. The depth-uniform bound propagates a single preparation error through exact recorder steps; it does not bound errors introduced afresh at every step. Effective synthesis of the word, physical switching, Hamiltonian actuation against the actual background and paid energy and duration still need a physical construction.

9.1 Reachability, gate synthesis and the native contribution

The uniform counter target uses standard finite-dimensional quantum operations. Barenco and collaborators establish universality of one-qubit gates together with controlled-NOT [3]; the product of nine Hadamards used here is an elementary instance of register state preparation. The issue for this paper is whether the permitted native controls can realize that target. Exact reachability from Lie generators is also established theory: D'Alessandro proves uniform finite generation for compact connected Lie groups, with factors drawn from one-parameter groups whose generators span the Lie algebra under brackets [4]. Our argument supplies the native Lie-generation result, the counter reindexing and the lift to the unrestricted field. Theorem 9.2 proves existence of a word in that native language; it does not extract a gate list or a quantitative word-length bound.

Finite-precision compilation asks a further question. The Solovay–Kitaev theorem, in the formulation of Dawson and Nielsen, starts from a fixed finite, inverse-closed gate set generating a dense subgroup of $SU(d)$ and gives approximation by words with polylogarithmic length in inverse tolerance [5]. Theorem 9.3 instead approximates the real parameters of one existing finite word by rational parameters. Its allowed angles range over all rationals, rather than a fixed finite alphabet. It establishes neither a synthesis algorithm with a complexity bound nor a bound on the bit length of the rational angles. The subsequent depth independence follows from exact isometric recording of the single preparation error; it is not a bound for noise added during later steps.

The operational distinction established here is between the recorder and the larger native control language. The former cannot prepare the uniform sector from the stated initial condition; the latter reaches it and intertwines its subsequent evolution with the coherent source trajectory for every square-summable input. Established control results supply a proof ingredient. The native invariant, admissible controls and full-field intertwining determine what that ingredient accomplishes for this dynamics.

10 Discussion: from retained information to personal persistence

The results establish information retention and coherent preparation for specified native recognition dynamics. Full-state recovery uses the entire field and current record; the window reading retains fewer distinctions. Coherent preparation requires additional controls beyond recording, and their mathematical existence leaves physical actuation, effective synthesis, energy and duration to be supplied. These conclusions provide concrete criteria for applications: identify the carrier, the actual evolution, the accessible record and the available controls.

Personal persistence is one such application. In the RS account, a soul is the persistent recognition structure associated with a conscious individual. The account connects a shared physical recognition substrate to local boundaries and retained individual histories. Its dual-aspect reading identifies an event's observable physical relation and its experienced inside as aspects of the same occurrence [10, 9]. This gives the application a physical question: which individual structure continues through a change of embodiment, and what makes that continuation the history of the same experiencing subject? Selecting that structure, following it through dissolution and establishing its experiential identity remain unfinished.

10.1 Selecting the individual carrier

The full native Hilbert space in this paper is the domain of a retention theorem. The construction has not selected within it the physical carrier of a particular individual. That selection must connect native interaction and retained-record dynamics to the individual's boundary, clock and pattern reading. The existing boundary description supplies positive spatial extent, temporal coherence of at least an eight-tick interval and an associated recognition pattern; a self-registry records the recognizer's own history [9, 10]. These ingredients motivate the construction, but their association with one individual must be derived for the actual evolution.

In particular, the proposed personal pattern of a physical state s must agree with the reading of its physically selected eight-posting history:

$$p_{\mathrm{personal}}(s) = p(h_{\mathrm{selected}}(s))$$

on a nonempty admissible carrier. Clock alignment, charge and complexity must belong to this same construction. Theorem 6.1 shows why the carrier matters: the complete specified window reading merges orthogonal states on the full field. A label-completeness claim restricted to an instantaneous consciousness sector [9] therefore needs its own physically justified sector and completeness argument. The full-field example neither establishes nor refutes completeness on a sector that has yet to be identified. It prevents full personal information from being inferred merely from completeness of the eight recorded postings.

10.2 Continuity through dissolution

Selecting a personal carrier would make the next question definite: what happens to its information during the actual loss or change of embodiment? The map from the embodied state into the native description, the physical dissolution process and any proposed reconstitution must be connected to the retained variables. Theorem 2.1 then gives a test for pattern retention. A claim about richer personal history must identify and retain the additional information it requires.

The adjoint identity in Theorem 7.1 establishes recovery for the specified V_n with the full output available. It does not identify bodily dissolution with that evolution or establish access to its entire record afterward. The application must therefore show where the individual's relevant information resides through the transformation, which carrier retains it, and what a proposed

recovery would act on. The mathematical event inverse and finite control word give constructions to connect to this process; physical implementation and its resources remain separate obligations.

This distinction also determines what a persistence claim must establish. Retaining a pattern, retaining a full state and continuing an experiencing individual are different claims. The first two supply information conditions for a proposed dissolution or reconstitution. The remaining experiential connection determines whether that physical history is the continuation of the same subject.

10.3 Experiential identity

Experience is itself an occurrence within the reality being explained. The RS dual-aspect account places it within the same recognition activity that carries comparisons and records [10]. The unfinished step is the precise physical identification between that activity and felt occurrence, together with the relation that makes successive occurrences belong to one subject. State recovery alone does not establish this relation. Nor does the nonduplication theorem: its conclusion concerns two commuting representations of every native action, with independence defined by (20).

An existing characterization makes the proposed identification explicit. Let $\mathcal{C}$ be the native comparison carrier, let $\sim$ be its native formation-energy transport equivalence, and let a phenomenal reading assign felt occurrence $F(c)$ and subject label $s(c)$. The proposed native phenomenal identity law is

$$\begin{aligned} &\forall c \in \mathcal{C},\ F(c), \\ &\text{and} \quad \forall c, d \in \mathcal{C}, \quad s(c) = s(d) \iff c \sim d. \end{aligned} \tag{28}$$

Proposition 10.1 (Meaning of native phenomenal identity)**.** *On the connected native formation-energy transport carrier,* (28) *is equivalent to every comparison being felt and all those comparisons having one subject.*

Proof. Native transport connects every pair, so $c \sim d$ holds for all c, d. Under (28), transport-to-label implication gives equal subject labels. Conversely, universal felt occurrence and one-subject composition give label equality, and native connectedness gives the transport relation. Both sides of the biconditional hold. □

This proposition states the content of the proposed law under native connectedness. It does not establish that the law is the actual phenomenal reading. The quotient $\mathcal{C}/\sim$ represents a reading satisfying it; physical selection of that reading remains unfinished. On the connected carrier the law concerns universal felt occurrence and one subject. An application to distinct personal histories must additionally identify the appropriate personal sectors and their continuity relation. The global characterization alone does not select those individuals.

Completing the personal-persistence application requires these three connections to hold for the same physical objects and transformations: a selected individual carrier, information retained through its actual dissolution or change of embodiment, and a justified experiential identity relation along that history. The present results establish the retention and preparation properties available for that construction. They give a precise basis for pursuing the application while leaving its personal-persistence conclusion open.

A Source-pinned mathematical and verification account

The accompanying bundle pins the declarations, hypotheses and remote compiler outputs. The retained-history recovery and nonduplication results use source commit

`786512c439b632763ae70fde9c62c613ad8eda88`.

The recovery and nonduplication checks used Lean `4.27.0-rc1` and Mathlib

`d7ea5678e6d426e87e9b4a65a48143c4874dc501`.

In the accepted remote checks cited below, audited roots passed compiler-kind and owning-module checks with only `propext`, `Classical.choice` and `Quot.sound`, or a subset. These are frozen-source checks. Increment coverage is distinct from complete coverage of the full personal-persistence objective. Namespace prefixes below are `IndisputableMonolith.Consciousness` unless stated otherwise.

A.1 Pattern reconstruction

Theorem 2.1 maps to `SoulZInformation.reconstruct_encode`, `encode_reconstruct`, `encode_injective` and `retains_pattern_iff_coordinates`. Its producing and coverage outputs are `receipts/producing_01.json` and `receipts/coverage_01.json`, relative to `plans/Actual_Reality_Papers_20261020/soul_z_pattern/`. The explicit nonzero-charge witness inhabits the represented carrier. The named physical dissolution target remains a specification.

A.2 The native operation and complete field

The definitions and results in Sections 3 and 4 are in `IndisputableMonolith.Foundation`. `NativeRecordedChargeSource.stepBlock` and `NativeRecordedChargeSource.current` give the displayed occupation blocks and current. The full Gram is `NativeRecordedUnitaryData.unrecordedQ_columns`, cast into the complex carrier by `NativeRecordedCertified.native_gram`. The recorded Gram is `NativeRecordedCertified.recorded_gram`; its reconstruction argument is `NativeRecordedIsometry.recorded_gram_of_reconstruction`. `NativeRecordedHistoryHilbert.historyStep_apply` gives the full coefficient formula, and `NativeRecordedHistoryHilbert.iterate_norm` gives norm preservation. `NativeCompleteHistory.embed_posting`, `NativeCompleteHistory.histories_dense` and `NativeCompleteHistory.complete_history_unique` supply compatibility, density and uniqueness of the complete realization.

These upstream sources are pinned in `source_archives/native_nonduplication_21/native_nonduplication_sources_21b.json` and its matching source archive, relative to the plan directory above. The source-manifest SHA-256 is

`c3133f6e838d450d06f21d24c9cd6c9d117904c97f6d5ef8e81f21bb7b2b4793`

The full recorded operation has no field cutoff or support restriction. The adjoint recovery and nonduplication audits below use this pinned operation through their actual imports.

A.3 Coherent-counter reference and preparation

Section 9 uses `SoulZNativeCounterCoherence.counter_step_intertwines`, `uniform_gram`, `uniform_embedding_norm` and `SoulZNativeCounterPreparation.coherent_step_coisomet`

ry, reducing_intertwiner, uniform_sector_norm_invariant, definite_uniform_sector_weight, recorder_cannot_prepare_uniform and unit_input_obstruction. The coherence source SHA-256 is

```
ec3dcabf7b2a2a293bde54d72fe2db8964687a3e70fe2749167d80f994d9dc28
```

The preparation source SHA-256 is

```
978c02cc775fe4abfcef917cce4869d21c6dedd958d09589ab0791f19924f28a
```

The frozen closure, its manifest and the runner are under source_archives/native_counter_preparation_23/. The producing receipt is receipts/producing_counter_preparation_23k.json; receipts/coverage_claims_23k.json checks all 37 roots in twelve reviewed groups, without a gap within that increment. The two changed modules and the audit compiled on the authorized Lambda host in 56.803638 seconds. Every audited root has only the standard three axioms or a subset. These checks establish the stated operator obstruction. Finite-word preparation has its own evidence below.

A.4 Finite-word preparation and the prepared trajectory

Theorem 9.2 uses SoulZNativeCounterWordPreparation.native_word_prepares_full_field and SoulZNativePreparedCounterTrajectory.native_prepared_counter_trajectory. The explicit counter construction includes register_hadamards_unitary, register_hadamards_zero_column, hadamard_counter_amplitude, counterCoordinates, counter_word_unitary, native_word_prepares_counter and counter_control_prepares in the preparation namespace. The finite reachability roots are IndisputableMonolith.Quantum.CubeLieGeneration.lieGenerationOn and IndisputableMonolith.Quantum.PowerRowUniform.word_of_unitary_on. The construction supplies the latter theorem's Lie-generation, register-size and unitary hypotheses. Its existence conclusion uses the literal native finite-word language; it does not assume a preparation word.

The preparation source SHA-256 is

```
875b64693e9afd658cf8cb7f3df5dd3108db4f4d6a218dcd42c7edafb32e49e3
```

All fourteen declarations and the two reachability roots passed the fresh kind, module and transitive-axiom audit. The new module and audit compiled on Lambda in 19.743936 seconds. Its frozen closure contains 1,221 Lean sources and three configuration files. Dependency binaries were matched to source bytes and frozen cache hashes; the two reachability roots were freshly axiom-audited rather than rebuilt. The producing receipt is receipts/producing_counter_word_25c.json, SHA-256

```
1ab6437b630ddb9895368dfb18a4bda1c43a3737ab5531fe0af242cab5c0d560
```

receipts/coverage_claims_25c.json covers all sixteen roots in seven reviewed groups, with no errors or gaps at increment scope. Its SHA-256 is

```
784c36fe7ecb8e5b96bcc829297d6294d9b4ef38332ab9de205d4008c2dd30e4
```

The source closure and cache inventory are under source_archives/native_counter_word_preparation_25/.

The trajectory source SHA-256 is

```
7bc03473818969b0faa39c43be3662505ca65d287341344c7d3736c65747e0fd
```

The trajectory and its audit compiled in 14.326150 seconds. Four roots passed the fresh standard-three audit: the trajectory, finite-word field preparation, `SoulZNativeCounterPreparation.unit_input_norm` and `SoulZNativeCounterCoherence.counter_step_uniform`. Its closure contains 1,222 Lean sources and three configuration files, reusing the matched preparation dependencies. The producing receipt is `receipts/producing_prepared_trajectory_26a.json`, SHA-256

`2368a790004d3099a417e03c7084280630119f9952f252a5b695a6864c1d0902`

`receipts/coverage_claims_26a.json` checks four reviewed groups with no errors or gaps at increment scope. Its SHA-256 is

`3b6cf8d4a2482966cb312a61a14b1b9bd2c7d40f43dd1bd0ed2e7c591d124cca`

The closure and cache inventory are under `source_archives/native_prepared_counter_trajectory_26/`. Neither check is a fresh whole-dependency or whole-Mathlib build. Physical actuation and personal or phenomenal identification remain outside both conclusions.

A.5 Finite rational precision on the unrestricted field

Theorem 9.3 is `SoulZNativeFinitePrecisionPreparation.finite_precision_prepared_trajectory`; its norm-one specialization is `finite_precision_unit_trajectory`. `rational_token_approximation` and `rational_word_approximation` give the same-length rational syntax. The actual field bound uses `counterMatrixControlLinear`, `counterMatrixControl`, `counter_matrix_control_word` and `counter_control_error`; `counter_iterate_sub` transports the difference through recorder iterates. The unchanged angle and product bounds are `IndisputableMonolith.Quantum.CubeFiniteAngleControl.braid_angle_error` and `contraction_product_error` in that quantum namespace.

The finite-precision source SHA-256 is

`638b3d1976483d1aa4a605ef96133755467104a104d60c159cf13c7dffd8e865`

The new module and its audit compiled on Lambda in 26.402611 seconds. All nine declarations and four dependency roots passed fresh kind, owning-module and transitive-axiom checks, using only the standard three axioms or a subset. The frozen closure has 1,224 Lean sources and three configuration files. Its 1,222 dependency binaries were source-matched; this check did not rebuild the dependency closure or Mathlib. The producing receipt is `receipts/producing_finite_precision_28c.json`, SHA-256

`dabdd215a74577daa49f69a14b4386410f6348e5cf362acfcd7e50b88d8469be`

`receipts/coverage_claims_28c.json` checks thirteen roots in eight reviewed groups with no errors or gaps at increment scope. Its SHA-256 is

`67c838cc9f8b8e1018caed8ed8ca0ed7c1d385cc788931a26f9a9558b3e202c6`

The source closure, cache inventory and exact failed proof inputs are under `source_archives/native_finite_precision_preparation_28/`. The quantifiers and norm-one specialization rule out a zero-vector-only reading. Effective synthesis, physical actuation and personal and phenomenal identification remain open; this increment does not complete their coverage.

A.6 The window and its scope

Sections 5 and 6 use `SoulZNativeArchivePattern`, `SoulZNativeCirculatingWindow` and `SoulZNativeWindowScope`. Relevant roots are `posting_sum`, `retainedRead_eq_windowRead`, `windowRead_eq_iff`, `windowRead_evolution`, `windingWindow_complete`, `native_support`, `window_action_scalar`, `window_read_scalar` and `complete_window_not_full_native_identity`. The circulating-window source SHA-256 is

`8950fe89efa13de122bae739d7f7dda0294e33eefc2a4802b305295129b4ec09`

The window-scope source SHA-256 is

`4c0ac33b3d0e6ae7b30e3d6ac3c8b92ccbbd89b9e2492bf6e9563d5465ce5573`

The frozen accounts are increments `17b/17d`, `18d` and `19b`. Their accepted source closures and outputs remain separate from the changed canonical clock source `16`, whose altered version has no accepted verification here.

A.7 Full recovery

The path is `IndisputableMonolith/Consciousness/SoulZNativeFullRecovery.lean`. Source SHA-256:

`480cec26f5168fe34774d1821b303df249cad956e212b8c82ceef45adb9054f2`

Theorem 7.1 maps to `recover_iterate`, `retainedObservable_apply`, `retainedObservable_matrix_element`, `retainedObservable_injective`, `retainedObservable_mul`, `retainedObservable_adjoint` and `recoverComplete_iterate` in that namespace. `iterate_eq_iff` and `iterate_distance` retain equality and distance. `eventUnitary_return` proves ready-output return. `normalized_recovery_witness` supplies norm-one packets for every integer address and finite depth.

All fourteen roots passed in 38.035682 seconds on the authorized Lambda host, with Lake, process and runner exit codes zero. The producing output is `receipts/producing_native_full_recovery_20a.json`. SHA-256:

`fd2bbaa076c93fb24bd43e10896842e2ed90b410e02ffd49d95506ee2f50037d`

The account `claim_account_20b.json` passed five reviewed groups with no metadata errors or gaps. Its coverage output SHA-256 is

`46224e80c230a14818f4e27562782e22d6fad9ce1d917a6a658c72f8b7b66b75`

The closure contains 168 canonical modules and three build-configuration inputs. Source archive SHA-256:

`3cbca25ce1073a987052043293f0c29eb217985ed74919dbc3a0bdbc05b9a6ba`

A.8 Nonduplication of full action

The path is `IndisputableMonolith/Consciousness/SoulZNativeNonduplication.lean`. Source SHA-256:

`92ad63885e384ee2cfd9b793f18a3c869ea3320ec875f9fa3e5e3891102c6e30`

Theorem 8.1 maps to `commuting_recoveries_force_commutativity` and `no_commuting_full_recoveries`. The explicit native pair is `nativeProjector`, `nativeTransition`; `native_operators_selfAdjoint` and `native_operators_not_commute` prove its properties. `retainedObservable_retains` and `retained_operators_not_commute` connect it to the actual family.

All nine roots passed in 26.389829 seconds, with Lake, process and runner exit codes zero. The producing output is `receipts/producing_native_nonduplication_21b.json`. SHA-256:

```
a5d206b5d8855824f5d3573ef239d9887cfb7d0dd71a7e1663c75e73206dc9ce
```

The claim account `claim_account_21b.json` passed four reviewed groups and all nine roots without metadata errors or gaps. Coverage output SHA-256:

```
0dc5313015a14091ff7a9e6cde867a2ed100a42e79d013254b0caf1f2931dc66
```

The closure contains 170 canonical modules and three build-configuration inputs. Source archive SHA-256:

```
1badc50a220b03ebbd6d4b5f529fe07b4caa9aa72dcdefd9967d3302f2c55a18
```

A.9 Physical interpretation and remaining obligations

Proposition 10.1 is the existing `NativePhenomenalIdentityCharacterization. native_phenomenal_identity_iff_universal_one_subject`. The canonical quotient is characterized in the same module. This is an inspected upstream result; no fresh source-matched producing check of that module is asserted by the recovery or nonduplication outputs.

`PhysicalPersonalWindowTarget` and `PhysicalDissolutionRetentionTarget` name the personal-window and dissolution-retention specifications. No physical witness is claimed here. The boundary selector, embodied-to-native map, physically actuated preparation and inverse controls, Hamiltonian and resource account, actual dissolution and reconstitution, experiential identification and personal temporal criterion remain to be derived. The mathematical counter preparation and finite-depth trajectory have the proved scope above. Increment `05`, changed canonical clock source `16` and complete-goal coverage also remain unverified at their recorded scopes. These obligations retain the full personal-persistence objective.

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