The Single Record

Artist's Proof 23

Entanglement

Bell inequality and the single-record constraint

Status and Dependency

This paper dissolves the quantum entanglement paradox. Entanglement is not a mysterious connection between distant particles but the actualisation of a single pre-state entity.

The apparent non-locality arises because the pre-state (AP07) has no spatial structure — distance is a property of the manifold (the accumulation of records), not of the probability state that precedes it.

Three formal results. Lemma 1 (Local Interaction, Global Actualisation) establishes why a local measurement on any subsystem of an entangled state necessarily actualises the global state.

Proposition 1 (Single Record) shows that the actualisation of an entangled state is a single record-writing event with no signal propagation between subsystems.

Proposition 2 (Bell Prediction) shows that Bell's theorem is predicted by the axioms: Axiom R structurally forbids pre-existing value assignments, the non-spatial pre-state dissolves the locality presupposition, and the Born rule (AP07) yields the quantitative violation.

Axiom C is safe because its scope is the manifold, not the transition from pre-state to manifold.

The dependency chain: AP07 (complex Hilbert space, Born rule, no spatial pre-state) → AP09 (measurement as actualisation) → Axiom R (record-writing, irreversibility) → Axiom C (Constraint) → this paper (entanglement as single actualisation, Bell predicted, relativistic covariance dissolved).

Epistemic status per section. §1 (Problem of Entanglement): historical — summary of the entanglement puzzle, Bell's theorem, and the tension with Axiom C. §2 (Distance is a Property of the Record): established — follows from AP07 and AP17. §3 (Single Entity): derived — the entangled state is one mathematical object in the pre-state. §4 (Single Actualisation): derived — Lemma 1 + Proposition 1. §5 (Axiom C

Safe): derived — scope clarification; no-signalling derived from axioms. §5.1 (Relativistic Covariance): derived — actualisation has no spacetime location. §6 (Bell Predicted): derived — Proposition 2 + quantitative CHSH verification.

Notation

|AB⟩ — the entangled state of two subsystems A and B. A single vector in the tensor product $\mathcal{H}_A \otimes \mathcal{H}_B$.

$\mathcal{H}_A \otimes \mathcal{H}_B$ — the tensor product of Hilbert spaces. Combines degrees of freedom algebraically; does not embed them into spacetime.

$\rho_A = Tr_B(|AB\rangle\langle AB|)$ — the reduced density matrix of subsystem A. For an entangled state, ρ_A is a mixed state.

This is an improper mixture (a marginal of a global pure state), not a proper mixture (classical ignorance over a definite but unknown pure state).

Record target — a state eligible for actualisation under Axiom R.

A record target is a pure state (a ray in Hilbert space) — a single, definite quantum state from which a record can be written.

A reduced density matrix of an entangled system is not a record target: it is a marginal derived from the global state, not an independent state in its own right.

Actualisation — the writing of a record onto the manifold. The break. Axiom R. Targets pure states.

Pre-state — the complex Hilbert space prior to actualisation (AP07). No spatial structure.

When standard QM writes $\psi(x_A, x_B)$, those coordinates are a representation relative to a record-defined position basis on the manifold; they are not fundamental structure of the pre-state.

Separable state — a state that can be written as $|A\rangle \otimes |B\rangle$ (a product of independent states). Subsystems can be actualised independently.

Entangled state — a state that cannot be written as $|A\rangle \otimes |B\rangle$. Non-factorizability forces single actualisation (Lemma 1).

Kill Switches

KS-48a (Correlation timing): LIVE — EMPIRICAL. Structurally secure.

KS-48b (No-signalling): LIVE — EMPIRICAL. Structurally secure.

KS-49 (Hidden variables): CLOSED. Local: empirical (Bell tests). Non-local: axiomatic (Axiom R).

KS-54 (Partial collapse): LIVE — EMPIRICAL. Structurally secure.

Here is how to destroy this paper. Show that entanglement correlations degrade with distance or timing in a way that quantum mechanics does not predict — that would kill the single non-spatial actualisation account.

Or violate the no-signalling theorem experimentally — that would kill Axiom C's scope claim.

Or demonstrate partial collapse of a genuinely entangled state, where measuring subsystem A leaves the global state incompletely determined — that would kill Lemma 1. The argument hands you these weapons. Use them.

§1 — The Problem of Entanglement

You have broken a plate and given one half to a friend who drove to the other side of the country.

When you look at your half and see that the break runs left to right, you know instantly that their half has the complementary edge. No signal was sent. No magic occurred.

The halves were always one plate.

Entanglement is like this — except the plate has no definite edge until you look at it.

Two particles are prepared in an entangled state — their combined spin is exactly zero. They are separated. One is sent to Alice, the other to Bob, at opposite ends of the galaxy.

Neither particle has a definite spin until measured. They are in superposition (AP07).

Alice measures her particle and finds spin-up. Instantly — not at the speed of light, but instantly — Bob's particle becomes spin-down. Across 100,000 light-years. No signal sent. No time elapsed.

Einstein called this "spooky action at a distance." It appears to violate locality. Bell's theorem (1964) is a mathematical result proving that no local hidden variable theory can reproduce the correlations predicted by quantum mechanics.

The Bell inequalities have been violated experimentally (Aspect, 1982; Hensen et al., 2015), confirming that the particles did not secretly decide their spins in advance. The correlation is real and instantaneous.

The question for the axioms: Axiom C dictates the causal bound c. No signal propagates faster than c on the manifold. How does instantaneous correlation survive without violating Axiom C?

§2 — Distance Is a Property of the Record

The apparent paradox rests on an assumption: that the two particles are separated. That there is a distance between them. That space lies between Alice and Bob.

Distance is not fundamental. Distance is a property of the manifold. The manifold is the accumulation of records (Axioms R and C; AP17).

Spatial structure is what records look like when they accumulate under a causal bound.

Before actualisation — before a record is written — there is no manifold. The pre-state (AP07) is a complex Hilbert space. It has no spatial structure. It has amplitudes, superposition, and the Born rule.

It does not have “here” and “there.”

Before actualisation, there is no distance. The concept of separation does not apply to the pre-state.

You have used a telephone. The voice on the other end sounds close — intimate, immediate. The physical distance is irrelevant to the experience of the conversation.

The pre-state is like this: the entangled particles are in the same conversation. The distance between the telephones does not exist inside the call.

§3 — The Entangled State Is a Single Entity

Up until the moment of actualisation, the entangled system is not two particles separated by space. It is a single, unbroken probability state in the pre-state.

The entangled state $|AB\rangle = (1/\sqrt{2})(|\uparrow\downarrow\rangle - |\downarrow\uparrow\rangle)$ is one mathematical object. It lives in the tensor product of the Hilbert spaces of A and B.

The tensor product provides algebraic distinguishability: A and B are different degrees of freedom. But algebraic distinguishability is not spatial separation.

The tensor product $\mathcal{H}_A \otimes \mathcal{H}_B$ combines degrees of freedom; it does not embed them into spacetime. Spatial separation is a property of the manifold, not of the Hilbert space.

Two subsystems can be algebraically distinct without being spatially separated. In the pre-state, there is no distance between A and B. They have not been written to the manifold as separate records.

The labels “A” and “B” refer to degrees of freedom, not locations.

Alice and Bob prepare the entangled state and send the particles to opposite ends of the galaxy. In the manifold’s description, the particles separate. The records of their trajectories diverge.

But the entangled state — the shared probability state — was never split. It remained a single entity in the pre-state.

The spatial separation is a property of the records that have been written so far (the trajectories), not a property of the probability state that has not yet collapsed.

§4 — The Collapse Is a Single Actualisation Event

Alice measures her particle. This is an actualisation event — the break (AP09). A record is written.

When does the break happen? Actualisation occurs when the interaction between the quantum system and the measurement apparatus creates an irreversible record — a record that cannot be unwritten (Axiom R).

This is not a matter of conscious observation. It is the point at which the interaction becomes thermodynamically irreversible: when the measurement apparatus undergoes a state change that constitutes a record.

The break happens when the record is written.

But Alice's detector interacts locally with subsystem A. How does a local interaction actualise the global state $|AB\rangle$?

Lemma 1 (Local Interaction, Global Actualisation). If $|AB\rangle$ is entangled (non-separable), then any interaction that creates an irreversible record involving subsystem A necessarily actualises $|AB\rangle$ as a whole.

Proof. Alice's measurement is represented by an operator M_a acting on subsystem A. But because $|AB\rangle$ is entangled, the measurement acts on the global state as $(M_a \otimes I_B)$:

$$\rho'_{AB}(a) = (M_a \otimes I_B)|AB\rangle\langle AB|(M^\dagger_a \otimes I_B) \,/\, \mathrm{Tr}[(M_a \otimes I_B)|AB\rangle\langle AB|(M^\dagger_a \otimes I_B)]$$

The record "a" (Alice's outcome) is a property of this global update, not a standalone update of A alone. The measurement map is defined on $|AB\rangle\langle AB|$, not on ρ_A.

The reduced density matrix $\rho_A = \mathrm{Tr}_B(|AB\rangle\langle AB|)$ is a marginal of the global state — it is not an independent state in its own right, and it is not a record target (see Notation).

Actualisation writes a record for the state on which the measurement acts. That state is the global state $|AB\rangle$. Therefore local interaction with any subsystem of an entangled state necessarily actualises the global state. ■

Note: The reduced state ρ_A is an improper mixture — it arises from tracing out the entangled partner, not from classical ignorance over a definite pure state.

The distinction between record targets (pure states) and reduced marginals (improper mixtures) is an ontological commitment: the reduced state of an entangled subsystem is not a standalone physical state eligible for actualisation, because it is derived from (and dependent on) the global entangled state.

You have pulled one thread in a woven fabric. The entire weave responds — not because a signal runs along the thread, but because the threads were never separate. They were one fabric.

Lemma 1 is the formal statement of this: the entangled state is one fabric, and pulling any thread actualises the whole.

Example: Singlet state under projective measurement

Consider the singlet state $|AB\rangle = (1/\sqrt{2})(|\uparrow\downarrow\rangle - |\downarrow\uparrow\rangle)$. Alice measures σ_z on subsystem A with projectors $P_\uparrow = |\uparrow\rangle\langle\uparrow|$ and $P_\downarrow = |\downarrow\rangle\langle\downarrow|$.

If outcome is ↑: $(P_\uparrow \otimes I)|AB\rangle = (1/\sqrt{2})|\uparrow\downarrow\rangle$. Normalised post-measurement state: $|\uparrow\downarrow\rangle$. One record is written. Both outcomes are determined: Alice gets ↑, Bob gets ↓.

If outcome is ↓: $(P_\downarrow \otimes I)|AB\rangle = (-1/\sqrt{2})|\downarrow\uparrow\rangle$. Normalised post-measurement state: $|\downarrow\uparrow\rangle$. One record is written. Both outcomes are determined: Alice gets ↓, Bob gets ↑.

In both cases, the global state collapses to a product state with both subsystem outcomes determined. One measurement, one record, one event. The single-record mechanism matches the standard collapse mathematics exactly.

Proposition 1 (Single Record). Let $|AB\rangle \in \mathcal{H}_A \otimes \mathcal{H}_B$ be an entangled (non-separable) state. Then the actualisation of $|AB\rangle$ is a single record-writing event. The record determines the outcomes for all subsystems simultaneously.

No signal propagates between subsystems during actualisation.

Proof. By Lemma 1, any local interaction triggering actualisation actualises the global state |AB⟩. By Axiom R, actualisation writes one record for the state being actualised. The state is |AB⟩ (one mathematical object).

Therefore one record is written. The record determines the outcomes for all subsystems (A and B) simultaneously, because the state being actualised contains both.

No intermediate step exists in which A's outcome is determined and a signal must propagate to determine B's.

Signal propagation (Axiom C) governs records on the manifold; actualisation is the creation of a record, not the propagation of one. Creation is not propagation. ■

Corollary (Separable states). If |AB⟩ = |A⟩ ⊗ |B⟩ (a product state), then subsystem A has a well-defined pure state |A⟩ independent of B.

The measurement map (M_a ⊗ I_B) factors: the update of A does not depend on B. Subsystem A can be actualised independently. Two separate records may be written.

The single-record mechanism applies only to entangled states.

Note on multipartite entanglement. The same argument applies to entangled states of N > 2 subsystems. If |ABC...⟩ is non-separable with respect to any partition, then local interaction with any subsystem actualises the global state.

The single-record mechanism scales: one record writes all N outcomes simultaneously.

The spatial localisation of the outcomes follows from prior records.

Before the entangled state collapses, the trajectories of A and B have been written to the manifold as separate records — A is at Alice's location, B is at Bob's.

The single actualisation event projects the global outcome onto these pre-existing spatial records. Alice finds spin-up at her location because that is where A’s prior records place it.

Bob finds spin-down at his location for the same reason. The spatial distribution of outcomes inherits from the spatial distribution of prior records, not from the collapse itself.

There is no signal from Alice’s particle to Bob’s particle. There is no propagation across space. The single probability state becomes a single record.

The “flip” of Bob’s particle is instantaneous because it is not a separate event. It is the same event. One pop. One record.

§5 — Axiom C Is Not Violated

Axiom C imposes a finite invariant propagation bound (c) on the manifold. It bounds the speed of signals between records on the manifold. Does entanglement collapse violate Axiom C?

The answer requires clarifying the scope of Axiom C.

Axiom C is a statement about the manifold: it governs what happens within the manifold (the propagation of records, the transmission of signals between spatially separated events).

The pre-state is not on the manifold (AP07: the pre-state has no spatial structure). Actualisation is the transition from pre-state to manifold — the act that creates records, not the propagation of records.

Therefore Axiom C's scope is: (a) the manifold and its contents (records, signals between records), not (b) the transition from pre-state to manifold.

The causal bound governs signals between records. It does not govern the writing of records.

Entanglement collapse is not a signal on the manifold. It is the writing of a record onto the manifold.

The act of actualisation is not bound by the speed limit of the reality it is actualising.

Axiom C says: once a record exists on the manifold, it propagates at most at c. Axiom C does not say: the act of creating a record must propagate. Creation is not propagation.

The break does not travel. It happens.

You have written your name on two lines of a contract simultaneously — one pen stroke, two signatures. The pen did not send a signal from line one to line two.

The stroke was one act that touched two places. That is actualisation: one act, one record, outcomes at every location where the pre-state had degrees of freedom.

§5.0.1 — No-signalling (derived from axioms)

After actualisation, Alice's local outcome is spatially located at her position on the manifold. Can she use entanglement to communicate superluminally?

- By Proposition 1, actualisation writes one record for $|AB\rangle$. (2) Alice's local observable O_A acts on the global state as $O_A \otimes I_B$.

(3) Alice's expectation value is $\langle O_A \rangle = \mathrm{Tr}(\rho_A \cdot O_A)$, where $\rho_A = \mathrm{Tr}_B(|AB\rangle\langle AB|)$. (4) This quantity depends only on the global state and Alice's observable.

The partial trace has removed all reference to B's degrees of freedom.

(5) Therefore Alice's measurement statistics are independent of any operation Bob performs on B — independent of whether Bob has measured, and independent of his choice of measurement basis.

(6) For Alice to learn anything about Bob's outcome, a classical signal bounded by c (Axiom C) is required.

Axiom C + Proposition 1 + the partial trace structure of quantum mechanics jointly imply no-signalling. The axioms reproduce the standard no-signalling theorem.
Axiom C holds.

§5.1 — Relativistic covariance

In a Lorentzian manifold (AP05), “simultaneous” is frame-dependent. If Alice and Bob are spacelike-separated (as they are in any Bell test), different Lorentz observers disagree about whether Alice measured first or Bob measured first.

This is the relativistic covariance problem for quantum collapse: if collapse is a spacetime event, it has a location, and different frames assign different time-orderings to spacelike-separated events.

The axioms dissolve this problem the same way they dissolve the distance problem. Actualisation is not a spacetime event. It is the transition from the pre-state (which has no spatial structure, AP07) to the manifold.

The pre-state does not have a spacetime location. Therefore the actualisation event does not have a spacetime location. It is ontologically prior to spacetime.

Different Lorentz observers disagree about the time-ordering of Alice’s and Bob’s measurement records on the manifold.

But since the collapse itself is not a spacetime event, this disagreement concerns the records (which are on the manifold and respect Axiom C), not the collapse.

The records are frame-covariant: all observers agree on the outcomes (spin-up for Alice, spin-down for Bob).

They disagree only on the time-ordering of when those records appear, which is exactly the standard frame-dependence of spacelike-separated events in special relativity. No observable contradiction arises.

The axioms handle relativistic covariance of collapse better than interpretations that treat collapse as a physical process in spacetime.

In those interpretations, collapse must either have a preferred frame (violating Lorentz invariance) or propagate instantaneously in all frames (creating causal paradoxes).

The axioms avoid both: collapse is not in spacetime, so it neither selects a frame nor propagates.

§6 — Bell's Theorem: Predicted, Not Accommodated

Bell's theorem (1964) is a mathematical theorem proving that no theory of local hidden variables can reproduce the statistical correlations predicted by quantum mechanics for entangled states.

The Bell inequalities have been violated experimentally (Aspect, 1982; Hensen et al., 2015). This rules out any interpretation where the particles carry pre-determined values that are fixed locally before measurement.

The axioms do not merely accommodate Bell's result. They predict it — both the qualitative violation and the quantitative value.

Proposition 2 (Bell Prediction). The axioms structurally forbid local hidden variables. Axiom R forbids pre-existing value assignments. The non-spatial pre-state (AP07) dissolves the locality presupposition.

Both pillars of Bell's theorem — realism and locality — are removed. The Bell inequalities are violated, and the quantitative violation follows from the Born rule (AP07).

Proof. Bell's theorem requires two assumptions: (1) realism — that each particle carries definite values for all possible measurements before measurement, and (2) locality — that the outcome at A depends only on the hidden variable and the measurement setting at A, not on the distant setting at B.

This yields the factorisation condition: $P(a,b|\lambda) = P(a|\lambda) \cdot P(b|\lambda)$, where λ is the hidden variable. Bell's inequality is derived from this factorisation. The axioms remove both assumptions.

First, Axiom R: states do not possess definite values prior to the writing of the record. There are no pre-existing values. The hidden variable λ is empty — there is nothing to condition on.

The factorisation condition is undefined because its left-hand side P(a,b|λ) presupposes a λ that does not exist. Second, AP07: the pre-state has no spatial structure.

The factorisation condition P(a|λ) · P(b|λ) presupposes that A and B are spatially separated systems with independent local descriptions. In the pre-state, spatial separation does not exist. The factorisation condition's presupposition of locality is dissolved.

Bell's inequality derivation fails at its first step. The inequalities must be violated. ■

You have just watched the axioms predict one of the most profound experimental results in the history of physics. Not accommodate it after the fact. Predict it from first principles. Axiom R kills realism.

The non-spatial pre-state kills locality. Both pillars of Bell's theorem removed. The violation is not surprising — it is structurally inevitable.

§6.0.1 — Quantitative verification: CHSH

The axioms commit to the Born rule (AP07) and the complex Hilbert space structure. These yield the singlet-state correlations directly.

For the singlet state $|AB\rangle = (1/\sqrt{2})(|\uparrow\downarrow\rangle - |\downarrow\uparrow\rangle)$, if Alice measures spin along axis $\hat{a}$ and Bob measures along $\hat{b}$, the quantum-mechanical correlation is $E(\hat{a}, \hat{b}) = -\hat{a} \cdot \hat{b} = -\cos\theta$, where θ is the angle between the measurement axes.

This follows from the Born rule applied to the singlet state.

The CHSH inequality (Clauser, Horne, Shimony, Holt, 1969) states that for any local hidden variable theory, $S = |E(\hat{a}, \hat{b}) - E(\hat{a}, \hat{b}')| + |E(\hat{a}', \hat{b}) + E(\hat{a}', \hat{b}')| \leq 2$. Choosing the standard optimal settings ($\hat{a} = 0°$, $\hat{a}' = 90°$, $\hat{b} = 45°$, $\hat{b}' = 135°$), the Born-rule correlations yield $S = 2\sqrt{2} \approx 2.83$. This exceeds 2. The CHSH inequality is violated.

The axioms do not merely predict that Bell inequalities are violated. They predict the exact magnitude of the violation: $S = 2\sqrt{2}$, the Tsirelson bound. This is the maximum violation permitted by quantum mechanics.

The prediction follows from the Born rule and the Hilbert space structure, both established in AP07.

Note on hidden variables: Bell's theorem rules out local hidden variables.

The axioms go further: Axiom R structurally forbids all hidden variables, including non-local ones, because states do not possess definite values prior to the writing of the record.

This is an axiomatic consequence, not an experimental result. The experimental confirmation of the Bell inequalities closes the local case. The non-local case is closed by the axiom.

§6.1 — Note on decoherence

The standard physics account of why entanglement appears to “collapse” involves decoherence: the interaction of the quantum system with its environment causes the off-diagonal elements of the density matrix to decay, making the system behave as if it has collapsed into a definite state.

Decoherence explains why macroscopic superpositions are not observed and provides the mechanism by which quantum systems become effectively classical.

The axioms’ account is complementary to decoherence, not in conflict with it. Decoherence describes the process by which the pre-state loses coherence through environmental interaction.

The axioms identify when this process constitutes an actualisation: when the interaction creates an irreversible record (Axiom R). Decoherence is the physical mechanism; actualisation is the ontological event.

The two are compatible: decoherence is what actualisation looks like from within the manifold.

§7 — The Deeper Point

Synthesis note: the following is non-load-bearing language. It carries no epistemic weight beyond the claims established above.

Einstein's discomfort with entanglement was a discomfort with non-locality. He assumed that spatial separation was fundamental — that if two things are far apart, they cannot influence each other instantly.

The axioms dissolve this assumption. Spatial separation is real but not fundamental. It is a consequence of records accumulating under a causal bound.

The pre-state — the probability state before actualisation — does not know about space. It is one structure. Whole. Unbroken.

What looks like "spooky action at a distance" is just the single pre-state becoming a record. The distance was never relevant. The pen hit the paper.

Both entries appeared because they were always the same sentence.

This is consistent with the axioms' deepest principle: separateness is experienced but not fundamental. Entanglement is not strange. It is the default. What is strange — what requires explanation — is separation.

§8 — Kill Switches

Global numbering note: Kill switch numbers are globally unique across the corpus.

KS-48a — Correlation timing (EMPIRICAL). If entanglement correlations degrade or deviate from quantum-mechanical predictions when measurement events are arranged in different relativistic orderings or at varying spacelike separations — that is, if correlations show timing-dependent or distance-dependent deviations — the single non-spatial actualisation account is threatened.

The single-record account requires that the break is not a propagating event and does not depend on the spacetime relationship between the subsystems.

Status: LIVE — EMPIRICAL. All experiments to date show no evidence of propagating collapse and no timing-dependent deviation from QM predictions. Structurally secure.

KS-48b — No-signalling (EMPIRICAL). If Alice's marginal measurement statistics are found to depend on Bob's measurement setting — that is, if the no-signalling theorem is violated experimentally — Axiom C is violated at the level of records and the entanglement account fails.

Status: LIVE — EMPIRICAL. No-signalling confirmed to high precision. Structurally secure.

KS-49 — Hidden variables (CLOSED). Bell's theorem rules out local hidden variables. This is experimentally confirmed to high precision (Aspect 1982; Hensen et al. 2015).

The axioms additionally forbid non-local hidden variables by construction: states do not possess definite values prior to the writing of the record (Axiom R). The local case is closed empirically.

The non-local case is closed axiomatically. If a viable hidden variable theory (local or non-local) were experimentally confirmed, Axiom R's account of measurement would fail. **Status: CLOSED (local: empirical) + CLOSED (non-local: axiomatic, Axiom R).**

KS-54 — Partial collapse (EMPIRICAL). If it were shown that measuring subsystem A of an entangled state can leave the global state partially collapsed — that is, if B remains in a superposition that is not fully determined by A's outcome — Lemma 1 would fail.

The single-record mechanism requires that local interaction with any subsystem of an entangled state actualises the global state. In standard QM, partial collapse of genuinely entangled states does not occur.

Status: LIVE — EMPIRICAL. Structurally secure; no experimental evidence of partial collapse for entangled states.

§9 — Conclusion

There is no paradox.

Before the break, there is only the pre-state. No space. No distance. No separation. The entangled state is a single entity — one probability state in one Hilbert space, not two particles at a distance.

Measurement is actualisation.

The measurement operator acts on the global state (Lemma 1): the reduced state of a subsystem is not a record target, so local interaction with any part of an entangled state actualises the whole.

The break happens once. One record is written. Both outcomes appear because they were always the same event. The spatial distribution of outcomes inherits from prior records, not from the collapse.

Axiom C is not violated. Its scope is the manifold — signals between records. Actualisation is the creation of records, not their propagation.

Relativistic covariance is preserved: the actualisation event has no spacetime location, so frame-dependent time-ordering applies only to the records, not to the collapse.

No-signalling follows from the partial trace structure: Alice's marginal statistics are independent of Bob's actions.

Bell's theorem is not accommodated but predicted: Axiom R forbids pre-existing values, the non-spatial pre-state dissolves the locality presupposition, and the Born rule yields $S = 2\sqrt{2}$.

You have been entangled with every person you have ever loved.

Not metaphorically — the quantum states of the atoms in your body have been correlated with the quantum states of the atoms in theirs, through every touch, every breath of shared air, every photon exchanged between your eyes.

The entanglement is real. The separation was always the illusion.

Claim Summary

Derived: Local interaction actualises global entangled state (Lemma 1, from measurement-operator structure + Axiom R record-target requirement). Entanglement as single actualisation of non-separable pre-state entity (Proposition 1). Separable states allow independent actualisation (Corollary).

Multipartite entanglement: single-record mechanism scales to N subsystems. Bell's theorem predicted: both realism and locality presupposition removed (Proposition 2, from Axiom R + AP07). Quantitative Bell violation: $S = 2\sqrt{2}$ from Born rule (§6.0.1).

Distance assumption dissolved (AP07: pre-state has no spatial structure). Axiom C scope clarified: governs manifold, not pre-state-to-manifold transition. Relativistic covariance dissolved: actualisation has no spacetime location (§5.1).

No-signalling derived from Axiom C + Proposition 1 + partial trace (§5.0.1).

Complementary: Decoherence (§6.1). Axioms compatible with decoherence programme; actualisation = irreversible record-writing.

Conditional on: Nothing. EH and QRA proved in AP20. Axioms unconditional.

Depends on: AP05 (Lorentzian spacetime, causal structure), AP07 (complex Hilbert space, superposition, Born rule, no spatial pre-state), AP09 (the break — QM, measurement as actualisation), AP17 (manifold = accumulation of records), AP20 (EH and QRA), Axiom R (record-writing, irreversibility, pure-state targets), Axiom C (Constraint on manifold).

Formal results: Lemma 1 (Local Interaction, Global Actualisation, DERIVED). Proposition 1 (Single Record, DERIVED). Corollary (Separable states). Proposition 2 (Bell Prediction, DERIVED). Quantitative: $S = 2\sqrt{2}$.

Kill switches: KS-48a (correlation timing, EMPIRICAL, LIVE). KS-48b (no-signalling, EMPIRICAL, LIVE). KS-49 (hidden variables, CLOSED: local empirical + non-local axiomatic). KS-54 (partial collapse, EMPIRICAL, LIVE).

Don’t be a cunt. Be kind.

This work is published for free, forever.

the420code.org