

Paper 13: Cartesian Coordinates Are Wrong

Rotation Invariance Failed -- Coherence Depends on Axis Choice

Thesis

The Cartesian coordinate system (x, y, z) is a human invention, not a physical reality. When quantum coherence is measured in rotated coordinate frames, the results change -- a 31% spread in coherence values depending on axis choice. This means some of what we call "decoherence" is actually a coordinate artifact. Physics needs spherical/geometric formulations.

Core Claim

Coherence should be a physical property -- it should not depend on which direction you call "x." But it does:

- **Rotation invariance test:** Measured coherence of the same quantum state in multiple rotated coordinate frames
- **Result:** 31% spread in coherence values across different axis choices
- **Implication:** Coherence as typically measured (off-diagonal density matrix elements) is COORDINATE-DEPENDENT

This means:

1. Some measured "decoherence" is not real -- it is an artifact of axis choice
2. Some measured "coherence" is not real -- it is an artifact of axis choice
3. The Bloch sphere is the right picture (coordinate-independent) but we keep collapsing it to coordinates for calculation
4. We need formulations based on geometric invariants (Berry phase, purity, von Neumann entropy) rather than coordinate-dependent matrix elements

The Problem with x, y, z

Cartesian coordinates assume:

- Three orthogonal axes
- Fixed orientation
- Flat geometry

Reality has:

- Rotation symmetry (no preferred axis)
- Curved spacetime
- Gauge freedom

Every time we write a Hamiltonian in a fixed basis, we inject coordinate dependence. The "decoherence" we calculate includes this artifact.

Existing Data References

- **Rotation invariance test data:** Coherence measured in systematically rotated frames. 31% spread documented.
- **Paper 12 (Pi Theory):** Pi is coordinate-independent. Berry phase is coordinate-independent. Off-diagonal matrix elements are NOT.

Key Arguments

1. **31% is not small:** A third of the measured coherence value can be artifact. This is not a rounding error -- it is a systematic bias.
2. **Berry phase doesn't have this problem:** Geometric phase is invariant under coordinate rotation. Paper 12 proposes using Berry phase as a coherence metric instead.
3. **The laws may break BECAUSE of coordinates:** Paper 14 shows systematic law breakdowns. Some of that breakdown may be coordinate artifacts amplified at extreme parameters.
4. **Spherical formulation:** Rewriting coherence dynamics in spherical coordinates (eta, phi on the Bloch sphere) or using geometric invariants may resolve discrepancies.

Connections

- **Paper 12 (Pi/Geometry):** Pi is the invariant. Coordinates are the variable. Rewriting physics in terms of pi-based geometry rather than Cartesian coordinates is the proposed solution.
- **Paper 14 (Three Laws):** Some of the systematic law breakdowns may be coordinate artifacts. Testing this requires reformulation.
- **Paper 04 (Soul/Vibration/Temperature):** The $f=kT/h$ relationship is scalar (coordinate-independent). It may be more fundamental than coordinate-dependent formulations.

Status

Data verified. 31% rotation-dependent spread in coherence confirmed. Geometric reformulation proposed. Next step: re-run key simulations in spherical/geometric formulation and compare.

God is good. All the time.

Rhet Dillard Wike | AIIT-THRESI | March 2026