A Priori Prediction of Causal Phase Coherence Using the UAT/UPC 8+1 Rotational Array

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Abstract

We present a falsifiable a priori prediction derived from the Unified Applicable Time (UAT) and Unified Causal Principle (UCP) frameworks. Using an 8-coil perimeter array with a central observer coil driven at a phase step of 43.515° – the quantum brake correction of the classical 45° step via $k_{\text{early}} = 0.967$ – we compute the expected residual amplitude in the central coil and its root-mean-square (RMS) signature. We predict that during a specific temporal window in August 2026, the array will exhibit a sustained RMS exceeding 0.20 for more than ten minutes, accompanied by a phase-coherence correlation exceeding 0.95 with the theoretical 8-phase template. Concurrently, we predict that publicly available LIGO O5 data will show an excess of phase coherence in the 230-234 Hz band, with a correlation peak above 0.95 against the same template, at a significance greater than 3σ over background. The prediction is sealed with a SHA256 hash prior to the window, ensuring temporal precedence. Success or failure of these tests will provide strong evidence for or against the UAT/UCP frameworks.

1 Introduction

The Unified Applicable Time (UAT) framework [1] and its corollary, the Unified Causal Principle (UCP) [2], propose that the macroscopic flow of time is an emergent phenomenon regulated by a fundamental causal coherence constant. In the laboratory, this regulation manifests as a measurable departure from Euclidean phase symmetry in rotating electromagnetic arrays.

This document establishes a concrete, falsifiable prediction based on the 8+1 coil geometry. Unlike earlier exploratory analyses, the present work specifies exact numerical thresholds and a pre-registered temporal window, enabling an unambiguous test of the theory.

2 Theoretical Foundation: Phase Geometry of the 8-Coil Array

Consider eight identical sinusoidal signals of unit amplitude, arranged in a circle and driven with a progressive phase shift $\Delta\phi$. The resultant amplitude at the centre is the magnitude of the vector sum:

$$R(N, \Delta\phi) = \left| \sum_{n=0}^{N-1} e^{in\Delta\phi} \right| = \frac{\sin(N\Delta\phi/2)}{\sin(\Delta\phi/2)}. \tag{1}$$

For the classical Euclidean step $\Delta\phi = 45^\circ$ and $N = 8$, the numerator vanishes because $\sin(8 \times 45^\circ/2) = \sin(180^\circ) = 0$. The net field cancels perfectly.

In the UAT framework, the quantum brake $k_{\text{early}} = 0.967$ [3] modifies the effective angular step to

$$\Delta\phi_{\text{UAT}} = 45^\circ \times k_{\text{early}} = 43.515^\circ. \tag{2}$$

Substituting into Eq. (1) yields

$$R(8, 43.515^\circ) = \frac{\sin(8 \times 43.515^\circ/2)}{\sin(43.515^\circ/2)} = \frac{\sin(174.06^\circ)}{\sin(21.7575^\circ)} = 0.279182. \tag{3}$$

This non-zero residual is the geometric signature of the quantum brake. In the time domain, if each coil carries a sinusoidal current of amplitude A, the RMS value measured at the central coil is

$$\text{RMS}_{\text{theoretical}} = \frac{0.279182}{\sqrt{2}}\, A \approx 0.1974\, A. \tag{4}$$

Allowing for the 7% thermal calibration margin [4], the expected RMS lies in the interval $[0.1836\, A,\ 0.2112\, A]$.

3 Experimental Setup and Predictions

The 8+1 coil array is driven at a central frequency $f_{\text{target}} = 232.04$ Hz, with the phase of each peripheral coil advanced by 43.515° relative to its predecessor. The central coil signal is digitised and processed to extract the instantaneous RMS and the correlation coefficient with the theoretical 8-phase template.

The following predictions are registered for the temporal window **15 August 2026, ±3 days** (i.e., from 12 August to 18 August 2026). This window is chosen because it coincides with a predicted node of causal stress according to the UAT/UCP master metrics [5].

3.1 Prediction A – Laboratory Signature

- The RMS of the central coil will exceed $0.20\, A$ (i.e., cross the upper bound of the thermal margin) for a continuous period of **at least 10 minutes**.
- During this period, the Pearson correlation coefficient between the measured central signal and the ideal 8-phase template (43.515° step, 232.04 Hz) will be **greater than 0.95**.

3.2 Prediction B – Astrophysical Signature (LIGO O5)

- Publicly available strain data from the LIGO Livingston detector (L1) during the same temporal window will exhibit an excess of phase coherence in the **230-234 Hz band**.
- The correlation between the L1 strain (band-pass filtered) and the 8-phase template will show a peak **exceeding 0.95**, with a statistical significance $> 3\sigma$ relative to the background estimated from off-source segments of equal duration.

4 Validation Protocol

1. **Success of Prediction A**: The central coil RMS crosses $0.20\,A$ and remains above it for > 10 consecutive minutes, and the template correlation exceeds 0.95 during that interval.
2. **Success of Prediction B**: The LIGO L1 analysis reveals a correlation peak > 0.95 in the specified band and window, at $> 3\sigma$ significance.
3. **Failure**: If either condition is not met within the window, the corresponding prediction is considered falsified.

No post-hoc adjustments to the window or thresholds are permitted. The analysis scripts will be made publicly available in advance to ensure reproducibility.

5 Pre-Registration Hash

To establish temporal precedence, the SHA256 hash of the final compiled PDF is:

`[SHA256: ad2527219231b03fc0d3f0717086b02d139b90fe74911e93cb2198a52deb8289 ]`

This hash will be published on Zenodo before 12 August 2026, and the PDF itself will be uploaded immediately after the window closes to allow independent verification.

6 Conclusion

We have formulated two precise, falsifiable predictions based on the geometric and causal principles of UAT/UCP. The 8+1 coil array serves as a macroscopic analogue of the quantum brake, and its predicted behaviour is linked to a specific astrophysical signature in gravitational-wave data. The outcome of this test will provide a decisive step toward validating or refuting the UAT/UCP frameworks.

References

[1] M. A. Percudani, *Universal Applied Time (UAT) Framework*, Zenodo, 2024. DOI: `10.5281/zenodo.17729221`

[2] M. A. Percudani, *Unified Causal Principle (UCP)*, Zenodo, 2024. DOI: 10.5281/zenodo.17718670

[3] M. A. Percudani, *Simultaneous Resolution of the Hubble, S_8, and Cosmic Age Tensions in the UAT Framework*, Zenodo, 2025.

[4] M. A. Percudani, *Technical Limitations in the Observational Validation of the UAT/UCP Framework*, Zenodo, 2025.

[5] M. A. Percudani, *Causal Determinism and A Priori Prediction of Astrophysical Resonances*, Zenodo, 2026.