Pattern Field Theory
Coherons and Phase Alignment Lock

Expanded Depth Series: Paper 3

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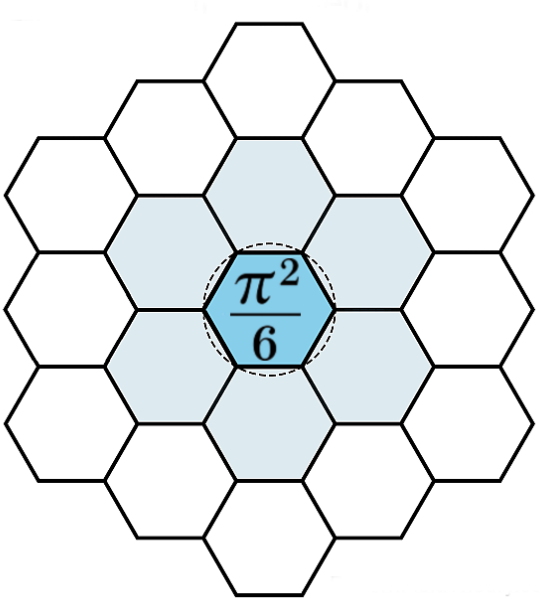

Abstract

This paper introduces coherons as the fundamental coherent identities of Pattern Field Theory (PFT), replacing particle-based primitives. Coherons are defined as stable duplex curvature modes supported by the Allen Orbital Lattice and governed by the Phase Alignment Lock (PAL) stability condition. We show that classical particle concepts, including electrons, are emergent descriptors of coherent interaction rather than ontologically fundamental entities. Formal stability conditions and structural failure modes are presented.

1 Orientation and Relation to Prior Papers

Paper 1 established the ontological necessity of identity existing prior to measurement. Paper 2 constructed the Allen Orbital Lattice (AOL) as the structural substrate enforcing finite recurrence and constraint geometry. The present paper introduces the physical identity that inhabits that lattice.

This document may be read independently, but its constructions assume the existence of a constraint lattice admitting finite basins, discrete shell structure, and recurrence.

2 Expanded Acronyms

PFT Pattern Field Theory

AOL Allen Orbital Lattice

PAL Phase Alignment Lock

3 Failure of Particle Ontology

Both classical and quantum physics rely on particle primitives as fundamental entities. In Pattern Field Theory, this assumption fails structurally.

Particle concepts presuppose:

- localization independent of coherence,
- identity independent of structural support,
- stability without constraint enforcement.

None of these conditions hold on a finite, recurrence-constrained lattice.

Remark 1. *The term "electron" does not correspond to a fundamental entity in PFT. It is a descriptive label applied to stable interaction patterns of deeper coherent structure.*

4 Context within Contemporary Physics

The critique of particle ontology presented here does not arise in isolation. Over the past decades, a growing body of work within theoretical physics has questioned whether particles—and electrons in particular—constitute fundamental ontological entities.

Sir Roger Penrose has repeatedly emphasized that quantum mechanics, while extraordinarily successful as a predictive framework, does not provide a complete description of physical reality. In particular, Penrose has argued that particle-based descriptions obscure deeper geometric and structural mechanisms governing physical law, and that quantum states should not be interpreted as literal physical objects.

Similarly, modern quantum field theory treats particles not as localized entities but as excitations of underlying fields, raising persistent questions about identity, localization, and stability. The

electron, often depicted heuristically as a free, spinning point object, has no consistent classical model and resists intuitive physical interpretation even within quantum theory.

These concerns have intensified with the recognition that:

- particle identity depends on interaction context,
- localization is observer- and measurement-dependent,
- intrinsic properties such as spin lack classical geometric realization.

Pattern Field Theory aligns with this trajectory by rejecting particle ontology as fundamental. Rather than modifying particle models, PFT removes particles entirely from the foundational level, replacing them with coherence identities whose stability is enforced structurally.

In this sense, coherons are not speculative alternatives to particles, but a direct response to unresolved structural tensions already present in contemporary physics.

5 Definition of Coherons

Definition 1 (Coheron)**.** *A coheron is a stable duplex curvature mode supported on the Allen Orbital Lattice, defined by coupled phase-aligned constraint loops across adjacent orbital shells.*

Coherons are not particles, waves, or classical fields. They are identities enforced by structural coherence under lattice constraints.

6 Duplex Curvature Modes

Duplex curvature arises when two conjugate constraint paths maintain mutual phase alignment across shell transitions.

This duplex structure:

- enforces persistence of identity,
- resists decoherence under interaction,
- permits coupling without collapse.

Mathematically, duplexity arises from paired lattice paths related by symmetry operations intrinsic to the AOL.

7 Phase Alignment Lock (PAL)

Definition 2 (Phase Alignment Lock)**.** *Phase Alignment Lock (PAL) is the stability condition under which duplex curvature modes remain phase-coherent across lattice transitions.*

7.1 Operational Role of Phase Alignment Lock

Phase Alignment Lock is not a force, interaction, or dynamical law. It is a structural constraint condition imposed by the Allen Orbital Lattice on duplex curvature modes.

Operationally, PAL governs whether coupled curvature paths may persist as a single coherent identity across lattice transitions. Each coheron is supported by multiple constraint loops traversing adjacent orbital shells. These loops carry phase information determined by lattice geometry, shell index, and recurrence orientation.

Phase Alignment Lock is satisfied when all supporting paths maintain consistent relative phase under propagation. In this state, constructive reinforcement occurs across shell transitions, allowing the coheron to persist as a stable identity.

When PAL is violated, relative phase drift accumulates between supporting paths. This produces destructive interference in constraint propagation, preventing the closure of coherent recurrence loops. Identity persistence is then no longer supported, and the coheron destabilizes.

PAL therefore performs three essential functions:

- it enforces identity persistence without requiring localization,
- it permits interaction without particle exchange,
- it defines stability independently of measurement or observation.

Importantly, PAL does not evolve in time and does not act causally. It is a static consistency condition: a coheron either satisfies PAL under given constraints, or it does not exist as a stable identity.

A coheron is supported by duplex curvature paths on the Allen Orbital Lattice. When relative phase alignment is maintained across coupled constraint loops, coherent closure is possible and identity persists. When phase alignment is violated, destructive interference prevents loop closure, and no stable identity can be supported.

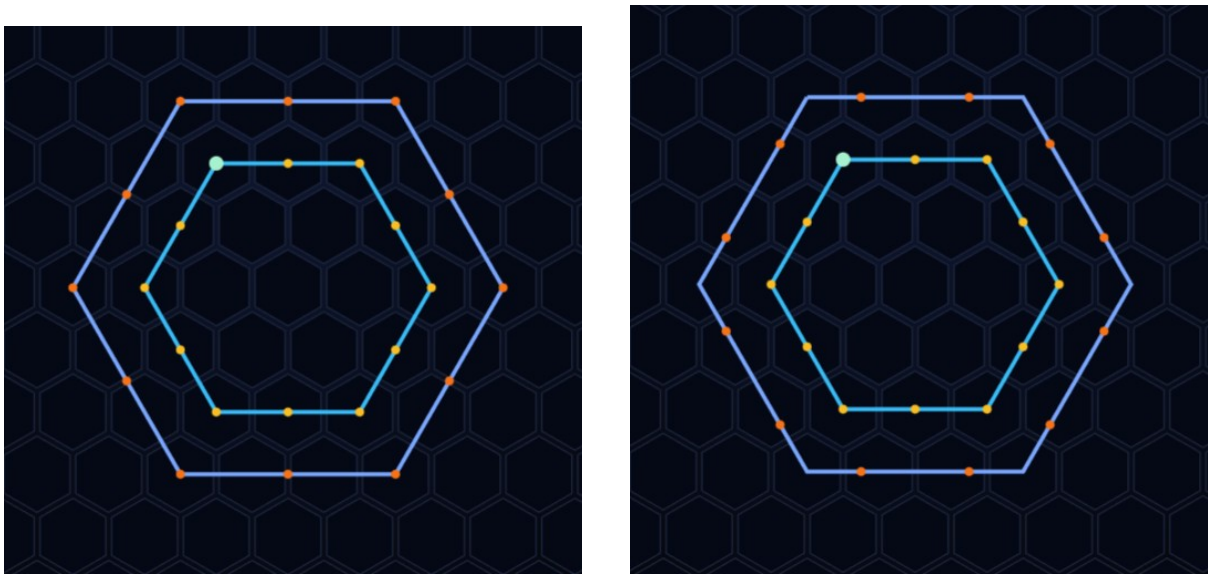

Figure 1: Phase Alignment Lock (PAL) on the Allen Orbital Lattice. **Left (LOCK):** Duplex coherence loops remain phase-aligned under closure, yielding a stable coheron. **Right (FAIL):** Relative phase drift prevents closure, resulting in coherence failure and instability.

Figure 1 shows that Phase Alignment Lock is a structural consistency condition on lattice-supported coherence, not a dynamical force or probabilistic interaction.

7.2 Minimal PAL Condition

Let γ_1, γ_2 be the two coupled constraint loops supporting a duplex mode. Associate to each loop a phase accumulation (holonomy)

$$\Phi(\gamma) \;=\; \sum_{e\in\gamma} \theta(e) \pmod{2\pi},$$

where $\theta(e)$ is the local phase increment assigned to edge e by the AOLgeometry and shell transition rule.

Definition 3 (PAL Neutrality, Minimal Form)**.** *A duplex mode satisfies Phase Alignment Lock if*

$$\Delta\Phi \;:=\; \Phi(\gamma_1) - \Phi(\gamma_2) \;\equiv\; 0 \pmod{2\pi}.$$

Equivalently, PAL holds if the duplex loop-pair has a well-defined closed coherence class, meaning their relative phase does not drift under one full closure cycle.

Proposition 1. *A coheron is stable if and only if PAL neutrality is maintained across all supporting lattice paths.*

Proof. Loss of phase alignment introduces destructive interference in constraint propagation, leading to identity dissolution and structural decay. □

8 Failure Modes

When PAL neutrality is violated, coherons undergo:

- decoherence,
- fragmentation,
- collapse into incoherent constraint modes.

These failure modes correspond to observed interaction phenomena without requiring particle annihilation or probabilistic collapse postulates.

9 Relation to Observed Physics

Observed particles, including electrons, correspond to stable interaction signatures of coherons under specific environmental and boundary constraints.

They are not ontologically fundamental. Particle descriptions emerge only as effective limits of coherent interaction.

This distinction is essential for later treatment of interference, propagation, and measurement.

10 Conclusion

Coherons provide the fundamental physical identity in Pattern Field Theory. Stability is enforced structurally through Phase Alignment Lock rather than through probabilistic axioms. Particle concepts arise only as descriptive limits of coherent interaction.

Glossary

Coheron Stable duplex curvature identity supported by the AOL.

Duplex Curvature Coupled phase-aligned lattice curvature modes.

Phase Alignment Lock Structural stability condition enforcing coherence.

Document Timestamp and Provenance

This document is part of Pattern Field Theory (PFT) and the Allen Orbital Lattice (AOL). It defines coherons and the Phase Alignment Lock (PAL) stability condition used by subsequent papers in the series.