Foundations of the Coherence Field Framework (GTCF)

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1. Purpose

These notes outline the minimal conceptual foundation of the Coherence Field Framework (GTCF). They do not constitute a complete physical theory. Their purpose is to clarify the structural basis from which the framework emerges and to provide a coherent ground for its mathematical formulation.

2. Physical reality as a coherent subspace

Reality as a whole need not be fully physical or measurable. It may be understood as a high-dimensional space of possible configurations.

Only certain regions of this space can support:

- stable differentiation,
- consistent relations,
- persistent structure,
- measurable change.

Only such regions form a physically describable domain. Physics therefore describes not total reality, but the subset in which stable and coherent change is possible.

3. Conditions for a physical domain

A stable physical domain requires the simultaneous presence of:

- **Minimal stable differentiation** — distinguishable structure must exist.
- **Global compatibility** — local differences must remain mutually consistent.
- **Possibility of change** — configurations must be able to transform.
- **Preservation of definability** — change must not destroy the stability of the domain.

If any condition fails, a stable physical layer cannot exist.

4. Change and time

Change is possible only within a stable coherent domain.

Time is not fundamental. It is defined as:

the measure of duration of stable change.

Without stable change, time has no operational meaning.

5. Global balance

A stable physical domain must remain globally balanced while allowing local change.

Schematically:

$$\Delta S_{\text{total}} = 0.$$

This does not imply absence of local variation. It implies that total coherent balance is preserved.

Local deviations are allowed. Global instability is not.

Stable physical reality therefore exists as a dynamically balanced configuration.

6. Emergent physical quantities

Within a stable and balanced domain of change, fundamental quantities arise naturally:

- **time** — duration of change,
- **energy** — measure of possible transformation,
- **distance** — measure of differentiation,
- **fields** — local configurations of change,
- **physical laws** — invariances preserving balance.

These are not imposed externally. They are structural properties of any domain capable of sustaining coherent change.

7. Laws of physics

Physical laws are not external rules applied to reality. They are:

properties of stable coherent domains in which definable change is possible.

Without such regularities, stable physical structures could not exist.

8. Role of GTCF

Within this conceptual framework, GTCF represents a mathematical attempt to describe global coherent balance.

It introduces:

- a minimal differentiation scale (coherence pixel),
- a maximal compatibility domain (horizon-limited coherence),
- a reference equilibrium state,
- local deviations,
- a global constraint enforcing balance.

The global action term

$$\left(\int (X - X_0)\right)^2$$

expresses the requirement that total deviation remains globally balanced.

GTCF therefore formalizes the condition under which a stable physical domain can exist.

9. Core statement

Physics is the local description of stable change within a globally balanced coherent domain.

The Coherence Field Framework is an initial mathematical formulation of this principle.