

# The KFX Family: Core Logical Kernel Statements (Frozen)

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## The KFX Family: Core Logical Kernel Statements

### KFX-A: Absolute Existential Kernel

**Theorem (KFX-A: Logical Existence Boundary).** A world exists if and only if there exists at least one finite trajectory in which a nontrivial state distinction is forced to appear and forced to be erased under global closure constraints. This is the minimal logical condition for world existence; any further degeneration collapses the system to the null world.

### KFX-B: Minimal Phase Kernel

**Theorem (KFX-B: Phase Non-Degeneracy Boundary).** Phase becomes non-degenerate if and only if there exists a finite trajectory in which inversion is enforced at an interior point and erased at the endpoint under fixed-length closure. This boundary is minimal: any reduction collapses phase to a trivial carrier.

### KFX-10: Complete Kernel

**Theorem (KFX-10: Kernel Completeness Boundary).** A kernel is complete if and only if non-degenerate phase, midpoint inversion symmetry, trajectory closure, and uniqueness of the valid step pattern are simultaneously satisfied. KFX-10 is the minimal system satisfying this conjunction.

### Residual KFX: Residual World Kernel

**Theorem (Residual KFX: Non-Degenerate Residual World).** A residual world exists if and only if finite-step residual quantities can be adjoined to each legal trajectory without destroying decidability of orbit legality. This extension is minimal with respect to preserving a non-degenerate residual structure.

### $\varepsilon$ -KFX: Minimal Evolvable Residual Kernel

**Theorem ( $\varepsilon$ -KFX: Minimal Evolvable Residual Boundary).** A residual representation is minimally evolvable if and only if all legal orbits collapse into a unique residual class while the residual space remains strictly non-degenerate. Any further compression collapses all historical distinctions.

## KFX Extreme Shell: Decidability Boundary

**Theorem (KFX Extreme Shell: Extreme Decidability Boundary).** For a fixed observation scale  $X$ , the KFX family collapses to a binary existence test:

$$\text{KFX}(X) \iff \exists!F \text{ s.t. } \text{Exec}(F) \wedge \text{Rollback}(F) \wedge \text{Resp}(F).$$

This boundary is irreducible: relaxing uniqueness or any conjunct collapses the system to the null state  $\perp$ .