The Law of Compressed State Dynamics (RLE Framework)

This document formalizes the axiomatic structure underlying the Recursive Loss Equation (RLE). It is intended as a field-level statement describing how bounded observables arise from additive, combinatorial, and irreversible internal system dynamics.

Axiom I — Physical Irreversibility

All physical systems accumulate irreversible change. Entropy increases monotonically; energy dissipation, fatigue, and degradation cannot be undone by representation or normalization.

Axiom II — Additive State Accretion

System evolution occurs through additive accumulation of states. Each step introduces a new configuration that coexists with all prior configurations. No state is removed; history is preserved.

Axiom III — Combinatorial Expansion

As states accumulate, the number of possible internal configurations grows multiplicatively and may increase exponentially or factorially with depth. This growth represents real internal cost, fragility, and recovery complexity.

Axiom IV — Compression by Normalization

Systems employ normalization (division) to collapse internal combinatorial complexity into bounded observables. This compression preserves ratios while discarding configurational detail.

Axiom V — Observational Invariance

Multiple distinct internal configurations may map to the same observable value. Equality of observation does not imply equality of physical state.

Core Equation (Recursive Loss Equation)

$RLE_n = (E_{n+1} - U_n) / E_n$, where $0 \leq RLE_n \leq 1$

The Recursive Loss Equation expresses system survivability as a bounded ratio. It contains no multiplicative growth terms; all apparent exponential or factorial behavior resides in the hidden internal state space, not in the observable scalar.

Law Statement

A system may undergo exponential or factorial growth in internal configuration space while exhibiting stable bounded observables. The cost of depth is paid internally, not reported externally. Normalization preserves observability at the expense of hidden fragility.