

## Dimensional Descent via Nested Tori

**$T^3 \rightarrow T^2 \rightarrow T^1 \rightarrow T^0$  Cascade:** A topological sequence reflecting recursive collapse through quantized toroidal manifolds, preserving phase-space invariants across dimensions.

**$\pi$ -Twist Recursion:** At each descent step, a discrete  $\pi$ -phase inversion occurs, encoding chirality and parity information.

## 8DHD Geometric Logic

**$E_8$  Lattice Embedding:** The foundational root system embedding the full gauge and matter spectrum; used to organize the nested tori in an 8D Clifford-algebraic frame.

**12-Band Chern Spectrum:** Quantized topological charges across 2-cycles of the  $T^4$  (gauge) torus; maintained through holomorphic projection.

## Information Plumbing of the Cosmos

**Void Out-Ports = Information Plumbing Nodes:** Interpret cosmic voids as low-entropy, high-permeability topological out-ports allowing for statistical gradient flow between phase manifolds.

**Black Hole  $\Pi$ -Flips:** Localized  $\pi$ -twists corresponding to topological conjugation under high curvature; represents a geometric switch enabling information extraction or encoding.

## Quantum Cosmology via Shell Topology

**$\Lambda$  as Outer-Shell Twist Residue:** The cosmological constant emerges as a residual curvature from an incomplete outermost  $\pi$ -twist in the nested 8D torus stack.

**Inflation = Boundary Twist Expansion:** Rapid early cosmic expansion driven by asymmetry between inner and outer  $\pi$ -twist parity states.

## Stability & Field Dynamics

**Node-Count Rule:** Predicts nuclear  $\beta$ -stability based on resonance node distribution over quantized tori.

**Flux Balance Estimate:** A discrete conservation law operating over Chern-class flux integrals through  $T^4$  cycles; correlates to mass-energy localization.

## Formal Proofs and Modeling

**Finite-Step Closure (Theorem 1):** Demonstrates convergence of recursive  $\pi$ -twist descent under topologically constrained information propagation.

**$\chi$ -Curvature Regression:** Maps scalar curvature ( $R$ ) to topological Euler characteristic ( $\chi$ ) within nested shell regions; statistical tool for vacuum structure inference.