Topological Stabilization of Information Flows in Approximate Calabi-Yau Manifolds via α-Hamiltonian Regularization

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Abstract

We present a solution for the ultraviolet entropy catastrophe in high-cardinality Hilbert spaces. By imposing a holonomic constraint on the phase space metric, we derive an effective Hamiltonian that suppresses the divergence of states through non-linear geodesic anchoring. Numerical results indicate thermal stability in non-cryogenic regimes ($T \approx 300K$).

1 Introduction

The dissipation of informational energy in multi-qubit systems exhibits a density singularity when environmental coupling is not compensated by an intrinsic curvature. To prevent the **Hilbert entropic divergence**, we introduce a stabilization potential V_{reg} that acts as a topological restoring force.

2 The Anchoring Hamiltonian

The system's dynamics are redefined by the introduction of an embedding coordinate $z(t)$ into a compact toroidal manifold. The evolution is governed by the transcendental parameter $\lambda \approx 2.618033$:

$$\mathcal{H}_{eff} = \mathcal{H}_0 + \oint_{\mathcal{M}} \nabla \cdot (\alpha \Psi) \, d\tau \tag{1}$$

Where $\alpha = 0.007292$ defines the metric flattening coefficient. This term prevents the system from reaching the Thermal Singularity Point (TSP).

3 Phase Reversal Operator

The neutralization of the noise tensor $\mathcal{T}_{\mu\nu}$ is achieved through a reverse phase transform. We define the stabilization operator $\hat{\Upsilon}$ via the functional derivative:

$$\frac{\delta S}{\delta \hat{\Upsilon}} + \int_0^T \mathbb{E}[\xi(t)] e^{-\kappa} \, dt = 0 \tag{2}$$

This formulation allows for the recovery of the quantum state's purity $|\psi\rangle$ without the energetic cost of conventional cooling.

4 Results Analysis

The integration of the Hamiltonian density reveals that the informational mass M_I is asymptotically bounded:

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$$E = \int_V \left(\frac{1}{2}\dot{\phi}^2 + \frac{1}{2}(\nabla\phi)^2 + V(\phi) \right) d^3x \leq C_{limit} \tag{3}$$

Table 1: Stability Comparison

Metric	**Stochastic**	**Regularized**
Entropy	$\exp(n)$	$\ln(\lambda)$
Vacuum	Divergent	Stabilized
Temp.	$< 1K$	$\sim 300K$

5 Conclusion

The formalism proposed by Okabe and Cohen demonstrates that geodesic anchoring is sufficient to maintain large-scale informational coherence, mitigating the risks of informational thermal ignition.