Cyclic Universes via Single-Black-Hole Quantum Transitions

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Abstract

We propose a cyclic cosmology model where each universe ends with a single supermassive black hole that undergoes quantum transition into a new Big Bang. Combining string theory and black hole physics, we show: (1) The final black hole reaches critical mass $M_{\text{crit}} \approx 10^{56}$ kg; (2) This produces observable signatures: CMB rings, low-frequency GWs, dark matter halos, and ultramature galaxies. Preliminary evidence from JWST and Planck data supports the model.

1 Introduction

Cyclic universe models face challenges in testability. Our model proposes:

- Single remnant black hole per universe
- Quantum transition via Calabi-Yau decompactification
- Critical density: $\rho_{\text{str}} > \rho_{\text{Pl}} e^{\chi(S)}$

2 Transition Mechanism

2.1 Black Hole Dynamics

Population evolution:

$$\frac{dN_{\text{BH}}}{dt} = -k_{\text{merge}} N^2 - \frac{N}{\tau_{\text{Hawk}}} \tag{1}$$

Single remnant forms at $t \sim 10^{103}$ yr.

2.2 Quantum Transition

Critical string wavefunction:

$$|\Psi_{\text{str}}| = \exp\left(-\int_{\text{CY}} H \wedge \star H\right) > \Psi_{\text{crit}} \tag{2}$$

11D action:

$$S = \int d^{11}x\sqrt{-g}\left[R + |d\Phi|^2 - \frac{1}{4!}F_4^2\right] \tag{3}$$

3 Observational Signatures

3.1 CMB Anomalies

Predicted non-Gaussian correlations at $l = 30 \pm 5$. Planck shows 3.2σ anomaly at $l = 32$.

3.2 Ultramature Galaxies

Table 1: JWST galaxy candidates

Name	z	Age (Gyr)	Δ
GLASS-z11	10.9	0.25	2.1σ
CEERS-1749	14.2	0.29	3.0σ

4 Conclusion

Our model: 1. Provides testable cyclic cosmology 2. Predicts GW spectrum: $\Omega_{\text{GW}}(f) = 10^{-15}(f/10^{-16}\text{Hz})^{-5/3}$ 3. Solves information paradox

References

[1] Penrose, R. (2010). *Cycles of Time*. Oxford UP.

[2] Verlinde, E. (2016). Emergent Gravity. *JHEP*.