APEIRON - HORIZONLESS CRITICAL RECONVERSION

Corrected authoritative frozen result - v3.1 - 17 September 2026

Status: SCIENTIFIC FEASIBILITY GO.
v3.1 supersedes v3.0 as the corrected authority. v3.0 remains immutable and is accompanied by a separate erratum/audit record.

1. Final scientific question

Can Apeiron reconversion be formulated as a horizonless, late-onset, self-regulating process that activates only near a critical compactness / stability boundary, while remaining compatible with long-lived compact objects and rapid supermassive-object growth?

2. Minimal trigger and dynamics

The event horizon is not treated as the physical trigger. The working trigger is local and dual: suitable positive signed curvature plus proximity to a stability boundary.

Canonical minimal choice:
C_G(x)=x, C_stab(x)=x
Mdot_conv = Gamma_0 M_zone x^2
xdot = Mdot_acc/M_zone - Gamma_0 x^2

The stationary point is:
x_* = sqrt[(Mdot_acc/M) / (Gamma_0 f_zone)], with f_zone = M_zone/M.

A stable regulated state requires x_*<1, equivalently **(Mdot_acc/M) < Gamma_0 f_zone**.

3. Corrected gravastar feasibility geometry

For the reconstructed continuous-pressure gravastar benchmark:

M_G ~ 0.3231
M_crit ~ 0.3348
Delta M ~ 0.0117
f_zone = Delta M/M_crit ~ 0.03495 ~ 0.0350

The activation point lies at M_G/M_crit ~ 0.965, i.e. about 96.5% of the critical mass coordinate **within this reconstructed equilibrium family**. This is not a statement that 96.5% of a real SMBH's entire cosmological growth history is completed before activation.

4. Corrected single-parameter consistency witness

The feasibility witness remains:

Gamma_0 = 3 x 10^-6 yr^-1
f_zone = 0.03495
C_G = x
C_stab = x

This is an existence witness only. It is neither a measured Apeiron constant nor a data fit.

The corresponding maximum regulated specific supply is:
(Mdot/M)_crit ~ 1.05 x 10^-7 yr^-1.

Regime	Mdot/M [yr^-1]	x_*	Result
Quiet system	1e-11	~0.00976	Very near activation threshold
Eddington-like quasar	2.2e-8	~0.458	Stable regulated point
~5 x Eddington	1e-7	~0.976	Near marginal stability, still x<1
Above critical supply	>1.05e-7	>1	No stationary regulated point

5. Compatibility checks

Long-lived quiet objects: compatible because the effective conversion rate is strongly suppressed near x=0.

Eddington-like growth: compatible for the witness because x_* remains well inside the stable zone.

Several-times-Eddington supply: compatible up to a finite critical supply; beyond that the stationary attractor disappears.

Early growth: not automatically blocked because the trigger is structural rather than an absolute-mass threshold. The 96.5% figure applies only to the reconstructed equilibrium-family coordinate.

NGC 4258 and M87*: do not currently require an additional Apeiron matter sink. The mechanism therefore remains a feasibility construction, not an observational detection.

6. Prediction candidates

x_* proportional to sqrt(Mdot_acc)
C_* - C_G proportional to sqrt(Mdot_acc)
tau_relax proportional to Mdot_acc^-1/2
(Mdot/M)_crit = Gamma_0 f_zone

These are model prediction candidates, not established empirical laws.

7. Final audited classification

HORIZONLESS CRITICAL RECONVERSION: SCIENTIFIC FEASIBILITY GO.

Final audit: PASS WITH MINOR ERRATUM incorporated into v3.1.

No internal feasibility STOP was found in the tested minimal construction. Observational evidence for matter conversion remains **NOT YET**. Full dynamical derivation and empirical validation remain **OPEN**.

Open requirements for any stronger claim: derive Gamma_0 from underlying Apeiron dynamics; simulate a full evolutionary trajectory; map x to observables; and test the predicted compactness/accretion population correlations.