APEIRON - HORIZONLESS CONVERSION / MISSING ACCRETION CHANNEL

Frozen research snapshot before opening the new branch - v1.0 - 17 September 2026

Status of this document: immutable-by-reference project snapshot. This PDF records the state of the hypothesis before further work begins. It is not a peer-reviewed result, not an observational detection, and not a new AP1 claim. Integrity is anchored by the SHA-256 file distributed with this PDF.

1. Starting point

The existing Apeiron reconversion idea treats matter-to-Apeiron return as a local conversion process. The relevant trigger is not assumed to be the event horizon itself, but an extreme local physical state, represented in the current minimal screening by a signed curvature activation based on the Gauss-Bonnet invariant.

Schematic reconversion law: **u^mu ∇_mu s = - Gamma_rec C(G) s**, where s labels the organised matter phase, Gamma_rec is a reconversion rate and C(G) is an activation function of the local curvature invariant G.

Energy bookkeeping is treated as sector transfer rather than disappearance: **∇_mu T_mat^{mu nu} = -Q^nu** and **∇_mu T_ap^{mu nu} = +Q^nu**.

2. Minimal compact-object screening completed before this snapshot

Object class	Event horizon	Current quick-screen result	Interpretation
Black hole	Yes	Reference conversion case.	Existing reconversion benchmark.
Ultracompact gravastar / de-Sitter-core object	No	Positive signed curvature threshold can be reached in the core.	Promising horizonless conversion candidate.
Tested ultracompact boson-star benchmark	No	Large |G| in the core, but G remains negative there; positive exterior values stay below the present signed threshold.	Not a candidate under the current signed-threshold screen.

Current working screen: **signed positive activation**, schematically G_hat >= G_hat_c, with the previously used benchmark threshold **G_hat_c = 3**. Replacing this with |G_hat| would be a different physical model and is not adopted in this snapshot.

3. Why horizonless objects matter for the reconversion idea

If reconversion is triggered by local curvature/state conditions rather than by a horizon, then a horizonless compact object could in principle contain a conversion zone. The gravastar/de-Sitter-core screen is the first positive indication within the current signed-curvature model that an event horizon is not logically necessary.

For the Apeiron interpretation, however, high curvature alone is not enough. The object must also have a physically meaningful matter-flow channel. If infalling matter is simply stored, re-emitted or expelled by ordinary processes, there is no observational need for an Apeiron sink.

4. Matter-flow question that motivates the new branch

The key observational quantity is a residual matter/energy budget after known channels are accounted for:

Mdot_in = Mdot_out + Mdot_stored + Mdot_rad/c^2 + Mdot_conv

Here Mdot_conv is only a hypothetical Apeiron conversion term. A positive Mdot_conv must not be inferred merely from low luminosity. Jets, winds, advection, storage, delayed thermalisation and other conventional channels must be considered first.

A useful dimensionless quantity for later work is the conversion efficiency **eta_conv = Mdot_conv / Mdot_acc**. A tiny absolute loss compared with the total mass of a supermassive object could still represent a large fraction of the newly accreted matter.

5. Observational direction identified

The most promising near-term empirical route is not to claim a detected disappearance channel, but to constrain how much hidden absorption/conversion could be compatible with systems that are extremely compact, accreting and weak in thermal surface emission.

Primary benchmark direction: **Sgr A***. Secondary comparison: **M87***. The theoretical horizonless benchmark should be an ultracompact gravastar or another de-Sitter-core object whose positive curvature threshold can be demonstrated independently.

6. Candidate-selection filter for the new branch

Retain only object models that simultaneously satisfy, or allow a controlled test of, the following:

• No event horizon in the model being tested.

• Very high compactness.

• A positive local curvature region capable of reaching the current signed Apeiron activation threshold.

• A specified accretion channel.

• A long-lived configuration for which continued accumulation would otherwise change the object substantially or drive collapse.

• No ordinary mass/energy-budget explanation may be silently omitted.

7. Scientific interpretation frozen at branch start

Supported as a project hypothesis: a local Apeiron conversion zone need not, in principle, coincide with an event horizon.

Not demonstrated: any real gravastar or other horizonless object converts matter into Apeiron; any unexplained accretion deficit has been observed; Sgr A* or M87* is horizonless; or Apeiron explains their low radiative efficiency.

Purpose of the next branch: test whether a horizonless compact object can simultaneously satisfy the curvature trigger and a physically/observationally meaningful matter-budget condition, and derive bounds on a possible Mdot_conv without inventing a positive residual.

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This snapshot must remain unchanged. Any subsequent calculation, candidate selection, observational bound or interpretation is to be stored as a new version or separate continuation record.