

Phase 4: Vacuum-to-FRW Consistency and Scale Sanity

A corridor-style test of the Phase 3 global-amplitude mechanism

Origin Axiom Program

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Abstract

Phase 4 tests whether the canonical global-amplitude mechanism defined in Phase 3 can be connected, in a structurally reasonable way, to FRW-style dynamics and vacuum-energy-like observables. The goal is to probe whether the non-cancellation floor that stabilises the toy vacuum can also support scale-sane behaviour when mapped into simple cosmological modules, without claiming a full cosmological fit or a theory of everything.

1 Introduction

Phase 4 sits between the mechanism-level vacuum work of Phase 3 and any future attempts to build a unified picture of vacuum, matter, and geometry. Its mission is narrow:

- take the canonical Phase 3 global-amplitude mechanism and non-cancellation floor as given;
- define simple, explicit mappings from the floor-enforced amplitude or residue into FRW-like dynamics and vacuum-energy-like observables; and
- study the resulting behaviour of the Origin-Axiom phase parameter θ in the corridor / ledger framework of Phase 0.

The guiding question is not whether we can reproduce the full Λ CDM model or fit precise cosmological parameters, but whether the Phase 3 mechanism can be made compatible with toy FRW modules in a way that is numerically stable, structurally sane, and expressible as a θ -filter in the sense of Phase 0.

Throughout this phase we distinguish carefully between:

- *binding* outputs, which may eventually define a Phase 4 θ -filter; and
- *non-binding* diagnostics and figures, which serve only as intuition and internal checks.

The present rung does not define any concrete mappings or filters. It only provides a minimal paper skeleton so that future rungs can add well-documented mechanisms and experiments without restructuring the front matter.

2 Mapping the Phase 3 vacuum into FRW-like observables

This section will, in later rungs, define explicit mappings from the Phase 3 floor-enforced global amplitude $A(\theta)$ (or a derived residue) into:

- one or more toy FRW modules; and/or

- simple vacuum-energy-like scalar observables.

The design goal is to keep these mappings:

- simple and explicit enough to be implemented and audited;
- flexible enough to explore several normalisation and coupling choices; and
- constrained enough that the resulting behaviour can be turned into a reproducible θ -filter, even if the outcome is an empty corridor.

At this rung the section serves only as a placeholder documenting the intended role of Phase

4. No specific mapping is yet fixed or used in claims.

3 Diagnostics, corridors, and failure modes

Later rungs will populate this section with:

- diagnostics for the FRW-like or vacuum-energy-like observables derived from the Phase 3 mechanism;
- the resulting θ -dependence and any induced corridors;
- explicit descriptions of non-empty, non-trivial corridors (if found); and
- structured descriptions of empty or pathological corridors, treated as informative negative results.

The Phase 0 ledger semantics require that Phase 4 either:

- contributes a well-defined θ -filter; or
- records a clearly documented failure mode that future phases can build on.

At this rung we do not yet present results or filters; we only identify the role this section will play once mechanisms and experiments are in place.

4 Limitations and outlook

Phase 4 is intentionally narrow in scope. Even once the mappings and diagnostics are implemented, the phase will not claim:

- a full derivation of cosmological parameters;
- a proof that the Origin Axiom is realised in nature; or
- a unique mechanism for connecting vacuum structure to FRW dynamics.

Instead, the goal is to provide a clean yes-or-no style test for a specific question:

Can the Phase 3 global-amplitude mechanism support scale-sane FRW-like behaviour, in at least one simple mapping family, without producing a degenerate or empty θ -corridor?

If the answer is “no” for all tested mapping families, Phase 4 will record this as a structured negative result, signalling that either the Phase 3 mechanism or the mapping strategy needs revision before further unification attempts.

Table 1: Draft Phase 4 claims. Binding status will be updated once the phase is complete and audited.

ID	Binding?	Summary
C4.1	no	Existence of at least one explicit mapping from the Phase 3 global amplitude or residue into an FRW-like or vacuum-energy-like observable with numerically stable behaviour.
C4.2	no	Existence of a non-empty, non-trivial θ -corridor for at least one such mapping.
C4.3	no	Structured negative result if all tested mappings yield empty or pathological corridors.

Appendix A: Phase 4 claims table (draft)

Table 1 summarises the intended Phase 4 claims. At this rung all entries are draft and non-binding.

Appendix B: Reproducibility notes (draft)

This appendix will eventually document:

- the Phase 4 directory and workflow structure;
- the gate levels (paper-only vs. paper+artifacts);
- the commands required to rebuild the Phase 4 paper and any binding θ -filters; and
- the run manifests and configuration files that define the tested mapping families.

At this rung, Phase 4 only provides a minimal paper skeleton and no mapping implementations. Reproducibility therefore reduces to rebuilding the present PDF via the Phase 4 gate script.

References