

# Wind-Down Status Snapshot: Learned Results, Open Proof Gates, and Handoff Queue

2026-02-09

## Abstract

**Superseded.** This snapshot was written on 2026-02-09 when the  $d=3$  branch was at AN-34A and several weekly tasks had not yet been executed. It is now superseded by `2026-02-13-final-closure-synthesis.tex`, which reflects the completed state through AN-42, weekly tasks A–F, frozen scores ( $\bar{S} = 9.19$ ), and explicitly deferred future-work gates. This file is retained for historical reference only.

## 1 Corpus and Method

The status pass scanned markdown artifacts under the active workspace (`rg --files -g '*.md'`), then extracted state-bearing signals (`done`, `closed`, `proved`, `queued`, `frontier`) and checked canonical paper and audit sheets.

## 2 What Is Learned

### Goal 1 Papers

1. Paper 1 (statics): scoped theorem-grade static variational consistency and static measurement-layer equivalence are documented in `2026-02-09-claim1-paper1-static-amplitude-qm-equivalence`.
2. Paper 2 (dynamics): scoped theorem-grade dynamic consistency and path-integral-equivalence chain (with historical section) are documented in `2026-02-09-claim1-paper2-dynamics-path-integral`.
3. Paper 3 (fields): the dimension-indexed program has progressed through AN-34A in a scoped  $d = 3$  branch, including weighted-local and graph-decay nonlocal lifts with explicit denominator-rate bookkeeping and a first-principles shell-tail rate transmutation lane; Lean wrappers now package the exhaustion/regularization commuting-limit interface.

### Top-10 Claim Snapshot

Using `2026-02-08-top10-claim-audit.md`:

1. strong scoped closure is already available for Claims 2, 3, 4, 5, 6, 7, 10,
2. Claim 8 has explicit unresolved high-dimensional rotating sectors,
3. Claim 9 has screened-Abelian theorem closure and scoped non-Abelian transfer lanes,
4. Claim 1 has high scoped maturity with explicit global interacting gap.

### 3 Open Proof Gates

#### Claim 1 Frontier

1. Next (field packaging): exhibit concrete exhaustion/regularization envelopes for the weighted-local graph-decay nonlocal channels and wire them into the AN-33L-C commuting-limit wrapper so the field-side statements can invoke the Lean wrapper without hidden hypotheses.
2. Full  $d = 4$  interacting closure still requires explicit G2/G3 completion (continuum existence and reconstruction gates).

#### Claim 9 Frontier

1. Beyond-window transfer control needs first-principles completion and full propagation into paper and audit lanes.
2. A new AF draft lane is now recorded in `2026-02-09-claim9-nonabelian-firstprinciples-transfer-c` with executable diagnostic scaffold `claim9_nonabelian_first_principles_transfer_check.py`.
3. Dynamical-matter string-breaking crossover remains at program level.

#### Claim 8 Frontier

1. Unresolved  $D \geq 6$  multi-spin rotating sectors remain explicit in the current theorem map.

### 4 Immediate Handoff Queue

1. Integrate AF lane into Claim 9 manuscript and audit only after validating the AF diagnostic and consistency checks in the same pass.
2. Start a dedicated theorem sheet for dynamical-matter string-breaking with explicit  $(G, D, N_f)$ -tagged assumptions and extraction regime.
3. Execute the field-side envelope instantiation and commuting-limit wiring step, then immediately synchronize Paper 3 under the existing paper update trigger rules.

### 5 Validation Contract

#### Assumptions

1. this report is a status synthesis, not a new theorem derivation,
2. all closure/open labels are inherited from tracked notes and reports.

#### Units and Dimensions

1. no new dimensional claim is introduced in this status document,
2. unit-sensitive statements are delegated to the cited theorem notes.

#### Symmetry/Conservation

1. no new symmetry or conservation claim is asserted here.

## Independent Cross-Check Path

1. run markdown corpus scan commands,
2. compare extracted statuses with the audit and paper tracks listed above.

## Confidence

High confidence for status extraction consistency. Medium confidence for frontier ordering, since ordering depends on strategic preference between Claim 1 and Claim 9 proof acceleration.

## 6 Reproducibility Metadata

1. date anchor: 2026-02-09 (US),
2. shell environment: `zsh`,
3. TeX build toolchain in this workspace: `/Library/TeX/texbin/pdflatex` (TeX Live 2025) via safe wrapper script.