Void-Prism Ancillary Signal Status: Persistent Directionality Without Decisive Null Rejection

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ABSTRACT
We present a standalone release of the void-prism ancillary pipeline and a compact evidence update using five independent posterior seeds. The joint scorer compares modified-gravity embeddings against an internal GR baseline via ΔLPD. Across the explicit multi-embedding run (minimal, slip-allowed, screening-allowed), all seeds remain same-sign positive, with mean fitted-amplitude shifts of +0.0423 (minimal), +0.0414 (slip-allowed), and +0.0490 (screening-allowed). To test whether this persistence is likely to reflect a real isolated signal, we run an efficient battery: block-permutation nulls, block-sign nulls, leave-one-block-out (LOO), and split-consistency checks. The sign persistence remains strong, but null-tail probabilities are not small (typical upper-tail $p \sim 0.27$–0.56), and LOO minima are negative in all embeddings. We therefore interpret the current void-prism channel as directionally consistent but not yet decisive: the signal persists, but statistical fluke or residual systematics remain plausible.

Key words: cosmology: observations – cosmology: theory – large-scale structure of Universe – gravitational lensing: weak

1 INTRODUCTION

Ancillary probes are useful for stress-testing the direction and channel localization of primary cosmological anomalies. Here we summarize the status of a void-conditioned prism observable based on the ratio

$$E_{\mathrm{G}}^{\mathrm{void}}(\ell) \propto \frac{C_{\kappa,v}(\ell)}{C_{\theta,v}(\ell)}, \tag{1}$$

constructed from Planck lensing, ACT/SDSS-derived velocity-proxy maps, and BOSS DR12 void catalog splits. The score reported throughout is

$$\Delta\mathrm{LPD}_{\mathrm{vs\,GR}} \equiv \mathrm{LPD}_{\mathrm{model}} - \mathrm{LPD}_{\mathrm{GR}}, \tag{2}$$

with GR treated as an internal baseline generated from the same background draws.

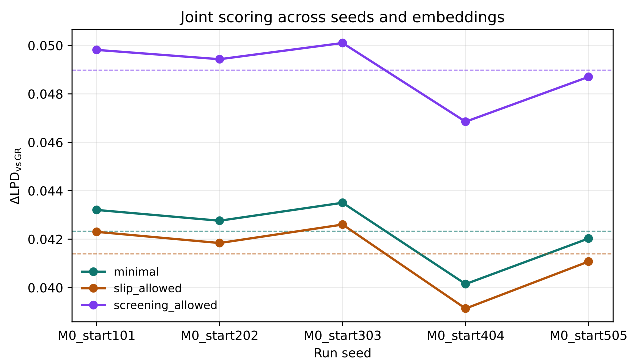

Figure 1. Per-seed fitted-amplitude ΔLPD values in the explicit 5-seed multi-embedding run. Dashed lines show embedding means.

2 DATA PRODUCTS AND PIPELINE

The release includes a standalone implementation containing: (i) theta-map construction, (ii) z/Rv-binned suite measurement with jackknife covariance, and (iii) joint posterior-predictive scoring. The bundled suite uses 8 blocks (4 redshift bins each split by median void radius), with 48-dimensional concatenated data vector and jackknife covariance from 603 regions.

Two result families are included:

(i) A legacy 5-seed minimal-embedding run with mean $\Delta\mathrm{LPD}_{\mathrm{vs\,GR}} = +0.0182$.

(ii) An explicit 5-seed × 3-embedding run with non-degenerate settings ($\eta_0 = 1.12$, $\eta_1 = -0.18$, $\alpha_{\mathrm{env}} = 0.25$, $\mu_{\mathrm{P,high\text{-}z}} = 1.05$).

3 UPDATED MULTI-EMBEDDING RESULTS

Figure 1 shows per-seed ΔLPD values for each embedding in the explicit run. All seeds are positive in all embeddings, with modest seed-to-seed scatter. Screening-allowed gives the largest mean shift, while minimal and slip-allowed are close.

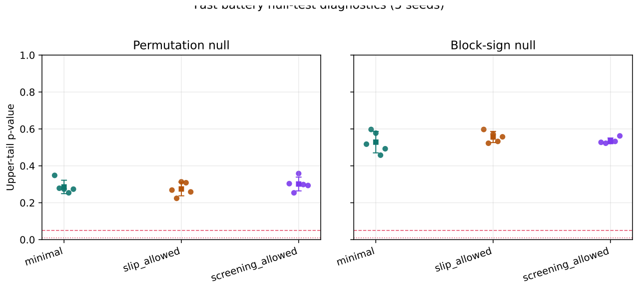

Figure 2. Fast battery null diagnostics across five seeds for each embedding. Horizontal red lines mark reference levels 0.05 and 0.01.

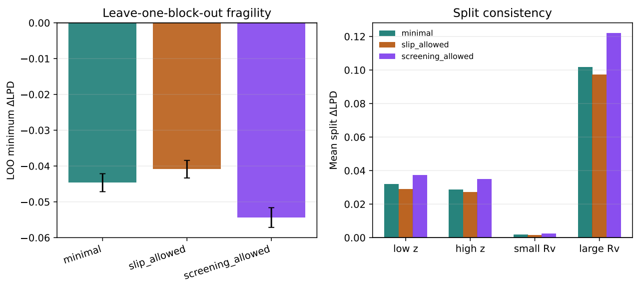

Figure 3. Robustness diagnostics. Left: mean and scatter of LOO minimum ΔLPD (negative values indicate block fragility). Right: mean split ΔLPD values remain positive.

4 FAST SIGNAL BATTERY

To test whether persistence alone indicates a real isolated signal, we ran a low-cost battery over all five seeds and three embeddings (draw cap 256):

- block-permutation null (misalignment null),
- block-sign null,
- leave-one-block-out robustness,
- split consistency (low/high-z, small/large-R_v).

Figure 2 shows null-tail behavior. Upper-tail permutation p-values cluster near 0.27–0.30 and sign-null p-values near 0.53–0.56, i.e. not extreme. Figure 3 shows that split means remain positive, but LOO minima are negative for all embeddings.

5 INTERPRETATION AND CONCLUSION

The updated status is:

(i) **Persistence:** the direction is stable (all seeds positive in all tested embeddings).
(ii) **Non-decisiveness:** efficient nulls are not strongly rejected.
(iii) **Fragility:** negative LOO minima indicate sensitivity to block composition.

Therefore, the void-prism channel remains a useful directional cross-check but not a standalone discriminator at current S/N and calibration depth. The practical reading is concise: the signal persists, but a statistical fluke or residual systematic explanation is still plausible.

DATA AVAILABILITY

All artifacts used in this letter are included in the repository under `artifacts/ancillary/void/`, including the explicit multi-embedding run and battery outputs.

ACKNOWLEDGEMENTS

This manuscript was generated from the public repository release of the void-prism ancillary pipeline.

REFERENCES

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