

Addendum 389: Target 1 — The Horizon Factor

Run honestly: 2π is forced by the smooth round S^3 , so the H_0 over-prediction is structural, not a fixable factor

(Addresses the H_0 tension of Addendum 388; extends 363/369, P04)

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Abstract

The 2026 scorecard (Addendum 388) found $H_0 = 2\alpha^2/T_{\text{breath}} = 75.8$ km/s/Mpc lying $\sim 3\sigma$ above SH0ES — the corpus over-predicts H_0 . The one data-facing knob is the horizon factor F in $a_0 = cH_0/F$ (with $H_0 \propto F$; the corpus posits $F = 2\pi$, the de Sitter / Θ -fold smoothness, Addendum 363). Target 1 asks whether the Θ -fold/void structure gives $F < 2\pi$, lowering H_0 into the data window. Run honestly, it does not, and the negative is clean. **The window.** $H_0 \propto F$ gives a data window $F \in [5.587, 6.066]$ (Planck to SH0ES); the posit $2\pi = 6.283$ sits *above* it, so a rescue requires $F < 2\pi$ — a conical *deficit* at the horizon. **The obstruction.** The corpus's horizon is the round $S^3 = \partial B^4$, and it is smooth: the family quotient $L(3, 1) = S^3/\mathbb{Z}_3$ is a *free* action (no fixed points, no orbifold cone), so the Euclidean smoothness period is exactly 2π , no deficit. $F = 2\pi$ is forced. **The void is the wrong kind of defect.** $\Lambda_0 = 1 - \pi^2/32$ is a volume-corner residual ($\text{vol}(B^4)/\text{vol}(\text{cube}) = \pi^2/32$ covered, Λ_0 the corners not covered) — a defect of the embedding *outside* the round S^3 , not a conical deficit *of* it; forcing it, $F = 2\pi\Lambda_0 = 4.35$, gives $H_0 = 52$ (-24σ). The de Sitter-rate correction $F = 2\pi/\sqrt{\Omega_\Lambda} = 7.56$ gives $H_0 = 91$ ($+21\sigma$), the wrong direction. **Verdict:** $F = 2\pi$ is forced, $H_0 = 75.8$ is the corpus's genuine prediction, and the $\sim 3\sigma$ tension is *structural*, not a fixable factor. One post-hoc lead — $F = 2\pi(1 - \text{edge}) = 6.14$, $H_0 = 74.1$, $\sim 1\sigma$ from SH0ES — is flagged to ground or reject, not claimed. The honest fix lies deeper. All claims pinned by `verify_P389.py` (9/9).

1 The window, and why a rescue needs a deficit

Since $a_0 = cH_0/F$ and a_0 is anchored, $H_0 \propto F$, and the posit $F = 2\pi$ gives $H_0 = 75.8$. The data require $F = 2\pi$ ($H_0^{\text{data}}/75.8$): SH0ES (73.17) wants $F = 6.066$, DESI (68.53) wants 5.681, Planck (67.4) wants 5.587. So the window is $F \in [5.587, 6.066]$, entirely *below* $2\pi = 6.283$. A rescue must therefore *lower* F below 2π — which, since the 2π is the Euclidean smoothness (no-conical-deficit) period of the horizon, means introducing a conical *deficit* (a period less than 2π).

2 The round horizon is smooth: $F = 2\pi$ is forced

Theorem 2.1 (No conical deficit on the round S^3). *The corpus's horizon is the round $S^3 = \partial B^4$, and it is smooth. The family quotient $L(3, 1) = S^3/\mathbb{Z}_3$ acts freely (no fixed points), so it introduces no orbifold cone; the Euclidean smoothness period at the horizon is exactly 2π , with no conical deficit. Hence $F = 2\pi$ is forced, and $H_0 = 75.8$. A smooth round horizon cannot carry $F < 2\pi$ without a conical singularity it does not have.*

Proposition 2.2 (The void is a volume residual, not an angle deficit). $\Lambda_0 = 1 - \pi^2/32$ is the corner residual of the embedding $B^4 \hookrightarrow [-1, 1]^4$: $\text{vol}(B^4)/\text{vol}(\text{cube}) = (\pi^2/2)/16 = \pi^2/32$ is covered, and Λ_0 is the corners not covered. This is a defect of the embedding outside the round S^3 , not a conical (angle) deficit of the horizon. Forcing it as a factor gives $F = 2\pi\Lambda_0 = 4.35$, $H_0 = 52$ (-24σ): unprincipled and wildly wrong. The de Sitter-rate correction $F = 2\pi/\sqrt{\Omega_\Lambda} = 7.56$ gives $H_0 = 91$ ($+21\sigma$), the wrong direction. Neither yields a principled F in the window.

3 Verdict and the one flagged lead

Corollary 3.1 (Target 1 is negative; the tension is structural). By Theorem 2.1 and Proposition 2.2, the Θ -fold/void structure offers no principled horizon factor below 2π . So $F = 2\pi$ stands, $H_0 = 75.8$ is the corpus's genuine prediction, and the $\sim 3\sigma$ over-prediction against SH0ES is structural — a consequence of the horizon's smoothness, not an adjustable coefficient. The bridge is not rescued at the horizon factor.

Remark 3.2 (The one lead, flagged and not claimed). One candidate lands close: $F = 2\pi(1 - \text{edge})$ with $\text{edge} = \pi/\alpha^{-1} = 0.0229$ gives $F = 6.14$, $H_0 = 74.1$, $\sim 1.0\sigma$ from SH0ES. Its story would be that the Euclidean smoothness is read over the *observable* (bulk + boundary) horizon, excluding the unobservable monadic edge layer. But there is no derivation that the horizon angle loses a layer fraction; it is a number landing near the window with a plausible-sounding but underived story. It is recorded here as a candidate to be *grounded or rejected* — not as a rescue. Claiming it would be exactly the δ_{CP}/PRVE numerology trap the corpus refuses: a coincidental fit dressed as a derivation. If a principled reason the horizon excludes the edge layer can be derived, this becomes a real fix; absent that, it is a coincidence on the watchlist.

Status

Target 1, run honestly, is a negative. The horizon factor in $a_0 = cH_0/F$ is forced to 2π by the smooth round S^3 horizon ($L(3, 1) = S^3/\mathbb{Z}_3$ free, no orbifold cone; Theorem 2.1), so $H_0 = 75.8$ is the corpus's genuine prediction and the $\sim 3\sigma$ tension against SH0ES is structural, not a fixable coefficient (Corollary 3.1). The data want $F < 2\pi$ — a conical deficit the round horizon lacks — and the void Λ_0 is a volume-corner residual outside the horizon, not an angle-deficit (forcing it gives $H_0 = 52$; Proposition 2.2). One post-hoc lead (edge-exclusion, $H_0 = 74.1$, $\sim 1\sigma$) is flagged to ground or reject, not claimed (Remark 3.2). The honest fix lies deeper — the $a_0 = cH_0/2\pi$ relation itself, the chart anchoring ($c = \pi/\alpha$, T_{breath}), or the closure hypothesis (Addendum 370) — or the data must rise. The horizon factor does not rescue the bridge; it shows the H_0 tension is structural and re-points the search. No published number changes. Verifier: `verify_P389.py`, 9/9 pass.