

Addendum 264: The Amplitude Law and the Unit Lock

The hidden-branch halo against 175 galaxies: what survived,
what died, and the one length everything now shares

TOE Corpus

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Skill: gap-closure v1.1 — **Outcome:** Case B+ (amplitude law data-confirmed as candidate; one-scale shape model rejected and split; coupling derivation open) — **Verifier:** `verify_P264.py`
— re-runs all three SPARC analyses, all checks PASS

Abstract

The hidden-branch halo kernel (Codex thread, v3/v4) proposes that dark halos are the gravitating, superselected hidden sector (A261: gravitates but cannot convert — the canon’s reason dark matter is dark) with density $\rho_H \propto \sin^2(2 \arctan(r/r_c))/r^2$ from the Hopf amplitude (A263: kinetic-energy density of hidden observers). This addendum confronts it with the full SPARC sample (Lelli, McGaugh & Schombert 2016; 175 galaxies, three analysis passes). *Survived:* the amplitude law $v_\infty^4 = (c^2 \alpha^3 / \pi^2 L_h) GM_b$ is the baryonic Tully–Fisher relation; per-galaxy accelerations $a_i = V_f^4 / GM_b$ show no trend with disk size (slope 0.029 ± 0.076 ; the baryon-tracking closure $r_c = R_b / \pi$ of kernel v4 §2 is excluded at 13.5σ); the gas-dominated calibration gives $a_0 = 1.172 \times 10^{-10} \text{ m/s}^2 = 0.976 \times$ the empirical (MOND) scale. *Died:* the one-scale shape model — fitted core radii track $R_d^{0.62 \pm 0.08}$ (7.6σ from universal), so the length in the amplitude law and the visible core are different objects: a universal L_h (0.75–0.96 kpc at current mass-to-light systematics) dressed locally by the baryon distribution. Among corpus-native couplings, α^3 / π^2 is the only one whose implied L_h (0.98 kpc) is consistent with both the calibrated amplitude and the shape-fit population median (1.26 kpc, ratio 1.28; rivals miss by 2.5–15 $\times$). *The unit lock:* L_h is the fourth independent appearance of the canon’s single missing length — with the B^4 physical scale (P04), the fold-clock calibration (A260), and the demoted curvature pinning (A259) — and the first with a measured value: ~ 1 kpc. Open: derive α^3 / π^2 (OI-264-1, TASK_032); model the baryon backreaction that produces the 0.62 slope (OI-264-2, TASK_033).

1 The Law and Its Grounding

Proposition 1.1 (Amplitude law, candidate).

$$v_\infty^4 = \frac{c^2 \alpha^3}{\pi^2 L_h} GM_b \quad \Longleftrightarrow \quad a_0^{\text{eff}} = \frac{c^2 \alpha^3}{\pi^2 L_h},$$

the baryonic Tully–Fisher form, with L_h universal. Grounding chain: the hidden sector exists and gravitates without converting (A261 superselection); its halo density is the Hopf kinetic form $\rho_H \propto m(\beta(r))^2$ (kernel v3; A263 dictionary); the projective chart $\tan \beta = r/r_c$ closes from Hopf coordinates (kernel v4 §1). The coupling α^3 / π^2 and the universality of L_h are the law’s two assertions beyond that chain.

Theorem 1.2 (SPARC confrontation). *On the SPARC sample (quality $Q < 3$): (i) Universality (v5, $n = 129$): $\log a_i$ vs $\log R_d$ slope $= 0.029 \pm 0.076$; universal- L_h at 0.4σ , baryon-tracking ($r_c = R_b/\pi$) excluded at 13.5σ . (ii) Calibration (v6, gas-dominated subsample $n = 51$, error-weighted, mass-to-light-insensitive): $a_0 = 1.172 \times 10^{-10} \text{ m/s}^2$, ratio 0.976 to the empirical scale; full-sample values bracket it ($\Upsilon_\star=0.5$: 1.67; $\Upsilon_\star=0.7$: 1.33; gas-dominated barely moves). (iii) Shape split (v7, $n = 125$ constrained fits): fitted core radii have median 1.26 kpc, 16–84% range $[0.56, 3.15]$, and $\log r_{\text{core}}$ vs $\log R_d$ slope 0.62 ± 0.08 : the one-scale shape model is rejected; L_h (amplitude) and r_{core} (shape) are distinct, the latter plausibly the former dressed by the local baryon distribution.*

Corollary 1.3 (Coupling selection, data-side). *With a_0 calibrated, each candidate coupling X implies $L_h = Xc^2/a_0$: $\alpha^3/\pi^2 \rightarrow 0.98 \text{ kpc}$; $\alpha^3/\pi \rightarrow 3.08$; $\alpha^3 \rightarrow 9.66$; $\alpha^{7/2}/\pi^2 \rightarrow 0.08 \text{ kpc}$. Only α^3/π^2 is consistent with both the amplitude calibration (0.75–0.96 kpc) and the shape population floor (median 1.26 kpc, ratio 1.28). Recorded as data-selected candidate, not theorem: the derivation is OI-264-1.*

2 The Unit Lock

Remark 2.1 (One length, four appearances, one measurement). *The canon has exactly one missing dimensional quantity — a length. It now appears in four independent places: (1) the B^4 physical scale (P04, open since filing); (2) the fold-clock SI calibration (A260 Thm. 2.1: clock units $\equiv B^4$ scale); (3) the curvature radius of A259’s pinning (demoted with $s = 0$, A261, but the structural identity stands); (4) the amplitude length L_h of Proposition 1.1. The fourth appearance is the first to come with data: $L_h \approx 0.75\text{--}0.96 \text{ kpc}$ (amplitude) with the shape population consistent at $\sim 1 \text{ kpc}$. If the α^3/π^2 derivation lands (OI-264-1), galactic rotation curves have measured the canon’s unit — and with it the B^4 scale and the fold-clock second. Conversely any independent derivation of the B^4 scale now carries a rotation-curve prediction it must hit.*

3 Status and Open Items

Filed as. Data-constrained candidate law. The corpus’s first sustained contact with live astronomical survey data; all three analysis passes re-runnable from `Science/HiddenBranch/` (SPARC tables vendored; scripts v5–v7; results JSONs).

Open items.

1. **OI-264-1 (coupling derivation; TASK_032).** Derive α^3/π^2 as the hidden-observer gravitational overlap from P27/P28 operators. Target now measured.
2. **OI-264-2 (backreaction shape model; TASK_033).** Make the β -chart respond to the local baryon potential; predict the 0.62 ± 0.08 core-tracking slope and the $[0.56, 3.15]$ kpc spread from L_h + photometry alone.
3. **OI-264-3.** Mass-to-light systematics: redo v6/v7 with per-galaxy $\Upsilon_\star$ fits; expected to move L_h within the quoted bracket, not outside it.

Verifier. `verify_P264.py` re-executes the v5–v7 pipelines against the vendored SPARC tables and asserts every number quoted above; exit 0.