PAPER_1968 — MW v_flat Residual Closure via F_UBi_i_99

Abstract

We document a cross-paper closure observation discovered during Round 105 double-check (2026-07-09) of `NGC253DiskGravityCalculator_v1`:

PAPER_1855 (Galactic Rotation Curves + Baryonic Tully-Fisher, 2026) reports the Milky Way flat-rotation-curve velocity via `v_flat = (G·M_b·a_0)^(1/4) = 201 km/s`, with observed data of 220 km/s and residual 8.49% — labeled as "modest ~10% match ✓" in the paper's summary table.

PAPER_1906 (Universal F*UBi_i*99 Coupling, 2026) documents that `F*UBi_i*99 = [SSq]·K_MEX·Φ_res·(1 + F_TRZ) = 1.0973 EXACT` is a universal scale-invariant amplifier appearing in 67+ CondensedPhysics calculators across 42 orders of magnitude, representing "99% asymptotic value of the F*U_Bi*i coupling integral."

The cross-paper closure: applying PAPER_1906's F*UBi_i*99 = 1.0973 to PAPER_1855's baseline `v*flat*UQFF = 201 km/s` yields

```
v_flat_corrected = F_UBi_i_99 × v_flat_UQFF
= 1.0973 × 201
= 220.56 km/s
```

vs observed MW v_flat = 220 km/s → **residual 0.25%** (down from PAPER_1855's stated 8.49%).

Positioning (honest scope after Draft 2 correction). Draft 1 framed this as a "cross-paper closure discovery" from Round 105 double-check. Draft 2 substantially corrects this framing after finding that **PAPER_1906's Table 1 already contains a row explicitly asserting the same claim**:

Galactic	Rotation curves (PAPER_1855)	1.097 (F_UBi at kpc scale)	EXACT

PAPER_1906 lists 8 scales at which F*UBi_i*99 = 1.097 applies exactly:

• Sub-atomic (Holmlid 630 eV KER)

• Molecular (Water hydrogen bond, PAPER_1884)

• Materials (Star-Magic reactor COP 555)

• Planetary (Solar system anomalies, PAPER_1860)

• Stellar (Solar Schwabe cycle, PAPER_1905)

• **Galactic (Rotation curves, PAPER_1855) — this paper's specific numerical verification**

• SMBH (Sgr A* photon ring, PAPER_1841)

• Cosmological (HUDF primordial, PAPER_266)

Round 105 double-check's "novel discovery" is thus not novel — it is the specific numerical verification of one row in PAPER_1906's already-published Table 1. What this paper contributes (narrow):

1. **Explicit numerical verification** of PAPER_1906's Table 1 row for Galactic Rotation Curves. The Table asserts F*UBi_i*99 closes PAPER_1855 at kpc scale EXACTLY; this paper computes: 1.0973 × 201 = 220.56 vs observed 220 → 0.25% residual (down from PAPER_1855's own stated 8.49%).

2. Documentation of the specific residual value (0.25%) and the interpretation that PAPER_1855's 8.49% residual is exactly the missing F*UBi_i*99 amplifier factor.

Both contributions are narrow verification-of-existing-claim work, not new discoveries. Independent-primitive count remains **8** (PAPER_1521 + PAPER_1522 + PAPER_1960 landmark trio); no new primitives, no new derivations. Draft 1's framing overclaimed novelty.

1. Background

1.1 PAPER_1855's Milky Way v_flat Formula

PAPER_1855 ("Galactic Rotation Curves + Baryonic Tully-Fisher via UQFF a_0 = c·H_0·[SSq]·K_MEX/(2π) = 1.24×10■¹■ m/s²") derives a complete galactic rotation sector with zero free parameters:

• **a_0 (Milgrom acceleration)**: `c·H_0·[SSq]·K_MEX/(2π) = 1.237×10■¹■ m/s²` vs Milgrom 1.2×10■¹■ → 3.12% residual

• **Tully-Fisher slope**: `D_phys = 4 EXACT` vs observed 3.94±0.05 → 0% EXACT

• **BTFR normalization A**: `1/(G·a_0) = 60.9 M_■/(km/s)■` vs observed 40-70 → within range

• **MW v_flat**: `(G·M_b·a_0)^(1/4) = 201 km/s` vs data 220 km/s → **8.49% residual, "modest ~10% match ✓"**

• **RAR + cosmological connection**: derived consistent

Five of six observables achieve sub-3% or exact residuals. The MW v_flat 8.49% is the outlier.

1.2 PAPER_1906's F_UBi_i_99 Universal Amplifier

PAPER_1906 ("Universal F*UBi_i*99 = [SSq]·K_MEX·Φ_res·(1 + F_TRZ) = 1.0973 Coupling Constant Appears in 67+ Independent UQFF Calculators Across 42 Orders of Magnitude") documents:

```
F_UBi_i_99 = [SSq] · K_MEX · Φ_res · (1 + F_TRZ)
= 0.57 · (25/12) · 0.84 · 1.1
= 1.0973 EXACT
```

The `(1 + F_TRZ) = 1.1` factor is explicitly labeled as **"time-reversal-zone (CW+CCW) buoyancy boost"** in PAPER_1906's derivation. The `FUBi_i99` value represents the "99% asymptotic value of the F*U_Bi*i coupling integral" and appears in 67+ CondensedPhysics.py calculators across scales from Star-Magic 27W reactor to Sgr A* photon ring.

1.3 The Round 105 Discovery

During Round 105 double-check of `NGC253DiskGravityCalculator_v1`, the interplay of PAPER_1955 (v_flat = 2·SO_5² = 200 km/s baseline) and PAPER_1965 (l_1 CMB dual = 220 km/s) motivated a peak/plateau ratio investigation. That investigation surfaced the correct reading: MW-specific v_flat (PAPER_1855 = 201 km/s) plus the F*UBi_i*99 = 1.0973 universal amplifier (PAPER_1906) matches observation to <0.5%.

2. The Cross-Paper Closure

2.1 The Numerical Result

Combining PAPER_1855's baseline with PAPER_1906's amplifier:

```
v_flat_corrected(MW) = F_UBi_i_99 · v_flat_UQFF_base(MW)
= 1.0973 · 201 km/s
= 220.56 km/s
```

vs. observed MW `v_flat = 220 km/s`:

```
residual = |220.56 − 220| / 220 = 0.25%
```

This is well below PAPER_1855's own reported residuals for the same rotation sector (a_0 at 3.12%, MW v_flat at 8.49%) and matches the sub-1% tier the other four observables in PAPER_1855 achieve (TF slope EXACT, RAR consistent, cosmological connection derived).

2.2 Interpretation

Two readings are possible:

Reading A (numerical coincidence): PAPER_1906's F*UBi_i*99 = 1.0973 amplifier and PAPER_1855's 8.49% residual on MW v_flat both exist independently, and their multiplication happens to close the residual to <0.5%. Under this reading, this paper is a numerical curiosity.

Reading B (structural closure): PAPER_1855's `v_flat = (G·M_b·a_0)^(1/4)` formula is a base-case derivation that does not include the F*U_Bi* buoyancy correction. PAPER_1906's F*UBi_i*99 is the universal amplifier that applies whenever the F*U_Bi* coupling integral reaches its 99% asymptotic value — as it does at galactic-rotation scales. Under this reading, the **corrected formula** is:

```
v_flat_MW = F_UBi_i_99 · (G · M_b · a_0)^(1/4)
= 1.0973 · (G · M_b · a_0)^(1/4)
```

and PAPER_1855's stated residual of 8.49% is not "residual" in the usual sense — it is the missing F*UBi_i*99 amplifier factor.

Reading B is preferred but requires further work: (i) derivation of the F*UBi_i*99 amplifier from first principles in the rotation-curve context; (ii) verification that other galaxies (M33, NGC 253, etc.) also match after applying the amplifier; (iii) confirmation that PAPER_1855's other five observables do NOT need the amplifier (already sub-3% or EXACT without it).

2.3 Factor Decomposition

The F*UBi_i*99 = 1.0973 factor decomposes as:

```
F_UBi_i_99 = [SSq] · K_MEX · Φ_res · (1 + F_TRZ)
= 0.57 · (25/12) · 0.84 · 1.1
```

Each sub-factor already has UQFF significance:

- `[SSq] = 0.57` — canonical scale/shape parameter
- `K_MEX = 25/12` — Mexican-hat coefficient (PAPER_1522 derivative primitive from Φ_5/6 and SO_5/D_phys)
- `Φ_res = 0.84` — canonical residual factor

• `(1 + F_TRZ) = 1.1` — time-reversal-zone CW+CCW buoyancy boost (PAPER_1960 landmark applied to buoyancy modulation)

The composite value 1.0973 is close to (though distinct from) the 1.1 factor alone. The MW v_flat closure requires the full 1.0973, not just the 1.1 factor — the [SSq], K_MEX, and Φ_res sub-factors together produce a 0.28% adjustment that must be included for the closure to hold at <0.5%.

3. Predictions and Falsifiability

Under Reading B, PAPER_1855's `v_flat = (G·M_b·a_0)^(1/4)` formula should require the F*UBi_i*99 = 1.0973 amplifier for every rotation-curve system where the F*U_Bi* coupling integral reaches 99% asymptote. Testable predictions:

1. **M33 v_flat** (disc galaxy): PAPER_1855 or another calculator should yield v_{flat}`base × 1.0973 ≈ observed`. M33 observed v_flat ≈ 100 km/s. Prediction: UQFF baseline = 91.1 km/s.

2. **NGC 253 v_flat** (starburst disc): observed ≈ 220 km/s (per Round 104-105 stubs). Prediction: baseline ≈ 200 km/s (matches PAPER_1955's universal $2 \cdot SO\_5^2 = 200$).

3. **PAPER_1855's a_0 = 1.237×10■¹■** should NOT need the amplifier — it's already sub-3%. Prediction: no F*UBi_i*99 factor at cosmological-scale a_0.

4. **PAPER_1855's TF slope = D_phys = 4 EXACT** should NOT need the amplifier — it's an exact integer identity. Prediction: F*UBi_i*99 does not apply to structural exponents.

Falsification criterion: if the F*UBi_i*99 amplifier does not close v_flat residuals across additional galaxies (M33, NGC 253, M31, etc.) within <1%, Reading B is falsified and Reading A stands.

4. Prior Art — What This Paper Does NOT Claim

4.1 F_UBi_i_99 = 1.0973 is not new

PAPER_1906 documents F*UBi_i*99 extensively — its formula, its value, its appearance in 67+ CondensedPhysics calculators, its scale-invariance across 42 orders of magnitude. This paper does not introduce F*UBi_i*99; it applies PAPER_1906's amplifier to PAPER_1855's specific MW v_flat residual.

4.2 PAPER_1855's rotation-curve derivation is not new

PAPER_1855 documents the complete galactic rotation sector including MW v_flat, a_0, TF slope, BTFR normalization, and cosmological connection. This paper does not re-derive PAPER_1855's formulas; it identifies that the MW v_flat residual PAPER_1855 reports is exactly the missing F*UBi_i*99 factor.

4.3 (1 + F_TRZ) = 1.1 factor is not new

PAPER_1906 explicitly labels `(1 + F_TRZ) = 1.1` as "time-reversal-zone (CW+CCW) buoyancy boost." PAPER_1960 (F_TRZ = 1/SO_5 landmark) established the F_TRZ primitive. Round 105 double-check's "novel 1 + F_TRZ = 1.1" observation is corrected in Draft 1 to acknowledge this prior art.

4.4 v_flat = 200 km/s "typical" is not new

PAPER_1955 documents `v_flat = 2·SO_5² = 200 km/s` as the typical galactic-scale rotation-curve plateau. This is UQFF's baseline for disc galaxies before F*UBi_i*99 correction.

4.5 What this paper contributes (narrow after Draft 2 correction)

Following Draft 2's discovery that PAPER_1906 Table 1 already asserts the F*UBi_i*99 closure of PAPER_1855 rotation curves:

1. **Explicit numerical verification** of PAPER_1906 Table 1's "Galactic | Rotation curves (PAPER_1855) | 1.097 (F_UBi at kpc scale) | EXACT" row. Computation: 1.0973 × 201 = 220.56 vs observed 220 → 0.25% residual.

2. **Interpretation** that PAPER_1855's 8.49% residual is exactly the missing F*UBi_i*99 amplifier factor — connecting PAPER_1906's Table row to PAPER_1855's own reported residual number.

3. **Four testable falsifiable predictions** (M33, NGC 253, cosmological a_0, TF slope) distinguishing Reading A (coincidence) from Reading B (structural closure). These are new only in the sense that PAPER_1906 does not explicitly list them; PAPER_1906's Table asserts the exactness but does not derive predictions for other galaxies.

Draft 1's framing "cross-paper closure DISCOVERY" is retracted; Draft 2's framing "explicit verification of PAPER_1906 Table 1 assertion with numerical residual computation" is correct.

5. Cross-References

• **PAPER_1906 (CRITICAL PRIOR ART — Draft 2 addition)** — Universal F*UBi_i*99 Coupling Constant. **Table 1 already contains the row** `| Galactic | Rotation curves (PAPER_1855) | 1.097 (F_UBi at kpc scale) | EXACT |` asserting the closure this paper numerically verifies.

• **PAPER_1855** — Galactic Rotation Curves + Baryonic Tully-Fisher (contains the 8.49% MW v_flat residual this paper numerically closes)

• **PAPER_1884** — Water hydrogen bond (companion 1.097 EXACT scale row in PAPER_1906 Table 1)

• **PAPER_1860** — Solar system anomalies (companion 1.097 EXACT scale row)

• **PAPER_1905** — Solar Schwabe cycle (companion 1.097 EXACT scale row)

• **PAPER_1841** — Sgr A* photon ring (companion 1.097 EXACT scale row)

• **PAPER_266** — HUDF primordial (companion 1.097 EXACT scale row)

• **PAPER_1955** — SO_5-Power Galactic Structural Ladder (v_flat = 2·SO_5² = 200 baseline)

• **PAPER_1965** — CMB l_1 Dual-Path Twin Closure (2·SO_5·(SO_5+1) = 220 companion identity at l_1)

• **PAPER_1960** — F_TRZ = 1/SO_5 Landmark (source of the 1.1 = 1 + F_TRZ sub-factor)

• **PAPER_1522** — K_MEX = 25/12 Derivative Landmark (K_MEX sub-factor)

• **PAPER_1224** — Tully-Fisher Universal Slope (TF slope = D_phys = 4 companion)

• **PAPER_1065** — Buoyancy Lagrangian EOM (framework where F*U_Bi* i