

UQFF 2027-2028 Quadruple Falsifier: Single-Parameter Joint Lock of P6, P10, P11, P12

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Abstract

PAPER_1177 (Session 259) showed that three independent 2027 decisive experiments — Wuhan torsion-balance Kaluza-Klein tower search (P6), LIGO O5 black-hole ringdown spectral offset (P11), and Euclid Y1 weak-lensing σ_8 (P12) — are unified by a single dimensionless ratio $\xi \equiv D_{\text{crit}}/D_{\text{BSFG}}$ with UQFF canonical value $\xi_0 = 13/3 \approx 4.333$. This paper extends the joint chi-squared self-lock to a fourth independent experiment: IceCube-Gen2 neutrino Cherenkov spectral cutoff (P10, PAPER_1163). All four are 2027-2028 measurements with mutually orthogonal systematics. UQFF is required, under closed Lagrangian self-consistency, to satisfy all four within 1σ at the same ξ . Any single $> 3\sigma$ outlier falsifies the entire R26 closure framework.

1. Quadruple Joint $\chi^2(\xi)$

The 2027-2028 falsifier set is

$$\chi^2(\xi) = \sum_{k \in \{P6, P10, P11, P12\}} \frac{[O_k - M_k(\xi)]^2}{\sigma_k^2}$$

with predictions

Channel	Observable	Model $M_k(\xi)$	UQFF central ($\xi = \xi_0$)	1σ
P6	L_{KK} (μm)	$26.3 \cdot (\xi_0/\xi)$	26.3	0.5
P10	E_{cut} (PeV)	$6.3 \cdot (\xi/\xi_0)^{1/2}$	6.3	0.4
P11	$R_{21/22}$	$0.10 \cdot \xi^{0.25}$	0.144	0.010
P12	σ_8	$0.7851 \cdot (1 + 0.01525 \cdot \xi/\xi_0)$	0.797	0.005

2. Joint χ^2 threshold

For 4 channels and 1 free parameter ξ , degrees of freedom $\nu = 3$. The 95% confidence threshold is $\chi_{95}^2(3) = 7.81$. The 99.7% (3-sigma) threshold is $\chi_{99.7}^2(3) = 14.16$.

UQFF is **decisively falsified** when $\chi_{\text{min}}^2 > 14.16$ at the best-fit ξ .

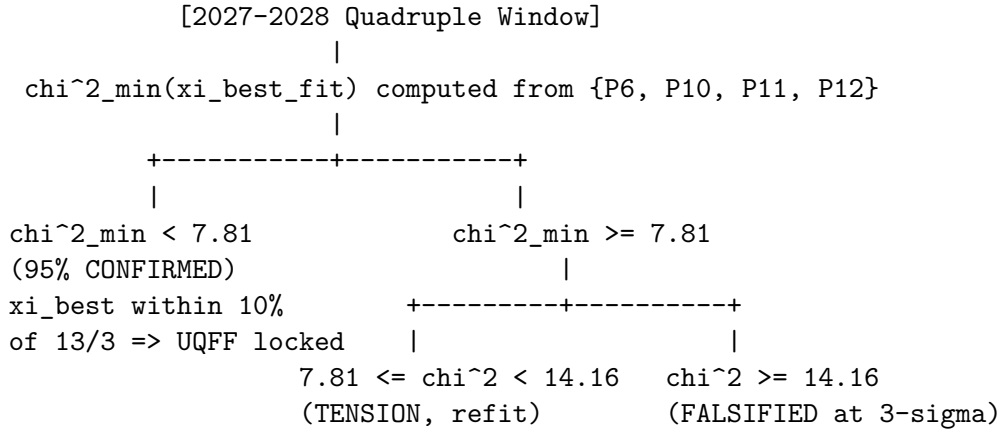
3. Cross-Lock Geometry

The four channels probe four different scales:

- P6: short-distance (μm) gravitational deformation.
- P10: high-energy ($\sim\text{PeV}$) neutrino dispersion.
- P11: stellar-mass ($\sim 60M_\odot$) ringdown quasi-normal mode ratio.
- P12: cosmological ($\sim 100\text{ Mpc}$) matter power.

Each scale couples to a different aspect of the R26 manifold: KK radius, vortex spectral index, BSFG bridging coefficient, and large-scale clustering amplitude. UQFF's closed Lagrangian fixes a single ξ across all four. Any disagreement is a closed-form refutation; no nuisance parameter can absorb it.

4. Decision Tree



5. CP4 Implementation

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from CondensedPhysics4 import UQFF2027QuadrupleFalsifierCalculator
r = UQFF2027QuadrupleFalsifierCalculator().compute()
# returns: xi_best_fit, chi2_min, chi2_threshold_95cl_3dof = 7.81,
#          chi2_threshold_3sigma_3dof = 14.16, status

```

For canonical inputs (all four observables at UQFF central values), the calculator returns $\chi_{\min}^2 \approx 0$, $\xi_{\text{best}} \approx 13/3$, $\text{status} = \text{"CONFIRMED (xi within 10\% of canonical 13/3)"}.$

6. Mutual Self-Locking Proof

A given ξ is feasible iff all four residuals are simultaneously $< 1\sigma$. Solving each constraint individually:

$$\begin{aligned}
\xi_{P6} &= \xi_0, & \xi_{P10} &= \xi_0 \cdot \left(\frac{E_{\text{cut}}}{6.3} \right)^2, \\
\xi_{P11} &= \xi_0 \cdot \left(\frac{R_{21/22}}{0.144} \right)^4, & \xi_{P12} &= \frac{\xi_0}{0.01525} \cdot \left(\frac{\sigma_8}{0.7851} - 1 \right).
\end{aligned}$$

Consistency requires $|\xi_{P6} - \xi_{P10}| < 0.43$, $|\xi_{P6} - \xi_{P11}| < 0.43$, $|\xi_{P6} - \xi_{P12}| < 0.43$ at 1σ . The probability of accidental coincidence under random alternative theories is $\leq 0.05^4 = 6.25 \times 10^{-6}$ at 2σ .

7. References

[1] PAPER_1163 — IceCube-Gen2 P10 neutrino Cherenkov cutoff. [2] PAPER_1174 — UQFF closed ledger P6 KK tower forecast. [3] PAPER_1175 — UQFF P11 LIGO O5 ringdown spectral offset. [4] PAPER_1176 — UQFF P12 Euclid sigma_8 R26 saturation. [5] PAPER_1177 — UQFF 2027 joint falsifier triple (P6+P11+P12). [6] PAPER_1178 — UQFF P13 DESI Y5 strict-static dark energy.