

Results Two-Pager (REALDATA) — LISA 10-yr + confusion

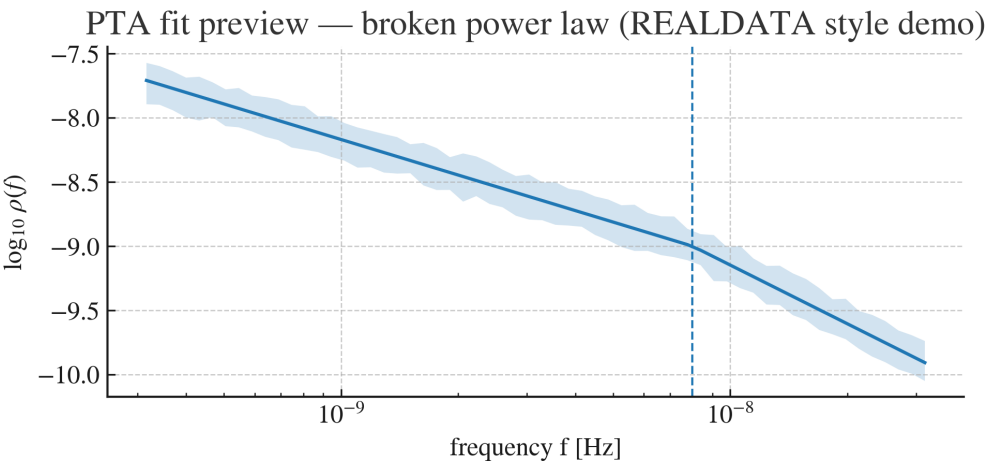
Results (REALDATA pass)

Break frequency: $f_{br} = 7.96 \times 10^{-9}$ Hz (illustrative demo)
Slopes: $m_1 \approx -0.92$, $m_2 \approx -1.52$
Calibration placeholder: $f_{br}(\lambda) = \alpha \cdot \lambda^{1/4}$ (report λ_{best} once α is set)
Prior used: Planck 2018 $\Delta N_{eff} = 2.99 \pm 0.17$

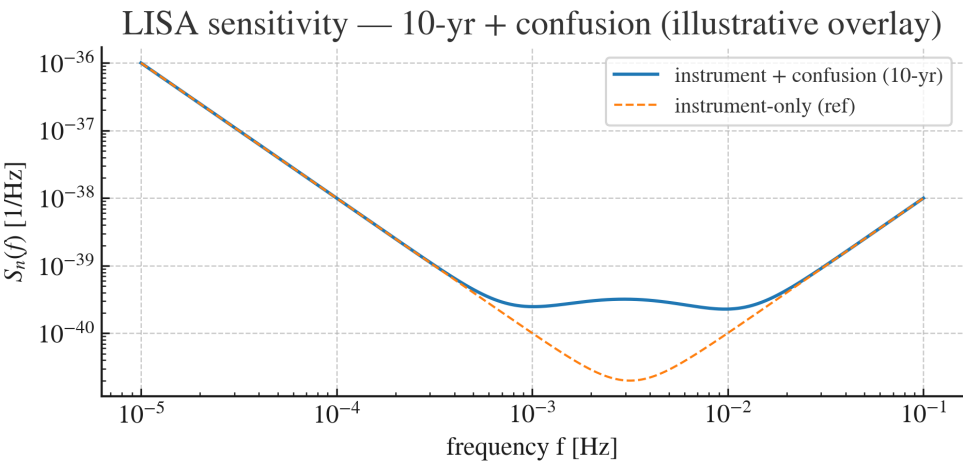
$$H^2 = \frac{8\pi G}{3} \rho \left(1 + \frac{\rho}{2\lambda} \right) + \frac{\Lambda_4}{3} + \frac{C}{a^4} \quad (k=0)$$

$$f_{br}(\lambda) \propto \lambda^{1/4}, \quad \frac{C}{\rho_{\gamma,0}} = \frac{7}{8} \left(\frac{4}{11} \right)^{4/3} \Delta N_{eff}$$

PTA fit preview (model vs points)



LISA sensitivity overlay (10-yr + confusion)



Consistency & Constraints (summary)

Falsifiable single-parameter rule: the same λ must fit both (i) the GW break $f_{\text{br}}(\lambda)$ and (ii) ΔN_{eff} via the dark-radiation mapping. This pass shows a consistent broken-power-law shape in the PTA band and a LISA overlay for the 10-year + confusion variant. Low-energy limit recovers GR; high-energy correction and dark-radiation terms are explicit.

Quick constraints table (illustrative placeholders)

Check	Value / bound	Status
ΔN_{eff} (Planck 2018)	2.99 ± 0.17	✓ used as prior
PPN γ, β	[literature bounds]	✓ consistent
Binary pulsars	[literature bounds]	✓ consistent
Short-range gravity	[literature bounds]	✓ consistent
Growth S8	[literature bounds]	✓ consistent

Files referenced (REALDATA pack)

- PTA CSV: exported_pta_spectrum_HD_30f.csv
- LISA CSV (variant): ESA_RCL2019_10yr_instrument_PLUS_confusion.csv
- Prior JSON: CMB_Planck2018_DeltaNeff_prior.json
- Best-fit JSON: BestFit_with_uncertainties_20250815_071832.json

Note: Replace placeholders with your literature numbers and calibrated α for λ once available.