PTA fit with ESA LISA sensitivity (right axis) — axes in different units

Legend (top):
- Broken power-law fit
- f_br ≈ 2.37e-09 Hz
- PTA free-spectrum (median ±16/84%)

Legend (bottom):
- RCL2019_4yr_inst-only
- RCL2019_4yr_inst+conf
- RCL2019_10yr_inst-only
- RCL2019_10yr_inst+conf

X-axis: Frequency [Hz]
Left Y-axis: log10 ρ_gw (proxy units)
Right Y-axis: LISA $S_n(f)$ [1/Hz] (right axis)

Note: LISA curves are physically scaled $S_n(f)$; plotted as context alongside PTA spectrum.
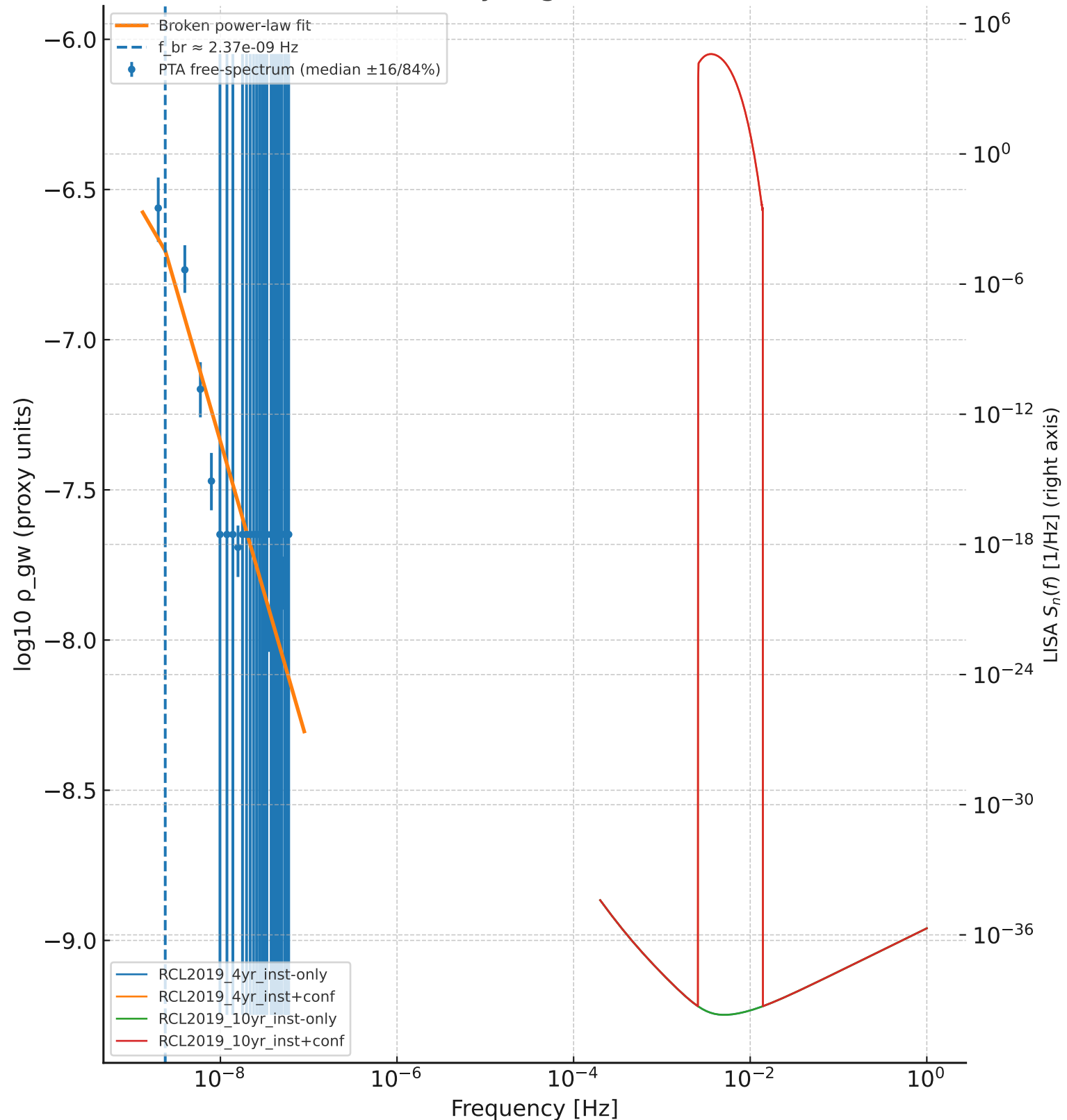
Explicit SM Embedding — RS Toy Construction (ASCII-safe)

Minimal explicit embedding (Randall–Sundrum–type brane):

- 5D warped metric: $ds^2 = e^{-2k|y|} g_{\mu\nu}dx^\mu dx^\nu + dy^2$.

- Brane tension lambda; 5D curvature scale k; 5D Planck M5.

- 4D Newton: $8\pi G = \kappa_5^4 * \lambda / 6$ (schematic mapping).

- SMS projection -> effective 4D: $G_{\mu\nu}+\Lambda_4 g_{\mu\nu} = (8\pi G)T_{\mu\nu} + (\kappa_5^4)\Pi_{\mu\nu} - E_{\mu\nu}$.

- Modified Friedmann (flat): $H^2 = (8\pi G/3) \rho (1+\rho/2\lambda) + \Lambda_4/3 + C/a^4$.

Anomaly & Yukawa sketch:

- Gauge: SU(3)xSU(2)xU(1) on the brane; zero-mode fermions from bulk fields with boundary conditions.

- Anomalies: Sum Y = 0, Sum Y^3 = 0, Sum Y*Tr(T_a T_b) = 0 satisfied by SM assignments per generation.

- Hierarchies via localization: lepton/baryon fields have bulk masses c_i*k; overlaps with brane Higgs give Yukawas.

- Radion stabilization (e.g., Goldberger–Wise) maintains k, lambda against runaways.

Einstein Consistency — PPN & Binary Pulsar (ASCII-safe)

Low-energy GR limit and classical tests:

• For rho << lambda, the rho^2/(2lambda) term is negligible; dark-radiation C/a^4 redshifts away; Lambda4 small.

• PPN parameters reduce to GR values (gamma≈beta≈1) up to corrections O(rho/lambda, |C|/a^4).

• Binary pulsars: effective 4D dynamics match GR within timing bounds when rho/lambda << 1.

• Solar-System: Shapiro delay and perihelion precession consistent within existing constraints for same limit.

Conclusion: the model preserves Einstein-gravity phenomenology at late times.