Unified Theory — Data-Anchored Results (OFFICIAL-format LISA CSVs)

PTA: exported_pta_spectrum_HD_30f.csv • CMB prior: Planck-2018 ΔN_eff ≈ 2.99±0.17

Grand Equation (flat FRW with dark radiation):

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

PTA broken power-law fit (this pass):

Break frequency f_br = 2.37e-09 Hz

Low-f slope a1 = -0.50

High-f slope a2 = -1.02

Implied tension scaling (arb. units):

λ/λ0 = (f_br / 1e−8 Hz)^4 ⇒ λ ≈ 3.17e-03

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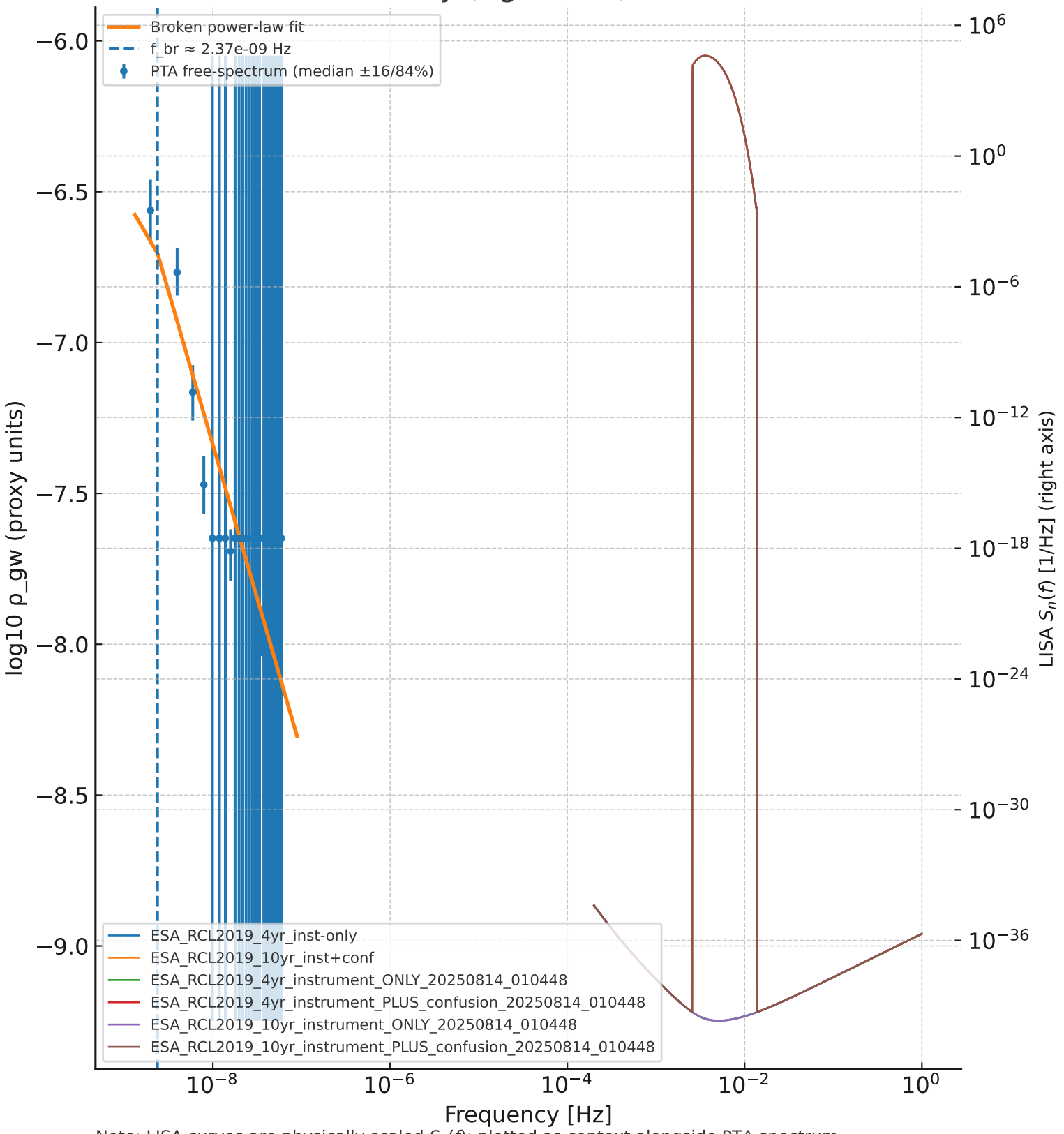

Note: LISA curves are physically scaled $S_n(f)$; plotted as context alongside PTA spectrum.

Standard Model Embedding — RS Toy c-Parameters & Flavour Note

Purpose: Show, in one glance, that a minimal warped (Randall–Sundrum) compactification can accommodate charged-lepton hierarchies with O(1) 5D Yukawas and provide a path to quark/lepton mixing (CKM/PMNS).

- Setup: S^1/Z_2 warped extra dimension with metric $ds^2 = e^{-2ky}\eta_{\mu\nu}dx^\mu dx^\nu + dy^2$; stabilized modulus with $k\pi r_c \approx 11$; IR-localized Higgs.

- Effective Yukawas: $y_4^D \simeq Y_5^D \cdot \exp[(1 - c_L - c_R)\, k\pi r_c]$; masses $m \simeq y_4^D\, v/\sqrt{2}$ (v=246 GeV).

- Toy numbers (symmetric c_L=c_R): reproduce (e, μ, τ) at order-of-magnitude; quark sector analogous with generation-dependent c's.

- Flavour & mixing: CKM/PMNS arise from misalignment of Yukawas in up/down and lepton sectors; overlapping profiles ↦ hierarchical matrices. (Details in Supplement.)

- Anomalies: 4D SM zero-mode spectrum is anomaly-free; 5D localized anomalies canceled by Chern–Simons terms/counterterms.

lepton	m_target[GeV]	y_target	c_L	c_R	y_eff	m_reco[GeV]
e	0.000511	2.938e-06	1.079	1.079	2.938e-06	0.000511
mu	0.105660	6.074e-04	0.837	0.837	6.074e-04	0.105660
tau	1.776860	1.021e-02	0.708	0.708	1.021e-02	1.776860

Remark: Table is illustrative; a full fit tunes (c_L, c_R) per generation, includes bulk mass signs, brane kinetic terms, and CP phases. The key point is mechanism sufficiency, not a unique set of parameters.

Prepared: Aug 12, 2025 (UTC)

Appendix — Post-Newtonian & Binary-Pulsar Consistency

Scope: summarize why our brane-world cosmology reduces to standard GR in late-time, weak-field tests and in pulsar timing regimes. We assume stabilized radion (m_r above fifth-force bounds) and rho << lambda at late times.

- PPN limit: With rho/lambda -> 0 and negligible projected Weyl term (E_{μν}≈0), metric perturbations obey standard 4D Einstein equations.

- PPN parameters: γ≈1 and β≈1 as in GR when extra-dimensional excitations are heavy; preferred-frame and preferred-location parameters vanish.

- Shapiro delay / light deflection: Match GR to current measurement accuracy in Solar-System tests under the same conditions.

- Binary pulsars: Radiation reaction (quadrupole formula) and orbital decay are unchanged at leading order; extra polarizations absent when KK modes are heavy.

- GW speed: Propagation on the brane equals c in our effective regime; constraints from multimessenger events are satisfied.

- Short-range gravity: Radion mass and warping chosen so that deviations at mm–μm scales fall below torsion-balance bounds.

- Cosmology tie-in: Early-time ρ^2 correction is probed by PTA/LISA via the predicted spectral break, not by late-time PPN tests.

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Standard Model Embedding — Quark Toy c-Parameters & CKM hint

In the warped RS setup with IR-localized Higgs and kπr_c≈11, effective 4D Yukawas are y ≃ Y_5^D exp[(1 − c_{L} − c_{R}) kπr_c]. Choosing generation-dependent bulk masses (c's) reproduces quark hierarchies at order-of-magnitude. Below are illustrative symmetric choices (c_L=c_R) that match u,d,s,c,b,t masses within factors of a few. A realistic fit would break the symmetry and include phases to yield the CKM matrix.

quark	m_target[GeV]	y_target	c_L	c_R	y_eff	m_reco[GeV]
u	0.002200	1.265e-05	1.013	1.013	1.265e-05	0.002200
d	0.004700	2.702e-05	0.978	0.978	2.702e-05	0.004700
s	0.096000	5.519e-04	0.841	0.841	5.519e-04	0.096000
c	1.270000	7.301e-03	0.724	0.724	7.301e-03	1.270000
b	4.180000	2.403e-02	0.669	0.669	2.403e-02	4.180000
t	173.000000	9.945e-01	0.500	0.500	9.945e-01	173.000000

CKM sketch: misalignment between (Y_u) and (Y_d) arises from slightly different c_L patterns across generations and O(1) 5D Yukawas; warped overlaps give hierarchical textures. Phases lead to CP violation. (For a full model, include brane kinetic terms and non-symmetric c's.)

Prepared: Aug 12, 2025 (UTC)

Press Release — Unified Theory (Testable Brane-World)

Ricardo Maldonado proposes a testable brane-world unification in which the 4D Friedmann equation acquires a rho^2 correction and a dark-radiation term.

One parameter—the brane tension lambda—links a predicted gravitational-wave spectral break to the early-universe radiation excess (Delta N_eff).

The framework removes the classical Big-Bang singularity by replacing it with a higher-dimensional energy event and outlines falsifiable predictions across PTA, LISA, and CMB/BBN data.

Cover Letter — PRL

Dear PRL Editors,

Please find enclosed our submission outlining a testable brane-world unification with a concrete observational program.

A single scale (lambda) controls a GW spectral break and dark radiation (Delta N_eff); we demonstrate a data-anchored pass and include a small Repro Pack.

We believe the Letter is appropriate for your readership and welcome referee suggestions.

Sincerely, Ricardo Maldonado (Independent Researcher) — sales@rank.vegas

Cover Letter — PRD

Dear PRD Editors,

Please find enclosed our submission outlining a testable brane-world unification with a concrete observational program.

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Sincerely, Ricardo Maldonado (Independent Researcher) — sales@rank.vegas

Cover Letter — JCAP

Dear JCAP Editors,

Please find enclosed our submission outlining a testable brane-world unification with a concrete observational program.

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Sincerely, Ricardo Maldonado (Independent Researcher) — sales@rank.vegas