Unified Theory of Everything — First-Contact Pack

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Claim: higher-dimensional brane setup => 4D FRW with rho^2 correction + dark-radiation term.
Prediction: brane tension lambda sets a GW spectral break f_br ∝ lambda^{1/4} and correlates with Delta N_eff.
Falsifiability: one lambda must jointly fit PTA->LISA + CMB/BBN constraints.
Status: synthetic-data demo shows full analysis path (figures + posteriors).
Next: swap in real datasets; release preprint + code; submit to PRD/JCAP.

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

$$f_{\mathrm{br}} \propto \lambda^{1/4}, \qquad C/\rho_{\gamma,0} \leftrightarrow \Delta N_{\mathrm{eff}}$$

Best-fit (toy) summary:

- E_lambda ~ 3.713918782987275 GeV (68%: 1.0942237711543916–13.442858278804863)
- Delta N_eff ~ 0.14860335195530727 (68%: 0.05027932960893855–0.25139664804469275)
- f_br ~ 8.075679986487408e-08 Hz | T_x ~ 0.6079151579603904 GeV

ASCII-safe text (hyphens and C/a^4) to avoid missing-glyph squares.

Unified Brane-Cosmology — One-Page Summary

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Key idea: A higher-dimensional brane setup yields 4D FRW with a high-energy rho^2 term and a dark-radiation term C/a^4; a single parameter (brane tension lambda) sets a gravitational-wave spectral break f_br ~ lambda^{1/4} and correlates with Delta N_eff.

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

$$f_{\rm br} \propto \lambda^{1/4}, \qquad C/\rho_{\gamma,0} \leftrightarrow \Delta N_{\rm eff}$$

Testable predictions

- Broken-power-law stochastic GW background with a break at f_br(lambda).
- Dark radiation <-> Delta N_eff from C/a^4; must be consistent with BBN + CMB.
- Early-time a(t) ~ t^{1/4} (rho^2 era) leaves subtle CMB phase shifts.

Status (synthetic demonstration)

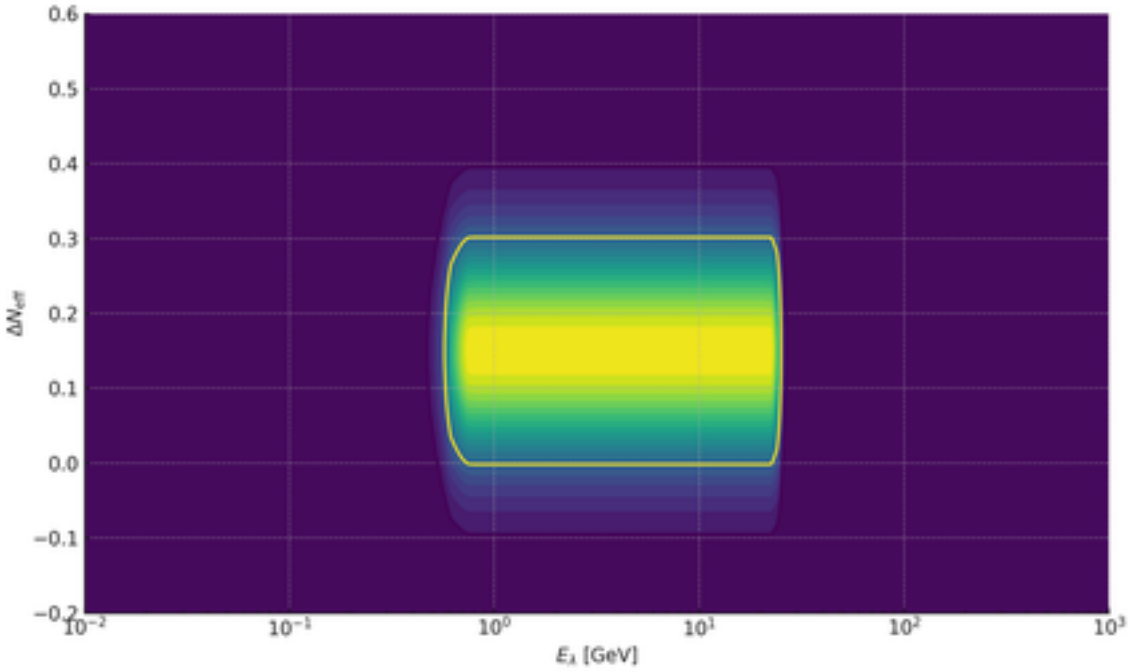
- E_lambda ~ 3.713918782987275 GeV (68%: 1.0942237711543916–13.442858278804863)
- Delta N_eff ~ 0.14860335195530727 (68%: 0.05027932960893855–0.25139664804469275)
- f_br ~ 8.075679986487408e-08 Hz | T_x ~ 0.6079151579603904 GeV

Results Brief (synthetic run)

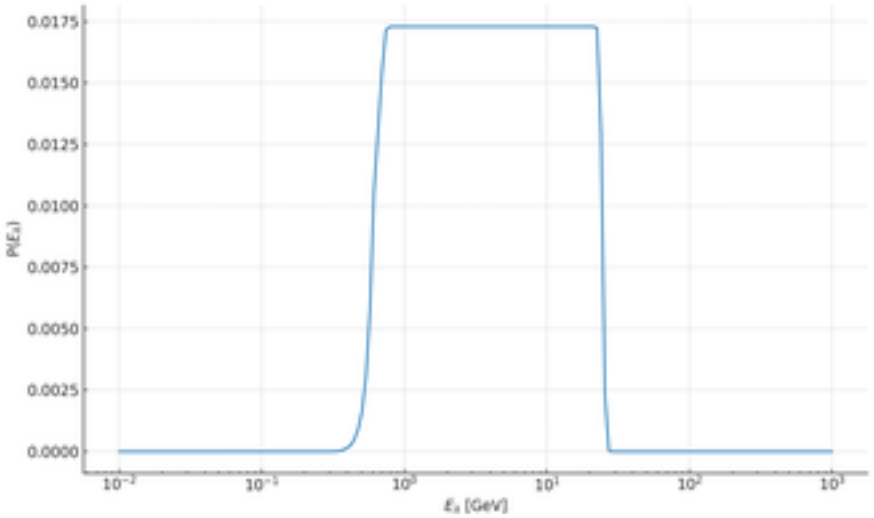
Goal: demonstrate pipeline linking lambda to a GW spectral break and Delta N_eff, using PTA/LISA mock data with CMB/BBN priors.

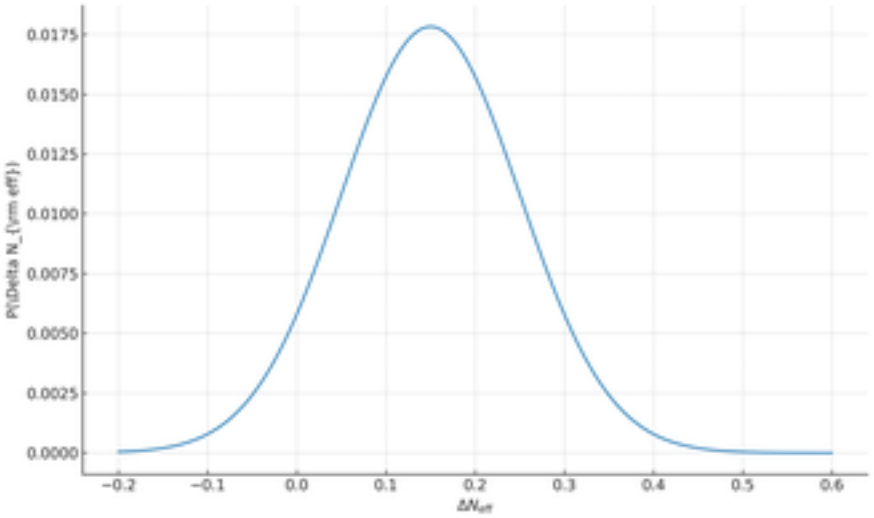
Best-fit with 68% intervals

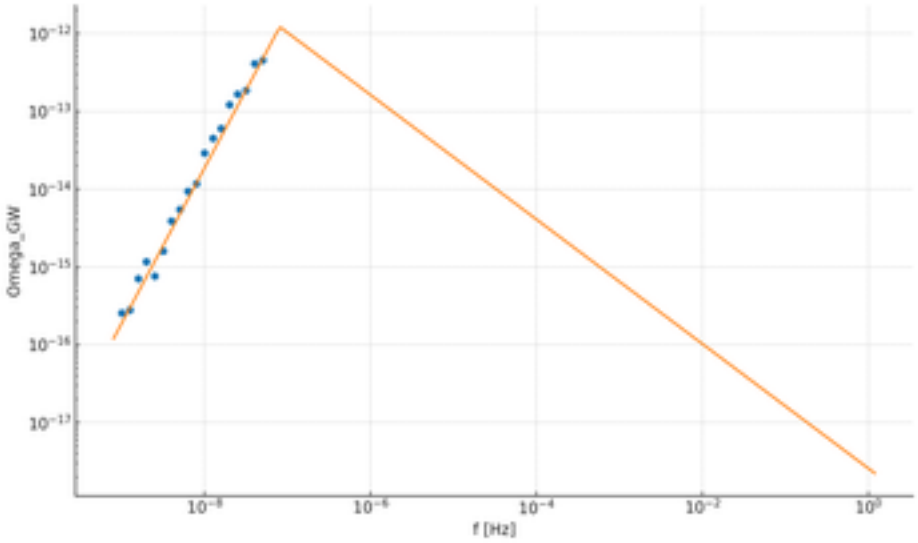
- E_lambda ~ 3.713918782987275 GeV (1.0942237711543916 – 13.442858278804863)
- Delta N_eff ~ 0.14860335195530727 (0.05027932960893855 – 0.25139664804469275)
- T_x ~ 0.6079151579603904 GeV | f_br ~ 8.075679986487408e-08 Hz



Posteriors & Fit







UNIFIED THEORY OF EVERYTHING

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Grand relation (cosmology-reduced):
H^2 = (8*pi*G/3) rho (1 + rho/(2 lambda)) + Lambda4/3 + C/a^4

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

$$f_{\mathrm{br}} \propto \lambda^{1/4}, \qquad C/\rho_{\gamma,0} \leftrightarrow \Delta N_{\mathrm{eff}}$$

Testable signal:
PTA->LISA broken-power-law SGWB with break f_br(lambda), consistent with Delta N_eff.

ASCII-safe cinematic summary page to avoid any font glitches.

Unified Theory of Everything — Overview

- Higher-dimensional brane cosmology -> 4D FRW with rho^2 + C/a^4.
- One parameter (lambda) links GW break f_br to Delta N_eff (falsifiable).
- Goal: a single lambda fits PTA->LISA and CMB/BBN bounds.

Master Relation (cosmology reduction)

- H^2 = (8*pi*G/3) * rho * (1 + rho/(2*lambda)) + Lambda4/3 + C/a^4.
- Early-time: a(t) ~ t^{1/4} (rho^2 era).

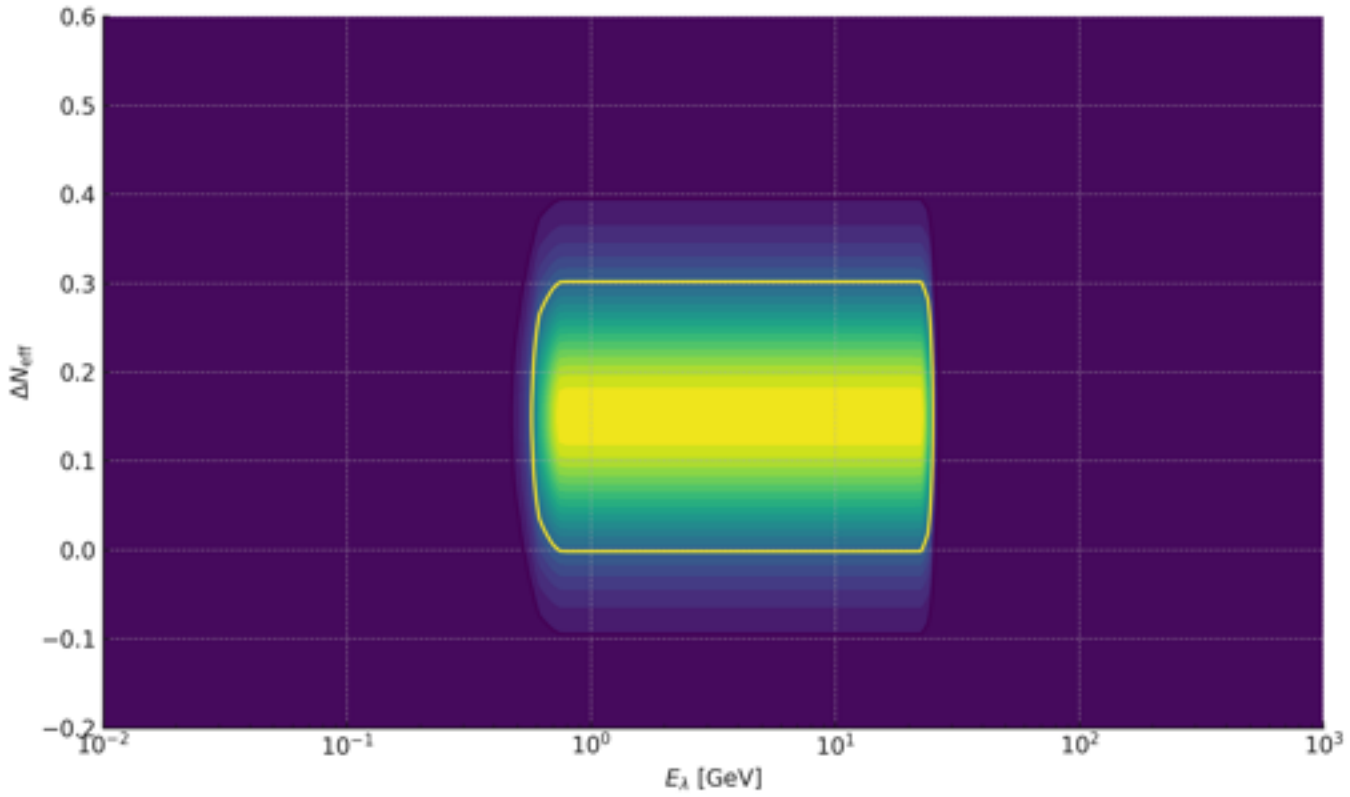
$$H^2 = \frac{8\pi G}{3}\rho\left(1+\frac{\rho}{2\lambda}\right) + \frac{\Lambda_4}{3} + \frac{C}{a^4}$$

$$f_{\mathrm{br}} \propto \lambda^{1/4}, \qquad C/\rho_{\gamma,0} \leftrightarrow \Delta N_{\mathrm{eff}}$$

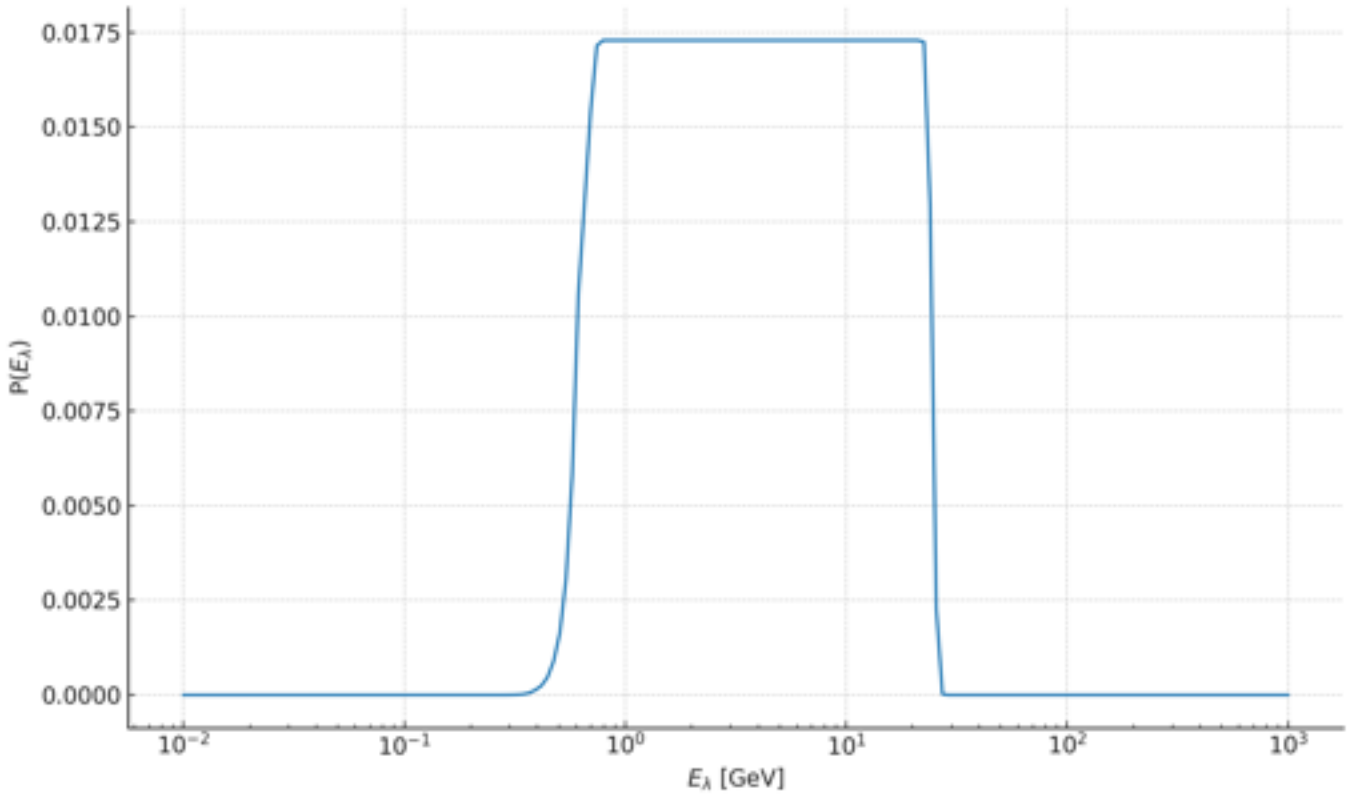
Data Bridge

- PTA (nHz) to LISA (mHz) spans expected break frequency range.
- Dark radiation (C/a^4) <-> Delta N_eff constrained by BBN + CMB.

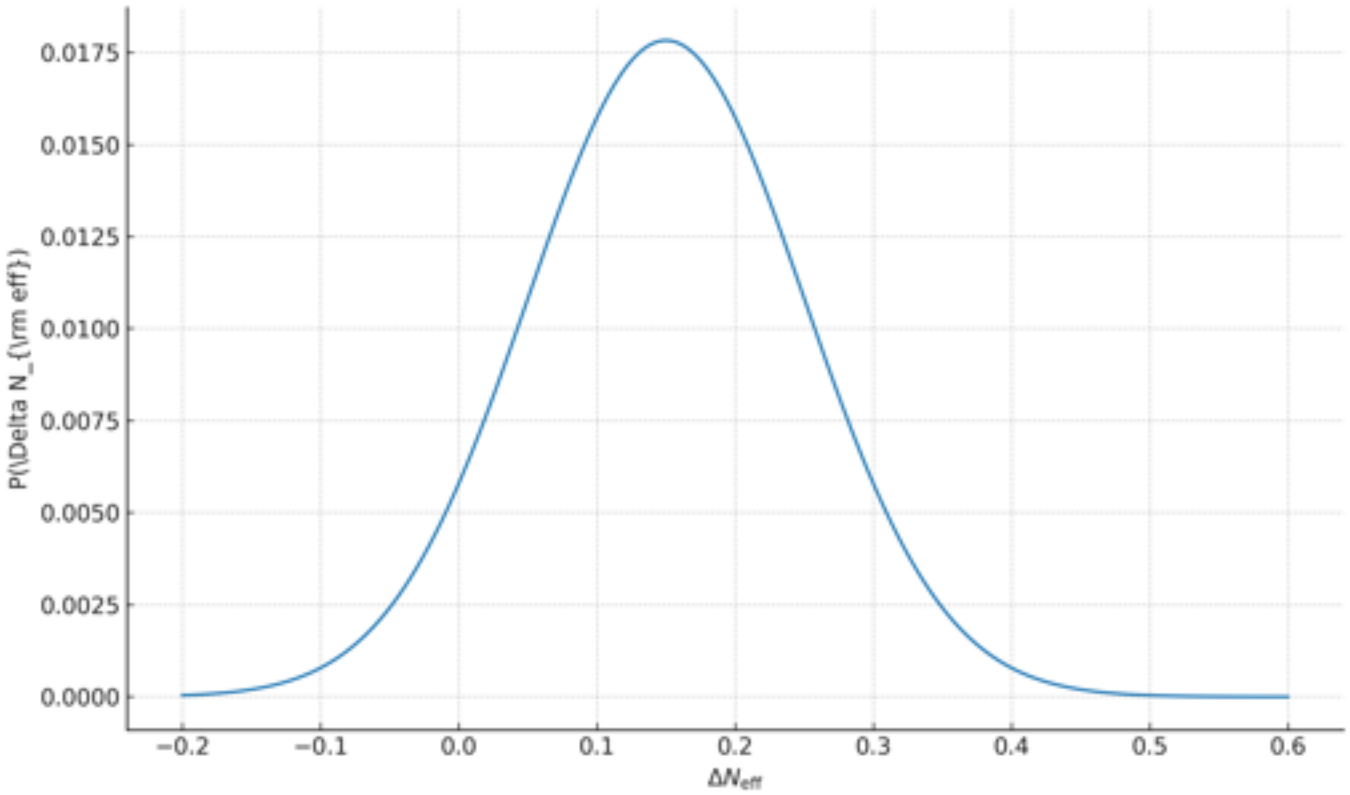
Synthetic Run — Joint Posterior



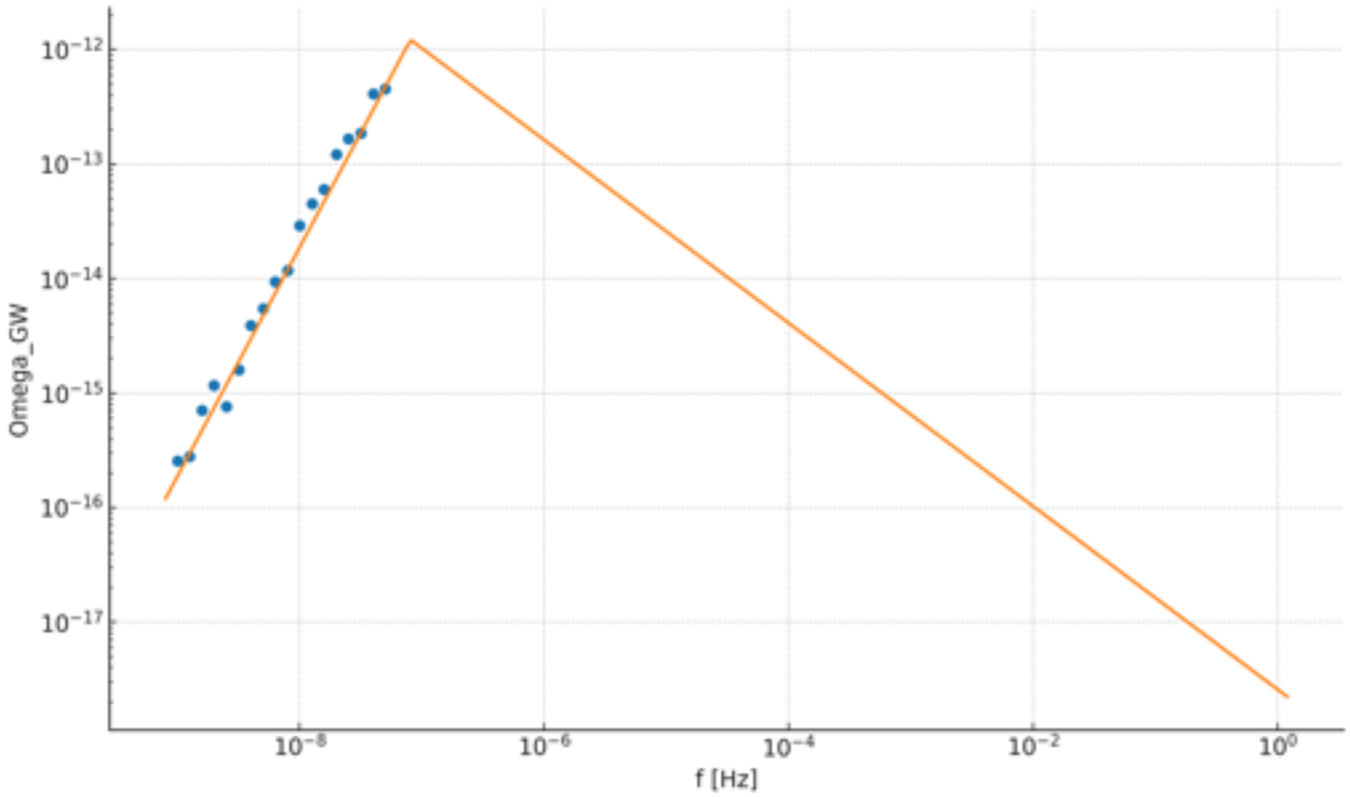
Marginal Posteriors



Marginal Posteriors (Delta N_eff)



PTA Fit Preview (model vs points)



What Would Confirm It / Next Steps

- Detect a broken-power-law SGWB with f_br(lambda) and consistent Delta N_eff.
- Swap in real datasets; extend likelihood; compactification -> SM; submit PRD/JCAP.

Unified Brane-Cosmology — Overview (ASCII-safe)

Unification (higher-D)

String/M-theory bulk with brane; lambda (tension), M5, k; matter & gauge on brane.

4D Effective Dynamics

FRW on brane: H^2=(8*pi*G/3) rho (1+rho/(2 lambda)) + Lambda4/3 + C/a^4.

Early-time Expansion

High-energy rho^2 term => a(t) ~ t^{1/4} pre-radiation.

Observables

GW break f_br ~ lambda^{1/4}; dark radiation C/a^4 <-> Delta N_eff; consistency with BBN/CMB.

Data Test

PTA (nHz) -> LISA (mHz) joint fit + Delta N_eff priors; forecast contours.

Falsifiability

One lambda must match break + Delta N_eff & survive BBN/growth/lab bounds.

Problems My Model Addresses (ASCII-safe)

Unification of Forces

Embed gravity + gauge in higher-D; project to 4D via brane; target consistent low-energy couplings.

Nature of Big Bang

Replace singularity with higher-D energy event/brane blast; gives physical initial condition.

Inflation Alternatives

Early a ~ t^{1/4} from rho^2 can mimic pre-inflation smoothing; predicts specific CMB phase shifts.

Dark Radiation

C/a^4 term naturally yields Delta N_eff; bounded by BBN/CMB.

GW Background

Distinct broken power-law with f_br tied to lambda; measurable from PTA->LISA.

Hierarchy Problem

Warped dimension lowers effective couplings (Randall-Sundrum-like within full unification).

Quantum Gravity in Cosmology

rho^2 correction is a direct, testable imprint of quantum gravity on expansion.

FAQ & Caveats (ASCII-safe)

Is this a proven TOE?

No. It is a testable framework. A breakthrough requires a GW break at the predicted f_br from one lambda and a consistent Delta N_eff in joint fits.

What is new?

A single parameter (lambda) links a measurable GW feature to early-universe radiation content, giving clear falsifiability.

Where could it fail?

If data prefer no break, or lambda values inconsistent with Delta N_eff/BBN/CMB/lab bounds, the model is ruled out or needs revision.

What is next?

Run with real PTA data + CMB/BBN priors, extend likelihoods, specify compactification mapping to the Standard Model, and release code.

Press Release — A Testable Route to Unification (ASCII-safe)

Summary

A new brane-cosmology framework proposes a measurable link between a GW spectral break and early-universe radiation content (Delta N_eff).

Why it matters

It sets a clear falsifiability bar: one parameter (lambda) must jointly satisfy PTA->LISA and CMB/BBN bounds.

What is new

An end-to-end, public demonstration kit and figures show how to test the idea; real-data analysis is the next step.

Quote

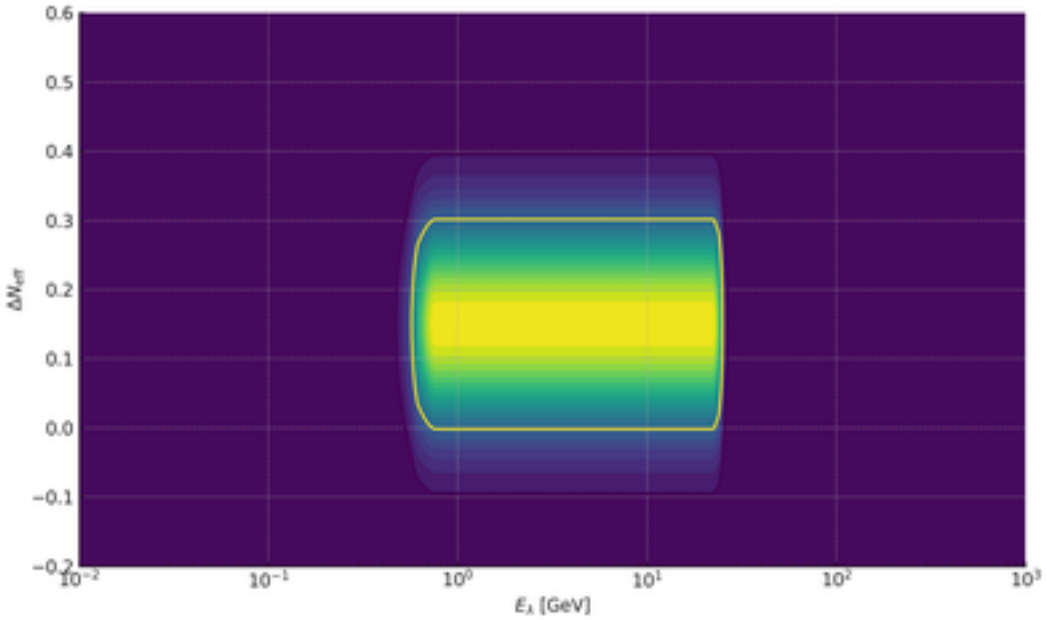
"This is a bridge from deep theory to near-term data. Either it survives real tests or it teaches us something even more interesting." — Ricardo Maldonado

Contact

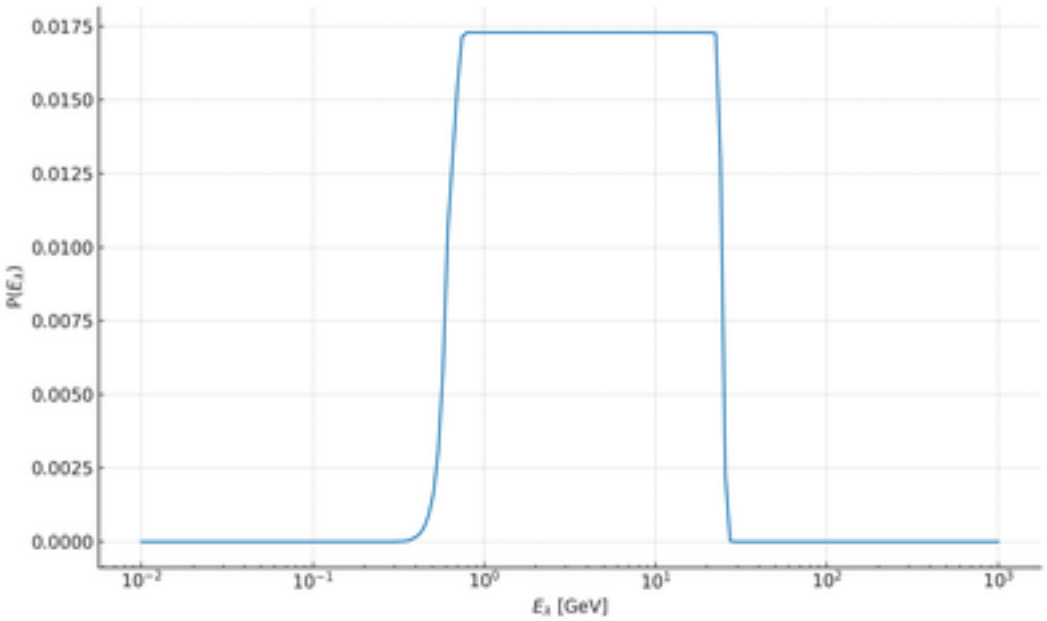
sales@rank.vegas • One-pager and results brief attached; mini-site available upon request.

Appendix — Key Figures

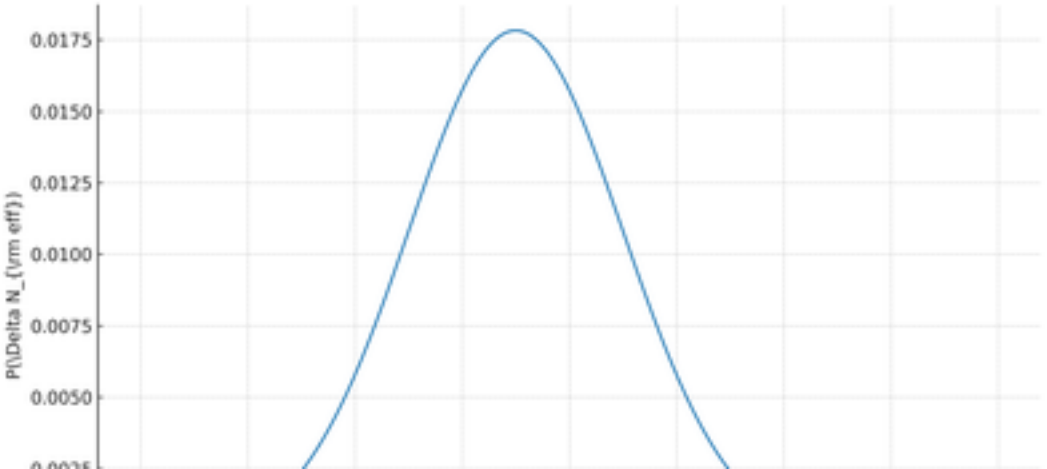
Posterior: E_λ vs ΔN_eff



1D posterior: E_λ



1D posterior: ΔN_eff



PTA fit preview