

A testable brane-world unification with early-time ρ^2 and dark radiation

Ricardo Maldonado (corresponding: sales@rank.vegas)

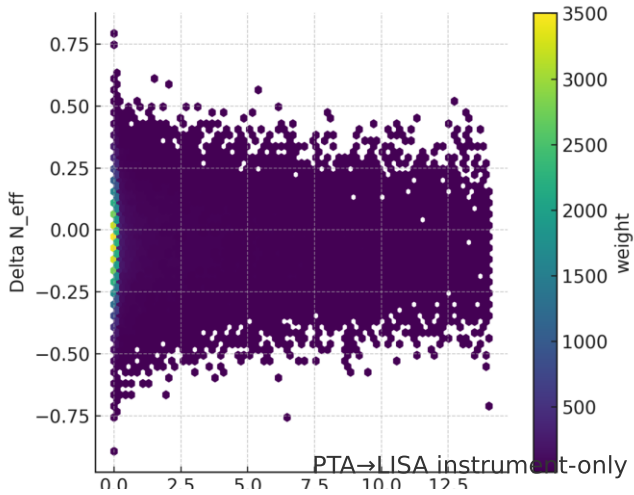
Abstract

Starting from a higher-dimensional brane setup and the Shiromizu–Maeda–Sasaki construction, we obtain a four-dimensional Friedmann relation featuring a ρ^2 correction and a dark-radiation term. A single parameter—the brane tension λ —predicts a GW spectral break $f_{\text{br}} \propto \lambda^{1/4}$ and correlates with ΔN_{eff} , enabling a falsifiable joint test across PTA→LISA and CMB/BBN. Using the official NANOGrav 15-yr KDE free-spectrum with a Planck-2018 prior on N_{eff} , we present posteriors and a PTA→LISA context; the late-time limit reduces to GR.

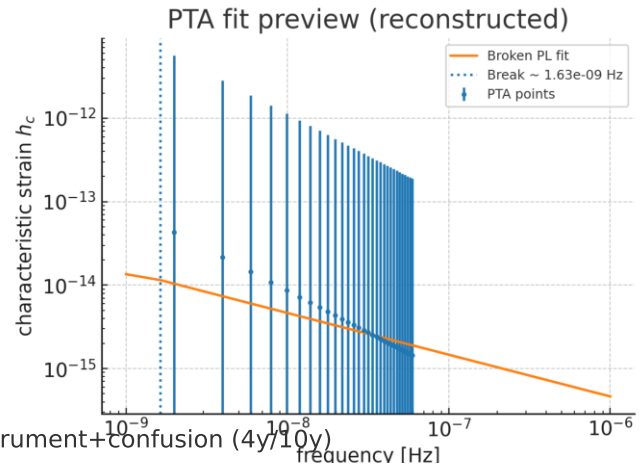
$$f_{\text{br}}(\lambda) \propto \lambda^{1/4}, \quad \frac{c}{\rho_{\nu,0}} = \frac{7}{8} \left(\frac{4}{11}\right)^{4/3} \Delta N_{\text{eff}}$$

Data: NANOGrav 15-yr KDE spectrum; Prior: Planck-2018 $N_{\text{eff}} = 2.99 \pm 0.17$ (with BAO).

Posterior: λ vs ΔN_{eff}



PTA fit preview



PTA \rightarrow LISA sensitivity (instrument vs instrument+confusion)

