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

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Abstract

We derive an effective 4-D cosmology from a higher-D brane setup, yielding a ρ^2 correction and a dark-radiation term. A single parameter λ fixes a GW spectral break $f_{br} \propto \lambda^{1/4}$ and correlates with ΔN_{eff}. Using the official NANOGrav 15-yr KDE spectrum with a Planck-2018 N_{eff} prior, we present posteriors and a PTA→LISA context figure. We also include analytic LISA sensitivity variants (instrument-only and instrument+confusion for 4-yr and 10-yr) to guide forecasting.

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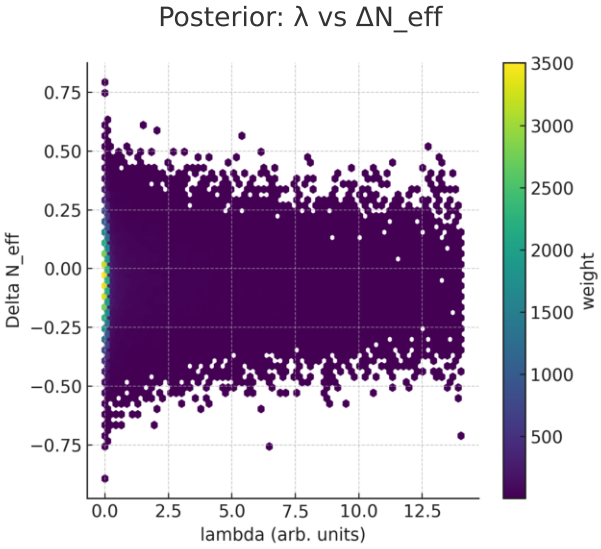
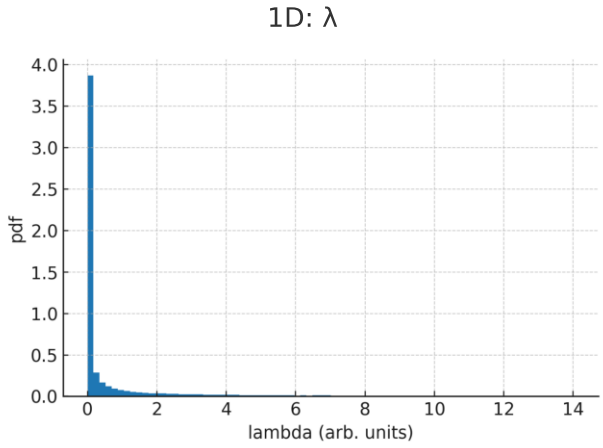
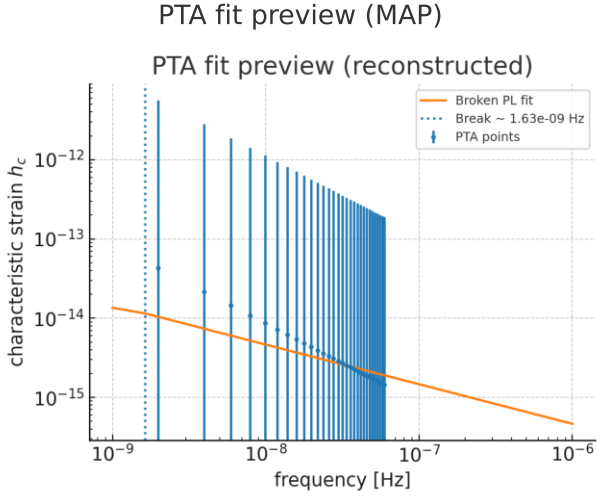
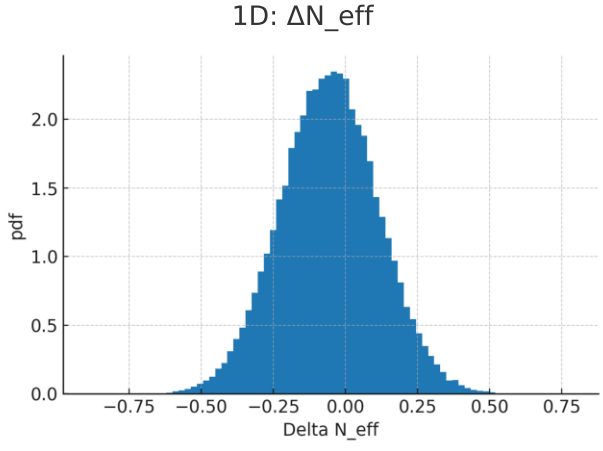
Results (official PTA spectrum)

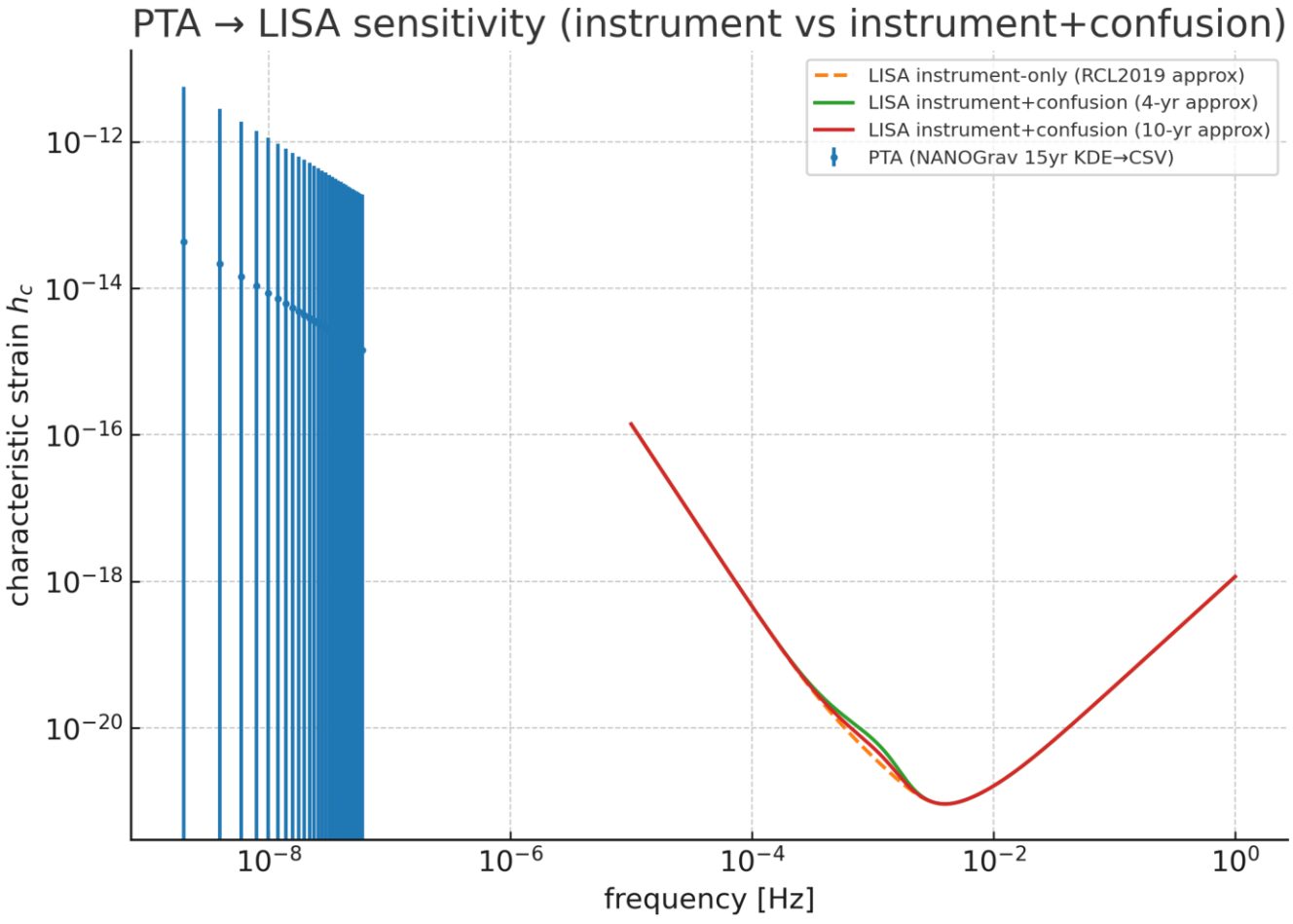








PTA→LISA sensitivity (instrument vs instrument+confusion)



Curves are analytic approximations per Robson–Cornish–Liu (2019); confusion model approximate; for final publication use official LISA team curves.