NEHOP'25 - New Horizons in Primordial Black Hole Physics



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## Bayesian free-form reconstruction of curvature perturbations from scalar induced gravitational waves

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The formation of primordial black holes (PBHs) from amplified density fluctuations in the early universe may also generate scalar-induced gravitational waves (GW), carrying vital information about the primordial power spectrum and the universe's expansion history. We present a Bayesian approach to reconstruct both the scalar power spectrum and the equation of state from GW observations, using interpolating splines to flexibly capture features in the data. The optimal number of nodes is chosen via Bayesian evidence to balance model complexity and reconstruction fidelity.

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