

Understanding acoustic scale observations: the one-sided fight against Λ

Monday 7 April 2025 15:04 (8 minutes)

The cosmic microwave background (CMB) and baryon acoustic oscillations (BAO) provide precise benchmarks for measuring the expansion history of the universe. In particular, the CMB angular scale measurement θ_* , which determines the ratio of the sound horizon to the angular diameter distance to the last scattering surface, offers a robust constraint on cosmological models independent of late-time physics. We show that the null energy condition of general relativity imposes strict limits on the BAO observables used by DESI. We also identify which regions of parameter space in the CPL parameterization $w(a) = w_0 + w_a(1 - a)$ remain viable while satisfying these conditions.

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Session Classification: Flash talks

Track Classification: UK Cosmo