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Study of DBI Fields: From Exact Results to Gaussian Process Reconstruction

Dirac-Born-Infeld (DBI) scalar fields offer a compelling framework for modeling dark energy. In this talk, I will present a comprehensive analysis of DBI fields, transitioning from theoretical exact solutions to data-driven reconstructions. First, I will discuss the dynamical system analysis of DBI fields in a modified gravity context, identifying exact fixed points for polynomial and exponential potentials and establishing conditions for the cosmic transition from deceleration to late-time acceleration. Next, I will shift to an observational perspective, using Gaussian Processes to non-parametrically reconstruct the DBI dark energy sector from the latest Hubble, BAO, and DESI datasets. This yields a fully model-independent Hubble constant estimate of $H_0 = 69.53 \pm 2.68$ km/s/Mpc, offering a valuable data point for the Hubble tension. Finally, I will show how we constrain and test the viability of various scalar potentials using MCMC analyses, providing a unified view of DBI cosmology from exact dynamical results to modern observational constraints.

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