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Testing gravity with cosmic microwave background in DHOST theory

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We developed a CMB Boltzmann solver to test gravity theories in the framework of the degenerate higher-order scalar-tensor (DHOST) theory. This theoretical framework includes the wide class of dark energy models such as the Horndeski theory and its extensions as certain limits, and the general relativity can be also recovered. In this talk, we show how to formulate the linear perturbations of gravity and matter in the DHOST theory and derive their effective description parameterized by time-dependent effective field theory (EFT) parameters, α_i $(i = B, K, T, M, H, L)$ and β_i $(i = 1, 2, 3)$. We then show that the angular power spectra of the CMB temperature anisotropies, E-mode and lensing potential as a demonstration and find that the parameter characterizing the DHOST theory, β_1, provides the larger modifications of the spectra, compared with other EFT parameters. We also show the results in a specific model in which the cosmic expansion as well as the EFT parameters are consistently determined.

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