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Cosmology with the final Planck data release (PR4)

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We present constraints on cosmological parameters using maps from the last Planck data release (PR4). In particular, we detail an upgraded version of the cosmic microwave background likelihood, HiLLiPoP, based on angular power spectra and relying on a physical modelling of the foreground residuals in the spectral domain. This new version of the likelihood retains a larger sky fraction (up to 75 %) and uses an extended multipole range. Using this likelihood, along with low- l measurements from LoLLiPoP, we derive constraints on Λ CDM parameters that are in good agreement with previous Planck 2018 results, but with 10 % to 20 % smaller uncertainties. We demonstrate that the foregrounds can be accurately described in the spectral domain with only negligible impact on Λ CDM parameters. We also derive constraints on single-parameter extensions to Λ CDM including A_L , Ω_K , N_{eff} , and P_{mv} . Noteworthy results from this updated analysis include a lensing amplitude value of $A_L = 1.036 \pm 0.051$, which aligns more closely with theoretical expectations within the Λ CDM framework. Additionally, our curvature measurement, $\Omega_K = -0.012 \pm 0.010$, now demonstrates complete consistency with a flat universe, and our measurement of S_8 is closer to the measurements derived from large-scale structure surveys (at the 1.6σ level).

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