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ISOCURVATURE FORECASTS FOR CMB S4, PIXIE, AND MAYBE CONSTRAINTS FOR ACTPOL

Zack Li and Jo Dunkley
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ABSTRACT

This is a sample document which demonstrates some of the basic features of LaTeX. You can easily reformat it for different document or bibliography styles.

1. INTRODUCTION

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2. METHODS

2.1. *Perturbations and Power Spectra*

For a set of the standard cosmological parameters with the additional isocurvature parameters, we compute a theoretical power spectrum with CLASS, a fast Boltzmann code written in C (citation). The adiabatic and isocurvature are contained in three functions, $\mathcal{P}_{\mathcal{RR}}(k)$, $\mathcal{P}_{\mathcal{II}}(k)$, and $\mathcal{P}_{\mathcal{RI}}(k)$, the curvature, isocurvature, and cross-correlation power spectra, respectively (cite Planck 2015 XX). Like Planck, we specify these power spectra through two scales, $k_1 = 0.002$ Mpc^{-1} and $k_2 = 0.100$ Mpc^{-1}. We use the same uniform priors as Planck,

$$\mathcal{P}^{(1)}_{\mathcal{RR}}, \mathcal{P}^{(2)}_{\mathcal{RR}} \in (10^{-9}, 10^{-8}), \tag{1}$$

$$\mathcal{P}^{(1)}_{\mathcal{II}}, \mathcal{P}^{(2)}_{\mathcal{II}} \in (0, 10^{-8}), \tag{2}$$

$$\mathcal{P}^{(1)}_{\mathcal{RI}} \in (-10^{-8}, 10^{-8}). \tag{3}$$

We follow Planck 2015 XX's convention of fixing $\mathcal{P}^{(2)}_{\mathcal{RI}}$ from these parameters. Then we sample over the ΛCDM scenario, but replace A_s and n_s with $\mathcal{P}^{(1)}_{\mathcal{RR}}$, $\mathcal{P}^{(2)}_{\mathcal{RR}}$ and add the three isocurvature parameters $\mathcal{P}^{(1)}_{\mathcal{II}}$, $\mathcal{P}^{(2)}_{\mathcal{II}}$, $\mathcal{P}^{(1)}_{\mathcal{RI}}$.

$$\{\Omega_b h^2, \Omega_c h^2, \theta_A, \tau_{reio}, \mathcal{P}^{(1)}_{\mathcal{RR}}, \mathcal{P}^{(2)}_{\mathcal{RR}} \tag{4}$$

$$\mathcal{P}^{(1)}_{\mathcal{II}}, \mathcal{P}^{(2)}_{\mathcal{II}}, \mathcal{P}^{(1)}_{\mathcal{RI}}\} \tag{5}$$

2.2. *Forecasting*

2.3. *ACTPol Likelihood*

We use the same methods as in Louis et al. 2016 for the ACT likelihood, marginalizing the ACTPol spectrum from $350 < l < 4000$ to construct a Gaussian likelihood function with an overall calibration parameter. We produce our parameter constraints by summing this with the Planck 2015 log-likelihood. We use the public CMB-marginalized 'plik-lite' Planck 2015 likelihood which uses TT for $30 \leq l \leq 2508$, a likelihood generated from CMB lensing, and a joint TT, EE, BB, and TE likelihood for the range $2 \leq l < 30$.

$$
\begin{aligned}
-2 \ln L = & -2 \ln L(\text{ACTPol}) & (6)\\
& -2 \ln L(\text{Planck TT}_{30<l<2508}) & (7)\\
& -2 \ln L(\text{Planck TEB}_{2\leq l<30}) & (8)\\
& -2 \ln L(\text{Planck Lensing}) & (9)
\end{aligned}
$$

In addition to the ΛCDM and isocurvature parameters, we need two nuisance parameters coming from the normalizations of the two instruments we use data from (Planck and ACT),

$$\{A_{planck}, Y_p\}. \tag{10}$$

3. RESULTS

TABLE 1
FORECASTING PARAMETERS

Experiment	l_{min} - l_{max}	f_{sky}	θ FWHM	σ_T (μK arcmin)	σ_P (μK arcmin)
CMB S4	30-3000	0.40	3.0	1.0	1.4
PIXIE	2 - 150	0.8	120	2.9	4.0
Planck 2017 high_l	30 - 2500	0.65	10,7.1,5.0	65.0, 43.0, 66.0	103.0, 81.0, 134.0

NOTE. — These forecasts are based on blahblahblah.