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RECONSTRUCTING SIMULATED CMB POLARIZATION POWER SPECTRA WITH THE ANALYTICAL BLIND SEPARATION METHOD

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We applied the Analytical Blind Separation (ABS) method, that extracts CMB signal from its contaminants, to simulated sky polarization maps, in order to test its ability to recover CMB E− andB−mode power spectra in the presence of two polarized foreground components, namely synchrotron and thermal dust, and an uncorrelated Gaussian distributed instrumental noise. We used multi- frequency Q and U microwave sky simulations, considering a hypothetical experiment operating in ten frequency bands in the 30-321GHZ range. Full and partial sky samplings were considered in our analysis. For the full sky case, making no prior assumption about polarized CMB foregrounds, the ABS estimator analytically recovered the E-mode and B-mode power spectra, considering tensor-to- scalar ratios $r = 0$ and $r = 0.05$, with a relative error below 20% with respect to the input CMB power spectra for the full multipole range considered ($2 \le l \le 1050$). For the partial sky analysis, the results were comparable to the full sky case. We found that the ABS method is able to estimate both CMB E-mode and B-mode power spectra within 1-σ at all scales for a full sky analysis, and for most of the scales ($50 \le l \le 1050$), for a partial sky analysis. For low-order multipoles ($l \le 50$), a noticeable divergence occurs in the partial sky analysis due to the uncertainties originated from both the ABS method and the pseudo power spectrum recovering. Thus, for low-order multipoles, a more detailed analysis for the partial sky case is needed in order to resolve the primordial B-mode. Despite this limitation, the ABS method was found to be a useful and reliable tool to extract CMB polarized signal from foreground and instrumental noise contaminated CMB data sets.

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