

Z306a Optimal delensing method for improving constraints on primordial gravitational waves for LiteBIRD

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Detecting the primordial B-mode polarization of the cosmic microwave background (CMB) induced by inflationary gravitational waves is a primary goal of current and future CMB experiments. However, gravitational lensing by large-scale structure generates B-mode contamination at the level of $r \simeq 0.01$ at the recombination bump, which can dominate the primordial signal at the targeted sensitivity of next-generation experiments such as LiteBIRD ($\sigma(r) < 0.001$). To address this, we present a new delensing approach based on pixel-weighted subtraction of lensing templates constructed from multi-tracer combinations of CMB and large-scale structure data. The weighting scheme optimally accounts for inhomogeneous noise, foreground residual and lensing cosmic variance across the sky while avoiding computationally prohibitive covariance modeling. Applying HL likelihood to estimate r , we find that optimal weight delensing can improve $\sigma(r)$ by up to 30%. This technique enhances the capability to constrain r from wide-sky surveys, and lays a key groundwork for science goals of LiteBIRD and future CMB missions targeting the inflationary epoch.