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## Evaluation of beam far sidelobes systematic effect on the future LiteBIRD satellite mission

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The discovery and confirmation of cosmic background radiation (CMB) is landmark evidence of the Big Bang model. Following the CMB fluctuation power spectrum measurements and other experiences, the  $\Lambda$ CDM model is established and considered the most successful cosmological model. The model of inflation, which is a period of accelerated expansion in the very early Universe, provides a mechanism for generating structures that are the seeds of CMB fluctuations. However, the physics of inflation is not understood and requires knowledge of particle physics in extremely high temperature and density environments which is hard to reach in the lab. Most inflation models predict the presence of primordial gravitational waves (GW), which are quantified by the  $r$  parameter: the ratio between tensor fluctuations and scalar fluctuation. The primordial GWs generate a curl pattern of the CMB polarization named B-mode, which is the best inflation probe. The CMB B-mode polarization is challenging to measure and remains undetected today. LiteBIRD is a Lite (Light) satellite for measuring B-mode polarization and studying Inflation from CMB Detection to achieve the precision of  $r < 0.001$  given the scientific goal of constraining inflation models. This precision is challenging to reach and requires accurate control of systematic effects. In this work, we study the calibration requirement on the beam far sidelobes, which is expected to be the primary source of the systematic for LiteBIRD. The far sidelobes will pick up the Galactic plane emission and contaminate the high galactic latitude area of the sky; the mismatch of our knowledge on beam far sidelobes will cause an incorrect estimate of the foregrounds and further affect the recovery of the CMB B-mode map. We simulate the error in the calibration, propagate it through the complete analysis pipeline and evaluate the bias  $\Delta r$ . Given the error budget, we drive the calibration requirement on the beam far sidelobe for LiteBIRD.

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