

## Paving the way towards a robust B-mode measurement

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The primary science goal of the vast majority of upcoming CMB experiments is the detection of B-modes sourced by primordial gravitational waves. While enhanced experimental sensitivity is essential to meet this target, diagnosing and removing sources of contamination that could potentially obscure the primordial B-mode signal will be equally important to claim a robust detection. This contamination can be of either cosmological origin (e.g cosmic polarization rotation induced by either primordial magnetic fields, or by the cosmological birefringence effect) or from uncontrolled instrument systematics. We apply the quadratic estimator (QE) technique to constrain or measure potential sources of contamination in CMB maps. Specifically we discuss the constraints that upcoming experiments including Simons Observatory and LiteBIRD will be able to place on anisotropic CPR. We also extend this QE cleaning formalism to efficiently reconstruct systematic effects, and perform blind cleaning on the CMB polarization maps. We specifically demonstrate the potential of this method by cleaning contamination sourced by differential detector gain from simulated maps with LiteBIRD like instrument characteristics.

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