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Measuring CMB Polarization with POLARBEAR and the Simons Array: Towards New Constraints on Neutrino Masses and Inflation

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Measurements of the polarization of the cosmic microwave background (CMB) are rapidly becoming an important tool to test the standard model of cosmology. In particular, searches for the faint CMB B-mode signals offer the prospect of detecting inflationary gravitational waves on large angular scales and mapping out the large scale distribution of matter in the Universe through CMB lensing on smaller angular scales. POLARBEAR is a CMB polarization experiment located in the Atacama desert in Chile that has been pursuing both goals since 2012. The Simons Array is an expansion of the POLARBEAR experiment to three 3.5 meter telescopes with new multi-chroic receivers. The first of these new receivers, POLARBEAR-2, will have first light in 2016. With exceptional sensitivity in multiple frequency bands and planned coverage of two thirds of the sky, the Simons Array will yield a high signal-to-noise mass map across most of the sky. Combining CMB lensing data from the Simons Array with future baryon acoustic oscillation data results in a 1-sigma constraint on the sum of the neutrino masses of 19 meV when foregrounds are ignored, increasing to 40 meV when including component separation and foreground residuals. Even after foreground separation, the Simons Array will be able to measure tensor-to-scalar ratios (r) as low as r = 0.014 at 2-sigma. We present the status of this funded instrument and its expected capabilities.

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