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Cosmic Inflation and Neutrino Masses at POLARBEAR and the Simons Array

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POLARBEAR is a ground-based CMB polarization experiment that is designed to characterize the B-mode (curl component) signal at both degree and sub-degree angular-scales.
B-modes at degree scale can reveal the existence of primordial gravitational waves and will be used for quantitative studies of inflation, such as the energy scale at which it occurred.
The sub-degree polarization data are an excellent tracer of the cosmological expansion rate and large-scale structure in the universe through gravitational lensing, and can be used to constrain the sum of the Neutrino masses.

POLARBEAR-1 started observing in early 2012 at 150 GHz with an array of 1,274 polarization-sensitive antenna-coupled transition-edge sensor (TES) bolometers, and first detected the sub-degree B-mode signal using CMB data alone.

The POLARBEAR-2 is a project for receiver upgrade to cover two frequency bands with 7,600 detectors per receiver
The Simons Array is a project to deploy three POLARBEAR-2 receivers on three telescopes.
Simons Array will survey of B-mode polarization at 95, 150, 220, and 270 GHz for effective monitoring and removal of foreground contamination.
The first receiver is in final stage of integration.
It is scheduled to deploy during the 2017/2018 austral summer season in the Atacama desert in Chile.
The projected constraints on the tensor-to-scalar ratio (the amplitude of inflationary B-mode signal) will improve over current constraints by almost an order of magnitude to $\sigma(r = 0.1) = 6.0 \times 10^{-3}$ (4.0×10^{-3} statistical), and the sensitivity to the sum of the neutrino masses when combined with DESI spectroscopic galaxy survey data will be 40 meV at 1-sigma after foreground removal (19 meV(stat.)).

We will describe the current status and prospects of the POLARBEAR-2 receiver system and the Simons Array project.

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