The POLARBEAR-2 and the Simons Array Experiment

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We present an overview of the design and status of the POLARBEAR-2 experiment and the Simons Array. The POLARBEAR-2 experiment is a Cosmic Microwave Background polarimetry experiment which aims to characterize the small angular scale B-mode signal due to gravitational lensing and search for the large angular scale B-mode signal from inflationary gravitational waves. The experiment has a 365~mm diameter focal plane cooled to 250~milli-Kelvin. The focal plane is filled with di-chroic antenna-coupled polarization sensitive Transition Edge Sensor bolometric pixels and will observe at 95~GHz and 150~GHz simultaneously. The 7,588 bolometers will be read-out by SQUIDs with 40 channel frequency domain multiplexing. The experiment will utilize high purity alumina refractive optical elements to achieve high optical throughput. The experiment is designed to achieve noise equivalent temperature of 5.7~μK$\sqrt{s}$, and this allows us to constrain signal from inflationary primordial gravitational wave correnspondingto a tensor-to-scalar ratio of $r = 0.01$ (2σ). The experiment will also be able to put a constaint on the sum of neutrino masses to 90 meV (1σ). The POLARBEAR-2 plans to start observations during 2016 in the Atacama desert in Chile. The Simons Array experiment is a project that deploys three POLARBEAR-2 type receivers by 2017. The Simons Array will cover 95~GHz, 150~GHz and 220~GHz frequency bands with high detector count for foreground control. Wide sky coverage from the mid-latitude Chliean site will allow cross-correlation study with other experiments. We will be able to constrain sum of neutrino masses to 19 meV (1σ) by cross-correlation with spectroscopic galaxy surveys.