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Deployment of POLARBEAR-2A

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POLARBEAR-2A (PB-2A) is a project to observe polarization of the cosmic microwave background (CMB) that deployed to the Atacama Desert in Chile (altitude 5200 m), and is a successor of POLARBEAR (PB) experiment. PB-2A is focusing on observation of polarization in CMB, especially polarization pattern called B-mode as it can constrain fascinating physics such as primordial cosmic inflation and neutrino masses.

The PB-2A uses the same telescope design as PB with a primary mirror of 2.5 m diameter. The receiver is newly designed with 6 times more detectors. Most optical components including alumina lenses in the receiver are cooled down to cryogenic temperature in to reduce thermal noise. The adopted detector is transition edge sensor which utilize the superconduction transition, with the detector stage cooled to 0.3 K with a three stage helium sorption refrigerator. In order to minimize parasitic thermal loading on the refrigerator, frequency division multiplexing of factor 40, and superconducting cables from SQUID input are used.

Three PB-2 receivers will be deployed. The first (PB-2A) and second (PB-2B) are equipped with dichroic arrays with frequency bands at 90 and 150 GHz (compared to only one band at 150 GHz in PB), while PB-2C will sensitive to 220 and 270 GHz. The multichroic measurement enables better foreground subtraction. With over 20,000 detectors across three receivers, Simons Array will place constraints on the tensor-to-scalar ratio, r.

PB-2A laboratory testing was finished and PB-2A was deployed to site in the austral spring 2018, and commissioning for science observations is ongoing. In the presentation, the motivating physics of the CMB is shortly explained, and then the design, test and performance of PB-2A is presented.

Less than 5 years of experience since completion of Ph.D

Y

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