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POLARBEAR**

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Measuring Cosmic Microwave Background Polarization with POLARBEAR

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POLARBEAR is a dedicated cosmic microwave background (CMB) polarization experiment located in the Atacama Desert in Chile. The CMB is electromagnetic radiation that originated from the early universe. Studying this remnant of the Big Bang allows us to learn about the early universe and how it expanded to what we see today. Observing the CMB polarization shows certain patterns on the sky, called E-modes and B-modes. E-modes arise naturally from Thomson scattering in a heterogeneous plasma. When the universe was young, it was composed of a hot plasma of baryons and electrons. Photons interacted with this plasma through Thomson scattering, in which electromagnetic radiation undergoes an elastic scattering with a charged free particle. As the universe expanded this plasma cooled, allowing electrons and protons to combine to form hydrogen. The photons were then free to traverse the universe, making up the CMB. B-modes, however, can only be created from gravitational lensing or gravitational waves arising from cosmic inflation. The POLARBEAR project was designed to search for this weak B-mode signal from cosmic inflation. Measuring this signal would provide direct evidence of inflation and a better understanding of the mechanism and energy scale of inflation. Upgrades are currently ongoing to increase sensitivity and frequency coverage. These upgrades will result in three telescopes, forming the POLARBEAR-2/Simons Array. The Simons Array will cover 95 GHz, 150 GHz, and 220 GHz frequency bands, allowing greater control of foregrounds.