

Next-Generation Cosmology with Advanced ACTPol

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The temperature and polarization of the cosmic microwave background (CMB) could hold answers to some of the most profound cosmological questions left open by the current Λ CDM paradigm including if there was a period of inflation in the early universe, the nature of dark energy and dark matter, or what caused the perturbations that seeded the current structure in the universe that we observe today. Because the polarization in the CMB is faint, measurements require high sensitivity. At these levels, galactic foregrounds from synchrotron and dust emission are significant and must be well characterized across many frequencies to be removed. Additionally, CMB polarization experiments that seek to probe large angular scales must scan large patches of the sky, which can be challenging because atmospheric $1/f$ noise can obscure information on large angular scales. However, the atmosphere is unpolarized, so modulating the incoming polarization can separate the faint B-mode signal from the fluctuations in the unpolarized atmosphere, facilitating the recovery of polarization information on large angular scales.

Advanced ACTPol (AdvACT) is an upgraded camera for the Atacama Cosmology Telescope that will measure the Cosmic Microwave Background in both temperature and polarization over a wide range of angular scales and five frequency bands from 28-230 GHz with unprecedented resolution and sensitivity. AdvACT's sensitivity, resolution, wide frequency coverage, and large sky coverage will enable it to simultaneously probe inflation at large angular scales while using small angular scale measurements to constrain the mass and number of neutrinos, dark energy, and dark matter. I will give an overview of the technologies employed in the AdvACT experiment including its polarization modulators, optics, and detectors.