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ACTpol: An experiment to measure small angular scale polarization anisotropies in the CMB MICHAEL NIEMACK, National Institute of Standards and Technology, ATACAMA COSMOLOGY TELESCOPE COLLABORATION — Small angular scale cosmic microwave background (CMB) polarization measurements can be used to constrain the neutrino mass and a precise measurement of the CMB gravitational lensing spectrum amplitude will improve constraints on the dark energy equation of state. In addition, these measurements will provide detailed characterization of foregrounds that are expected to contaminate large angular scale searches for the predicted polarization signature of gravitational waves during the epoch of inflation. The Atacama Cosmology Telescope (ACT) is a six-meter telescope on the Atacama plateau, Chile that was built to characterize the cosmic microwave background (CMB) on small angular scales. Since 2007 ACT has been used to measure the temperature anisotropies in the CMB in three bands between 140 - 300 GHz with arcminute resolution. We report on the design of a new instrument for ACT that will add polarization sensitivity to the telescope (ACTpol). The design includes new optics to couple to a 150 GHz polarization sensitive camera under development at NIST that comprises a large array of feedhorn coupled polarimeters. The polarimeters are planar superconducting ortho-mode transducers combined with stub filters and bolometric transition-edge sensors to measure the radiation.

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