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SPT-3G: The Next Generation Receiver for Polarized Cosmic Microwave Background Measurements with the South Pole Telescope

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The South Pole Telescope is a millimeter-wavelength telescope dedicated to observations of the Cosmic Microwave Background (CMB). The next generation upgraded receiver, known as SPT-3G, is scheduled for deployment in early 2016. SPT-3G will have a focal plane of 2,710 pixels. Each pixel contains six transition-edge sensor (TES) bolometers, sensitive to orthogonal linear polarizations and three frequency bands (90, 150, 220 GHz), for a total of 16,260 detectors in the focal plane. With an order of magnitude more TES bolometers than the current receiver, SPT-3G will open a new regime of sensitivity in high-resolution mapping of the CMB. After four years of observation of 2500 square degrees of the sky, SPT-3G will map the B-mode polarization signature from gravitational lensing of the CMB with high signal-to-noise, a signal that is currently only statistically detected. Lensing B-modes trace the growth of large-scale structure in the universe, which is influenced by neutrino mass. SPT-3G will constrain the sum of neutrino masses with an uncertainty of ˜ 0.06 eV, an significant step towards differentiating between hierarchies. Additionally, SPT-3G will detect thousands of new galaxy clusters, extending to lower mass and higher redshifts, through the Sunyaev-Zel'dovich effect. This sample will enable SPT-3G to place improved constraints on the evolution of dark energy, using the cluster abundance to probe the expansion history of the universe. I will discuss these opportunities as well as giving an overview of the SPT-3G detector and readout architecture, including receiver integration status and recent laboratory performance.

Oral or Poster Presentation

Oral

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