APR13-2013-000895

Abstract for an Invited Paper
for the APR13 Meeting of
the American Physical Society

CMB Observations with the South Pole Telescope

RYAN KEISLER, University of Chicago

I will describe a program of cosmological research centered on using measurements of the cosmic microwave background (CMB) to address questions relevant to physics: What is the absolute mass scale of neutrinos? How many species of neutrino-like particles were present in the early Universe? How does gravity behave on cosmological scales? Did inflation occur, and, if so, at what energy scale? A new generation of CMB experiments is targeting these questions, and I will focus on recent results from the South Pole Telescope (SPT). The SPT is a ground-based mm-wave observatory located at the geographic south pole in Antarctica, and in 2011 finished its initial, 2500 square-degree "SPT-SZ" survey. The data from this survey provided an unprecedented combination of resolution, area, and sensitivity, and has been used to make ground-breaking measurements of the CMB anisotropy and the gravitational lensing of the CMB. These measurements have, in conjunction with data from the WMAP satellite, led to strong constraints on the number of neutrino-like particle species present in the early universe and the shape of the power spectrum of primordial density fluctuations. The SPT-SZ data overlaps with the ongoing Dark Energy Survey (DES) footprint, and the joint dataset will provide new probes of large-scale structure, such as the relative velocities of massive galaxy clusters. In 2012, a new polarization-sensitive camera, SPTpol, was installed on the SPT, and I will summarize its performance and prospects for detecting the B-mode CMB polarization pattern. Finally, I will touch on what will be possible with a third-generation camera, SPT-3G. The leap in sensitivity provided by this camera will yield, for example, a constraint on the sum of the neutrino masses relevant for exploring the neutrino mass hierarchy.