

CU Physics Department Colloquium

Monday, March 7, 2011 4:10 PM 428 Pupin Hall

Cosmology from 17,000 Feet: Results from the Atacama Cosmology Telescope

The Atacama Cosmology Telescope (ACT) is observing the Cosmic Microwave Background (CMB) from high in the Chilean Andes. The CMB provides a snapshot of the universe when it was only 400,000 years old, long before the formation of any stars or galaxies. The nearly uniform density (to a few parts per hundred thousand) means that well understood linear physics describes the physics of the CMB and lets us reliably transform observations of the CMB into constraints on fundamental parameters of the cosmos. ACT provides a significant improvement to our knowledge of the CMB on small (few arcminute) scales. We present the results from the first full season of ACT data and what we learn from them, including better limits on the number of relativistic species, the initial power spectrum from inflation, early helium density, potential contributions to structure formation from cosmic strings, and the imprint of galaxy clusters on the CMB. We are currently upgrading ACT to have polarization sensitivity, and expect it to be on the sky in 2012. We present some of what we expect to learn from ACTpol, including the summed mass of neutrino species to ~ 0.05 eV, the regime where we expect a detection.

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