

Detection of B-mode Polarization in the Cosmic Microwave Background with Data from the South Pole Telescope

This paper represents the culmination of all those LDRD \$\$'s invested into the CMB program through the astrophysics strategic initiative and it is the first science paper published using the new SPTPol camera which included the TES bolometers home grown and built at Argonne.

Abstract:

Gravitational lensing of the cosmic microwave background generates a curl pattern in the observed polarization. This "B-mode" signal provides a measure of the projected mass distribution over the entire observable Universe and also acts as a contaminant for the measurement of primordial gravity-wave signals.

In this letter we present the first detection of gravitational lensing B modes, using first-season data from the polarization-sensitive receiver on the South Pole Telescope (SPTpol). We construct a template for the lensing B-mode signal by combining E-mode polarization measured by SPTpol with estimates of the lensing potential from a Herschel-SPIRE map of the cosmic infrared background.

We compare this template to the B modes measured directly by SPTpol, finding a non-zero correlation at 7.7 sigma significance. The correlation has an amplitude and scale-dependence consistent with theoretical expectations, is robust with respect to analysis choices, and constitutes the first measurement of a powerful cosmological observable.

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