CMB Polarimetry with Bolometers

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The polarization of the Cosmic Microwave Background promises a wealth of cosmological information. In particular, a curl-mode polarization signal, induced by the gravitational wave background from the inflationary epoch, may be detectable if inflation occurs at the GUT energy scale. However, deep searches for CMB polarization require significant advances in instrument sensitivity and unprecedented control of systematic errors. We describe the development of the BICEP (Background Imaging of Cosmic Extragalactic Polarization) receiver, designed to deeply probe CMB polarization on degree angular scales at 100 and 150 GHz using polarization-selective bolometers. We are developing new bolometer technology with phased superconducting slot-line antennas, transition-edge superconducting sensors, and integral stripline filters. Large arrays of antenna-coupled bolometers, operating over a wide range of wavelengths, will provide significant gains in system sensitivity compared to current capabilities.

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