POLARIZATION-SENSITIVE ANTENNA-COUPLED BOLOMETER ARRAYS

Arnold, K.S.[1], Holzapfel, W.L.[1], Lee, A.T.[1]
, Mehl, J.[1], Myers, M.J.[1], Richards, P.L.[1]
, Tran, H.T.[1], Engargiola, G.[3], Spieler, H.[4] , Ade, P.[2]
[1]Department of Physics, University of California, Berkeley, Berkeley, California 94720
[2]School of Physics and Astronomy, Cardiff University, Cardiff, Wales, United Kingdom
[3]Department of Astronomy, University of California, Berkeley, Berkeley, California 94720
[4]Lawrence Berkeley National Laboratory, Berkeley, California 94720

Bolometers are the most sensitive broadband detectors of millimeter wavelength radiation. For bolometer experiments probing the Cosmic Microwave Background (CMB), the detector noise is often limited by the photon noise of the signal. To increase overall sensitivity, experiments of the future must employ an increased number of bolometers. A polarization experiment, designed to probe signals one to two orders of magnitude below the temperature anisotropy in the CMB, certainly requires this type of increased sensitivity. There has recently been much progress in the multiplexed SQUID (Superconducting Quantum Interference Device) readout of bolometers, facilitating this type of focal plane bolometer array.

We are developing a lithographed array of antenna-coupled bolometers for polarization studies of the CMB. The planar antennas are crossed double slot dipoles, with the beam pattern of each pixel optimized by direct contact with a dielectric lens. Superconducting niobium microstrip filters are used to define the frequency bands, and microstrip transmission lines couple the power to suspended bolometers. The antenna array is multichroic, with single-color pixels distributed among three frequency bands. The bands have been designed to optimize retrieval of astrophysical information while minimizing atmospheric contamination. These arrays are being developed for use in the ground-based PolarBeaR experiment, and they would also be a good match for other future experiments.

Verification of the eight layer process used to fabricate the arrays will be discussed. Results will be shown from the testing of the electrical and thermal properties of the suspended transition-edge sensors, as well as the electromagnetic properties of the antenna and microstrip.

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: arnold28094

Date Received: September 23, 2005

1. (a)
Kam Arnold
351 LeConte Hall
UC Berkeley Physics Dept.
Berkeley, CA
94720 USA
karnold@berkeley.edu
(b) 510 643 8161
(c) 510 643 5204

2. B - Fields and Waves

3. (a)

4. C - Contributed Paper

5. No special instructions