A Search for Arcminute Scale Anisotropy at 145 GHz

*S. R. Golwala[(1)], J. Sayers[(1)], P. Rossinot[(1)], P. A. R. Ade[(2)], J. E. Aguirre[(3,4)], J. J. Bock[(5)], S. F. Edgington[(1)], J. Glenn[(4)], A. Goldin[(5)], D. Haig[(2)], A. E. Lange[(1)], P. D. Mauskopf[(2)], H. T. Nguyen[(5)]

(1) Division of Physics, Mathematics, and Astronomy,
California Institute of Technology, Pasadena, CA 91125

(2) School of Physics and Astronomy, Cardiff University,
5, The Parade, P.O. Box 913, Cardiff, CF24 3YB Wales, UK

(3) Jansky Fellow, National Radio Astronomy Observatory

(4) Center for Astrophysics and Space Astronomy and
Department of Astrophysical and Planetary Sciences, University of Colorado,
593 UCB, Boulder, CO 80309-0593

(5) Jet Propulsion Laboratory, California Institute of Technology,
4800 Oak Grove Drive, Pasadena, CA 91109

We present the results of a search for arcminute-scale anisotropy in the cosmic microwave background at 145 GHz. Our results are derived from observations we made with Bolocam on the Caltech Submillimeter Observatory (CSO). Bolocam is a large format camera consisting of 144 bolometers with an eight arcminute field of view and one arcminute FWHM angular resolution on the CSO. We surveyed two science fields, the Subaru/XMM Deep Field and a field in Lynx, covering a total area of approximately 1 square degree. The noise properties of the maps are extremely uniform, with RMS variations in coverage of approximately 1.5% for twenty arcsecond map pixels. The point source sensitivity of the maps is approximately 100 μK_{CMB} per beam. Fluctuations in emission from the atmosphere limited the sensitivity of our measurements, and we describe several algorithms designed to remove these fluctuations. We also performed simulations to determine the concomitant attenuation of astronomical flux. For anisotropies with an angular power specrum flat in $l(l+1)C_l/2\pi$, our observations have an angular multipole window function with center at $l = 5700$ and FWHM = 2800. At these scales the CMB power spectrum is expected to be dominated by anisotropies due to the Sunyaev-Zel'dovich effect (SZE), and have an approximately flat spectrum in $l(l+1)C_l/2\pi$. We find no evidence of anistropy in our observations and set an upper limit, the first such limit at mm-wavelengths and in this multipole range. We calculate the resulting constraint on the amplitude of the SZ anisotropy power spectrum at these angular scales.