Poster

Noise Performance of the Multiwavelength Sub/millimeter Inductance Camera (MUSIC) Detectors

Seth Siegel (California Institute of Technology)

Co-Authors: C. Bockstiegel, S. Brugger, N. G. Czakon, P. K. Day, T. P. Downes, R. Duan, J. Gao, A. K. Gill, J. Glenn, S. R. Golwala, M. I. Hollister, H. G. LeDuc, P. R. Maloney, B. A. Mazin, S. G. McHugh, D. Miller, O. Noroozian, H. T. Nguyen, J. Sayers, J. A. Schlaerth, A. K. Vayonakis, P. R. Wilson, J. Zmuidzinas

MUSIC is a multi-band imaging camera that employs 2304 Microwave Kinetic Inductance Detectors (MKIDs) in 576 spatial pixels to cover a 14 arc-minute field of view, with each pixel sensitive to 4 bands centered at 0.87, 1.04, 1.33, and 1.98 mm. In April 2012 the MUSIC instrument was commissioned at the Caltech Submillimeter Observatory with a subset of the full focal plane. We examine the noise present in the detector timestreams during observations taken in the first year of operation. We find that fluctuations in atmospheric emission dominate at long timescales (< 1 Hz), and fluctuations in the amplitude and phase of the probe signal due to readout electronics contribute significant 1/f-type noise at shorter timescales. We describe a method to simultaneously remove the amplitude, phase, and atmospheric noise using the fact that they are correlated among carrier tones. After removal, the complex signal is decomposed, or projected, into dissipation and frequency components. White noise from the cryogenic HEMT amplifier dominates in the dissipation component. An excess noise is observed in the frequency component that is likely due to fluctuations in two-level system (TLS) defects in the device substrate. We compare the amplitude of the TLS noise with previous measurements.