ANTENNA-COUPLED MICROWAVE KINETIC INDUCTANCE DETECTORS

Anastasios Vayonakis[1], Peter Day[2], Alexey Goldin[2]
, Rick LeDuc[2], Ben Mazin[2], Shwetank Kumar[1]
, Jiansong Gao[1], Chao-Lin Kuo[2], Jeff Stern[2] , Jonas Zmuidzinas[1]
[1]Caltech
[2]JPL

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: vayonakis20991

Date Received: September 18, 2005

Kinetic Inductance detectors are very promising for future large scale millimeter and submillimeter direct detection focal plane arrays. They can be easily fabricated, and many detectors can be frequency multiplexed through coupling to a single feedline. Microwave readout provides a lot of bandwidth per detector, allowing a large number of pixels to be read using a single cryogenic microwave amplifier and warm readout electronics. Sensitivity is now good enough for ground based imaging, and approaching the requirements for CMB-pol.

Planar antennas are also of great interest for future millimeter and submillimeter focal plane arrays. Each antenna consists of an array of N long slot antennas which are fed along their length at M points. The resulting N*M feed points are combined using a binary summing tree made of low-loss superconducting microstrip lines. The amplitude and phase of the electric field at each element of the array control the pointing and far-field beam pattern. By passively adding the electric fields of each antenna in a phase-coherent manner, we can synthesize the diffraction-limited beam. Due to its large size, the resulting array antenna produces a narrow beam pattern and can therefore be used without additional optical coupling elements. Such architecture promises a lot of advantages compared to existing systems. Compared to bolometers with extended area radiation absorbers, antenna-coupled detectors provide greatly reduced thermally active area, allowing for gains in sensitivity and response speed. Furthermore, the large sub-K feedhorn optics which comprise more than 95

1. (a)
   Anastasios Vayonakis
   A. Vayonakis
   1200 E. California Blvd.
   Caltech 320-47
   Pasadena, CA
   91125 USA
   avayona@submm.caltech.
   (b) 626-395-2601
   (c) (626) 796-8806
2. J - Radio Astronomy
3. (a) S-J/B1
4. I - Invited Paper, Program chair: Simon Radford
5. No special instructions