A Millimeter/Submillimeter Microwave Kinetic Inductance Detector Camera for Multicolor Mapping

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Microwave Kinetic Inductance Detectors (MKIDs) are sensitive, superconducting, Cooper-pair-breaking detectors. They lend themselves to elegant multiplexed readout using HEMT amplifiers and software-defined radio technology. Recently 16-pixel, two-color, antenna-coupled MKID arrays have been tested in the laboratory, demonstrating readiness for large-scale focal plane arrays for astrophysics. Additionally, MKID noise has been reduced to the BLIP level for 750 μm to 1.3 mm observations from Mauna Kea. Hence, we are building a four-band (750 μm, 850 μm, 1.1 mm, and 1.3 mm) MKID camera to make observations, first from the Caltech Submillimeter Observatory, and later from the Cornell-Caltech Atacama Telescope. The MKID camera will utilize an array of 600, four-color, antenna-coupled MKIDs, for a total of 2,400 channels, yielding a high survey mapping speed. We will report on a conceptual design for this camera and laboratory results from a small-scale demonstration camera[4]. A successful demonstration of large-scale MKID arrays will provide an alternative technology to transition-edge sensors (TESs) for SOFIA, the Beyond Einstein Cosmic Microwave Background Polarization Probe (CMBPol), and SAFIR.

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