Development of 1000 arrays MKID Camera for the CMB Observation

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***Abstract*— The antenna-coupled Microwave Kinetic Inductance Detector (MKID) is being developed at NAOJ in cooperation with KEK and RIKEN, aiming for a precise measurement of the Cosmic Microwave Background (CMB) with LiteBIRD: a future satellite mission lead by KEK. In particular, the B-mode polarization of the CMB is one of a few probes for inflation era, which is far beyond the epoch of recombination. Many observations have been attempted to find it, but all haven't succeeded so far because of the lack of sensitivity. We need a millimeter camera with higher sensitivity and larger number of arrays to find it. MKID camera, which consists of array of superconducting resonators, is one of the possibilities to satisfy such requirements. The advantages of MKID camera are: hundreds of pixels can be read out with only single line by frequency dominant multiplexing; the fabrication process is simple and that leads to high yield rate (more than 90 %) of the array; high sensitivity with NEP (Noise Equivalent Power) of about 10^{-19} can be ideally achieved.**

We have successfully developed 102 pixels of MKID camera for the frequency of 440GHz with epitaxially-grown aluminum (Al) on silicon (Si) wafer, and measurement of beam pattern with Si lens array is underway. In parallel, we are developing 1000 pixels camera with mosaic design. Each module consists of 256 KIDs which is larger than the existing camera, so that we are also constructing a new test-bench with optimizing the system. The optimization includes antenna design, Si lens size for each pixel and optics system inside the cryostat.

We would like to present the status of the development of the 1000 pixels camera with its performance assessment such as yield rate, comparison of the measured parameters (resonant frequency, Q value etc.) to the design values and its optical characteristics.