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Development of Microwave Kinetic Inductance Detectors and a newly-developed Readout System for LiteBIRD

Primordial gravitational waves generated by inflation have produced an odd-parity pattern “B-mode” in the cosmic microwave background (CMB) polarization. LiteBIRD (Light satellite for the studies of B-mode polarization and Inflation from cosmic background Radiation Detection) aims at detecting this B-mode polarization precisely. It requires about 2000 detectors capable of detecting a frequency range from 50 to 250 GHz with ultra low noise. Superconducting detectors are suitable for this requirement. We have fabricated and tested MKIDs and developed a
new readout system.
We have designed antenna-coupled MKIDs. Quasi-particles are created by incident radiation and are detected as a change of the surface impedance of a superconductor strip. This change of the surface impedance is translated to the change of the resonant frequency of a microwave signal transmitted through the resonator. We also have developed a new readout system for MKIDs. The newly-developed readout system is not only able to read out the IQ signals with the homodyne detection for multi-channels, but also provides a unique feature of tracking the resonant frequency of target resonator. This mechanism enables us to detect signals with a large dynamic range. We report the recent RD status of developing MKIDs and the read-out system for LiteBIRD.

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