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GroundBIRD: CMB polarization experiment with MKID array

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The GroundBIRD is a telescope aiming a precise observation of the polarization of the cosmic microwave background (CMB) at the Teide observatory in Spain. The E-mode polarization of CMB has been observed by various experiments and provided useful information of the early universe. On the other hand, the B-mode of CMB polarization, which is known to be generated by the primordial gravitational wave from the cosmic inflation of the universe, is not detected yet.

To achieve maximum sensitivity for the B-mode detection, the GroundBIRD telescope adopts two extra features: a fast rotation scanning and application of kinetic inductance detector (KID). The GroundBIRD scans the sky by continuous rotation at a speed of 20 rpm in azimuth direction, tilted by a few tens of degrees from the zenith. This allows us to suppress greatly the $1/f$ noise. Combining rotation scanning with the rotation of the earth, the total field of view can be larger than 40%, which corresponds to the large angular scales and multipole moment $l \sim 6$. The focal plane consists of seven modules for two target frequencies, six for 145 GHz band and one for 220 GHz band. Each module has 23 polarization-sensitive antenna coupled KID array. The KID technology allows us to read out order 100 detectors with single ADC. These two advantages enable us to detect or constrain the tensor-to-scalar ratio which parameterizes the energy scale of the inflation, in particular the low l region. In this year the telescope is transported from Japan to Spain, assembled and being commissioned. We present the recent updates, results, and plan of the GroundBIRD experiment.

Less than 5 years of experience since completion of Ph.D

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