Poster

Dual-polarization Planar Antennas Fed by Coplanar Waveguides for Kinetic Inductance Detector Cameras

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Dual-polarization planar antennas for millimeter-wave observations have been developed. Our design is suitable for large focal plane arrays, since the antennas and detectors are made from the same superconducting layer and are patterned with one photolithographic process. The antenna consists of two double slot antennas that orthogonally cross each other. The each double slot antenna is independently fed by a coplanar waveguide (CPW) that also plays a role of a microwave quarter-wave resonator. The resonator operates as a millimeter-wave detector called as a microwave kinetic inductance detector (MKID). Antenna performance is optimized for 220 GHz observations by using 3D electromagnetic field simulators, CST and HFSS. The width and length of each slot antenna were designed to obtain wide (~15%) antenna bandwidth. The distance between the slot antennas is determined to get symmetrical beams radiated from a substrate lens fed by the double slot antennas. The antennas and MKIDs were fabricated with an aluminum film on a high resistivity silicon wafer. We examined the antennas with a silicon-substrate lens array at frequencies of 200-240 GHz in a 0.3 K cryostat. We discuss beam patterns, polarization alignments, and optical efficiencies of the antennas.