Abstracts

An Improved Solution for Integrated Array Optics in Quasi-Optical mm and Submm Receivers: The Hybrid Antenna

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The hybrid antenna discussed here is defined as a dielectric lens-antenna as a special case of an extended hemispherical dielectric lens that is operated in the diffraction limited regime. It is a modified version of the planar antenna on a lens scheme developed by Rutledge. The dielectric lens-antenna is fed by a planar-structure antenna, which is mounted on the flat side of the dielectric lens-antenna using it as a substrate, and the combination is termed a hybrid antenna. Beam pattern and aperture efficiency measurements were made at millimeter and submillimeter wavelengths as a function of extension of the hemispherical lens and different lens sizes. An optimum extension distance is found experimentally and numerically for which excellent beam patterns and simultaneously high aperture efficiencies can be achieved. At 115 GHz the aperture efficiency was measured to be (76±6)% for a diffraction limited beam with sidelobes below -17 dB. Results of a single hybrid antenna with an integrated Superconductor-Insulator-Superconductor (SIS) detector and a broad-band matching structure at submillimeter wavelengths are presented. The hybrid antenna is diffraction limited, space efficient in an array due to its high aperture efficiency, and is easily mass produced, thus being well suited for focal plane heterodyne receiver arrays.

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