SCUBA-2 TES ARRAYS

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We describe the fabrication and performance of the 40 by 32 pixel SCUBA-2 prototype. SCUBA-2 is expected to use 8 of the two-side buttable arrays, with 4 being operated at 450 microns and the remainder at 850 microns. At these wavelengths the SCUBA-2 instrument will increase the mapping speed of the James Clerk Maxwell Telescope in Hawaii by factors of several hundred.

The dilution refrigerator test facility at Cardiff University has been used to measure the first SCUBA-2 prototype array using multiplexer electronics supplied by NIST. The array has been deployed in the focal plane assembly and uses the cold electronics and wiring expected to be used in the SCUBA-2 instrument.

We report the performance of the focal plane engineering; in particular the thermal isolation results and the temperature of the multiplexer and array versus the power dissipated in the focal plane. We also report the test results from measuring the NEP, response speed, and intrinsic and optical responsivity of the large portions of the array. The intrinsic and optical responsivity are used to estimate the pixel absorption efficiency. We also estimate nearest neighbour and distant pixel electrical cross talk. The performance of the multiplexer and the day to day reproducibility of the SQUID tuning and array biasing are presented. The optical responsivity is compared with models of the expected optical absorption efficiency.

We compare the results with the need for the science grade arrays for SCUBA-2 and compare the operational needs of the instrument with the experience of operating the prototype. The impact of the measurements on the fabrication of the science grade arrays is also outlined.

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