Fabrication and performance of large format transition edge sensor microcalorimeter arrays

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We have produced a variety of superconducting transition edge sensor array designs for microcalorimetric detection of x-rays. Designs include kilopixel scale arrays of relatively small sensors (~75 micron pitch) atop a thick metal heatsinking layer as well as arrays of membrane-isolated devices on 250 micron pitch and smaller arrays of devices up to 600 micron pitch. We discuss the fabrication techniques used for each type of array focusing on unique aspects where processes vary to achieve the particular designs and required device parameters. For example, we evaluate various material combinations in the production of the thick metal heatsinking, including superconducting and normal metal adhesion layers. We also evaluate the impact of added heatsinking on the membrane isolated devices as it relates to basic device parameters. Arrays can be characterized with a time division SQUID multiplexer such that greater than 10 devices from an array can be measured in the same cooldown. Device parameters can be measured simultaneously so that environmental events such as thermal drifts or changes in magnetic fields can be controlled. For some designs, we will evaluate the uniformity of parameters impacting the intrinsic performance of the microcalorimeters under bias in these arrays and assess the level of thermal crosstalk.