The Transition-Edge-Sensor Array for the Micro-X Sounding Rocket

M.E. Eckart, J.S. Adams, C.N. Bailey, S.R. Bandler, S.E. Busch, J.A. Chervenak, F.M. Finkbeiner, R.L. Kelley, C.A. Kilbourne, J.-P. Porst, F.S. Porter, J.E. Sadleir, S.J. Smith, E. Figueroa-Feliciano and the Micro-X collaboration

The Micro-X sounding rocket program will fly a 128-element array of transition-edge-sensor microcalorimeters to enable high-resolution X-ray imaging spectroscopy of the Puppis-A supernova remnant. To match the angular resolution of the optics while maximizing the field-of-view and retaining a high energy resolution (< 4 eV at 1 keV), we have designed the pixels using 600 x 600 sq. micron Au/Bi absorbers, which overhang 140 x 140 sq. micron Mo/Au sensors. The data-rate capabilities of the rocket telemetry system require the pulse decay to be ~2 ms to allow a significant portion of the data to be telemetered during flight. Here we report experimental results from the flight array, including measurements of energy resolution, uniformity, and absorber thermalization. In addition, we present studies of test devices that have a variety of absorber contact geometries, as well as a variety of membrane-perforation schemes designed to slow the pulse decay time to match the telemetry requirements. Finally, we describe the reduction in pixel-to-pixel crosstalk afforded by an angle-evaporated Cu backside heatsinking layer, which provides Cu coverage on the four sidewalls of the silicon wells beneath each pixel.