Poster

**High Count-rate Studies of Small-pitch Transition Edge Sensors for X-ray Astronomy**

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We are developing kilo-pixel arrays of small pitch transition-edge sensors (TESs) for high spectral resolving, high count-rate applications in astrophysics and solar physics. These arrays require energy resolutions of 2-4 eV full-width-at-half-maximum (FWHM) in the soft X-ray energy band at incident count-rates of at least 300 counts per second (cps) per pixel. We have fabricated and tested pixels that are 65-micron in size on a silicon substrate with an embedded Cu heat-sinking layer. One of these TESs has already shown excellent performance with a decay time constant faster than 200~\micro s and a FWHM energy resolution of 1.58-eV for 6-keV X-rays, but at count rates of just a few cps. High incident X-ray rates can degrade detector resolution due to pile-up and cross-talk, which in turn leads to a trade-off between energy resolution and throughput. In this presentation, three different TESs, including the 1.58-eV-resolution device, are tested at various incident rates of X-rays up to 1030 cps. We have demonstrated an energy resolution of less than 3 eV FWHM for an input count rate of 400 cps. We investigate TES performance as a function X-ray count-rate and TES transition temperature, and discuss the role of the circuit inductance and detector non-linearity on the maximum achievable throughput.