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Transition-edge Sensor Microcalorimeters for a Diffuse Soft X-ray Sounding Rocket Mission

Main author:

MORGAN Kelsey

Co-authors:

Adams Joseph, NASA GSFC
Bandler Simon, NASA GSFC
Betancourt-Martinez Gabriele, NASA GSFC
Chervenak James, NASA GSFC
Eckart Megan, NASA GSFC
Finkbeiner Fred, NASA GSFC
Kelley Richard, NASA GSFC
Kilbourne Caroline, NASA GSFC
Lee Sang-Jun, NASA GSFC
Mateo Jennette, NASA GSFC
McCammon Dan, University of Wisconsin-Madison
Morgan Kelsey, NIST
Porter F. Scott, NASA GSFC
Sadleir John, NASA GSFC
Smith Stephen, NASA GSFC
Wassell Edward, NASA GSFC

A fuller understanding of the extent and composition of the soft Diffuse X-ray Background at _ keV requires more high spectral resolution data. The spectrum contains many closely spaced emission lines, making 2 eV energy resolution desirable in order to resolve individual lines. Without a current or planned mission capable of both the energy resolution and throughput necessary to efficiently make such an observation, we have designed a TES detector optimized to make this measurement from a sounding rocket. At present, multiplexing capability is limited to a few hundred pixels. Therefore, individual pixels must be on the order of 900 μm x 900 μm, much larger than standard devices. To do this, we couple Mo/Au bilayer TESs to large, thin gold absorbers. We present spectra from pixels with 900 μm x 900 μm x 0.5 μm cantilevered absorbers with 6 eV FWHM energy resolution. With straightforward modifications, such as thinning the

absorbers and reducing the operating temperature, we believe we can achieve 2 eV resolution. However, since yielding thinner cantilevered absorbers is difficult, we have made 765 μm x 765 μm x 0.3 μm absorbers with a different geometry that achieve 3 eV FWHM resolution. Energy-dependent broadening is minimal at 1.5 keV, well above the energy range of scientific interest.