

Impact of Improved Heat Sinking of an X-ray Calorimeter Array on Crosstalk, Noise, and Background Events

C.A. Kilbourne, J.S. Adams, R.P. Brekosky, J.A. Chervenak, M.P. Chiao, R.L. Kelley, D.P. Kelly, F.S. Porter

The x-ray calorimeter array of the Soft X-ray Spectrometer (SXS) of the Astro-H satellite will incorporate a silicon thermistor array produced during the development of the X-Ray Spectrometer (XRS) of the Suzaku satellite. On XRS, inadequate heat sinking of the array led to several non-ideal effects. The thermal crosstalk, while too small to be confused with x-ray signals, nonetheless contributed a noise term that could be seen as a degradation in energy resolution at high flux. When energy was deposited in the silicon frame around the active elements of the array, such as by a cosmic ray, the resulting pulse in the temperature of the frame resulted in coincident signal pulses on most of the pixels. In orbit, the resolution was found to depend on the particle background rate. In order to minimize these effects on SXS, heat-sinking gold was applied to areas on the front and back of the array die, which was thermally anchored to the gold of its fanout board via gold wire bonds. The thermal conductance from the silicon chip to the fanout board was improved over that of XRS by an order of magnitude. This change was sufficient for essentially eliminating frame events and allowing high-resolution to be attained at much higher counting rates. We will present the improved performance, the measured crosstalk, and the results of the thermal characterization of such arrays.