

## Capability of the ASTRO-E Hard X-ray Detector for High-Energy Transients and $\gamma$ -Ray Bursts

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The Hard X-Ray Detector (HXD) is one of the instruments onboard the Japanese cosmic X-ray/ $\gamma$ -ray satellite ASTRO-E, scheduled for launch in January 2000. The HXD covers the energy range from 10 keV to 700 keV with a very low background, typically  $1 \times 10^{-5}$  c s<sup>-1</sup> cm<sup>-2</sup> keV<sup>-1</sup> at 200 keV on ground, with a typical effective area of 330 cm<sup>2</sup> at 50 keV. The X-ray detection part consists of 4×4 GSO/BGO well-type phoswich scintillators and 64 2mm silicon PIN diodes, surrounded by 20 Anti-counters working as active shields on 4 sides. The Anti-counters are made of 4 cm thick BGO crystals, with a very large geometrical area 1200 cm<sup>2</sup> per one side, remaining the effective area 600 cm<sup>2</sup> per one side at 1 MeV. The Anti-counters are additionally used for monitoring high-energy transient sources and  $\gamma$ -ray bursts in an energy range of 100 keV to 2 MeV.

The transient monitoring function is achieved by Earth Occultation method. For an accurate position determination of transient objects, X-ray spectra from the Anti-counters are read out every 1 sec (0.5 sec on condition) with an absolute timing accuracy of 30.5  $\mu$  sec. The onboard CPU compress these spectra data when the telemetry limitation is severe.

The  $\gamma$ -ray burst detection is achieved by monitoring the Anti-counter counting rates with a time resolution of 1/32 sec. The automated burst detection algorithm utilizes both hardware circuits and the onboard software. Once a  $\gamma$ -ray burst occurs, light curve data of Anti-counter before and after burst is telemetered. The overall angular response of the Anti-counters has been measured in laboratory by irradiating them with isotopes from various directions in June 1999. Based on this calibration information, crude positions of the  $\gamma$ -ray bursts can be determined by comparing signal intensities detected on the four sides.