ABSTRACT

Astro-E2 is an X-ray astronomy satellite scheduled to be launched on Feb 2005. X-ray CCD cameras, XIS (X-ray Imaging Spectrometer), are installed on the focal plain of four X-ray telescopes. Calibration of the XIS is currently in advance. We report on the soft X-ray part (0.2-2.2keV) of the XIS calibration performed at Osaka University. So far, we have completed the calibration of four FI-CCD cameras, and are doing that for two BI-CCD cameras. We show the outline of the calibration and some preliminary results here.

Step 1 Absolute QE of Gas PC

The absolute QE of the gas proportional counter (PC) was measured with the slant incident method (see Hayashida et al., 2003, SPIE4851,p.933). X-rays from spectrometer through a slit are irradiated to the PC set at different incident angle.

Step 2 Relative QE of XIS-EU(XIS Engineering Unit) to Gas PC

We did a chopping measurement using X-rays from spectrometer through a slit. X-ray spectra taken with the PC and the XIS-EU, XIS Engineering Unit which has a CCD chip of the same model (CCID41) to the XIS flight models in it. Higher order light from the spectrometer is clearly visible. In this case, the first order light is centered at 0.525keV.

Step 3 Modeling the QE of XIS-EU

We reduce the PC spectra and the XIS-EU spectra into the counting rate ratio at various energy points. Using the gas PC QE model we made in step1, the XIS-EU QE is obtained as in the left panel. We fit the QE data points with a model in which electrodes structures are taken into account. Note that we measure the QE of the XIS-EU CCD for which BPSG layer thickness is designed to be 0.13µm thicker than XIS FM FI-CCDs. Note also that optical blocking filter is not installed in XIS-EU and XIS-FM during the calibration.

Step 4 Measuring Relative QE of the XIS-FM (Flight Model) to XIS-EU

We irradiate X-rays from the spectrometer to XIS-EU or XIS-FMs. We don’t use the slit in front of the XIS to get CCD PH spectra for continuous X-ray energies from 0.2-2.2keV. The relative QE of each XIS-FM to XIS-EU is obtained.

Step 5 Modeling the QE of XIS-FM

Before we make the final QE model functions, we have to review all the steps from step1 to reduce and evaluate systematic errors in these processes.

Linearity, Energy Resolution, Pulse profile of XIS with FI-CCD

Measured counting rate as a function of incident X-ray energy is compared between XIS-BI0 (one of flight model camera with BI-CCD) and XIS-EU (FI-CCD). The ratio of these two indicates the relative QE.