ASTRO-H

INSTRUMENT CALIBRATION REPORT
SXI MASK
ASTH-SXI-CALDB-MASK

Version 0.1

10 March 2016

ISAS/ GSFC

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Table of Contents

CHANGE RECORD PAGE (1 of 1)

DOCUMENT TITLE : SXI Mask			
ISSUE	DATE	PAGES AFFECTED	DESCRIPTION
Version 0.1	March 2016	All	First Release

Introduction

1.2   Purpose

This document describes how the Mask CALDB for the Soft X-ray Imager (SXI) is prepared. The CALDB file structure is define in the ASTH-SCT-04 and available from the CALDB web page at http:// hitomi.gsfc.nasa.gov.

1.2   Scientific Impact

The detector part of the SXI consists of 4 CCD chips placed on a single focal plane. One corner of each chip is illuminated by 55Fe calibration source where Mn K fluorescence lines are always detected. The Mask CALDB file identifies the SXI field of view, CCD/segment boundary, and calibration source regions in both ACT and DET coordinate, to be flagged by the *sxiflagpix* task.

Release CALDB 20160310

Filename	Valid date	Release date	CALDB Vrs	Comments
ah_sxi_mask_20140101v001.fits	2014-01-01	20160310	001	

2.1 Data Description & Results

Misalignment of the CCDs
There are gaps between the four CCD chips as shown in Figure 1. Since the four chips are placed on a single focal plane, the gaps appear in a DET (or FOC, SKY) coordinate image.
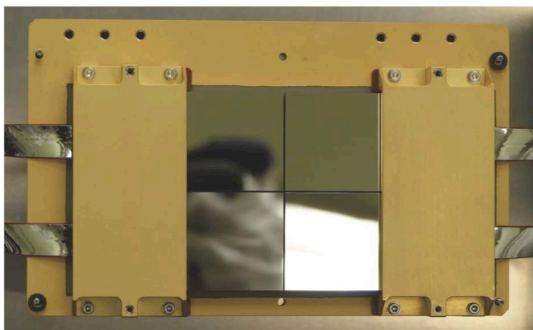

Figure 1: Look-down view of the SXI CCD detectors. From the left-bottom, the name is CCD1, CCD2, CCD4, CCD3, clockwise.
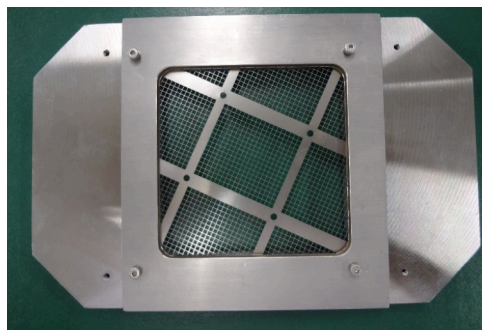

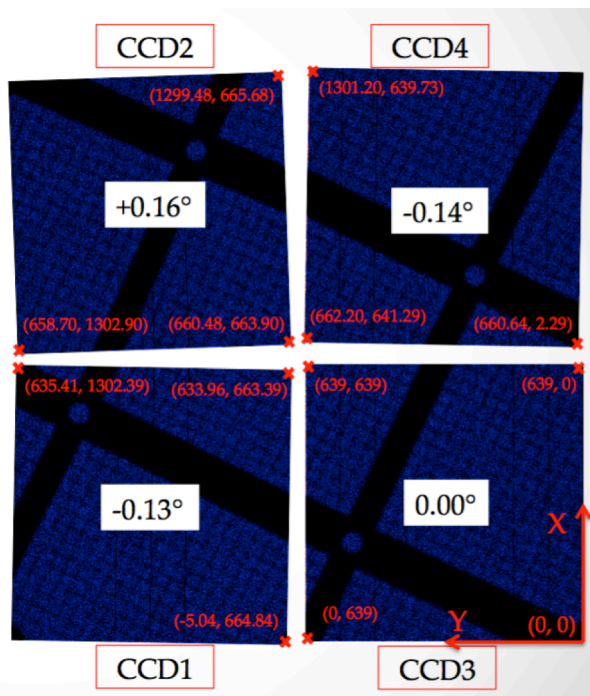Figure 2: Mesh material used for the misalignment calibration.

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Figure 3: Resulting image of the measurement with the mesh (Figure 2) and 55 Fe source. The rotation angle and the relative position of each CCD corner (where the right-bottom corner of CCD3 is assumed to be the origin) are given.

Figure 4: SXI image obtained during the FNC-N thermal vacuum test. Note that the images are given in the RAW coordinate. The left-bottom corners are (RAWX, RAWY) = (0, 0).

Unfortunately, the four CCDs are not perfectly aligned. The SXI instrument team, therefore, calibrated the misalignment using a 'mesh' shown in Figure 2. The measurement was performed in December 2013 at Kyoto University. Putting the mesh above the CCDs, they illuminated 55Fe source, and obtained the image given in Figure 3. The 640x640 pixel square of each CCD is shifted/rotated by hand so that the mesh structure is reconstructed. The calibrated rotation angle and the relative position of the CCDs are given in the figure. The typical gap width between the chips is found to be about 1 mm, corresponding to ~40 arcsec in the SKY coordinate.

Calibration source illuminated regions

The regions where the 55Fe calibration source events are detected were identified using FNC-N Thermal Vac data (ObsID: 00050634). The obtained image is given in Figure 4. The calibration source regions are indicated with the yellow ellipses.

The identified regions are also summarized in Table 1 in the ds9 region file format.

Table 1: Location of the calibration source regions. The format is in ds9 standard.

RAW coordinate
CCD1   Segment CD   ellipse(307.49781,656.04604,95.598658,82.024116,0)
CCD2   Segment AB   ellipse(16.446287,650.19292,91.700601,85.186348,0)
CCD3   Segment AB   ellipse(8.8772279,644.68307,95.208274,85.687454,0)
CCD4   Segment CD   ellipse(302.30855,650.75462,92.954529,81.229403,0)
ACT coordinate
CCD1   ellipse(628.49781,657.04604,95.598658,82.024116,0
CCD2   ellipse(17.446287,651.19292,91.700601,85.186348,0)
CCD3   ellipse(9.8772279,645.68307,95.208274,85.687454,0)
CCD4   ellipse(623.30855,651.75462,92.954529,81.229403,0)

2.2 Final remarks

This is the first release of this CALDB file based on ground measurements. After the launch, the calibration source regions will be investigated once again, and may be updated if the location will have changed from the ground measurements (which happened for the *Suzaku* XIS). After that, the file is not expected be updated any more in orbit.

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