JX-ISAS-SUZAKU-MEMO-2010-06
Title: Photometry using the XIS-1 data taken with the narrow window modes
Category: XRT, XIS
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Date: 2010-10-17

# Photometry using the XIS-1 data taken with the narrow window modes

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October 18, 2010

## 1 Overview

We report a limitation of the photometric capability of the XIS-1 when it is operated with a narrow window mode such as 1/4 or 1/8. The inaccuracy in the attitude control along the DET-X axis is larger than along the DET-Y direction since Dec. 18th, 2010. Unfortunately, the narrower boundary of the window option is set on the DET-X axis for XIS-1 (and XIS-2) while it is on the DET-Y axis for the others (XIS-0 and 3). It has often happened that an XRT-I image is focused near the edge of the boundary in the XIS-1 data. Consequently, a part of the image does not fall into the selected area within the window boundary of the XIS-1 and is not recorded in the data recorder.

## 2 XIS images of the 1/4 window option

Figure 1 and 2 show the XIS images taken with the 1/4 window option at the HXD nominal aim-point. They were taken on August 13th, 2010, after the IRU-S2 operation was started (see suzakumemo 2010-04). The focused image is modulated larger along the DET-X and smaller along the DET-Y directions.

It is seen that a fraction of the XRT image is not accumulated with the XIS-1 detector when the image approaches to the window boundary (Figure 1). Unfortunately, the window boundary of the XIS-1 and -2 detector always set on the DETX axis (XIS-2 is no longer functional during the operation phase using the IRU-S2.). The possibility of the loss of photons is larger in XIS-1 and smaller in XIS-0 and -3.

Figure 2 shows that the images in SKY coordinates show a single peak of the image. This is because the image is reconstructed in the ground processing by taking into account the error of the pointing direction. However, the tail of the image that was not recorded in the data recorder can not be recovered with this process.

At any aim-point, the boundary of the window mode of the XIS-1 and -2 is always set on the DET-X coordinate while that of the XIS-0 and -3 is on the DET-Y. The loss of the photons in the XIS-1 image with the narrow window option commonly happens both at the XIS and HXD nominal aim-points.

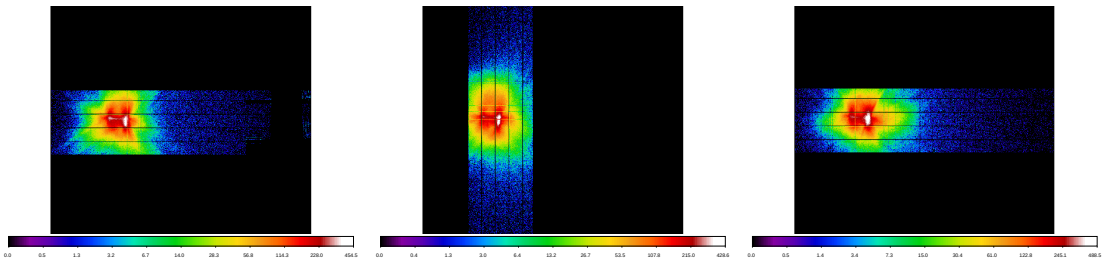

Figure 1: Examples of the focused images in the DET coordinate of XIS-0(left), 1(middle) and 3(right). The data are taken with the 1/4 window option at 2010-08-13. The double peak on the focus position appears with a separation of ∼1.2 arcmin along the DETX axis.

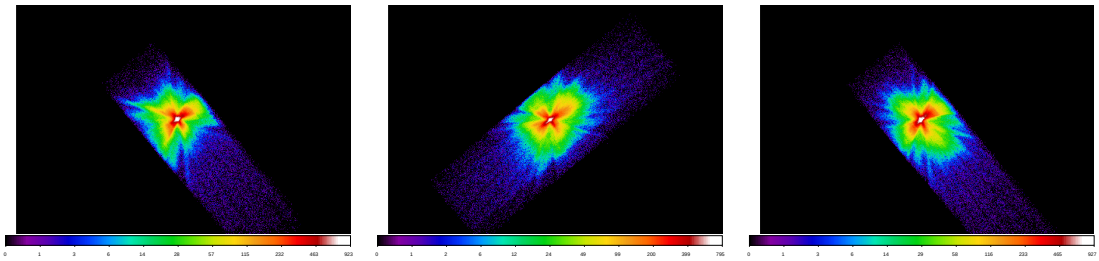

Figure 2: Same as Figure 1 but in the SKY coordinate. The processing in the ground corrected the pointing error and reconstructs the focused image.

# 3 Steps for data analysis

For photometry of the XIS data taken with the narrow window option, we encourage you to consider the following analysis step.

1. Please run the arf generator xissimarfgen with the option of the attitude(=???.att). The xissimarfgen calculates the variation of the effective area and outputs the arf file that takes into account the lost counts falling outside the window boundary.


# Acknowledgment

We thank Mr. C. Baluta for English correction of the original writing.