

1 Summary

Since April 1, 2015, some parts of the XIS3 exhibit instrumental artifacts. Charge leakage is observed in segments A and B. By eliminating the damaged area, this has little impact to the science data.

2 Data Inspection

2.1 Frame data

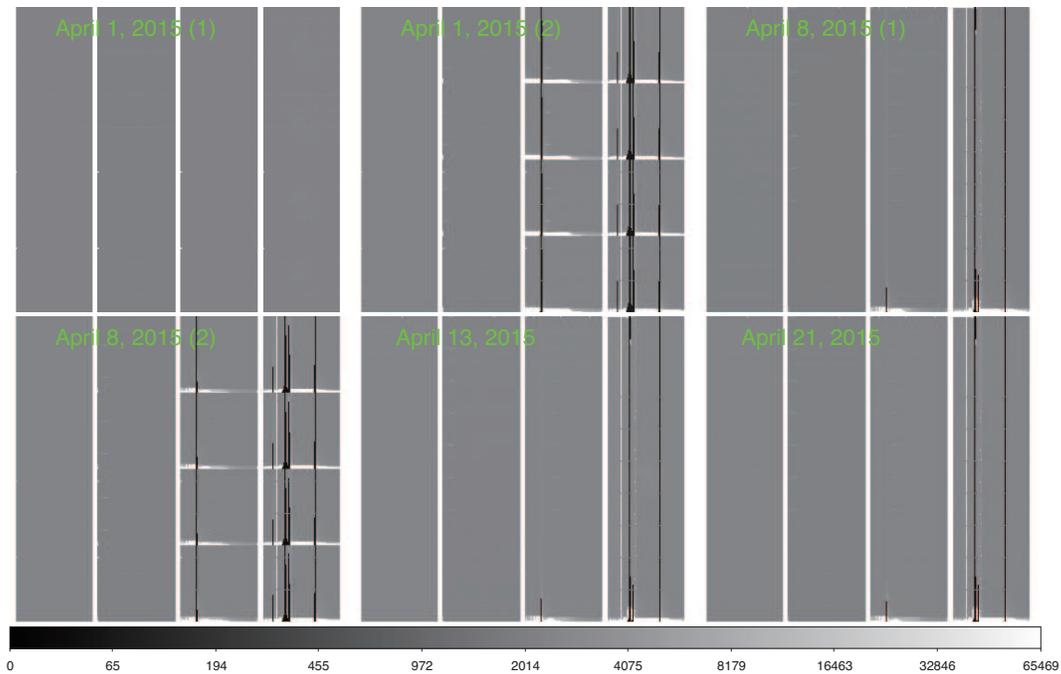


Figure 1: Dark frame image of XIS3 on April 1, 8, 13, and 21, 2015. The segments A, B, C, and D are displayed from right to left. The images on April 1, 2015 (2) and April 8, 2015 (2) were taken in 1/4 window mode.

Figure 1 shows the dark frame images taken in April, 2015. The damage occurred in some time in April 1. Since then, the instrumental artifacts are seen in segments A and B.

Figure 2 indicates the frame dump image on May 18, 2015. In figures 1 and 2, the following features are observed in segments A and B (a) charge leakage close to the readout node (the bottom side of the image), (b) charge leakage in the CI rows and their neighboring rows, and (c) vertical dead columns in segments A and B. The feature (a) is always observed since the beginning of this anomaly. (b) is seen only in 1/4 window mode. There are two types in the feature (c); some dead columns are always seen, others were observed in 1/4 window mode.

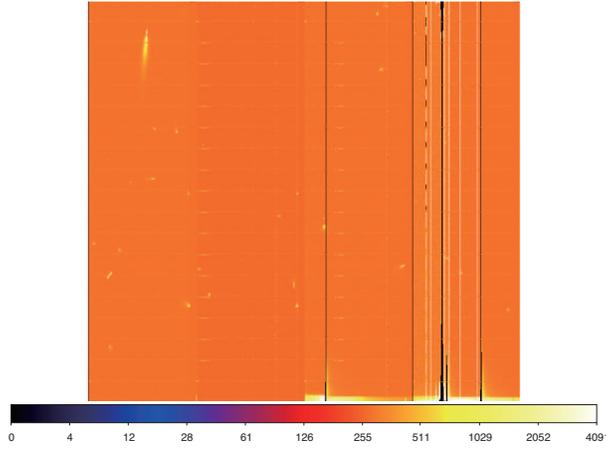


Figure 2: Frame dump image of XIS3 on May 18, 2015. The segments A, B, C, and D are displayed from right to left.

2.2 Day-Earth data

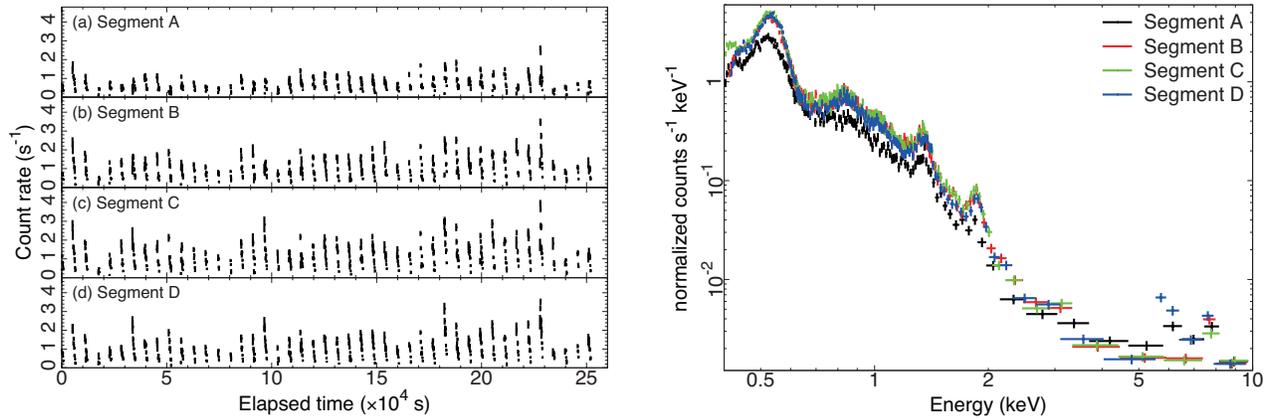


Figure 3: Day-Earth image of XIS3 on April 16, 2015. *Left* : Light curves of count rate in the 0.2–10.0 keV band. The curves are binned by 512 s bin^{-1} . *Right* : The spectrum of each segment. Black, red, green, and blue indicate segment A, B, C, and D, respectively.

Figure 3 shows the day-Earth image taken on April 16. The left panel shows the count rate light curve. The rate of segment A is lower than the others, and that of segment B is lower than segment C. The right panel shows the spectra. Segment A has a lower apparent intensity. These are typical outcomes of telemetry saturation.

2.3 Science data – W49B

To investigate the impact for the science data, we analyzed W49B observation taken after the anomaly and put into public immediately. The source is very bright and is appropriate to check whether the telemetry saturation has any effect to science data in a practical case. However, the loss of the exposure times by the telemetry saturation is almost zero, and the impact even for such a bright source is almost negligible if the damaged area is removed by region filtering.

Figure 4 shows the light curve (left) and spectra (right) before and after the filtering of telemetry-saturated intervals, in which little change is found.

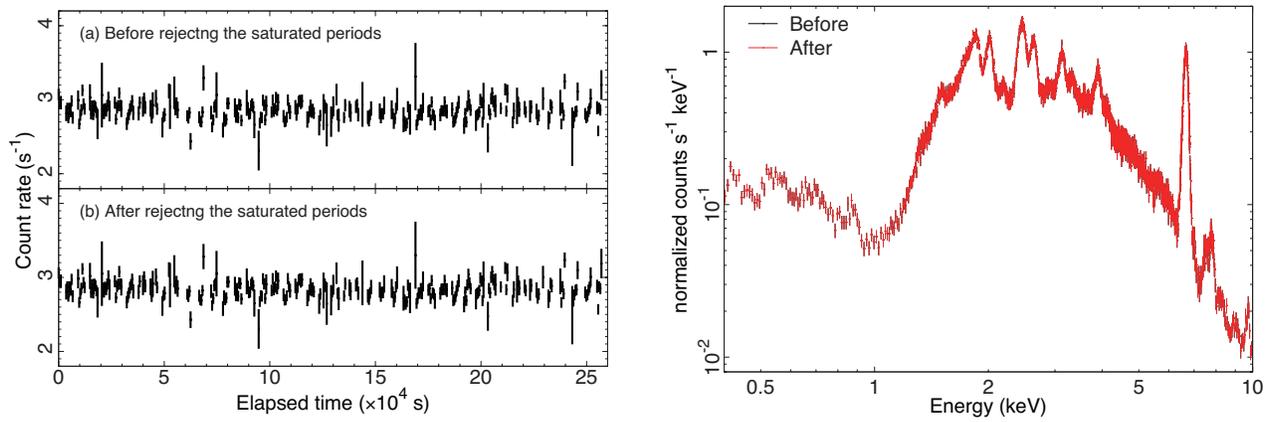


Figure 4: W49B data of XIS3 on April 13, 2015. *Left* : Light curves of count rate in the 0.2–10.0 keV band. The curves are binned by 512 s bin⁻¹. (a) Before rejecting the saturated periods, and (b) after rejecting that period. *Right* : The spectrum of before (black) and after (red) rejecting the saturated periods.