A cross-section sketch of the XIS is shown to the right. The molecular contaminant is thought to build up on cold exterior surfaces of the housing, including the OBF.

The most likely source is outgassed plastic material from a shock absorber on the spacecraft’s inertial reference unit (not shown). It is thought to be a phthalic ester such as di-2-ethyl hexyl phthalate (DEHP, C₂₀H₂₄O₄).

The transmittance of the contaminant for the same epochs, assuming composition only of C and O in the number ratio C/O = 6 (equivalent to DEHP). Also plotted are the transmittance of solar abundance neutral gas at typical interstellar values. Improper treatment of contamination can mimic errors in best-fit absorbing column. Time history of the on-axis contamination surface density for each detector. The rate of contamination has decreased during the second year, with XIS3 appearing to saturate. The dotted lines show the empirical fits used in the current version of xissimarfgen; note that XIS3 diverges from this trend for recent times, while the other sensors are close to the projected values. XIS2 ceased operation in Nov 2006.

Caveats for Suzaku Observers

Improper treatment of the contamination can produce erroneous results when analyzing Suzaku/XIS data. The xissimarfgen FTOOL accounts for the temporal and spatial variations described here, yet our current understanding suffers some limitations. Here we list several caveats of which all Suzaku users should be aware.

- above 0.6 keV
  - contamination well-modeled for XIS1,2,3, ~10% sys. error
  - contamination on XIS0 is underestimated for mid-2006 onward, fixed in June 2007 CALDB release
- between 0.3-0.6 keV
  - C/O ratio is not well constrained (C/O > 67)
  - changes in \( \Delta \alpha_{\text{eff}} \) from the C edge (0.28 keV) to just above the O edge (0.53 keV)
  - could introduce spurious features near the O edge
- below 0.3 keV (the "C-band")
  - decrease in \( \Delta \alpha_{\text{eff}} \) with time is seen in some soft sources, e.g. RXJ1856 (shown)
  - C+O insufficient, additional elements required
  - composition may be time dependent
  - C-band calibration is uncertain at this stage
- extended sources
  - spatial distribution is modeled from BI chip only
  - FI chips might have different distributions

Non-uniformity of the Contamination

The spectra are from observations taken near the bright Earth limb with the BI chip, summed over 4 week intervals. The bright lines are due to atmospheric N K\( \alpha \) (392 eV) and O K\( \alpha \) (525 eV) emission, which uniformly fill the field of view. Shown are August 2005 (left) and Dec 2006 (right). The line ratio has clearly changed.

The images are maps of the N/O line flux ratio across the BI chip for these data. In August 2005, this ratio is uniform across the field, as expected. As the contamination increases, the ratio decreases across the FOV, but at a faster rate in the center. We infer that the contaminant is thicker at the center of the OBF, where the filter is colder.