esa

MEMO

date/*date*	22-3-2005	ref./*réf.*	page/*page* 1 / 3
from/*de*	Norbert Schartel, XMM-Newton Project Scientist	visa/*visa*	
to/*à*		copy/*copie*	

Subject/*objet* **Estimate of the scientific impact of the MOS-1 event from 9/3/2005**

At present it seems likely that the MOS-1 event from 9/03/2005 will have two lasting effects:

1. CCD-6 will not be usable for scientific observations in future
2. A hot column near the bore-sight (which falls on CCD1) has appeared, but only events with energies below 200 eV are affected. Also, a number of new hot and bad pixels have developed, which will be flagged in the standard way.

In the following, a preliminarily estimate of the scientific impact is provided. PIs of accepted observations are asked to read carefully the 'Detailed impact for specific source classes' and should follow the recommendations provided.

General evaluation:

1. The probable loss of CCD-6, one out of the six peripheral CCDs of MOS-1, will have no major impact on the overall scientific output of the mission.

2. Concerning the hot column on CCD1: Given that only events below 200 eV are affected (with the nominal MOS energy range being 100 eV – 12000 eV) and that only a small fraction of the source area falls within the affected column, there are no impacts on the expected scientific output.

Detailed evaluation of the CCD-6 impact on the scientific output:

CCD-6 covers, to a first order approximation, 1/7 (14%) of the geometrical area of MOS-1. MOS1, in turn, only contains some 22% of the total effective area of the EPIC instrument (MOS1, MOS2 and pn). This number (14%) is an upper limit because:

a. not all of the geometrical area of the peripheral CCDs is illuminated

b. due to the specific properties of X-ray telescopes, the image performance decreases with increasing off-axis angle. Therefore, the scientific value decreases for the peripheral CCDs with increasing off-axis angle.

For the scientific output of the mission it is important to see, as indicated above, that MOS-1 is operated in parallel with the MOS-2 camera and the pn camera. Therefore the sky area, which is no longer covered by CCD-6, is still covered by the remaining two cameras. The ratio of the effective areas between pn, MOS-1 and MOS-2 can, to first order, be described as 1:0.4:0.4. Therefore, over about 14% of the field of view the effective area decreases by 22% which corresponds to a loss of 12% in signal-to-noise.

Detailed scientific impact for specific source classes:

1. Point sources (on axis): no impact

2. Extended sources (r < 5.5 arcmin): no impact

3. Extended sources (r > 5.5 arcmin): the impact depends on the scientific question to be addressed:

   a. Analysis of point sources in the field: about 12% reduction of the signal-to-noise in about 14% of the field of view (falling in the off-axis area). This must be treated by the calculation of the effective area and exposure map, which will be fully supported by the SAS.

   b. Analysis of extended emission: about 12% reduction of the signal-to-noise in about 14% of the field of view (falling in the off-axis area). This must be treated by the calculation of the effective area and exposure map, which will be fully supported by the SAS.

   c. Extended emission with specific focus on soft X-ray emission lines: In this case the signal-to-noise ratio might decrease by up to 30% in 14% of the field of view (falling in the off-axis area) as the pn camera might not provide the required spectral resolution. (The number of such cases is expected to be extremely small, e.g. 1-2 Comets per year).

4. Field observations: see 3.a

5. Serendipitous sources: see 3.a

6. Specific areas:

   a. Elongated extended sources (d > 5.5 arcmin): It might be that by defining a specific position angle, an elongated extended source can be placed on the detector in such a way that the source falls on a MOS-1 CCD different from CCD-6. PIs of accepted proposals are asked to check carefully the visibility and the position angle constraints for their targets (http://xmm.vilspa.esa.es/external/xmm_sched/vischeck/index.shtml) to see whether such a possibility exists. In this case they are kindly asked to inform immediately the XMM-Newton SOC at xmmpi@xmm.vilspa.esa.es with the proposal number in the subject line.

   b. Secondary source in the field of view at a distance > 5.5 arcmin: Besides the primary target, an accepted observation might contain a second (off-axis) source of scientific interest at a distance > 5.5 arcmin. Also here the possibility might exist to place the secondary source such that it falls in a MOS-1 CCD different from CCD-6. PIs of accepted observations falling in this category are kindly asked to follow the recommendation provided in 6.a

Norbert Schartel
XMM-Newton Project Scientist