XMM-Newton CCF Release Note

XMM-CCF-REL-254

# EPIC MOS screening thresholds

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## 1 CCF components

| Name of CCF | VALDATE | EVALDATE | Blocks changed | XSCS flag |
|---|---|---|---|---|
| EMOS1_SCREENTHRESH_0001.CCF | 2000-01-01 | | SCREEN_THRESH | NO |
| EMOS2_SCREENTHRESH_0001.CCF | 2000-01-01 | | SCREEN_THRESH | NO |

## 2 Changes

These files give the screening thresholds which should be used when determining the low-energy noise properties fo the MOS CCDs.

For each CCD, the file gives the soft-band minimum and maximum, the hard-band minimum and maximum and the rate-band minimum and maximum energies in keV. In addition it gives the threshold for classifying each MOS CCD as noisy. These thresholds are expressed as selectlib-style string expressions containing two variables—the hardness ratio $H$, i.e., the ratio of hard-band to soft-band event rates, and the event rate $R$ in the rate band. Both $H$ and $R$ are to be measured within the CORNER region as specified in a block of the same name in the CCFs EMOSn_LINCOORD_nnnn.CCF only.

According to a presentation by Kip Kuntz during the XMM Background Working Group meeting in 3/2009, the characteristics of the low-energy noise is changing with time. It is thus expected that the thresholds will have to be revised from time to time.

## 3 Scientific Impact of this Update

This CCF is read by the new task emtaglenoise beginning in SAS 9 as part of the procedure to identify CCDs suffering from low-energy noise in an observation, based on an algorithm described in Kuntz and Snowden (2008) A&A 478, 575–596. As such, it provides a new functionality in SAS. Placing all numeric quantities and event selection criteria in a CCF allows these thresholds to be modified in the future as the noise characteristics change.

# 4 Estimated Scientific Quality

Kuntz and Snowden (2008) have showed how, using these thresholds, one can effectively identify if CCDs 4 and 5 of MOS 1 and CCDs 2 and 5 of MOS 2 suffer from low-energy noise in all observations publicly available as of 1st April, 2006 (which numbered over 2000). The current specification of the screening thresholds is taken verbatim from Table 1 of Kuntz and Snowden (2008).

Figure 9 of the same paper displays graphically how they were chosen. For MOS 1 CCDs 4 and 5 and MOS 2 CCD 2, the thresholds unambiguously delineate noisy observations from normal ones on the ($H$,$R$)-plane. For MOS 2 CCD 5, the normal and noisy observations blend together, and the noise strength varies smoothly between theh normal and noisy states. Kuntz and Snowden's chosen division point is 'where the amplitude of the low energy excess is comparable to the uncertainty in the mean spectra.' They have detected no noisy observation in the remaining CCDs.

# 5 Test procedures and results

The SAS task emtaglenoise reads this new CCF via CAL calls:

```
calServer.state()->ccd()->set(_ccdnr);
ScreenThresholdServer *st = 0; st = calServer.getAtom(st);
_minEnergy[i] = (int)( 1000 * st->ratebandmin() );
_maxEnergy[i] = (int)( 1000 * st->ratebandmax() );
_minEnergy[i] = (int)( 1000 * st->softbandmin() );
_maxEnergy[i] = (int)( 1000 * st->softbandmax() );
_minEnergy[i] = (int)( 1000 * st->hardbandmin() );
_maxEnergy[i] = (int)( 1000 * st->hardbandmax() );
const string & thresh = st->threshold();
```

Using the test harness of emtaglenoise, we have shown that the SAS task successfully reads in and makes use of data in this CCF and subsequently produces the expected low-energy noise classification on Fedora and Solaris, in high-memory mode.