XMM-Newton CCF Release Note

XMM-CCF-REL-162

Low energy noise rejection for pn.

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1 CCF components

Name of CCF	VALDATE	List of Blocks changed	CAL VERSION	XSCS flag
EPN_REJECT_0001	2000-01-01T00:00:00'		3.152	NO

2 Changes

With SAS 6.0 we provide a new task called "epreject". "epreject" corrects shifts in the energy scale of specific pixels which are due to high-energy particles hitting the EPIC PN detector during the calculation of the offset map. Furthermore it suppresses the detector noise at lower energies by statistically flagging events according to the known noise properties of the lowest energy channels. For detailed description please see the task description of "epreject".

For that new tasks a new CCF component EPN_REJECT_0001 is provided.

2.1 Energy Shift correction

For the energy shift correction some prepared fits images (Median maps) are read from the CCFs. The correction values themselves are in the NOISE_MAP_INDEX table called COR_VAL related to energy ranges.

2.2 Noise Suppression

The noise suppression is performed afterwards using the in FITS format provided noise maps in the CCF.

3 Scientific Impact of this Update

The offset correction recovers errors of up to several 10 eV for point sources that happen to fall on a bright patch caused by a wrong offset value.

The reduction of the detector noise allows to extend the useful energy range down to an instrumental energy of 120 eV.

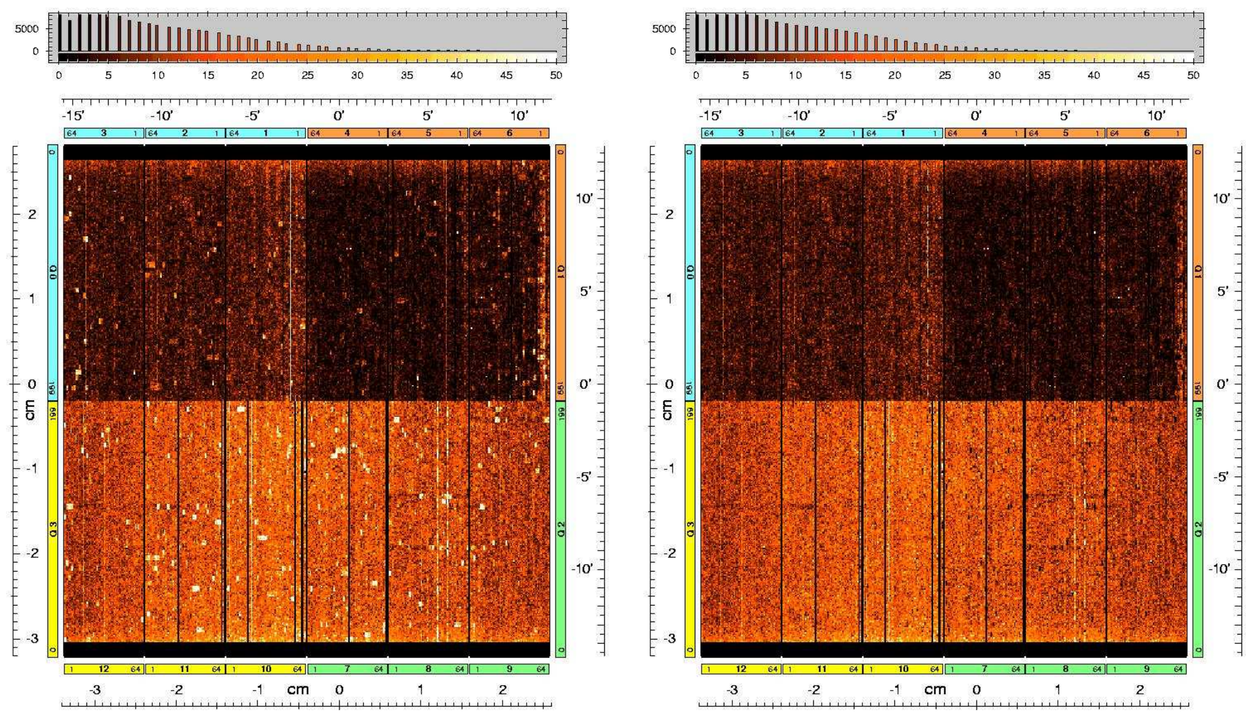

Figure 1: Events with raw amplitudes of 20 ADU in a closed 23.2 ks FF exposure. The number of events per pixel is color coded according to the color bar at the top, ranging from zero (black) to 50 (white), Before (left) and after (right) applying the task epnreject for correcting the energy scale in specific pixels.

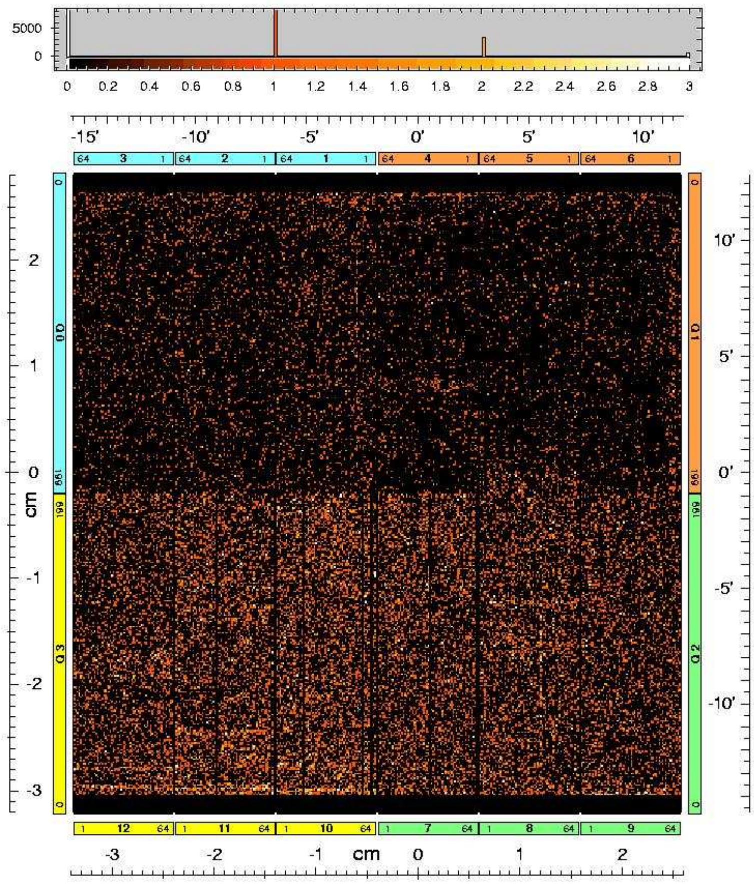

Figure 2: Events with raw amplitudes of 20 ADU in a closed 23.2 ks FF exposure, after correcting the offset shifts and after suppressing the noise. Note that the intensity scale extends now from 0 to 3, while it covered the range 0 to 50 in Figs. 1 and 2.

4 Estimated Scientific Quality

5 Test procedures & results

Tests with the new EPN_REJECT_001 have been successfully performed at MPE. Figures 3 and 4 demonstrate the new task. Both are extracted from the Vela SNR observation 0367_0112930101_PNS003 with the selection:"PHA.ge.20 .and. PI.gt.120 .and. PI.lt.200 .and. TIME.lt.124393155" The data for Figure 3 have been processed with the default settings of epchain plus "screenlowthresh=0". Figure 4 shows the same data however processed also with epreject.

The scaling of both images is linear (Figure 3: 0–40 and Figure 4: 0–20).

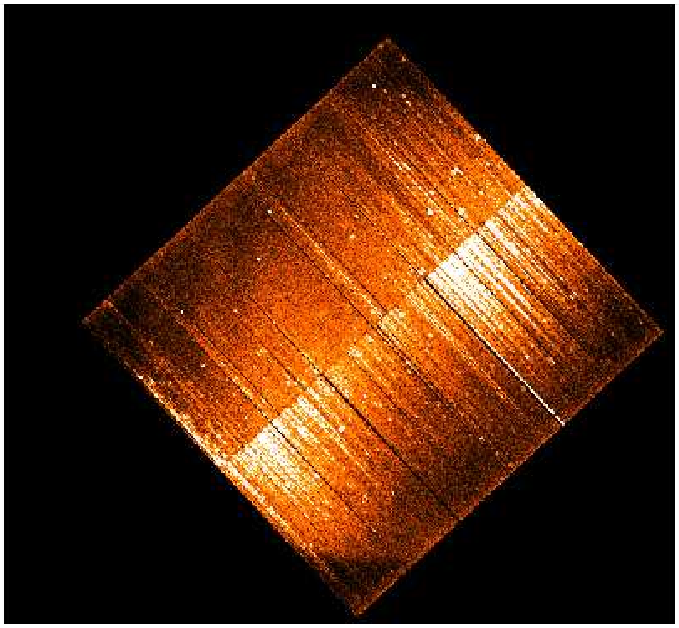

Figure 3: Vela SNR image in the energy range 120-200 eV without epreject. Scale: 0–40

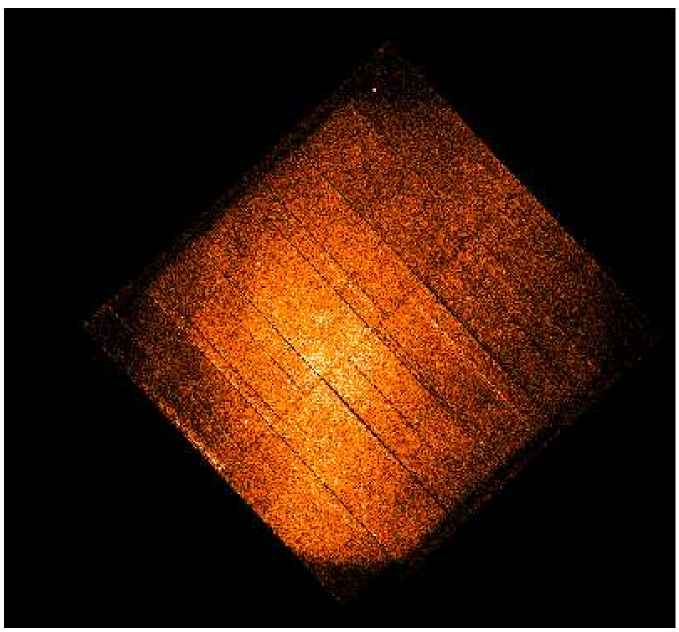

Figure 4: Vela SNR image in the energy range 120-200 eV with epreject. Scale: 0–20

6 Expected Updates

The first part of this task (te energy shift correction) is particularly important for observations where the offset map was not transmitted. For more recent observations, where the corresponding offset map is available, the offset shifts can be directly derived from the offset map. That is not yet implemented.