XMM-Newton CCF Release Note

XMM-CCF-REL-209

OM Grisms Astrometry

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1 CCF components

Name of CCF	VALDATE	EVALDATE	List of Blocks changed	XSCS flag
OM_ASTROMET_0012	2000-01-01T00:00:00	—	FILTER-GRISM10	NO
		—	FILTER-GRISM20	NO
		—	POLYNOM_MAP	NO
		—	POLYNOM_MAP2	NO

2 Changes

When using the OM grisms, the position of the sources in the field of view is translated to the grism image in the position of their corresponding zero orders. This translation can be mapped so as to recover from any zero order position the corresponding position of the source in the "direct" image. Then the normal SAS OM astrometric tools can be used to compute the astronomical coordinates of the source producing a spectrum through the OM grisms.

The transformation between direct image and grism image can be considered as a form of geometric distortion that can be mapped if we have both images. We have used observations of Sco X-1 field with the V filter and both OM grisms, obtained in revs. 402 and 688.

All images were processed with SAS so as to obtain modulo_8 and geometric distortion corrected images corresponding to the V filter and grisms images. (It should be noted that the grisms images were not rotated). Then a similar procedure to the one used to derive the geometric distortion was used.

A 4th order polynomial provides a good fit. Its coefficients and the corresponding regularly sampled distortion map, for both grisms, have been incorporated into the CCF.

This will be used by the SAS in the following way. First, the position of the zero order of each spectrum determined by *omdetect* and *omgrism* tasks in the *omgprep* rotated image has to be de-rotated. Then the new grism distortion map can be applied to compute the position of the source in the direct image, and from there the algorithms in *omatt* can be used to derive the Right Ascension and Declination of the source producing the spectrum.

3 Scientific Impact of this Update

Astrometry in the OM grisms will allow the user to know the coordinates of the objects producing a spectrum through the grisms. This is particularly interesting in the case of multi-object spectroscopy (remember that OM grisms can be used in User Defined window configuration to register the spectrum of the target sitting at the Boresight, or in full frame to have the spectra of all objects in the field of view).

4 Estimated Scientific Quality

The position of the sources will not have the same accuracy that can be achieved with the OM lenticular filters. The internal consistency of the transformation is 1.1 and 1.3 pixels RMS error for the UV and V grisms respectively.

After all transformations are applied, we expect to obtain coordinates within better than 10 arcsec for the objects whose spectrum is observed.

5 Expected Updates

This is the first version of the transformation map. The corresponding SAS tasks to use it are already implemented and an extensive testing phase is starting now. Modification of the maps after more data are analyzed will be implemented if necessary.

6 Test procedures

Grism observations will be processed using the newly developed code and the new contents of this CCF. Cross-correlation with USNO catalog provided by SAS task *omatt* will give us the errors in the overall transformation process.

7 Summary of the test results

As pointed out before we expect errors of less than 10 arcsec. Preliminary results confirm this expectation. Detailed results will be included in this RN at a later stage, when more extensive testing has been performed.

References