XMM-Newton CCF Release Note

XMM-CCF-REL-148

OM Astrometry

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1 CCF components

Name of CCF	VALDATE	EVALDATE	List of Blocks changed	XSCS flag
OM_ASTROMET_0010	2000-01-01T00:00:00	—	FILTER-V	YES
		—	FILTER-U	YES
		—	FILTER-B	YES
		—	FILTER-UVW1	YES
		—	FILTER-UVW2	YES
		—	FILTER-UVM2	YES
		—	FILTER-WHITE	YES
		—	FILTER-MAGNI	YES
		—	FILTER-GRISM1	YES
		—	FILTER-GRISM2	YES
		—	POLYNOM_MAP	YES

2 Changes

The new distortion map is based in observations of the G153 field. The U filter was used and the positions of 813 stars were measured. The old map was based in a LMC field with only 230 sources.

Since the main source of distorsion is the detector fiber taper, this map can be applied to all filters, as it was the case with the previous one based in V filter. Tests made, e.g. for the UVW1 filter, indicate that the map is adecuate for all filters.

The previous map had been obtained by fitting the measured offset (distorted position minus linear position, or detector minus sky positions) as a polynomial function of the linear (sky) position. However, SAS needs to convert the measured detector position into undistorted one so as to assign

proper astronomical coordinates. Therefore what is needed is a function of the measured detector (distorted) position and this is how the new distortion map has been built.

3 Scientific Impact of this Update

Since the distortion is now much better mapped, the astrometry for the whole field of view is better now. The reconstructed positions have now an error around 1.6 pixels (rms) while the errors (distortion) in the distorted image are 27.0 pixels (rms).

4 Estimated Scientific Quality

The improvement in the pointing reconstruction accuracy that can be achieved with this distortion map is from 10% to 20%. For the UVW1 filter we have measured 0.8".

5 Expected Updates

No more observations will be performed. This map can be considered as final. However, monitoring of the instrument in the long term may indicate that some adjustement is necessary in the future.

6 Test procedures

The map has been verified for internal consistency, by comparing corrected positions of a number of stars in different fields with their sky values.

Then, SAS 5.4 was used to reprocess the G153 field, and the final positions, RA and Dec. were cross-correlated with the USNO catalogue.

7 Summary of the test results

Table 1 gives a comparison between old and new distortion maps for several fields.

Table 2 shows the errors in the coordinates determined by SAS (cross correlation with USNO catalogue) using the new map

Field	New map	Old map
	(rms error in pixels)	(rms error in pixels)
G153	1.61	2.43
3C273	3.04	3.1
LMC	1.75	1.9
EXO	1.03	1.27

Table 1: Note. The old map was based on the LMC field

Filter:	U RA Dec	B RA Dec	UVW1 RA Dec
old map	1.1" 1.2"	1.2" 1.6"	
new map	1.0" 0.9"	1.1" 1.3"	0.8" 0.8"

Table 2: Pointing reconstruction accuracy

References