XMM-Newton CCF Release Note

XMM-CCF-REL-3

EPIC ASTROMETRY

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October 3, 2000

1 CCF components

Name of CCF	VALDATE	List of Blocks changed	CAL VERSION	XSCS flag
EMOS1_LINCOORD_0012	2000-01-01T00:00:00	LINCOORD FOV		YES
EMOS2_LINCOORD_0012	2000-01-01T00:00:00	LINCOORD FOV		YES
EPN_LINCOORD_0008	2000-01-01T00:00:00	LINCOORD FOV		YES
XMM_MISCDATA_0011	2000-01-01T00:00:00	MISCDATA		YES
XMM_BORESIGHT_0013	2000-01-01T00:00:00	BORESIGHT		YES

2 Changes

The CCF files, LINCOORD, contain the data for CCD geometries and MISCDATA includes the focal length (translating to the mm to arcseconds conversion), while the file BORESIGHT includes the pointing direction alignments between star tracker and instruments. LINCOORD and BORESIGHT generally have to be updated together.

The PN camera comprises a monolithic CCD, so that this geometry is well understood, and confirmed with ground measurements. The focal lengths were determined on-ground, but found to be 0.1% shorter than predictions, and the cause of discrepancy never satisfactorily explained. Measurements on several astrometric fields have remnant statistical and systematic errors which are of the same order.

The current analysis is limited by a number of factors, these include:

- the reported star tracker pointings have not been translated systematically into valid ODF formats, and many analyses have been conducted on the basis of REQUESTED pointings.

- Furthermore the detailed valid Attitude History Files have not yet undergone any re-calibration for guide star locations within the field, which in the ISO programme were found significantly to improve location accuracies.
- The departure from circular symmetry of the Point Spread Function with off-axis angle can produce a systematic shift in the simple centroid calculation
- The CCD focal planes do not match the ideal curved focal surface: The PN focal plane is flat, while the MOS focal plane has stepped locations of the off-axis CCDs, in a direction parallel with the optical axis.
- The telescope tube itself will out-gas, and may be subject to micro-cracking of its carbon fibre. Trend analysis will be required to determine if there is a long term shift in boresights.

We expect these files to be updated with improving knowledge of the MOS CCD locations and systematic trend analysis of boresight calibrations

3 Scientific Impact of this Update

First release

4 Estimated Scientific Quality

At the time of writing the PN camera astrometry files are being updated to reflect the improving knowledge, and residual location errors of a source centroid may be typically 1 - 2 arcseconds.

The MOS camera is subject to an additional uncertainty, in that the 7 CCDs per camera were individually mounted, and the distance between CCDS and rotations must further be accounted for. As a consequence, the existing astrometry files are not as well-determined as PN. We suggest the GO assume position locations to 3 - 5 arcsecs in some CCDs.

Due to a limit in the Absolute Measurement Accuracy of the AOCS system, it is expected that for any single observation there can be a significant difference between actual and reported boresight of order 3 arcseconds.

The field of view is defined by the filterwheel structure. Potentially small variations in the stop locations might change the actual field of view as seen in detector co-ordinates. The existing field of view data used for expsoure maps may have small inaccuracies at the $\sim$1 pixel level

5 Expected Updates

Further analysis of several fields is under way, and these will allow a refined set of calibrations files, as available. Thereafter the limitations will be set by the AOCS sub-system and extensive trend analysis of its systematic deviations will be required to make a major improvement.

6 Acknowledgements

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