XMM-Newton CCF Release Note

XMM-CCF-REL-23

OM Photometry

R. Much

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1 CCF components

Name of CCF	VALDATE	List of Blocks changed	CAL VERSION	XSCS flag
OM_PHOTTONAT_0002	2000-01-01T00:00:00	PHOTTONAT		Yes
OM_COLORTRANS_0004	2000-01-01T00:00:00	COLORMAG		No

2 Changes

First release

The *om_phottonat* file contains the detector charcteristica, such as CCD reset times, shift in horizontal and vertical direction, flush time and position of readout area within CCD. The numbers were derived from laboratory measurements and are supposed not to change inorbit.
The *om_colortrans* file includes the defintion of the zero points of the various broadband filters and the parameters of the colour transformation of the OM-U, OM-B and OM-V-filter into the standard systems. The zero point was derived in the following way:

- Matching the OM repsonse using the measurements of BPM16274 and LBB227.
- the zeropoints in U, B, V are set in a way that the simulations with the Vega spectrum (from ESO ftp server) matches the average brightness found in the literature which is (0.025, 0.03, 0.03) mag respectively.
- In the UV filters the ESO Vega brightness is arbitrarily set to the U value, i.e. 0.025 mag
- Magnifier and White brightness of Vega are arbitrarily set to 0.03 mag

The colour transformation analysis was performed by comparing simulated count rates of model spectra for different stellar types with values from literature and using the results of the LBB227 and BPM16274 data analysis. Input model spectra were taken from Pickles (1998, PASP, 110, 863). The Pickles spectra are normalized to 1. at the wavelength of 555.6 nm. Therefore the spectra had to be renormalized to allow absolute calibration. The analysis comprised of the following steps:

1. The UBV response was taken from the literature (Allen, Astrophysical Quantities). Stepsize is 20 nm.
2. The flux of Vega was calculated for the three filters.
3. The Vega flux was corrected to mag 0, as the average literature flux of Vega is non-zero (v=b=0.03, u=uvw1=uvm2=uvw2=0.025). In this way the flux of a zero magnitude star in the V-filter was calculated.
4. The spectrum of each spectral type in the Pickles library was normalized to yield the flux corresponding to a 0 mag star in the V-filter.
5. The brightness of each library spectrum was calculated for the B and V filter as well. The derived colours agree with the values published by Pickles within 0.05 mag, whereby the largest differences were found for the U-B colour of early types.
6. The expected OM count rates for the filters V, B, U, UVW1, UVM2 and UVW2 were calculated.
7. applying the methode of Harris, the coefficients of the colour transformation were calculated. All spectra were considered, i.e. for this version the solution were not calculated for subranges of the colour index.

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

- analysis is mainly based on simulations with model spectra.
- the throughput calibration is based only on data of the two calibrators LBB227 and BPM16274.
- colour transformation for different colour intervals is not yet done. The quality of the colour transformation gets worse as the spectral type gets later. This problem can be overcome by defining colour several transformation each only valid in certain colour intervals.
- the quality of the transformation still has to be assessed in detail, i.e. the inspection of outliners is still TBD.

Both files describe the redundant OM detector chain.

We expect the file *om_colortrans* to be updated once colour transformations are calculated for different intervals and once the results of the dedicated ground based photometric observation programme become available. Early results of the ground observations are expected in October 2000.

3 Scientific Impact of this Update

First release

4 Estimated Scientific Quality

An inorbit update of the parameters in the PHOTONAT file is very unlikely and the ground based data probably contain the best achievable values.
The colour transformation of model spectra was found to be generally good at the 0.1 mag level or even better. However there are outliners, which need inspection. The colour transformation gets worse as one goes towards late type spectra (B-V > 1). Recommendation: assume accuracy of 0.5 if redder than B-V >1.0.
The accuracy of U-B transformation is generally better than 0.1 mag, however there are again some outliners, which need inspection. The U-V transformation is generally better than 0.1 mag, but there are some outliners for U-V > 1. BV transformation is generally better than 0.05 mag for the range $-0.5 < B-V < 1$. Towards the red, i.e. with increasing colour index the transformation gets worse with B-V residuals up to -0.3 mag. The V magnitude is good within 0.05 mag, with some outliners with a residual up to 0.2 mag.

5 Acknowledgements

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