XMM-Newton CCF Release Note

XMM-CCF-REL-69

CCF Release note
(Encircled Energy Function of the X-ray telescopes)

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April 3, 2001

1 CCF components

Name of CCF	VALDATE	Blocks changed	CAL VERSION	XSCS flag
XRT1_XENCIREN_0001	2000-01-01T00:00:00	XENCIREN	SAS 5.1	NO
XRT2_XENCIREN_0001	2000-01-01T00:00:00	XENCIREN	SAS 5.1	NO
XRT3_XENCIREN_0001	2000-01-01T00:00:00	XENCIREN	SAS 5.1	NO

2 Changes

The files describe the Encircled Energy Functions of the flight x-ray telescopes XRT1, XRT2 and XRT3 vs energy. The XRT1, XRT2 and XRT3 telescopes are respectively associated with the MOS1, MOS2 and PN EPIC cameras. Each file consists of a header and a table section. The table section contains tables of coefficients which provide the on-axis enclosed energy as a function of the radius in mm of a circular extraction window. These tables are provided for different energies. Parameters provided in the header are used to extrapolate this tables to off-axis encircled energies values using a calibration routine [1].

3 Scientific Impact of this Update

This note describes the first release of the encircled energy CCF files. The released tables are used by the SAS to correct the EPIC response matrices from scattering losses of photons out of circular windows selected by the users to extract the EPIC spectra of x-ray sources.

4 Estimated Scientific Quality

The CCF files contains 6 tables of encircled energy functions which were generated using scisim in combination with a numerical model of the x-ray telescopes [2]. In-orbit calibration verification indicates that the in-orbit telescope PSFs are identical to the on-ground measurements [3] [4] within the accuracy limit of background subtraction. Hence, the accuracy of the tables provided in the CCF library can be estimated by comparison with on-ground calibration test measurements. Figure 2 indicates that the tabulated encircled energy function on-axis at 1.5 keV, 4.5 and 8.0 keV agrees with on-axis PANTER measurements of the 50% and 90% energy width to an accuracy better than 3 % accuracy. Fig. 3 indicates that the parametrized off-axis encircled energy function agrees with on-axis PANTER measurements of the 50% and 90% energy width to an accuracy better than 3 % accuracy.

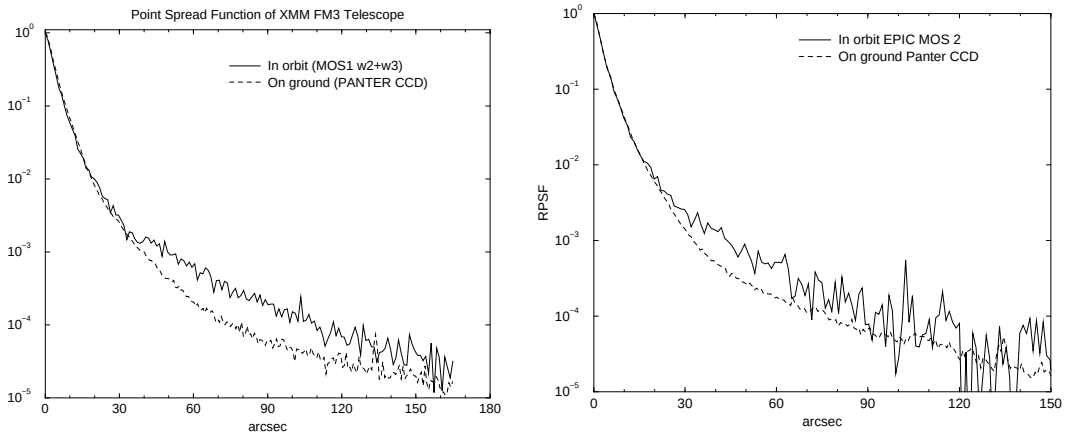

Figure 1: PSF of the XRT1 (left) and XRT2 (right) telescope measured with the MOS1 and MOS2 camera operating respectively in window and full frame mode. The radial energy distributions of the PSFs measured in-orbit are identical to on-ground measurements within the accuracy limit of background substraction.

References

[1] Christian Erd, Philippe Gondoin, David Lumb, Rudi Much, Uwe Lammers, and Giuseppe Vacanti. *Calibration Access and Data Handbook*. XMM-PS-GM-20, issue 1.0, ESA/SSD, September 2000.

[2] Ph. Gondoin, B. Aschenbach, H. Brauninger, D. de Chambure, J.P. Colette, R. Egger, K. van Katwijk, D. Lumb, A. Peacock, Y. Stockmann, J.P. Tock, and R. Willingale. *Simulation of the XMM Mirror Performance based on Metrology Data.* In *SPIE Proc.*, volume 2808, pages 390–401, 1996.

[3] Ph. Gondoin, B. Aschenbach, M. Beijersbergen, R. Egger, F. Jansen, Y. Stockman, and J.P. Tock. *Calibration of the first XMM flight mirror module: I. Image Quality.* In *SPIE Proc.*, volume 3444, page 290, 1998.

[4] Ph. Gondoin, B. Aschenbach, C. Erd, D.Lumb, S. Majerowicz, D. Neumann, and J.L.Sauvageot. *In-orbit calibration of the XMM-Newton telescopes.* In *SPIE Proc.*, 2000.

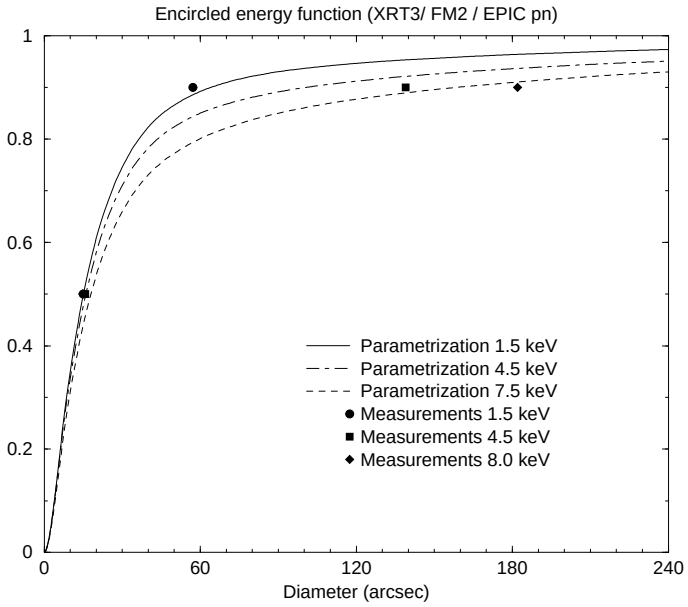

Figure 2: On-axis encircled energy function of the XRT3 telescope (in front of the EPIC p−n camera for three different energies. The parametrized curves are compared with measurements of the 50% and 90% energy width performed at the PANTER faility.

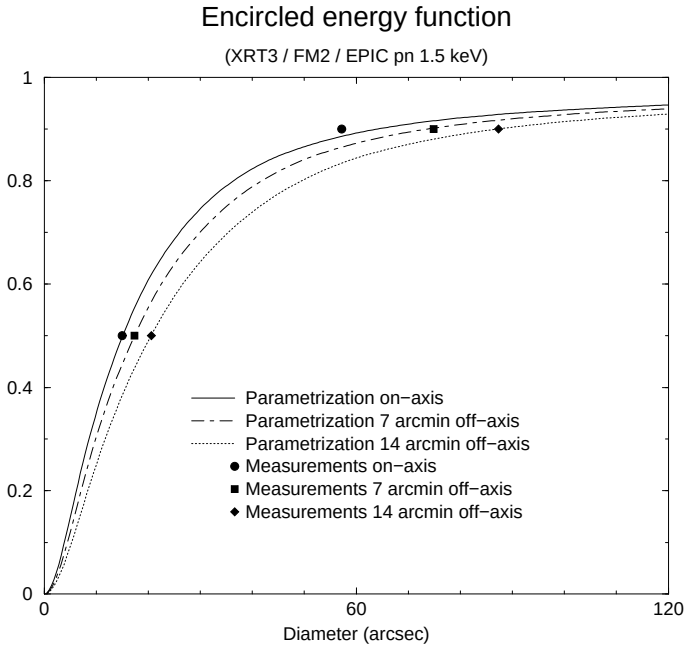

Figure 3: Encircled energy function of the XRT3 telescope (in front of the EPIC p−n camera for three different off-axis angles. The parametrized curves are compared with measurements of the 50% and 90% energy width performed at the PANTER facility.