FINAL PERFORMANCES OF THE X–RAY MIRRORS OF THE JET–X TELESCOPE

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The Joint European X–ray Telescope (JET–X) is one of the core scientific instruments of the SPECTRUM RONTGEN-γ astrophysics mission. The project is a collaboration of British, Italian and Russian consortia, with the participation of the Max Planck Institut (Germany). JET–X was designed to study the emission from X–ray sources in the band of 0.3–10 keV. Citterio et al. (1996 and references therein) describe its structure, composed by two identical and coaligned Wolter I telescopes. Focal plane imaging is provided by cooled X–ray sensitive CCD detectors which combine high spatial resolution with good spectral resolution, including coverage of the iron line complex around 7 keV at a resolution of $\Delta E/E \sim 2\%$.

To measure the effective area of the telescopes, the detectors (PSPC or CCD) were either directly exposed to the incoming X–ray beam or put in the focal plane collecting the photons reflected by the telescopes. The ratio between the two exposures gave the effective area values. The mean values obtained by using the two flight models were 161 cm^2 at 1.5 keV and 69 cm^2 at 8 keV, respectively. These values match very well the theoretical

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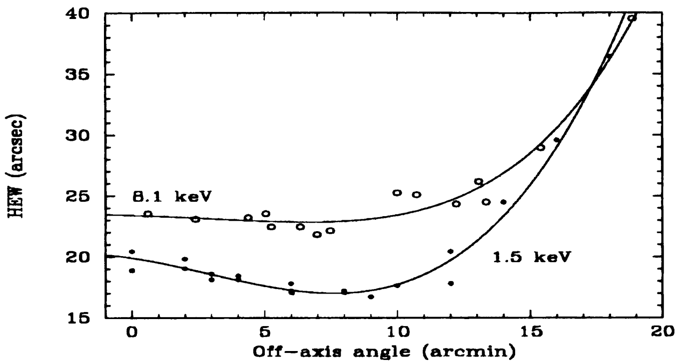

Figure 1. The results of the end-to-end tests at the Panter facility confirm that the required HEW is achieved also at large off-axis angles.

ones (see Figure 3 in Citterio et al. 1996). Another test, concerning the evaluation of the angular resolution, was carried out using a CCD detector in the focal plane; after half the exposure time the detector was moved by a distance equivalent to 20". The two sources are well resolved on the resulting CCD image, confirming the excellent angular resolution achieved by JET-X (see Figure 2 in Citterio et al. 1996).

Crowded field regions and extended X-ray emitting sources represent key targets for the JET-X telescopes. Thus, it is required that the Half Energy Width (HEW) remains good also at large off-axis angles. To illustrate the JET-X capabilities, we plot in Fig. 1 the HEW of one full telescope as a function of the off-axis angle, as measured during the end-to-end test at the Panter facility in München. As it can be seen, up to $12'$ at 1.5 keV the HEW is below $\sim$ 20" (filled circles) and at 8.1 keV it is almost constant at a level of $\sim$ 23" (open circles). Beyond this off-axis angle, the mirror figuring errors dominate, producing almost the same HEW at all energies. The best HEW at 1.5 keV is obtained at $\sim 8'$ off-axis, due to a small displacement in the JET-X focus, introduced to improve the off-axis response. As a general result, the end-to-end calibration tests provided a successful confirmation of all the JET-X performances.

References

Citterio O., et al. (1996), Characteristics of the flight model optics for the JET-X telescope on board the SPECTRUM X-Gamma satellite, Proc. SPIE 2805, 56