EPIC pn Calibration

- Comparison between the FF and eFF mode

- Optical loading

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Detector noise in eFF and FF mode

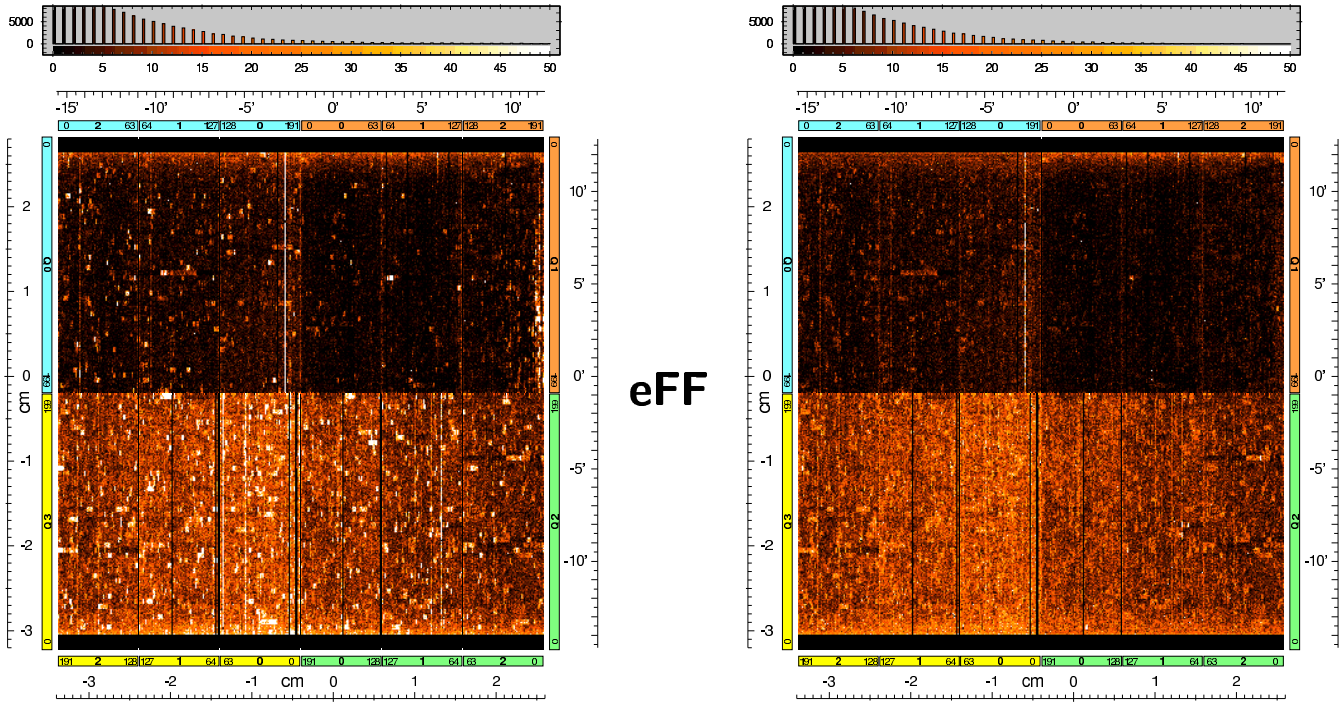

Fig. 1. Image of all photons with 20 .. 30 adu accumulated during 16 289 s in the eFF closed exposure 0537_0134521701_PNS005. **Left**: Initial image. **Right**: Image after applying the spatial offset corrections.

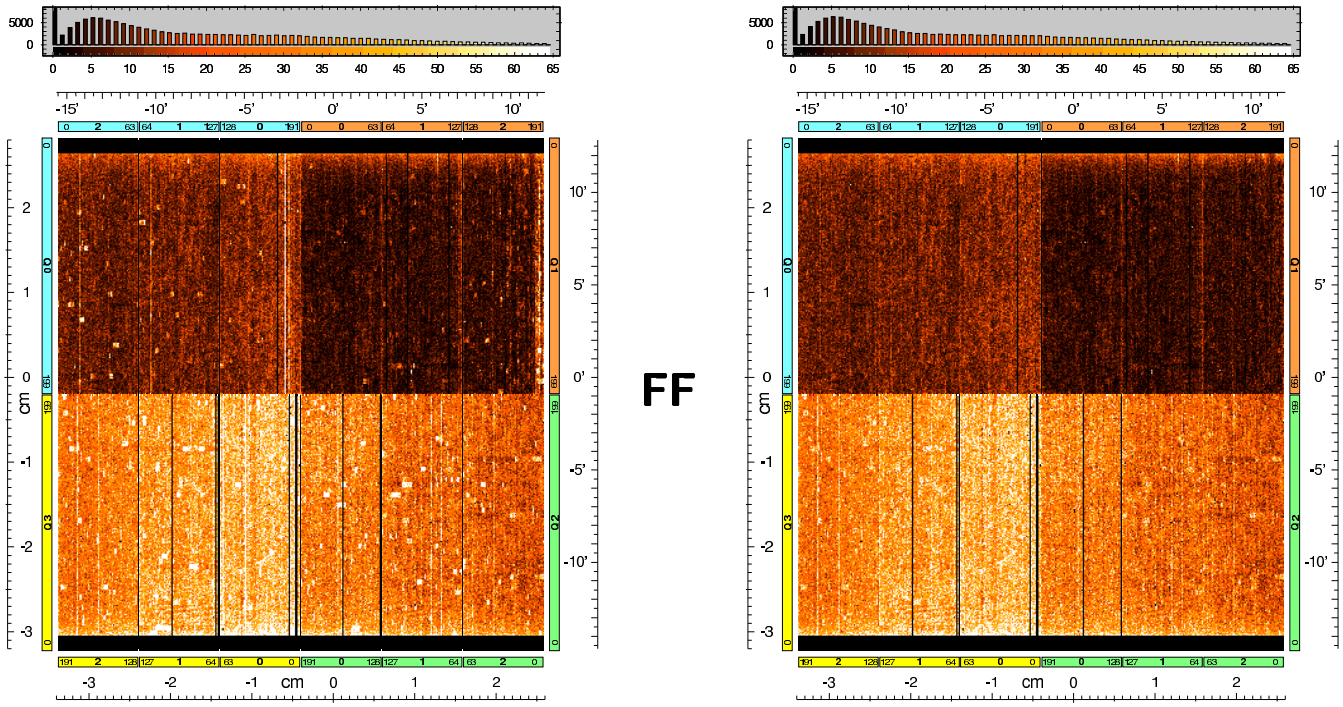

Fig. 2. Image of all photons with 20 .. 30 adu accumulated during 21 048 s in the FF closed exposure 0532_0136540501_PNS008. The intensity scale has been normalized to the same exposure time as in Fig. 1. **Left**: Initial image. **Right**: Image after applying the spatial offset corrections.

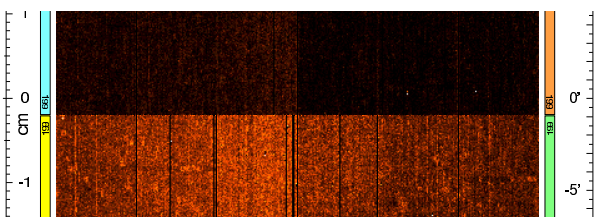

Fig. 3. Same as Fig. 2 right, but with an intensity scale normalized to approximately the same number of frames as in the eFF exposure (Fig. 1).

Detector noise in eFF and FF mode

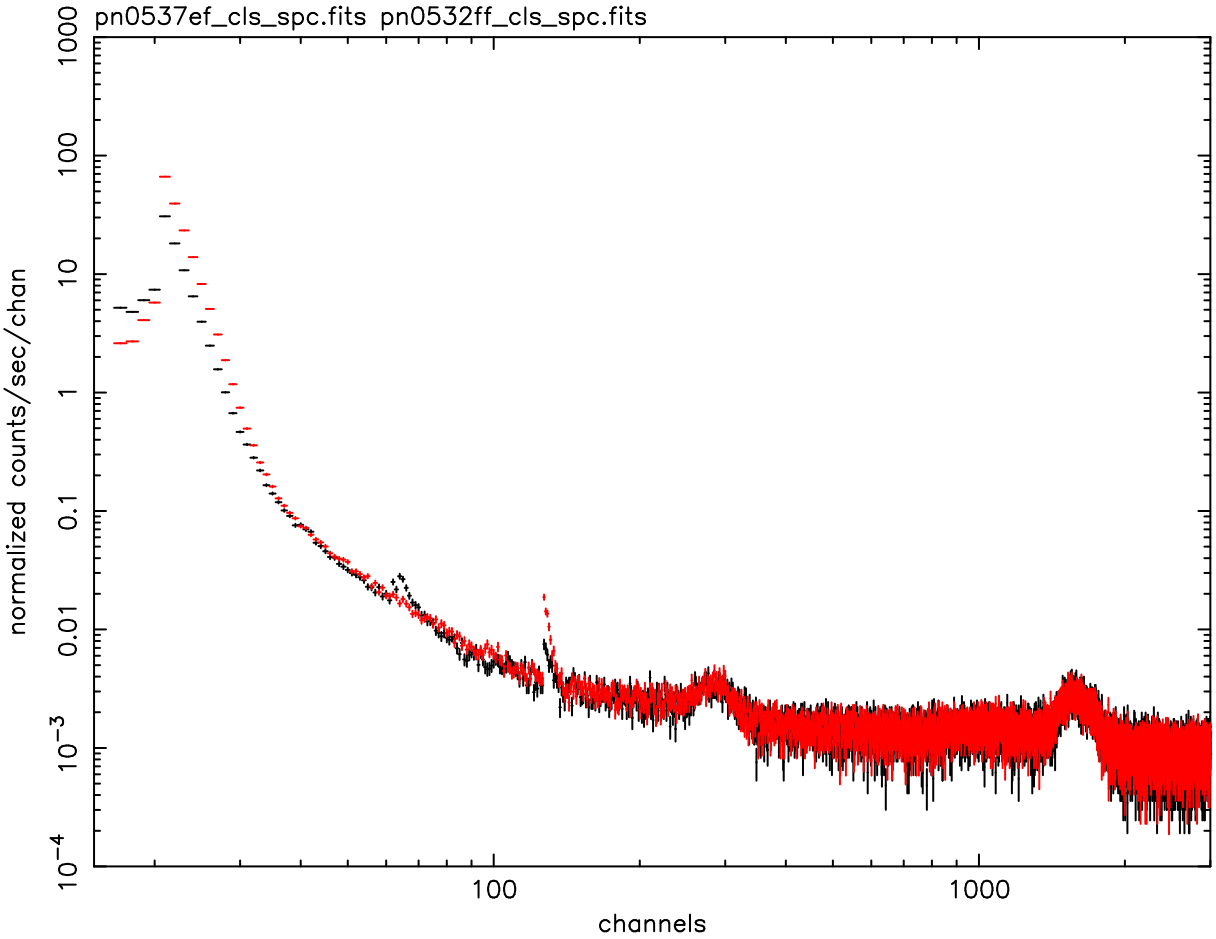

Fig. 4. Comparison of the raw spectra between the FF and eFF mode, normalized to the same exposure time. The eFF detector noise is generally below the FF. Values below 20 adu result from the additional offset correction; the flux drops there because of the reduced number of affected pixels.

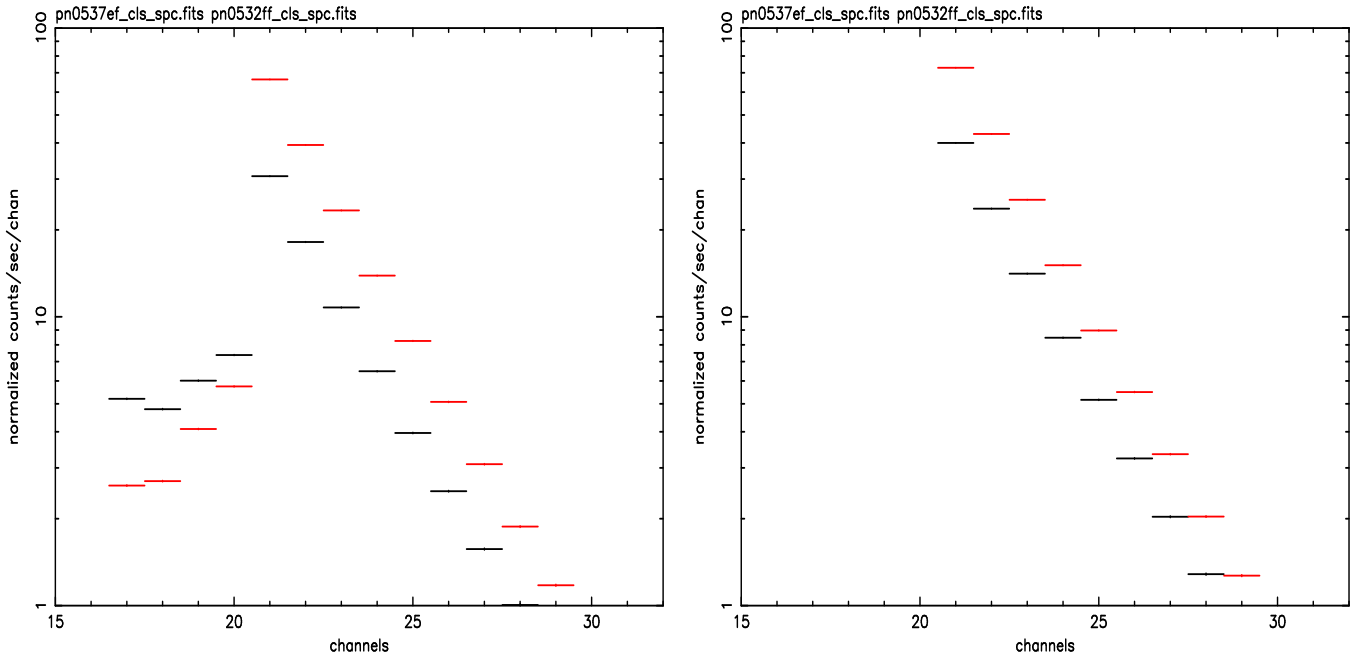

Fig. 5. Left: Enlargement of Fig. 4, showing that the noise in the FF mode is ~ 2.16 times of that in the eFF mode. **Right**: same as left, but without the additional offset correction. In this case the noise in the FF mode would exceed that in the eFF mode by a factor of only ~ 1.85.

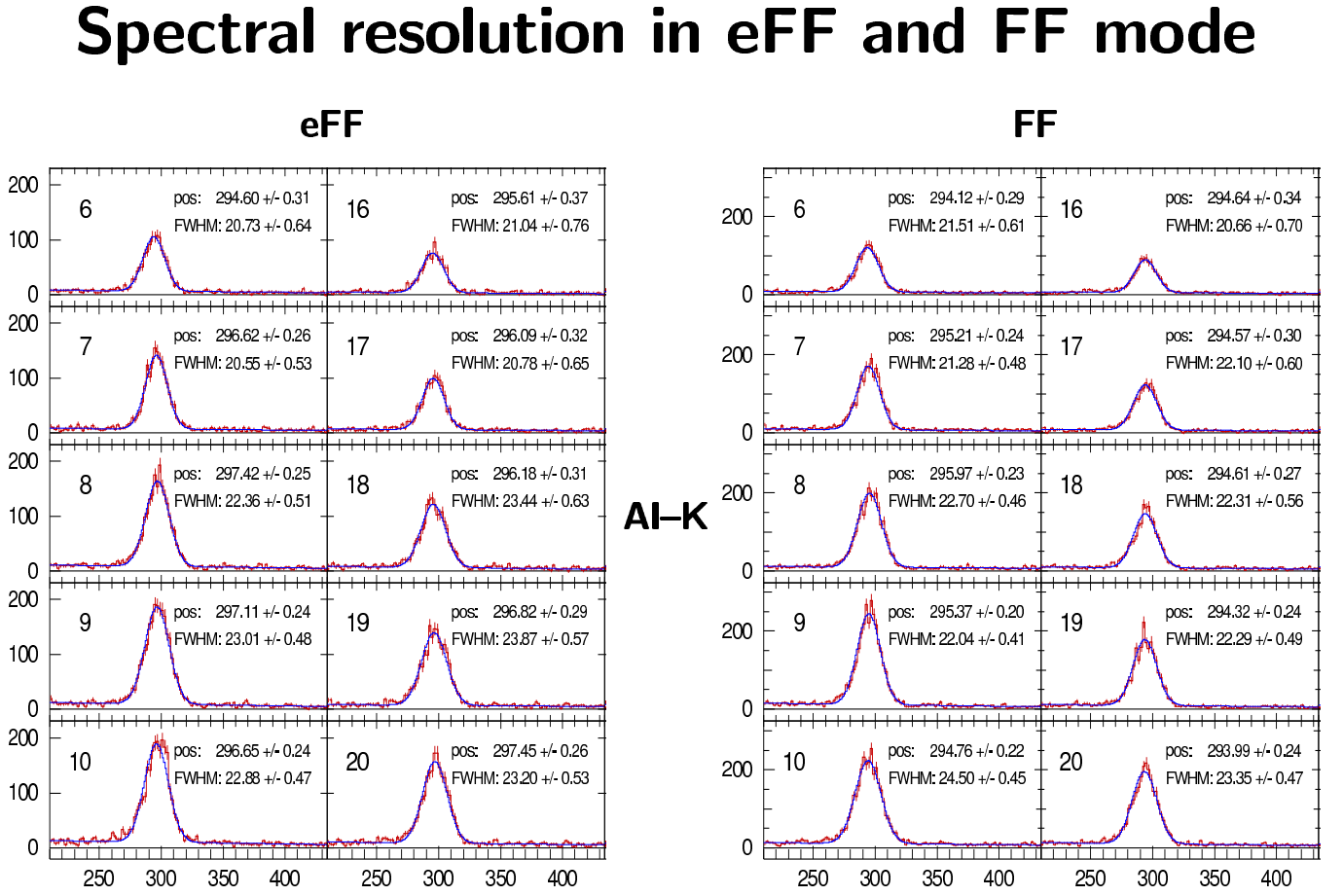

Fig. 6. Spectra of all singles around the Al–K line at 1.486 keV obtained with the internal calibration source during a 18 342 s exposure in **eFF** mode (0388_0107260201_PNS005; left), and during 22 212 s in **FF** mode (0402_0153950201_PNS009; right), without additional offset corrections. Each spectral frame covers 20 rows and 62 columns; the frames at bottom have the maximum distance from the readout nodes. Spectra are shown for CCDs 4 and 5 (from left to right).

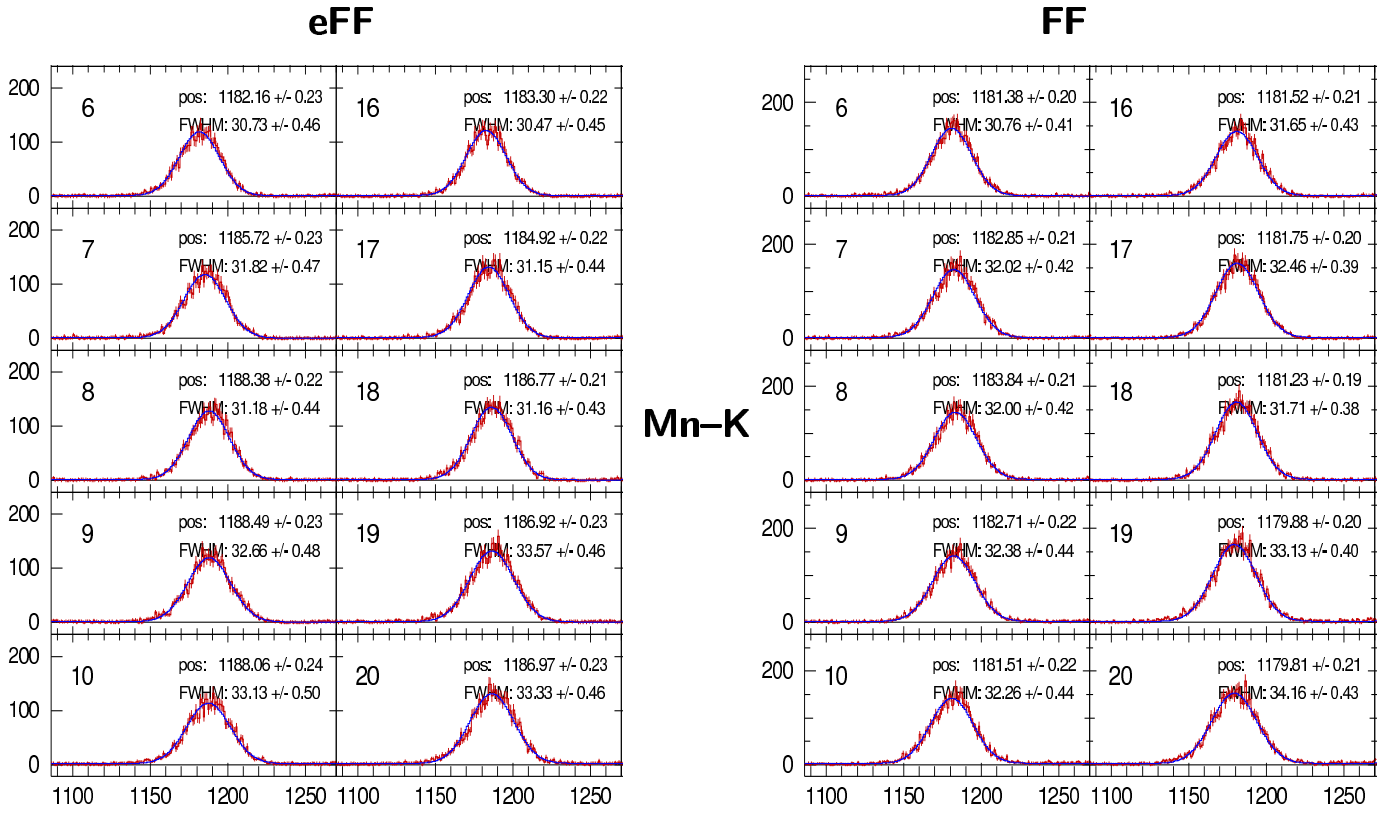

Fig. 7. Same as Fig. 6, but for the Mn–K line at 5.894 keV. There are no significant differences in the energy resolution between both readout modes.

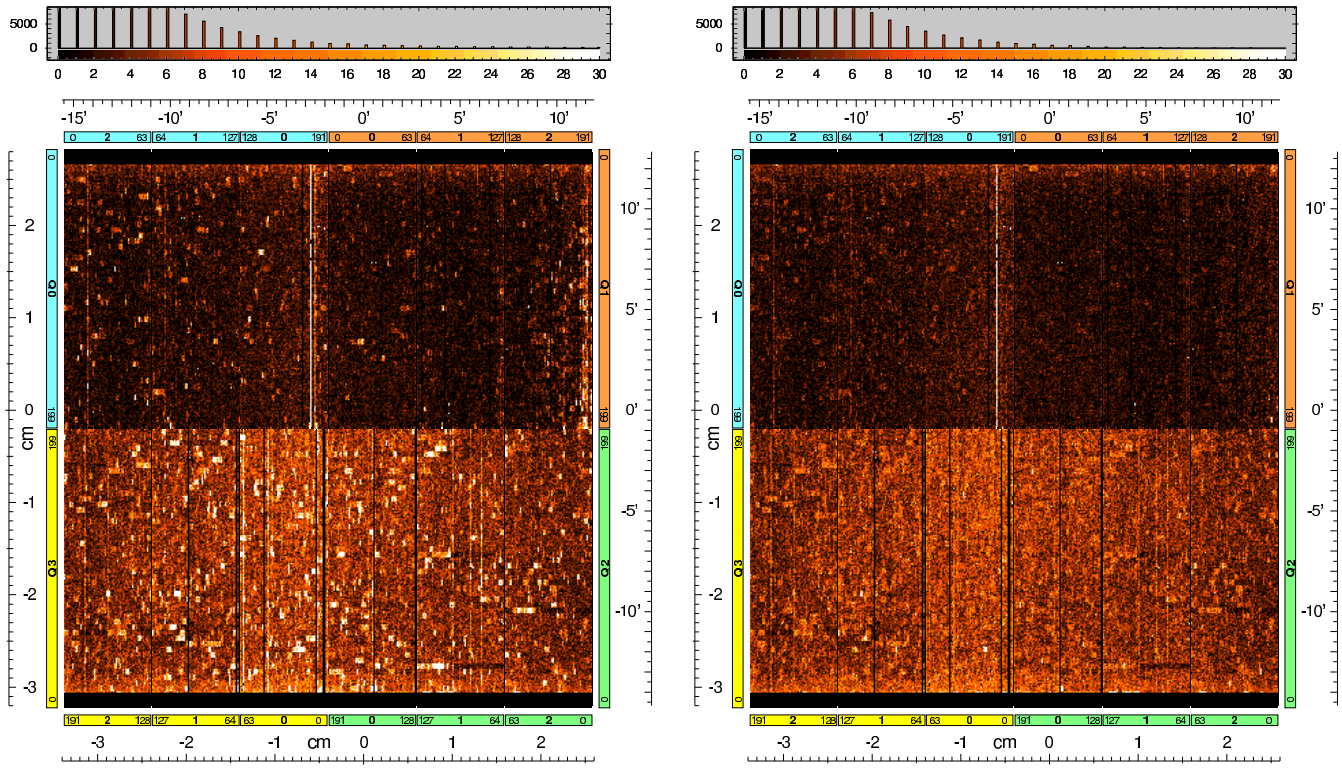

Fig. 8. Image of all photons with 20 adu accumulated during 23 030 s in the **eFF** exposure 'RX J0852-GN' of the Vela SNR (0252_0112870301_PNS003). **Left**: Initial image. **Right:** Image after applying the spatial offset corrections.

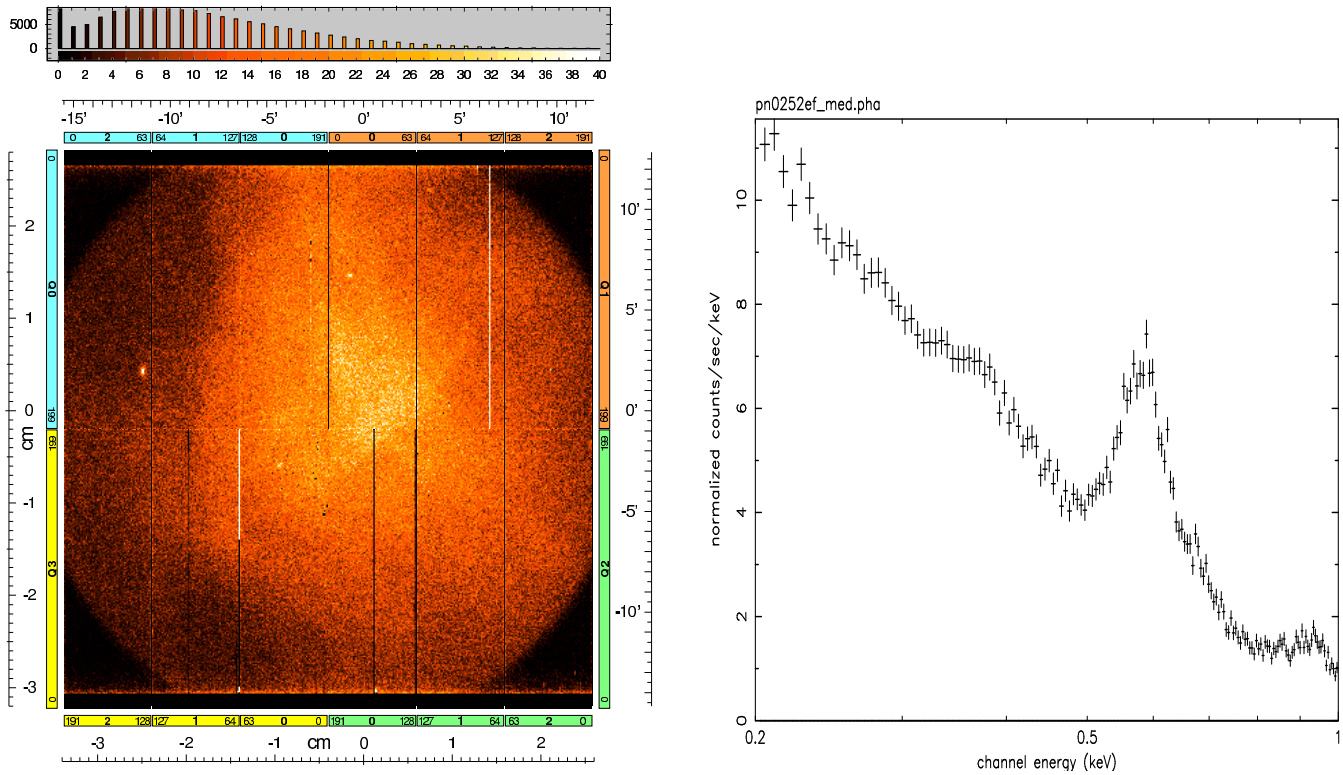

Fig. 9. Left: Image of all photons with 0.2 – 1.0 keV accumulated during 23 030 s in the **eFF** exposure 'RX J0852-GN' of the Vela SNR (0252_0112870301_PNS003), after applying the additional offset corrections. **Right**: Spectra of all singles within 0.2 – 1.0 keV in CCD 4 with $y > 150$.

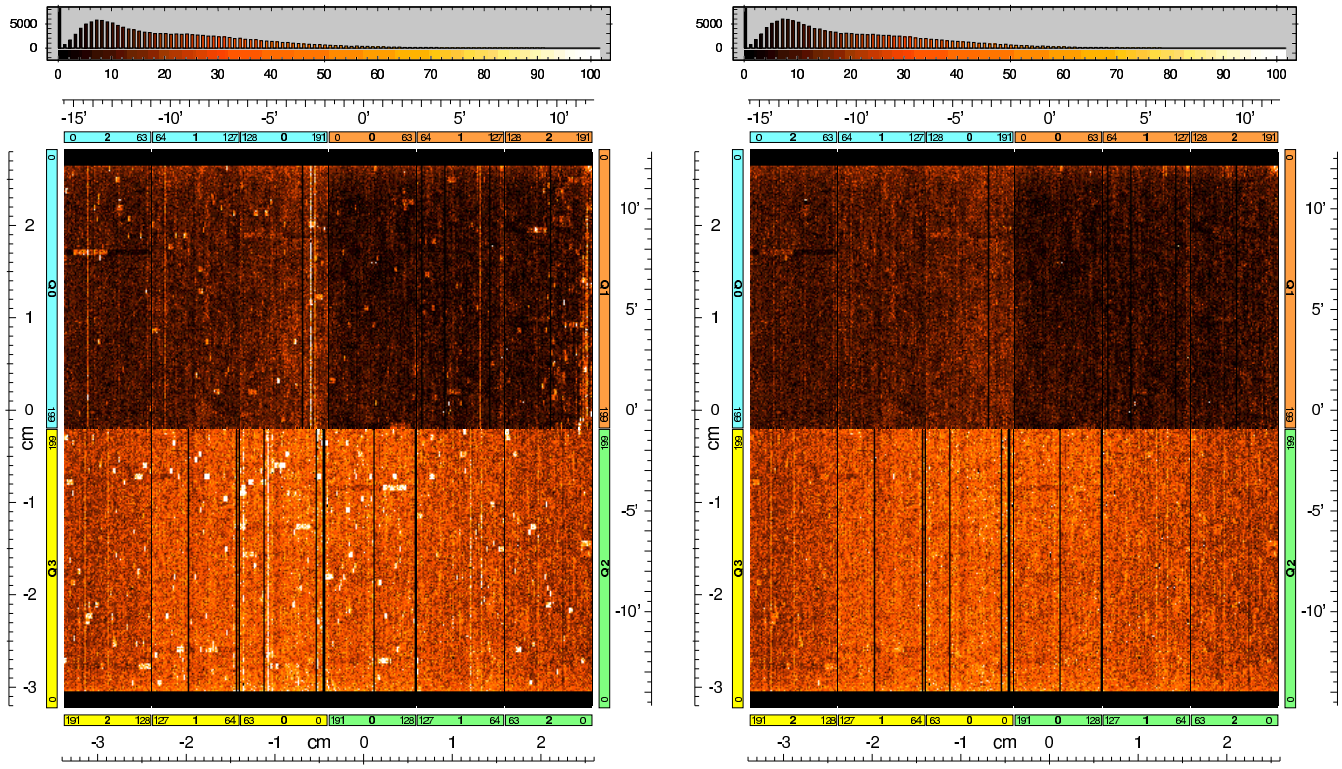

Fig. 10. Image of all photons with 20 adu accumulated during 58 547 s in the **FF** exposure 'RX J0852-GN' of the Vela SNR (0448_0153750701_PNS009). **Left**: Initial image. **Right:** Image after applying the spatial offset corrections.

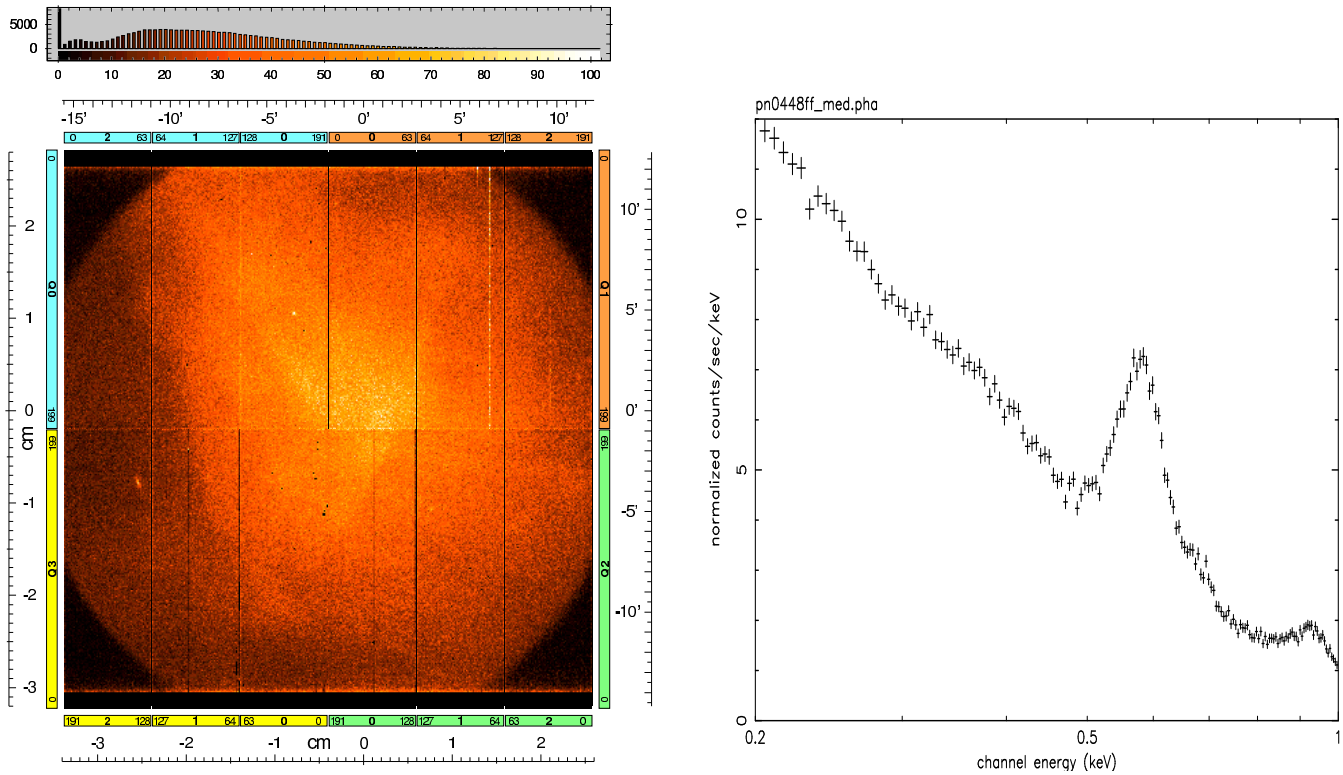

Fig. 11. Left: Image of all photons with 0.2 – 1.0 keV accumulated 58 547 s in the **FF** exposure 'RX J0852-GN' of the Vela SNR (0448_0153750701_PNS009), after applying the additional offset corrections. **Right**: Spectra of all singles within 0.2 – 1.0 keV in CCD 4 with $y > 150$.

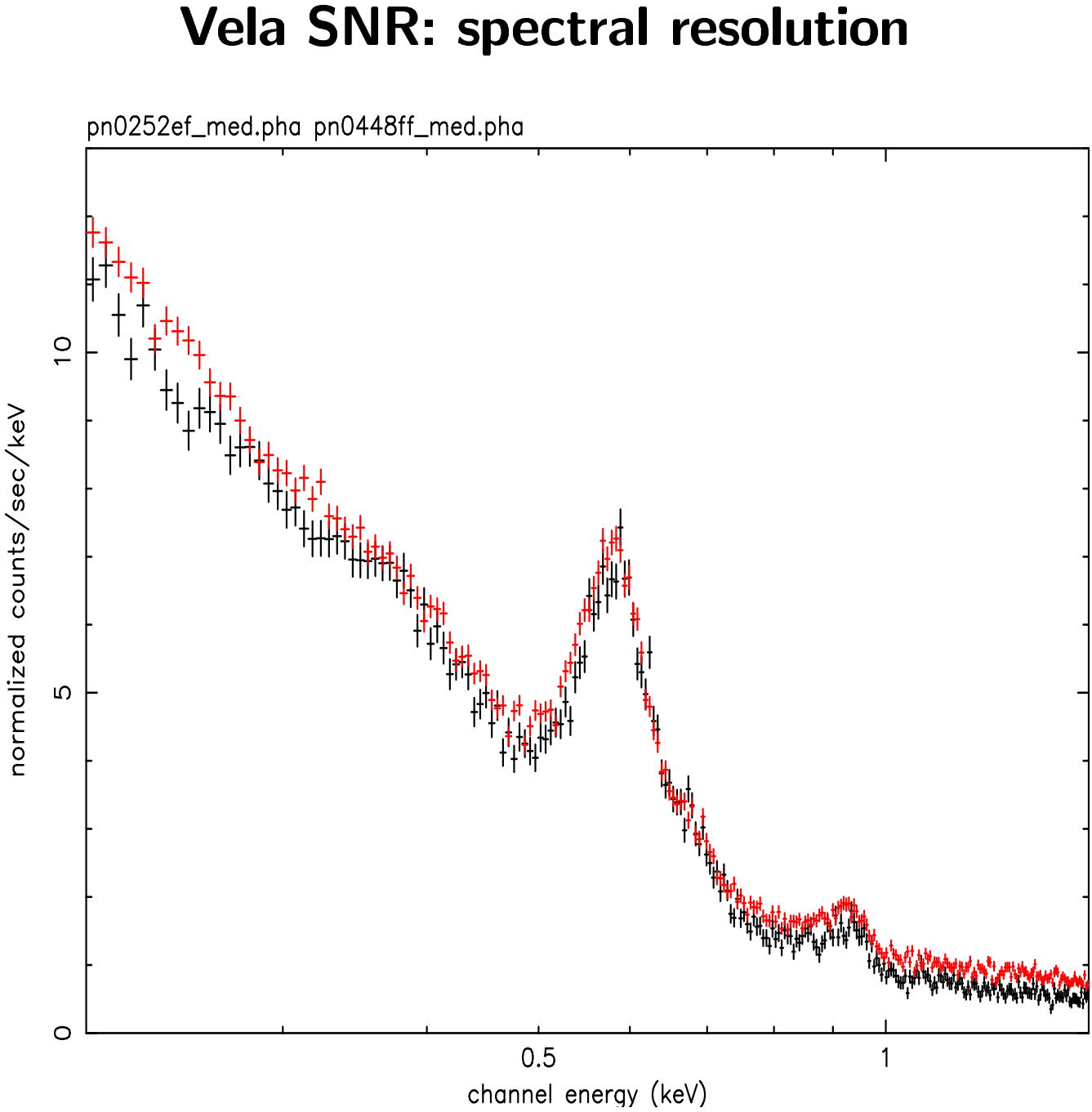

Fig. 12. Direct comparison between the spectra shown in Figs. 9 and 11. The upper (red) data points refer to the FF observation. The FWHM of the eFF observation tends to be somewhat smaller.