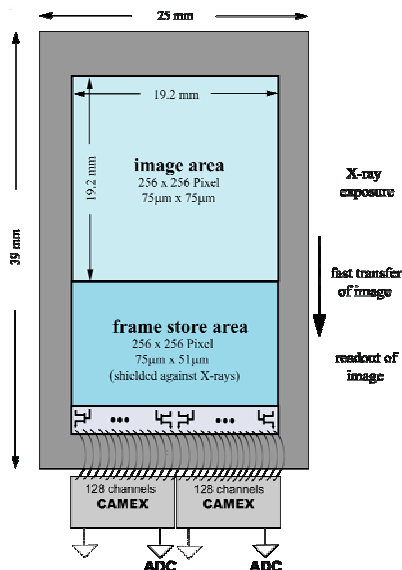
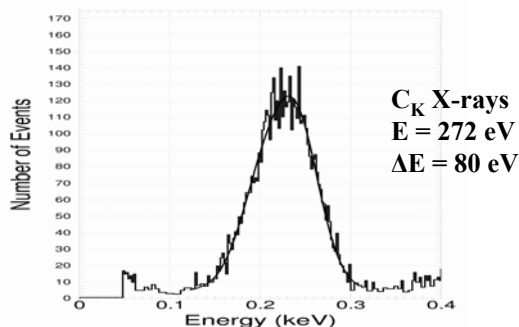


The PN-CCD detector is meanwhile operating for nearly 5 years very successfully on board of the XMM-Newton satellite as focal plane detector. The continuous development of the devices resulted in a 'frame store PN-CCD'. This advanced charge coupled device will be provided for the DUO mission to investigate the questions related to the 'dark energy' problem in astrophysics. The seven flight detectors for DUO are currently produced in the MPI Semiconductor Laboratory, Munich. Pixel sizes, energy bandwidth, frame rates and device formats have been adapted to the scientific requirements of the DUO mission.

The frame store PN-CCD has been developed for single X-ray photon spectroscopy in the energy band from 0.3 keV to 10 keV with high quantum efficiency ( $\geq 90\%$ ), position and unprecedented time resolution. The addition of a frame store to the XMM-Newton PN-CCD allows X-ray photon accumulation in the image area independent of the simultaneous readout of the previous image from the frame store. Tests with the advanced PN-CCD type showed further improved performance with an energy resolution close to the theoretical limits.



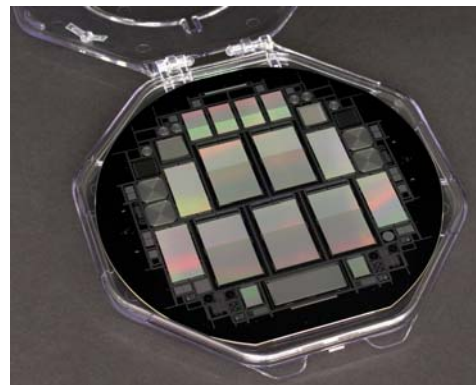
**Figure 1:** Schematic drawing of the frame store PN-CCD detector for DUO.



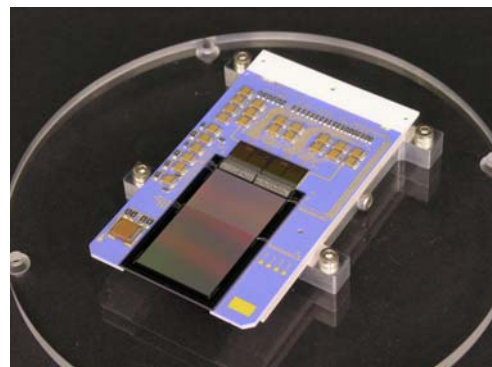
**Figure 2:** Spectrum showing the excellent low energy response of the frame store PN-CCD.

**References:**

- N. Meidinger et al., *CCD Detector Development for the DUO and the ROSITA Mission*, Proc. SPIE 5501, 2004.
- R.E. Griffiths et al., *DUO – The Dark Universe Observatory*, Proc. SPIE 5488, 2004.



**Figure 3:** Frame store PN-CCD wafer of 6 inch diameter fabricated for DUO.



**Figure 4:** CCD detector module for DUO. The board carries the frame store PN-CCD and two 128-channel CAMEX analog signal processors for the parallel readout of the 256 CCD channels.