

The MOS internal background

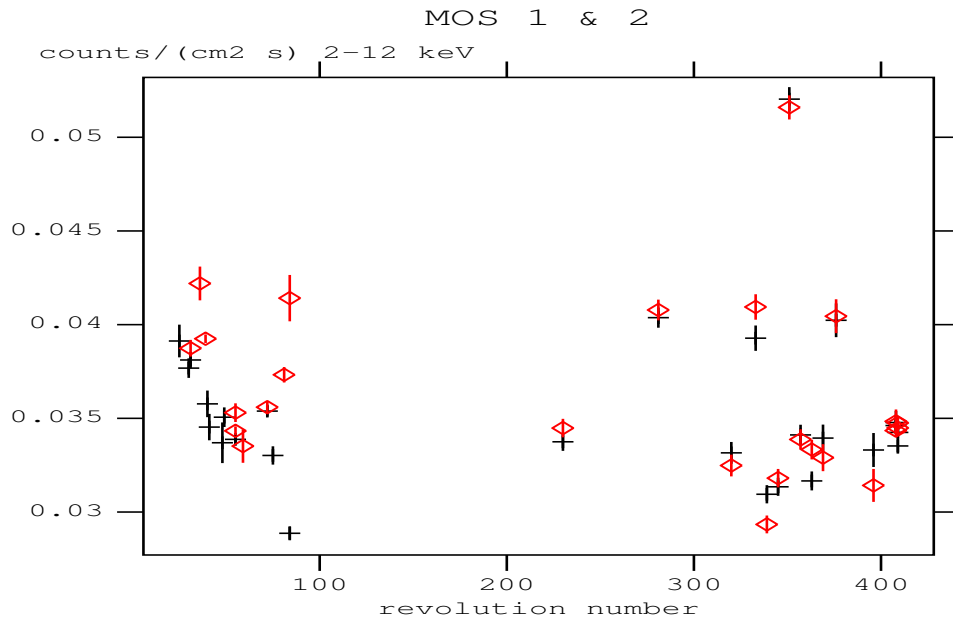
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Milano

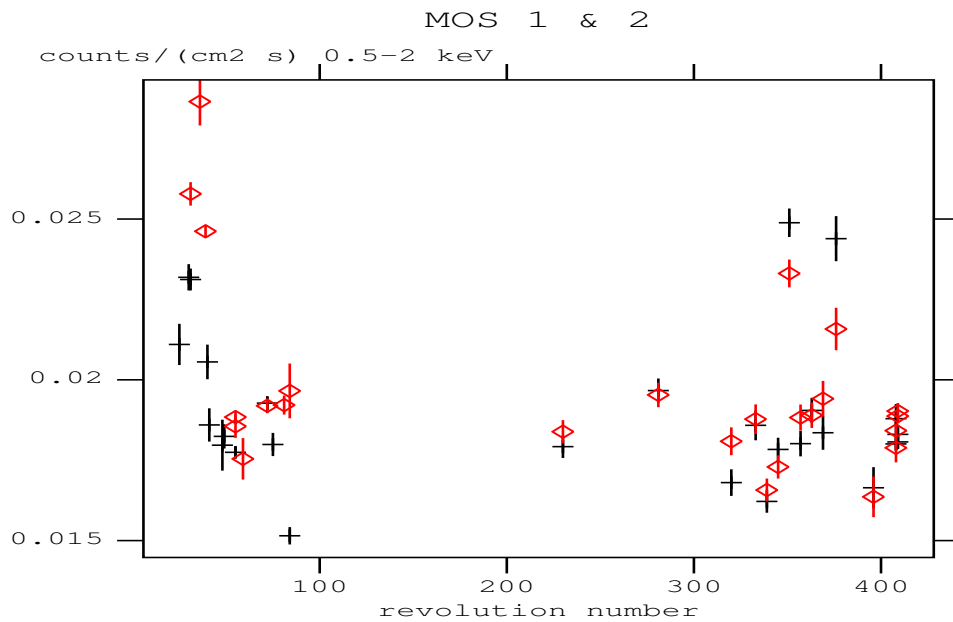
Overview of the presentation

1. Temporal behaviour of MOS internal bkg:
the spectral shape
2. Are CLOSED observations representative
of the actual internal bkg ?
3. Calibration of the vignetting curve using the CXB:
a feasibility study

MOS internal bkg temporal behaviour

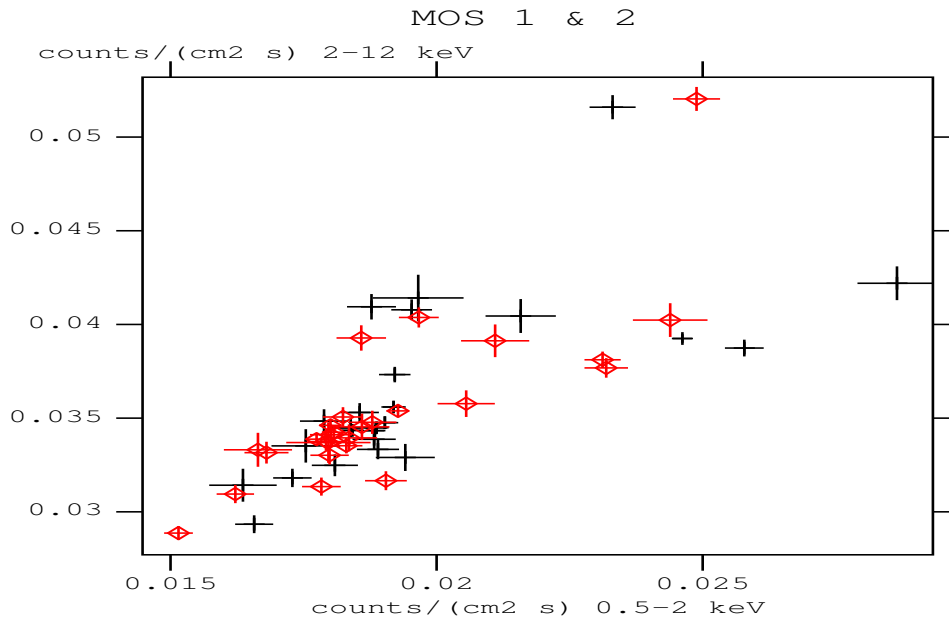


Light curve of the continuum component



Light curve of the fluorescence component (Al-K and Si-K)

MOS internal bkg temporal behaviour

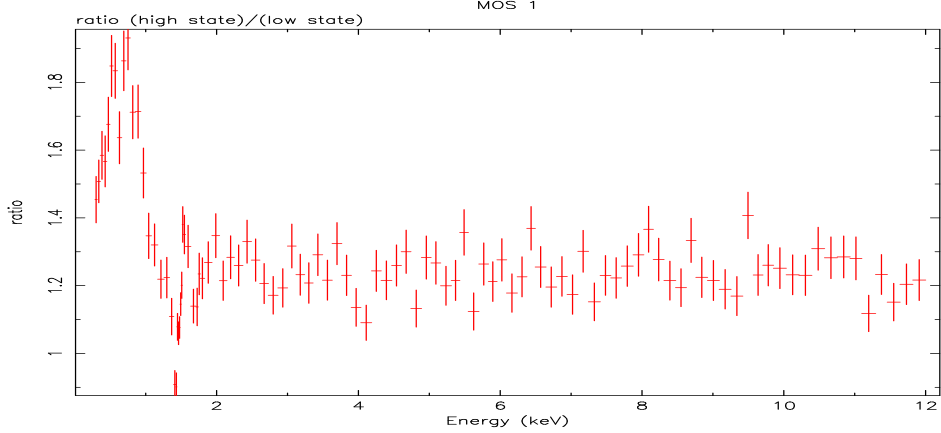
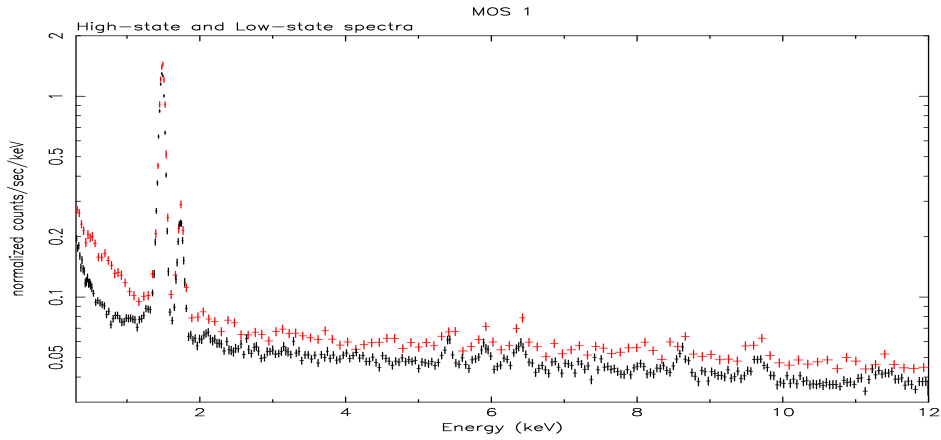


Correlation (fluorescence) vs. (continuum)

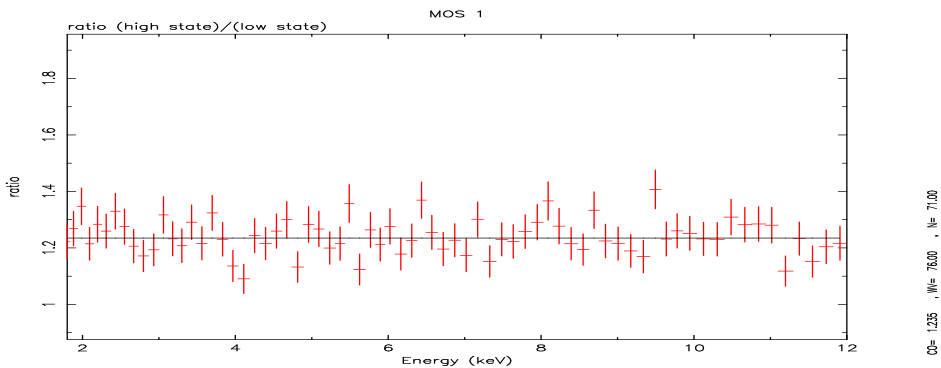
- Variation of 30 ÷ 50 % in intensity for both continuum and lines
- Variations of continuum and line intensity are rather uncorrelated
- What happens to the internal bkg spectral shape?

We studied the ratio of closed spectra $\frac{high-state}{low-state}$

MOS internal bkg temporal behaviour

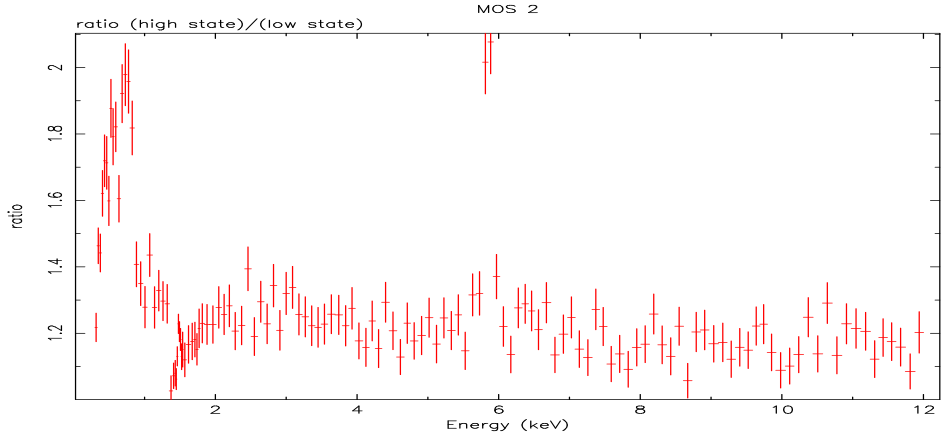
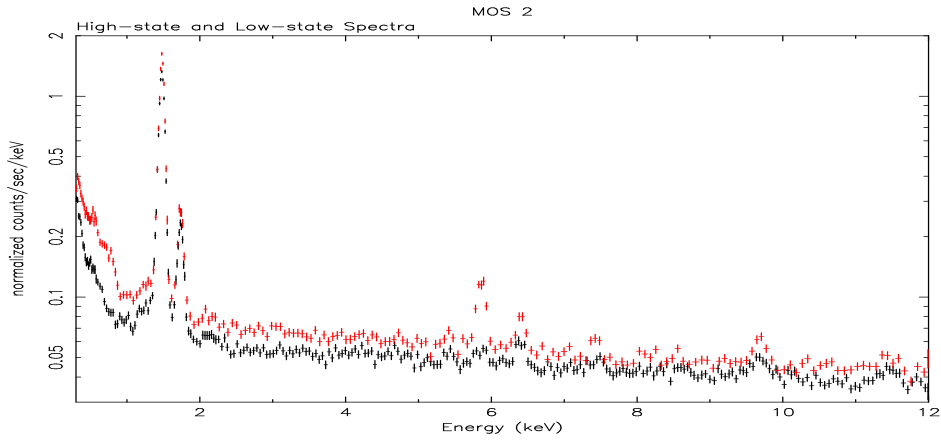


Ratio $\frac{\text{High state}}{\text{Low state}}$ for MOS 1

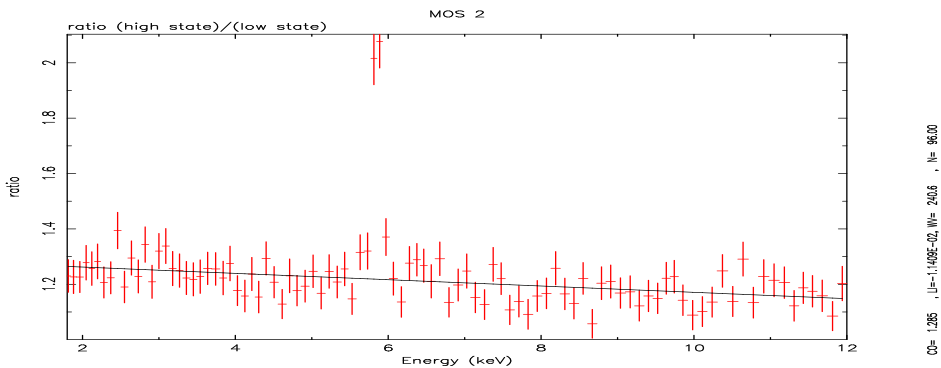


- Ratio *constant* in the 2÷12 band; $c = 1.23 \pm 0.01$
- Linear fit: slope statistically null; $n = (1 \pm 4) \times 10^{-3}$

MOS internal bkg temporal behaviour

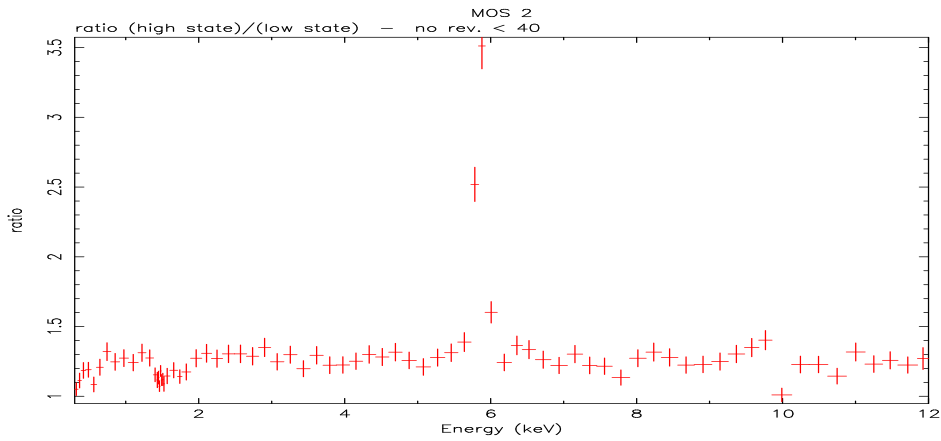
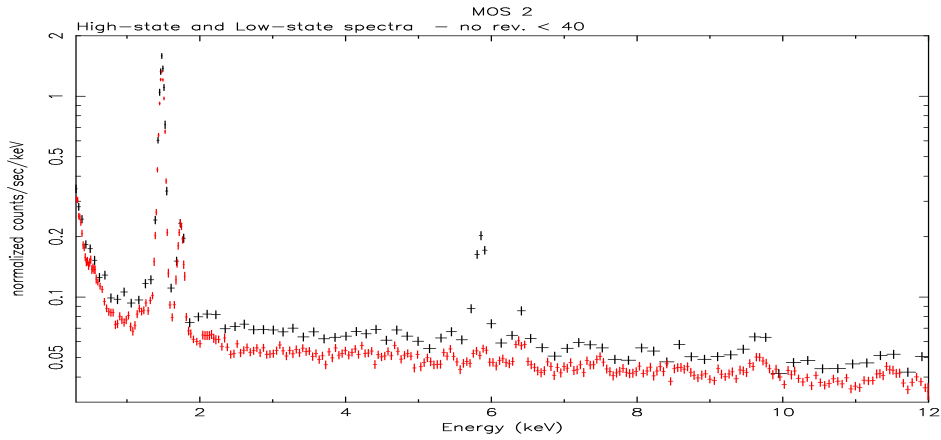


Ratio $\frac{\text{High state}}{\text{Low state}}$ for MOS 2

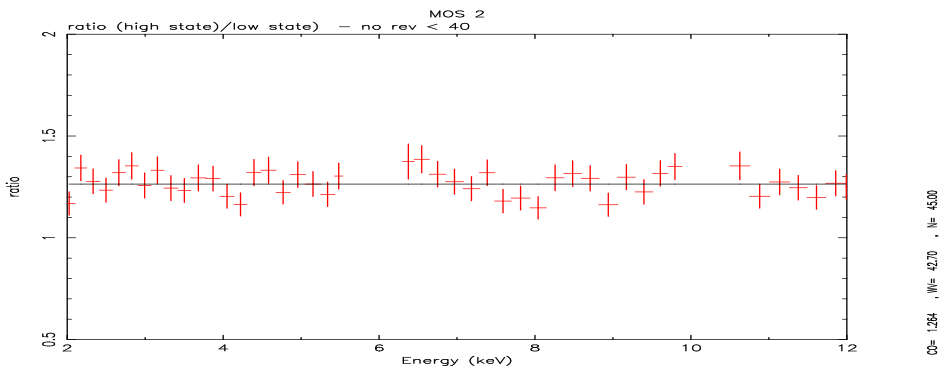


- High state *steeper* ?
- Linear fit: slope $n = (1.1 \pm 0.3) \times 10^{-2}$

MOS internal bkg temporal behaviour



Ratio $\frac{\text{High state}}{\text{Low state}}$ for MOS 2 — no rev. < 40



- Ratio *constant* in the 2÷12 band; $c = 1.20 \pm 0.01$
- Linear fit: slope statistically null; $n = (2 \pm 5) \times 10^{-3}$

Closed obs. vs. internal bkg



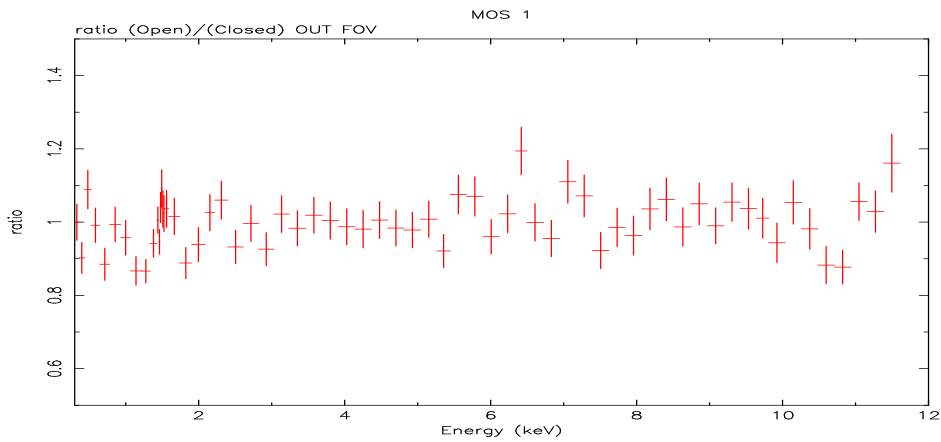
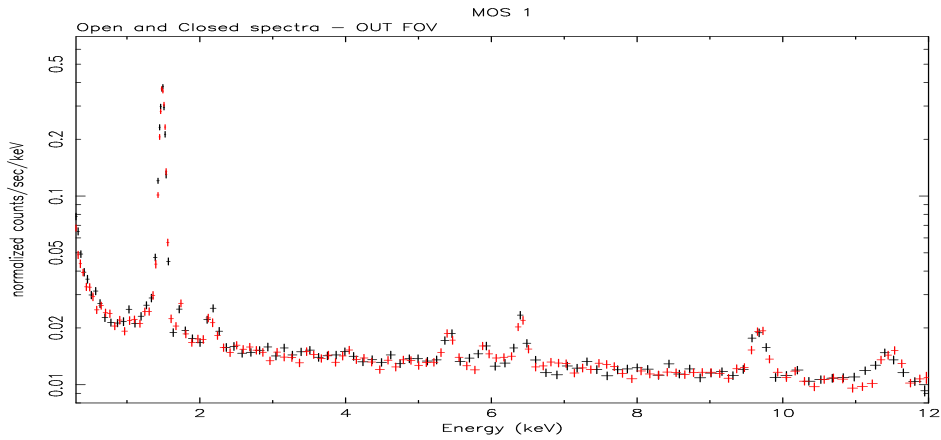
Out of FOV region

- Are the CLOSED obs. representative of the *actual* internal bkg ?

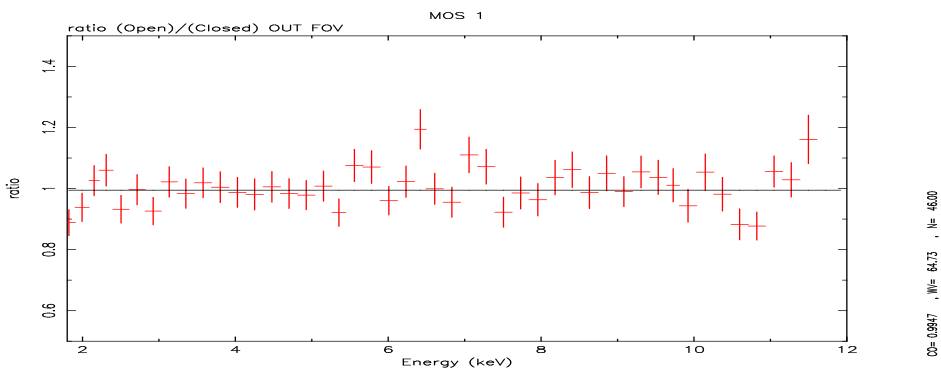
We extracted spectra from the region OUT FOV

We studied the ratio $\frac{Open}{Closed}$

Closed obs. vs. internal bkg

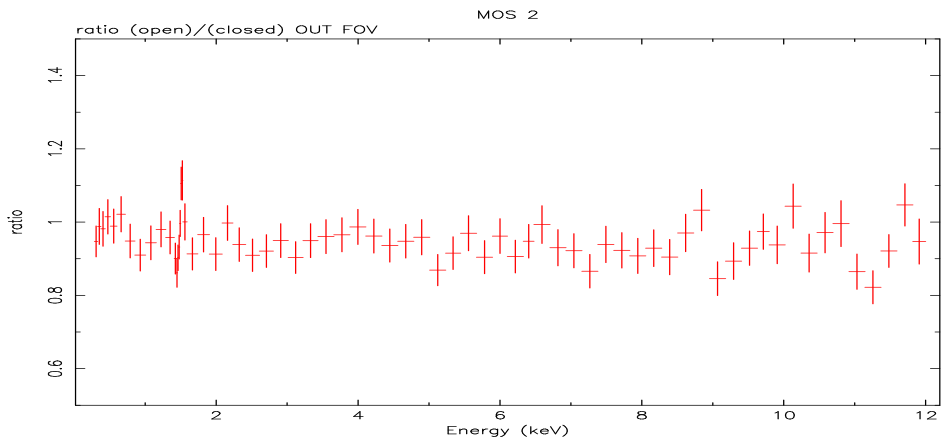
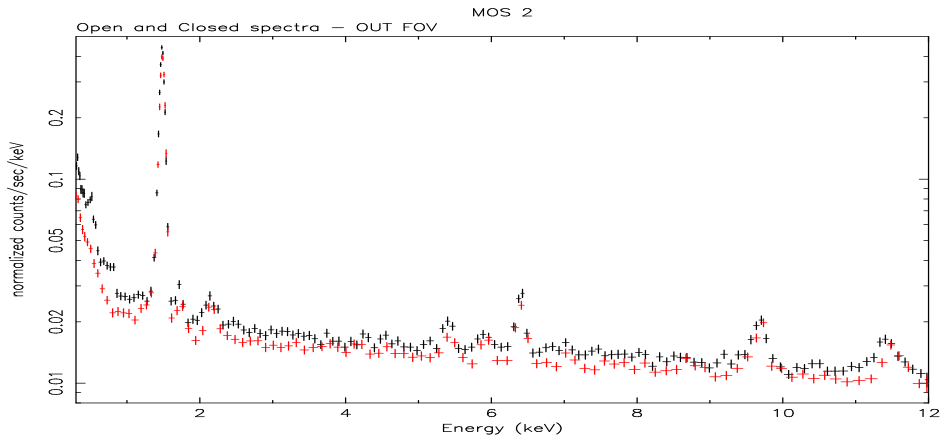


Ratio $\frac{open}{closed}$ OUT FOV for MOS 1

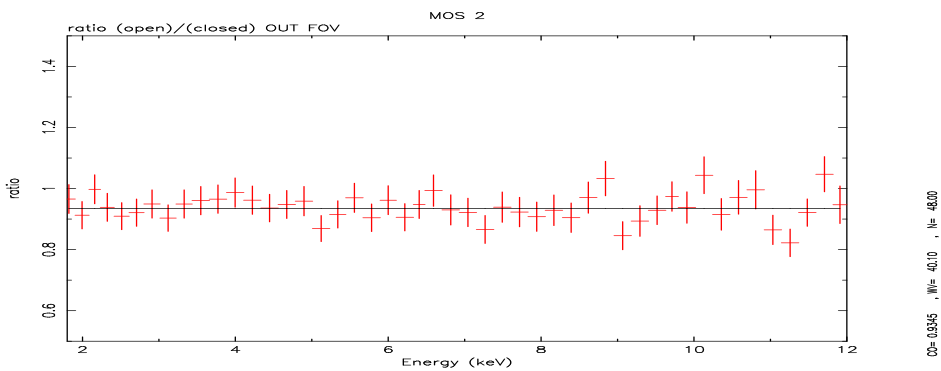


- Ratio *constant* in the 2÷12 band; $c = 0.99 \pm 0.01$
- Linear fit: slope statistically null; $n = (3 \pm 5) \times 10^{-3}$

Closed obs. vs. internal bkg



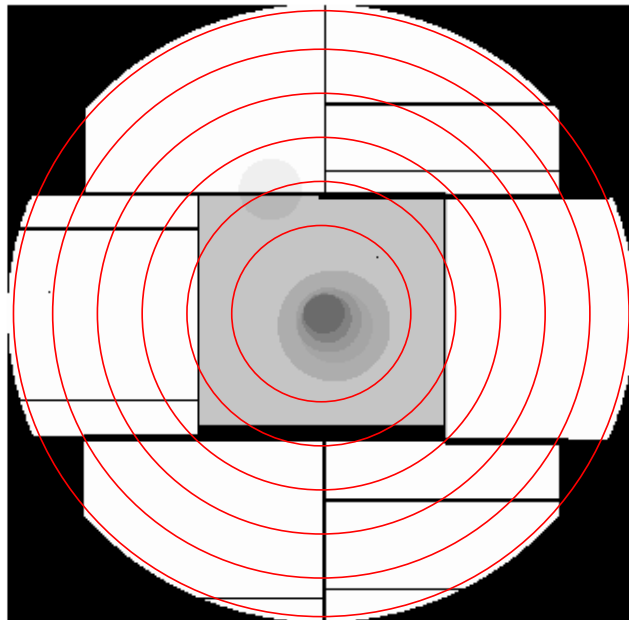
Ratio $\frac{open}{closed}$ OUT FOV for MOS 2 - no rev < 40



- Ratio *constant* in the 2÷12 band; $c = 0.94 \pm 0.01$
- Linear fit: slope statistically null; $n = (-2 \pm 4) \times 10^{-3}$

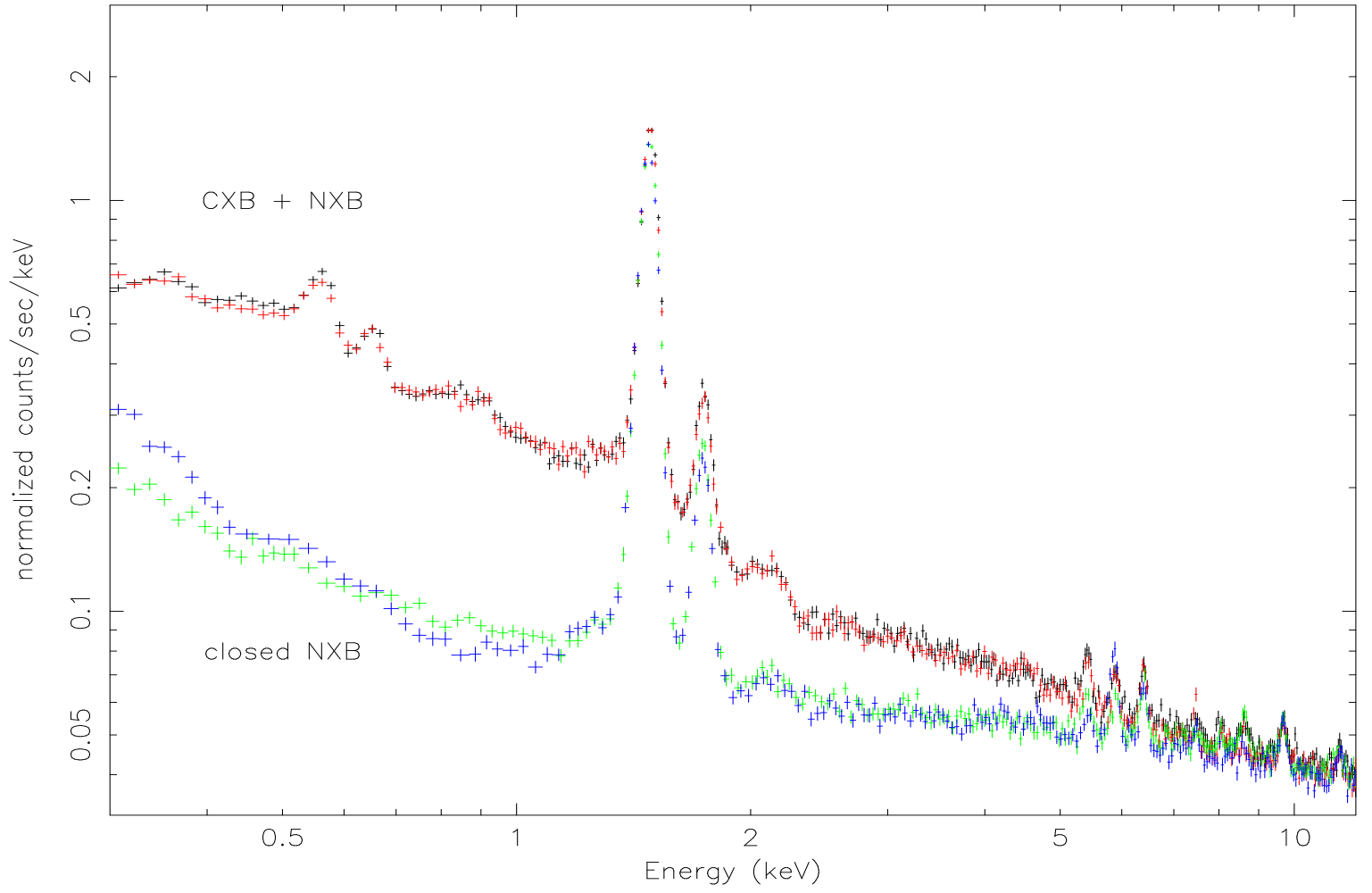
MOS vignetting curve

- Set of high galactic latitude fields
- For each obs: Hot pixel rejection; ad-hoc GTI filtering
- Merged dataset: ≈ 300 ks for MOS1 and MOS2
- We computed the count rate 0.7–1.0 keV (high signal–to–noise) in annular regions
 - corrected for vignetting
 - internal bkg–subtracted
- The resulting Count–rate vs. radius curve should be *flat* if the vignetting curve is well known

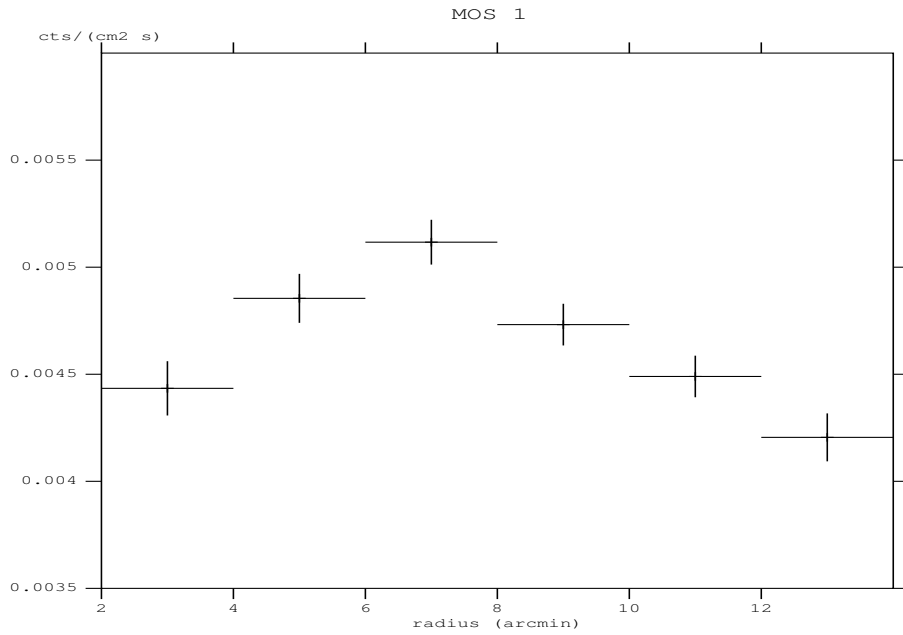


The annular regions superposed on the exposure map
for the MOS1 dataset

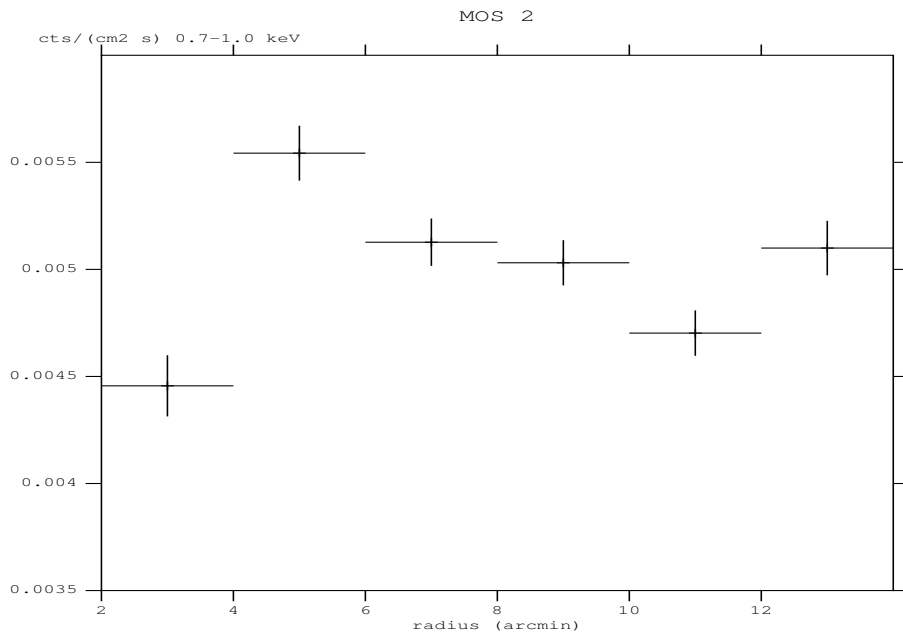
MOS 1 and MOS 2



MOS vignetting curve

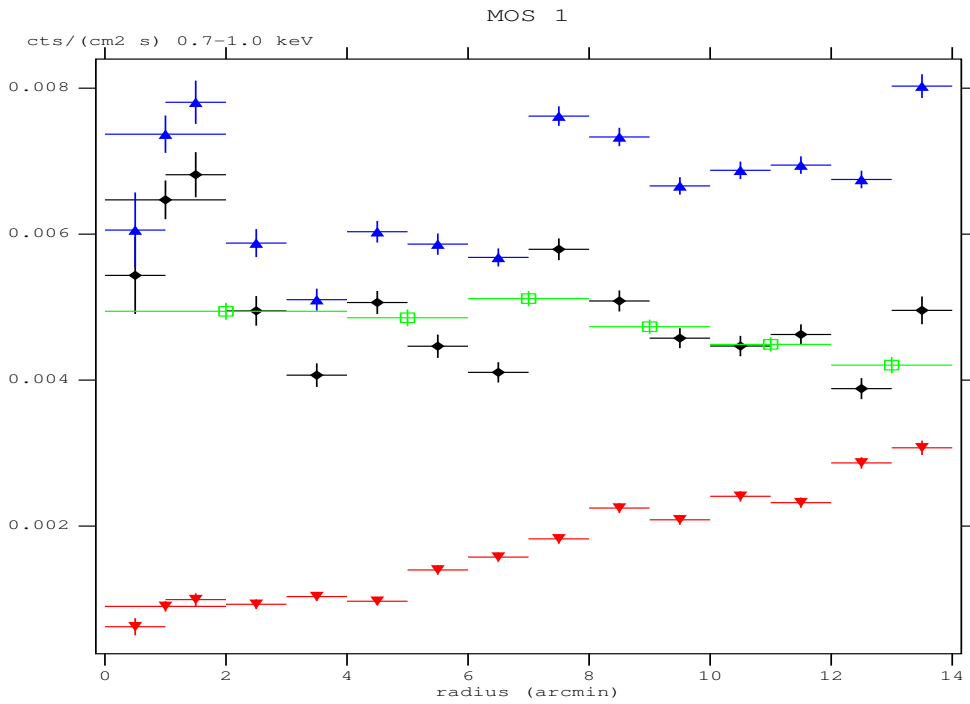


Residual vignetting in 0.7-1.0 keV for MOS 1



Residual vignetting in 0.7-1.0 keV for MOS 2

MOS vignetting curve



On smaller angular scales fluctuations induced by sources

More statistics needed

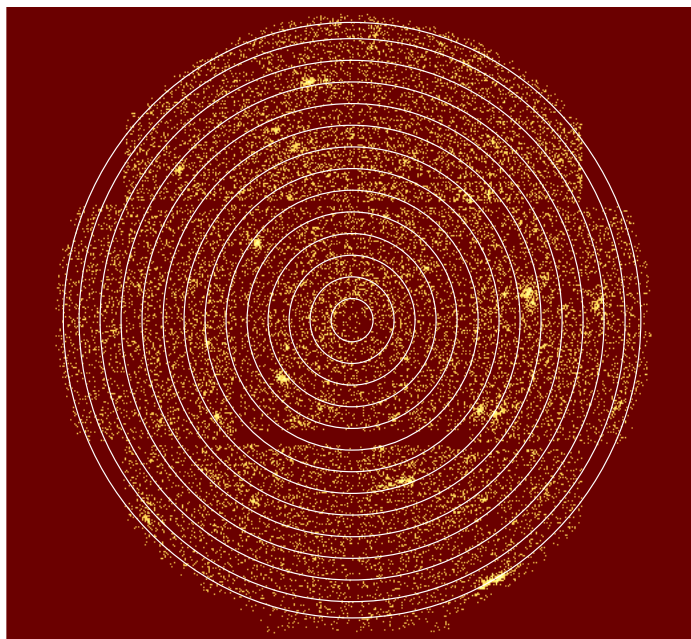
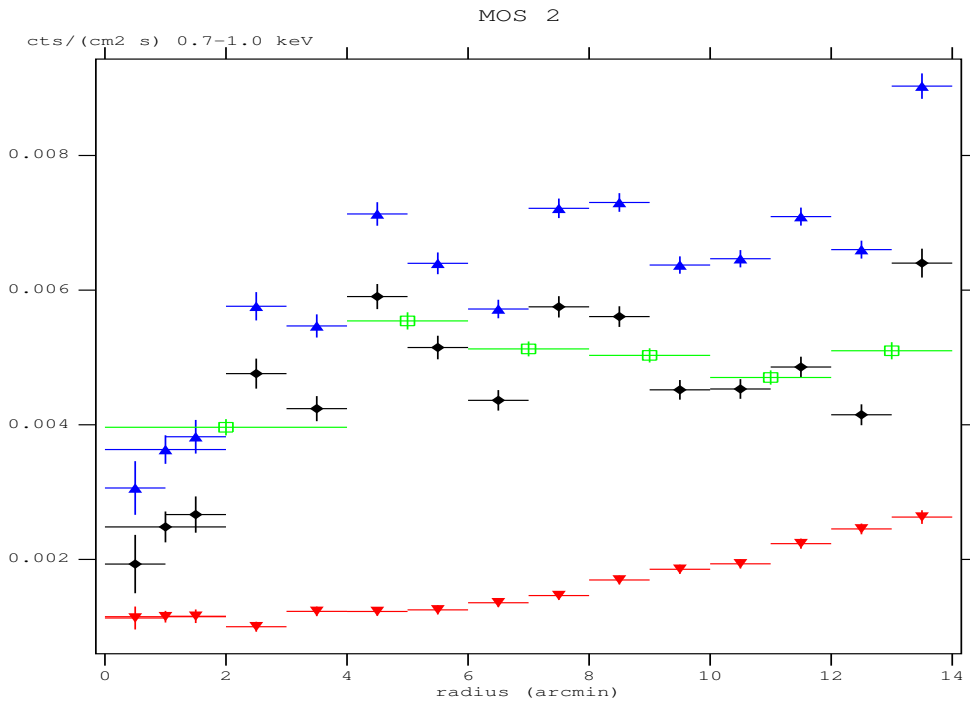


Image in 0.7-1.0 keV for MOS 1

MOS vignetting curve



On smaller angular scales fluctuations induced by sources

More statistics needed

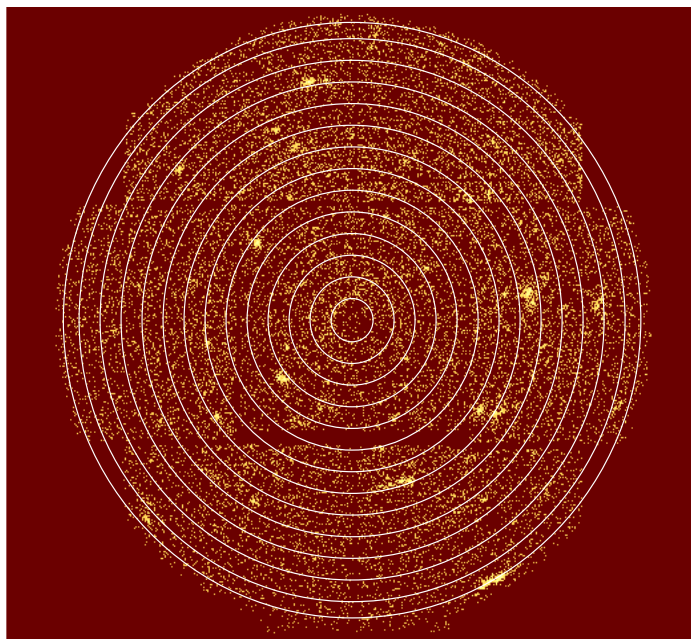


Image in 0.7-1.0 keV for MOS 2

Conclusions

1. Temporal behaviour of MOS internal bkg:
 - Strong variations in intensity (30–50%)
 - Variations of line and continuum uncorrelated
 - The shape of the continuum **is constant**
2. CLOSED observations vs. internal bkg
 - Analysis of OUT FOV evts for both Open and Closed obs.
 - Variations of line intensity
 - The shape of the continuum **is the same**
3. Calibration of the vignetting curve using the CXB
 - Coarse angular scale: **evidence for deviations** (Optical axis offset ?)
 - Further statistics needed, work in progress (increase in statistics by a factor of ≈ 3)