# Update of the XMM calibration status

Presentation for IACHEC II

Lake Arrowhead, CA, USA

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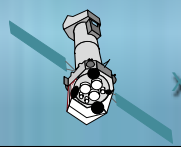
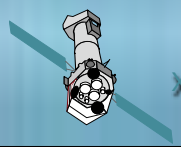
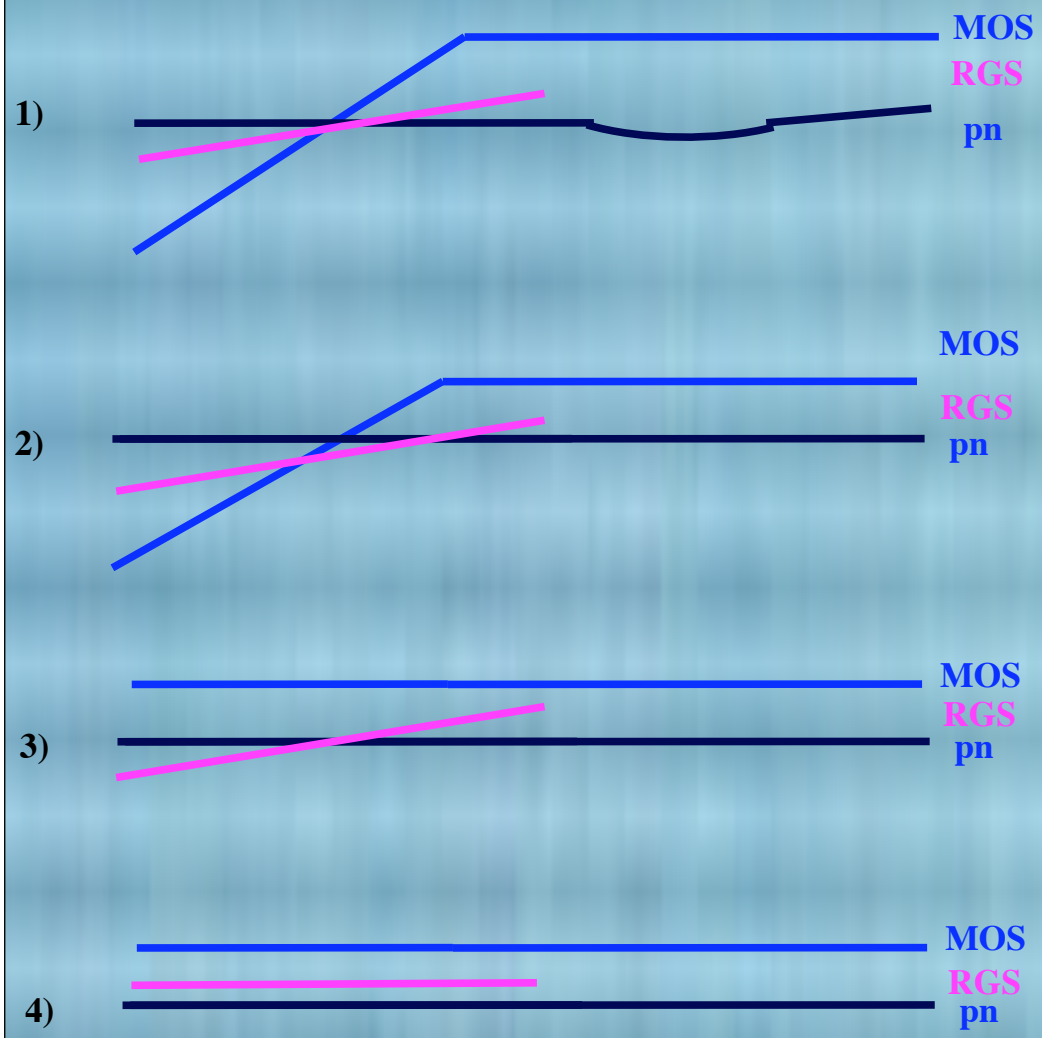


menu

- MOS
  - column dependent CTI/Gain implemented (no details here)
  - planned change of QE
  - planned refinement of rmf
- pn
  - possible FIFO reset correction
  - energy refinements
- RGS
  - refinements of the effective area model
- General
  - off axis PSF



# strategy




1. situation SAS 7.0

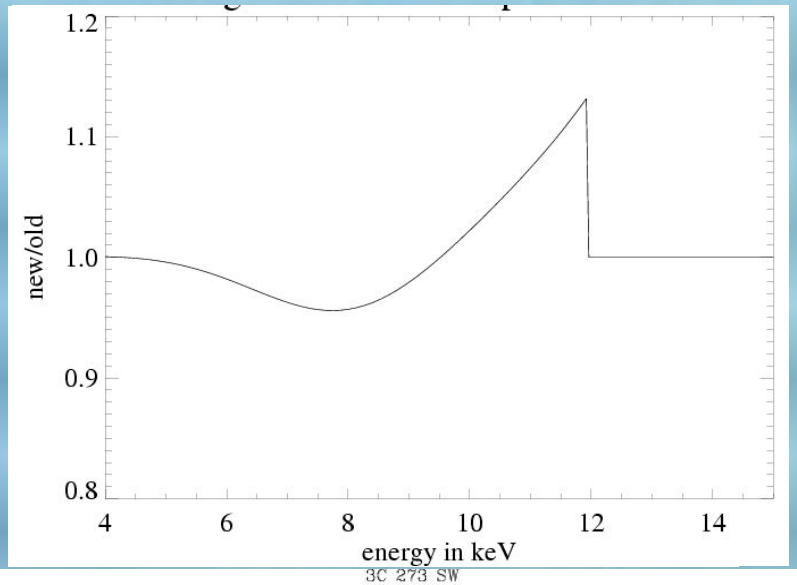
2. Change pn XRT from 6-12

3. Change MOS QE at lower and medium energies

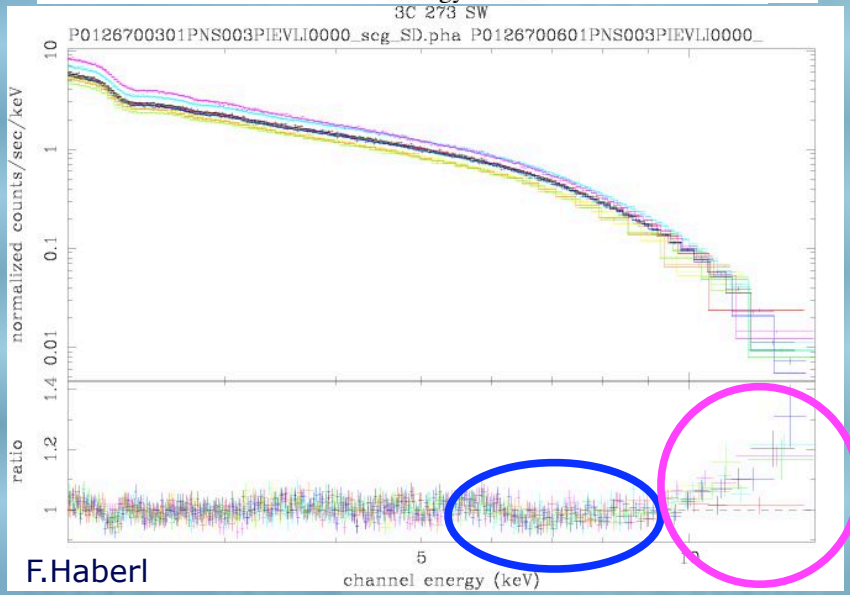
   →That would introduce an overall but energy constant offset in flux of around 6-10 %
   → RGA effect ?
   → absolute normalisation problem from ground cal?
   + FIFO overflow

4. refine RGS time dependent effective area

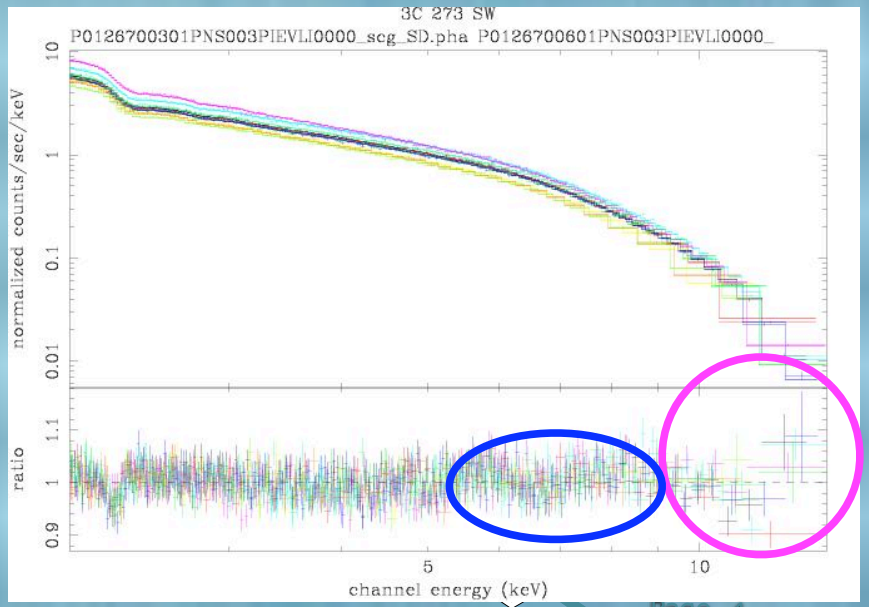
# pn-telescope effective area



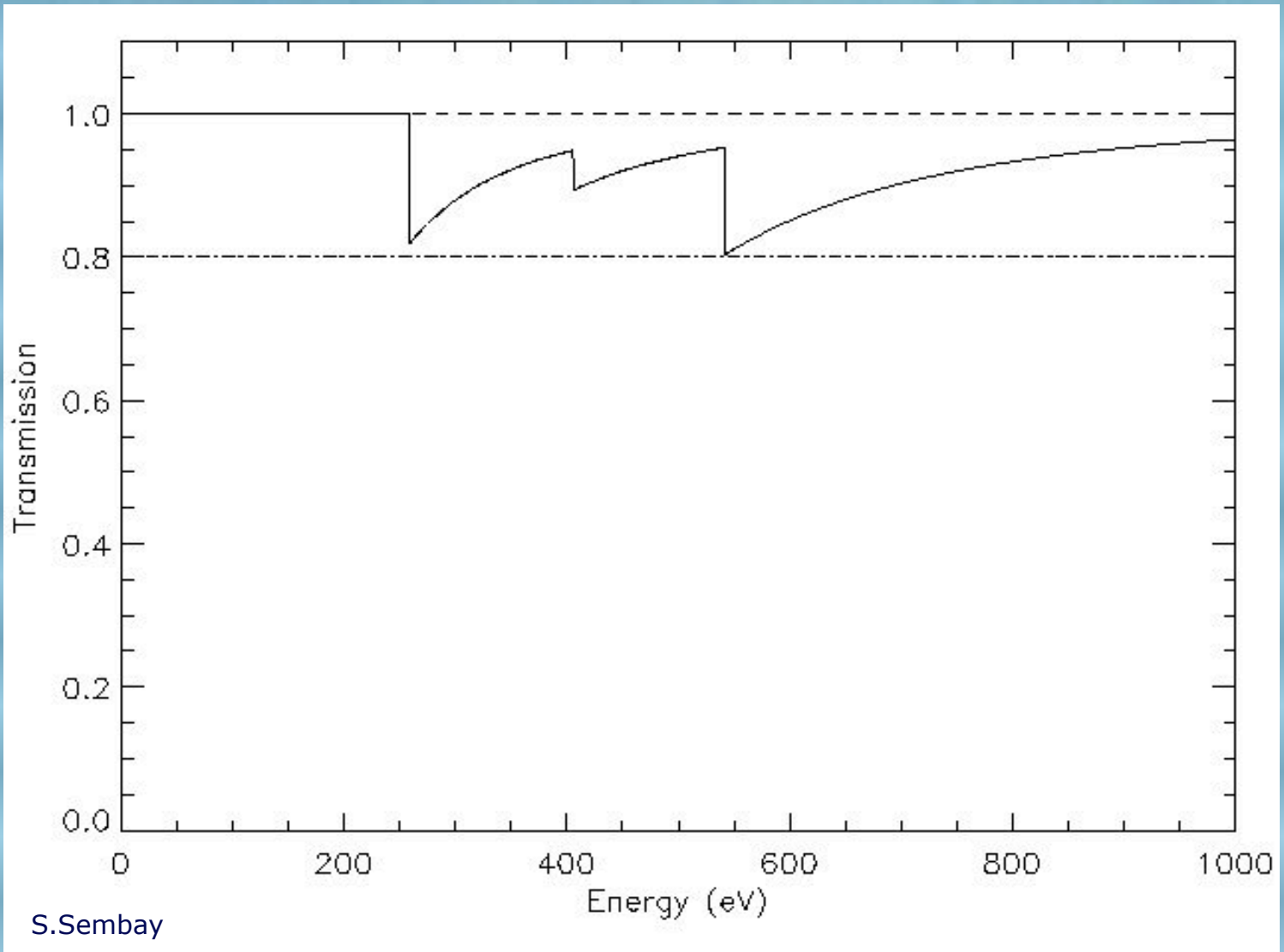

- residuals seen in various sources
- Especially for 3C273 featureless continuum by RXTE
- Reduce residuals around 7 keV and between 9-12 keV for observations with very high statistics
- is not changing high energy slope significantly




F.Haberl



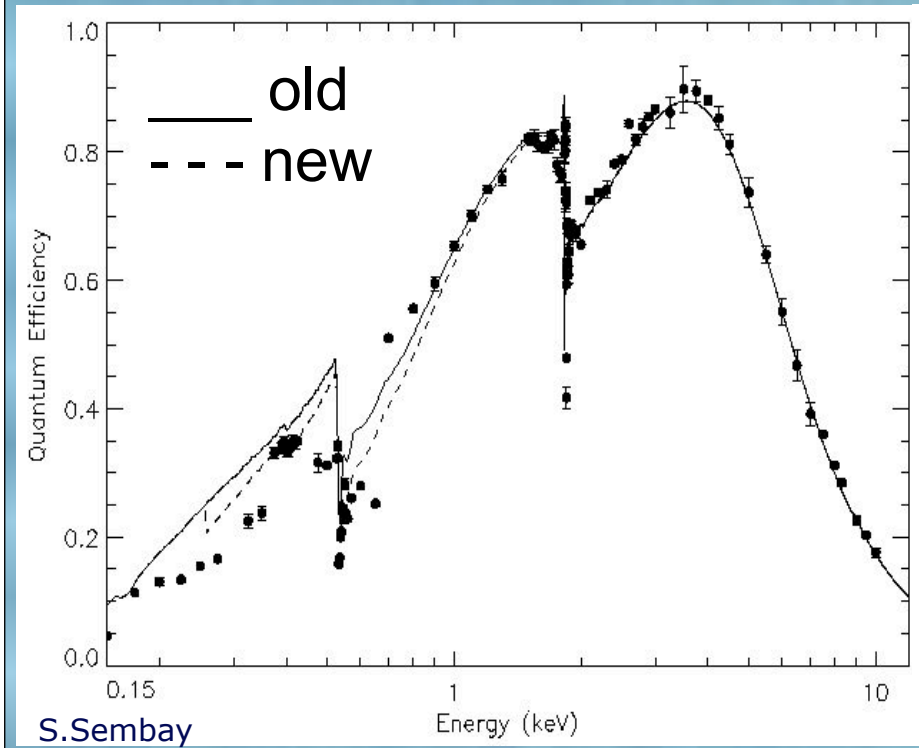
# MOS- adjustment of edges at C, N, O, only




S.Sembay

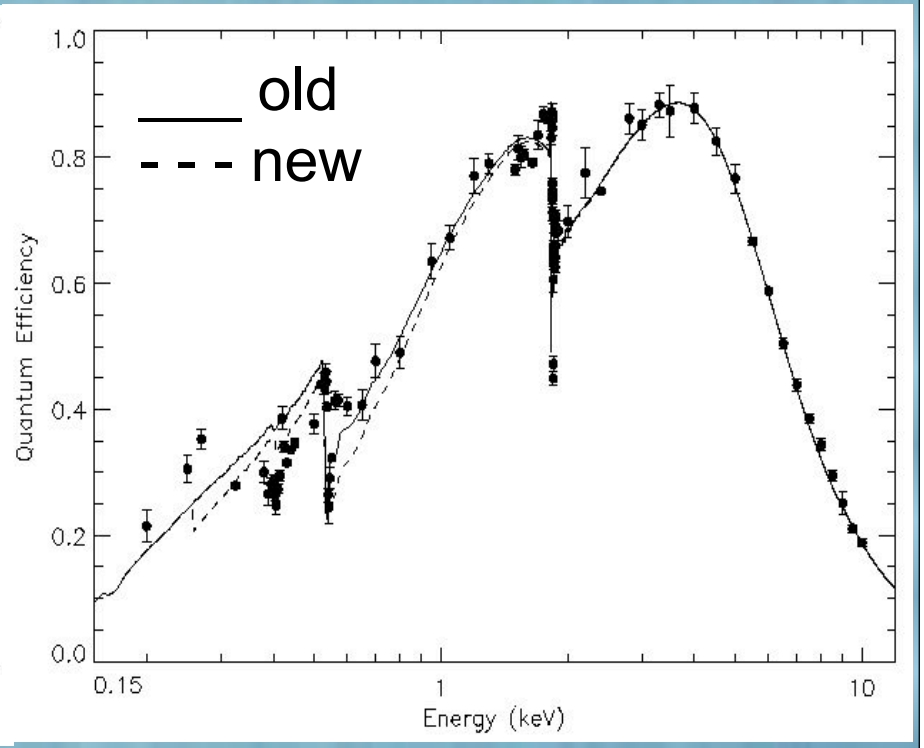
# comparison with ground measuremt

## CCD1 MOS1

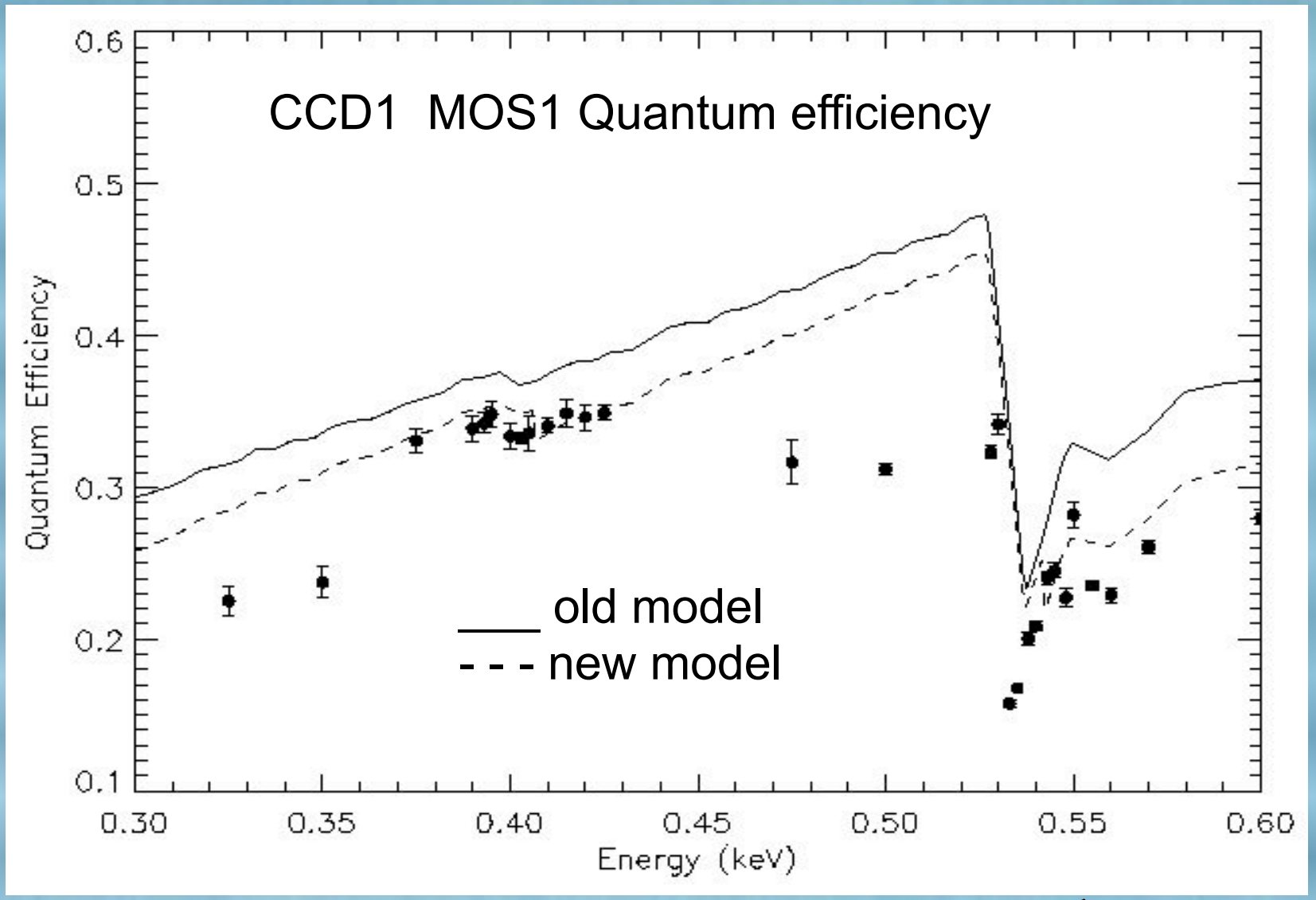



S.Sembay

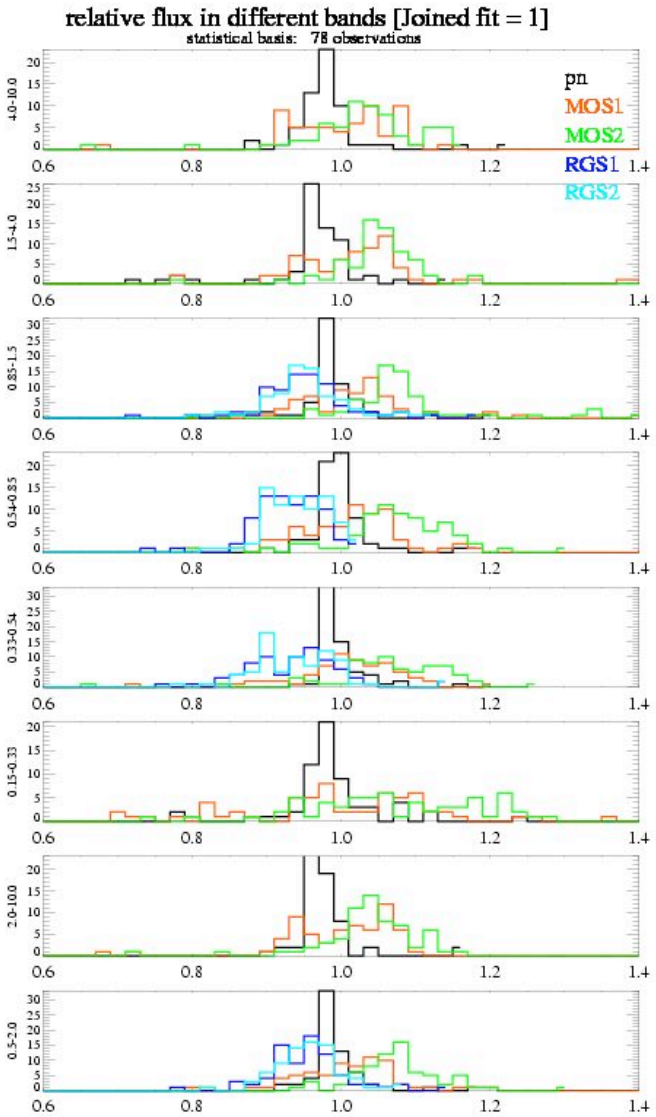
## CCD1 MOS2



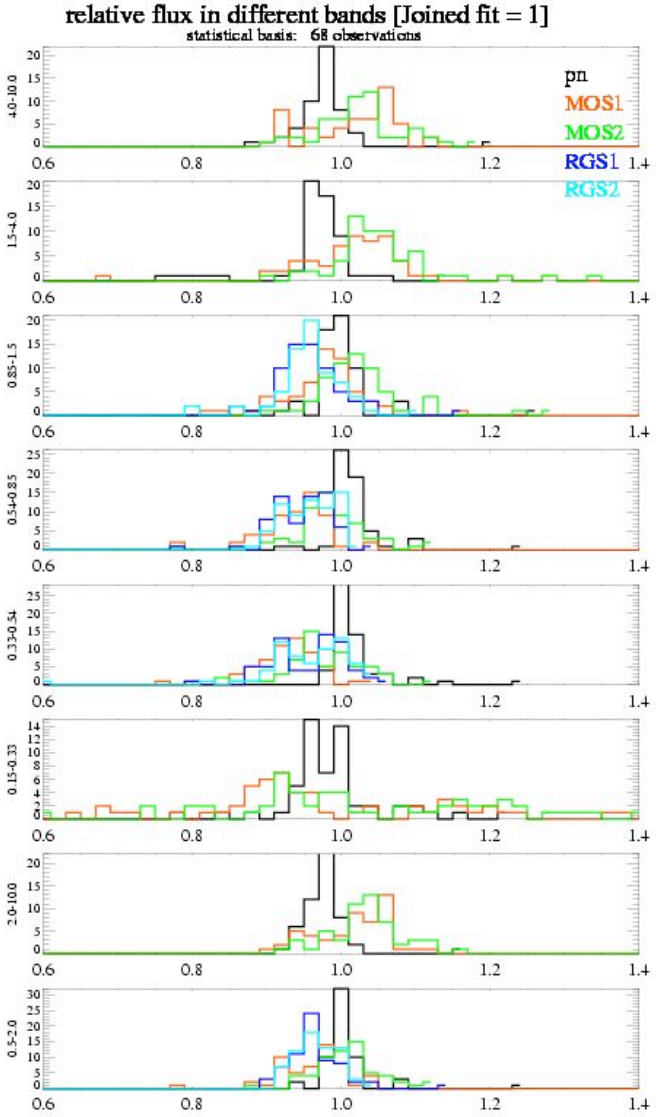
# ZOOM in


CCD1 MOS1 Quantum efficiency
Quantum Efficiency
Energy (keV)
0.6
0.5
0.4
0.3
0.2
0.1
0.30
0.35
0.40
0.45
0.50
0.55
0.60
___ old model
- - - new model

# flux evaluation



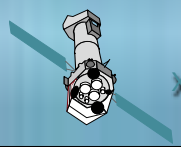

SAS 7.0 new MOS QE



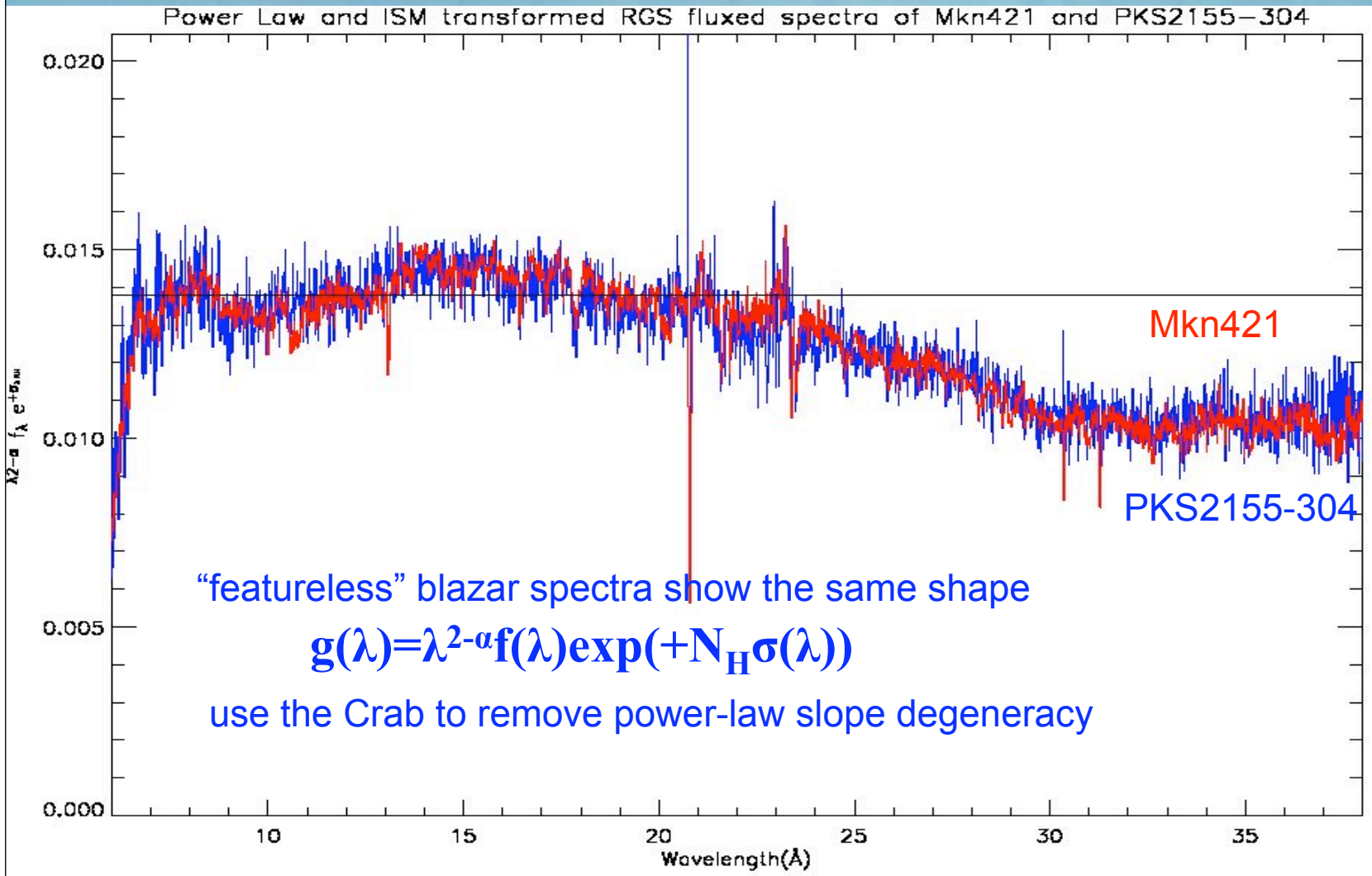

SAS 7.0 pub

# pn- FIFO reset correction

- Maximal ionizing particles in combination with high BG and or bright sources can cause the pn FIFO to overflow
- this is followed by a recovery time where no data can be detected
  --> reduction of effective lifetime depending on readout mode
  --> energy independent flux deficit of up to 3-5 %



# Basis of RGS effective-area corrections

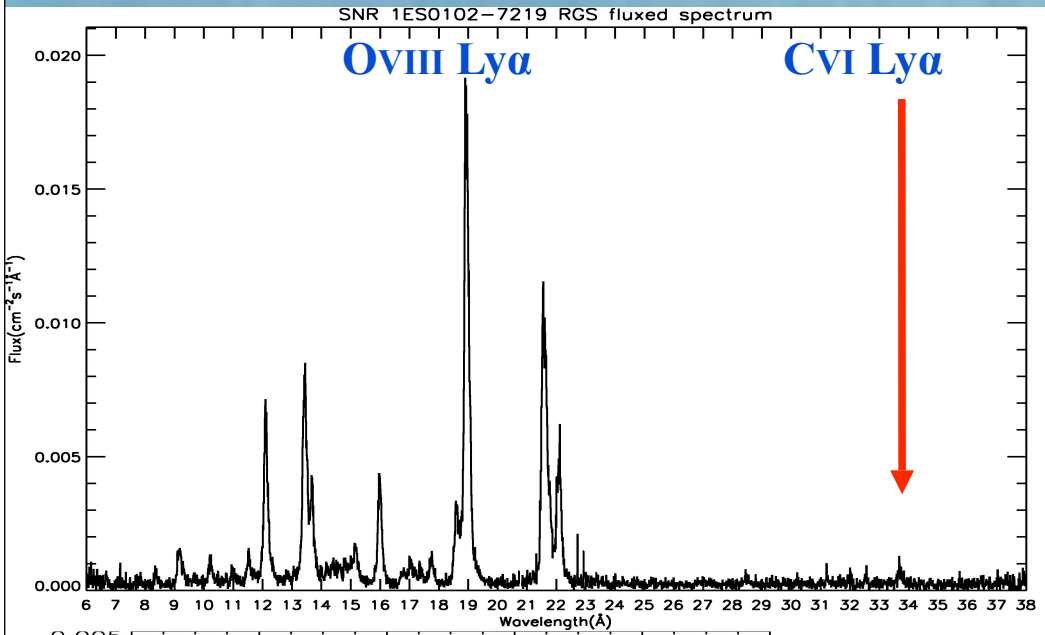


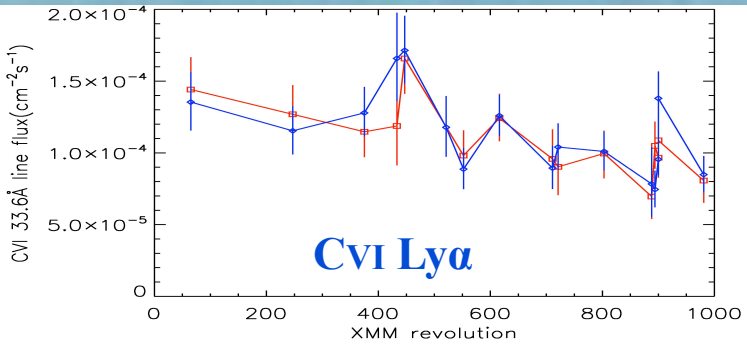

"featureless" blazar spectra show the same shape

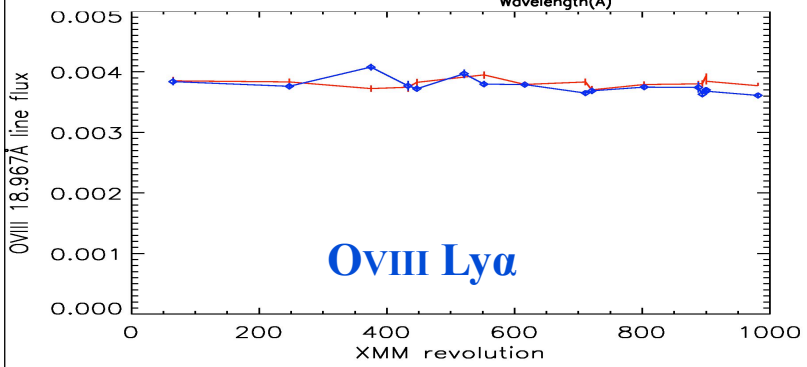
$$g(\lambda)=\lambda^{2-\alpha}f(\lambda)\exp(+N_H\sigma(\lambda))$$

use the Crab to remove power-law slope degeneracy

# RGS long-wavelength time-variability



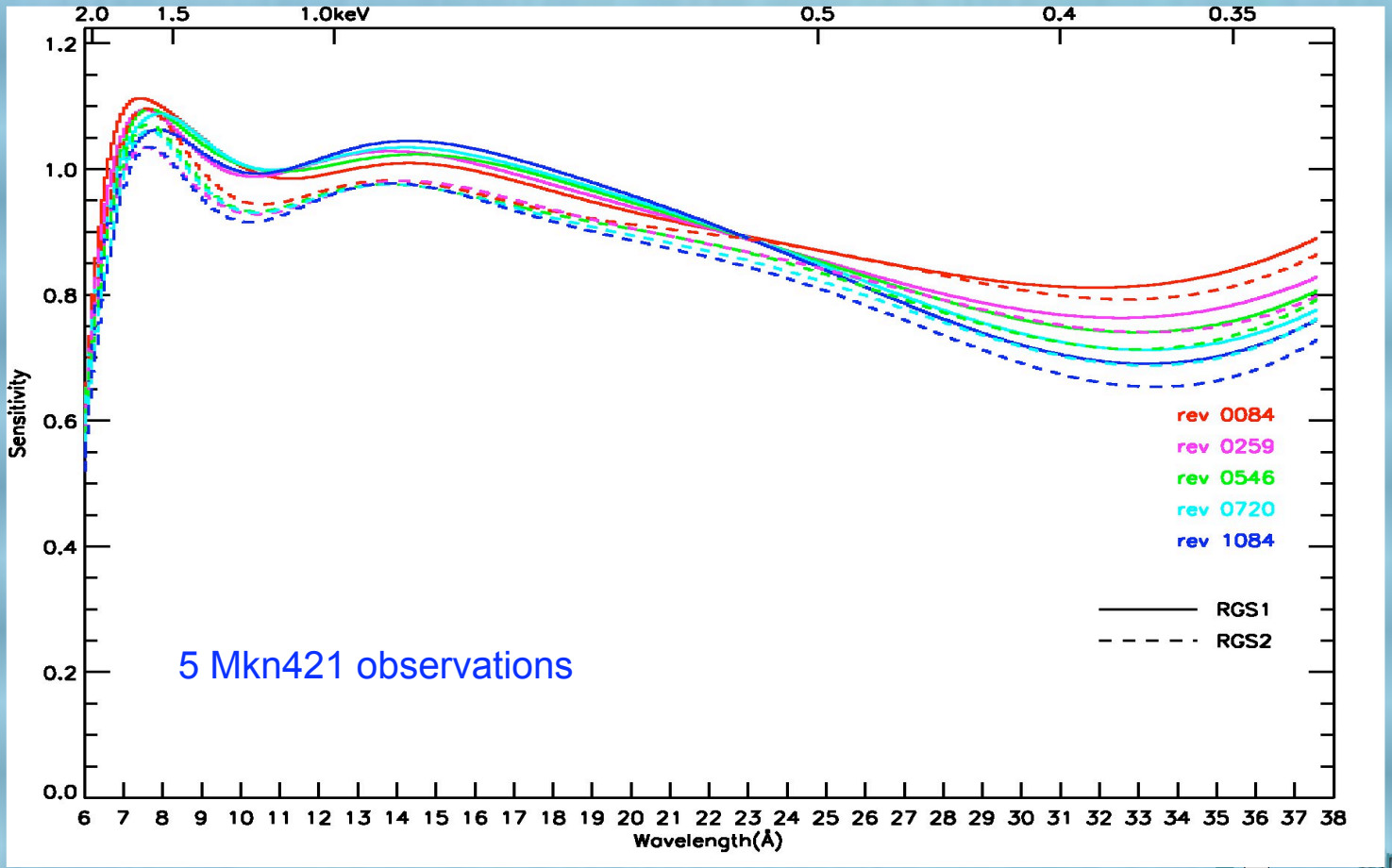



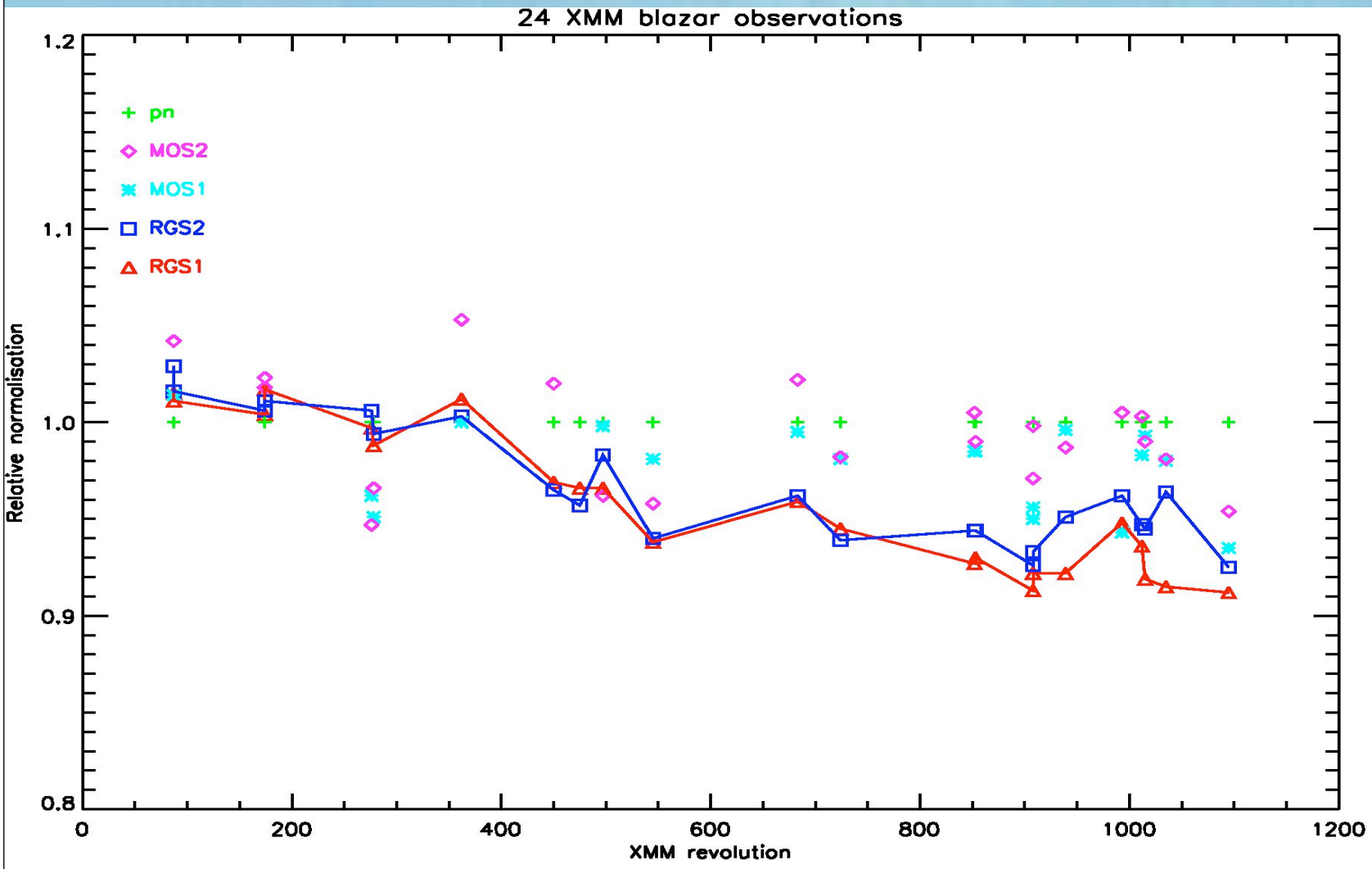

2006 RGS_EFFAREACORR CCF = PolynomialCorrection(t)×CrabCorrection

# RGS 2006 effective-area corrections

- fit blazar spectrum with ISM-absorbed powerlaw 10<λ(Å)<25
- model residuals by sum of Chebyshev polynomials
- repeat throughout the mission ⊗ Crab adjustments ⇒ EFFAREACORR CCF

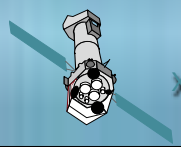


# RGS vs EPIC 2006 statistics

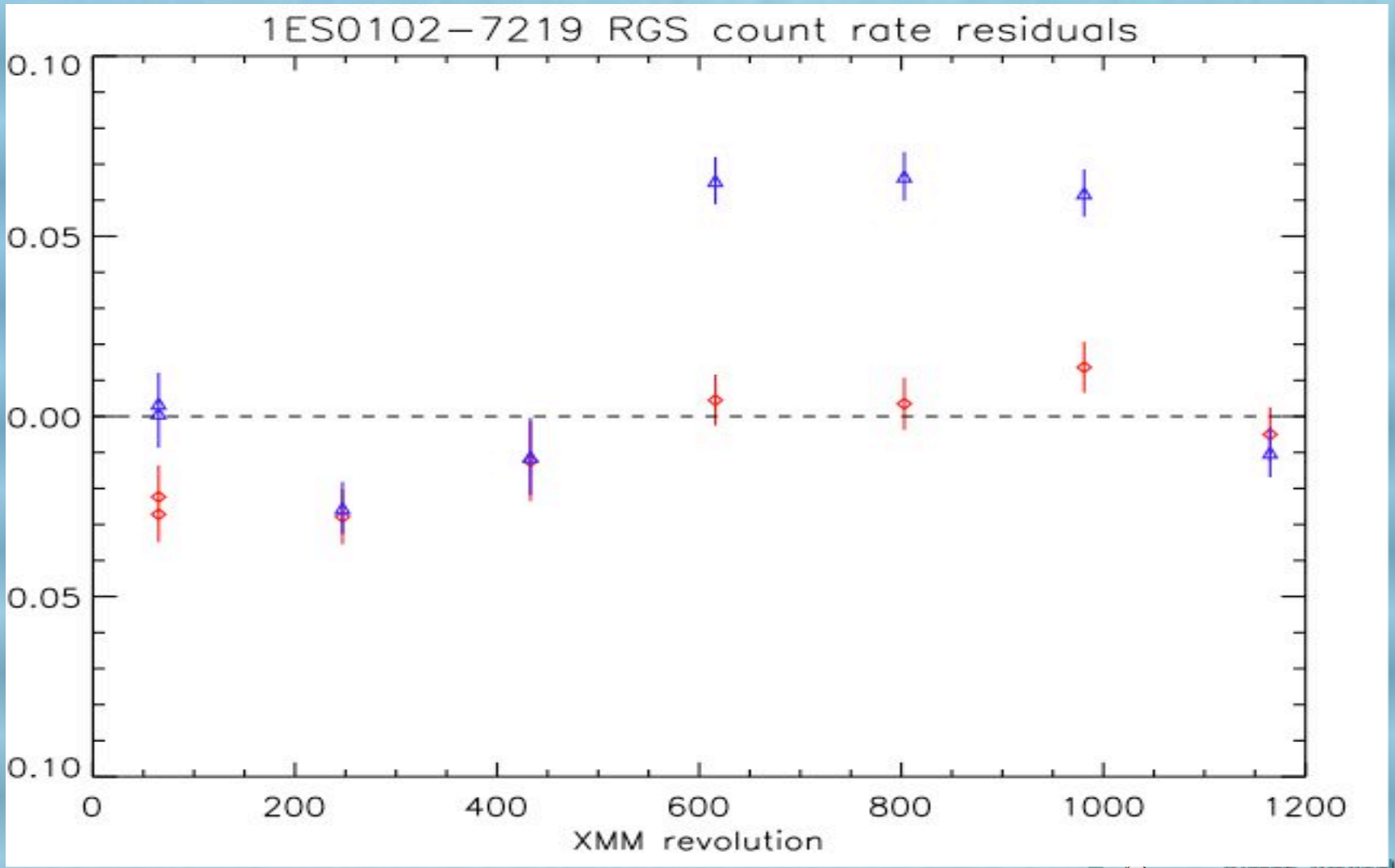


# RGS 2007 effective-area corrections

- Δ(RXJ1856-3754) & Δ(Vela PWN)
  - ⇒ linear build-up of contamination by Carbon
- Crab power-law reference spectrum
  - …is curved
  - …is piled-up
  - …suffers from interstellar dust scattering
  - …is subject to InterstellarAbsorption(Z)
- 2007 RGS EFFAREACORR CCF =
  - PolynomialCorrection(!t)×exp(-Ct)×CrabCurvatureCorrection
  - currently under test
    - SNR 1ES0102-7219 (weak continuum + broad lines)
    - HR1099 (strong continuum + narrow lines)
    - 24-blazar sample (ISM-absorbed smooth continua)
      - ⇒ RGS (vs EPIC) stable < 5%



# SNR 1ES0102-7219 with 2007 EFFAREACORR



# RGS vs EPIC statistics