RGS – EPIC-pn Cross Calibration

Rosario González-Riestra

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RGS Calibration Status

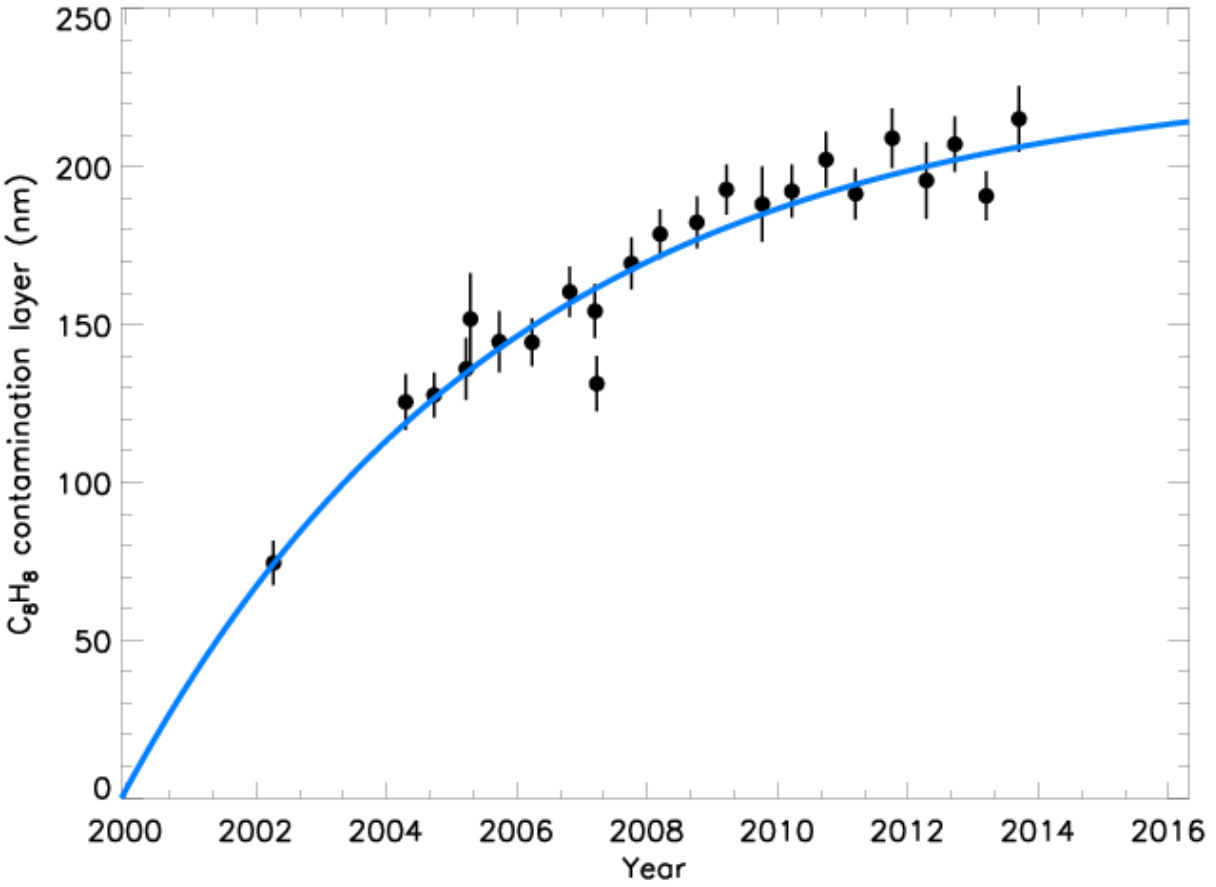
Wavelength scale accuracy	1st order: 6 mÅ 2nd order: 5 mÅ no systematic offset
Line Spread Function	Δ FWHM/FWHM ≤ 10%
Effective area	Absolute effective area: 10 % Bad (hot/cool) pixels: less than 3% of detectors surface. No changes in the last years Contamination: 47% decrease in effective area at 35 Å, taken into account in the calibration. Same for RGS1 and RGS2, within errors.

For details, refer to

"Calibration and in-orbit performance of the RGS on board XMM", de Vries et al., 2015, A&A 573, p128

"Status of the RGS Calibration", XMM-SOC-CAL-TN-0030, July 2014

RGS Contamination model



From RXJ1856 countrate at 35 Å

Assuming that the contaminant is a type of Hydrocarbon (C_8H_8) coming from the carbon-fiber structures of the telescope tube.

RGS/EPIC-pn rectification factors (I)

Motivation:

Indications of systematic differences in flux from EPIC-pn and RGS longward 24 Å (E < 0.5 keV)

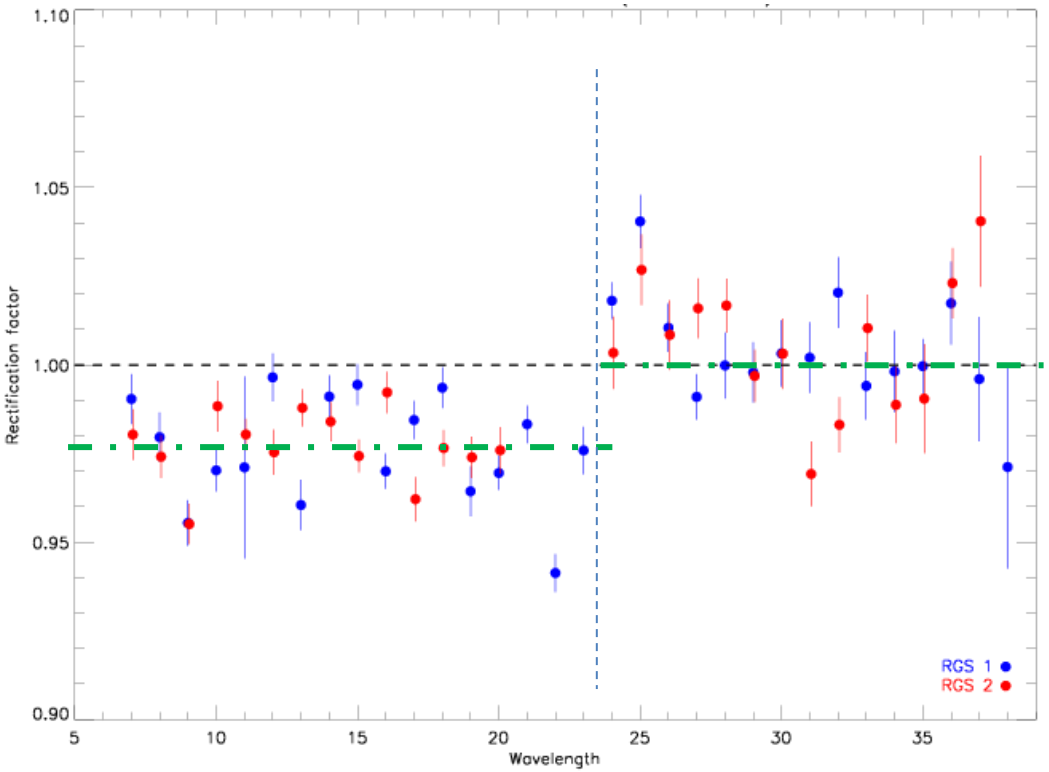
Derived from 43 observations of 3C 273, PKS 2155-304 and H 1426+428 processed with SASv10. All EPIC-pn Small Window mode

Flux ratio (RGS[12]/EPIC-pn) computed in 1 Å step through XSPEC fits:

- Spectra binned to 25 cts/bin
- Chisq statistics
- Fixed N_H
- Model:
  - PKS 2155 and H 1426: Broken power law
  - 3C 273: Two power laws

see XMM-CCF-REL-269, XMM-SOC-CAL-TN-0089

RGS/EPIC-pn rectification factors (II)



- Implemented as an step function:

	7 - 23.5 Å	23.5 - 38.5 Å
RGS 1	**0.97± 0.02**	**1.00 ± 0.01**
RGS 2	**0.98 ± 0.01**	**1.00 ± 0.02**

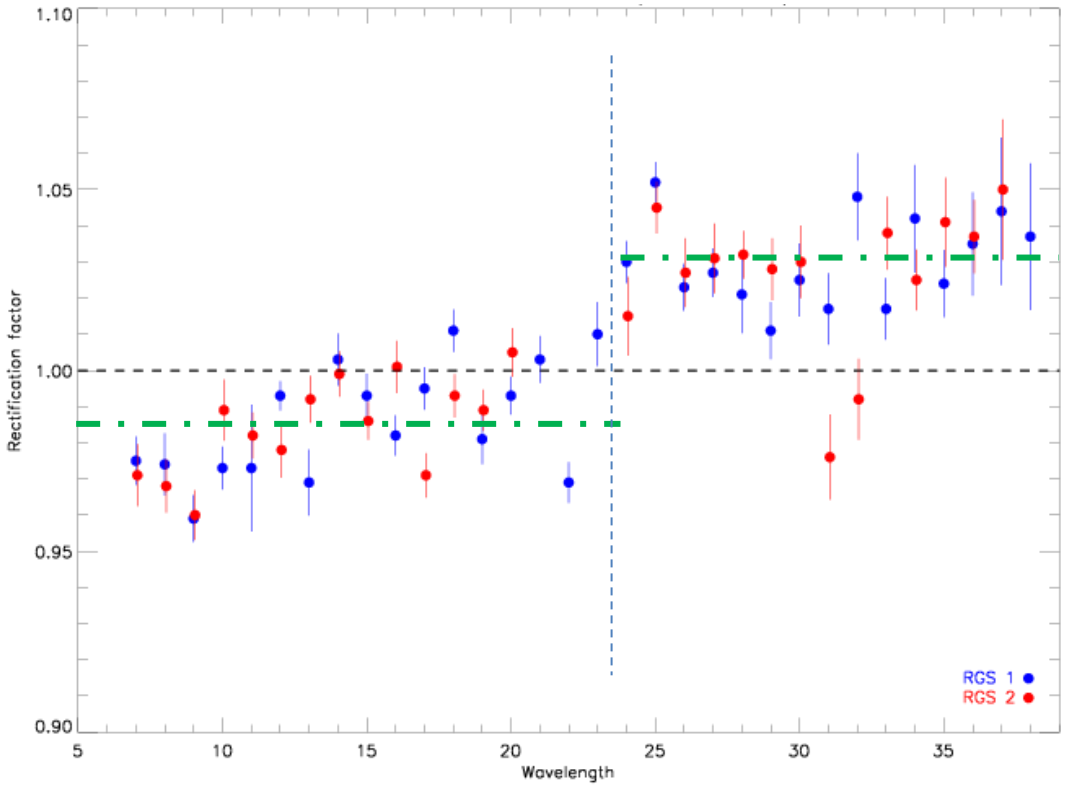
- Factors stored in extension **`RECTIFICATION`** in **`RGS[12]_EFFAREACORR.CCF`**
- Correction applied to the RGS effective area via the **`rgsrmfgen`** parameter **`withrectification=yes`**

Need for new rectification factors ?

- More data (51 observations)
- EPIC-pn and RGS processed with SASv14 and calibrations available in November 2014

Differences from previous may come from:

- Different sample
- New RGS contamination model
- New EPIC-pn calibrations (PSF, CTI, redistribution…)
- Different extraction regions for EPIC-pn spectra (larger inner annuli radius, more accurate pile-up correction)



	7 - 23.5 Å	23.5 - 38.5 Å
RGS 1	**0.98 ± 0.02**	**1.03 ± 0.01**
RGS 2	**0.99 ± 0.01**	**1.03 ± 0.02**

Need to be re-evaluated every time calibrations and/or SW change