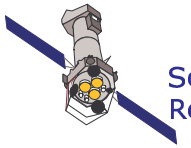
RGS/MOS-cooling

Results

February 03, 2003

L. Metcalfe



XMM-Newton
Science Operations & Data Systems Division
Research & Scientific Support Department

CONTENT :

* immediate results of cooling

* contamination

* open points

RECOMMENDATIONS OF THE XMM-NEWTON USERS GROUP re. COOLING

at UG Meeting of 16/17 September 2002

"The UG however encourages the Project to take all necessary steps to make sure that the XMM data are of the best possible quality, and at the same time strongly recommends that the Project take measures that keep the impact on users in terms of data delivery etc. at a minimum."

"The Users Group feels that in order to make sure that the scientific capabilities of XMM-Newton can be maximally exploited the MOS and RGS CCDs should be cooled despite small remaining risks. Recommendations were formulated considering the expected scientific improvements as well as the delay in data delivery."

Recommendation 2002-09-17/18: The Users Group appreciates the effort to maximise and to maintain the high performance of the instruments. Also, a steady data flow from XMM-Newton to the scientific community has now been achieved. The impact of the cooling on the data delivery should thus be minimised.

Action 2002-09-17/08: As far as data delivery is concerned, XMM-Newton SOC and XMM Newton SSC should evaluate the possibility to deliver initially data with a preliminary calibration and to reprocess such data after the cooled instruments are calibrated.

THE PLAN

COOLING

MOS Instrument Settings

Focal plane temperature: -120 deg C

Voltages: unchanged

RGS Instrument Settings

Focal plane temperature: -110 deg C

Voltages: some serial voltages adjusted

BAD PIXELS

MOS1 :

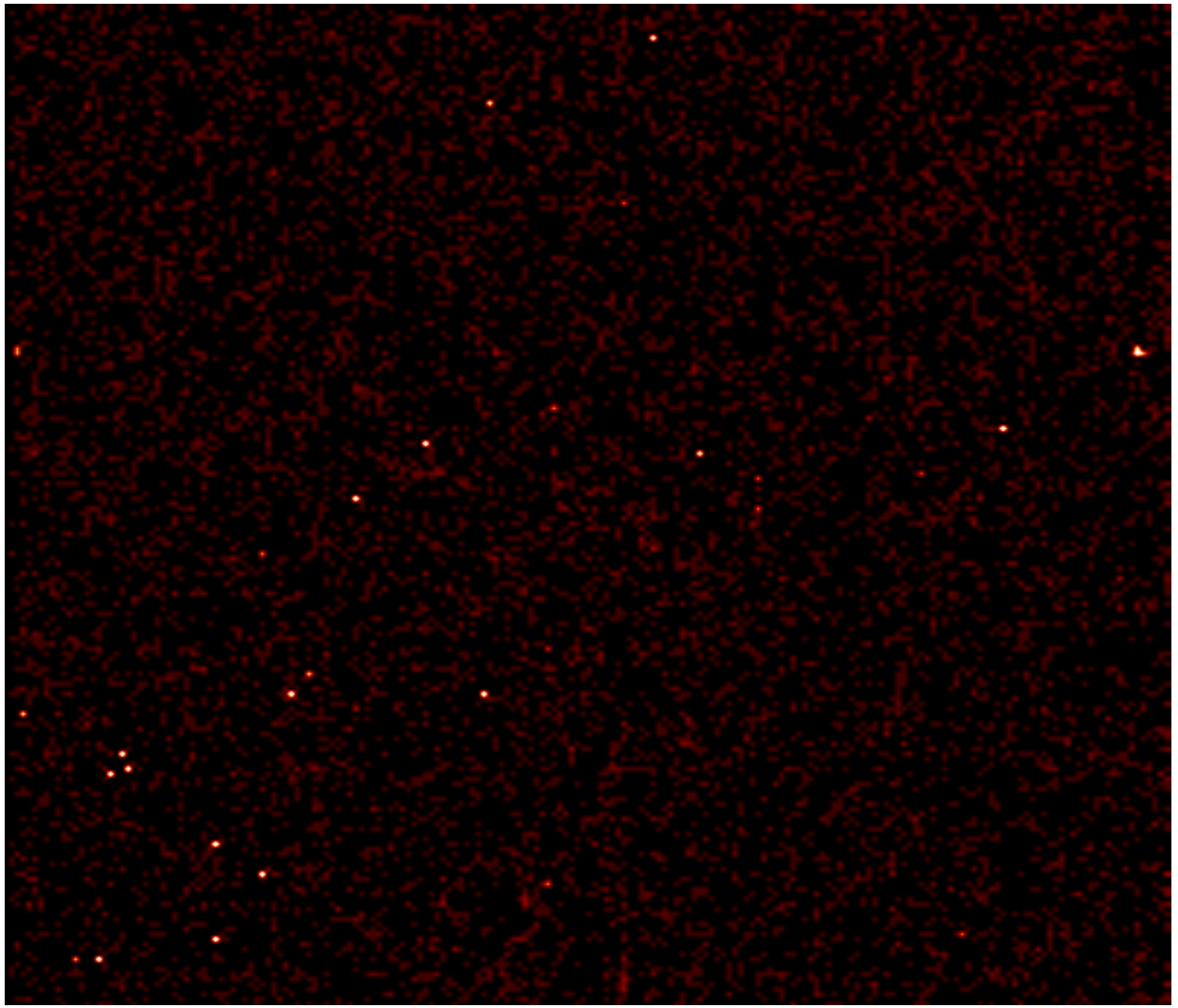
98 ⇒ 38

⇒ -61 %

MOS2 :

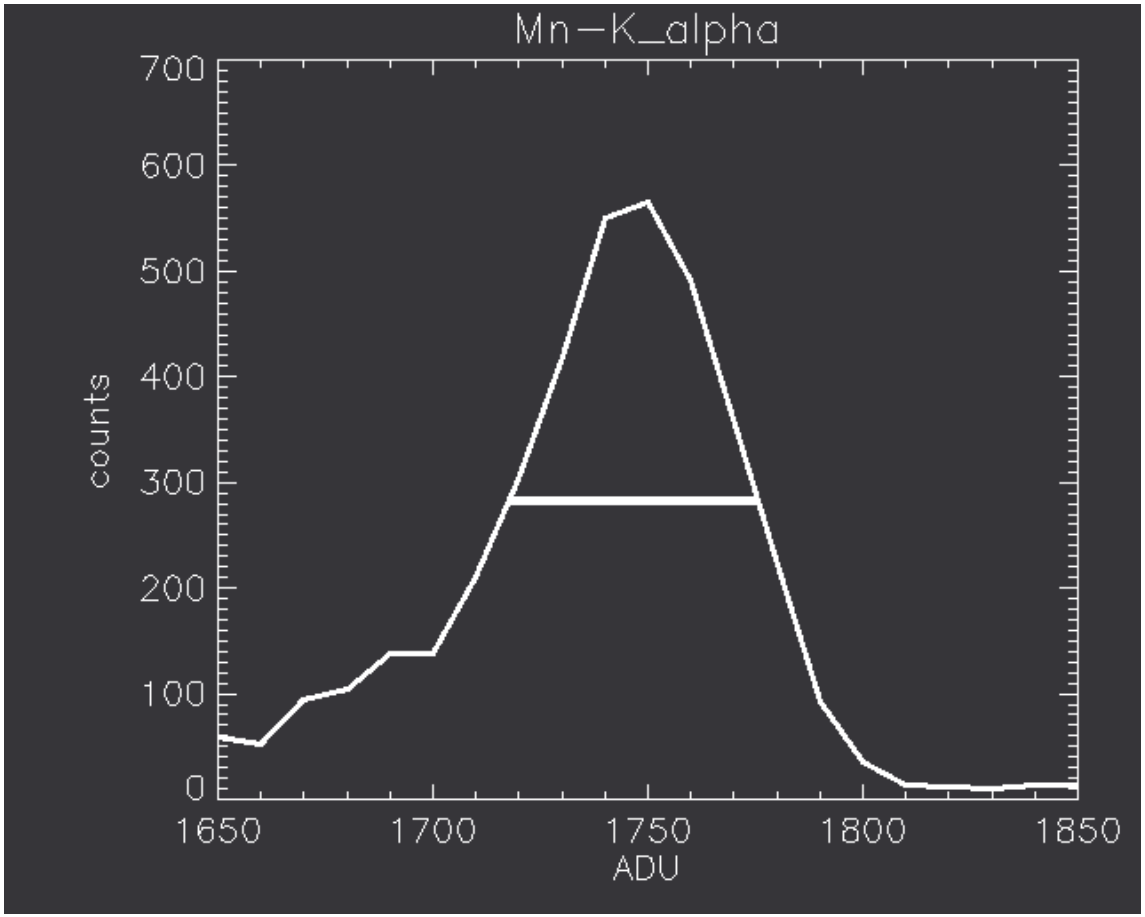
167 ⇒ 24

⇒ -86 %



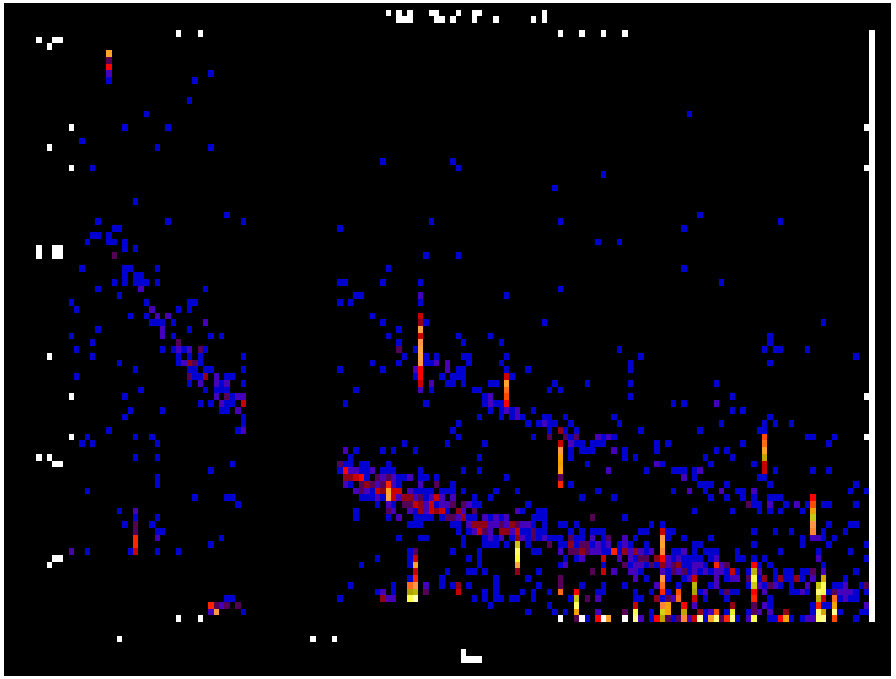
ENERGY RESOLUTION-1

FWHM of the Mn K line (@5.9 keV) reduced from ~160eV to ~140eV.

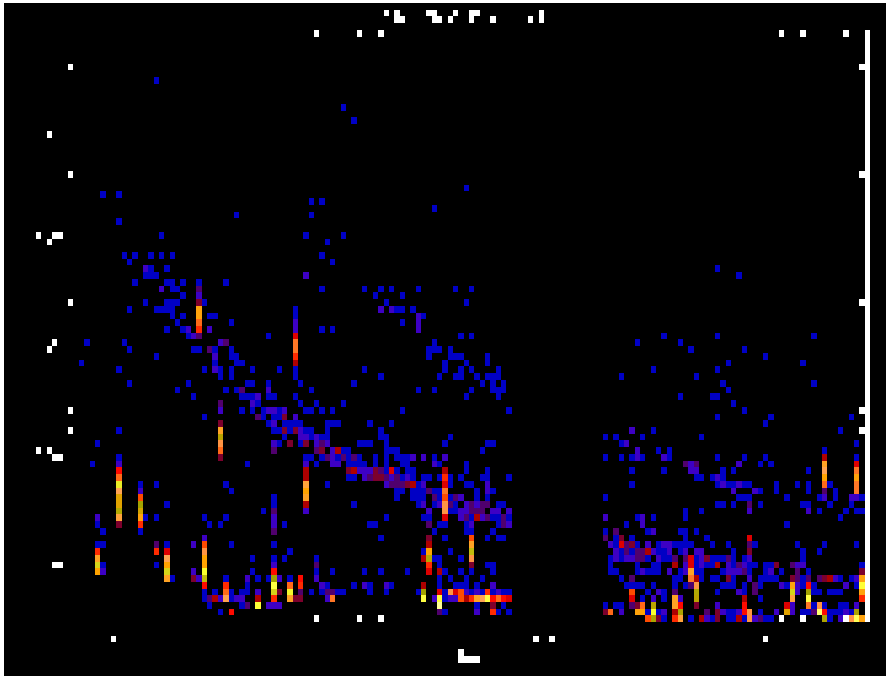


COOLING RGS

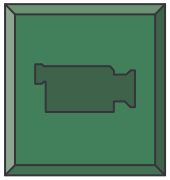
The RGS instruments' operational temperature was decreased in early November from -80°C to -110°C: Mkn421 was observed during the 9 hours necessary for decreasing the CCD temperature

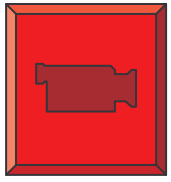


RGS1

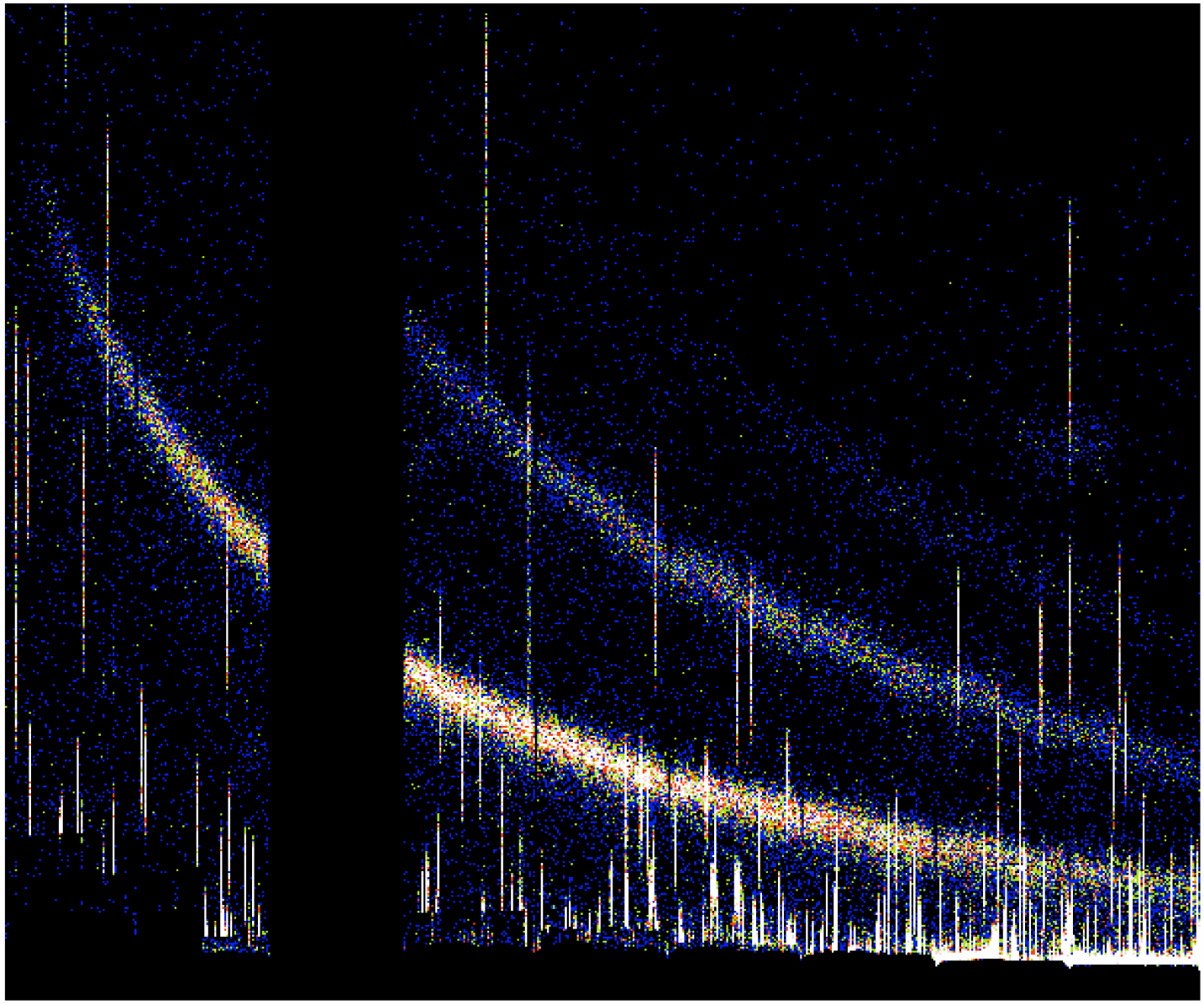


RGS2

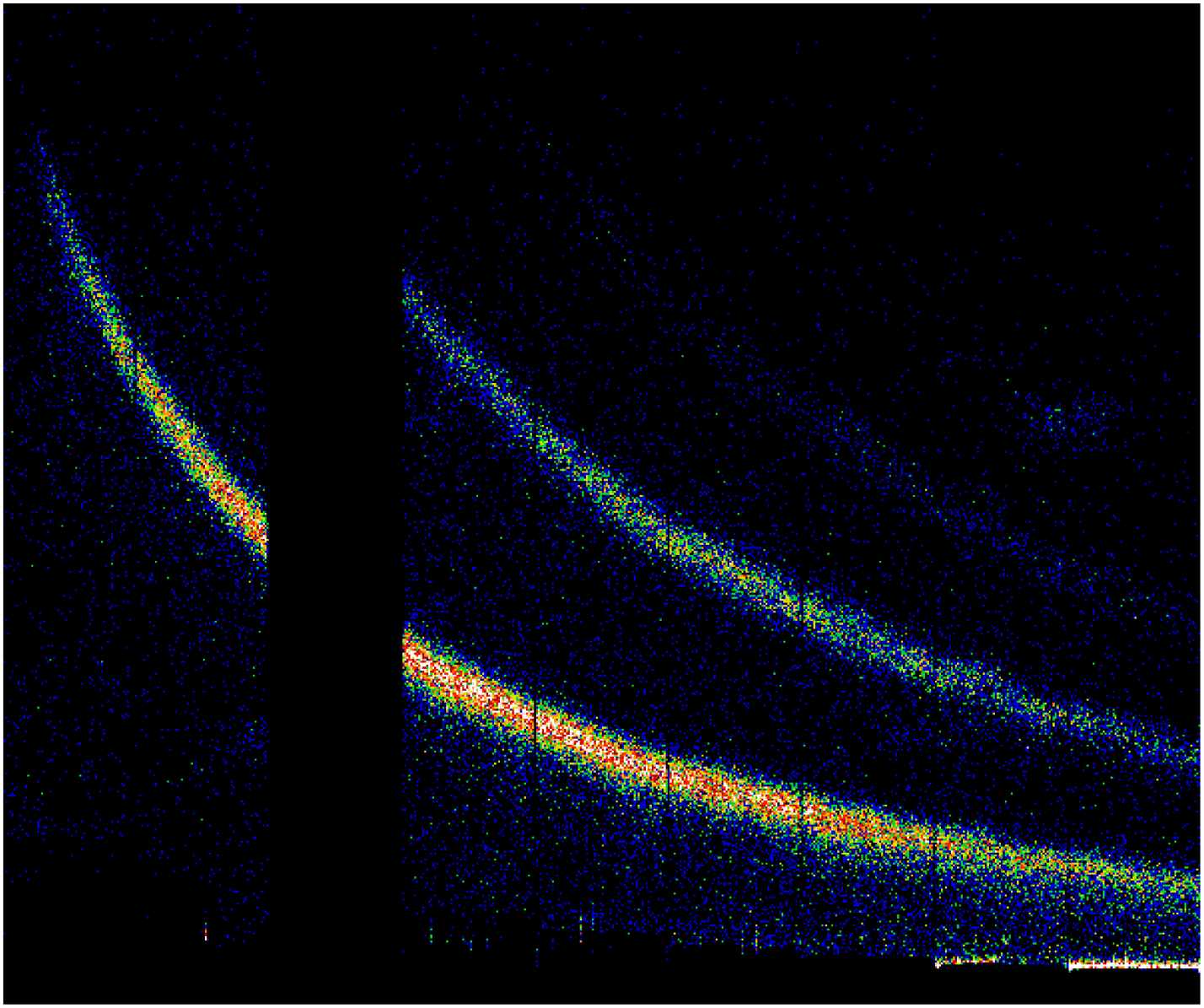




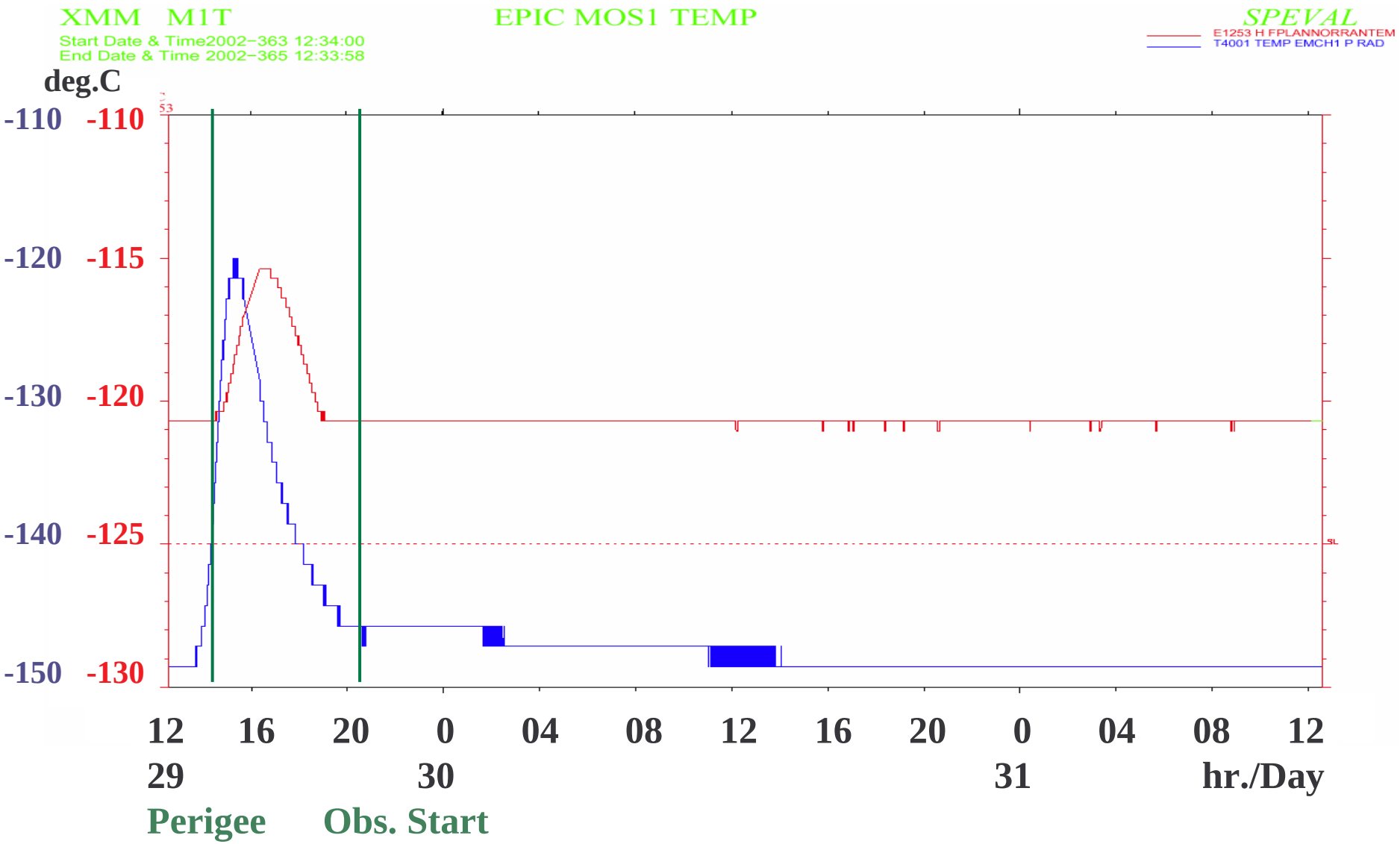
RGSL at its initial operating temperature of -80° C



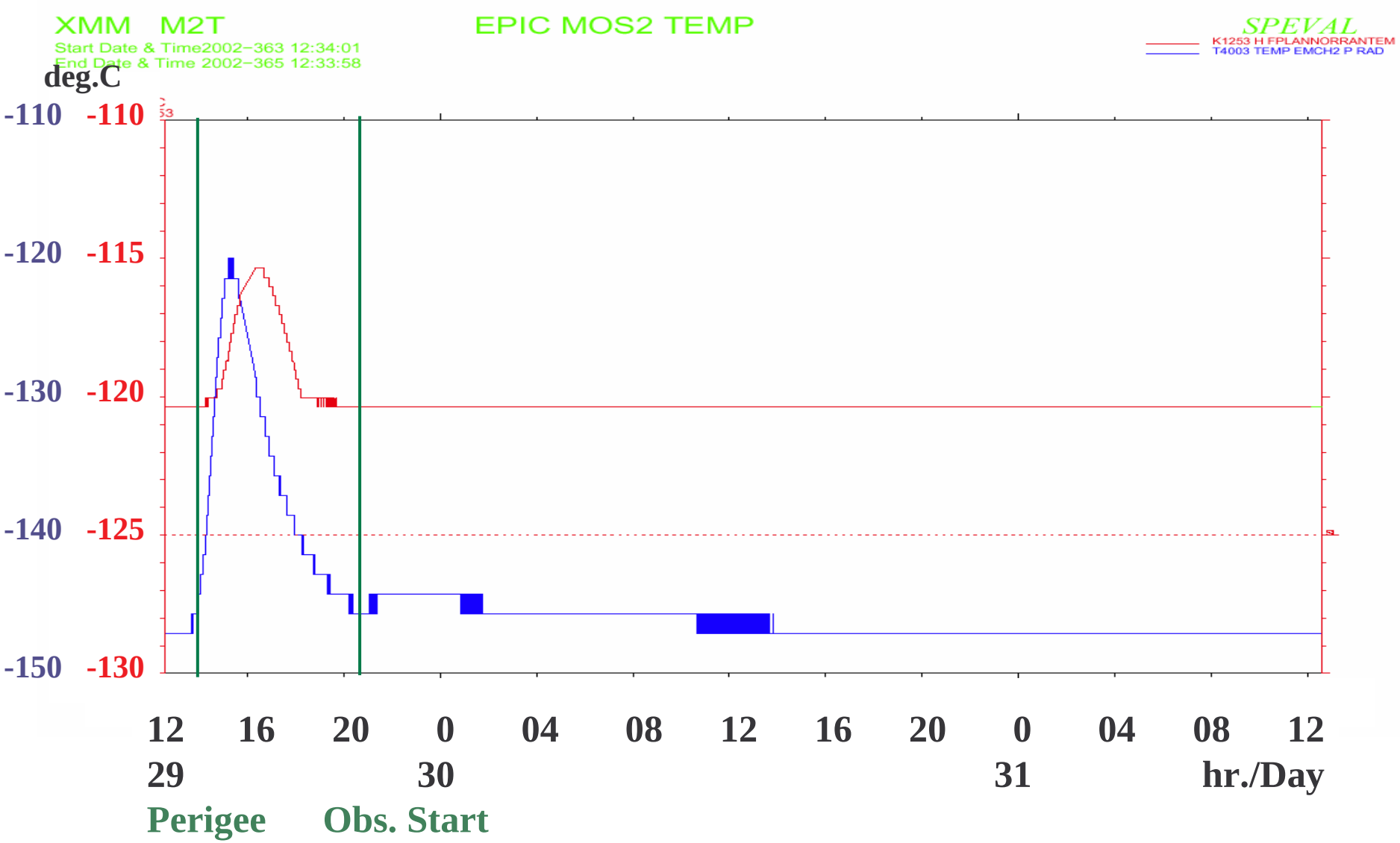
RGS1 after cooling to -110° C



PERIGEE T EXCURSIONS MOS1

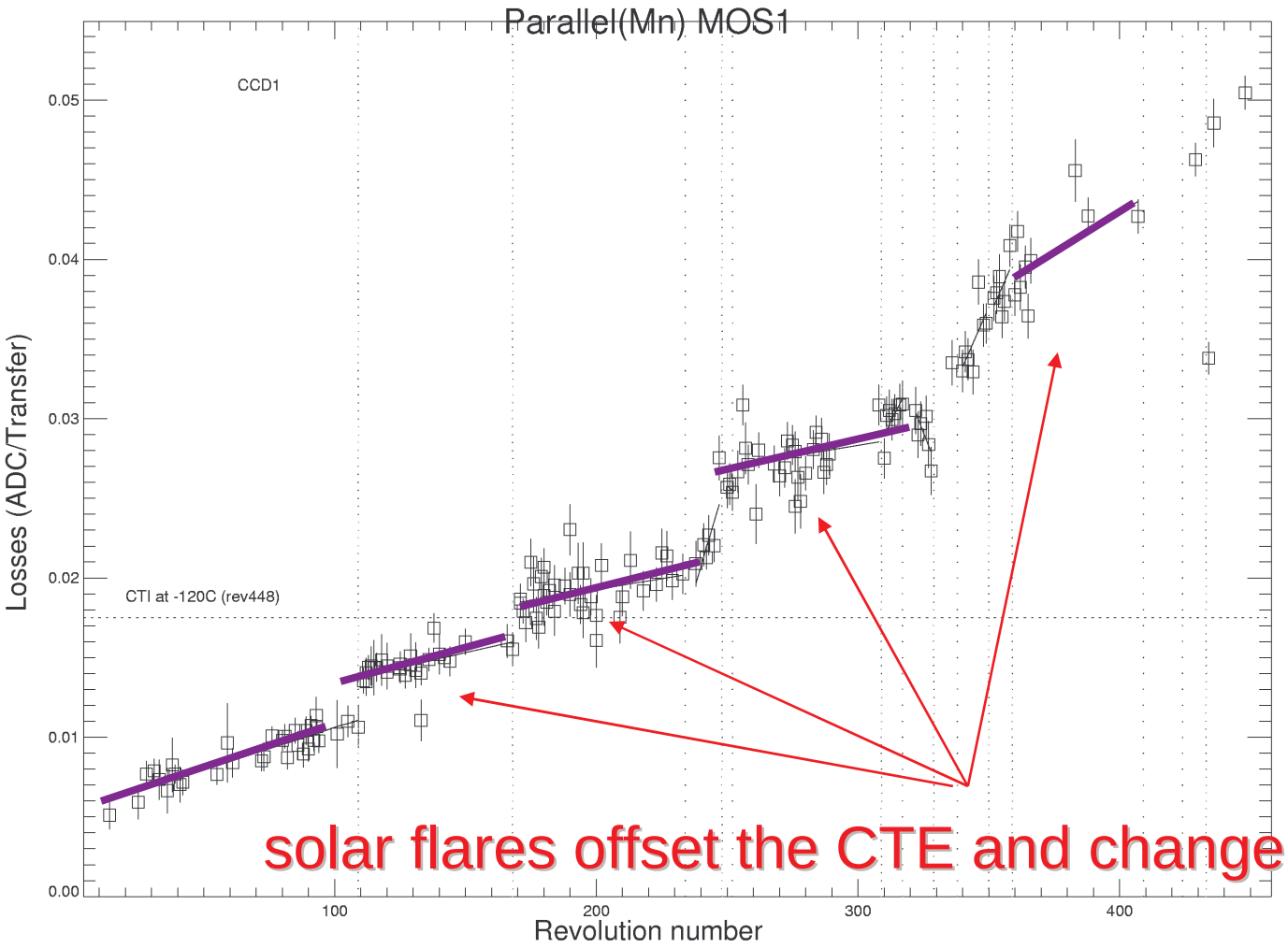


PERIGEE T EXCURSIONS MOS2



MOS CTE degradation

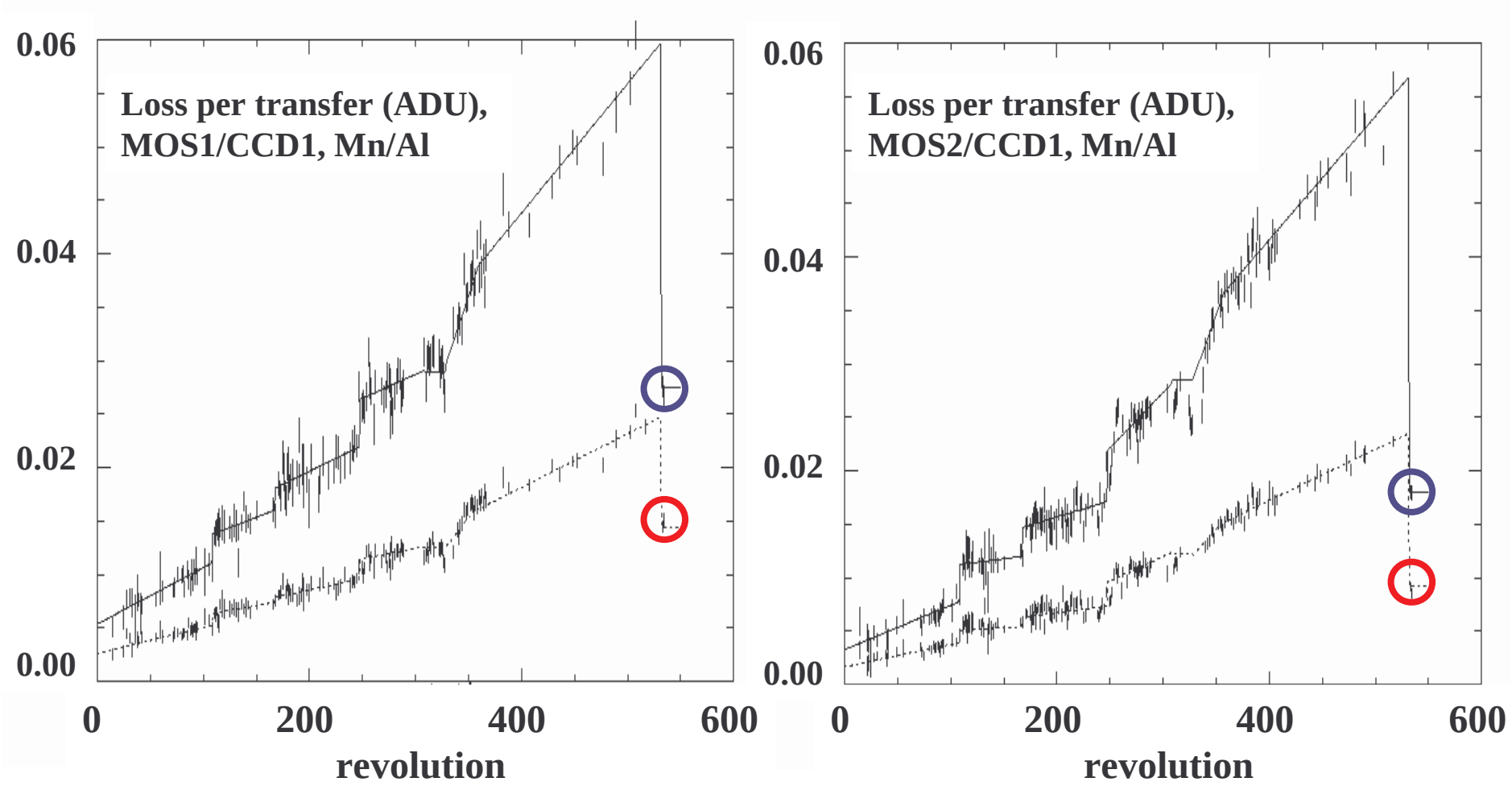
high energy radiation degrades CTE continuously



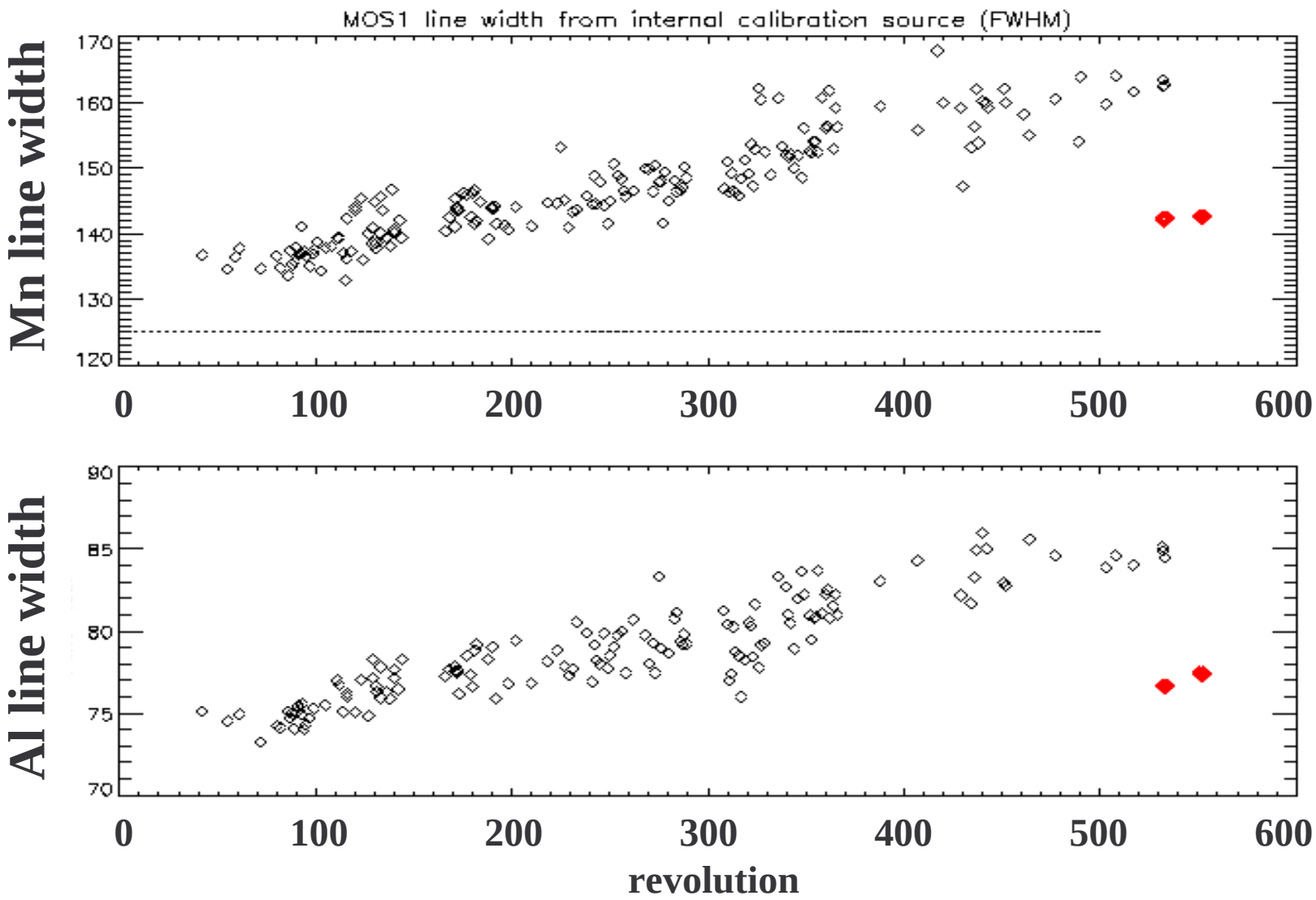
solar flares offset the CTE and change slope

MOS CTI

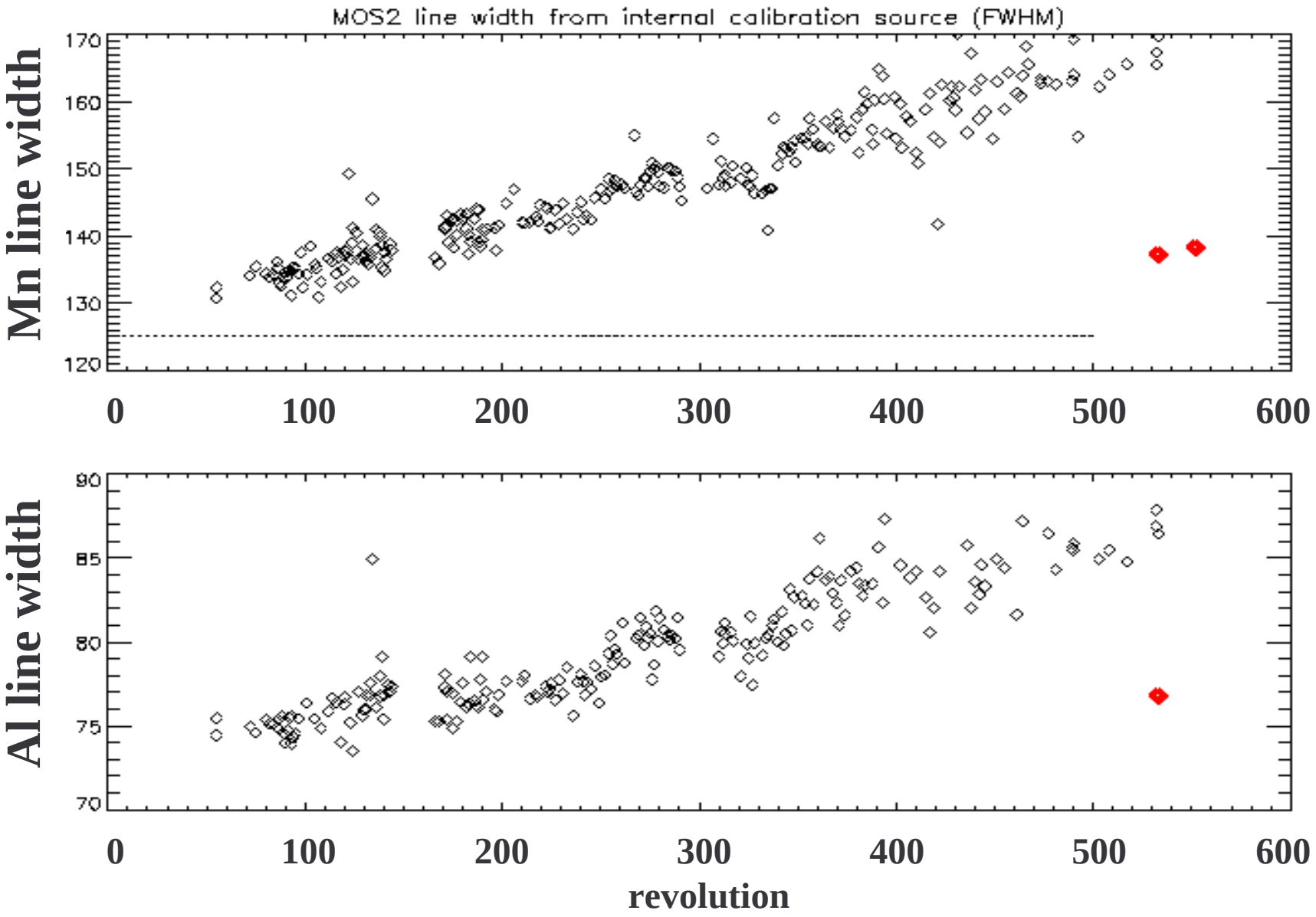
parallel CTI reduced by factor 2 to 3 depending on CCD



ENERGY RESOLUTION: MOS1

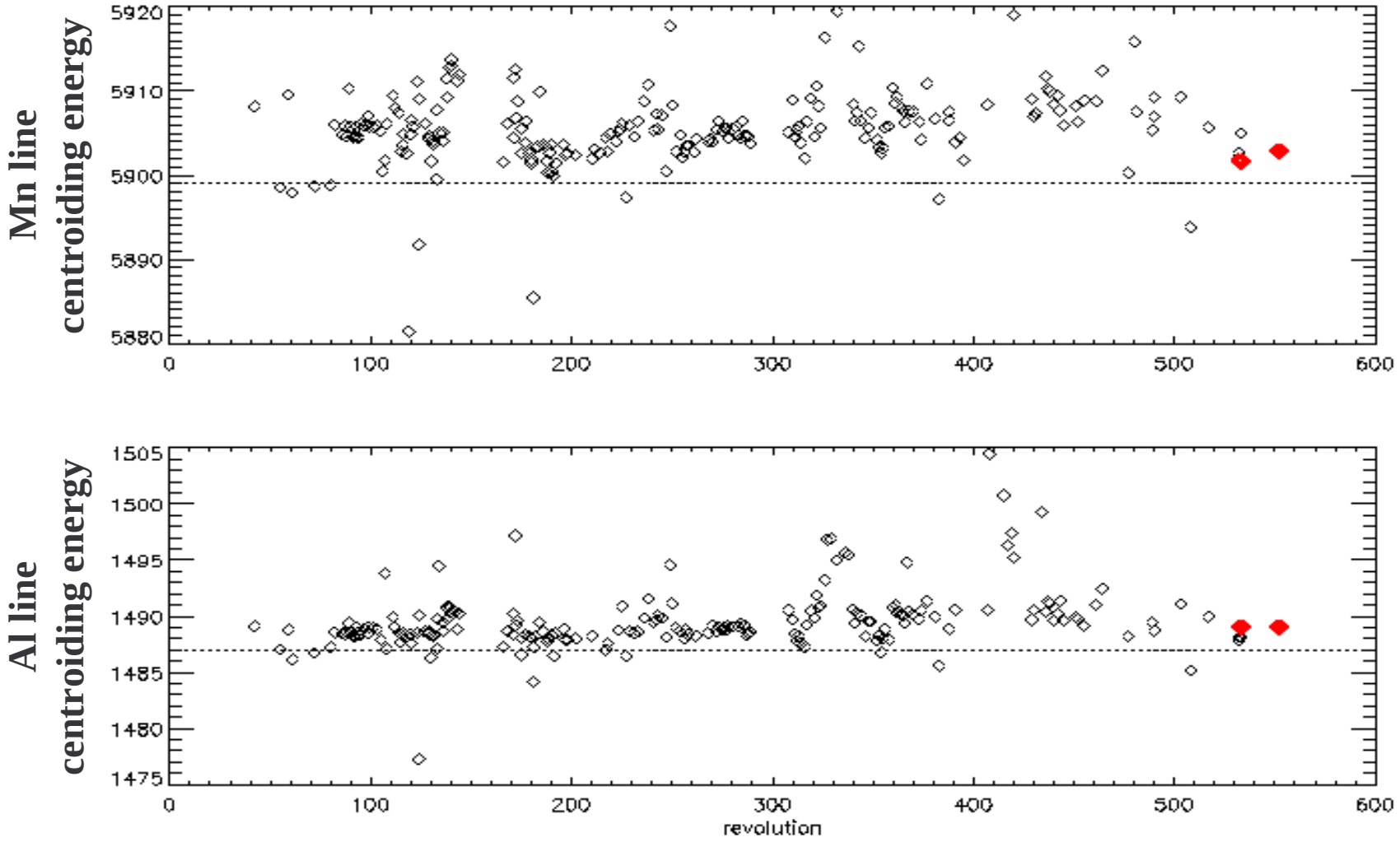


ENERGY RESOLUTION: MOS2



GAIN

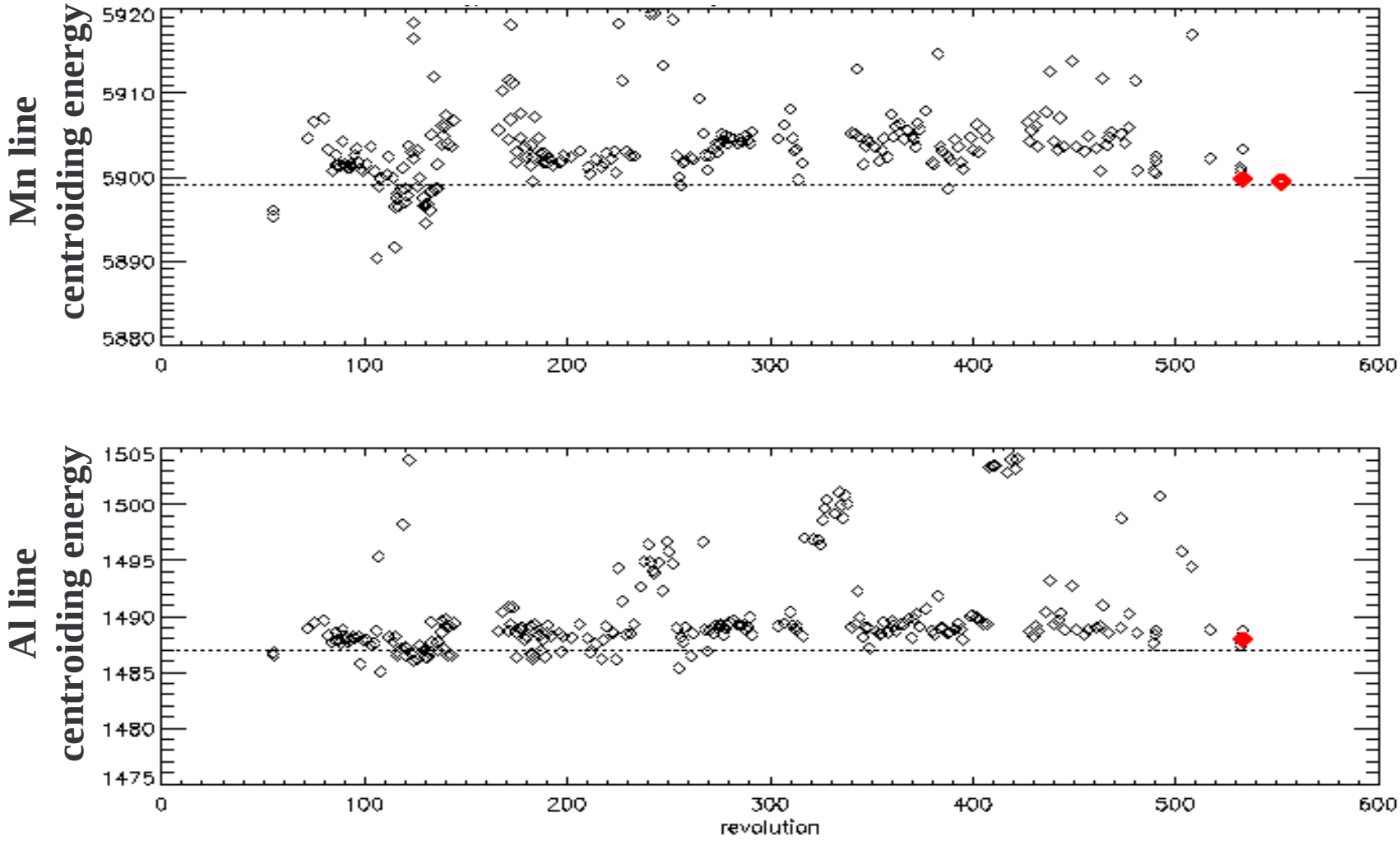
MOS1 energy scale monitoring with internal calibration source PAT1



RECONSTRUCTED LINE POSITION WITH SAS5.4_REL

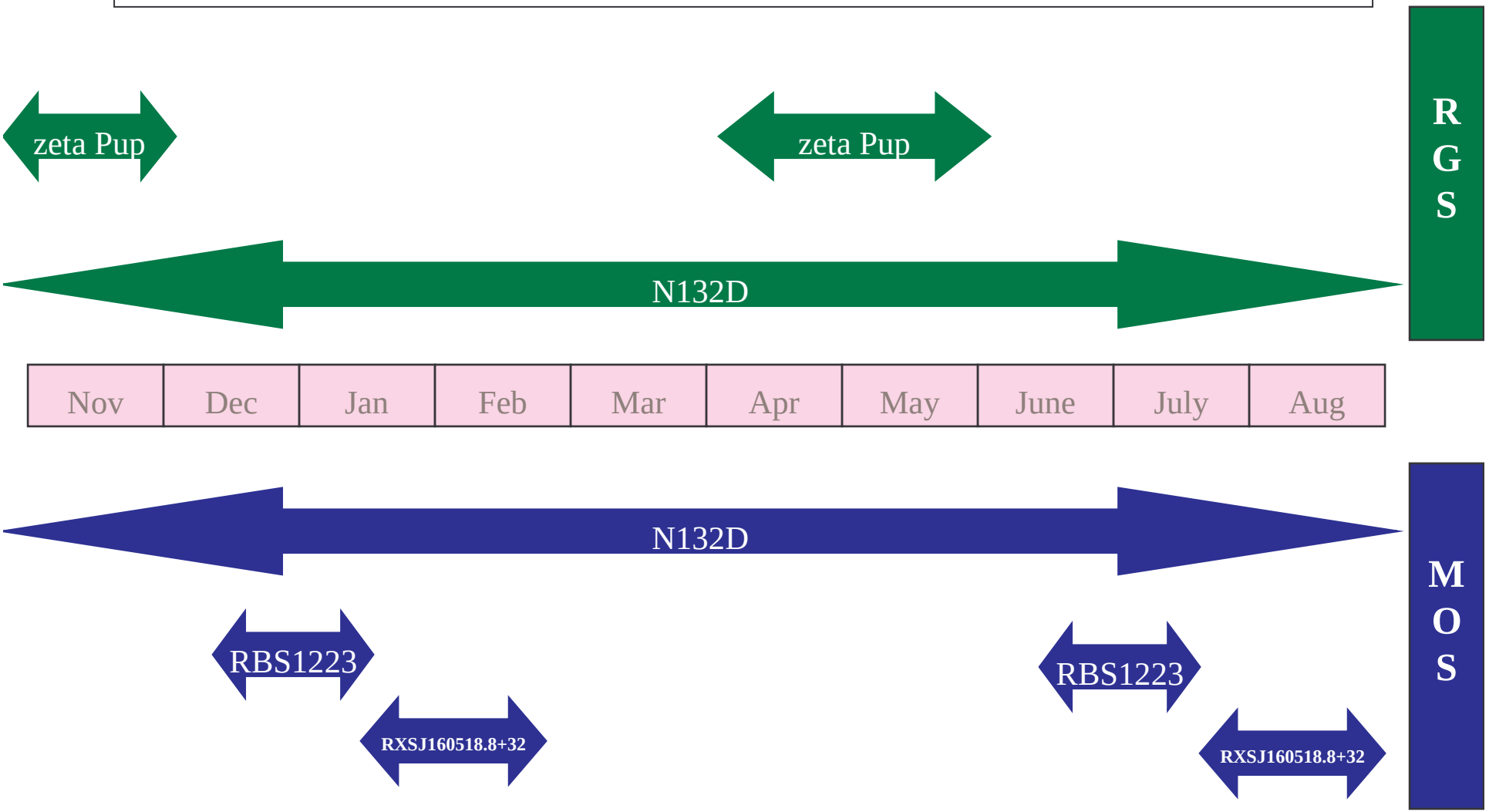
GAIN

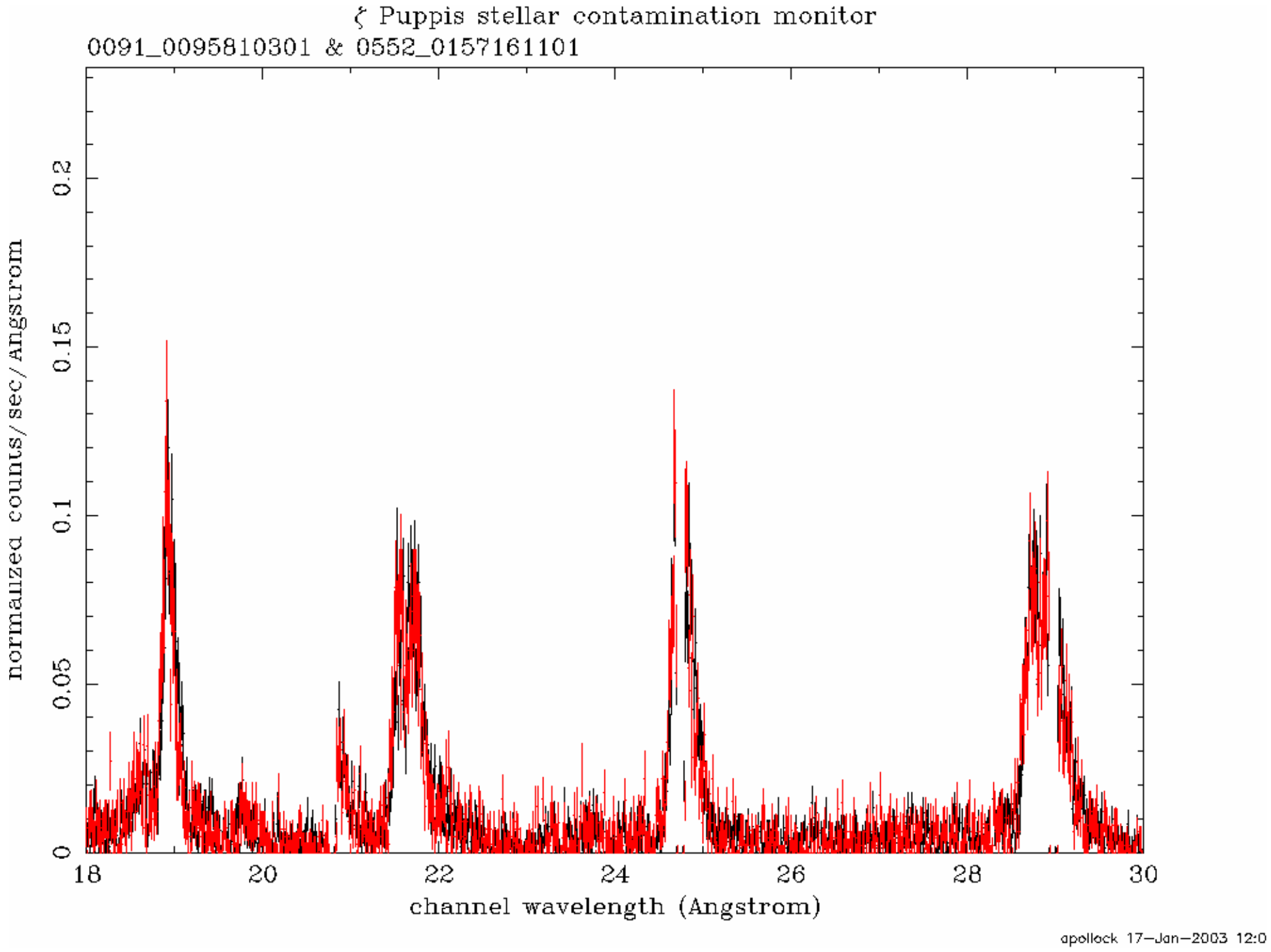
MOS2 energy scale monitoring with internal calibration source PAT1



RECONSTRUCTED LINE POSITION WITH SAS5.4_REL

contamination monitoring

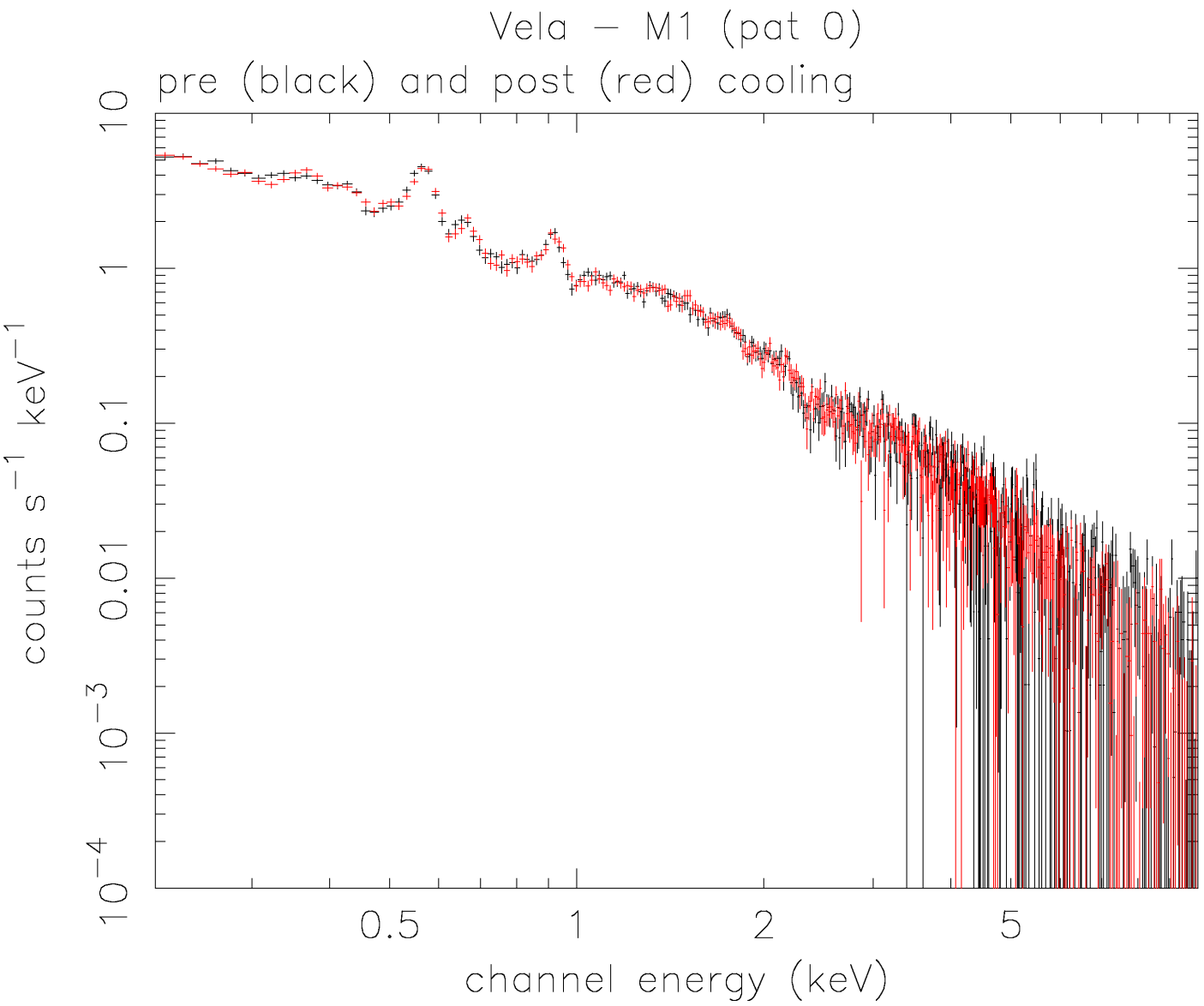



ζ Puppis stellar contamination monitor
0091_0095810301 & 0552_0157161101
normalized counts/sec/Angstrom
0
0.05
0.1
0.15
0.2
18
20
22
24
26
28
30
channel wavelength (Angstrom)
apollock 17-Jan-2003 12:0

CCF Status

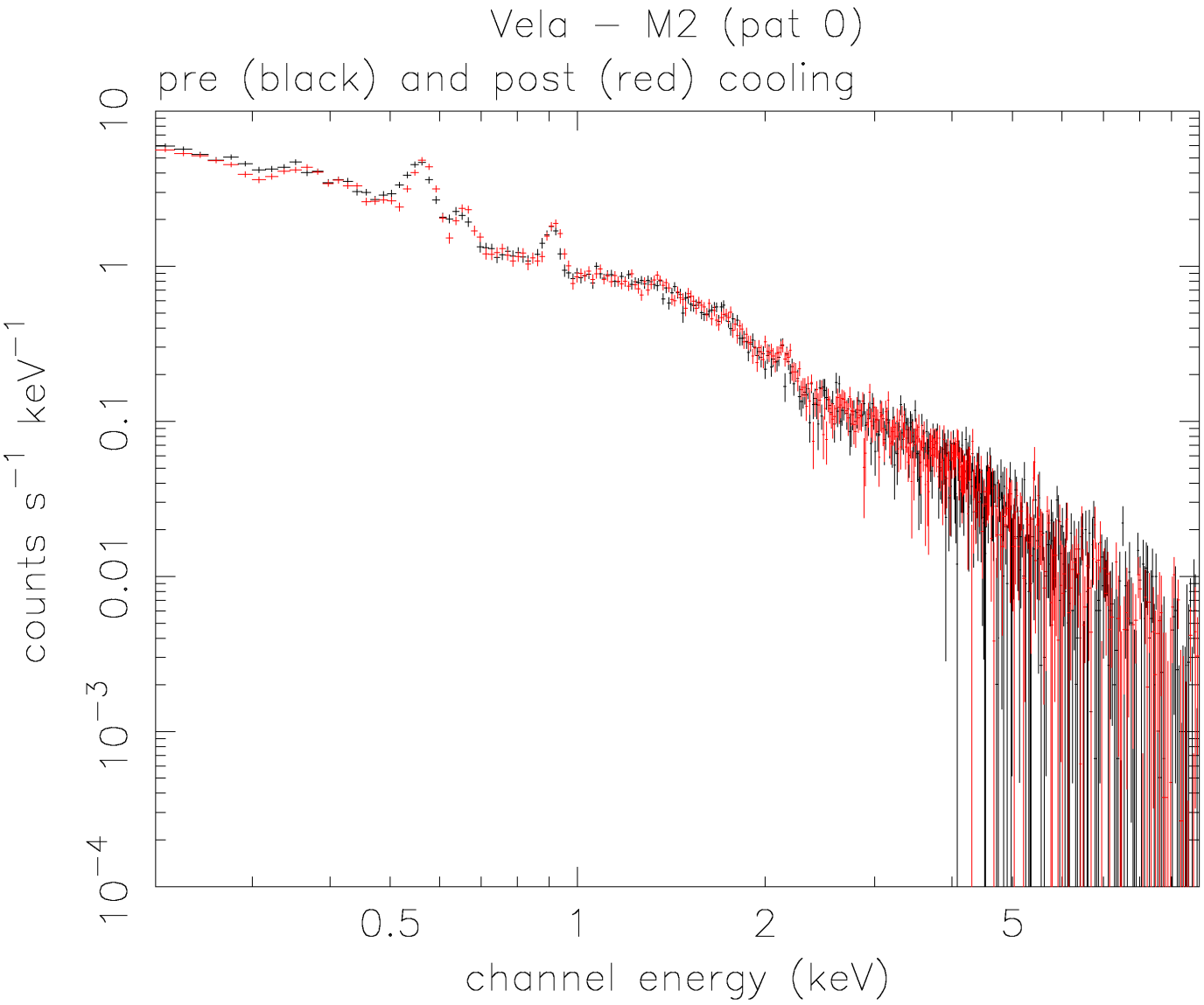
CCF	in work	DT	RN	CCR	RT	public	resp
EPN_CTI_0011	X	X	X	X	X	X	MK
EMOS_x_ADUCONV (12-18)	X	X	X	X	X	X	MK
EMOS_x_ADUCONV_0019	X	X	X	X	X	X	SS/MK
EMOS_x_CTI (7-15)	X	X	X	X	X	X	BA/MK
EMOS_x_BADPIX_0016	X	X	X	X	X	X	BA/MK
EMOS_x_HKPARMINT_0016	X	X	X	X	X	X	BA/MK
EMOS_x_QUANTUMEFF_0013	X	X	X	X	X	X	RS
EMOS_x_REDIST (13-19)	X	X	X	X	X	X	RS
EPN_QUANTUMEFF_0012	X	X	X	X	X	X	RS
related to cooling							

Vela SNR pre and post-M1



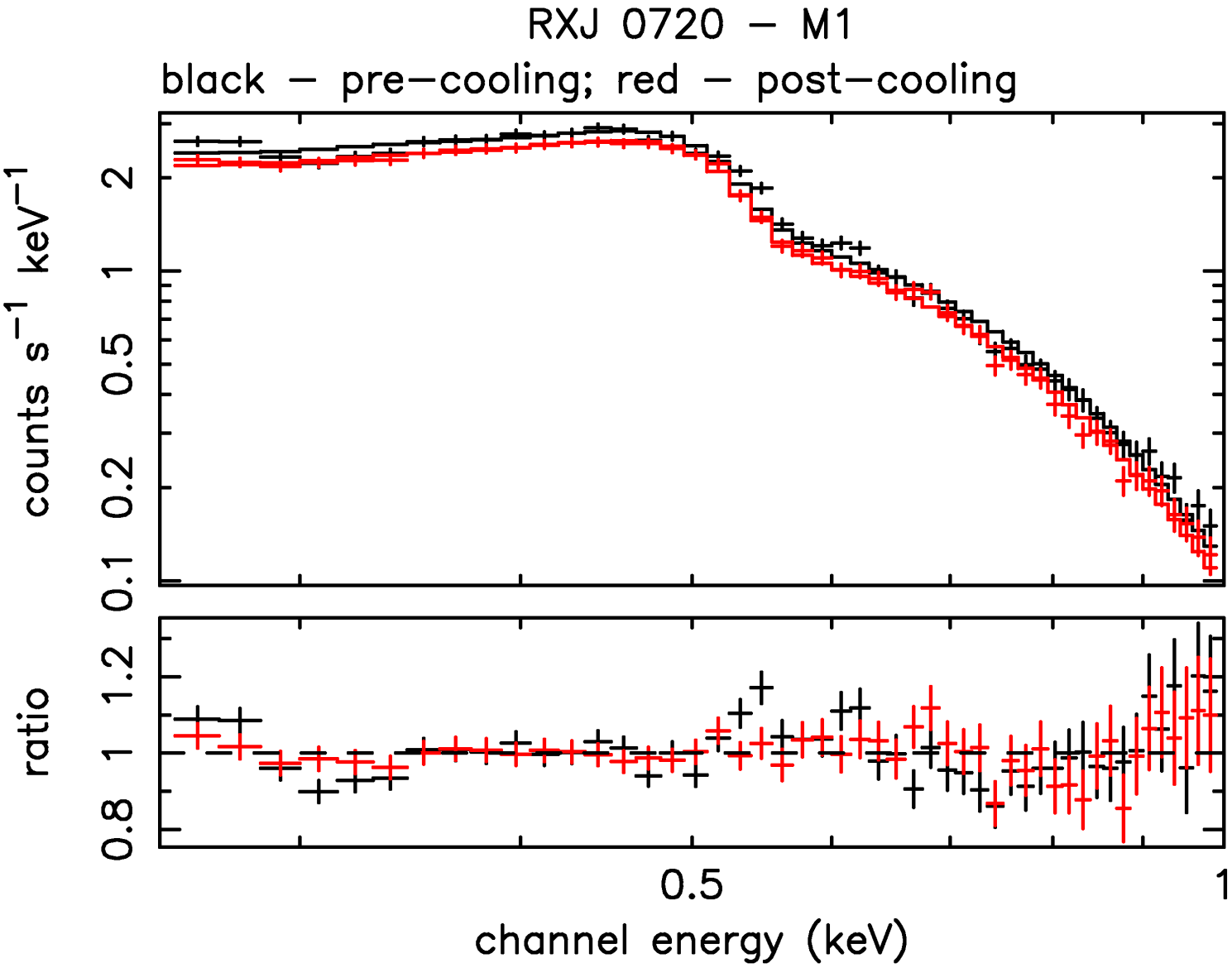
no evidence for a change in QE due to contamination going from Rev 533 (pre-cooling) to Rev 534 (post-cooling)

Vela SNR pre and post-M2



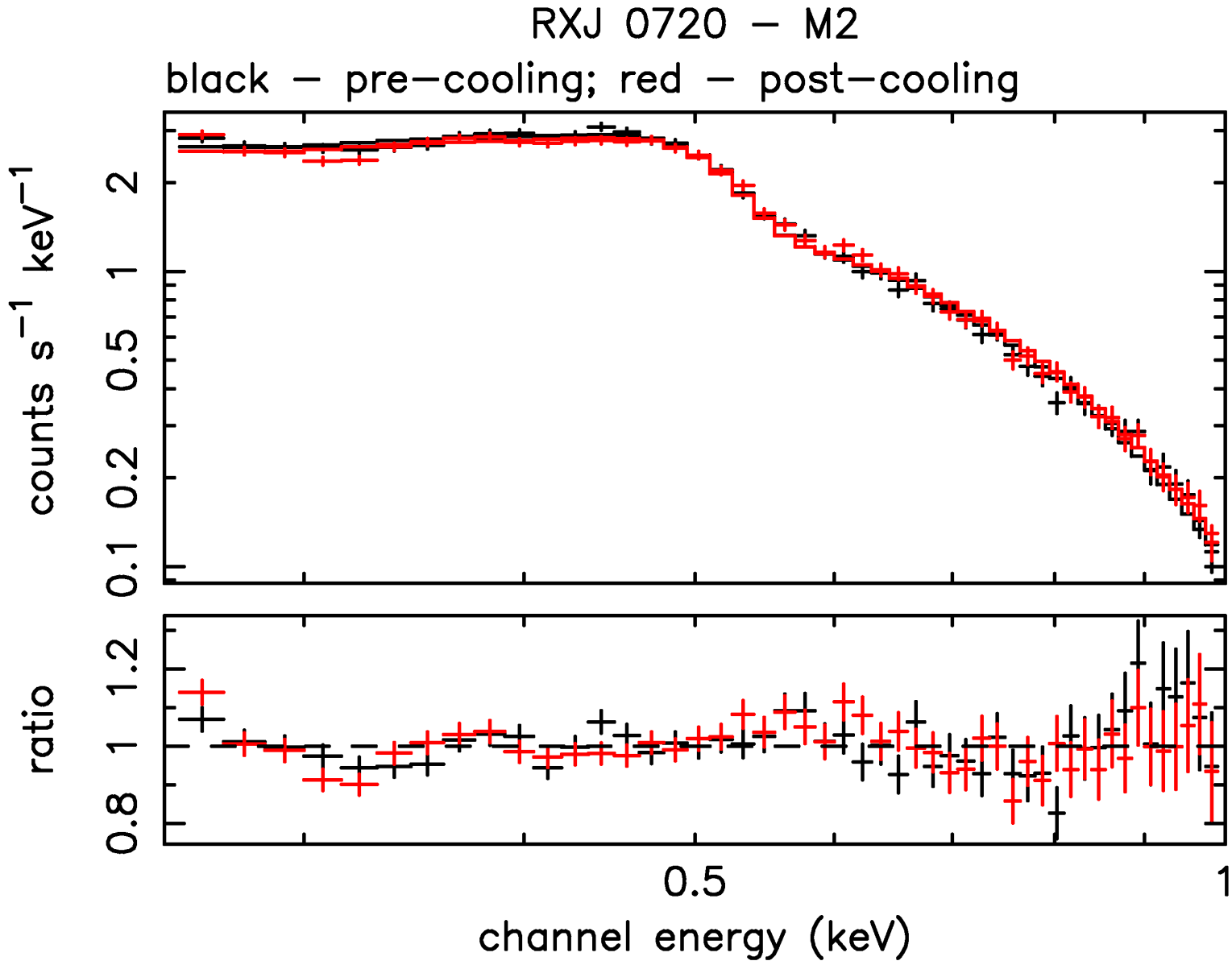
no evidence for a change in QE due to contamination going from Rev 533 (pre-cooling) to Rev 534 (post-cooling)

RXj 0720.4-3125-M1



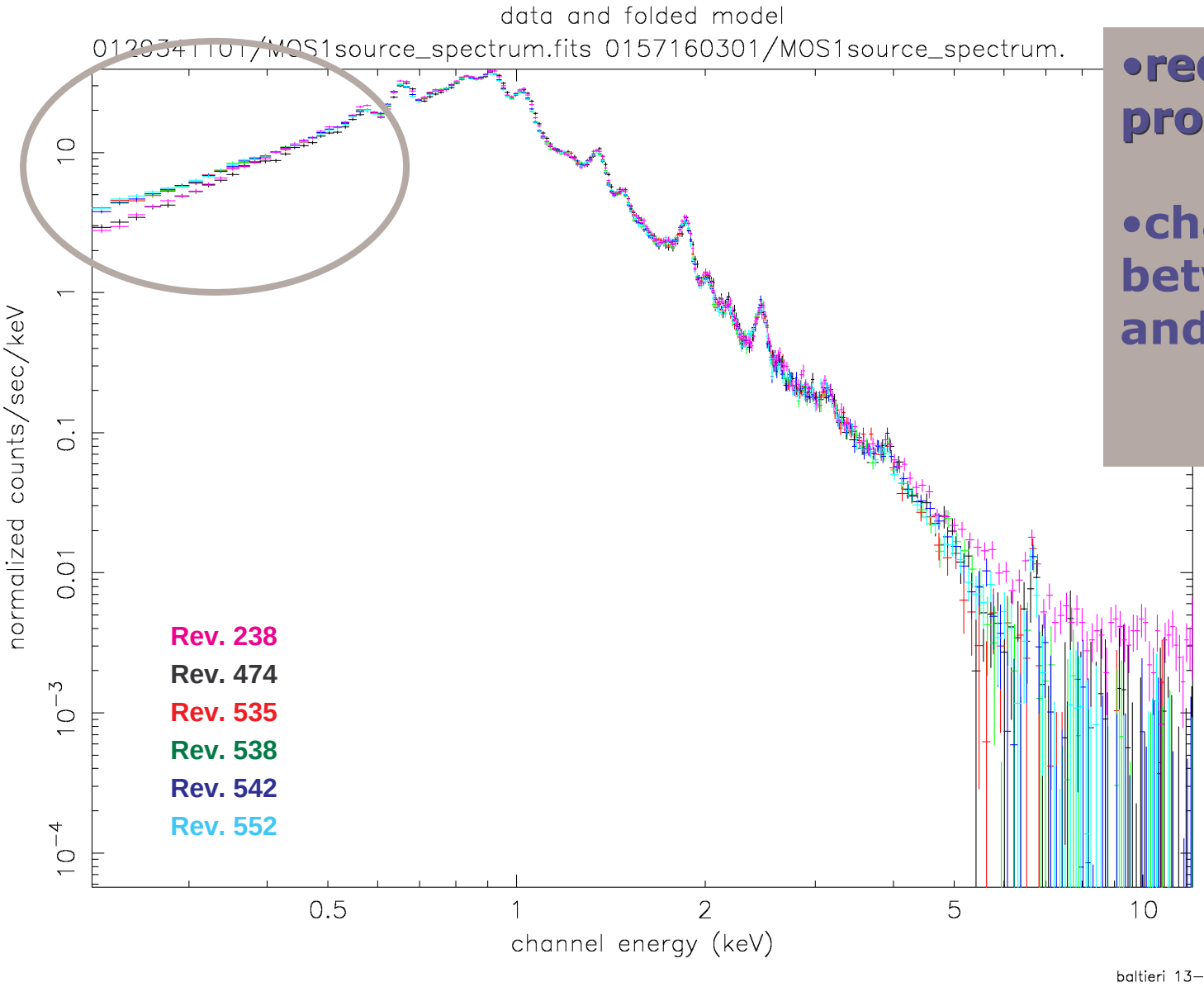
drop in flux but spectral shape is the same

RXj 0720.4-3125-M2



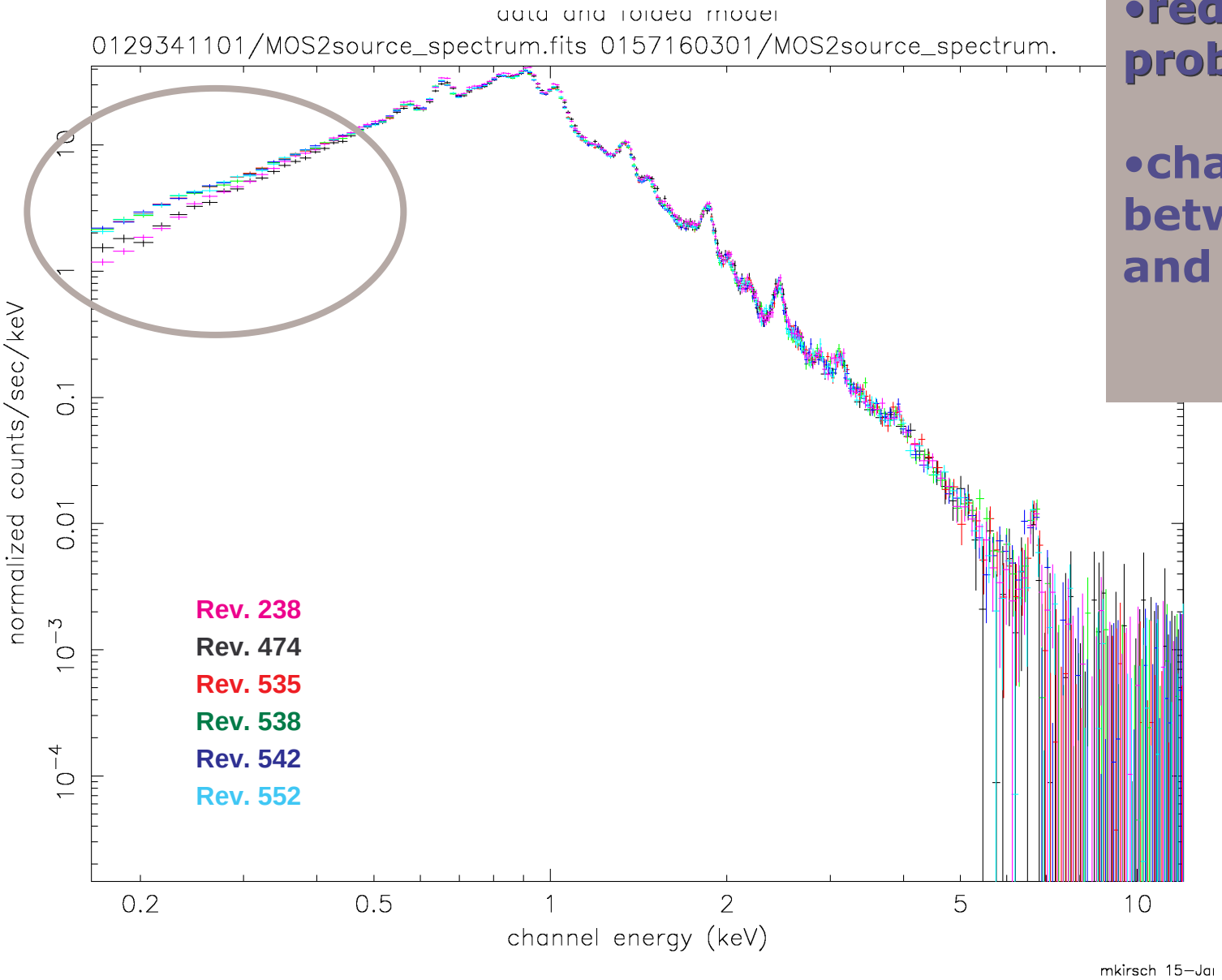
Entirely consistent

N132D-M1



- **redistribution problem?**
- **change between 474 and 535.**

N132D-M2



- **redistribution problem?**
- **change between 474 and 535.**

OPEN POINTS (MOS)

MOS:

. Updates to CCD temperature calibration curves received from the Instrument team on 15/01/03 were implemented in Database Release 4.1 on 22/01/03.

. Rxj0720.4-3125 MOS1/MOS2 post-cooling differences to be further investigated and understood with a view to giving an account of the effect to the User Community asap.

. MOS QE increase on N132D below 0.5 keV, reaching 30% at 0.2 keV, to be further investigated and understood with a view to giving an account of the effect to the User Community asap.

. check zeta pup observations

OPEN POINTS (RGS)

RGS:

. Derive 2nd.-order refinements for the calibration of ODFs from the Cool-A to Cool-C 4 week period.

. Confirm stability of wavelength calibration post-cooling.

. Future NRCOs are needed for Zeta Puppis and Mkn421 when they become visible in 2003 April and May (Cool-D !?)

. update the 1 X 1 Hot stuff:

- run the Spectroscopy 1 X 1 Storage section/Spect 1 X 1
- diagnostic 1 X 1 required

ACTIONS (from cooling review)

AI Wrap-1: on the SOC (MK) to summarise current planning for CALCLOSED measurements with a view confirming PI agreement to the strategy at the EPIC/TTD/Calibration meeting.

AI Wrap-2 : on the SOC (MK) to specify any ongoing monitoring of CCD noise with a view to confirming a strategy with the PI at the upcoming EPIC TTD/Calibration Meeting.

AI Wrap-3 : on the SOC (MK) to specify current planning for bright-pixel monitoring with a view to confirming a strategy with the PI at the upcoming EPIC TTD/Calibration Meeting.

CONCLUSIONS

. Very strong improvements in instrument performances seen

. Product distribution stopped December 03

. Pipeline restarted with full re-calibration December 19

. Product distribution resumed January 16, 4 working days beyond planned target

. Some calibration features to be understood.