RGS/MOS-cooling

Results

February 03, 2003

L. Metcalfe
CONTENT:

* immediate results of cooling
* contamination
* open points
RECOMMENDATIONS OF THE XMM NEWTON USER 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 $\Rightarrow$ 38
$\Rightarrow$ -61%

MOS2:
167 $\Rightarrow$ 24
$\Rightarrow$ -86%
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.
RGS at its initial operating temperature of -80° C
R after cooling to -110° C
PERIGEE T EXCURSIONS MOS1

XMM MIT
Start Date & Time 2002-363 12:34:00
End Date & Time 2002-365 12:33:58

EPIC MOS1 TEMP

deg.C

SPEVAL
E1262 H F PLANETARY TEMPERATURE
T4001 TEMP EMCH1 P RAD

Perigee  Obs. Start
PERIGEE T EXCURSIONS MOS2

Start Date & Time: 2002-363 12:34:01
End Date & Time: 2002-366 12:33:08

Perigee       Obs. Start

12 16 20 0 04 08 12 16 20 04 08 12
29 30 31 04 08 12
hr./Day
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

Loss per transfer (ADU), MOS1/CCD1, Mn/Al

Loss per transfer (ADU), MOS2/CCD1, Mn/Al
ENERGY RESOLUTION: MOS1

MOS1 line width from internal calibration source (FWHM)

Mn line width

Al line width

revolution
ENERGY RESOLUTION: MOS2

MOS2 line width from internal calibration source (FWHM)

Mn line width

Al line width

revolution
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

N132D

zeta Pup

RBS1223

RBS1223

RBS1223

RBS1223
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related to cooling
Vela SNR pre and post-M1

Vela – M1 (pat 0) pre (black) and post (red) cooling
	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

data and folded model

0120341101/MOS1source_spectrum.fits 0157160301/MOS1source_spectrum.

- redistribution problem?
- change between 474 and 535.

Normalized counts/ sec/keV

Rev. 238
Rev. 474
Rev. 535
Rev. 538
Rev. 542
Rev. 552

channel energy (keV)
N132D-M2

0129341101/MOS2source_spectrum.fits 0157160301/MOS2source_spectrum.

- 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 CALCCLOSED 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.