

Meeting date	04.-06.02.2003	ref./réf.	XMM-SAS-V/2003-79/Mn	page/page	1 8
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date de la réunion

Meeting place	Tuebingen	chairman	S. Sembay
<i>lieu de la réunion</i>		<i>président</i>	

Minute's date	20-02-2003	Participant Alexis Finoguenov Andrea de Luca Andy Read David Lumb Vadim Burwitz Wolfgang Pietsch Eckhard Kendziorra Frank Haberl Jean Ballet Konrad Dennerl Michael Freyberg Nicola La Palombara (partly) Kallol Mukerjee Philippe Ferrando Philippe Marty Richard Saxton Silvano Molendi Slava Zavlin Steve Sembay Ulrich Briel Guillermo Buenadicha (partly) Leo Metcalfe Marcus Kirsch Matthias Ehle Mauro Casale (partly) Michael Smith Stephane Rives (partly) Martin Stuhlinger Steve Snowden Tony Abbey
<i>dates de minute</i>		

Subject/objet	EPIC CAL Meeting	copy/copi	F.Jansen
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1 Introduction (EK)

2 Summary CAL workshop MPE (MK)

Summary of pn workshop MPE in 10/2002

(see Minutes http://xmm.vilspa.esa.es/~xmmdoc/EPIC/CAL_MEETING_MINUTES/index.html)

3 Pn calibration

3.1 Frank Haberl- status of pn response, and latest developments

- **Last meeting (Vilspa July 2002)**

The Oxygen edge: Fudge to reduce the depth

RX J1856.5-3754: Redistribution at low energies (PEM)

- **Now implemented (SAS5.4.1)**

New Quantum Efficiency curve

RX J1856.5-3754: Redistribution re-adjustment

SW mode CTI correction: reduce over-correction

- At Gold edge 0.5 % under correction

- N132D 1ES102: OVII / VII triplet , use line ratios from RGS,

- **Current status of EPIC-pn response PN 6.4**

- Energy shift is not caused by wrong CTI correction in SW but by a Gain shift in all Modes

- CTI under correction at 600 eV in FF mode (Vela) change will influence all modes (increases energies which are already too high) needs 'gain' reduction at low energies. This can be done in energy-channel conversion in PEM.

- CTE degradation seems to slow down

- some further monitoring before action

3.2 Konrad Dennerl – FF versus eFF

- Less detector noise in eFF

- Vela SNR: FWHM of eFF observation tends to be somewhat smaller

3.3 Konrad Dennerl – Optical loading

- Optical PSF larger than X-ray PSF

- Optical loading and counting mode:

- star of mag 6 is sufficient in FF mode with the thin filter to trigger counting mode by optical loading, if a "flat" offset map is used

- counting mode may be triggered already by fainter stars(7-8 mag), threshold depends on the details how the readout noise increases with decreasing raw amplitudes below 20 ADU

- Residual optical light and CTI

- Systematic deviations from exponential charge loss caused by optical/infrared light shining through the ventilation hole, which reduces the charge loss in this area due to partial saturation of traps

- Error in absolute energy: $\pm 3\%$ at $E < 1$ keV, 0.5% at $E > 6$ keV

[Optical PSF treatment of PHS tools AI MK](#)

[Vela observation of the order of 24 h to check CTE\(optical loading\) AI MK ask Fred and Leo](#)

4 MOS

4.1 Steve Sembay- MOS cooling and current responses

- MOS cooling
 - RXJ 0720: no evidence for contamination
 - 1ES0102: Ne and Mg lines agree within 1 %
- Time dependent rmf can be produced by the SAS, SAS is using average and stepwise function for ccfs
- Time dependent CTI and ADUCONV CCFs are available.

4.2 Steve Sembay- Low Energy Epoch Dependent Response Variation

- RXj0720: indication of dramatic change in response for low energies from rev 78 to 533/534, (20, 25 % 0.1-0.5 keV)
- N132D more flux for low energies change between 474 and 535.

4.3 Jean Ballet – MOS columns with bad energy

- Detected on Kepler SNR and confirmed on Tycho's SNR
- A few columns per CCD are off in energy by > 10 %
- Small variations (~10 eV) from column to column
- Solution :
 - Find a threshold (for example on MnKalpha energy) below which the column (or part of) is considered bad
 - Declare very bad columns in the BADPIX CCF
 - correct the energy on a column to column basis (similar to Chandra?) 2nd priority , requires software and CCF change (in CTI correction)

5 SAS and CCF

5.1 Matthias Ehle – CAL Observation plan

- Planned CALCLOSED observations as of 2003: on average every 8.1 revolution (parasitically to non-EPIC routine cal observations or dedicated)
- 4.4% of available time for science observations is used for routine cal observations (in first half of 2003). NRCOs are not included.

5.2 Richard – Software

- News on MOS
 - Timing (+ Burst) mode support
 - Time dependant CTI/gain correction
 - Time dependant RMFs
 - Enhanced epatplot support
- News on pn
 - QE revision
 - CTI fix for SW mode
- Especget in SAS, produces spectrum and bg
- Problem at 7 keV for pn extracted sources in an annulus solved

AI on RS: Request on model output for epatplot

6 Analysis Methods

6.1 Konrad Dennerl- low energy challenge (methods for improving the low energy spectra and images)

- Correction of incorrect spatial offsets (Correcting the energy of events in pixels which have received an incorrect offset; these pixels and the required amount of energy correction can be determined from images accumulated at 20 adu This will also be possible with a sort of readjusting the offsetmaps cleaning by common mode and column filtering (get rid of the noisy patches in the offset maps)
- Monte Carlo suppression of detector noise
- Monte-Carlo suppression of out-of-time events
- These methods open the 120-200 eV band, by subtracting noise due to wrong offsets, detector noise events, out of time events

6.2 Jean Ballet - Pile – up corrections on 3C273

- Modelling the influence of pile-up taking different PSF models into account

7 MOS/PN Cross Calibration

7.1 Silvano Molendi – 3C 273 and the effects of pile-up

- Pile up is tricky, it can produce various kinds of effects, requiring adequate treatment. Diagonal events provide a PSF independent solution applicable in the moderate pile-up limit.
- HARD BAND cross-cal:
 - MOS1 returns harder spectra than all other instruments
 - MOS2, PNS and PND spectra are relatively close
 - PNS return softer spectra than PND (QE problem?)
- EPIC/MECS cross-cal:
 - MOS2, PND always agree with MECS
 - MOS1 harder than MECS
 - PNS sometimes harder than MECS sometimes not

7.2 Richard-Saxton - Flux comparison with SAS5.4

Comparison with and without vignetting correction derived from G21.5

- Mos-2 and PN broad-band fluxes agree to better than 5% at all energies.
- Mos-1 over-predicts PN by 4-8% above 2 keV and Mos-2 by ~4% higher flux above 4.5 keV – possibly, needs a further QE tweak
- The Mos-1/Mos-2 distribution gets significantly wider off-axis
- The Mos-1/PN distribution has a sigma 2.5 times wider than that of the Mos-1/Mos-2 distribution.

7.3 Marcus Kirsch – PKS0558 MOS/pn/RGS

- pn residuals at O-edge decreased with the new QE and CTI in SW-Mode by 3-4% (SAS 5.4.1)
- still problems around gold edge for the MOSs
- RGS shows significant trend in spectral shape: harder spectrum
- Individual EPICs show residuals $\pm 5-7$ %
- EPIC cameras agree within $\pm 10-13$ %
- EPIC & RGS agree within ± 20 %

7.4 Dave Lumb – Vignetting

- 10 % discrepancy between M1 thin and M2 medium filter below 300 eV
- M1 and pn results agree well with Alexis analysis on Coma

8 Summary of Action Items

AI_CAL_TUEBINGEN_2003/1: MK to ask for a long Vela operation (100 ksec) in order to measure possible CTE effects related to optical loading in pn ventilation hole

AI_CAL_TUEBINGEN_2003/2: MK/MS to follow up optical PSF/Xray PSF for PHS

AI_CAL_TUEBINGEN_2003/3: RS Request on model output for epatplot

AI_CAL_TUEBINGEN_2003/4: SS to provide MK with statement on low energy MOS flux problem

AI_CAL_TUEBINGEN_2003/5: SM to provide MK with statement on PS problem

AI_CAL_TUEBINGEN_2003/6: RS to follow up the possible coordinate problem

AI_CAL_TUEBINGEN_2003/7: MK to implement values from filter CCF_6 in a new CCF

AI_CAL_TUEBINGEN_2003/8: EK/UB/MK to organise an observation with fixed offset upload in perigee

9 Open old action items

EPIC_CAL_MEETING

AI_CAL_VILSPA_2002/5: Frank to verify pn QE with the Crab

AI_CAL_VILSPA_2002/8: Martin to co-ordinate filter analysis with the aim of finding out which filter is in which camera

EPIC_CAL_WORKSHOP

SS to check the implemented O edges

SS to check the filter transmission concerning carbon edge

SS to check if the excess between 1.8-2.2 keV could be cured with a different treatment of the Silicon edge, fluorescence, or gold edge.

SS to check QE (thickness of MOSs) for high energies

10 Closed old action items in period of last Cal_meeting to this CAL-meeting

EPIC_CAL_MEETING

AI_CAL_VILSPA_2002/1: Hand over the ADUCONV from Leicester to VILSPA (Paul to Bruno) (done)

AI_CAL_VILSPA_2002/2: Steve to provide VILSPA with MOS Timing response matrices (done)

AI_CAL_VILSPA_2002/3: MK to look for a field on which an open filter / filter comparison could be done (done by MS)

AI_CAL_VILSPA_2002/4: Silvano to analyze Circinus A with respect to pn/MOS energy differences (done)

AI_CAL_VILSPA_2002/7: Steve to reanalyse thick filter data (done by MS/MK)

AI_CAL_VILSPA_2002/9: MPE (Ulrich) to analyse Coma data for MOS and pn (done by AF)

AI_CAL_VILSPA_2002/10: Bruno and Paul to work out new time dependent CTI_CCFs correlated to the steps found in the CTI monitoring (done)

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AI_CAL_VILSPA_2002/11: Paul to develop new ADU CONV.CCFs and time dependent RMFs, in line with the new CTI_CCFs ADU CONV and RMFs (done)

EPIC_CAL_WORKSHOP

RS to implement new QE in CCFs (done)

MJF to implement CTI-code for SW correction in SAS(done)

MJF to implement new long term code in SAS (done)

MK to derive new CTI CCF (SW values, long term values (new slope and additional quadratics) (done)

MK to contact Dave concerning filter reliability at the carbon edge energy (done)

MK to check open filter measurement HZ43 Rev.:89 (done by MJF/MS)

MK to look for source for open filter measurement,, no optical light from source and in the FOV (done by MS)

SM to compare 3C273 observations on REVs 94, 95, 96, 277 (Mid November)(done)

SM to investigate on the PKS0558 data concerning the excess 1-8-2.2 keV problem.(done by MK)

BG workshop

MJ Freyberg-pn BG during 3 years

BG paper ESTEC conference 2002

- Internal BG produces various line features (spatially inhomogeneous)
- External BG caused by low energy protons produces a flat spectrum in the camera without features
- Inhomogeneity of doubles for low energies
- Pattern distribution depends on instrument mode
 - SW mode different from same window in FF mode
 - EFF mode less noise than in FF (singles)
- Electronic noise depends on pattern type, spatially inhomogeneous
- Switch for OOT invents for bright sources and for extended sources in SAS

Andrea De Luca- MOS internal BG

Temp behaviour.

- Variations ~25 %
- Variation up to an order of mag during high radiation
- Variations in different spectral ranges are poorly correlated
- Ratio (high state)/(lowstate) flat even when intensities differ by 100 %
- Smooth secular variation (20 %) seen both in closed and calclosed

Steady partial BG

- Presence of steady partial BG
- Var up to 300 % in quiescent NXB on FOV
- Spectral study of extended sources heavily affected
- Spectral shape of contamination bg component
 - Flat PL
 - Photon index from 0,8-1.4 unpredictable
 - Intensity unpredictable

Steve Snowden-BG studies

- The spectra of the background event data from the unexposed corners of the MOS camera show variations in hardness as well as the expected variation in the coarse count rates. This spectral variation is as great as +/- 10% in the 0.5-1.0 keV band after normalising to the >2.5 keV band (excluding the background lines).
- Using the RASS diffuse background data to constrain the cosmic background spectrum in blank fields indicates that there is a significant background component beyond the filter-wheel closed spectrum, even during quiet periods. Significant BG component beyond the filter wheel closed spectrum , even during quiet periods

Dave Lumb-Analysis in "lightly contaminated" proton background

- GT observations of high-z clusters were made in a large range of proton conditions. Even after flaring mitigation the background varies strongly from observation to observation.
- The normalisation in out-of-field counts at high energy varies modestly (10%), but the variation IN-FIELD can be a factor ~5. With modest extent objects, the only recourse is to use background close to the central object, and analysis has been made of the amount of proton vignetting that is experienced, in order to estimate the change in normalisation that might be required.
- A compilation of blank fields with a large range in proton flaring has been preliminarily analysed. They show a wide range of spectra that defy a simple modelling.

Andy Read- The XMM-Newton EPIC Background: Production and Usage of Background Maps and Event Files, and Analysis of the Vignetting

- I have constructed XMM-Newton background maps for the 3 EPIC instruments in their different instrument/mode/filter combinations and in several different energy bands using a superposition of many pointed observations. Event datasets for the different instrument/mode/filter combinations have also been constructed, with longer exposure times than for previously created files. Here I describe the construction of these background maps and event files, their properties and their usage.
- Preliminary results in using these files to define the EPIC vignetting are also presented: Flatter vignetting(energy) found compared to UHB. Statistic is not good enough for determining the optical axis.
- [Link from VILSPA to those files should be introduced on VILSPA web pages](#)

W. Pietsch-Title: EPIC pn background flars:dependence on orbit position and viewing direction

- Including of radmon information of high flaring seasons filtering good time intervals. update on results presented at earlier meetings, based on all data processed till now with the SSC pipeline :
 - Observations are highly effected by radiation at the end of the revolution → observation window should be eventually made shorter, since those observations can not be used as useful science.
 - Influence of viewing direction in correlation to flight direction concerning radiation: not clear if there are areas with lower or higher BG, no recommendations for observation angles with orbit position can yet be given (ongoing).

Philippe Marty- a proposal

Proposal for collecting of all BG fields (Andy, Dave ,,,) combine with Phillippes closed SW and Konrads Monte Carlos OOTE corrections in order to create a eventfile with eventually additional flag for OOTE probability etc, in the FITS file.