esa

MEETING

Meeting date *date de la réunion*	**26.-27. 10 2006**	ref./*réf.* XMM-SOC-CAL_EPIC-MIN-0017	page/*page* 1/8

Meeting place *lieu de la réunion*	**Mallorca**	chairman *président*	S. Sembay
Minute's date *dates de minute*	03.11. 2006	Participant	Martin Turner Andy Read Eckhard Kendziorra Konrad Dennerl Vadim Burwitz Steve Sembay Ulrich Briel Marcus Kirsch Matthias Ehle Martin Stuhlinger Tony Abbey Darren Baskill Leo Metcalfe Richard Saxton Steve Snowden Herman Marshal Paul Plucinsky Michael Smith Chris Tenzer Michael Martin Jenny Carter Antonio Martin Carrillo Guillermo Buenadicha (partly) Neil Cheek (partly)
Subject/*objet*	EPIC CAL Meeting 17	copy/*copi* *A.Parmer*	Minutes by M.Kirsch & M. Stuhlinger

1 EPIC-pn

1.1 Update on the CTI, the absolute energy scale and the energy resolution (K. Dennerl)

- No need for changes – stable controlled situation

1.2 Investigation of the sudden jumps in the absolute energy scale (K. Dennerl)

- Some utliers in calclosed monitoring are caused by particle radiation
- Energy resolution improved during high background due to increased trap situation
- Temperature effects have been implemented into SAS but never been activated due to not understood CCD offsets
- New temperature correction only based on Mn data improves energy positions

1.3 Suppression of the low-energy noise: an improved approach (K. Dennerl)

- New Monte Carlo method to improve low energy cleaning
- Different noise properties in the individual modes (noise increases from eFF, FF, LW to SW) require mode dependence
- Could provide clean images down to 130-140 eV

1.4 Relative Timing (A. Martin-Carrillo)

- deltaP/P=3.7×10^{-8} (timing and burst mode for Crab)
- deltaP/P=4.7×10^{-8} (small window)
- deltaP/P=$(4.5 \pm 9.9) \times 10^{-8}$ (all pulsars)

1.5 Absolute Timing and time jumps (M. Kirsch)

- 70 µ sec standard deviation (requirement was: better than 1 ms)
- XMM phase 0 -350 µ sec earlier than radio peak
- Statistical errors much smaller than standard deviation --> possibly still systematic effect (GS delays have recently been updated. This is not implemented in time correlation for archived data)
- Reliable S/W to find remaining time jumps after SAS corrections
- Less than 2 % time jumps in all modes but EFF (20 %). EFF needs further investigation
- Time jump search algorithm in SAS can now be investigated to be refined in order to reduce time jumps

1.6 Burst mode cal with NRCO 62, prel. Results (M. Kirsch)

- NRCO on Cas-A performed
- Correction function derived from Cas-A results in positive residuals for Crab spectra
- Some iterations needed

1.7 First attempt to derive deadtime of EPIC-pn from FIFO reset counters (M. Martin)

- max ionizing particle leads to saturation of on chip amplifier stage
- FIFO overflow causes dead time in data
- One FIFO overflow causes 1 (FF) to 2 (Timing Mode) lost frames

1.8 Simulation of particle induced EPIC-pn background with Geant4 (C. Tenzer)

- QE and BG simulations
- Images and spectra
- Used to study symbol X detectors

1.9 EPIC-pn Timing-Mode Closed Filter Background (on behalf of MF)

- Measurements of noise below lower threshold
- OCR 1762 successful
- Count rates (dominated by low energy spectral part) as expected
- No unexpected increase of background below default threshold
- Maybe general trend that background increases with time: increasing power-law normalization (solar minimum)

2 EPIC-MOS

2.1 CTI and Gain model for MOS (D. Baskill)

- Erroneous values in a CTI CCF caused data loss in the pipeline processing of MOS2 CCD4 at energies below ~600 eV, in the pre-cooling epoch only. This has now been corrected with the release of a new CTI CCF for that epoch.

- Problem originated in the serial CTI, which appeared to improve in both time and energy for MOS2 CCD4 in the pre-cooling epoch.

2.2 Timing Mode spectral calibration (D. Baskill)

- The Gatti correction is not applied timing mode, resulting in noisy spectra
- Redistribution of events on a probability basis leads to a significant improvement.

2.3 Automated Spectral Response Fitting (S. Sembay)

- Refinement of RMF is lengthy process when done on a case by case basis, using different sources to calibrate the RMF with spatial and time dependence
- Automation of process using idl optimization codes by Marquard (Goddard)
- Smoothing out the residuals in early MOS 3C273 data improves cc with pn, MOS and probably RGS
- Forcing spectral agreement between MOS and pn in RXJ1856 improves residuals in contemporary MOS2 3C273 data

3 XMM SLEW MODE

3.1 Slow Slew Survey tests (R. Saxton)

- FLAGSs – currently all events marked bad
- All frames are marked as extended because not enough time to read a frame while next one is looking at the sky (need 500 ms)
- Bad pixels need remapping
- Pattern 0 only, but need to calculate pattern fraction
- E3/E4 BG determination problematic
- 10 arcmin position error (should be easy to spot)
- vignetting effects

3.2 MOS 3x3 Pixel Mode (A. Abbey)

- 3x3 works
- some changes in spectral response which need further investigation
- Caveat: aux file has problems regarding times (setup problem, non understanding of sequencer read out?)

3.3 XRT PSF in Slewing Mode (A. Read)

- Possible CCF 2D PSF images
- for each instrument mode energy .. 2-D PSF as function of impact parameter
- Azimuthal MOS RGA vignetting variations not yet included

4 Cross Calibration and BG

4.1 The Cross-calibration Pre-(View) tool (M. Kirsch, M. Stuhlinger)

- Internal Cross Calibration (preview) tool released
- linked from our internal cross calibration page
  http://xmm.esac.esa.int/~xmmdoc/internal/int_cal_instr_supp/cross_cal/index.php
  or directly http://xmm.esac.esa.int/cgi-doc/ept/preview.pl
- The website is the front end to easily access our cross calibration data archive and gives the possibility to judge the calibration situation of the XMM-Newton EPIC and RGS instruments by comparing joined and individual fits and their parameters and fluxes on various targets and observations for different calibration versions (currently SAS6.5 and SAS7.0).

4.2 Cross-calibration of XMM and Chandra (H. Marshall)

- Chandra cross cal available on web.
- Cross-cal Chandra-Suzaku started.
- Flux comparisons using 17 AGN:
- LETG fluxes agrees better with MOSes, in 0.5-0.85 keV similar (but lower than pn), in 0.85-1.5 very good agreement of all instruments. LETG agrees with pn at high energies.

- MEG between MOS and pn in 0.5-0.85 keV band.
- Trends in comparison of LETG/EPIC and MEG/HEG/EPIC look similar.
- 8 more simultaneous observations for analysis, common Chandra/XMM GTIs needed.
- Contamination monitoring: C increases more than model predicts.

4.3 Further work on cross calibration at lowest energies between ROSAT-LETGS-EPIC using WD and NS Spectra (V. Burwitz)

- Paper available: 2006 A&A 458, 541.
- WD NLTE pure H model spectrum of HZ43: flux differences of 30% dependent on model assumptions (temperature, surface gravity etc.)
- RXJ1856: soft X-ray to UV: two temperature bb model: surface + hot spot: 62.8+/-0.4 eV and 32.3+/-0.7 eV.
- Fine tuning of LETG-HRC-S effective (maximum up to 20% between 50-70A) area using physical models/data comparison of HZ43, Sirius B and RXJ1856.
- After correction, LETG N_H/temperature agrees with pn.

4.4 A Comparison of HETG and RGS results on E0102 and an update on the BI CCD CTI correction for ACIS (P. Plucinsky)

- 1ES0102: no Fe, common model for HETG and RGS
- For HETG: use Pollock RGS model, use Dans spatial remnant model.
- Very good agreement between RGS and HETG within 10-20% in brightest line fluxes, HEG sees indication for some low level Fe.
- For 1ES0102, Chandra, RGS and MOS agree at low energy, and pn might have a low energy problem. Re-analysis with newest RGS model necessary.
- CTI correction for S3 and S1 will be includes in CIAO, so from Dec.2006 all 10 CCDs will have CTI correction included.
- Using CTI correction on 1ES0102, OVII triplett shoulder and OVIII line described perfectly.

4.5 Cross-calibration of RGS and MOS using Zeta Puppis (J. Carter)

- Aim: check low energy – gain relationship (currently linear).
- Cross-cal of RGS and MOS: fit RGS, save model, fit MOS. Model 36 gaussians + brems + absorption.
- Total Band 0.3-2 keV, subbands 0.3-0.8 keV, 0.8-2 keV.
- RGS flux degradation in 0.3-2keV band over mission, approximately 8% per 1000 revns.
- Concentrate analysis on 4 lines over band range.
- MOS1: Line 1 show 2 eV higher line energy than RGS, line 2 agrees, larger shift for line3, large scatter for line 4 in both RGS and MOS.
- Line 3 shows flux decrease, line 1+2 highly scattered with weak decreasing trend overall
- MOS e-sacle in agreement with RGS although systematic offset at 1 keV of 2-3 eV.
- Scatter in flux values for both rgs and MOS, especially at low energies.
- Flux of MOS generally above RGS values apart from highest energies.

4.6 RGS Calibration Update (A. Pollock)

- Schedule for new CCF: 2007-01-31: new rgs effareacorr and rgs background templates.
- PI extraction region from 90% & 95%
- RGS physical test harness: SNR 1ES0102-7219 is constant, CVI line. HR1099 is bremsstrahlung continuum, Procyon strong CVI line, no continuum.
- Still to improve: SAS7.0 model background higher than data at CVI line for 1ES0102. RGS flux drops by about 10% over the mission.
- C contamination model describes time dependent effareacorr effects. Layer thicknesses consistent for RGS1 and RGS2.
- Procyon spectrum: agreement with MOS1, 10% difference to MOS2 and 13% to pn.
- Crab spectrum at low energies: not single po, but weighted sum of spatial dependent po indices found using Chandra (Mori et al) => curvature at low energies.

4.7 2XMM plots (Steve Sembay, Silvia Matteos)

- 2XMM pn versus MOS fluxes
- 0.2-0.5 keV: large spread in lowest band compared to other bands. MOS1 double peak. Big difference of 15% in on-axis (CCD1) and off-axis fluxes (peripheral CCDs) in MOS1 for lowest band.

4.8 Report on BGWG (A. Read)

- Major releases:
  - BG analysis web page with recommended information, papers, etc.
  - XMM-ESAS
  - Blank sky event files
  - Filter wheel Closed event files
- Development:
  - SAS tool for flare screening
  - XMM-ESAS for pn
  - Improvements/updates on blank sky eventfiles
- Flare background analysis: season effects: winter months have quieter background than summer months.

5 AOB

Matthias Ehle: Chandra needs input for their XMM instrument sheets (see Action Items)

5.1 Dates:

- Next CROSS-CAL Workshop: 18-19 Januar, ESAC
- Next EPIC-CAL meeting: 11-13 April, Italy (Milano, Palermo) or Saclay ??
  → TBD in the next EPIC manager meeting
- IACHEC 8-11 May LA, US
- Next EPIC BG working group: linked to CAL meeting

6 Long term calibration plan

- MOS:
  - CTI/Gain for special column areas
  - Re-check redistribution for line rich sources not yet perfect in lines
  - Still flux differences of ~ 10 % compared to pn
  - Spatial dependence of very low energy response of MOS (lab testing at LUX in 2006)
  - Spatial variation of low energy QE. Situation in SAS and CCF ?
  - Outer CCD calibration regarding QE, off axis PSF,
  - Rate dep. CTI model (some Vela data in combination with Calsource are already available)
- pn:
  - pn energy refinement for fast modes (CTI(energy, rate)), possibly NRCO needed
  - Fast modes arf
  - Redistribution for line rich sources not yet perfect in lines
  - High energy flux lower than MOS, mirror measurements soon at PANTER (in 2006)
  - Random jumps in pn energy scale of <20 eV (NRCO on PKS2155 in July)
  - Detector noise in different modes
  - Special CTI due to vent hole (can only be checked after implementation of column gain refinement)
  - usage of the FIFO-reset-counter for improving the integration time (lab measurements at IAAT, possible check also at PANTER in 2006)
  - Investigation of double event behaviour (ongoing at MPE)
  - Time jumps + timing document
- general:
  - PSF: off axis PSF (possible raster point NRCO needed in 2007, in combination with SW mode test on the outer CCDs),
    additional gauss (low priority),
  - Astrometry: possible residual in the position angle rotation (Euler ? angle) of the order of 0.1 deg. (considered to be low priority)
  - Thin and medium filter: not worth spatial calibration, but check thin1 versus thin2 filter

7 Actions items

AI_EPIC_CAL_17_01: MK to propose strategy for EFF non-focus CCD calibration
AI_EPIC_CAL_17_02: MK and KD to implement new pn time/temperature dependent CTI/Gain by end 2006
AI_EPIC_CAL_17_03: MK, MM to test FIFO reset correction
AI_EPIC_CAL_17_04: MS and MK to follow up flare screening method with regard to the effects of hot pixel, possible badpixfind changes required
AI_EPIC_CAL_17_05: MK to collect input for Chandra short guide by 18.11. 2006
AI_EPIC_CAL_17_06: MST to updated CC status including Chandra XMM flux table by 16.12.2006
AI_EPIC_CAL_17_07: MST to coordinate flux bands with SSC
AI_EPIC_CAL_17_08: SS to calibrate Pattern 0 for 3x3 mode

8 Open old action items

AI_EPIC_CAL_16_01: Implement LW CTI refinement into CCF before August (MK, MJF)
AI_EPIC_CAL_16_03: Implement column dependent CTI/Gain correction (RS, DB)
AI_EPIC_CAL_16_05: Provide estimate for the need of additional MOS CLOSED observations (SSn)
AI_EPIC_CAL_14_1: Additional time column with other 0 point for OHL (RD, MK, MJF)
AI_EPIC_CAL_14_3: MK to implement time jump in a Qcheck type procedure in the long term

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

AI_EPIC_CAL_16_02: MK to initiate NRCO for Burst mode energy cal refinement and carry through calibration changes (MK)
AI_EPIC_CAL_16_04: Change energy binning of MOS DRM from 15 to 5 eV (RS)
AI_EPIC_CAL_16_06: Create CAL functionality and CCF to deal with FIFO reset effect (RS)
AI_EPIC_CAL_14_02: MK to update frame times according to analysis presented in 1.1
AI_EPIC_CAL_15_07: Provide input for column region dep CTI (DB)
AI_EPIC_CAL_15_08: Implement column region dep. CTI into SAS (RS, MK)
AI_EPIC_CAL_15_10: 0.75 sec star tracker delay to get into system (MK, RS)
AI_EPIC_CAL_15_11: Track implementation of 'switch all 1 CCD slews for pn to CLOSED', Specify date for implementation by end of October (MS)

10 Splinter meetings

Note that Action items set in the splinter meetings are not tracked in the official EPIC CAL minutes

10.1 Paper of Nevaleinen (MT, MK, LM, UB, SS, SSn)
The revised version of the paper has been seen as not critical anymore. However it was decided that MK, SS, AP, FH should respond to the last message of JK addressing again the problem of the differences in the photon spectra in Fig 3.

10.2 Report on reliability of instruments till 2014 (MT, MK, LM, UB, SS, SSn)
SS will provide summary of the patch situation with the aim to show that the patch has stabilized.
MK will provide plots of CTI and energy resolution as a function of time in combination with radiation plots.