Danish Space Research Institute
Juliane Maries Vej 30
DK-2100 Copenhagen

JEM-X SDAST meeting 28, 3rd–6th May 2004 at DSRI, Copenhagen

N.J. Westergaard, P. Kretschmar, C.A. Oxborrow

June 25, 2004

1 Participants

Jérôme Chenevez jerome@dsri.dk
Paul Connell paul.connell@uv.es
Peter Kretschmar peter.kretschmar@obs.unige.ch
Stefan Larsson stefan@astro.su.se
Niels Lund nl@dsri.dk
Sami Maisala smaisala@astro.helsinki.fi via IRC
Silvia Martínez-Núñez silvia@dsri.dk
Tim Oosterbroek tooster@rssd.esa.int
Astrid Orr aorr@rssd.esa.int
Carol Anne Oxborrow oxborrow@dsri.dk
Nicolas Produit nicolas.produit@obs.unige.ch
Niels Jørgen Westergaard njw@dsri.dk

The first two days of the meeting were the formal SDAST meeting, followed of two days of informal discussions about imaging and source spectrum extraction. Some people did not participate in all four days of the meeting.

2 SB, CBJ: JEM-X status

- JMX1 nominal
- Gain change caused by change of conductivity due to drift of ions when HV is on. Effect is temperature dependent. Negative side effects:
  - loss of spectral resolution
  - change of spatial gain variations
  - gain depends stronger on intensity (high intensity-¿local gain drop)

- JMX2 energy resolution 9% -¿ 14%
- JMX2 short activation (6h) showed recovered plate, comparable to orbit 30, but very rapid 'aging', i.e. increased gain to in-use levels. But energy resolution might be improved (11%).
- Hope for longer activation during next SPI annealing.
- Gain glitch dips in JMX2 have become more frequent and deeper (comparison of rev 30 vs 150). In orbit 30 75% of time was on normal gain, in orbit 150 it's ¡30%!
- JEM-X FM1 in lab is worse - gain goes up by factor 5.
- All microstrip plates have maximum intensity above which they will be "quenched". Rates in instrument:
  - 50 keV/s/mm^2 Cal. sources
  - 1.5 keV/s/mm^2 CRs in space
  - ¡0.1 keV/s/mm^2 X-ray sources
- Up to now it seems that calibration source spectra are still representative of the overall gain evolution.
- Findings:
- No concern (anymore):
  - anode strip losses
  - gas contamination
  - pressure loss
- Micro-strip plate aging IS a concern
- Should keep "one JEM-X only" policy
- Xe line has to be monitored. Propose to use all-detector spectrum and fit Xe line to see if it is OK.

AI28.1 **AI 28.1:** On PK: Make detector spectra of all available SWs to see Xe line. Due: End May 2004

AI28.2 **AI 28.2:** On CAO: Write SCREW: j_calib_gain_fitting to add HV values to gain history. Due: End May 2004

3 CAO, PK, NJW, SL, SM: OSA 4.0 status

- some HK parameters should go into gain history tables as well.
- New j_cor_gain and j_cor_position
- New scripts, possibly new j_bin_bkg_***
- New j_src_spectra and _lc
- New j_bkg_spat_sel, new BKG models for JMX2 ready in testing by NJW
- New j_ima_tools
- New responses, will have to be redone with j_src_spectra-4.0.0
- NJW can't easily find VERSION numbers for JEM-X files.

4 CAO: Documentation

- See attached slides
- CAO points out her various pages which seem underused
- ADD wil need update in May/June timerange.

5 JC: ISDC Rotation

- Rotation will be kept, should be aligned with GCDE and interesting parts of GPS since the planning is better now.
- Regular topic on DSRI monday meetings.

AI 28.3: On PK: Email ISDC-ops concerning instrument reps. and access to data. Due: End May 2004 AI28.3

6 AO: JEM-X and ISOC

- A. Orr gave overview of her duties. Partially taking over from R. Much.
- JEM-X 2 should be switched on as long as possible in next activation, 40 ksec is definitely not enough.
- JEM-X team needs confirmation when configuration changes are actually implemented.

7 JC: XE line modelling

- Xe line after reactivation of JMX1 in Apr 04 matches very well that of Feb 03.

8 SM: Background modelling

- Sami finds Xe line variations from 29-33 keV in rev 41 data.
- Spectra should have changed significantly after rev 170, not yet analyzed.
- Weak source reported in ATEL 223 also not found with bkg corrections.
- For GRS 1915+105 there is a slight improvement in DETSIG. Somewhat smoother noise pattern.
- Also results for Cen X-3 slightly improved.

9 NJW, NL, PC: Imaging

- NJW has developed j_ima_refined_imaging, but needs 9 min per image.
- NL explained his midisky, among other points:
- redistribute shadowgram to idealized 1*1 mm grid

DSRI

- IROS mechanism using pixel illumination function catering for: + mask, mask support, collimator
- Backprojection by "image response"
- emphasized problems of extended footpoints
- PIFs per energy band, digitized to 256 steps (zero to parametrized max. illumination.
- In source removal, positions are refined up to 4 times.
- Some discussion about pixel corrections.
- Actual PIF calculation requires both PHA and PI (photon energy)
- PC working on jemiros (midisky) [should be named j_ima_iros] Wrapper around midisky.

10 JC: Mosaicking

- See attached viewgraphs
- RW's tool at ISDC is based on JC's work at DSRI
- None of JC's input parameters conform to ISDC naming system
- Weighted exposure maps are also produced by JC's program
- The "Weighted Intensity" map is the final mosaicked image
- Signal Map = (Weighted Instensity)/(Wieghted Exposure)
- Different sources can be best seen in either the weighted intensity or the signal map
- Maps can be distorted due to incorrect projection on the spherical sky, since maps reflect a locally flat area of sky

11 NP: Spectral extraction using PIFs

- NP would like to use GEANT to create PIFs.
- Has generic function regress.C once event data and PIFs have been read in and events summed to "shadowgrams".
- Calculates (no fit) linear solution to flux over PIF value in shadowgrams =¿ slope is source flux, zero offset=bkg.
- Shadowgrams must be corrected for efficiency, and have flatg bkg in his scheme

12 SL, NL, CBJ: Spectral extraction

- SL Calculates PIF at 8 different energies internally then uses PIF values making cut at 75% as maximum PIF values vary with energy.
- With latest j_src_spectra and Crab: $PL = 2.12 \pm 0.03, N_H = (1.4 \pm 0.5)E22$
- NL:In 5*5 pattern, one line of pointing positions has 10% higher flux than others! Why???
- CBJ: With own simple analysis got jumps in Crab lc. If assumes collimator is tilted by 8', this could be explained.
- PIF Calculation
  - j_src_pif by end of June [SL] Creates 1 PIF per source and energy band including vignetting, pixel sizes etc.
  - j_src_spectra by end of June [PK] Uses PIF and event lists, applies deadtime, grey filter, GTIs ... Interpolates between PIFs calculated for closest energy bands.
  - j_src_lc by end of July [PK]
  - Pixel corners go to IMOD table.

13 PK, SL, NJW: Shared library functions

- Naming scheme: JEMXtypeofdataAction, e.g., JEMXeventsRead
- PK will propose C struct for events and read/write functions. Ditto for spectra.
- SL will propose C struct and functions for lightcurves.
- NJW will propose C struct and functions for detector maps and images

14 General Discussion:Test Cases

- It was agreed to do a better follow-up on the software changes since this has not been done in a systematic way in the past.
- The scheme below is a starting point and scripts (or ?) should be defined so that an analysis can be redone in an easy and well-defined way when a new method/program is available.

Which property	What data	Who	S/W
LC stability	Crab; rev 43,44 102, 170	SL,CBJ,NL	ISDC,CBJ,NL
Image flux stability	Crab	NJW,CBJ,NL	ISDC,CBJ,NL
Spectral shape	Crab X-ray burster	SL,PK SB	ISDC,CBJ
BKG inclusion	Fields with a	SaM, PK	ISDC

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                        strong and a
                        weak source

Timing                  Crab            SB,SL          ISDC

Misalignment            GCDE+Crab+Vela  NL,NJW         ISDC,NL

Detection sensitivity

Coding noise from       GRS 1915+105    JC,NJW
strong source           & IGR J19140
   (One idea is to add shadowgrams with and without source)
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- NJW will initiate a documentation of these activities and their results. This will also go into the performance documents that must be delivered in June 2004 (also AO in July).
- The algorithm for deriving a source flux from a peak in a reconstructed image must be clearly defined.

15 General discussion: Priorities

- 1 : Spectral shape - also for weak sources
- 2 : Light Curve stability
- 3 : Imaging flux stability
- Lower: BKG determination, timing, misalignment

AI28.4 **AI 28.4:** On NJW: Add detector pixel corner positions to IC file IMOD-GRP. Due: End May 2004

AI28.5 **AI 28.5:** On NJW: Add detector pixel sizes to IC file IMOD-GRP. Due: End May 2004

AI28.6 **AI 28.6:** On NJW: Add list of mask open hole positions to IC file IMOD-GRP. Due: End May 2004

AI28.7 **AI 28.7:** On NJW: Add tilt keyword in IC file IMOD-GRP: COLL-MOD. Due: End May 2004

16 New Action Items

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