Minutes of JEM-X SDAST meeting #37

Copenhagen 13-14 March, 2007.

Participants:
Peter Kretschmar, ESAC,
Silvia Martinez-Nunez, Univ. of Valencia
Simona Soldi, ISDC
Stéphane Paltani, ISDC
Niels Lund, DNSC
Carl Budtz-Jørgensen, DNSC
Søren Brandt, DNSC
Jérôme Chenevez, DNSC
Niels J. Westergaard, DNSC
Carol Anne Oxborrow, DNSC

JEM-X status (SB): The particle background rate has been increasing in the entire mission so far.
The gain of the microstrip plate keeps going up – with constant voltage, so regular voltage commanded decreases are used to keep the real gain around 20 PHA channels/keV.
The energy resolution has developed in time going from 9.5% to 10.5% but from revolution 400 it has been almost constant.

We must think about switching to JMX2 as default instrument maybe from AO5 observations or next Crab calibration in half a year's time. Using both instruments as standard setup should probably wait until the end of the INTEGRAL mission is reasonably well known.

The temperature sensitivity for the gain was 1% in the beginning but it is now around 2.5% - almost proportional to the gain increase.

In connection with the eclipse seasons the DFEE is switched off and the setting is saved in the DPE and the recovery is not running smoothly. CRC test ends with an error in memory segment B to C (B000 – CFFF). It was discussed whether a new standard procedure should (or could)be implemented to prevent this.

The INTEGRAL orbit will evolve (due to interactions with the Moon) to very low perigee in 2012 and it will dive into the proton radiation belt. A boost maneuver in 2010 could lift the minimum perigee distance since there is enough fuel for it.

ISDC news (SP): Simona Soldi will take over some of the testing of JEM-X software and the development of the scripts from Silvia Martinez.
Masha Chernyakova is leaving ISDC so a reorganization of the help group is required.
OSA6.1 with ISGRI energy determination (LUT) is planned with better results than 6.0 but there is no fixed time for it yet. There is a lack of calibration lines between 60 keV

and 511 keV. But now there seems to be a solution that must be tested thoroughly, however. It will be decided from the JEM-X software development status whether a 'small' ISGRI release will be made or the two will be combined into a 'bigger' OSA release.
Nami Mowlavi will stop working on the operations and he will be replaced by Volker Beckmann. Pierre Dubath and Nami will start working on Gaia. SP is involved in the EDGE proposal.

ESOC/ESA/ESAC news (PK): Alvaro Gimenez is leaving the post as Head of RSSD. He will be replaced by Martin Kessler (interim) and a new head will be appointed after first Cosmic View selection.
Science Operations of missions past PV phase will be led by Vincente Gomez (Head ESAC).
ISOC staff changes: New senior developer: Silvia de Castro, Junior developer: Pieter Jan Baeck. Rees Williams will "fade out" from summer 2007, no replacement is in place yet. MEOR (Mission Extended Operations Review) to make recommendations on support and operations beyond design life of 5 years. Process should be finished by end of May 2007.

Report from IUG and ISWT (NL): AWG has made a statement that no definite maximum time should be defined for XMM and INTEGRAL but studies on cost minimization should continue. LISA has (nominally) been taken out of the current planning and this has freed enough money to continue XMM and INTEGRAL for some time. This could be bad new for XEUS. So there is still a chance that INTEGRAL will be supported after 2012. Perhaps a Russian ground station can be used free of charge.

JEM-X representative (JC): A new round with fewer people is to be started. From an ISDC point view the best reason would be have a specific project to work together face to face for each visit. We aim to go there at least every two months but more frequently when the need arises. SP will be traveling quite a lot so it is important to check the dates with him well in advance of each visit.

INTEGRAL final archive (SP): What can be delivered to the community after INTEGRAL mission life?
SPI wants to make a full analysis of the sky – all spectra and diffuse emission etc.
For JEM-X and ISGRI there should be images in a range of energy bands. If someone wants to look for an undetected source: create an archive of all the pixels in the sky as a function of time i.e. the flux as a function of time. JEM-X will require 100 million files that need to be organized in a clever way. Software to collect the necessary information must also be written.
There was a discussion about how this can be supported and what the angular and time resolution should be. Perhaps it would be better (also) to keep the event list. But such a list can only be used together with an instrument description and adequate software. The entire archive will be kept but it is uncertain whether software such as OSA will still be around for the analysis 15 years from now. A discussion of this was started and various suggestions and comments were made around the table. PK will make some inquiries at his ESAC(ISOC network.

New developments of j_ima_iros (NL): A graceful handling of excessive source list presented by the user must be introduced. j_ima_iros will be changed to use three predefined energy bands for source searching and after that handle the user requested energy bands. (Later in these minutes there is more discussion aboutthis). A correction has been applied to the source position to make a consistent link between source finding and PIF definition.
The energy dependent penetration into the detector implies a need for an energy dependent source position correction. Perhaps this one can be handled accurately enough by the CDELT coordinate keyword.

Upcoming Crab calibration and dead time investigations (SB): After switch-on it takes about 5 hours before the gain has leveled off.
There is an additional deadtime correction that amounts to 10% when the greyfilter setting is below 15.

- Grey filter rejection is not as random as expected
- Extra deadtime correction is required
- Is the drift velocity going down?
- Can we improve the performance by increasing the drift voltage?

Alternative spectral extraction (j_ima_cross) (SP): IDL software by CBJ has been converted into C-code.

- Integrate with OSA, but do not reinvent the wheel
- Use coordinates and energy from COR-level
- Only replace imaging part of j_ima_iros; no source detection, flux extraction (reuse j_ima_shadowgram)
- Will require j_ima_src_locator and mosaic_spec
- What about light curves?

Problems:

- 1 mm pixels makes a convolution matrix of 10^8 elements
- Fast if you have more than 1GB memory
- Solution: Apply the convolution per pixel, but then one must build all images in memory at the same time

One can specify the part of the image that is required (around a source)

Differences in approach between CBJ and SP:

- Coordinates, energy …
- Do not add counts, but efficiency corrected (DT,GF, EE, QE) counts
- Needs to build separate variance maps
- Dynamic detector map
- Use all pointings from the revolution
- Remove hotspots dynamically

A discussion started on how to keep track of dead anodes: SP wants to combine data from an entire revolution in an IC file. The question is whether it should be in raw or corrected coordinates.

Status:

- Imaging seems to work
- Implementing "small memory" method
- Implementing flat-fielding
- Small issues remaining …

Dither pattern COP change effect (JC): Observations of GRS1915+105 with and without COP change have been compared. COP changes do really reduce the noise in the mosaic image of hexagonal patterns.

Electronic efficiency and other effects (NJW): See presentation.
Imaging with 1 mm mask (a single $1mm^2$ hole in the mask model represents the real mask hole, open cells are represented by '1' and closed cells by '0') and the shadowgram is also made with a 1 mm grid. FFT folding of these two yields the variance map that can be flatfielded with a Gaussian of sigma 4.5 pixels.
Basic results:

- The peak volume contains 75% of the counts expected when comparing with the count rate in the shadowgram of Crab observations.
- This fraction drops by 20% towards the edge of the FOV; the reason is not known.

Spectral results:

- The electronic efficiency (E_{eff}) is derived by comparing Crab spectra from low and high gain observations.
- Fitting S/E_{eff} with RM*(Crab photon spectrum * ARF) – S is detector spectrum and RM is the redistribution matrix gives good agreement between model and detector spectrum for all gains (between 14 and 24).
- The derived photon index is on the low side: between 1.93 and 2.0

Caveat: The thermal blanket absorption was left out in this analysis and its effect on the photon index remains to be seen (action on NJW).

IGR J17254-3257: A new bursting neutron star (JC).

Wednesday

Pulse phase resolved spectroscopy of Vela X-1 (PK)

Needs for temperature corrections for source positions (NL): There is a clear need for a temperature correction and the required software has been made. The JMX1 mask temperature is used as parameter for JMX1 corrections and JMX2 mask for JMX2 corrections although they track each other quite well.

Tracking a hotspot should be conducted over an entire revolution. NL will discuss the hotspot detection with CAO to include experience in the COR detection and then j_ima_iros can rely on that detection by the event status flag.

General comment by SP: Proposals for changes in software should be written down and discussed with ISDC before implementation.

Hard X-ray emission from AGN seen by INTEGRAL and other missions (SS).

Documentation (SP): Update the ADD to help the development of new software and software changes and updates. Make the ADD a "working tool".
The SVR should be produced quite soon relative to OSA6.0.

SVR: Plan of action from latest minutes of SDAST meeting. NJW will put pressure on people to produce plots and text.

Analysis User Manual: SS takes the responsibility for it, in the sense that she will read it and make requests for new text and figures wherever needed.
Comment by SMN: It could be mentioned in the Analysis User Manual that making two (or more) observation groups – one for the first energy channels and one for the last energy channels can produce any number of spectral bins by combining them.

ADD (JC): Version 11.0 is coming; needs mostly input about j_ima_iros and jmx_lib_pif. The background executables (from Sami Maisala's components) should be removed completely. A SCREW will be written by SMN.

Action of PK and NJW: How can one implement a correction for the first and the last bin in a lightcurve?

Future deliveries (CAO): j_calib_gain_fitting (see presentation)

There was a request for a drawing or another clear presentation of what happens in various situations. This could be documented as an extra section per component in the ADD.

PK made the comment or rather urge that for larger software changes one should *always* make an ADD – it can be as simple as a drawing showing the inputs and outputs and place relative to other components.

OSA6.1 deliveries: SP j_ima_cross will not be ready for OSA6.1 since a prototype needs yet to be made. Including it will be a big change so a definite improvement must be documented before its inclusion into the scripts is initiated.

NJW: j_ima_src_locator to be updated. It has been submitted to ISDC but not feedback has arrived. At ESAC or ISOC there is (limited) manpower for well-defined jobs. *Action*:

send mail to PK to initiate a test of j_ima_src_locator for e.g. a comparison with the source finding in j_ima_iros itself. Inclusion into the script requires a new template (JMX1-SRCL_RES, OBS.-SRCL-RES or ?). SP will send an overview and comparison with IBIS.

NJW+NL: The script needs to be updated to produce the three predefined shadowgrams for the search of sources.
A discussion was started on whether one should define a separate data structure for the three standard shadowgrams and images. A parameter 'keepStandardImages' could be used to save all images in the same (old) datastructure. One of the concerns is the use of mosaic_spec – how will it know which energy bins to use?
This statement can be put in the user manual: Source finding will be done in j_ima_iros. Parameters for the standard energy bands should be applied in the parameter list. A complementary parameter for the user defined energy bands should also be present.

The conclusion of this discussion:

- No new datastructure
- Hidden parameters will define the three standard energy bands
- Other parameters will define the user energy bands (may be left out in which case only the standard ones will be given)
- All shadowgrams (3 plus the user defined ones) will be saved to disk
- A keyword in each sky image will tell 'mosaic_spec' whether a given image should be used for spectral extraction
- 'mosaic_spec' should be taught to understand this keyword

J_src_properties could be made to work on SRCL-CAT if SRCL-RES does not exist so the imaging step can be skipped.

JC: j_ima_mosaic: Continue and expand the use of dynamic memory allocation. The limitation of a fixed input image size will be lifted which leads to the possibility to make a mosaic of mosaics. This can be ready for OSA6.1.
It was also discussed how to combine sky images from both JEM-X1 and JEM-X2.

Next meeting: Aim for the first three weeks of June 2007. Use meeting organizer to find the best dates.

Adjourned/NJW