SDAST Meeting number 33

2005-09-22 DNSC Copenhagen

Premeeting: SB, TO, PK, NL, NJW

Future personpower for JEM-X.

TO offers to use about 20% of his time for the JEM-X work, probably best with testing, not so much programming.

PK can also use some of his time e.g. by launching large jobs and give some help on specific issues.

Spectral extraction.

How long time should we continue to use the existing code – and how long should we continue upgrading it?

The PIF for each source should be stored as a map based on raw position. This could be a separate file or at least an index list.

Positioning and detector spatial resolution can be tested by looking at shadowgrams from an on-axis strong source e.g. GRS1915+105.

Baseline: NL will make the code for a new j_src_spec_iros with help from NJW, TO, and PK. NJW will find out how to implement the gain dependent ARF into the existing j_src_spectra. SB will analyze the j_ima_iros positioning problem.

TO will define a list of 'secondary calibration sources' in order to explore the spectral extraction for a range of spectral slopes.

For j_src_spec_iros make an ADD: a flow diagram with separate blocks or modules. SL is asked to make a diagram of his code.

We can analyze sources that have been observed simultaneously with XTE.

Normal meeting

Participants: NL, SB, CBJ, CAO, JC, SP, SL, TO, KP, NJW

SW trigger setting: Go to 40000 rate limit always which is a simple solution.

NL: JEM-X status

- SB has found ways to recover some of the lost energy resolution
- Jérôme has found one more dead anode since last SDAST meeting
- The hotspot has had a period of high activity but has decayed

SB: JEM-X status

- Very slow loss of anodes. Steady increase of detector gain.
- Slowly degrading energy resolution
- Slow but significant change of spatial gain map
- Lower temperature may slow down degradation of energy resolution

After an extended period of HV-off the gain returns to its original value but accelerated ageing occurs over a period of 10-20 hours.
Activation of dormant unit for science use should take this effect into account as well as reactivation after several days of safe mode.

JMX1 energy resolution is 10.5% at 22 keV
JMX2 energy resolution is 12% at 22 keV

High background radiation periods have lower gain across the detector but for the calibration sources the effect is not so large – probably because the corresponding detector areas are already pretty loaded.
Such period could be excluded via the GTI mechanism.

Action PK: Check that the limits are set to a reasonable level.

Hot spot activity (right now quite weak): Indicated by “buffer loss”. Little mean TM impact. No easy onboard fix.

Deriving new spatial gain map. Detector plane in 32×32 equal size panels. Add gain corrected spectra for each panel for more than 20 revolutions. Then the Xe line peak position shows the local gain shift.

The particle induced background has a distribution with a feature connect with the amplifier positions. For signals dominated by noise the position algorithm introduces a bias towards amplifier position. This is worse in the backplane direction where signals are smaller. Background estimation when done well should regard this phenomenon.

Operations: HV activation at beginning of revolutions is now in a single step. SW-trigger limit set to 25000 can be controlled by ISOC. See decision above, however.

Upcoming calibrations and tests. Crab calibration at low voltage to test the spectra obtained at different gain levels. Detector efficiency tests and position determination resolution measurements during OMC flatfield also at lowered HV. The telemetry format is TEST.

Users Group (NL): Maximise the scientific return from the INTEGRAL mission.

Problems with j_ima_iros source positions. A new set of alignment parameters has been produced that yields better positions.

ISDC (SP): OSA5.1 has been postponed, just one piece of software to be included. [*After the meeting it turned out that ISDC will issue OSA5.1 anyway*].

Guideline for what parameter types are allowed: queried, learned, hidden with respect to the GUI. New way of treating such parameters is for OSA6 which will be planned in the end of October 2005. How to apply the gain dependent efficiency? Either in the ARF or in the spectrum? An important aspect is the question about combining several or many spectra. This is much easier if the gain dependent effects are put into the spectra.

Cross-calibration report for the INTEGRAL instruments. For JEM-X a systematic error of 2-3% is required to get the reduced chi-square close to one. ISGRI Crab spectral slope is 2.25, SPI Crab spectral slope is 2.15 (compatible with JEM-X).

Scripts status (SMN represented by CAO): SCREW and SPR fixing for OSA5.1.

Gain history (CAO): New j_cor_gain handles all revolutions except 0023. The Xe line at 29.6 keV is slowly drifting away relative to the FRSS calibration sources. This is corrected by the XE_CHAN keyword in the JMXi-SPAG-MOD (member of the IMOD) header. A few extra epochs need to be included to minimize the relative Xe peak changes. New SPAG tables do improve the energy resolution. The rate of glitches is increasing (also their size) and that can not be corrected for.

How can we deliver tables with standard gain history tables and how can j_cor_gain produce such tables?
The gain history table is a matter for a complete revolution and not a single science window.
The discussion seems to converge against producing a smoothed gain history table in the revolution pipeline. The next question is how to verify the proper functioning of the table by checking the Xe peak position and width. Can this be implemented in the OSM? How many science windows are needed for a genuine test? What are the requirements for such test spectra – one per revolution or one per day or even shorter timescale? Sliding: What happened during the last 24 hours.

Missing part in OSM is to generate the PI values but that can be implemented. Need clear requirements for ISDC: What should the duty scientists do with the background spectrum, how to interpret it. The spectra should be visualized.

New IC category with smoothed gain history tables. Scripts check first the IC content and if nothing is found use the standard unsmoothed gain history table. All this can be overridden by the parameter ‘COR_gainHistory’. The IC file must have well defined VSTART and VSTOP. There could also be a flag saying “don’t use the IC file but go directly to the raw gain history table”.

Current spectral extraction (SL): Locates illuminated area as well as non-illuminated area for a given source. A PIF is calculated using the energy dependent position accuracy. PIF cut level such that “open area” contains 75% of the flux.

Friday

Gain related effects (SB): Gain is the ratio between the signal and the energy of the incoming photon. There is a 20% variation of the “slow” signal as a function of position in X (“curtain” effect).
In the ideal world E = linPHA/G (‘E’ stands for energy and ‘G’ for gain). Including known effects we can calculate the energy from the electronic signal. But there are other effects such as glitches and failure of the calibration source to track the general trend that cause trouble.

Action PK: Look into the possibility of JEM-X to have a high TM allocation when recording diagnostic data in the beginning of each revolution.

ARF is not only a function of energy but also of the actual gain which is a function of time and position in the detector.
Position resolution: At low photon energy this depends on the gain since the electronic noise plays a the most important role. The resolution is measured by the calibration sources having a diameter of 1 mm again by using diagnostic data with 0.25 mm position steps. The results are compatible with what is given in the JMXi-DPOS-MOD data structure.

Remark by CBJ: The deconvolved image gives the same information through the width of the PSF.

It was mentioned that the spatial gain map changes as a function of (long) time. Perhaps the calibration sources do not track the general behaviour of the detector in the beginning of each orbit because the areas below the calibration sources have been severely loaded.

ARF and gain (NJW):

Produce a smoothed gain history as part of the revolution pipeline
Specific delivered gain history files (smoothed)

Action SB, NJW, CAO: To clarify the need for a smoothed gain history table per revolution

Action NJW: circulate previous list of wished test to be done in systematic tests

Person power: JC will most probably get a three year of PRODEX money. CBJ will be more occupied by ASIM. SB will devote more time to other projects (ASIM, PLANCK?).
SMNs situation is not quite clear so we may need a 'script person' soon: ISDC? SL will still be reachable but will have no time to continue SW development on JEM-X.

The ADD needs a complete overhaul e.g. due to new imaging etc. Is this for JC?

New SVR at end of November 2005. The period folding example can be done better with OSA5 software. Also spectral part can be updated as can the position determination.

Action SP: Can CAO, JC, SB, NJW get access to core program data (NL has that right but would like to delegate it to the named persons).

JC (Side remark: Anode 172 is now dead) GX3+1 burst results.

The need for a detectormap created in the correction level has disappeared with the introduction of j_ima_iros and changes in j_src_spectra/lc that make their internal version of the map or equivalent information.

There is a possibility to introduce the ISDC misalignment matrix for j_ima_iros and j_src_spec_iros if the coordinate correction is done to an "idealized detector system", so the misalignment matrix only takes care of the STR direction relative to the boresight.

Action ISDC: To make a proposal how to implement the smoothed gain history table in a suitable place in the system.

ISDC needs an overview of the new and changed components of JEM-X ISSW for OSA6

Next meeting: End of November (week 48) focussed on spectral extraction in Copenhagen.

End of meeting.