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JEM-X SDAST Meeting 21: December 11th–12th 2001

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Participants

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1 PK: Pipeline scripts

- Scripts written as interpreted C programs using ISDCroot and the CINT interpreter so that ISDC libraries and ROOT functionality can be used
- All scripts have IRAF-style parameter files
- LL still working on a tool to remove all data structures in an observation of a particular processing level and higher
- Not all scripts support the 'clobber' parameter correctly yet
- 'IC' is instrument characteristics: every data structure that defines or characterises the instrument but isn't updated in a regular automatic way
- Scripts use a tool that ensure that correct IC files are always used, valid for the time the data was taken
- jemx_scw_analysis is a wrapper around the analysis/pipeline scripts such as j_correction and j_imaging. Most of the actual work is done in the lower level scripts.
- jemx_scw_analysis works on one Science Window at a time
- jemx_science_analysis is wrapper for jemx_scw_analysis and jem_obs_analysis, which only really calls the mosaicing tools for JEM-X

- OBT is used for as much as processing as possible and conversion to real time is done mostly for end products
- jemx.h is not currently in the standard include directory, and hence not available to the scripts because it is delivered separately and independantly with every ISSW component
- ISDCtask initialises programs and also reads parameter file allowing transparent access to parameter values—but can lead to strange script failures if a parameter file is corrupted
- Script input parameters are not all the parameters for every called executable, only the most changeable ones. Could be a need for more input parameters
- For performance reasons DAL has been completely rewritten at the lowest level (invisible to us) and will be included in next Reference Platform
- PK wants IRcheckOGParameters split into at least 2 functions because it does at least 2 things
- Blindly coping all parameters from parent script to child can be dangerous, so it's done inseveral stages
- RILlogString must be used in scripts: takes a single string as its argument (use sprintf to create it). This is due to a shortcoming of the CINT interpreter
- NL wants to combine data from both units. This will at best be an interactive tool in V3 (see Dream Tools, below).
- Currently for 'level' the first executed level is the one used.
- Within a script other scripts and executables are treated identically
- kKEEP parameter indicates that input parameters are copied over keeping their prefixes

AI 21.1 **AI 21.1:** On CAO to Find Peter's nice script diagram and put it in ADD7.0. Due: mid-Feb 2002
AI 21.2 **AI 21.2:** On CAO,PK to Look into delivery jemx.h as independant package. Due: mid-Feb 2002

NL: JEM-X Hardware status

- both FM1 and FM2 integrated on the satellite, and have been through quite a bit of testing
- FS being assembled in Helsinki
- Have been some metallic particles inside the detector which has short-circuited part of anode segment 4 on FM1
- FS had a cracked Microstrip plate. IT looking into whether assembly procedure caused crack and new procedure needed to prevent cracking
- New MSP being fitted in FS, which will be delivered at end February 2002 but will not be calibrated at Ferrara
- Tests showing the mask shadowgram on the detector indicate better position resolution than expected
- NL: What about an analysis tool to include rotation of the mask?

- JMXi-DETE-MOD contains info. about position of calibration source spots, so we could make larger spots for certain key frequencies to reduce FRSS spillover on the detector
- FM1 will be replaced by FS after Payload Calibration
- During Payload calibration FM1 will be run with anode segment 4 switched off. Unfortunately gas gain is still only quarter of what it should be at nominal voltage in the other 3 segments
- Increasing voltage by 110V almost brings FM1 up to nominal gain
- Gain varies dramatically across the detector - highest in segment 2 and falls off to about 60% at outer edges of segments 1 and 3. Segment 3 apparently strongly affected by segment 4
- Energy resolution is a little degraded by this but can be mostly compensated for with good calibration
- Quantum efficiency remains unchanged but effective detector area reduced by 25%
- Photons below 2 KeV are not seen due to Be window, not due to electronic noise limitations of detector
- Timing test on FM1 with Am source (60 Kev, photon plus alpha). Scintillation detector picks up the alpha to allow for time correlation of photon detection. Am gives about 1000 cts/sec, but detection in FM1 was about 0.3 cts/sec so hard to find Am events in noise. Results show 122 μSec time resolution. Am timing gun has 1 μSec resolution.

2 ALL: SVT Test Cases

This subject was discussed using CAO's original email (pertinent parts reproduced here) from October as the starting point. The test cases to be simulated by PK using OSIM are as follows:

- Peter suggests that his scripts should have an OSIM processing on/off switch so that processing requiring housekeeping doesn't get done during Science Validation tests on simulated data.
- All test cases to be simulated using expected background strengths and Xenon fluoresence lines
- Each test case will be a pointing in a 25-by-25 point dithering pattern. Spectra for each source should be specified as XSPEC input parameters. Source information to be used as input to OSIM should place sources as if in a dithering pattern
- It is important that the strong source and the 3 weaker sources always have the same strength and spectral shape as they are moved around the FOV and combined, so that we can see trends in the processing results
- Case 1: Strong Crab-like source on axis: How good is position determination, flux estimate and spectral reconstruction? How does PSF vary across the detector?
- Case 2: 1 strong Crab-like source at edge of Fully coded field of view. Now how good are position determination, flux and spectrum?
- Case 3: 1 strong Crab-like source in Partially coded FOV: Now how good are position, flux and spectrum?
- Case 4:Single weak source on-axis: how good is it's position, flux and spectrum? dow does PSF vary over the energy range?

- What we want to do with these cases is find trends: in going from 1) to 3) do we see a pattern in flux estimates or position determination. Is there a tendency for off-axis sources to have their positions too close/far from the on-axis direction, or to have their flux over/under-estimated? Is there greater loss of high-end energy resolution for off-axis sources? Etc.
- Case 5: 3 weak sources with distinct spectra in fully coded FOV. How good are position, flux and spectral determinations? Distinct lines should be used, possibly the iron line at 32 KeV and a cyclotron line at 10 KeV, and one source without any lines to see how much of the other sources lines turn up there. Each source should have distinct spectral indices. How much spectral cross-talk do we pick up?
- Case 6: the strong source and the 3 weak sources all in FCFOV. How much are weak sources affected by strong source and vice versa?
- Case 7: The strong source in Parially coded FOV and the 3 weak sources in the fully coded FOV. Again, how much do the sources affect each other?
- Case 8: The strong source in fully coded FOV and the 3 weak sources in partially coded FOV. Again, how much do the sources affect each other?
- As we go from 5) to 8) we can expect to see worsening results for the 3 weak sources, but can we characterise the deterioration? Do position determinations simply get fuzzier, or do they get 'pulled' (or 'pushed') by the strong source? Is weak source determination compromised by ghosting of the strong source?
- Case 9: Field with 10–15 medium strength sources scattered over entire FOV: how many do we find? How good are the postition and flux determination of those we find?
- Case 10),11),12) and 13): The strong source and one of the weak sources at various separations: 10', 6', 3', and 1'. How well can we distinguish the two sources? And where does the weak source disappear into the strong one?
- Case 14: One unknown field set up by Peter: how well can we reconstruct it?
- Peter will set up a test sky with one input catalogue provided by DSRI, and then 'point' at the relevant part of the test sky to make each test SWG.

AI 21.3 **AI 21.3:** On NJW/NL to To make FITS catalogue of SV test cases for PK. Due: Mid-Jan 2002
AI 21.4 **AI 21.4:** On PK to Make simulations of SV test cases from catalogue. Due: Feb. 2002

3 NJW: Ferrara Calibration of FM2

- new x-ray tube fitted, can go down to 9 KeV, so improved on FM1 calibrations
- Scans at 17 KeV and 25 KeV over all detector area with x-ray tube using vertical scans to utilise faster up-down motor on x/y table
- 6 KeV Fe-55 source scan over detector
- Starings at 4 positions on detector (one for each anode segment), scanned over energy range 9–50 KeV with clustering around 35 KeV which also produces 3 KeV photons
- 20 KeV scan done over detector area with detector area to show effect of collimator.
- Carl is working on calibration data now and a report will be issued soon.
- FM2 is now integrated on the satellite and works fine

4 PK: V1/V2 Status

- j_prp_{ spec,rate,frss,evts}_obt : in maintenance phase with small problems still being worked on
- j_prp_status_table: Integrated and tested, no known problems
- j_prp_ecal_obt: Nicolas Produit working on this one, not delivered yet
- j_prp_verify: delivered, integrated but untested. Lots of missing functionality. RW has list of components under configuration control—must assume that CCB will want to approve all new functionality.
- j_calib_gain_fitting: Integrated but largely untested due to lack or realistic test data. Must be redelivered with newly agreed interface.
- j_calib_adc: Integrated but untested: must be redelivered
- V2 works fine up to j_ima_shadowgram that has minor problems and must be redelivered before Christmas. Needed for SV processing and Payload Calibration
- j_ima_basic_recon: needs redelivery before Christmas
- j_ima_src_find, j_ima_cor_intensity: both working okay and have been tested
- j_ima_refined_recon: Still undelivered, part of V3
- j_src_spectra: PK still waiting for version 2.4 from SL. Peter's output has problem with the zero channel, SL's doesn't
- j_scripts now grouped in one package, waiting for 2.1 to be delivered
- j_bin_****: delivered and work but are largely untested
- Lightcurve components expected to be delivered this week but it won't be happen

AI 21.5: On PK to Check that spectral test data okay in zero channel. Due: Mid-Jan. 2002 AI 21.5
AI 21.6: On NJW to Give spectral response to SL for j_src_spectra coding. Due: Dec. 31 2001 AI 21.6

5 SL: Results of simulations

- Investigating PSF—shows elongation in Y-direction and clear offset between position found in j_ima_src_find and visible peak for on-axis source.
- For off-axis source intensity falls off more or less linearly—break at 2.4deg shows edge of FCFOV (i.e. vignetting). Shows however, nearly 12% difference in vignetting/countrates.
- This should be mentioned in 'known limitations' for OSIM docs

6 PK: ISDC News and Schedule

- New building under construction for software people
- Just one physical connection between office network and operations (barn) network for security reasons
- RR now paid by Planck, hence he works quite a bit for that project now
- New person expected from UK as operations manager with Nami
- Marc Turler also working partly on Planck
- New Tubingen person expected to work on archive
- V1 is mostly out of developement and into testing, except for IBIS
- SM-N to take over script maintenance from PK
- SVT-E merges seamlessly with Payload Calibration and will be first real workout of V1. Includes a test orbit.
- ISDC hoping to see many IT people during SVT-E/PLC so they can get to know operations etc. at Versoix
- SDAST schedule: PK currently doing verification on ISSW
- Early Jan. 2002 PK to make SV test data
- KE scheduled to do JEM-X QLA scripts Jan./Feb. 2002
- V2 developement to be finished Feb./Mar. 2002
- SL thinks he'll first be finished June 2002
- PK wants A version of V2 with l/c stuff running in Jan.2002
- SDAST to aim to have final V1/V2 release before launch in beginning June 2002, so delivery will be mid-May 2002
- Expect rapid developement immediately after launch but CC will be very important during this phase—running parallel system for newly delivered software.
- Updated release of ADD should be June 2002
- Some V3 tools will have to become V4 if not needed until after launch, and may never be implemented if we don't have time to develope them
- SM cannot deliver j_performance in mid-Dec. as agreed due to system crash at Helsinki. Hopes to deliver preliminary version by end Dec (without FRSS monitoring) with an update in January. Complete tool including calibration data expected by April 2002.
- Interactive background fitting expected by end May
- First delivery of interactive calibration (j_ical) expected end of Jan. 2002, last delivery by end of May.

7 SM: Interactive background handling

See figures attached to this file

- Choose spectral shapes, spatial distribution and scaling: shouldn't be too fancy or gets too hard to use
- Input data structures same as for automatic background handling since basically the same processing
- ISDCroot people developing a new class for image visualisation
- SM thinking of using DS9 for visualisation of images—can be called with parameters. calls to DS9 must be nicely wrapped.
- SM wants clickable map of detector spectral models (pure-click version may be a luxury) which may be done by finding the pixel number with DS9 and then finding that model separately.
- Choose spatial model first, then spectral model, then do scaling. Use ROOT for scaling factor display
- Can choose to save newly-made background model in own private catalogue
- Still need to re-run image reconstruction to check that background model just found truly improves the quality of end produts
- Must also bear in mind that shadowgrams are actually made in scewed coordinates
- PK suggests that very rough bkg. removal could involve imaging using only in circle of detector where background is least. This is rough method used by SAX WFC.
- PK suggests using uncorrected, unbinned shadowgrams as input to this tool
- It is necessary to save your own catalogue because it's so time-consuming to process every SWG this way
- This is not a tool for naive users
- Tool could be used very simply just to play around with scaling of the automatically chosen models

8 ALL: Dream Tools

- NL would like to have a tool to add together end products of both JEM-X detectors
- Images already have a generic mosaicing tool but we also need to be able to do source finding on combined images to improve flux estimates, and possibly positions
- XSPEC should be able to take in separate JEM-X1 and JEM-X2 data and analyse them separately because of their different response functions. Currently this seems to be possible because both units are treated completely separately
- Robust spectral typing for survey work including sensible energy bands

AI 21.7: On NJW to Write AD for merged-image source-finding tool. Due: Feb.2002 AI 21.7
AI 21.8: On NJW to Write AD for robust spectral classification tool. Due: Feb.2002 AI 21.8

9 CAO: ADD 6.3

- Schedule agreed for ADD review before release of ADD 7.0 is:
- Feb.4th 2002: Deadline for comments on ADD 6.3
- Feb.15th 2002: CAO circulates list of proposed changes for ADD7.0
- Interested parts exchange emails about this list
- Feb.20th 2002: CAO circulates list of serious/contentious changes
- Feb.21st 2002: IRC meeting of interested parties to discuss the serious changes
- CAO and PK submit any SCREWs that may be needed after IRC meeting
- CCB meets to review changes
- Mar.15th 2002: CAO publishes ADD7.0, referring to SCREWs
- Both ADD and ISSW are under CC so must have CCB approval for changes

10 CAO: Interactive calibration

See figures attached to this file

- ROOT has fitting routines so don't need to make source intensity fitting functions for j_ical_frss
- Throughouut j_ical_frss SWG must be changed to REVOL
- May be best not to access entire mission table of calibration results from FRSS—instead do an index selection
- Basic functions for j_ical_frss should be: makeIdxAvg; displayIntensities; displayGainCoeffs; displaySpectra; fitSpectra
- j_ical_diagnostic could be pure executable using SCWG index as input parameter
- James Peachey has made GUI for building OGs
- Could have an ISDCroot script wrapping the executable
- Must choose whether to loop over SCWs in executable or script
- j_ical_gain figure should be split over two pages
- SWG should become a time range
- Output of first part of j_ical_gain should be time intervals of stable gain
- DAL3JEMXgetEvents can be used to select only the events we want (i.e. during periods of constant gain)
- Slew data is not public, but one day per week we have galactic plane scan which is public, so can use that data
- Really need image display tool for this: see remarks above

- For j_ical_dead can use archive browsing to pick out public data plus other criteria. Should we loop over SWGs? What about looping over something else?
- Looping over packets should be loop over periods of HK packets
- Need to have both high and low hardware trigger periods within the analysis time range
- For j_ical_collimator use only slew data that's available
- 'Choose upper energy' should become 'Choose energy range'
- Use line mappings with cross points as anchor points in mapping
- Use RR's tools with read in
- Priorities for developement are: j_ical_diagnostic (executable); j_ical_frss; j_ical_gain; j_ical_dead ; j_ical_collimator

11 SM: Interactive Performance Monitoring

See figures attached to this file

- Leave out gain calibration monitoring for time being
- Master performance/parameter table is input to this tool since the table creation tool runs first
- Index of SWGs is input to this and other tools
- jemxNum = 3 should be used to indicate both units together
- No need to display parameter limits because that's done by RR
- Master table must have cleverly named columns to indicate which unit produced the parameter
- We need a generic ISDC tool to merge two tables with different time scales e.g. HK and calibration data

12 Next Meeting

It was decided that the next 2 meetings would be held at ISDC:

- 26–27th March 2002
- 4–5 June 2002

13 Old Action Items

- Actions AI20.5 and AI20.15 were declared closed
- All other open actions had new due dates set in the new year

14 Action Items

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