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JEM-X SDAST Meeting 23: June 4th 2002 at ISDC, Versoix

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1 Participants

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Due to economic constraints SM could not travel from Finland, so he participated for the entire meeting via IRC with CAO typing on behalf of SDAST.

2 PK: ISDC news and schedule

- ISDC mostly been busy with GSRR (Ground Segment Readiness Review)
- Conclusion from wrap up meetings (144p report): big problems with IBIS, but basically all first version ISSW in place, but things could be improved. e.g. more sophisticated source finding.. Limitation is ISSW not ISDC tools.
- Simon Shaw from Southampton coming as operations coordinator, but his contract is unsure
- Couple of operators in training Jan Soldan, Patric Haymoz and one more operator to be hired
- Still worried about level of Instrument support ffrom ITs at ISDC during operations
- SVT-F last big opportunity to give everything a good work out. Schedule not changed much by wrap up meeting
- Currently no formal schedule for interactive background tools
- 17th May scripts 2.3.0 delivered.

- 10 June deadline for redelivery of executables.
- Katja taking over templates from Marc but she will be in Garching for a while.
- 14th June scripts to be redelivered and frozen except for bug fixes. 30th June is Freeze of functionality. Some worries about stability etc. So but for bug fixes must freeze S/W soon.
- 5th July short technical and scientific validation of redelivered software to check there's been no dramatic changes in s-w behaviour.
- 9th Aug. delivery of updated SVR by NJW (after his holiday)

3 CAO, PK, ALL: ISSW Deliveries and Schedule

- CAO's V3 software shcedule stalled: no progress on V3 at the moment.V1 and V2 have to take precedence.
- In j_ical j_ical_frss is the most urgent, but here the issue is greatly complicated by the newly observered behaviour of the instruments:

  1. Poor energy resolution at operating temperatures
  2. Glitches in gain, probably localised to the areas on the detector immediately in the calibration spectra spots. This means that offline gain fitting will be quite important but does not raise any new architecture problems.

  We're not even sure if the gain glitches are of any importance given the reduced energy resolution
- Lightcurve tools and timing analysis: SL on holiday in July for 3 weeks (same for CAO). SL can work on lightcurve stuff for a few weeks solidly after this.
- SM thinks he can deliver the interactive background handling tools by 1st October but a lot depends on what changes he makes in his automatic background handling programs.
- Immediately after launch ISDC expecting a shock wave of SPRs and no SW will be accepted during the early PV phase so 'after launch' will mean the end of the year..
- SM must make sure that the new ADD 7.1 includes a very thorough description of the interactive background tools
- SM still a little confused over what's needed for the tools especially where diffuse background is concerned. PK says that the parameter interface for the moment is most important: they must be frozen by June 10th.
- All other background issues dealt with at the end of the meeting to stop it trampling over everything else.

AI23.1 **AI 22.1:** On CAO: Put numbers on the gain variation problems see in JEM-X1. Due: End Aug.

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4 PK: scripts and general integration

- Mostly little SPRs, no problems here. Most components are labelled 'M', meaning minor problems and cannot be called 'W' (working) until all SPRs are closed
- Still have nothing for j_ima_refined_recon so must be added later
- SPRs 145* ARE SPRs from Bruce which have to do with floating point trapping done by the new make files, and its up to the delvelopper to find these floating point exceptionts. Indicates that unsafe numerical practices are being used.
- Scripts have a trivial SPR on a parameter name. PK expects to do scripts with Silvia and be done before 10th July. Silvia's staying at ISDC for another week to work on scripts and IBAS
- V3 still is problematic.j_perf_collect supposed to be tested by PK for visualisation on ISDC system but he's been a away so it didn't get done.
- j_ima_, j_bin_ and j_src_ have a fair number of SPRs on them, but nothing very serious. Stefan expects to get all his SPRs cleared by the 10th.

5 SL, Spectral and Lightcurve extraction

- SL has resolved most of the SPRs.
- Detector resolution and using instrument characteristics for instrument-based flux determination will be part of next delievery.
- Currently source fluxes are rather off.
- Sprectral response (rmf file) will be updated in the new version being delivered next week.
- Phase folding isn't tested yet but will be in new Coordinate transformation from sky to instrument coordinates. Most important for offline analysis, so not included the new V2 version.
- Restricted imaging and non-flat backgrounds also not tested yet but will be included in new deliveries
- SL finds difference between shadowed and illuminated parts of detector to calculate the flat background and correct fluxes.
- Still checking effect of non-flat background. This behaviour can be switched off is we don't want it, or it isn't working well. SL thinks the flat background handling works well enough by itself.
- XSPEC can take a way a background that's provided by the user in a file, so this can be handled externally to SL's executables. However SL would like to do background subtraction in his executables, so we must keep XSPEC background file empty.
- SL stores for each spectrum: in one file columns TSTART, TSTOP of the integration time for each individual spectrum. But this clashes with ISDC usage where TSTART and TSTOP define Science window time limits. So SL proposes changing his column names to TFIRST and TLAST, but PK says the template MUST be delivered in the next couple of days. SCREWs need to be written soon too. This also affects NJW and SL's other executables, and possibly PK, so they all have to check that this change is made throughout V2.

- SL: About lightcurve extraction: data structure has OGIP column names TIME TIMEDEL RATE ERROR which can be used by standard packages, but also used other columns: BRATE BERROR BARYTIME, which each user will have to know how to use themselves. Clearly users will need to know how to use BARYTIME. There will be a generic ISDC tool to look at BARYTIME, but SL also wanted to provide it right in with each spectrum so that users had the option to use it.
- Not foreseen to do pulse phase folding in this tool. PK thinks his spectral binning program will do pulse phase folding, but no one will really trust this until they have a real pulsing source to test it on.

6 SL: Timing Analysis

- SL has an old timing analysis program called DES for time series analysis and simulation. Has data handling (detrending, transformations, time calibration), does statistical and time series analysis (ACF, CCF, power spectra etc.) Also does astronomy-specific calculations (catalogues, barycentric time, doppler delay correlation, ephemeris phasing, photometric data reduction). DES can also do modelling and simulations:
  - Time sampling over time series, and simulate time series: periodic, with noise etc. Menu driven program, and IDL window.
  - Can visualise all sorts of things against time:e.g. power spectra etc.
  - Folding data with various periods produces a sinc-like function showing the peak at the time series period.
- Currently DES only reads ascii files but fdump can be used to make a fits file. All this functionality could be very useful for timing analyses of JEM-X data.
- Thierry says that we can't sort out individual events for each source, but this is what SL proposes to do (using a strictly statistical probablility that each photon belong to a particular source, naturally).
- SL proposes delivering a j_src_events component to make event lists of each source so that these events can be put into DES and analysed.
- Not forseen as a pre-launch tool—delivery at end of year, and would not be formally part of ISDC requirements, because timing analysis has always been considered beyond ISDCs remit.

7 NJW: Fluxes and derived units

- NJW has been discussing flux units with Ken. FLUX contains peak size of source in counts divided by observation time (ontime) multiplied by 1.25 to correct for out-of-peak photons, divided by open fraction of mask and mask area. All this gives units cts per cm2 per sec. Ken suggests that unit should be no area factor, and just counts per sec. to make NJWs fluxes correspond more closely to SL2 spectral fluxes.
- Question is what to use? IBIS is still not clear on this question.
- Area is needed to do direct comparison of fluxes between JEMX and the other instruments without having to take into account their different areas.

- SL actually prefers the cts per cm2 per sec, and can't see that the user would be confused between the two different sorts of fluxes.
- Decided to stick with the two different sets of flux units for images (NJW) and spectra (SL)
- It must be made very clear in the User Manual what units are produced by each component.

AI 22.2: On NJW: Write SPR: images need to be stored in cts per cm2 per sec. Due: Aug 2002 AI23.2
AI 22.3: On NJW,SL: Write notes for ADD7.1/UM on flux units (images/spectra. Due: Aug 2002 AI23.3

8 PK, NJW, SL: Scientific Validation

- Conclusion at wrap-up meeting was that we were okay for imaging, but not so good for spectraa
- Series of simulations made with OSIM and with DSRI simulator, and the results seem to agreed.
- All the test cases showed that strong sources are found easily but weak sorces are concealed by the strong sources.
- Precision of source finding is better than one arc minute, and even better for the strong sources.
- SL Took spectral models used for simulations and fed them to the fitting program, (three parameters) and made fits keeping varying parameters constants and see how the others vary. The results are very good. In all cases the chisq values are very good.
- Conclusions is that fits to spectral shapes are good in all cases and so are chisq. The only small problem is the normalization. The correction factor (1.25) has to be taken into account, but other things are also a bit off. Normalisation is off by a factor of 2
- No answers yet for sensitivity to line features in the spectra and that should be worked on.
- Results of scienctific validation was that there were no critical points. Thierry seemed to think that there was nothing to worry about.
- TBD: should out-of-peak-loss factor (1.25, see above) not be hardcoded as it is now, but be a model parameter, especially since it could vary across the detector area? NL has managed to recreate ESTEC test sources for both units (NB non-parallel source beams) and get the flux factor 1.25.

AI 22.4: On NJW,SL: Should out-of-peak-loss factor be in IMOD group?. Due: Sep.2002 AI23.4

9 NJW: IROS

- IROS and source finding which now basically works. Makes data structure FIND-RES which comes before SRCL-RES, and is a list of results for a whole shadowgram. This list of sources comes from running j_ima_src_find for first time.

- IROS takes most significant source from that list and computes its shadowgram and the peaks adjusted to match actual peak. The normalised calculated shadowgram is subtracted from the actual shadowgram and this is repeated over and over for each list in the FIND list to find new sources that might have been too weak to see in the presence of the most significant sources
- DETSIG is column containing the detector significance (not merely flux is used).
- After IROS is run FIND-RES contains additional rows and an additional column 'ORIGIN' that indicates whether source was found by basic reconstruction or by IROS.
- Program still doesn't find weak sources so well
- For each iteration EVTS-SHD and RSTI-IMA are added to the SWG index tables - i.e. a new version of these data structures for every iteration. PK suggests that NJW should have a maximum iteration parameter that limits the number of iterations and more importantly the number of extra data structures.
- Negative pixel values produced by the shadowgram subtraction are treated mathematically simply as noise and there's no computational rule to forbid these unphysical values.
- Sometimes IROS finds alternative sources to the ones originally appearing in FIND-RES, though mostly it refinds those sources.
- IROS will not be part of the most basic analysis, but be included according to a parameter in the scripts.
- For weaker sources are found initially with a lower DETSIG than when found with IROS which suggests the IROS is a good thing. User should use the FIND-RES list by looking at the DETSIG values. A weak source found only by basic recon is probably not a real source compared to a weak source of higher DETSIG found with IROS.
- Iterative process is not fast, can take 5-10 minutes to run through detector grid which is 1000X10000 to provide the required resolution, so this is mostly an offline procedure

10 SMN and PK: Scripts

- The science and Scw scripts have many parameters (some of them redundant) like SWG (in and out) and JEMX number which are both telling us which instrument is being used. So now the user can give instrment number and OG id but OG DOL is empty then standard OG DOL is created using instrument number. A sanity check makes sure that instrment number corresponds to INSTRUME keyword.
- The SCW pipeline script has SPR because it mishandles slews. Now if SW_TYPE !=POINTING then script exits with a warning
- Checking program jemx_check_sw now has additional functionality put in by Peter
- j_scripts had missing parameters - general clean up effort and SMN has checked that all the parameters are passed and included.
- Tool q_flag_sources is gone because of Ken's way of thinking which is cleaner and doesn't need this flagging of special sources, however, q_identify_sources is still used.

- SPR because the scripts create files that have no entry e.g. for missing data types. So lots of empty data structures. So need that at each step should check which data types are present and only create the needed data structures. Some executables shouldn't even be run if certain data types are missing.
- After this week it's expected that most of the practical coding will be done by Silvia though PK will still maintain interest in the scripts. PK may still make code changes or design changes.
- PK will take responsiblity for maintaining the ADD descriptions of the scripts.

11 NJW: status of instrument model group

- Recently sent version 9.0 of IMOD-GRP: should match the June 10th deliveries.
- Corrected discrepancy between PHA binning tables used by the OBSW and the tables that appeared in IMOD-GRP. These are the binning tables that convert telemetry PHA channels into ADC channels (4096 linear channels) which later gets made into PI channels according to the gain fitting of the calibration spectra.
- It also includes new versions of DEAD-MOD, CORX-MOD and CORY-MOD, the contents of which have all changed their meanings but not their formats
- Must be sure that our IC delivery is done in time for Tess to access it
- Other changes forseen to IMOD involve getting data from the calibration for corx and cory. This is all about fine-tuning the numbers but everything can run okay with the IC file as it now stands.
- Basically NJW thinks we have a working version of the instrument model group, so that's looking good.
- It's important that the PHA to PI conversion description gets included thoroughly in Masha's UM.

12 SM: Background handling

- Sami's made another update on the ADD desription of the BKG, but still a few open questions
- New data structures: e.g. JMXi-GALD-DBG, diffuse galactic background. Sami's made templates but the big problem is that ISDC needs these things in their system very soon. For a dummy delivery you could put all zeros in the data structure.
- PK and NJW look over the proposed template, decide if we just added we just added TANGLE, TSLOPE and SPE_INUM to ATTI-DBG then we could re-use that data structure and scrap this new one
- Have to decide what the strategy for describing the ROLL ANGLE, but see DAL3AUX first to see how ISDC handles these things.
- We will remove the roll angle in ATTI-DBG, and have a roll-free map. that will be rolled and then tilted in the background handling.

- What is model selection function for this table? PK and NJW prefer snapping to the closest tabulated background because interpolation can get very messy. There is a SLA_LIB function that can find the closest coordinate in RA and DEC.
- The effect of the roll angle is to determine where on the detector the highpoint of non-flat backgrounds fall. But do we also change the shape of the shadowgram?
- We need to do the tilt/roll and THEN convolve with NJW thinks the diffuse nature means that it doesn't need to be convolved with the mask too: tilting and rolling should be enough. PK thinks that must tilt first then rotate to calculate the diffuse background
- SM extensively updated ADD entries for background handling. Names should be '_sel' not '_select' because that's what's in the ISDC system, so ADD still needs changing.
- j_bkg_scal_calc: you can require to be really precise, you could find the attitude every 8 seconds
- SM plans to change all code to use phase angle, but may have to be left to the post-launch update
- This is not a problem because we don't expect our BKG handling to make much sense until well after launch, because we need mostly experience with real telemetry to get this to work. New data bases will of course be made after launch.
- Nothing sensible that can be said about interactive background handling at this point. It's most important to have the automatic tool working first, and gather experience with it
- The automatic tool is needed to build up the model catalogues for the interactive version

AI23.5 **AI 22.5:** On PK,NJW: find OGIP standard names for COODEG and COOSTR. Due: Aug.2002
AI23.6 **AI 22.6:** On PK: Write an URGENT SCREW to change JMXi-ATTI-DBG.tpl. Due: ASAP
AI23.7 **AI 22.7:** On SM: Make the new ATTI-DBG template. Due: ASAP
AI23.8 **AI 22.8:** On SM: Email his summary document for today to all SDAST. Due: ASAP

13 Old Action Items

- AI18.16 recurring request to NJW-NL to provide operations HK parameters to be monitored. Make due date ASAP. PK could discuss this directly with NL next week when he comes.
- AI 19_1 changed to end June for CAO to call meeting with IT and discuss many topics on which we need their answers
- AI19_7 due date now june 6th.
- AI21.7 and AI21.8 more realistic due date is AUG 2002 not July, other things are more important
- 22.3 22.5 and 22.6 are closed
- first version of SVR is infact delivered.
- 22.9 goes into normal work
- 22.12: new due date 14th June

- AI020502_1 first part done, but making report will be done by June 30th
- AI020502_2 closed by todays discussion.

There was no other business, and no date has been set for the next SDAST meeting

14 New Action Items

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