



IASF/Roma

11 Feb 2009

## Attendants

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Christoph Winkler	ESA, ESTEC	CW
Michael Schmidt	ESA, ESOC	MS
Richard Southworth	ESA, ESOC	RS
Marcus Kirsch	ESA, ESOC	MK
Peter Kretschmar	ESA, ESAC	PK
Erik Kuulkers	ESA, ESAC	EK
Pietro Ubertini	IASF Roma	PU
Angela Bazzano	IASF Roma	AB
Giovanni La Rosa	IASF Palermo	GLR
Lorenzo Natalucci	IASF Roma	LN
François Lebrun	CEA Saclay	FL
Jean-Pierre Roques	CESR Toulouse	JPR
Elizabeth Jourdain	CESR Toulouse	EJ
Roland Diehl	MPE	RD
Federico Cordero	SPI, VEGA	FC
Søren Brandt	DTU Space	SB

## 1 Welcome & Agenda — PK

The Agenda was modified to move some items earlier, but otherwise unchanged.

## 2 Actions & Open Issues — PK

IOCG/01-01	Will be closed after meeting on 23 Mar 09.
IOCG/01-03	Action closed, discussion ongoing between MOC and JEM-X team
IOCG/01-04	Closed, limit was updated
Co/13-04	closed since last meeting
Co/11-07	ongoing, discussed at this meeting
Co/08-03	will be closed after meeting on 23 Mar 09.

Some discussion following IOCG/01-05 (IBIS — Provide a study of TM loss effects).  
IBIS could change priorities on board to avoid data gaps.

### 3 Mission Status & Open Anomaly Reports — MOC

INT_SC-245	IREM counts 2 orders of magn. too low	need to check for low values as well/
INT_SC-244	Normal IREM anomaly	pending
INT_SC-242	IBIS HV breakdown	open for tracking
INT_SC-238	JEM-X 1 DFEE CRC Anomaly. Happened 11 times now.	
INT_SC-225	SPI problem with acquisition of some blocks of SPID	SEU, closed
INT_SC-222	IBIS VETO crash	SEU, closed
INT_SC-218	SPI IASW 4.3.4 TM parameter E0229 incorrect	fixed in next SW patch. No date set for this.
INT_SC-212	Problem acquiring parameters in TM ...	closed
INT_SC-204	JEM-X CSSW anomalies	no impact; keep open for tracking
INT_SC-201	JEM-X DPE crash	keep open for tracking
INT_SC-194	SPI PSD channel rates malfunction	keep open for tracking
INT_SC-185	VETO Calibration, Bottom & Lateral Counters reduced count rates	Keep open & monitor

<b>Action IOCG/02-01 on JPR, FC</b> <i>Devise smarter alert logic for SPI</i>	<b>Due: 31 Mar 2009</b>
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## 4 Operations Status

### 4.1 Spacecraft, shared operations — RS

RS is new SOM, his SOE position will not be replaced. S. Fahmy is Deputy SOM. Merging with XMM team is ongoing.

Interface to stations is stable - no major changes foreseen. The Bear lakes option has been abandoned.

Interface to ISOC stable, setting up transfer of raw TM. Interface to ISDC mainly stable. Some problems with NRT reduced by investigation of firewall usage at ESOC. Interface to PIs good.

Solaris 8 hardware is reaching end of life in 2011 (clients) / 2012 (servers), in case of mission extension beyond 2012 an upgrade will be necessary. Currently testing Linux for Control System, which is one possible option for upgrade.

Reported on some platform anomalies (see vgs).

Fuel consumption remains low. Solar panels evolving smoothly degradation slowing down and still far from limit when pitch angle would have to be changed.

Perigee attitude dropping quickly at the moment, minimum will be 3000 km. Need to monitor radiation belt passages. Could be raised, if necessary, but not by much (~1000 km) essentially only delaying the time when low altitudes will be reached (see MEOR).

The altitude assumed for Radiation Belts Entry in Mission Planning products is now

adjusted twice per year to take account of seasonal variation in belts entry altitude. By doing this we will gain about 76 hours science time in 2009.

Standard operations are OK, despite reduced Flight Control Team. Anomaly recover times are slower. Implementation changes are much slower.

SB asked about the switch problems on XMM and how they might affect Integral. RS explained that while Integral shares essentially the same switches, for Integral both switches can be commanded from two sources via separate drivers. For every switching both drivers are commanded using a mixture of real time and time tagged commands. Additionally, as safety measure there are always at least three sets of time-tagged TCs resident on-board to move the RF switch to both available positions.

FL was concerned about the lower perigee in the future and effects on background. Some discussion, but not much can be concluded at the moment.

## **4.2 SPI — JPR**

Reported on SPI annealing #12 (see vgs). GeD#12 is back to nominal. Energy resolution is “under control”. Next annealing pushed to April to avoid GC visibility window. Degradation will be further than before, but annealing will be one revolution longer.

High-energy particle rate still shows no sign of decrease according to next solar-maximum entry (expected: late 2008/early 2009), overall background continues its slowly-rising trend. Further event data compression is proposed by FC (see below).

The SPI veto system performance and homogeneity was verified to be satisfactory.

In Rev 728 cryocooler tuning was too late, large step in temperature. For this reason the data have not been used in Crab calibration.

## **4.3 IBIS — GLR**

Actions and anomalies have been discussed before in MOC presentation.

## **4.4 IBIS — FL**

FL checked out IBIS and VETO countrates, similar to what has been seen by SPI. Slightly surprising due to solar cycle. JPR later showed that the current cycle truly is delayed in activity compared to predictions.

## **4.5 JEM-X — SB**

Gain evolution continuing, increase is slowing down. Last step down in revolution 747, next one expected towards end of 2009. Gain dependence on temperature has increased. Is corrected for in analysis S/W but makes it more difficult to keep instrument in  $\pm 10\%$  range.

Had a period of  $\sim 12$  months without anode loss, consistent with average loss of 2–3% per year.

Particle rate is still rising, solar activity remains very low.

Cd calibration sources decayed by factor  $\sim 28$ , Fe source by  $\sim 5$ , but still useful for gain calibration. Also using Xenon fluorescence.

Might switch to JEM-X 2 for start of AO-7. Consider using both units when “end is near”, but this would require having at least 5+5 telemetry packets available for JEM-X.

Problems with DFEE encountered in eclipse season (see MOC report) may be better understood by dumping CRCs. The DFEE off period should be minimized to avoid temperature effects on gain. Interaction with MOC on this is ongoing.

Electronic efficiency as function of gain is understood and measured, to be included in OSA 8.

The source detection limit is determined by systematics (collimator and anode strips).

#### 4.6 OMC — PK for MM

There have been no operational anomalies.

Trigger mode was tested successfully again due to false GRB alert (flaring SGR while attitude not yet stable), imaging after few 10s. But still waiting for another real GRB within OMC FoV.

CCD temperature seems to have increased slightly (1-2 C) in the hot case during last year.

The OMC PSF varies depending on X & Y position, and the source centering on a pixel. This is corrected in the latest OMC S/W incorporated in OSA 8.

#### 4.7 ISOC — PK

PK presented the current ISOC team, including YGT Delphine Anger and Research Fellow, Simone Migliari. Unfortunately, one of the two developers, Pieter Jan Baeck is planning to leave in May and a replacement is to be found. The main software changes for the current AO will be done, but this will slow down work on future improvements, e.g., for the Archive.

The proposal submission for AO-7 is running smoothly. Deadline is 20 Feb, TAC meeting 23-25 March at ESAC.

First six weeks of 2009 were unusually busy with 8 TOO notifications and 3 executed TOOs.

ISOC software progressing to incorporate new AO scheme. A new ‘smart’ Long-Term Planning tool is becoming available.

If the 3×3 pattern used in latest Crab calibrations will be used more, one should consider making it a defined pattern instead of using custom pointings. ISOC also *must* have a clear interface from each instrument team to provide summary input on calibration observations.

Archiving of raw TM progressing slowly, held up by firewall issues ESOC/ESAC. Next major ISDA release slowly shaping up. Ingestion of data lagging behind (no problem yet, as private data is not distributed), frequently time lost due to small changes at ISDC.

## 4.8 ISDC — RW

Some changes in organization at ISDC.

Went down to one operator, backed up by 2 s/w engineers. One scientist on duty, s/w and h/w support on call.

Data distribution mainly as usual (1-2 months), with one exception, where PI preferred to wait for processing problems to be resolved.

New issue with ISGRI timing: 16 ms TM gaps during huge flares *not flagged in the telemetry* and thus not corrected.

Longer gaps flagged in the telemetry and taken into account in analysis.

## 5 IBIS GS hardware support — RS

MOC has a proposal from Vega for a contract with the IBIS team, preceded by a transfer under ESA responsibility. Some discussion around funding.

Have found space at ESOC for equipment (10 m<sup>2</sup>). Move expected in March.

## 6 Further event data compression — FC

Without data compression, SPI would require today ~119 TM packets. Through compression of single events (SE) implemented in IASW 4.3.4 reduced to ~103.

Similar compression can be achieved for multiple and PSD events, reducing telemetry by 13+3 events. Alternatively the PSD data could be mostly suppressed. In total up to ~20 packets could be saved.

Details of the compressions were presented.

Work could be done within ~3 months of work.

MS asked if a similar approach could be applied to IBIS. PU replied that this was not possible. The question has been analyzed in the past, but the event distribution is not identical to SPI and the IBIS CPU is already used to more than 95%, leaving little room for more processing. An extended discussion ensued with no clear outcome.

SPI will try to do something within their contract with Vega, but the priorities are different. If 50 kE were available, the further compression could be done quickly.

## 7 Crab calibrations

### 7.1 Results from previous SPI observations — EJ

Results from 3 periods were presented: early mission, regular campaigns and 2008 campaign with deeper observations. Revolution 728 had a big change in temperature (see above) and was thus not used.

Results from different periods very comparable. High energy spectrum (>500 keV) rather stable, about 10% in flux normalization.

Data has allowed to study systematic effects above  $\sim 700$  keV. Data good up to  $\sim 2$  MeV. Problem with calibration data for last 100 revolutions, is being resolved.

## 7.2 Results from previous JEM-X observations — SB

Electronic efficiency and collimator corrections have greatly improved Crab stability. The calibration report should probably be updated.

## 7.3 Calibration and software work — FL

FL explained the problem of defects seen in ISGRI images with bright sources in the field which have been linked to glue spread over some mask holes, leading to incorrect subtraction of bright sources.

Legacy deep survey of GC region limited by lack of knowledge of the mask. Largest defects around Crab are at level 16 mCrab.

“Bright source suppression” by excluding pixels affected by glue mostly removes noise (see vg) but also some weaker sources disappear. In crowded regions, esp. GC too much area is removed as one source after the other is taken into account.

Currently (OSA7) the mask model is wrong to  $\sim 10\%$ . Using existing observations, mask corrections will bring the error down to  $\sim 5\%$ .

Mask model should be improved from in-flight measurements “mask radiography”. Requests 550 ks of calibration observations twice a year until 2012 (3 Revs minus 1 5\*5 pattern). Should be done as  $3 \times$  grid with COP move and pattern rotation of  $\arctan \frac{1}{3} = 18.4^\circ$ . This should lead to  $\sim 4$  Ms of calibration data and a mask model uncertainty of  $\sim 1\%$ . As a side-effect other calibration efforts (e.g. misalignment matrix) would need to be redone as well.

The idea was discussed at some length. RD pointed out that it would be desirable to find scientifically-interesting point source targets other than Crab, to amalgamate point source response calibrations with science observations. Examples could be Cyg X-1 or Sco-X-1 with science targets within the surrounding regions. FL noted that Cyg X-1 is an obvious candidate, but one would need to clean Cyg X-3 and EXO 2030+375. Sco X-1 might help up to 40–50 keV, but the effect is visible up to 80 keV or beyond.

Some attendants wondered if the problem couldn't be solved by systematically fitting all available data.

Another question that was raised was if the the required accuracy of 1% per pixel is compatible with the pointing stability accuracy. This needs to be verified.

CW: is loss of sensitivity comparable to time possibly spent on calibration? PU: Need to take into account that one would improve past observations as well.

If such a long multi-Ms exposure were to be done, an effort would be first required by the instrument teams to ‘amalgamate’ their wishes rather than concatenate individual requests so to make the observation even longer. This could mean that the dither pattern for the corners should be optimized so that SPI can benefit from that as well, rather than adding to it.

JPR points out that cross-calibration report for IWS7 was done just for Rev 300 - it

should be done for all revolutions!

After some more discussion it was decided to have a dedicated calibration meeting in mid-end March to discuss a common calibration strategy for a joint proposal to the IUG and distribution of work before the next IUG meeting. W. Hermsen (IUG chair) should be invited as well. Groups should do their 'homework' before the meeting, e.g., study the suitability of the Cygnus field, answer the question of sufficient pointing stability, etc.

<b>Action IOCG/02-02 on ISOC</b> <i>Organize calibration meeting at ESTEC.</i>	<b>Due: 18 Feb 2008</b>
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## 8 Time correlation status — RS

For Revolutions 1 to 700 time correlation data has been regenerated and supplied to ISDC. The orbit determination problem has been resolved. Additional improvements were also made (see vgs). Still checking on problematic points with ISDC.

Iteration ongoing with ISDC, probably finished within next few weeks.

Time correlation shows long-term evolution, but taken into account. Since oscillator is *not* temperature controlled, the correlation is only valid for 15–20 minutes without update.

JPR asks when data will be available at ISDC. Requires reprocessing. But TCO files will be available from ISDC once agreed. JPR proposes to have them available immediately.

## 9 OSA status & prospects — RW

Main improvement of OSA8 will be the JEM-X software and inclusion of `spimodfit` tool from Garching. Inclusion of PICsIT software by P. Lubinski in OSA is not foreseen for the moment, as too specialized. OSA9 will focus on ISGRI, improvements discussed above will *not* be part of OSA8.

Will inquire with users if need to keep Solaris support.

Shift in ISGRI energy calibration by 5% (comparing 763 and 770 with revolutions 424/425). Ad-hoc energy calibration improves issue at one level, but makes things worse for long rise-time. The corrections were discussed for some time, several attendants expressing that a fixed response was an urgent matter.

## 10 OSA status & prospects — SB

Gain corrections have been further improved. `j_ima_iros` imaging tool is taking over both imaging and source data extraction. Includes, e.g., PSF dependence on energy.

## 11 Archive development — RW

General distribution of NRT data is working since one month. Data is usually available after  $\sim 3$  h.

Third revision (`rev_3`) processing is waiting mainly for the solution of time correlation issues and porting of some executables to Linux. He would also like to see if 16 ms gaps can be resolved before starting `rev_3` processing. Note that ACS times are shifted by 125 ms.

It is expected to take place up to summer. “All sky interface” with real-time ISGRI & JEM-X images, light-curves and spectra for any position could be available in summer or end-of-year if based on `rev_3` data. Dito for a source interface.

## **12 AOB**

At the June SPC Meeting a proposal will be presented to group mission extension requests. AP hopes to have Integral only up for discussion in 2010.