Integral Ops. Coordination Group Meeting 04

ESOC **25 Mar 2010**

Attendants

Søren Brandt	DTU Space	SB
Stefano De Padova	ESA, ESOC	SDP
Albert Domingo	LAEFF, CAB	AD
Frank Dreger	ESA, ESOC	FD
Carlo Ferrigno	ISDC	CF
Jutta Hübner	DLR	JH
Elizabeth Jourdain	CESR Toulouse	EJ
Peter Kretschmar	ESA, ESAC	PK
Lorenzo Natalucci	IASF Roma	LN
François Lebrun	CEA Saclay	FL
Jean-Pierre Roques	CESR Toulouse	JPR
Alfonso Sancho	ESA, ESOC	AS
Frederic Schmidt	ESA, ESOC	FS
Richard Southworth	ESA, ESOC	RS
Pietro Ubertini	IASF Roma	PU
Roland Walter	ISDC	RW
Christoph Winkler	ESA, ESTEC	CW
Xiao-Ling Zhang	MPE Garching	XZ

1 Welcome & Agenda — PK

The Agenda was accepted unchanged.

2 Actions & Open Issues — PK

PK summarized the status of open GS Issues, most of which are in the process of being closed, as discussed during this meeting (see viewgraphs).

There were only three open actions from before this meeting:

IOCG/03-01	DFEE anomaly	Closed (see JEM-X Status)
IOCG/03-05	NPHS parameters for bright sources	Maybe closed, pending confirmation
Co/11-07	waiting for conclusion of IOCG/03-05	

FL commented that in his opinion all information regarding action IOCG/03-05 was available. PK requested that FL contact G. La Rosa and A. Bazzano again who reported some remaining open questions.

3 Mission Status & Ground Segment Status

3.1 MOC status report — RS

RS presented the current Flight Control Team (FCT) with Carmen Lozano and Mike Walker excused for medical reasons. Jutta Hübner will join the FCT in April, replacing Salma Fahmy as Spacecraft Operations Engineer. The strong support by Frederic Schmidt (XMM-Newton FCT) in the last months was especially noted.

The overall performance remains high despite reduced manpower (see viewgraphs). The spacecraft status remains stable, except for the radiation impact on the solar arrays, discussed separately. Fuel consumption remains moderate with large reserves left.

The control room was renovated. Interfaces to ground stations and other GS elements are stable. The communication lines with ISDC have been upgraded. Some time in the delivery of consolidated data could be saved if the actual shipping of CDs could be replaced by electronic transfer or shipping of unchecked CDs, but RW expressed that the current delays were "reasonable" and ISDC preferred not to change the current setup.

After the meeting, CF noted that the FTS machine at ISDC was very old and might need replacement.

Action IOCG/04–01 on RS	**Due: end April**
Check replacement options for FTS machine at ISDC.	

Tools available at MOC, several with Web interfaces available were presented (see viewgraphs). Due to rising cost and trouble to procure Sun equipment, a posible move to a LINUX based Mission Control System during 2012 is being discussed.

The effort in maintaining the PI workstations at MOC is increasing due mainly to ESA security requirements.

Past issues with time correlation appear to be closed with ISDC rev_3 data.

3.2 Instrument status & anomalies — FS

FS summarized the status and open anomalies for the instruments. For SPI the LCL configuration could be successfully changed. A trip off procedure to temporarily run in a 3-compressor mode after an SEU until the fourth compressor can be brought into use again, still needs to be defined. The cold plate temperature was jumping up during perigee passages but could be maintained by selecting specific perigee passage attitudes. For other news see the viewgraphs.

3.3 SPI status — JPR

The instrumental background is slowly evolving with the solar activity, but also sometimes showing abrupt changes, e.g., on 18 February (see viewgraphs).

The nominal HV has been lowered to 3 kV after the 16^{th} annealing. The energy resolution recovery was good, but not perfect. The next annealing is foreseen for 25 April, with camera switch-on on 11 May. This is a bit late, but acceptable.

Generally SPI operations are smooth. The optimized perigee attitude is successful.

CD data from Toulouse available via Web with account.

3.4 IBIS Status — PU

The INTEGRAL ASI contract is reduced compared to the past, but keeps team in good shape until end 2013 at least.

IBIS operations are smooth with only minor anomalies (see viewgraphs). Contract with 'new' Vega is going smoothly, extended until August 2013.

An open issue are the IBIS OBSW patches. The ECOE workstation is now very old (12 years). Following previous exchanges, a new Linux box has been sent to MOC, but the setup has not yet been changed. G. La Rosa plans to visit MOC within a month, but work could be started remotely already.

Action IOCG/04–02 on MOC	**Due: end June**
Replace current IBIS ECOE.	

3.5 JEM-X — SB

Action IOCG/03-01 can be closed. A procedure without power cycle for the case of a DFEE CRC anomaly has been devised.

With both units in use, additional scientific results can be obtained now (see viewgraphs fro examples).

JEM-X operations are stable and anode loss is about 1%/year or even less. Gain evolution remains as main issue, with much stronger temperature dependence: 4%/deg C in JEM-X1 now, i.e., up to $\sim$20% variation in some revolutions. The overall effort for gain calibration is increasing as calibration sources are much weaker now.

It may become necessary to control HV settings on the basis of predicted temperature, based on pitch angle, in the future. A temperature effect of SPI annealing is also observed.

3.6 OMC — AD

Operations are running very smoothly. Monthly flatfield calibrations are performed routinely, searching for high zodiacal light levels when possible. A new calibration strategy has been partially implemented (from revolution 966). Flatfield, bad pixels and photometric calibration are very stable. Hot pixels and dark current are slowly increasing, but no concern yet (see viewgraphs).

3.7 ISDC status — RW

The Swiss funding request for 2012 (federal support) has been submitted. There are ongoing changes in manpower allocation to missions at ISDC, temporarily complicating matters for INTEGRAL, but level of support should not change up to end of 2012 (see viewgraphs for details). Because of the changes at ISDC, RW wants to minimize changes in system at this moment in time.

The ISDC operational hardware is being migrated to Linux based systems.

Recent problems with timing for SPI-ACS are under study.

The CD ROM delivery delay is now back down to ∼4 weeks. Consolidated data delivery will somewhat slower in the coming weeks, due to the S/W team reorganization.

CF discussed the time correlation checks done at ISDC. Rev_3 Crab data have been checked by Lucien Kuiper who found agreement between IBIS, RXTE/PCA and Fermi.

RS pointed out that with only one ground station, deviations can no longer be detected by discrepancies between data from different stations. Third parties, like ISDC, are required to find discrepancies.

XZ mentioned missing data for SPI in rev_3 data sets. The problem has been identified at ISDC and data will be reprocessed. Some events from dead detectors are found in the data. These are filtered by OSA, the last failure will be taken into account in the next OSA release.

3.8 ISOC status — PK

PK reported on the status at ISOC. No changes in core team since last meeting.

Mission planning generally smooth, but affected by orbit evolution, i.e., asymmetric belt entry/exit or the requirement to pick special perigee passage attitudes for SPI. Some specific examples were given.

OMC flatfield calibration handling has been improved, but there is more work to do yet.

AO-9 preparations are going smoothly, some time is foreseen for Earth/CXB observations.

The ISOC Science Data Archive will be upgraded to new Archive infrastructure, starting this year.

4 Orbit evolution and radiation belt effects

RS summarized the evolution of the orbit. The changes have lead among other matters to a very asymmetric passage through the radiation belts with very late entry, but also exit at higher altitude than earlier in the mission.

Solar arrays are visibly affected by radiation since perigee passage came below 6000 km. It is not clear yet if this means reaching a point where operational changes are required, or not. The issue is being studied and RS will also discuss with Alenia.

The average eclipse duration has been decreasing, but the number of revolutions with eclipses increasing, due to the changing orbit.

Earth albedo effect is also seen on solar arrays, but RS still needs to do a study of this.

Action IOCG/04–03 on RS	**Due: end June**
Set up monitoring of Earth Albedo effect on solar arrays.	

The handling of the belt exit in the planning cycle was discussed as in January the belt exit height suddenly increased and ISGRI was activated early. The belt model shown in presentations is not new and also averaged over the year. A better prediction is required.

Action IOCG/04–04 on ISOC	**Due: end June**
Coordinate improved model for belt exit prediction with MOC.	

The ISOC duty scientist shall also compare the improved model weekly with the prediction in order to recognize required changes earlier. Normally changes to the perigee exit height should be requested in an OCR ∼6 weeks in advance.

The evolution of the SPI coldplate temperature evolution was discussed in some detail. The strategy to search for an optimal perigee attitude was quite successful, but is very constraining for planning, possibly it would be sufficient to keep the angle between Earth vector and -Z axis high enough (see slide 15). Evidently, the illumination by Antarctica will vary strongly with the season. But FS pointed out that also right after annealing, with low stroke settings, the temperature appears to be more sensitive to shadowing.

Action IOCG/04–05 on ISOC+MOC	**Due: end Aug**
Develop strategy for perigee attitudes over the year.	

5 Earth/CXB observations

RS summarized the plans and procedure (see vgs).

Total time used for such observations in 2012 is fixed as upper limit (see AO-9 documentation). Need to see from first simulation how many (up to 5) observations will be done.

Celia Sanchez will co-ordinate the CXB observation from ISOC. A wiki page will also be set up to collect all inputs.

RW emphasized that precise reconstructed attitudes are very important for the analysis. RS noted that this depends on IMU calibration.

6 (Cross)-Calibration Status

6.1 SPI results — EJ

Results are similar between the normal 5×5 pattern and the mask calibration observations.

The averaged spectrum of revolutions 966-986 & 970 shows some systematic deviation.

The last observation (revolution 1029) was affected by background changes.

The last three Crab calibration observations indicate a stable flux (normalization at 100 keV) within an uncertainty of a few %.

6.2 IBIS results — LN

LN summarized the published information on variability of the Crab flux. JPR asked how Fermi/GBM subtracted background or accounted for Earth albedo, also pointing out effects affecting the accuracy.

A discussion on possible steps forward ensued.

6.3 ISGRI Gain Calibration — FL

FL explained the reasoning behind the change in correcting gain variations in ISGRI. A linear fit to the gain evolution is not sufficient, temperature corrections need to be included.

`idl_energy` is working in IDL and has been translated to C. Its use will require a new ARF. RW asked about the influence on the Crab flux, but

This correction is still approximative, a full correction would need the LUT2, requiring a large amount of work which will go on for many months. Since the LUT2 implies a 3-dimensional correction, its adaption for xspec use may imply an effective loss in energy resolution.

6.4 JEM-X calibration results — SB

The history of Crab calibrations for JEM-X was summarized. The analysis of the recent observations with different drift voltages is ongoing. JEM-X might want to change the default drift voltage in the future.

A 'first principles' analysis shows a general decreasing trend in JEM-X rates over the mission. It seems to be a currently unknown "dead-time" effect. Observations of Sco X-1 show a correlation of 0.7 between the increase of S/W triggers and the increase in accepted events.

PU proposed to schedule an hour at the end of the revolution during the next Crab observation to study the effects of increased counts from the radiation belts.

RW reminded the attendants about his presentation at the IUG showing results for the Crab nebula in general agreement with ISGRI in 25-40 keV.

6.5 IACHEC meeting — LN

LN presented the work of the International Astronomical Consortium for High Energy Calibration (IACHEC) and the upcoming meeting 11-14 April in Frascati.

Mentioned the example of a paper by the IACHEC on cross-calibration issues using data from G21.5-0.9. A paper on the Crab is planned.

6.6 Discussion

A general discussion on the priorities for cross-calibration followed.

It was pointed out that the Crab *spectrum* appears to be stable, whatever the possible flux variations. JPR emphasized that the shape should be compared carefully in specific revolutions. This was generally agreed.

PU proposed to reserve half a day at the upcoming Chia Laguna conference for updates and discussion on (cross-)calibration.

Action IOCG/04–06 on LN, EJ, NJW	**Due: end April**
Define a baseline for cross-calibration.	

7 AOB

The next IOCG meeting will be done when required, probably in early 2012.

RS invited the scientists present to give talks at the internal ESOC seminars.