



ESTEC, 21+22 April 2009

Minutes from 14 May 2009

## Attendants

Wim Hermesen	SRON	WH
Eugene Churazov	IKI Moscow	EC
Andrea Goldwurm	CEA Saclay	AG
Mark Leising	NASA, MFSC	ML
Jörn Wilms	Sternwarte Bamberg	JW
Ed van den Heuvel	Univ. Amsterdam	EvdH
Giorgio Palumbo	Univ. Bologna	GP
Jacques Paul	APC Paris	JP
Sergei Grebnev	IKI Moscow	SG
Pietro Ubertini	INAF Roma	PU
François Lebrun	CEA Saclay	FL
Jean-Pierre Roques	CESR Toulouse	JPR
Roland Diehl	MPE Garching	RD
Søren Brandt	DTU Space	SB
Miguel Mas Hesse	INTA Madrid	MM
Roland Walter	ISDC	RW
Christoph Winkler	ESA, ESTEC	CW
Peter Kretschmar	ESA, ESAC	PK
Guillaume Bélanger	ESA, ESAC	GB

## 1 Welcome — WH

The agenda was changed to move the discussion on mission extension forward, swapping it with the AO-7 discussion.

The previous minutes were accepted without changes.

Previous actions:

IUG 05-02: Contact Valencia on IBIS mask – closed, little effect

IUG-05-07: Handling extreme operational cases – ongoing, see below

IUG-06-01: Draft supporting letter – closed

IUG-06-02: Verify actual TM usage for IBIS and SPI and circulate – closed

IUG-06-03: Study options to automate distribution of NRT data to PIs – closed

## 2 Mission Status & Extension — PK for AP

Recent developments within the SRE Directorate were summarized. Mark McCaughrean will become new Head of SRE-S (Research and Scientific Support Department) end June. Martin Kessler has been appointed Head of the Science Operations Department (SRE-O) which will include astronomy (*ASCA*, *HST*, *Integral* and *XMM-Newton*), solar system missions and a new division (SRE-OD) for development. AP continues to act as Head of the astronomy operations division (H/SRE-OA) until end June 2010.

The status of *Integral* remains very good. The only major anomaly since the last meeting is the loss of SPI GeD#5. Fuel and solar power status are good. The Revised Operations Concept is working smoothly. At the second Integral Operations Coordination Group (IOCG) meeting in Rome, the main issues were the still rising background rate and the discussions about calibration. A special meeting on calibrations was held on 27 March at ESTEC, agreeing on a global strategy to be presented to the IUG.

The status of the Mission Extension up to 2012 was reviewed. At the moment no final decision has been taken and the SPC has requested to be presented with some options at its June 2009 meeting. An extraordinary meeting of ESA's advisory structure to consult on mission extensions will take place on 14 May.

One option including significant cost cuts and corresponding consequences with respect to mission operations was presented for the IUG to comment on. A discussion began, but was deferred until after the next presentation.

### **3 2010 Extension & Science Case — CW**

CW began presenting the work for possible extension beyond 2012, reminding the IUG on the list of strengths and weaknesses listed in previous AWG/SSAC recommendations. These comments should be taken into account when preparing the next request. He proposed to nominate "godfathers" from the IUG to find responses to the questions raised by the advisory bodies for the three main topics: compact stellar-size objects, nucleosynthesis and lines, extragalactic & CDB). The following IUG members volunteered to play this role: PU for AGN, JW/TB for compact objects, RD for nucleosynthesis.

CW continued with the current necessity of looking into possible areas for savings. One major option with less effect on the science would be the use of a Russian ground station. This option has been studied in the past but ESA decided to remain with Redu. EC explained that while the Russian side was generally ready to discuss this option again, a first step would need to come from ESA given the previous withdrawal. PU noted that if the Malindi station could be used, then ASI might be interested, but this option has not been explored at all.

Different worries were expressed, regarding the possible effects of cost-cutting, e.g., extremely reduced or no AOs or no TOO support.

RW asked if certain tasks could be handled by the ISDC in order to reduce manpower cost. Some IUG members requested a detailed breakdown of operational costs in order to better understand the options.

After some more discussion, WH proposed to draft a recommendation to be discussed the next day.

### **4 AO-6 and AO-7 Results — CW**

CW summarized the observations executed so far in AO-6, both normal and TOO.

For AO-7, 76 proposals were received, 10 for short ( $<1$  Ms), 35 for Key Programmes ( $\geq 1$  Ms) and 31 TOO proposals. Detailed statistics were presented. 92% of accepted

non-TOO proposals are Key Programmes, more than fulfilling the IUG recommendation of at least 80%. In general there is a trend to larger programmes. The detailed programme became available the following day after notifying the PIs individually.

A selection of science highlights was presented. Seven press releases have been published since June. Publication statistics are encouraging with two successive months of 15 refereed publications each, which is the maximum rate.

## **5 AO-7 TAC deliberations — EvdH**

The previous presentation was very complete already, so little to add. In the panel chair meeting proposals on the Magellanic Cloud region were included, which had remained just below the cut in the individual panels but raised widespread interest.

The list of questions for TAC members was felt to be too detailed, EvdH has an action to propose a new list. Also rules shall be instated to regulate the fontsize and readability.

This time there was no problem with the guaranteed Russian share as a sufficient number of proposals were submitted and accepted. WH noted that the Russian community should be encouraged to also write proposals in the second round. Russian proposals are only open to observers affiliated with Russian institutions. Conversely, Russian observers can propose for data rights in all accepted proposals.

EC expressed his surprise that there was no correlation between the priorities provided by the Russian Academy of Science and the ranking by the TAC. He felt this might be taken badly by the Russian community. CW explained that the input from the Russian Academy is **not** passed on to the TAC, since this was clearly refused in earlier AOs — the TAC works independently from outside influence.

The concern was raised that lack of a specific long programme targeted at the Galactic Centre might lead to reduced interest in data right proposals. Suitability of accepted proposals for subsequent data rights proposals was considered in all panels as a criterion and some of the accepted proposals cover other regions of high source density.

## **6 ISOC Status Report — PK**

The ISOC team is currently reinforced by a YGT (D. Anger) working on a smarter Long Term Planning tool which may be used operationally for AO-7. S. Migliari has joined ESAC as an Integral Research Fellow. One of the two developers (P.J. Baeck) is leaving for private reasons and a replacement must be sought. The major software changes for AO-7 should be finished before he leaves.

ISOC has been busy with the first phase of AO-7. Observers were informed about the TAC decisions while the meeting was ongoing. The new AO scheme decided in the last IUG meeting has led to major changes to software and database design. Observers shall be supported for the data right stage with added Web tools. Software issues reported at the last meeting have been fully resolved.

TOOs are usually implemented as fast as technically possible or requested by the observer.

The transfer of raw telemetry from MOC and archival at ISOC has begun. The next major release of the ISDA is slowly coming into shape. Still a lot of time is spent following changes at the ISDC; a meeting at ISDC is scheduled for end of May.

## 7 Dither patterns — PK, JPR

PK explained the repeated conflict between the requirements of deep surveys and SPI science which are best covered by a  $5 \times 5$  pattern and the needs of some observers to have continuous X-ray monitor coverage which currently is only covered by the Hex pattern and raised the question if another pattern (e.g.,  $3 \times 3$ ) would be better.

JPR explained the background rationale behind the current dithering strategy. SPI requires a step size of at least 2 deg, larger step sizes and scans can help for diffuse emission studies. For a single source in the FOV a hexagonal pattern was derived in detailed studies as best compromise but this pattern is not suitable for SPI in crowded fields (e.g., GC) or for diffuse emission. The  $5 \times 5$  pattern is also important for the energy response  $>100$  keV. Any new pattern would need to be carefully studied in detailed simulations.

MM proposed a “centrally-enhanced”  $5 \times 5$  pattern with more time spent on the central points, but this would not really help.

The conclusion was to keep the situation unchanged, in any case there is a shrinking number of observations using the Hex pattern in recent years.

## 8 ISDC Status Reports — RW

RW summarized the funding situation. Swiss funding is stable up to 2011; US & UK funding has stopped. Germany and Poland contribute 1 FTE each

T. Courvoisier is going on a sabbatical and RW is now responsible for Integral at ISDC. The ISDC structure has been re-organized around sub-projects. NRT operations are run with only one operator (plus s/w engineers for weekends) and one duty scientist.

Operations are running smoother than ever. The good time is very close to 100%. Data distribution happens typically within 5 weeks.

The time correlation issue has been resolved in many iterations with MOC. Corrected auxiliary files are available from ISDC and are used in reprocessing.

Archive usage scatters a lot, with possibly a small downwards trend since 2007.

OSA7 has had 202 downloads (OSA 5.1 180). OSA 8 is planned for release end of May, focussing on JEM-X improvements. Flux information will come from imaging (source results). Lightcurve analysis on short timescales are still to be done with the previous tool. There are also several updates to the SPI ISSW with, e.g., new response data (taking into account the loss of detector #5) and the `spimodfit` tool. For ISGRI a number of minor, but relevant fixes have been made. Improvements on image quality and energy calibration require new ARFs which will be included in OSA 9. The ISGRI misalignment varies with temperature, up to almost 1 arcmin, a correction is included in OSA 8.

OSA 9 will focus on ISGRI and is slated for a release possibly already in October.

The third revision of the Archive is being processed, expected to be ready in summer. New interfaces for JEM-X and ISGRI data with high level products foreseen to be ready in October (processed with OSA 8) and December (processed with OSA 9) respectively. These interfaces are aimed at supporting all-sky surveys, something not well done in W3Browse, for example with high-level products and VO support.

In the case of very bright bursts (1E 1547.0-5408) ISGRI has a problem with non-flagged gaps which is under investigation.

The ability to have direct NRT access is very much appreciated by the users.

JW reported that there were still problems in fast data download of large datasets from Bamberg and the US, with downloads becoming slow after a short while.

## 9 Bright sources in ISGRI — FL and PK

PK noted that while a general strategy for reacting to an extremely bright source has been agreed, he has not been successful in collecting the required detailed information to close this issue yet.

FL reported on results of looking into the test data for revolution 666 (10 ks) where the threshold was raised to the maximal value of 75 or 85 keV respectively, depending on the threshold.

Leaving only one module with normal threshold and changing the threshold for the rest reduces the countrate by a factor 2. This should be sufficient for sources up to 5–10 Crab. Switching off modules progressively would reduce the count rate by a factor of  $\sim 3$ . In an extreme case one could leave just one module on

EC asked if the calibration was understood in case of such threshold changes. Basically the information is known and one would have the single unmodified module for comparison. Leaving all modules on would lead to long drop-outs in the light curve.

CW inquired about the turnaround time. FL emphasized that these configuration changes should be a procedure done autonomously at MOC. PK will include the information presented at this meeting and push again for inputs from the rest of the IBIS team in order to have a solid baseline for MOC.

<b>Action 07–1 on PK</b> <i>Make sure work converges on the TM issue</i>	<b>Due: end May</b>
---	---------------------

## 10 OMC status and operations — MM

The CCD is very stable, the number of bad pixels remains stable. The dark current is rising slowly, but well within acceptable limits. The CCD coating evolution seen in the flatfields have settled into a stable structure. The calibration demonstrates that the lenses are not getting darker through radiation effects and that the overall transparency of the CCD coating remains invariable.

Calibration with standard stars is stabilizing at  $\sim 3\%$ , probably limited by uncertainties in catalog information.

Operations are running very smoothly. OSA 8 will contain several further improvements for the photometric extraction.

The OMC archive at LAEFF (<http://sdc.laeff.inta.es/omc/>) contains now more than 160000 sources with more than 50000 having >50 photometric points and more than 4500 sources with >500 points. Excluding robots and internal accesses, the OMC archive has been accessed 16619 times and 7317 lightcurves have been downloaded.

Compilation of the first OMC Output Catalogue has begun. It contains 1500 sources with  $\geq 20\%$  flux variation. These data were also used for AGN studies (Beckmann et al. 2009, see above).

## 11 SPI status and operations — JPR

In the 12th annealing (17<sup>th</sup> August to 3<sup>rd</sup> September, 2008) GeD #12 went back to nominal behaviour. The high energy particle background is still rising. The next annealing has been pushed back to 20<sup>th</sup> April 2009 as a compromise with the long-term planning, leading to a record degradation which hopefully can be recovered by having one revolution more of annealing.

EC asked if extending the annealing duration would recover the energy resolution. In theory yes, but the evolution is not precisely known. The annealing could be split in two parts, but one wants to keep the heating/cooling cycles to a minimum.

The proton particle rate at the beginning of the mission was  $\sim 6000$  now it is above 10000. The latest solar cycle predictions foresee a solar maximum in 2013 instead of 2010. SPI is looking into further telemetry reductions by loss-less compression for PSD and multiple events.

JPR reported on the failure of detector #5. The failure occurred close to the perigee passage, as for GeD17. The high voltage will be reduced during perigee passages.

New responses have been created, but still need testing. Next Crab calibration will allow verification of updated responses in greater detail.

## 12 IBIS — FL

FL presented the problem of glue or potting effects in the IBIS mask calibration. The sensitivity to faint objects is currently limited by incorrect subtraction of the shadow pattern cast by bright sources. Excluding regions affected by glue helps at first order, but in crowded regions too much data is removed. Thus, the mask model must be improved. Simulations show ghost residuals up to  $1.6 \times 10^{-3}$  of the transparency uncertainty (in %). Need to arrive at 1% level of uncertainty (or less) for deep (Ms) surveys of fields with moderately bright sources.

Besides the Crab, Cyg X-1 is a good candidate for mask transparency studies, but requires removal of at least Cyg X-3 and EXO 2030+375.

Combining 'difference maps' (observations and model of illumination) from Crab and Cyg X-1, one also sees bridges between mask pixels and at least one bright line at the

top right, where the mask is more transparent than predicted. On questions on the details FL reminded the IUG that the picture is derived by a fitting procedure which is found to not be perfect, investigation is ongoing.

The best strategy is still being investigated. Analysis of Crab calibration and Cygnus fields observations show good coverage for two of the four corners. Possibly, upcoming Cygnus observations could be adapted to suit the calibration needs and “fill the gaps”.

### 13 Long-term calibration plan — GB

Following up on the IOCG Meeting #2, a special calibration meeting took place at ESTEC on 27<sup>th</sup> March with representatives from ISGRI, SPI and JEM-X. A common plan has been elaborated and a plan has been devised up to AO-8:

1. A total of 1.2 Ms for radiography of the IBIS mask corners.
2. 600 ks in the standard mode to calibrate the SPI high-energy response.

With added information gained in the mean time and presented by FL before, one might be able to reduce this.

CW emphasized that the added calibration time was not included in the TAC preparation for AO-7, so extra calibration time would go off the time available

Accepted deep observations on the Cygnus regions could potentially be used to achieve a large part of the goals. ISOC needs to investigate this option.

<b>Action 07-2 on ISOC &amp; IBIS team</b>	<b>Due: mid May</b>
--	---------------------

<i>Investigate possibilities to use the accepted Cygnus region observations in AO-7 for the IBIS mask calibration.</i>
--

A discussion ensued if added time was actually required and helpful. While WH proposed 600 ks of calibration time for AO-7, other IUG members were skeptical if this was really warranted. The decision was deferred until the action on the Cygnus field was resolved.

### 14 SPI calibration & Crab results — JPR

JPR summarized the history of Crab observations, emphasizing the significant amount of time spent in other patterns than  $5 \times 5$ .

Comparing different periods demonstrates an overall stable calibration. The longer exposure in the past have allowed to study systematic effects, gain corrections and the instrument stability giving now reliable data up to a few MeV in the standard  $5 \times 5$  pattern. A single 50 ks exposure allows only checking up to  $\sim 200$  keV, while 4 revolutions would allow a good control of SPI up to 2 MeV. EC and JW remarked that precise spectral calibration at 2 MeV will not affect many sources.

JPR also emphasized that solid reference spectra for cross-calibration are needed and that good cross-calibration has so far only been done for a short time interval.

As a “bonus” of the Crab work, JPR presented SPI pulse profiles. There is an annual variation between SPI Crab phase and the radio phase, which is probably due to uncertainties in the radio ephemeris, or in the accuracy of the used Crab position. (After the meeting further investigation showed that the latter was the cause of the annual phase variation)

He also presented an overall Crab pulsar spectrum ranging from X-rays to TEV.

## **15 JEM-X status & calibration — SB**

The gain continues to evolve as expected, leading to regular lowering of the drift voltage settings. If JEM-X1 remains in use, the next lowering would be expected for end of 2009. The gain dependence on detector temperature has increased from 1% per degree to almost 4% per degree, which might lead to an earlier need for a voltage change.

Anode losses have slowed down to new  $\sim 1\%$  per year; there was a 12 month period in 2007/2008 with no losses.

The JEM-X particle background is still rising, confirmed by the Oulu neutron monitor. The rate since launch has about doubled, but due to on-board selection, the deadtime has only increased from 13% to  $\sim 20\%$ .

One might switch to JEM-X2 for the start of AO-7, which has been operated for  $\sim 200$  revolutions instead of 600+ for JEM-X1. Close to the end of the mission (if known), both detectors would be used, if sufficient telemetry is available.

There are major improvements for JEM-X analysis in OSA 8. Source detection remains limited by systematic uncertainties, e.g., in the collimator model. OSA 8 prototype results on the Crab were presented, demonstrating a much more stable flux reconstruction than with the current software.

To calibrate time-dependent questions of the JEM-X calibration (gain, spatial gain, effective area changes, ...), short staring observations ( $\sim 10$  ks) on the Crab remain necessary. The standard  $5 \times 5$  is useful for JEM-X off-axis response determination, special observations (like, e.g.,  $4^\circ$  circle) on short times are easier to use.

## **16 Cross-calibration using Cyg X-1 — JW**

For a study of stellar wind, Cyg X-1 has been observed with Integral, XMM, RXTE, Suzaku & Swift.

Suzaku agrees well with SPI. Other missions differ by constant offsets, removing that, deviations are on the level of 5%. The uncertainty in the Suzaku background limits the accuracy of the comparison to  $\sim 10\%$ .

RW asked if a difference in spectral slope was seen between IGSRI and SPI? The number could be derived, but JW pointed out that the power law slope and folding energy are not independent.



## 17 Cross-calibration with 1E 1547.0-5408

WH summarized the known facts about 1E 1547.0-5408 which was known as AXP and recently behaved more as SGR.

The source has been observed with up to 5 observatories (Integral, RXTE, Suzaku, Swift, Chandra) concurrently, but the overlap is for short time intervals. Statistics limit the ability to cross-calibrate, since the source is evolving.

## 18 Promoting the mission

JW noted that at a recent IYA event, they were mainly distributing Chandra material. CW explained that the 5-year brochure is available freely from ESTEC, as may some other material, but overall ESA's visible PR effort is done by a very small team.

ISOC has been featured in the Live-Webcast "Around the world in 80 telescopes" and offers a competition for secondary school and University undergraduate students "Be an Integral astronomer".

## 19 PSR J1846-0258 / Kes 75 — WH

WH reported on observational results for PSR J1846-0258 (Kes 75) an object known as normal young pulsar, but showing magnetar-like behaviour in 2006 with a radiative outburst with a decay time of about 60 days accompanied by five short  $(\leq 0.1 \text{ s})$  bursts. The peak of the radiative outburst was just missed by INTEGRAL.

The pulse profiles do not change with energy from PCA to ISGRI. Interestingly, the RXTE pulse profile do not change from the quiet state. The spectra seem to show an additional soft component on top of an emission with the same spectrum as in the quiet state.

## 20 Monitoring INTEGRAL Science Fields

### 20.1 Progress on Extragalactic Astronomy — PU

The number of AGNs detected by Integral is steadily increasing, the latest IBIS data indicates  $\sim 200$ .

Similar amount of sources are found in recent IBIS and Swift/BAT surveys. Almost 90% of AGN are Seyfert galaxies with about even ratio of Sey1/Sey2.

The high energy coverage is important for AGN modelling and X-Ray Background studies. A new diagnostic diagram allows to classify Compton-thick sources. Broad-band spectra allow to determine the distribution of  $\Gamma$ ,  $E_{\text{cut}}$  and  $R$  to be studied. The Integral results generally point towards flatter spectra and lower cut-off energies than typically used in XRB modeling. Several further results were presented.

The comparison of cross-correlation constants shows that Integral seems to lign up well with X-ray ( $C \sim 1$ ) while for BAT a trend is there to be systematically low ( $C \sim 0.5-0.6$ ).

MM added results from optical follow-up of  $\sim 60$  sources. Surprisingly, all types of AGN sources seem to have the same *average* correlation between optical and hard X-ray flux, albeit with significantly different distributions.

## 20.2 Advances in nucleosynthesis studies – RD

With the accumulated data, spatially resolved fits of  $^{26}\text{Al}$  emission can be obtained. Line widths can be constrained down to  $50 \text{ km s}^{-1}$  (about a factor 10 tighter than in X-rays).

Models of  $^{26}\text{Al}$  production in stars have been improved. Different models predict different dependence of  $^{26}\text{Al}$  over time. This can now be compared with data for regions of known age. The Sco/Cen region appears to show up at  $8\sigma$ .

$^{60}\text{Fe}$  is clearly detected in the Galaxy. For individual regions (Cygnus, Vela) limits have been derived. The Integral results on  $^{60}\text{Fe}$  have led to additional measurements of nuclear rates. The estimated  $^{60}\text{Fe}$  lifetime has almost doubled, from a recent re-determination.

For  $^{44}\text{Ti}$  there have been mainly non-detections, except for Cas A, this implies high velocities. Work is ongoing on model yields and their variabilities. Simulations show that the electron abundance is the dominating parameter.

Positron annihilation studies of two alternative approaches within the SPI team both indicate asymmetries off of the bright central bulge, though at very different significances. The SPI annihilation results drive various efforts on models and simulations with a large range of possible sources (DM; SgrA; Pulsars; Binaries; ...) being discussed.

Observational results have been presented at a dozen different workshops and conferences in 2008 and 2009 so far and will be at more meetings.

As a follow-up to his proposal to the IUG to do monitoring and check for science return, RD has studied the connection between observations and publications for nucleosynthesis proposals and presented the results.

Finally, RD pointed out that SPI ACS data have been prominent contributions in recent science highlights for transients, i.e., the bursts of 1E1547.0-5408 and GRB 080916C.

## 20.3 Advances in compact object studies – TB

TB presented recent progress in the field of compact objects, concentrating especially on LMXB and including results from various missions.

There is ongoing debate for X-ray novae if the inner disk radius recedes at low mass accretion rate, or rather not with different teams giving different answers.

In GRS 1915+105 Chandra observations (Neilsen & Lee) show alternatively a jet in the 'hard' state and a strong (disk) wind in the soft state, both with comparable mass loss. This indicates that a disk wind can suppress jet formation in these systems.

For BH transients, the evolution of the high-energy cutoff with spectral states is studied by combining Integral data with X-ray observatories. Several results have been published indicating a common trend in the evolution with the states.

In several neutron star LMXB broad iron lines have now been observed which can be used to estimate the inner disk radius and compare this with timing information.

Since June 2008, 55 papers on compact objects have been published based on Integral data.

## **20.4 Advances in compact object studies – JW**

For HMXB the trendy themes are SFXT, obscured sources and neutron stars with high magnetic fields.

As an example, results from the giant outburst of EXO 2030+375 were presented (Klochkov et al.)

At the moment, published papers tend to be on individual sources instead of overviews, thus garnering relatively few citations per paper.

IGR J16479-5414 may be an intermediate system between ‘normal’ wind accretion and flares when encountering clumps in the wind. This is similar to Vela X-1 where strong flares were found by Integral. The lognormal flux distribution in Vela X-1 matches models of astronomers studying stellar winds in general. Collaborations have begun on some of these sources..

## **21 Science Workshop Plans**

### **21.1 Workshop for 7 years of Integral**

A second science workshop: “The Extreme Sky: Sampling the Universe above 10 keV” is being prepared by PU and colleagues. The workshop will have an emphasis on survey work. As dates October 13–17 are foreseen in order to celebrate seven years of Integral in space. The location could be either Chia Laguna, Sardinia or Otranto (Lecce), Puglia. Details are still being worked out.

### **21.2 Next Integral Workshop, Dublin — CW (for L. Hanlon)**

The proposal for the 8<sup>th</sup> Integral Workshop is to meet 27–30 September 2010 in Dublin Castle, Ireland.

A broad range of topics shall be addressed, encouraging the participation of the wider community, especially Fermi and ground-based gamma-ray observatories. A title still needs to be found. There was general agreement with the broad scope.

The question of the number and role of invited talks led to some discussion. It was proposed to have a few invited speakers to introduce sessions, before the detailed presentations.

The Workshop contributions will most probably be published online.

SB noted that for the 7<sup>th</sup> Workshop it worked out well for the mix of attendants to have a lower conference fee for students.

## **22 IUG membership — CW**

CW pointed out that EC and WH have to be replaced as external IUG members after mid 2009 and four further members (ML, TB, AG, JW) after mid 2010. He asked for suggestions for new members fulfilling the criteria of active researchers in high-energy astrophysics, using Integral data and not formally affiliated as PI or CoI with the instruments.

## **23 Recommendation on cost savings — WH**

WH presented a draft recommendation which was discussed in some detail. A copy was to be circulated within the IUG and sent to AP up to Friday, 23 April. *The final recommendation has been appended to these Minutes*

## **24 Next Meeting**

The results of the second phase (data rights) of AO-7 will be known in September. The next IUG meeting will take place 10+11 December 2009 at ESTEC.

## Appendix: IUG Recommendation

### Cost Savings of the INTEGRAL Science Operations: Recommendation from the INTEGRAL Users Group

The INTEGRAL Users Group discussed possibilities to further reduce the costs to ESA of the science operations of the INTEGRAL mission. Cost savings were already achieved in the Ground Segment when the operation teams for INTEGRAL and XMM-Newton in the MOC in Darmstadt were reduced in size and merged. Further reduction of personnel for INTEGRAL and XMM-Newton in the MOC is considered by the IUG to challenge the safety of the two satellites' operations, and is therefore not acceptable.

Sizable cost savings up to ~20% with minor, if any, impact on the science return can be realized if the REDU ground station can be replaced by the Russian Bear Lakes station, as already investigated in 2007. The IUG encourages ESA management to reinvestigate this option.

The IUG also considered whether cost savings can be achieved in the INTEGRAL Science Operations Centre in ESAC. It was noted that the small ISOC team does not include instrument specialists responsible for scientific monitoring and in-flight calibrations. In the case of INTEGRAL, these tasks are delegated to the hardware teams and the INTEGRAL Science Data Centre, so, not an ESA cost item. A significant reduction of the personnel in ISOC to achieve a major cost reduction would therefore have major implications. Certainly, Announcement of Opportunities for submitting observation proposals could not be supported anymore. Even a smaller reduction of the ISOC team will severely limit Target of Opportunity observations, which address a most important aspect of the gamma-ray sky. Moreover, the scientific interest in these ToO observations has increased significantly with the operations of the high-energy gamma-ray missions Fermi and Agile. The IUG does not recommend such a solution, because of the disproportionate decrease in the science performance of the mission compared to the cost savings.

On behalf of the INTEGRAL Users Group,

Prof. dr. W. Hermsen, Chair  
24 April 2009