Integral User Group Meeting 14

ESTEC, 21+22 January 2013 **Minutes from 11 March 2013**

Attendants

Angela Bazzano	INAF Roma	AB
Antony J. Bird	Univ. Southhampton	AJB
Søren Brandt	DTU Space	SB
Carlo Ferrigno	ISDC	CF
Sergei Grebenev	IKI Moscow	SG
Lorraine Hanlon	UCD	LH
Dieter Hartmann	Clemson	DH
Jutta Hübner	ESA, ESOC	JH
Wim Hermsen	SRON	WH
Peter Kretschmar	ESA, ESAC	PK
François Lebrun	CEA Saclay	FL
Miguel Mas Hesse	INTA Madrid	MM
Mikhail Revnivtsev	IKI Moscow	MR
Jean-Pierre Roques	CESR Toulouse	JPR
Norbert Schartel	ESA, ESAC	NS
Richard Southworth	ESA, ESOC	RS
Mark Türler	ISDC	MT
Pietro Ubertini	INAF Roma	PU
Ed van den Heuvel	Univ. Amsterdam	EvdH
Jacco Vink	Univ. Amsterdam	JV
Christoph Winkler	ESA, ESTEC	CW

1 Welcome, Agenda, Actions

AB presented herself and welcomed the three new IUG members Lorraine Hanlon, Tony Bird and Dieter Hartmann. She also announced that Giorgio Palumbo resigned for personal reasons from his position as Mission Scientist.

N. Gehrels could not attend the meeting in person, but was contacted by phone for the discussion of the next INTEGRAL Workshop.

The agenda was approved without changes.

Action 12–1 on PK, closed
Action 12–6 on AB, would need to test, not clear if really necessary.

2 Mission Status

PK began with news from the INTEGRAL mission (see viewgraphs).

The instruments and the platform are operating nominally most of the time. It is foreseen to change the slew strategy from closed loop to open loop; this won't impact performance but will reduce one risk factor for ESAMs. There have been few ESAMs so far with INTEGRAL, a comparable number for XMM-Newton. INTEGRAL is in the process of moving from the Redu Groundstation to Kiruna, which actually gives better coverage outside radiation belts.

But mid January, Redu was suddenly fully assigned to Galileo without previous consultation! This led to significant re-planning and the cancellation of one planned Earth Observation for safety reasons.

In response to Action 12-1 PK explained the handling of radiation belts entry and exit. The expected times need to be predicted a couple of weeks in advance in order to maximise science time. Currently there are two models developed at MOC and SOC with somewhat different predictions into the future. The data is monitored carefully to refine these.

3 Status report by Project Scientist

CW's presentation (see viewgraphs) began with an overview of scheduled observations and ToO observations within the last year. Continued with statistics on AO-9 completion, where finally ∼25 Ms could be scheduled. Including the planned observations, the Russian under-return of the past will probably be compensated by the end of AO-10. There were 7 GRBs in 2012 with one public during a GPS scan and 3 ToO observations were performed.

Regarding the Mission Extension, operations are confirmed until end 2014, but the SPC will decide in June 2013 about the perspective for further extensions.

Arvind Parmar has become Head of the Astrophysics and Fundamental Physics Missions Division (SRE-SA).

In AO-10 a total of 59 proposals were received for an oversubscription of ∼3.3. During the second call 39 data right proposals were received. The deadline for AO-11 observing proposals is 12 April 2013.

The term for the new IUG members (LH, DH, AJB) is until July 2016. A new IUG chair will have to be identified for the period mid 2013 to mid 2017; CW invited suggestions.

CW presented a short list of interesting science results since June (see vgs). He is now in the SRE outreach committee and invited suggestions for results from high-energy astronomy.

The publication rate is stable with on average 6–7 papers per month and ∼750 refereed publications so far (total ∼2000). A discussion ensued about the actual size of the INTEGRAL community and the impact — which figure of merit should be used? The oversubscription rate has declined in the long run, due to a variety of factors, e.g., the large number of fields & sources observed already, or the observation that previously competing groups now share forces.

4 Instrument & Calibration status, Science Ground Segment

4.1 OMC

MM briefly presented the OMC status (see viewgraphs). The CCD status is very stable. The number of hot pixels is slowly increasing, but remains low (currently ∼0.07%).

Last Christmas the OMC cover power line was on autonomously. This had no effect on operations, but the event is under investigation.

The effect of new open loop slewing strategy is less than feared, with a maximal shift of 4 pixels, 7–8 for GPS. This can still be handled by the centring algorithm.

The first version of the OMC catalogue has been published with lightcurves available for over 5000 sources. Individual data files can also be downloaded for analysis.

4.2 JEM-X

SB explained the JEM-X status (see viewgraphs) in some detail in order for the new IUG members to be informed.

Both units are running jointly since 2010. JEM-X1 has now been used for ∼1020 revolutions, JEM-X2 for ∼600 revolutions. Both units are at ∼75% of original effective area. There has been no further anode loss since Dec 2011.

The gain is now strongly temperature dependent (4-5% per degree K). The automatic gain correction is usually performing well, still an interactive process for final gain calibration is in place, with a correction table delivered to ISDC for every revolution. The increased TM rate helps with calibration, since calibration data is less affected by grey filtering now. The calibration sources have declined by > 100 since launch. The increase in particle events and decrease in gain correlates with 4–9 MeV protons in solar CMEs measured by GOES.

Gain depression by solar events. Charge deposition on the plate. JEM-X excess triggers correlate well with GOES proton data at 4–9 MeV. JEM-X count rates leading by ∼20 minutes in time. Explanation by 5 MeV protons able to penetrate Be Window.

MR inquired about the status of the flux calibration. There is ongoing work between ISDC and the JEM-X team. The temperature dependence is taken care off in the off-line gain calibration, but for the reasons explained above, NRT data can be much worse than consolidated data.

Action 14–1 on CF	**Due: end March**
Circulate information on flux scatter in NRT and consolidated data from Crab calibration observations	

4.3 SPI

The update on the SPI status (see viewgraphs) was presented by JPR.

The 19^{th} annealing went smoothly, the 20^{th} was finishing at the time of the meeting and the camera was activated smoothly the day before.

The slope of degradation in energy resolution does not vary as much as expected with the increase in proton flux; something to study on occasion.

There is a new SPIDAI data analysis interface available in Toulouse:

`http://sigma-2.cesr.fr/integral/spidai`

4.4 IBIS

For the sake of new UG members PU gave an overview of the IBIS instrument before explaining the ongoing calibration efforts (see viewgraphs).

The funding situation from ASI has improved significantly since the MEOR 2012.

For spectral calibration there have been significant improvements with OSA 10, but there remains a feature at ∼55 keV for bright sources in the ISGRI spectra and there is a ∼2% difference between on-axis and off-axis fluxes.

Below <50 keV there is no significant difference between the OSA9 and OSA10 Crab rates, above 50 keV the rates are ∼5% lower in OSA10, but the shape of the longterm Crab lightcurve remains.

A cross-calibration effort based on nearly simultaneous Crab observations is ongoing between NuSTAR and INTEGRAL is ongoing, involving Lorenzo Natalucci. In the future also data from G21.5−0.5 and 3C 273 will be used. As pecial session on cross-calibration >10 keV will be organized at the IACHEC in March (Hothorpe Hall, UK).

4.5 IBIS Energy Calibration

FL explained in detail the changes in the ISGRI energy calibration (see viewgraphs).

Action 14–2 on FL,EJ **Due: next meeting**
Provide combined Crab light curves also with SPI data (see FLs talk).

New ARFs are needed about every six months to follow the spectral evolution. CF asked about the planned delivery of the next set of calibration files.

PU proposed more than two Crab calibrations per year. With one Crab calibration early in the visibility interval plus a 45 ks 'snapshot' later in order to get more or less evenly distributed data. AB noted that this would cut into the time available for GC visibility, but can be managed, since it's only a short time interval.

A discussionabout the NOMEX calibration and azimuthal dependence of fluxes did not converge on a clear result. CF pointed out that work was done at the ISDC, but the expertise has been lost.

WH and colleagues found for 4 AXPs consistent fluxes between pulsed data from Swift/GBM, RXTE and INTEGRAL.

Action 14–3 on ISOC/GB **Due: end Feb**
Collect list of open issues in IBIS calibration to allow coordination.

JPR raised again the question of a long calibration for the SPI response above 200 keV. Estimates that they would need 4 revolutions in 5×5. After some discussion about the usefulness of different calibrations, IUG concluded that a coordinated approach across instruments was required to to maximise the return to the community in scientific terms.

Action 14–4 on ISOC/GB **Due: end Jan**
Request calibration requests with justification from PIs, for commenting by the IUG.

4.6 ISDC

CF presented news from the ISDC (see viewgraphs). Manpower is now shared with other projects. This does not affect operations, but 'extra' activities like, e.g., NOMEX calibration.

The delay in CD delivery from MOC has increased.

OSA 10 has renovated interest from outside users. It was downloaded >100 times from outside. It is not tracked which fraction of this is from individual users versus institutional downloads.

JV noted that Chandra asks downloaders if downloading for personal reasons or for institute.

The further development of the high-level data interface HEAVENS is on hold, due to funding questions.

For the long-term future, CF raised the question if OSA could/should be simplified. No consensus was reached on this question. NS remarked that work should go on in parallel on both high-level data products and a simplified analysis software.

4.7 ISOC

PK gave a brief overview of the ISOC status (see viewgraphs). A senior software developer left, but was smoothly replaced.

4.8 MOC and Spacecraft status

RS gave an overview of the spacecraft status (see viewgraphs). Fuel consumption and telemetry usage are OK. The increased degradation of the solar arrays, due to the highly increased proton dose continues, but the extrapolated margin is still good.

He also presented a quick overview of anomalies and operational changes in 2012 as well as team changes at MOC. The Mission Control System at MOC will be moved to a Solaris 10 virtualised system.

Regarding ground stations, the move to Kiruna1 as prime ongoing, but this station may not always be available and backup stations have visibility constraints. If a gap in coverage can not be avoided, feedback from the PI teams indicate that usually instruments should be left running.

4.9 IBIS Mask Calibration

FL presented slides (see viewgraphs) prepared by S. Soldi on the mask calibration and modeling. The "ghost busters" scheme in OSA 10 to exclude detector pixels from the reconstruction, which correspond to the projection of a bright source through mask elements affected by defects has significantly improved imaging results, but is not perfect.

One simple improvement is to extend the region covered by the algorithm. This will be included in the next OSA release. Second order effects would still remain; it is not clear who will pick up S. Soldi's work on this.

5 INTEGRAL Workshop 2014

CW presented a proposal by the US colleagues to hold the 10^{th} INTEGRAL Workshop in Annapolis, USA (see viewgraphs). INTEGRAL Workshops have been held in participating countries, but not yet in the USA. Special emphasis would be given to collaborations with, e.g., Swift, Fermi and NuSTAR.

The IUG generally approved this idea. SB raised the point that maybe a larger contribution for student support should be provided then.

6 Earth/CXB Observations

MT summarized results from the new set of Earth Observations (EO) (see viewgraphs). The new data is much more complicated to interpret than the 2006 data sets, due to the changed geometry of passing through the radiation belts, but also higher solar activity.

In the fifth observation (EO 2.5) strong auroral emission was observed. The JEM-X and IBIS spectrum requires two bremsstrahlung components. Imaging with JEM-X and SPI could be tried, as it was done in 2006.

An extended discussion ensued on the question if it was worth to continue these observations and how their acceptance in the programme should be handled, e.g., by the TAC including external specialists. No final

JH gave an overview of the operational issues related to Earth Observations (see viewgraphs).

After careful evaluation a pre-perigee Earth Observation seems now possible. Given various other constraints, there are two times in the year, in summer and towards the end of the year when these could be done.

After some further discussion it was decided to try another EO in early summer in the pre-perigee approach and make further observations dependent on the analysis results of this, thus having at most one more observation in 2013.

Action 14–5 on MT	**Due: end June**
Inform IUG about outcome of the pre-perigee EO.	

MT was encouraged to publish his existing results in suitable journals, several IUG members agreed to contact colleagues who might be interested in the Aurora studies.

7 Preparation mission extension

PK summarized the steps and decisions taken so far (see viewgraphs). At the SPC meeting in June 2013 an indicative decision will be required for any further extension beyond 2014. Since the Ministerial Council in Nov 2012 approved a flat budget without inflation correction, a shortfall of funds for operations is predicted for the future.

All missions are requested to look into operational or post-operational saving options, including options significantly affecting scientific performance. A selection of these options will then be compiled into an overall package. There is no defined target for individual missions, but overall significant savings are expected to be necessary. The IUG will need to comment on the impact of any saving options on the scientific performance. CW emphasized the need for detailed technical information about each option and a work schedule.

An extended discussion ensued including some brainstorming on a variety of options, revisiting various already brought up at previous meetings. Major savings could be obtained without hurting the mission performance if a ground station at much reduced cost could be used by INTEGRAL. DH compiled a first list for iteration within the IUG.

As a new option LH raised the possibility to use a ground station in Ireland, that is currently being refurbished. RS and PK will investigate this.

Action 14–6 on MOC/ISDC	**Due: end April**
Test connection MOC–ISDC over internet instead of dedicated line.	

8 De-orbiting INTEGRAL?

PK also presented results from a study by Flight Dynamics showing that INTEGRAL would not de-orbit naturally, but become a risk for the Low-Earth Orbit and the protected Geo-stationary Orbit zone in the future. A controlled de-orbit might be possible in 2020, which would require a large fuel reserve, potentially impeding scientific observations beyond 2016. Fuel saving options that have been tested for XMM-Newton will be implemented. A detailed study on de-orbiting options is ongoing.

9 Next Meeting

Special meeting to discuss saving options proposed for Monday 11 March, if sufficient information is available to warrant the meeting.

10 AOB

AJB reported that New Astronomy Reviews was soliciting a special issue on 10 years of INTEGRAL. The IUG generally agreed with the idea, starting from the list of talks at the Paris workshop. AJB will collect propositions.

11 New scientific results

11.1 Polarization with SPI

JPR presented the methods for polarization studies with SPI and results for the Crab, Cyg X-1 and GRB 041219a (see viewgraphs).

11.2 HMXB with INTEGRAL

MR presented on behalf of A. Lutovinov the results of a HMXB survey with INTEGRAL as presented at the Paris Workshop (see viewgraphs).