INTEGRAL User Group Meeting #24

WebEx, 10 July 2020 **Minutes last updated on September 3, 2020**

Attendants

Roland Diehl	*MPE Garching*	*RD (invited)*
Albert Domingo Garau	*OMC, CAB*	*AD (invited)*
Matthias Ehle	ESA, ESAC	ME (Mission Manager)
Carlo Ferrigno	ISDC	CF
Sergei Grebenev	IKI Moscow	SG
Jochen Greiner	SPI, MPE Garching	JG
Lorraine Hanlon	UCD	**LH *(chair)***
Wim Hermsen	SRON	WH
Margarita Hernanz	CSIC	MH
Erik Kuulkers	ESA, ESTEC	EK (Project Scientist)
Philippe Laurent	IBIS, CEA/APC	PL
Niels Lund	*JEM-X, DTU*	*NL (invited)*
Julien Malzac	IRAP/CNRS, Université de Toulouse	JM
Julie McEnery	NASA	JM
Sandro Mereghetti	INAF Milano	SM
Jan-Uwe Ness	*ESA/ESAC*	*JUN (taking Minutes)*
Jean-Pierre Roques	SPI, IRAP Toulouse	JPR
Lara Sidoli	INAF, Milano	LS
Sergey Sazonov	IKI Moscow	SS
Norbert Schartel	ESA, ESAC	NS (deputy Project Scientist)
Richard Thomas Southworth	*ESA, ESOC*	*RS (invited)*
Pietro Ubertini	IBIS, INAF Roma	PU
Ed van den Heuvel	Univ. Amsterdam	EvdH, TAC chair

1 Welcome, Agenda, Actions, Recommendations

EK welcomed the IUG members.
Three IUG members left 1 July 2020 and are thanked for their service to the IUG: Diego Götz (F), Angela Malizia (I) & Diego Torres (ES).
The IUG welcomes three new members: Margarita Hernanz (E), Julien Malzac (F) & Lara Sidoli (I) Guests: Roland Diehl (MPE), Albert Domingo Garau (OMC, CAB, deputising for Miguel Mas-Hesse), Niels Lund (JEM-X, DTU, deputising for Søren Brand), Jan-Uwe Ness (ISOC, taking the minutes, deputising for Guillaume Belanger), and Richard Southworth (ESOC).

1.1 Agenda

Agenda was accepted with no additional items.

1.2 Actions

Action 20–1 on CF: Coordinate the activity to produce a report on cross-calibration

> On-going—Infrastructure for cross-calibration product generation is in place and several example sources will be processed, e.g. allowing comparison of NuSTAR and INTEGRAL-SPI results (with R. Staubert, JPR is also involved). A report has not

yet been generated. Initially a calibration meeting was postponed due to COVID19 hoping for a later meeting face to face in Rome but more likely online meeting in October. Currently no due date can be given.

Action #24–1 on PU	**Due: directly after IUG #24**
Call for calibration meeting in October 2020	

Action 21–2 on EK/LH: Maintain a set of publicly available slides on mission status to be used for presentations (due Feb 2020).

On-going—Due date changed in view of extension case preparation.

Action 21–7 on EK/LH: Review the status of the documentation available to the public (due at IUG #24)

On-going—no progress. New due date, LH to remind EK.

Action 21–10 on PL: Deliver Compton mode analysis software to ISDC. Some difficulties encountered with integration using OSA 11 libraries (due at IUG #24).

On-going—No progress due to confinement. Resume work in September

Action 21–12 on LH/EK: To draft a request to Lorenzo Natalucci to finish the cross-calibration paper on the Crab (due July 2019).

On-going—No progress, Lorenzo working on the paper, status unclear

Action #24–2 on EK	**Due: Directly after IUG #24**
Reminder from EK/LH by email (better than by phone)	

Action 21–14 on PL: To begin writing ISGRI calibration report and report at IUG #24.

On-going—Delays due to confinement Work has started at Saclay in a small dedicated team. Also to be worked on during planned calibration meeting. Started a paper on the evolution over 18 years. Project is in good shape.

Action 21–15 on EK: To discuss with CF how to present the cross-calibration results and OSA11 results on the web

Pending work by LN related to Action 21–12.

Action 22–6 on EK: Formulate a reply to TAC about the question of the polarisation software, and a statement to be posted on the INTEGRAL AO documentation and News (due Feb 2020).

Closed—Addressed in AO-18 documentation; We can ask himfor polarisation studies, best to consult the experts and set up collaborations.

Action 22–7 on PL: Check mission documentation for agreement on software deliverables from instrument PI in regards to polarisation-specific software (due IUG #25).

On-going—new due date IUG #25.
Comment: Start preparation work to analyse all data down to date zero with new software. CF: Already produced calibration tables, pending responses. Complex work with Lionel Metrailler in Geneva 2days per week. Ongoing, complex and late start with Lionel working on other project as well, and only at Geneva until end of the year.

Action 23–1 on TF: MOC to confirm the reason for the occasionally missing SPI telemetry packets and possible workaround. (due IUG #24).

Closed —

Action 23–2 on SG/SM: Share data on GRBs found by RSDC analysis with SM to understand why they were not triggered by IBAS. (due IUG #24).

On-going — SM reports having discussed shortly after IUG #23: Indeed some GRBs detected as sub-threshold events by IBAS. Not surprising to have better sensitivity in offline analysis compared to IBAS.

Action #24–3 on SM	**Due: IUG #25**
Present status of GRB detection threshold at IUG #25	

Action 23–3 on PIs: Instrument and Centre PIs to provide info on future funding to 2025, ensuring National Funding Agencies are informed as to the assumptions being made in the submission. (due 1st week of February 2020).

Closed — done for extension case

Action 23–4 on PL: Write a few line explanation of new calibration approach for IBIS to go on the OSA web-page (due December 2020)

On-going — Not yet done.

Action 23–5 on PU: Organise calibration meeting to be held in/around May 2020 (due January 2019)

On-going — postponed to October 2020, see Action 22-7

1.3 Recommendations from previous Meeting

Recommendation 37: Shorter proprietary period
In view of the requirement to change the Science Management Plan, with endorsement by the AWG, SSAC and SPC and agreements to be reached between different parties (including the Russian Federation), it was concluded that the current proprietary period be maintained and Recommendation37 be withdrawn.

2 The aftermath of the 8th ESAM: Anomaly, status, and introducing a new observing strategy — RS (viewgraphs)

- RS describes in detail the evolution of critical parameters around the 7th and 8th ESAM (see presentation slides). Most critical is a pressure drop that leads to low and unpredictable thruster performance.
- RS describes possible root causes. The tanks contain Hydrazine (N_2H_4) fuel and molecular Nitrogen (N_2), separated by an elastic membrane that communicates pressure from the N_2 section to the fuel section to push it into the propellant system. N_2 might have migrated into the hydrazine section. This leads to reduced pressure and loss of N_2 that is expelled with the burnt fuel.
- Status: 25-30kg fuel left (originally 520kg).
  With each thruster firing N2+Hydrazine is expelled, and is thus a risk to lose further pressure. It may be an ageing effect but unclear why it started so suddenly.
  However: spacecraft is under control!

- Challenge: Unreliable thrusters with risk of further safe-mode entries
- RS explains 2 solutions: (1) new biasing procedure (safe/reliable) (2) wheel speed adjustment by suitable slew patterns (about yaw axis) to cancel out angular momentum. Successful initial tests, much reduced Reaction Wheel Biasing (RWB).
- Successful science activities, but currently labour-intensive (a lot of trial and error)
- Work to be done to make new procedure less work-intensive but spacecraft is operable.
- PU expresses congratulations. Very impressed, especially also during COVID times.
- JPR asks about constraint on solar axis: Couldn't adjustment of roll angle help to use solar radiation pressure? RS is looking at this option, even though it is only a small effect.
- LH expresses great appreciation on behalf of the IUG
- In response to a query from CF, RS noted the main issue is the unknown rate of nitrogen migration through the membrane, which motivates the reduction in use of the RWB.
- PU: can the orbit change? RS: Very local effects and no significant change expected; re-entry time may change only by hours.

3 Managing the new observing strategy in the GO programme — EK (viewgraphs)

- EK presented the Project Scientist report.
- EK describes the impact of the new mission planning constraints, steep learning curve implementing new planning procedures to have fewer iterations with MOC in future
- Impact on GO programme: More slewing and stricter constraints on slew distances, 5-10% less science time.
  RS comments that RWB are currently only done during work hours (for better control) but will be go back and will then be less constraining
- To balance angular momentum, so-called Z-flips need to be included in the observing plans, thus targets roughly 180 degree sky distance apart. This is a constraining factor, and GB has studied to which degree such target combinations can be found during different visibility seasons.
  Conclusion, in Spring/Autumn (visibility of Galactic Centre), there are enough targets for Z-flip strategy, Summer/Winter less flexibility, and we need to resort to multi-revolution strategies, thus accumulation of angular momentum over 1 or 2 revolutions, only to be compensated in the next 1-2 revolutions.
- TOOs: continuously increasing demand. Impact of "Z-flips": reduction of TOO time by up to 50% if the TOO observation requires a full or even longer continuous observation. Z-flip requires interruption of long observations to observe other targets. However, the Z-flip strategy can be replaced by a RWB if the trade off against the science value justifies the risks.
- PU, supported by many others, noted the importance of the 4π ACS capability in multi-messenger science, with the fast TOO response secondary to that.

Action #24–4 on PU	**Due: soon after IUG #24**
Write some text about MM science to EK for delta extension case	

4 INTEGRAL Mission Extension: MEOR, AWG/SSAC milestones, SPC #163 outcome — ME (viewgraphs)

- ME presented the Mission Manager report. Extension process changed from 2-year to 3-year cycle. Request for 2023-2025 in progress:
- Highly praised feedback from AWG and a big Thank You from head of Science Operations Division.
- SSAC ranked INTEGRAL above threshold ranking third with two other ESA missions
- A temporary cash flow problem lead to proposing to SPC to extend 7 missions while postponing the 3rd ranking ones (including INTEGRAL) to next SPC meeting.
- SPC: Postponed extension decision for *all ten* missions to next meeting (1 Oct 2020).
- Need to prepare a delta report by early September (difference to previous report incorporating new strategies): Address main changes and impact of Z-flip strategy, failure investigation, remaining life time estimate, orbit control, science impact compared to earlier extension request.
- PL: For extension, need to emphasise that there is no impact on instrument performance!
- LH: IUG should make a recommendation in support of delta report
- PL: Issue an acknowledgement letter to MOC+ISOC as 90-95% efficiency is extremely impressive given the circumstances.

Recommendation 38: IUG Supporting Delta Report
Write a text related to Multi-Messenger (MM) science impact to support the text for the delta extension case.

Action #24–5 on PU,LH **Due: early September**
Write a support letter to SPC

5 AOB

LH: Status of conferences:
PU reports that Sardinia meeting has been postponed to **24-29 May 2021**, same venue, already posted on Canadian meeting list. EK: Organisation of PR material has started.
It was suggested to invite RS to report on the anomaly the crisis management during the meeting.

PL reported on discussions in setting up a Memorandum of Understanding (or Letter of Intent) between the KM3NeT team and the INTEGRAL project, to receive alerts on their ultra-high-energy neutrino events. This will be pursued later this year.

6 Next Meeting

To be decided after next SPC and can be done remotely again.