



Newsletter of the INTEGRAL Science Operations Centre



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Foreword

Christoph Winkler - Project Scientist

ISOC is completing the preparations for the forthcoming Announcement of Opportunity (AO-3) which will be released on 13 September 2004 calling for new INTEGRAL observing proposals for the period February 2005 until August 2006.

Furthermore, this issue of the ISOC Newsletter provides you with latest news on INTEGRAL as highlighted below:

As before, the spacecraft is performing flawlessly. Unfortunately, on the payload side, we witnessed the malfunction of another SPI detector (#17) on 17 July. The count rate from the detector went to almost zero and has remained at this value despite initial recovery attempts. Investigations into the cause of this malfunction are on-going. SPI continues to operate with 17 out of 19 Ge detectors.

The past months and weeks have been busy with TOO's and more GRB's in the FOV. The INTEGRAL GRB 031203 is the closest GRB on record but also the faintest. Two papers in *Nature* (Vol. 430, August 2004) by Sazonov et al. and Soderberg et al. describe this unique event. Using INTEGRAL and XMM-Newton data on NGC 4388, V. Beckmann et al. (ApJ, in press) found more evidence that massive black holes are surrounded by a doughnut-shaped dust cloud.

The proceedings of the 5th INTEGRAL workshop (Munich, 16-20 February 2004) are in press and the special publication ESA SP-552 will be available shortly.

3rd Announcement of Opportunity (AO-3)

Paul Barr - Resident Astronomer

ISOC is now finalizing the preparations for the 3rd Announcement of Opportunity, AO-3. The duration of the AO-3 programme will be eighteen months, in order to decouple the INTEGRAL time allocation process and observing cycle from those of XMM-Newton. The documentation, proposal submission and support software for this AO are being made available at <http://www.rssd.esa.int/Integral/>. Key milestones for this AO are shown in Table 1, below.

Table 1: INTEGRAL AO-3 Schedule

Release AO-3	13 Sep 2004
Proposals due	29 Oct 2004 15:00 CEST
TAC Meeting	06 Dec - 10 Dec 2004
Communication of TAC results	03 Jan - 01 Feb 2005
AO-3 observing cycle	18 Feb 2005 - 17 Aug 2006

Mission Status

Arvind Parmar - Mission Manager

INTEGRAL continues to operate smoothly with all the spacecraft sub-systems performing nominally. The two INTEGRAL batteries were reconditioned during May 2004. This is necessary because during nominal operations the batteries are hardly discharged due to the good performance of the power sub-system. Reconditioning involves fully discharging each of the batteries and is needed to ensure the maximum battery lifetime. Analysis of the battery performance shows that they are both in good condition, as are the solar panels and the power conditioning sub-system. Fuel consumption remains low at around 0.16 kg/week, with approximately 168 kg remaining as of August 2004.

In order to reduce the amplitude of any residual background structures in the IBIS images, the standard INTEGRAL 5x5 dither pattern will be modified from the end of August 2004 onwards. After each complete set of 25 dither pattern dwells, the central pointing position of the next cycle will be offset slightly from the last. This is to ensure that residual structures in the background images are better averaged out, improving the achieved sensitivity. The central offsets are arranged in a 7x7 pattern (Fig. 1) providing up to 49 central dither pattern positions, depending on the number of complete dither patterns in an observation. In addition, between each of the 5x5 dither dwell patterns, the roll angle of the individual pointings will change by 6 degrees (i.e. from +3 to -3 degrees). Again, this should help in reducing any residual structures in the background images.

The high-energy instruments have noticed a gradual increase in background counting rate probably mainly caused by changes in solar activity. In order to better distribute the available telemetry between the instruments, the

ISWT decided to decrease the time resolution of the PICsIT energy histograms from 1.95 ms to 3.9 ms and make the resulting 5 additional packets available to SPI. This change was implemented on 2 July 2004.

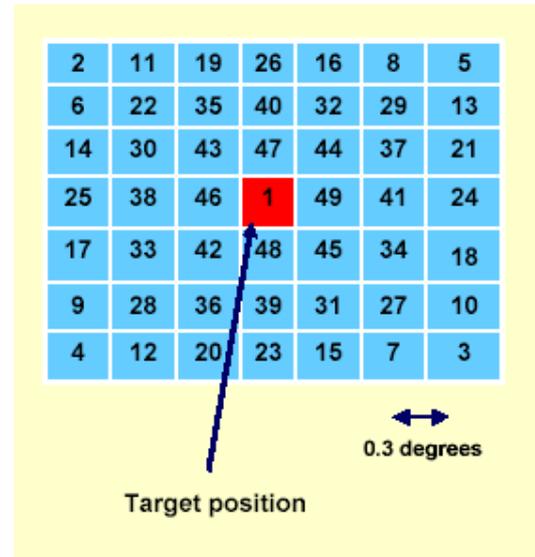


Figure 1: 7x7 offset pattern for the central pointing of the nominal 25 point dither pattern.

IBIS operations have been smooth with only one major anomaly on 2004 June 2, when just before entering the radiation belts the IBIS electronic unit stopped responding to commands. This was a potentially hazardous situation since the PMT tubes on the Veto sub-system could be damaged by a perigee passage, if left powered-on. The situation was recovered by the prompt interaction of the team at the INTEGRAL Mission Operation Centre who manually powered-down IBIS. The unit was fully recovered the next day and the problem has not recurred.

The 4th in-flight annealing of the Spectrometer (SPI)'s Ge detectors was successfully completed on June 30th. The baking duration was 121 hours. This annealing, or baking, is necessary to maintain their outstanding (E/ΔE ~ 500) spectral resolution which is degraded by

the intense cosmic particle background. After the annealing, the energy resolution had returned to close to the pre-launch value. However, on July 17th 2004 one of the 19 SPI Ge detectors failed (#17). This is the second failure, following that of #2 in December 2003. From the observed symptoms and analysis of the data obtained during recovery attempts, the two detectors appear to have failed in different ways, although the cause could be the same. The cause of the failures is still under investigation by the Instrument Team, ESA and CNES and it is unclear whether there is any link to the annealing which in both cases occurred around 2 weeks before the failures.

JEM-X1 continues to be operational, with JEM-X2 dormant. The gain increase of JEM-X1 is around 1% every 5 days, which is slightly slower than seen from JEM-X2. Due to the lower operating voltage, only 1 anode has been lost following activation of JEM-X1 in 2004 March. JEM-X2 has been occasionally switched-on to monitor its health and to investigate any evolution in the energy resolution while dormant.

The OMC continues to operate nominally and an updated OMC catalogue will be delivered to the ISOC after the summer.

Science Highlights

Erik Kuulkers - Operations Scientist

Since the last Newsletter INTEGRAL has continued to present prompt results via ATel's and GCN's. We highlight here a few results. New sources were reported in ATel's #261 (IGR J07597-3842), #275 (IGR J01363+6610), #278 (IGR J11305-6256) and #281 (IGR J00370+6122). An unusually long X-ray burst (but not a so-called superburst) from the bright persistent X-ray source GX 3+1 was noted during a coordinated INTEGRAL-XMM-

Newton observation of Sgr A* on August 31 (ATel #327). The soft gamma-ray repeater SGR 1806-20 was found to be active again when INTEGRAL started to observe near the Galactic Centre region (ATel #313, #324, #325). Based on this activity, INTEGRAL performed a TOO observation on August 17-19. Other TOO's which disrupted the schedule since last Newsletter were performed to look at S5 0716+71 (May), 3C 273 (June), SN 2004dj and GX 339-4 (both in August).

INTEGRAL and XMM-Newton continue to be strong partners. It was thought that the centre of most AGN contain massive black holes which are surrounded by a doughnut-shaped gas cloud, called a torus. Depending on our line of sight, the torus can block the view of the black hole in the centre. The two ESA satellites confirmed the above view based on observations of the relatively close-by AGN, NGC 4388. Beckmann et al. (astro-ph/0406553; to be published in ApJ Letters) looked edge-on into the doughnut to see features which never before were revealed in such a clarity. Their findings prompted the publication of an ESA Science News Release.

INTEGRAL continues to detect GRB's in the field of view of its instruments: with respect to the last Newsletter these are GRB 040323, GRB 040403, GRB 040422, GRB 040624, GRB 040730, GRB 040812 and GRB 040827 (initial detections reported in GCN #2525, #2560, #2572, #2613, #2634, #2640, #2670, respectively). They were all reported to be long bursts, i.e., they had durations between 8 and 50 seconds. GRB 040812 was special because it occurred, for the first time, in the fully coded field of view of both IBIS and JEM-X. INTEGRAL's GRB reports triggered, as usual, follow-up observations by, e.g., XMM-Newton, Chandra, VLA, and Keck. For GRB 040827, XMM-Newton discovered a potential X-ray counterpart (GCN #2678, #2688).

GRB 031203 was observed with INTEGRAL as a rather typical GRB with a duration of 20 seconds (GCN #2459). However, given its small distance (a redshift, z , of about 0.105 derived from optical observations of the host galaxy; typical redshifts for GRB are around 1-2) the burst had an unusual low luminosity. This is reported by Sazonov et al. in a recent Nature paper (Vol. 430, p. 646). Radio observations of the same GRB, supporting the view that it is a sub-energetic GRB, are reported by Soderberg et al. in the same issue of Nature (Vol. 430, p. 648). They also suggest that GRB 031203 is the first cosmic analogue to GRB 980425 (a GRB which was associated with a peculiar supernova).

During the end of Spring and part of the Summer most of the time was spent on nucleosynthesis observations (e.g., Carina, Cygnus-X region), as well as extra-galactic sources (e.g., Mkn 590, Abell 2256). The Galactic Centre region came into our view again after that, and it is this region, where we shall spend most of the observing time for the coming months, see http://www.rssd.esa.int/Integral/isoc/html/schedules/AO2_Long_Term_Plan.html

Preparations have begun for the next in-flight calibration (Crab) scheduled for End of September (rev 239, 27-30 Sep).



Figure 2: Artist's impression of a GRB, see the INTEGRAL Picture of the Month for September 2004. Credit: CXC/M. Weiss

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