Newsletter of the
INTEGRAL Science Operations Centre

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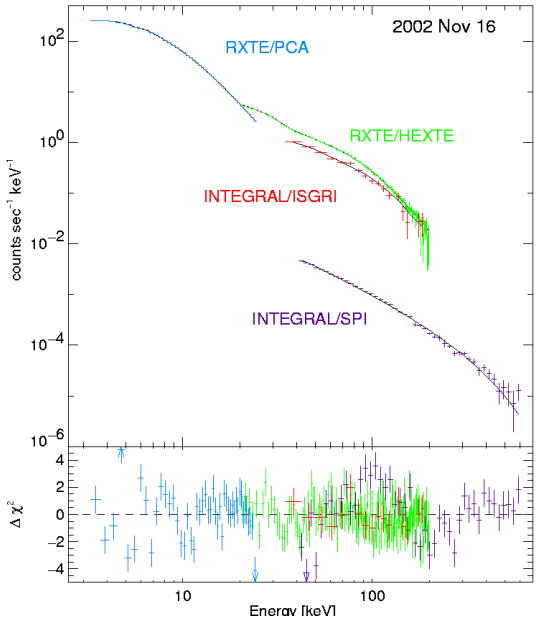
News from PV Phase

Rudolf Much - Deputy Project Scientist

After completion of the Performance Verification phase the INTEGRAL routine operation phase commenced with revolution 26 as planned on December 30, 2002.
See **http://astro.estec.esa.nl/Integral/isoc/html/schedulesAO1_Short_Term_Plan.html** for the latest schedule information.
One of the last observations during PV phase was the simultaneous observation of Cyg X-1 by RXTE and INTEGRAL. The Figure shows a comparison of the Cyg X-1 count spectra obtained by INTEGRAL's γ-ray instruments and by RXTE. At this early stage of instrument calibration and tuning the consistent picture is very encouraging. The small residuals of the spectral fit and good agreement with RXTE reflect favorably on the instrument ground calibrations, and the status of the ISDC analysis software.

The Crab Nebula calibration observations have not yet been performed due to solar viewing constraints and are currently planned for revolutions 39 to 45 (February 7 to 26, 2003). An initial analysis of the PV data has led to preliminary results for the instrument sensitivities and performances. Final results will only become available after completion of the Crab calibration data analysis in April 2003. Note that the data of the Crab calibration observations will be publicly available.

The preliminary instrument sensitivities and performances were found to be close to those given in the AO-1 documentation. However as already reported in ISOC Newsletter #6 (Dec. 2002) there are two exceptions:



Comparison of the Cyg X-1 spectrum obtained by INTEGRAL and by the X-ray satellite RXTE. Courtesy: K. Pottschmidt (ISDC) for the ISDC team, the INTEGRAL instrument teams and the RXTE Cyg X-1 monitoring campaign.

- during routine operation only one JEM-X detector is being operated, and at a lower HV setting than originally planned.
- measures had to been taken to transmit the generated data volume within the available telemetry bandwidth.

Both items are addressed in more detail in the following contributions.

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JEM-X Update

Rudolf Much - Deputy Project Scientist
Astrid Orr - JEM-X Operations Scientist

As reported in ISOC Newsletter #6, a degradation of some anodes in both JEM-X detectors was observed after the first weeks of operation, and it was decided to lower the high voltage setting on the JEM-X detectors and to only operate the JEM-X2 detector for the foreseeable future during routine operations. Both JEM-X detectors will however be operated during the Crab calibration observations in order to complete the calibration of both instruments. The attempts to correlate the anode degradation with orbital events (e.g. perigee passage), general background levels or solar flares, failed, and no correlations were found. The degradation is most probably caused by the impact of high-energy cosmic ray particles. Ground tests at GSI Darmstadt are planned with the flight spare detector later this year to confirm the degradation mechanism.

The lowering of the high-voltage setting results in a low-energy cutoff of about 4 keV (analysis still ongoing), rather than at 3 keV given in the AO-1 documentation. Due to the operation of JEM-X2 only, the sensitivity at 6 keV is 60% of that given in the AO-1 documentation. Since IBIS and SPI are the prime instruments on INTEGRAL it is not intended to increase observing time to compensate for the decrease in JEM-X sensitivity - this would in any case not help with the reduced energy coverage. Instead, observers are encouraged to investigate the possibility of using other missions such as XMM-Newton or RXTE to recover this information, if it is required to fully achieve the JEM-X related scientific goals of the proposal.

Observations using High Energy Timing Data

Rudolf Much - Deputy Project Scientist
Tim Oosterbroek - SPI Operations Scientist
Erik Kuulkers - IBIS Operations Scientist

Once the instruments were fully switched on, their configurations were optimized. An important criterion for the optimization was the onboard rejection of background events. The IBIS veto units reduce the ISGRI count rate by a factor ~ 7. An ISGRI onboard software patch is in preparation which will reject on-board certain invalid background events and thus reduce the ISGRI background counting rate by an additional ~20%.

The SPI anticoincidence shield (ACS) reduces the SPI count rate by a factor 20-25. Although the onboard background suppression is very efficient, two additional measures had to be taken to transmit the generated data volume within the available telemetry bandwidth:

- The dither dwell time was increased to 2200 sec for both normal observations and the galactic plane scans (see Newsletter #6). The SPI and PICSIT histogram accumulation durations were adjusted accordingly.

- There are three different types of SPI science events, namely the single events, the PSD (pulse shape discrimination) events and the multiple events. During normal operations the SPI single events are now accumulated on-board into histograms and are no longer transmitted as single events. PSD and multiple events mainly occur at higher energies (>200 keV).

As a consequence there will be less timing information available than expected above about 300 keV (beyond the energy range where ISGRI is the most sensitive instrument on-board INTEGRAL). Event by event high-energy timing information will still be provided by ISGRI and by the SPI multiple event and PSD event data, but with lower overall efficiency (see the AO-1 documentation).

Ways of minimizing this loss are being investigated. In the case of observations where the full high-energy timing information is required, observers are requested to contact the ISOC help desk **inthelp@rssd.esa.int** for further information.

Upcoming Instrument Activities

Rudolf Much - Deputy Project Scientist

Several important instrument activities are planned in the interval until the end of February. The first SPI annealing is scheduled to start on February 6th. The main IBIS and JEM-X Crab calibration programme will be executed in parallel. SPI will commence its Crab calibration programme once the annealing cycle is completed on February 19th. Patches for the IBIS and SPI on-board software will be uploaded in early February.

During early operations the spacecraft environment was affected by out-gassing and a positive drift of the SPI cryostat temperature (+0.03 K/day) indicates that the cool detector parts were polluted during this period. This is also indicated by the 10% degradation of the average energy resolution of the SPI detectors since the beginning of operations. In addition, detector #15 showed since the beginning of operations a reduced spectral resolution which suggests the presence of pollution/contaminents. Although the SPI annealing is not strictly needed for another 2 months, the main reason for annealing the SPI Germanium detectors now is operational efficiency. The default post-annealing calibration observation is not required this time, as it can be combined with the already planned Crab observation. The IBIS Crab calibration observations with high telemetry demand can be executed in parallel to the SPI annealing. Because of the low contamination state of the SPI detectors, no pulse shape discrimination calibration is required after annealing, saving an additional 2 days of dedicated SPI operations.
During the annealing process the temperature of the Ge-detectors is raised from its nominal operational temperature (–183 deg C) to +100 deg C. The detectors are kept at the high temperature for about one day to clean the cold instrument parts from contaminants and to anneal radiation damages in the detector (defects in the Ge crystals). After three days of passive cooling the cooler is switched on again and the detectors are cooled down to their nominal operating temperature of 90K. The whole annealing process will last 12 days.

The main IBIS Crab calibration takes place in parallel to the SPI annealing. The IBIS calibration team requires, during this calibration, a high telemetry rate, which can be combined with the SPI annealing, where the SPI telemetry demand is very small. The IBIS calibration foresees a 300 ksec staring observation with the Crab on-axis and 5 pointings of 80 ksec each placing the Crab at 9.6 degree off-axis (at different azimuth angles: 0, 90, 180, 270 deg) and 10.4 degree off-axis (azimuth angle 315 deg). The observations are executed in the period from February 7th to February 18th. The SPI calibration will start on February 19th and amounts to 506 ksec in total: a hexagon dither observation with the Crab on-axis and 3 slightly offset 5x5 dither pointings.

As an outcome of the PV phase the IBIS and SPI team have prepared on-board s/w updates. It is planned to upload the s/w patches before the start of the Crab observations. The SPI s/w patch is mainly of operational use, as it will safeguard the SPI spectra accumulation at any point in time. The IBIS s/w patch will implement an on-board data filter, which will reject invalid background events and will reduce the ISGRI background by ~20%.

Targets of Opportunity (ToO) Update

Rudolf Much - Deputy Project Scientist

Once the full INTEGRAL operations team was back from the well deserved Christmas break INTEGRAL was ready to react and schedule Target of Opportunity (ToO) Observations from January 6, 2003 onwards. ToO observations should be requested via the dedicated ISOC ToO Notification Web Page **http://**

astro.estec.esa.nl/Integral/isoc/html/too/my_too_alert.html

This Web page shall be used by observers requesting new ToOs, or notifying the ISOC once the trigger criteria for their accepted AO-1 (ToO) observations are fulfilled.

The ToO Notification Web interface consists of two pages and a popup window. The first page requires filling in the source name, source position and whether the ToO observation is new, or belongs to an accepted AO-1 ToO proposal. After hitting the "continue" button a window will pop up with an interface to the target visibility checker. The visibility checker page is already filled in with default values (source position specified in first page, default 5x5 dither pattern, current date). The observer should verify - before submitting the ToO request - that the source is visible. Obviously, it does not make sense to submit a ToO request for a transient source not visible by INTEGRAL in the near future.

The second page has a slightly different flavour depending whether an observation is already accepted by the Time Allocation Committee or whether a new ToO is submitted. In both cases there are mandatory fields, which are:

- the source position and uncertainty,
- the date and time of the trigger event,
- the satellite, telescope or instrument which was used to detect the trigger event, and
- the observer's name and E-mail address.

In the case of an already accepted observation the ID of the proposal has to be provided. For new ToOs some further mandatory information is required, such as dither pattern, instrument configuration, source brightness and of course the number of requested observations and their duration. Finally, a free text field can be used to provide the scientific justification (for new ToOs) and any special information or additional comments. Observers are encouraged to specify as many details as possible in this free format text field, which affect scheduling, such as coordinated observations, typical behavior of this type of transient, fluxes, spectra, nearby sources etc.

The ToO notification is submitted by hitting the "alert us" button. The ISOC duty scientist is informed about the incoming ToO alert via SMS (mobile phone). The provided information is checked for completeness, the feasibility of the proposed observation is verified and the compliance to the ToO criteria is confirmed. In case additional information is required the observer (PI) will be contacted by the duty scientist. In consultation with the Project Scientist it will be then decided whether and when the observation will be planned. The new observation sequence is generated at ISOC and submitted to the Mission Control Center (MOC) in Darmstadt. Once the timeline is successfully generated from the "observation sequence" at MOC the PI of the ToO observation will be informed about the exact details of the ToO observation.

Announcement of Opportunity #2 (AO-2)

Christoph Winkler - Project Scientist

ISOC staff have begun the planning activities for the second Call for Observing Proposals (Announcement of Opportunity #2, AO-2) to be issued later this year to the scientific community at large. Technically, the same interface as during the AO-1 (Nov 2000 - Feb 2001) will be available to download the software for writing and submitting scientific proposals via the ISOC WWW pages which should be consulted in due time. The current AO-2 schedule is shown in the Table below. Please check the ISOC WWW pages for any further information and updates on AO-2.

We remind all PI's of approved AO-1 open time proposals on the policy concerning possible scheduling of approved (oversubscribed) AO-1 observations during AO-2: AO-1 A-grade (highest scientific priority) proposals which **cannot** be scheduled during AO-1 cycle (17 Dec 2002 - 16 Dec 2003) will automati-

cally be carried-over to AO-2, i.e. no re-submission to ESA for AO-2 is required for A-grade AO-1 proposals which have not been executed during AO-1. This does **not** hold, however, for TOO observations (which have obtained grade A also due to scheduling priority), which must be re-proposed for AO-2 in case they are not scheduled during AO-1. B-grade and C-grade proposals approved during AO-1 which can not be scheduled during AO-1, must be re-submitted for AO-2. As a consequence B-grade/C-grade targets become free for new AO-2 proposals.

Table 1: Schedule AO-2

Activity	Date
Release AO-2	15 July 2003
Deadline for proposal reception at ISOC	01 Sep 2003
Proposal evaluation by Time Allocation Committee	October 2003
ESA release of AO-2 observing programme	25 Oct 2003
AO-2 observing programme	17 Dec 2003 - 16 Dec 2004

How to reach the ISOC?

ESA-ESTEC, Science Operations and Data Systems Division (SCI-SDG), Keplerlaan 1, 2201 AZ Noordwijk, The Netherlands
Fax: +31-(0)71-56-55434,
Phone: +31-(0)71-56-5xxxx (see below)

http://astro.estec.esa.nl/Integral/
E-mail:*name*@rssd.esa.int
(*name* = first initial and surname, max 8 characters)
ISOC helpdesk: inthelp@rssd.esa.int

Table 2: ISOC personnel

Name	Function	Phone	Mailcode
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Parmar, A.	Acting Project Scientist and Project Manager	4532	SCI-SA
Much, R.	Deputy Project Scientist	4756	SCI-SDG
Hansson, L.	ISOC Manager	3471	SCI-SDG
Texier, D.	Project Science Coordinator	4754	SCI-SD
Sternberg, J.	System Engineer	4001	SCI-SDG
Nolan, J.	Operations Engineer	3401	SCI-SDG
Barr, P.	Resident Astronomer	5139	SCI-SDG
Orr, A.	Operations Scientist	3943	SCI-SDG
Kuulkers, E.	Operations Scientist	6145	SCI-SDG
Oosterbroek, T.	Operations Scientist	3612	SCI-SDG
Dean, N.	Software Engineer	3959	SCI-SDG
Jacobs, F.	Software Engineer	4507	SCI-SDG
Jeanes, A.	Software Engineer	4246	SCI-SDG
Treloar, J.	Software Engineer	4528	SCI-SDG
Williams, O.R.	Software Engineer	4645	SCI-SDG
Riemens, M.	Secretary	4754	SCI-SD