Newsletter of the
INTEGRAL Science Operations Centre

No. 3 August 2001

INTEGRAL AO-1: General Observer Programme

Christoph Winkler - Project Scientist

The INTEGRAL Time Allocation Committee (TAC), chaired by Prof. E.P.J. van den Heuvel (Amsterdam) completed the peer review process of AO-1 observing proposals in June as scheduled and recommended the AO-1 observing programme to ESA. The General Observer (open time) Programme, endorsed by the ESA Director of Science, is shown in the attachment. It is well-balanced and comprises the best and most exciting new science that can be achieved by INTEGRAL. The observing programme for AO-1 will allow a great variety of innovative studies of objects and phenomena that never before were possible.

The scientific programme consists of the following major elements:

1. A variety of studies of compact objects in our Galaxy and in the Magellanic Clouds, ranging from studies of the hard X-ray components in the spectra of well-known X-ray binaries such as Scorpius X-1 and Cygnus X-1, studies of sources with relativistic jets, such as SS433 and the galactic "micro-quasar" GRS 1915+105, to isolated neutron stars and young radio pulsars, X-ray bursters and a variety of Target of Opportunity (TOO) sources, particularly black hole transients. A special place have the very long pointings on the Large Magellanic Cloud and on the Galactic Center region, which will allow a range of studies of compact objects in these areas of the sky.
2. In the extragalactic part of the programme a central place is given to the most important categories of hard X-ray and gamma-ray emitting objects, such as Active Galactic Nuclei (AGNs), Blazars, Seyfert I and II galaxies, Quasars, Ultra-Luminous Infrared galaxies and Starburst galaxies as well as clusters of galaxies.
3. In the field of nucleosynthesis the required exposure times are very long, mostly of order 10^6 seconds or longer. The main programmes to be carried out are here:

- explosive nucleosynthesis (in Supernova 1987A),
- the physics of Supernova remnants (Cas A and Tycho),
- the physics of star-forming regions (Cygnus and Cen-Cir).

The adopted pointings will allow (combined with the core programme) to achieve a fairly good coverage of the Galactic plane in the line of the 1.8 MeV line of Al^{26}, thus mapping current large-scale nucleosynthesis in the Galaxy.

4. Finally, among the "miscellaneous" objects, studies are included ranging from non-thermal phenomena in the winds of early-type stars, to the very peculiar object η-Carinae and TOO studies of Gamma Ray Bursts (GRB's).

The full list of approved open time observations is shown in the attachment to this Newsletter
(see also http://astro.estec.esa.nl/Integral/isoc).

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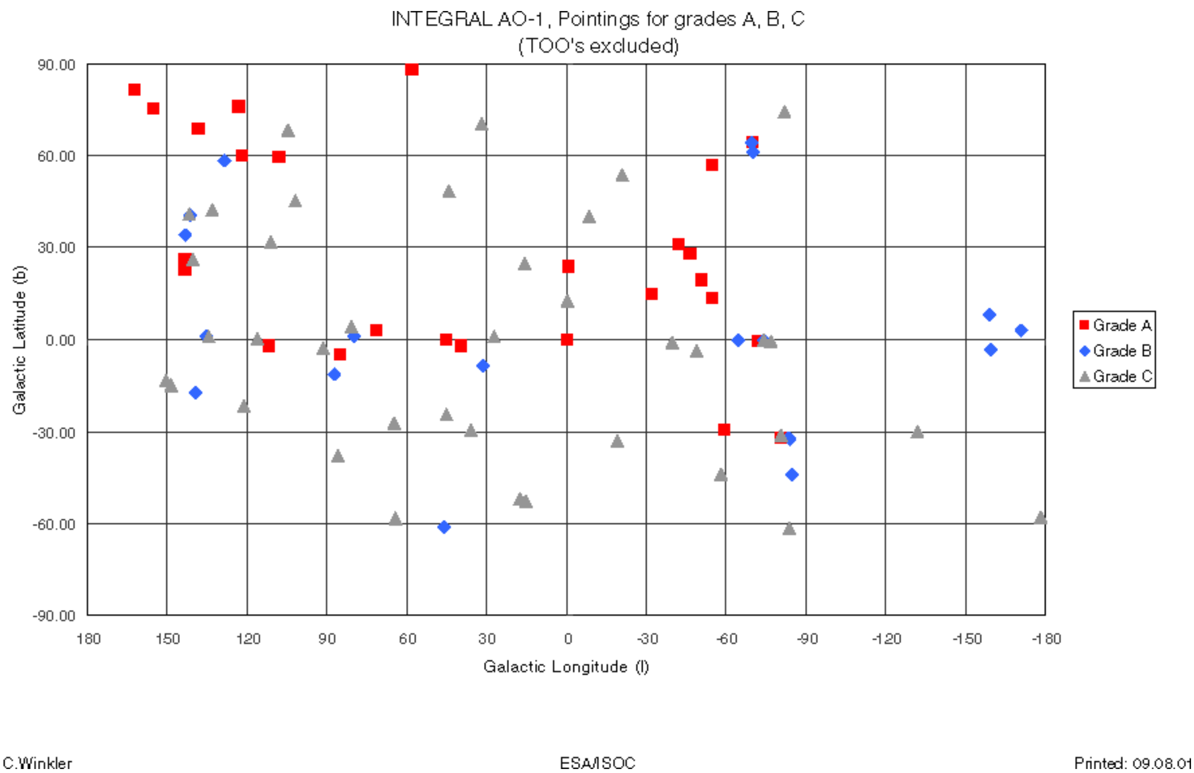
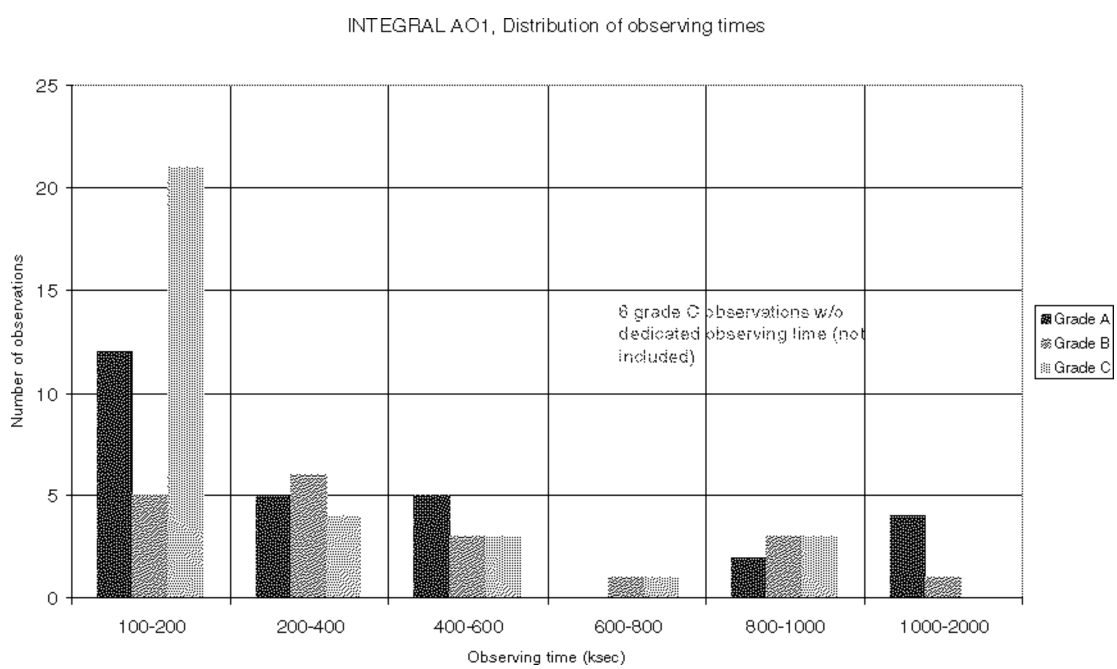


INTEGRAL AO-1: approved open time pointings.



INTEGRAL AO-1: histogram of exposure duration

Notes on scientific grade:

The TAC approved individual observations of a proposal by assigning a grade, A, B, C or TOO (for Target of Opportunity observations) to each observation. A special sub-group of proposals, using serendipituous data on GRB's, has been identified as "GRB". The characteristics of a specific grade are as follows:

Grade A: Excellent proposal. Highest scheduling priority. A-grade proposals which can not be scheduled during AO-1 will automatically be carried-over to AO-2, i.e. no re-submission to TAC for AO-2 is required. This does **not** hold, however, for TOO observations (see below), which must be re-proposed for AO-2 in case they are not scheduled during AO-1.

Grade B: Very good proposal. High scheduling priority. B-grade proposals which can not be scheduled during AO-1, must be re-submitted for AO-2 when B-grade targets become free for new proposals.

Grade C: Good proposal. Low scheduling priority. C-grade proposals which can not be scheduled during AO-1, must be re-submitted for AO-2 when C-grade targets become free for new proposals.

Grade TOO: Accepted TOO proposals have always grade A for scheduling priority. See above for further details. TOO observations will only be executed if certain trigger criteria are fulfilled. The maximum time to be spent and source constraints are given in the attachment. TOO proposals will, unlike other grade A proposals, not be transferred to AO-2, but must be re-submitted for AO-2.

GRB: No scheduling impact as serendipituous data are being used.

General note on scheduling:

The scheduling on INTEGRAL will be optimized in such a way that greatest scientific return is ensured within the time available. Consequently the allocated priorities (grades) do not reflect the sequence of the observation within the AO-1 cycle. However, it is emphasized that - for operational and technical reasons- no guarantee can be given that any particular observation will in fact be executed.

ISOC scientists preparing the TAC meeting: Rudi Much, Christoph Winkler, Paul Barr, Norman Trams (from left to right).

Naming Convention for new INTEGRAL sources

Norman Trams - Resident Astronomer

Given the unprecedented sensitivity and spatial resolution of its instruments, and the variable nature of the gamma ray sky, it is likely that INTEGRAL will discover many new sources of gamma radiation. In order to help observers, and to facilitate future references to INTEGRAL discovered gamma ray sources, especially with SIMBAD and related services, a naming convention for newly discovered INTEGRAL sources has been established and registered with the International Astronomical Union (IAU). Observers who discover new gamma ray sources in their data are requested to use this naming convention in any papers describing the data and the new sources. This way, the source can be included in the SIMBAD database with its proper designation, and is immediately recognizable as an INTEGRAL discovered source.

The adopted naming convention consists of a unique INTEGRAL specific acronym, IGR (for **I**NTEGRAL **G**amma **R**ay source) and the source coordinates (epoch J2000), truncated to fit the template (not rounded). The naming convention thus is:

IGR JHHMMm +-DDMM

where HHMMm is the truncated J2000 right ascension in hours, minutes and tens of minutes, and +-DDMM is the truncated J2000 declination in degrees and minutes. As an example a new source at J2000 coordinates RA = 14h 33m 35s, Decl = -46d 37m 15s would get designation IGR J14335-4637 (not IGR J14336-4637). Similarly the designation for a source at J2000 coordinates RA = 4h 15m 52s, Decl = +29d 15m 56s is IGR J04158+2915.As stated, if observers when publishing new sources discovered with INTEGRAL, use this convention, the sources will later be easily searched for in the CDS and SIMBAD databases.

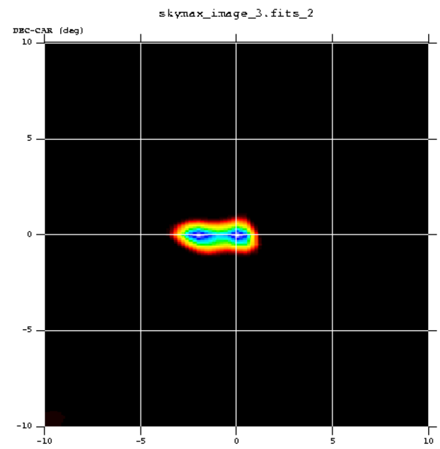
Payload Status

Rudi Much - Operations Scientist

The calibration campaign of INTEGRAL's Spectrometer SPI took place in Bruyères Le Châtel (France) from March 31 to May 6, 2001. 413 calibration runs were performed and a total volume of 6 Gb of SPI data were acquired. Main objectives of the calibration were the demonstration and measurement of SPI's imaging performance in flight configuration and the measurement of the efficiency over the full energy range from 20 keV up to 8.3 MeV.

The facility in Bruyères Le Châtel offers the usage of a Van De Graff accelerator. The calibration sources with photon energies above 3 MeV were generated via induced nuclear reactions using the accelerator beam, while radioactive sources were used for all measurements below 3 MeV. The measurements were preformed with different source distances. The sensitivity measurements were performed with sources placed at a distance of 8 m from the Ge detectors, while the imaging performance tests were made with strong radioactive sources placed at a distance of 125 meters (~ point-like sources). After the end of the calibration SPI was delivered to Alenia for integration on the spacecraft.

Meanwhile the calibration data analysis is fully underway and first results are available demonstrating the expected instrument performance. For the first time it has been possible to generate an image from multiple SPI detector data using the maximum entropy method. By combining several ^{60}Co calibration runs with different source positions it is possible to emulate a "dithering" observation. The Figure below shows such a "*spi-skymax*" image based on data of five ^{60}Co calibration runs with different orientations of the instrument with respect to the radioactive source hence simulating a dithering observation of two sources separated by 2 degrees. The sources are clearly resolved without artefacts, demonstrating that the SPI resolution is better than 2 degrees.



Maximum entropy image in the light of the 1173 keV line of multiple ^{60}Co calibration runs simulating a dither observation of two point sources 2 degrees apart. The point sources are resolved demonstrating that SPI's spatial resolution is better than 2 degrees (image courtesy of A. Strong/MPE Garching).

Progress was also made for the other instruments. The ISGRI flight model has been delivered to Laben for integration on July 6th. After OMC and SPI this is the third delivered flight element. The ISGRI instrument is in an excellent state. It has no dead pixels and the number of noisy pixels is much better than specification: less than 1% compared to a specification of less than 5%. Meanwhile the PICsIT manufacturing is proceeding as planned. The first 2 detector models have been manufactured. Currently one of them is under acceptance testing. The IBIS Veto inclusive the data handling system were successfully tested at Laben.

The first of the two JEM-X flight detectors was welded. The bake out of this detector has started.

Review of the Science Ground Segment

Lars Hansson - SGS Manager

The Science Ground Segment (SGS) to support the INTEGRAL mission is distributed over two sites, the ISOC and the ISDC. The third part of the ground segment is the mission operations center (MOC) and the associated ground stations.

A review was called in July by the Astrophysics Division. The principle objective was to bring all parties to a common understanding where we are, where we are heading and assessing the plans and remaining work to arrive at a SGS suitable to support the INTEGRAL mission. The board was composed of a set of experts both from inside and outside ESA but independent from the SGS development.

Clearly much good progress has been, and continues to be, made. The ISDC, in particular, has made great strides since the last review. Additionally, ISOC has successfully concluded the AO1 process. The approach of incremental builds with ever-increasing functionality and early system and end-to-end tests is very promising. A good start has been made in definition of operational procedures, including contingency recovery. The main critical points addressed by the board are:

1. The distributed nature of the ground segment represents a challenge. It is an area that requires more coordination.
2. Lack of progress in some points raised at previous reviews on project and SGS level.
3. Instrument team (IT) interfaces and interactions with SGS. It appears there is a lack of commitment and understanding on at least some IT's side on provision of manpower and support during the operational phase. There is also missing documentation in this area.
4. Commissioning phase including performance validation. The responsibilities and detailed plans should be available at this time.
5. Scientific archive. The board expressed concern about the lack of coherent approach within SGS.

The board issued a set of recommendations and actions to the SGS for implementation and consideration. A follow-up is planned in about six months time.

Any Other Business

The spacecraft flight model arrives at ESTEC (July 2001).

How to reach the ISOC?

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(*name* = first initial and surname, max 8 characters)

Table 1: Key ISOC personnel[a]

Name	Function	Phone
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Hansson, L.	SGS Manager	3471
Barr, P.	Resident Astronomer	5139
Much, R.	Operations Scientist	4756
Orr, A.	Operations Scientist	3943
Trams, N.	Resident Astronomer	3476
Sternberg, J.	System Engineer	4001
Nolan, J.	Operations Engineer	3401

a. The complete list of ISOC staff is available on the ISOC WWW.