



Newsletter of the INTEGRAL Science Operations Centre



No. 15

November 2005

Foreword

Christoph Winkler - Project Scientist

INTEGRAL is doing very well and many new highlights can be reported in this 15th issue. As communicated earlier, the spacecraft -- being in orbit now for more than three years -- is performing flawlessly. The instruments and the ground segment are nominal.

4th Announcement of Opportunity (AO-4)

Planning is underway to prepare the release of the 4th Announce of Opportunity for scientific investigations with INTEGRAL (AO-4). The AO observing programme will last 12 months and about 18×10^6 s of scientific observing time will again be available for scheduling of open time (General Observer) observations.

Table 1: INTEGRAL AO-4 Schedule

Release AO-4	13 March 2006
Proposals due	21 April 2006
TAC Meeting	30 May - 02 June 2006
Communication of TAC results	June 2006
AO-4 observing cycle	17 August 2006 - 16 August 2007

Please see <http://integral.esac.esa.int/> for further (up to date) information.

Paul Barr 1955 - 2005



It is with great sadness that we have to inform you of the sudden death of Dr. Paul Barr. Paul joined ESA in 1983 and worked on a number of projects including EXOSAT, ISO and INTEGRAL. He worked in ISOC as senior mission planner, interfaced with IBIS and supported preparations of AOs from the early development phase in 1997 until ISOC had moved to ESAC in Spain early in 2005. We will miss a good scientist and colleague.

The INTEGRAL Users Group

In July 2005, the INTEGRAL Users Group (IUG) was established and met for the first time in ESTEC. The IUG has the tasks to

- advise the Project Scientist on all matters relevant to maximizing the scientific return of INTEGRAL within the boundary conditions,
- advise the Project Scientist to ensure that INTEGRAL maintains the principal characteristics of an observatory satisfying the objectives of the scientific community at large,
- act as a focus of interest of the scientific community in INTEGRAL and act as an advocate for INTEGRAL within that community,
- maintain contact with the wider scientific community on matters specific to INTEGRAL (e.g. coordinated observations) and to provide a route so that the community can advise ESA on INTE-

GRAL's scientific goals from a general point of view,

- monitor the ISOC and ISDC activities to ensure they meet the needs of the user community within the resources available,
- participate in major programme reviews.

The IUG is chaired by Christine Done (Durham/UK) and members are: Eugene Churazov (IKI), Stephane Corbel (Saclay), Wim Hermsen (SRON), Gottfried Kanbach (MPE), Chryssa Kouveliotou (NASA) and Luigi Piro (INAF). IUG membership is for two years after which half of the members will be replaced. The users community is invited to contact the IUG chair Chris Done (chris.done@durham.ac.uk), on all IUG related matters.

INTEGRAL Mission Status

Arvind Parmar - Mission Manager

At their 113th meeting on 21 November 2005 the ESA Science Programme Committee (SPC) approved a 4-year extension to INTEGRAL operations until 16 December 2010. As usual, there will be a review of the scientific

performance and mission status in another 2 years time. The Astronomy Working Group (AWG) and Space Science Advisory Committee had earlier expressed their satisfaction with the current status of the INTEGRAL Observatory and its science return. They noted that INTEGRAL provides a powerful capability to explore extreme phenomena and were pleased to see clear signs of a maturing mission. The planning for this second extension maintains the current scientific capability of the mission. In any future mission extensions it may be appropriate to reduce the level of operational support, so decreasing costs, but at the expense of scientific capability.

The AWG recommended that INTEGRAL's unique capabilities should be exploited through key projects and every effort made to increase involvement of the broader community by making data more easily available, and publicizing the mission's achievements and capabilities. The INTEGRAL Science Working Team (ISWT) and newly formed INTEGRAL User's Group are being consulted about

2003	2004	2005	2006	2007	2008	2009	2010	
Year 1	2	3	4	5	6	7	8	
Nominal Mission		First Extension				This Extension		
		Open Time 75%	Open Time 75%	Open Time 75%	Open Time 80%	To be defined	To be defined	
Open Time 65%	Open Time 70%	Open Time 75%	Open Time 75%	Open Time 75%	Open Time 80%			
Core Programme 35%	30%	25%	25%	25%	20%			

Fig. 1: INTEGRAL nominal and extended mission

the most appropriate way in which to implement such projects. It is expected that the first key project will be implemented in AO-4.

The amount of time available to the astronomical community during the second to fourth extension years had previously been agreed to be 75%. The SPC confirmed that the amount of observing time available to the astronomical community during the fifth extension year (2007 December 17 to 2008 December 16) will be 80%, with the remaining 20% being for the ISWT (see Fig. 1). The ISWT is composed of the instrument and data centre principal investigators, mission scientists, the project scientist, and representatives of the US and Russian scientific communities.

INTEGRAL operations continue smoothly with the spacecraft, instruments and ground segment performing nominally. The agreement with NASA for the use of the Goldstone DSN station has been extended for 1 year until 16 December 2006.

In collaboration with the ISDC, the ISOC Science Data Archive (ISDA) was opened to the public in July. This utilizes the same JAVA interface as used for the XMM-Newton and ISO archives to provide users familiar with these archives with a similar way of accessing INTEGRAL products and results. The archive is described in more detail elsewhere in this newsletter.

The summer months of this year were notable for intervals of strongly increased solar activity. Since then the solar activity appears to have returned to more normal levels for this part of the solar cycle. This enhanced activity resulted in a reduced observing efficiency, but has not produced any long-term degradation of the instrument performances.

The 5th and 6th SPI annealings took place in 2005 February and June. This procedure is

necessary to maintain the SPI high spectral resolution. The SPI switch-on's were nominal and the energy resolution was recovered, as expected, after both annealings. It is worth recalling that following the losses of two (out of 19) SPI detectors approximately 2 weeks after the ends of the two previous annealing cycles, extensive ground tests were conducted. However, these failed to reveal any link between annealing and the failures, and as a precaution, the procedure for the subsequent annealings was modified to minimize the thermal stresses on the pre-amplifiers. This appears to have been successful as there have been no further detector failures since 2004 July.

Science Highlights

Peter Kretschmar - Deputy Project Scientist

The number of INTEGRAL scientific results is increasing steadily. The following can therefore only present a selection of results¹, which have been reported since the previous issue of the ISOC Newsletter.

The all-sky distribution of 511 keV emission as observed by SPI (Fig. 2) has been analyzed by Knödlseher et al. (A&A 441, 513, 2005). The main contribution found is emission from the Galactic Bulge region with an extent of 8° FWHM, plus a weak contribution from the disk but no positive latitude enhancement as reported in the past by OSSE. Type Ia supernovae and/or low-mass X-ray binaries are the prime candidates for the source of the Galactic Bulge positrons. Positrons produced by Light dark matter could also explain the observed annihilation emission characteristics. Spectral analysis of the 511 keV emission (Churazov et al., MNRAS 357, 1377, 2005; Jean et al., astro-ph/0509298) indicate that 97% of the

1. An up-to-date list of INTEGRAL scientific publications can be consulted at <http://integral.esac.esa.int/Publications/>

positrons forming positronium before annihilation and a warm ISM as most probable annihilation medium.

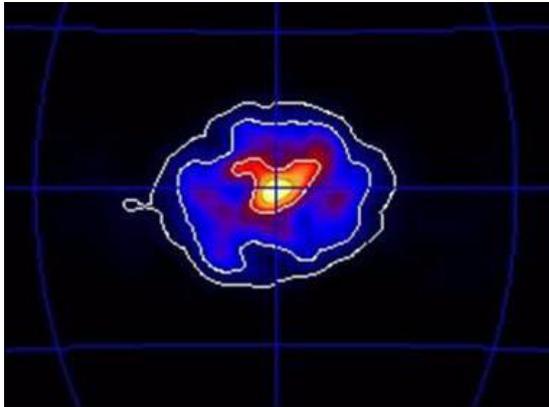


Fig. 2: 511 keV diffuse emission from the Galactic Centre region (J. Knödlseeder et al., *A&A* 441, 513, 2005)

Photons from the radioactive decay of ^{26}Al (1808.65 keV) are a key tracer for star formation as ^{26}Al is produced during nucleosynthesis in massive stars. The line has been observed by INTEGRAL at high significance in the inner Galaxy. For the first time, spatially-resolved spectroscopy at sub-keV precision could be performed, and showed small energy shifts of the centre of the emission line consistent with Galactic rotation. This demonstrates, that the ^{26}Al emission has its origin in the inner Galaxy. A Galaxy-wide interpretation of the measured gamma-ray intensity thus yields the total amount of ^{26}Al in the Galaxy. Using current massive-star nucleosynthesis models, this measurement represents an independent estimate of the Galactic core collapse supernova rate (Diehl et al., 2005, in press).

Combining about 7 Msec of INTEGRAL observations of the Galactic Centre region, Bélanger et al. (astro-ph/0508128) find a faint, persistent source within 1' of Sgr A* with no apparent variability. Together with recent H.E.S.S. results this indicates the detection of a compact region of diffuse emission.

Beckmann et al. (ApJ 631, 506, 2005) have combined data from three different satellites - INTEGRAL, Swift, RXTE - plus IR data from 2MASS and Spitzer GLIMPSE to identify the source IGR J16283-4838 as another neutron star embedded in Compton-thick material and member of the new class of highly absorbed sources detected by INTEGRAL. This study was subject of a recent ESA Science News release.

The global characteristics of sources in the first IBIS/ISGRI source catalog have been studied by Dean et al. (astro-ph/0508291). They find that the majority of unclassified gamma-ray sources are most probably highly obscured HMXB systems, confirming the results obtained for individual sources like IGR J16283-4838.

Two more of the Galactic TeV sources detected by H.E.S.S. have been identified with sources observed by INTEGRAL, IGR J18135-1751 and AX J1838.0-065 (Ubertini et al., ApJ 629, L109, 2005; Malizia et al., ApJ 630, L157, 2005). These observations indicate pulsar winds or SNR's as probable sources rather than more exotic objects, like "dark particle accelerators".

Thanks to its wide FOV and regular monitoring of the Galactic Plane and the Galactic Centre region, INTEGRAL observes many transient events. An especially interesting case are fast X-ray transients, i.e. transient sources with outbursts of just a few hours duration (Sguera et al., astro-ph/0508018; Smith et al., astro-ph/0510658). As Grebenev & Sunyaev (Ast. Lett. 31, 672, 2005) show for one of these sources, the outburst duration is much shorter than the viscous timescales of a standard accretion disk.

Soft gamma-ray emission of unexpected strength has been observed (Fig. 3) from the accreting ms pulsar IGR J00291+5934 (e.g. Falanga et al., A&A 436, 647, 2005). If mod-

eled by thermal comptonization this indicates much higher electron temperatures (40 keV) than those obtained from X-ray data alone. Evidence has been found that most of this high energy radiation (up to 150 keV) is originating near the poles of the neutron star.

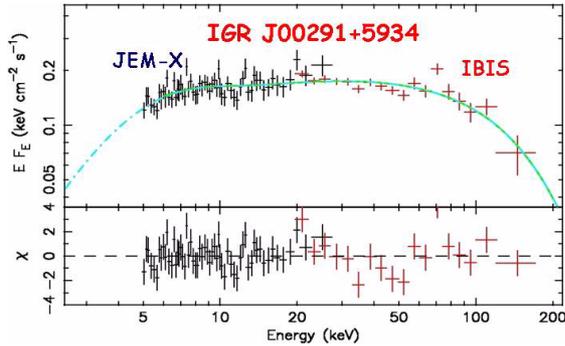


Fig. 3: High energy total spectrum of the accreting ms pulsar IGR J00291+5934 (M. Falanga et al., *A&A* 436, 647, 2005).

A first catalog of 42 AGN's observed with INTEGRAL has been published by Beckmann et al. (astro-ph/0510530 & astro-ph/0510833). Only 5 blazars are contained in this sample of bright, local AGN and only four Compton-thick AGN. This implies that the missing Compton-thick AGN needed to explain the cosmic hard X-ray background would have to have lower fluxes than discovered by INTEGRAL so far.

Krivonos et al. (*ApJ* 625, 89, 2005) use the serendipitous sources detected in a deep observation of the Coma cluster to extend extragalactic source counts in the 20-50 keV band to a flux limit of ~ 1 mCrab improving previous results by a sensitivity gain of >10 . Following up on eight newly detected INTEGRAL sources with Chandra observations, Sazonov et al. (astro-ph/0508593) have unambiguously identified five of these with AGN's in nearby galaxies, while one is probably an X-ray binary in the LMC. The X-ray spectra of the AGN's all show significant amounts of absorption (N_H in the range 10^{22} - 10^{24} cm^{-2})

demonstrating that INTEGRAL is beginning to sample the expected large number of obscured AGN's.

Since February, 36 Astronomer's Telegrams have been issued reporting new sources, source brightening, X-ray bursts or unexpected spectral properties. Several of these events have led to INTEGRAL Target of Opportunity observations on a variety of sources: the transient Black Hole Candidates GRO J1655-40 (ATel #422, 432, 438, 442), SWIFT J1753.5-0127 (ATel #574) and XTE J1818-245 (ATel #583); the blazar 3C 454.3 (ATel #497) in a flaring state; the Be/X-ray binary [13]A 0535+262 (ATel #601); the accreting ms pulsar HETE J1900.1-2455 and a new BHC, IGR J17269-4737 / XTE J1727-476 (ATel #631).

Since the last Newsletter, eleven Gamma-Ray Bursts or X-ray flashes have been observed in INTEGRAL's FOV (GCN #3059, 3323, 3348, 3430, 3446, 3472, 3552, 3607, 4002, 4007, 4192). It is a rare occasion to find a burst also within the JEM-X FOV, thus it was quite a coincidence to have two such bursts on May 2 and 4 this year. The first of these had an optical counterpart with a tentative redshift of $z=3.793$. On 26 June 2005, a GRB finally happened close enough to the optical axis to be imaged by the OMC camera. The automatic trigger and OMC reprogramming worked fine, but by a serious case of Murphy's law, α Cru, the 13th brightest star in the sky (0.8^m), was so close to the GRB position that it saturated the CCD around the GRB position - see INTEGRAL Picture Of the Month (POM) for July.

Forty-nine new sources have been reported since the last ISOC newsletter in ATels and other publications - see especially Revnivtsev et al. (astro-ph/0508155) and the second ISGRI source catalogue (Bird et al. 2005, *ApJ* in press). A full up-to-date list concerning new sources is given at <http://isdc.unige.ch/~rod-rigue/html/igrsources.html>

Galactic Bulge Monitoring Program

Erik Kuulkers - Operations Scientist

The Galactic Bulge region is rich in bright and variable high-energy X-ray and gamma-ray sources and is a popular target for INTEGRAL. From the start of the General Observer program AO-3 (2005, February 17) INTEGRAL is monitoring the Galactic Bulge region regularly, whenever it is visible. One complete hexagonal dither pattern (7 pointings of 1800 seconds each) is performed during each INTEGRAL revolution (i.e. roughly every 3 days). This is done under an approved AO-3 proposal (PI: Kuulkers). As a service to the scientific community, the JEM-X light curves (3-10 keV and 10-25 keV) and the IBIS/ISGRI light curves (20-60 keV and 60-150 keV) are made publicly available as soon as possible after the observations are performed. In addition, IBIS/ISGRI mosaic images of each hexagonal observation are provided, with information on the detected sources. Last, but not least, all IBIS/ISGRI 20-60 keV mosaic images per revolution are stacked into a movie, showing the ever-changing gamma-ray sky.

The results, as well as more information about the program, can be retrieved from the INTEGRAL Galactic Bulge Monitoring WWW page hosted at the ISDC: <http://isdc.unige.ch/Science/BULGE/>. A public announcement to the community at large was made in ATel #438.

By now we have had two seasons of monitoring, i.e., from revolutions 287-307 (2005 Feb-Apr) and 347-370 (2005 Aug-Oct), respectively. The next season will start in 406 (Feb 2006). Currently, the results have been re-analyzed using the OSA5.0 software.

So far quick-look results have been reported in 10 ATel's (#438, 442, 453, 583, 592, 593, 598, 615, 622, 642). Some of the highlights are:

- Precisely at the start of the program the black-hole X-ray transient GRO J1655-40 was reported to become active. The INTEGRAL GRO J1655-40 light curves nicely complement observations at soft X-ray (RXTE) and radio (VLA) wavelengths.
- Various other transient sources popped up and faded away (e.g., the Rapid Burster, H1743-322, IGR J17098-3628, SAX J1747.0-2853, XTE J1818-245, XTE J1739-285).
- In 2005 August, XTE J1739-285 was found by INTEGRAL to be bright at soft and not detected at hard X-ray energies (ATel #592). About a month later the situation had reversed; it was bright at hard and weak at soft X-ray energies (ATel #615). Although at first the state change was attributed to the compact object being a black hole, it was proven to be a neutron star based on the occurrence of type I X-ray bursts detected with JEM-X (ATel #622).

Most of the sources in the field of view of the program clearly vary on timescales of a few days, it is therefore of no surprise that the Galactic Bulge region is a region to stay tuned on.

Science Operations - Highlights

Erik Kuulkers - Operations Scientist

The last (February) issue of the ISOC Newsletter was published just before the start of the current AO-3 cycle. In the mean time, we have finished almost all observations carried-over from AO-2 (300 ksec remaining on Cas A/Tycho) and we are well underway in performing AO-3 observations.

We have finished 2 Galactic Centre region visibility seasons. In those seasons we completed either observations dedicated to point sources in that region (or at least closeby, e.g., PSR B1509-58) or dedicated to whole regions (e.g. Galactic disk, Galactic bulge/Centre region). Some of them were coordinated with other satellites and/or ground-based observatories (e.g. GX 17+2, GRS 1915+105, Cen A). We specifically mention here the large observing campaign on GRS 1915+105 on Oct 17 and 18 which involved INTEGRAL, Swift, Suzaku

and Spitzer from space and many radio observatories, as well as infra-red observatories from ground.

Outside the Galactic Centre region visibility window, INTEGRAL mainly devoted its time to extra-galactic targets, such as M51 and the Coma Cluster. In the on-going AO-3 INTEGRAL has already spent a lot of time on the Galactic spiral arms (Crux, Norma and Scutum), either as part of the General Observer or Core Programme. Some of these will continue next year. In March and October special calibration observations took place on the Crab.

As the Galactic Centre region and plane harbour many active sources, various (X-ray) transients were observed as INTEGRAL TOO's (see page 4 for details).

During the past months several solar flares have hampered INTEGRAL observations. The revolutions affected are (part of) 315 (May), 349 (Aug), and 354-356 (Sep). Only in a few cases it did result in a re-allocation of observation time (e.g. TOO on HETE J1900.1-2455).

The coming months will be devoted to SPI (nucleosynthesis) observations, such as Vela region/GRO J0852-4642, Cas A/Tycho and SN 1006/Cen X-4. The next Galactic Centre visibility season will start at the end of February, and, as usual, will be a busy time.

The 7th SPI annealing operation (during which the detectors are heated and subsequently cooled again) will be performed during revolutions 396-400. The instrument will not be available for scientific observations during that period, consequently and as usual, the ISOC will select targets which have IBIS as their prime instrument, and do not rely on SPI.

In order to further reduce residual background structures in the IBIS images, the standard

INTEGRAL 5x5 dither pattern was modified end of August 2004. A so-called "wandering Centre of Pattern (COP)" was introduced (see ISOC Newsletter #12, September 2004), i.e. after each complete set of 5x5 dither pattern dwells, the central pointing position of the next cycle is offset slightly from the previous one. In addition, between each of the 5x5 dither dwell patterns, the roll angle of the individual pointings changed from +3 to -3 degrees, further helping in reducing any residual structures in the background images (see also ISOC Newsletter #12).

From revolution 324 (June 8) onwards, the roll angle for each of the individual pointings is set to zero again, while the orientation of the 5x5 dither pattern is set such that the axis of the dither pattern makes a 11.3 degrees angle with respect to the instruments axes (previously the 5x5 dither pattern was fixed on the sky). The latter approach gives a stronger reduction of residual structures; the angle is not an arbitrary value, but has been optimized such that it minimizes systematic structures in the IBIS images.

From revolution 373 (Nov 2) onwards we have now implemented a COP offset for the hexagonal dither pattern as well (Fig. 4). This COP pattern consists of two hexagons (red dots in Figure below) around the original centre point of the (blue) dither pattern. Hence the COP pattern will consist of the centre point plus 2 x 6 points and the centre is the same for all hexagons.

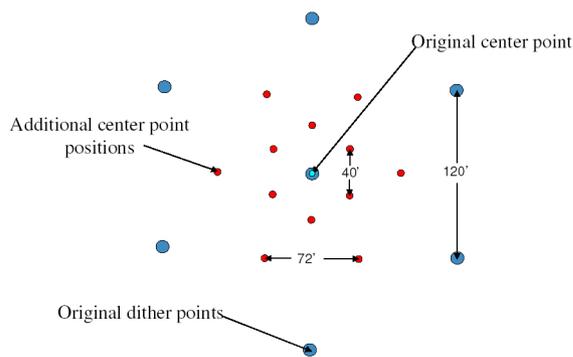


Fig. 4: Pattern outline of the central pointing offsets (red dots) of the nominal 7 point hexagonal dither pattern (blue dots).

The inner hexagon has points with a distance of 40 arcminutes and the outer one 72 arcminutes. The alignment of all the hexagons are aligned to the instrument axes at all times. This means that the COP patterns are not fixed on the sky. The “phasing” of the inner COP hexagon is fully co-aligned with the pointing hexagon. The outer COP hexagon is tilted 30 degrees w.r.t. the inner COP hexagon and the pointing hexagon. The COP point order is as follows: after the centre point one proceeds with the six inner hexagon points and then do the outer ones. After 13 COP points the COP pattern is repeated from the centre again.

The ISOC Science Data Archive

Rees Williams - Archive and Operations Scientist

The ISOC Science Data Archive (ISDA) was opened to external users in July 2005. It offers an alternative and complementary method of accessing public INTEGRAL data to the established archive maintained by the INTEGRAL Science Data Centre (ISDC). The archive can be found at <http://integral.esac.esa.int/isda>

The ISDA has been developed using the same browser technology as that developed by ESA for the XMM-Newton Science Archive (XSA)

and the ISO Data Archive (IDA). In particular it uses a similar JAVA interface to provide an intuitive and configurable user interface. While data from INTEGRAL, with its wide field-of-view and long observation times, are rather different from X-ray observatories such as XMM-Newton, it was found to be relatively straightforward to adopt the XSA/IDA interface for use in the ISDA. Consequently, astronomers who have accessed data via either of these archives will find the ISDA familiar and easy to use.

Providing a highly flexible system of browsing and downloading the data and products was an important aim. In particular browsing is possible either at the level of observations, individual dither pointings, or so-called observation groups. Casual users have easy access to high level data products without being exposed to the full complexity of the data. Meanwhile, experienced users can have full access to data from their choice of individual pointings without having to view large web-pages with many hundreds of entries.

In this initial release the only high-level data products available are images. These are indicated in the browser results pages by icons. Clicking on an icon will result in a larger postcard of the image being displayed. From this image a choice of interactive tools are available for examining data from the original FITS image file and performing simple analysis.

In the future the emphasis will be to provide more high-level data products and improved tools to visualize these products. As the first part of this process the newly released Second ISGRI Soft Gamma-ray Source Catalogue (A. Bird et al., ApJ, in press, 2005) will be made available via the ISDC within a few months. Not only the basic catalogue will be released, but also light-curves and broad-band spectra.

The ISDA was extensively demonstrated both at the recent “X-ray Universe 2005” Symposium and the Astronomical Data Analysis and Software Systems (ADASS) XV conference. Use of the archive is consequently gradually increasing as the community becomes aware of its existence. During the first 8 weeks of operation 99 visits were logged at the site, with a total of 17 users actually requested data. During the second 8 weeks of operation these numbers increased significantly with 184 visits and 28 users requesting data.

The ISDA development team at ISOC would like to acknowledge the help of the ISDC archive team in setting up the ISDA. Without their expert advice and support this alternative method of accessing INTEGRAL data would not have been possible.

The 6th INTEGRAL workshop

Christoph Winkler - Project Scientist

Preparations have begun to organize the 6th INTEGRAL workshop¹ ‘The Obscured Universe’ which will take place from 2 - 8 July 2006 in St. Petersburg, Russia. The workshop will be associated with the XIth Marcel Grossmann meeting (<http://www.icra.it/MG/mg11>). It is planned, that the Marcel Grossmann meeting and INTEGRAL workshop will have a joint opening session in Tavricheskiy Palace, two joint scientific sessions, a common broad cultural programme and a common conference dinner.

Information on workshop registration and hotel booking, instructions for authors and kits for the preparation of abstracts (including

1. The workshop is co-sponsored by ESA, IKI, Russian Academy of Sciences, Russian Basic Research Foundation, Pulkovo Observatory, Applied Astronomy Institute, Ioffe Physical Technical Institute.

examples) are available via the Local Organizing Committee:

<http://hea.iki.rssi.ru/integral06>

The deadline for receipt of abstracts is **01 March 2006**

The scientific programme will cover:

- X-ray binaries (IGR sources, black-hole candidates, neutron stars)
- Isolated neutron stars, pulsars, physics of compact objects
- Nucleosynthesis (supernovae and supernova remnants, gamma-ray line emission)
- Surveys and extragalactic sources, unidentified sources
- Gamma-ray bursts and soft gamma-repeaters
- INTEGRAL status and instrument overviews (invited talks only)
- Science data processing and analysis (posters only)
- Future instruments and missions (posters only)

The second circular will be published in January 2006.

Outreach

Christoph Winkler - Project Scientist

News stories were published on the Web recently, including selected highlight results from the past three years of operations, scientific results obtained on the fastest accreting milli-second pulsar IGR J00291+5934 (see also above) and on IGR J16283-4838, another example of the new class of highly obscured binaries. During 2005 the following items have been addressed so far:

- INTEGRAL reveals new class of “supergiant” X-ray binary stars, ESA Space Science News, 16 November 2005
- INTEGRAL: three years of insight into the violent cosmos, ESA Space Science News, 17 October 2005.
- Star eats companion, ESA Space Science News, 06 September 2005.
- Three satellites needed to bring out one ‘shy star’, ESA Space Science News, 13 July 2005.
- Gamma Burst hits the Earth, Max-Planck-Gesellschaft, SP 8/2005 (26), 18 February 2005.

- Un monstre cosmique, Université de Genève, communiqué de presse, 31 January 2005.

All press releases and Web stories related to INTEGRAL can be found at <http://integral.esac.esa.int/press/press.html>.

ISOC now at ESAC

Lars Hansson - ISOC Manager

The move of ISOC from The Netherlands to Spain has been completed, except for the “helpdesk” which will move to ESAC shortly. The transition was very smooth and no unforeseen interruptions has occurred. All scientific mission planning has been carried out from ESAC since the beginning of the AO-3 cycle starting mid February this year. The INTEGRAL web pages have moved to ESAC with the new address <http://integral.esac.esa.int>. The team has changed with some team members leaving and new ones arriving (see below).

Contact INTEGRAL science operations

The INTEGRAL science operations team is located at ESAC, while the Mission Manager and Project Scientist are located in ESTEC. Details are provided below.

ISOC		
European Space Astronomy Centre (ESAC) Urb. Villafranca del Castillo P.O. Box 50727, 28080 Madrid, Spain Fax: +34-91-8131-308 Phone: +34-91-8131-xxx http://integral.esac.esa.int/		
E-mail = name@sciops.esa.int (name = first initial and surname, max 8 chars) ISOC helpdesk: inthelp@rssd.esa.int		
Name	Function	Phone
Hansson, L.	ISOC Manager	235
Kretschmar, P.	Deputy Project Scientist	399
Kuulkers, E.	Operations Scientist	358
Sanchez, C.	Operations Scientist	375
Williams, O.R.	Archive and Operations Scientist	274
O'Rourke, L.	Operations Engineer	363
Balm, P.	Software Engineer	357
Homminga, M.	Software Engineer	335
Matagne, J.	Webmaster	303
Willis, A.	Secretary	254

ESA-ESTEC		
Research and Science Support Department Keplerlaan 1 2201 AZ Noordwijk, The Netherlands Fax: +31-71-56-54690, Phone: +31-71-565-xxxx E-mail = name@rssd.esa.int (name = first initial and surname, max 8 chars)		
Name	Function	Phone
Parmar, A.	Mission Manager	4532
Winkler, C.	Project Scientist	3591