INTEGRAL

Science Operations Centre

Announcement of Opportunity for Observing Proposals (AO-5)

AO-5 Science Data Rights

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1 Purpose of the document

The ESA INTEGRAL Science Management Plan (SMP) [1] defines the policy on data rights on all scientific data obtained from the INTEGRAL scientific instruments during the entire mission. Scientific instruments of INTEGRAL are SPI, IBIS including particle radiation monitor (IREM), JEM-X, and OMC. The nature of some important INTEGRAL science objectives and of some design aspects of the payload require, however, to specify the data right policy - within the framework outlined by the SMP - in more detail.

This document specifies in detail the INTEGRAL science data rights with the emphasis to establish rules which are simple, pragmatic and fair.

This document has been endorsed by the INTEGRAL Science Working Team. It is based on INTEGRAL Technical Note INT-TN-14571.

1.1 Applicable documents

[1] INTEGRAL Science Management Plan ESA/SPC(94)1, rev.2

2 Introduction

The ESA International Gamma-Ray Astrophysics Laboratory (INTEGRAL) mission is an observatory utilising scientific instruments provided by PI consortia. Routine processing and standard analysis of scientific data will be performed at the INTEGRAL Science Data Centre (ISDC), provided also through a PI collaboration. The nominal mission lifetime was two years following the end of in-orbit commissioning phase, i.e. from 16 Dec 2002 until 16 Dec 2004. The extended mission phase has recently been approved until December 2010, subject to a further scientific review as part of a new mission extension request in Fall 2007.

The basic concept of the INTEGRAL observing programme is outlined in [1] (see also *INTEGRAL Guaranteed Time*). Basically it consists of two elements: the Core Programme and the General Programme.

The AO-5 cycle of observation has a duration of 12 months, starting 16 August 2007 until 15 August 2008.

The Core Programme uses 25% of the total scientific observing time during 2007 and 20% during 2008. The observing time during the Core Programme is the "guaranteed time" for the members of the INTEGRAL Science Working Team (ISWT) in return for their contributions to the programme. The Core Programme has been defined by the ISWT and is described in detail in the AO document *INTEGRAL Guaranteed Time* (see also section 4 for an overview).

The General Programme[1] will be open to the scientific community which can apply for observing time ("open time") by responding to a call for proposals (Announcement of Opportunity). This part of the programme uses 75% of the total observing time during 2007 and 80% during 2008. Key programme observations are part of the General Programme.

2.1 Proprietary data rights

Each observer (Core Programme and General Programme) will receive the data from all instruments pertinent to his/her observation and these data will remain his/her propriety for one year. All the data obtained during the Core Programme and General Programme will be publicly available through the archive one year after the data have been processed and dispatched by the ISDC (see also
Table 1 for information on public data).

[1] *According to the ESA-RKA agreement, a 27% share of the General Programme observing time is reserved for Russian scientists.*

This simple propriety rule is applicable to all INTEGRAL scientific observations - as it is for all ESA science missions. However, as explained below, due to the nature of some important science objectives addressed by INTEGRAL and because of some design aspects of the payload, specific rules and detailed procedures are required for certain cases - within the framework of the SMP [1] - in order to specify the data rights in an unambiguous way. These cases include:

- Targets of Opportunity (TOO),
- Survey observations of the Core Programme,
- Multiple targets in the large instrument field-of-view (FOV), including serendipitous sources

While data rights for these topics are covered in general terms in the SMP [1], case studies by the ISWT during development phase were performed and detailed procedures have been defined in order to establish a complete set of rules. These studies also investigated options and defined details of procedures as recommended in the SMP[1].

Finally, this document also covers the data rights for specific subsets of observational data:

- Selected subsets of data,
- Split observations,
- Calibration data,
- Data obtained during slews,
- Re-processed data,
- Instrument housekeeping data, and
- Data for public relation purposes.

2.2 Public data

We extract and summarize below (from the body of this document) those data types and conditions which lead to the release of public data. Details are provided as indicated in Table 1

Table 1 Public data from INTEGRAL

Data type or condition	Reference (Section)
All private data one year after processed and dispatched by ISDC.	2
Data from a dedicated TOO follow-up observation are publicly available, if the TOO event is discovered (during any observations) in the routine scrutiny of INTEGRAL data performed at the ISDC, and there is no accepted TAC proposal.	3.3
Data from a dedicated TOO follow-up observation are publicly available, if the TOO event is suggested to the Project Scientist by outside information, and there is no accepted TAC proposal, and the TOO is an obvious event in the judgment of the PS or is requested by numerous scientists.	3.3
For GRB in FOV: location (and errors), trigger time, peak flux, fluence, lightcurve (plot only), duration.	3.4.1
For GRB outside FOV: light curves from SPI ACS.	3.4.2
Source position and flux for serendipitous sources detected during QLA analysis at ISDC, at the latest one week after the observer (PI) has been notified by ISDC.	5.3
All data from "de-selected" instruments (any observation)	0
All data obtained during dedicated in-flight calibration observations during extended mission phase.	9.1.1
All data obtained during long slews.	10
Soft Δ-releases of re-processed public data	11.2
Hard Δ-releases of data, originally made public immediately.	11.3
All instrument housekeeping and engineering data.	12
Data required to support responsibilities and/or public relations activities of ESA, RKA and Russian Academy of Sciences.	13

3 Targets of Opportunity (TOO)

3.1 Introduction

The gamma-ray sky is highly variable and many of the mostly unpredictable TOO events are scientifically important and often warrant to alter the pre-planned observing schedule. Many of these events in the INTEGRAL range are caused by Galactic compact objects, and some of them will be covered during the survey observations of the Core Programme (see section 4 and AO document on *INTEGRAL Guaranteed Time* for details). Other TOO's will be detected during the General Programme or will be reported from other space mission or ground based observatories.

It shall be noted that proposals for TOO follow-up observations (known/unknown location) can be made in response to this AO. Once the event satisfied the TOO criteria as specified by the proposer (and approved by TAC) and the observation has been executed, the usual data right policy is applicable for these data as it is for any other source.

3.2 General rules/guidelines

General rules and guidelines applicable to TOO proposals/observations are described in the *INTEGRAL Manual*.

3.3 The TOO data rights

The planned CP survey observations make the situation of data rights for TOO observations different for the INTEGRAL mission, compared to other missions. In order to maximize the scientific return from the INTEGRAL mission it was decided to exploit the large fields-of-view of the main instruments by performing survey observations to also monitor Galactic objects for potential TOO events. As a result, the ISWT has the data rights for any TOO event discovered in these CP observations. Therefore, proposers for a TOO observation should realize that if an event which matches their TOO criteria has to be discovered during the survey observations (see for more information the AO document on *INTEGRAL Guaranteed Time* and section 4), the ISWT retains the data rights for the TOO discovery. If the TOO event is discovered during the General Programme, or the alert comes from an outside source, then the data rights will be assigned to the proposer (see below for details).

For the INTEGRAL mission the main criteria determining TOO data rights[2] are:

- The TOO event is discovered in the INTEGRAL data of the General Programme[3]
- The TOO event is discovered in the INTEGRAL data of the Core Programme (survey observations).
- The TOO observation is suggested to the Project Scientist by outside information from other space missions or ground based observatories.
- There is a TOO proposal accepted by the TAC.
- There is no accepted TOO proposal.

The data rights for different combinations of the above criteria are presented below, starting from the following two categories:

Category (1): The TOO event is discovered in the routine scrutiny of the INTEGRAL data performed in the ISDC.

Category (2): The TOO observation is suggested to the Project Scientist by outside information from other space missions or ground observatories.

Category (1): The TOO event is discovered in the routine scrutiny of the INTEGRAL data performed in the ISDC (see Figure 1).

(1a) The TOO event is detected during the General Programme, and

i) it is covered by a TAC accepted observing proposal: The successful proposers also obtain the data rights for the ongoing observation in which the event was detected, and for possible follow-up observations. Note, however, that section 5 on multiple sources in the FOV does also apply for TOO observations.

or

ii) it is not covered by a TAC accepted observing proposal: The data collected during the ongoing observation will remain the property of those scientists having approved targets in the FOV, similar to the case for serendipitous sources (see also section 5). The data of possible follow-up observations will immediately be placed in the publicly available archive at the ISDC. The PS (ISOC) will announce this widely to the general community.

(1b) The TOO event is detected during the Core Programme (survey observations, see *INTEGRAL Guaranteed Time* and section 4): The data rights for the CP observation in which the event was detected are for the ISWT, through organization and coordination by the PS. The data of any dedicated (i.e. re-planned) follow-up observation for this TOO will immediately be placed in the publicly available archive at the ISDC, unless a TAC accepted proposal has been identified: in that case the data rights are for the successful proposer.

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[2] *"Data rights" are understood following [1] as the usual one year proprietary period (see section 2)*

[3] *Key Programme (KP) observations are part of the General Programme*

<u>Category (2):</u> The TOO observation is suggested to the Project Scientist by outside information from other space missions or ground observatories (see Figure 2).

(2a) The TOO is covered by a TAC accepted observing proposal. The successful proposer has the data rights.

(2b) The TOO is not covered by an accepted observing proposal, <u>and</u>

i) the TOO is an obvious event in the judgement of the PS (e.g. a near-by Supernova), or the TOO observation is requested by numerous scientists: The data from a dedicated TOO follow-up observation will immediately be placed in the publicly available archive at the ISDC. The PS (ISOC) will announce this widely to the general community. If the TOO detection was located in the FOV of an ongoing observation, the data from that ongoing observation will remain the property of those scientists having approved targets in the FOV of that observation.

<u>or</u>

ii) the PS is told of a TOO event by a particular person, and that person is an isolated voice: The PS can award the data rights to that person for the ongoing observation as well as for possible follow-up TOO observations.

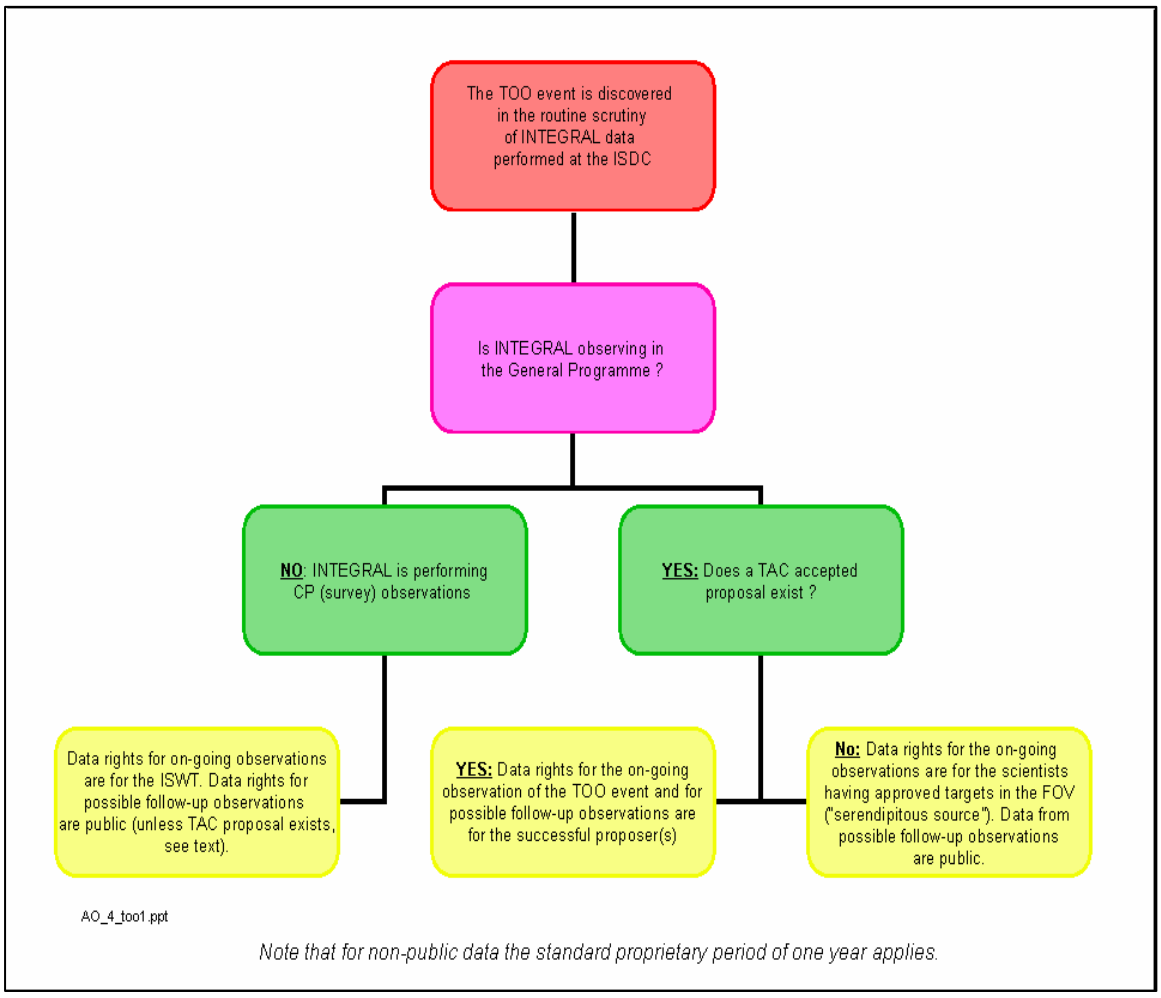
The TOO event is discovered in the routine scrutiny of INTEGRAL data performed at the ISDC
Is INTEGRAL observing in the General Programme ?
NO: INTEGRAL is performing CP (survey) observations
YES: Does a TAC accepted proposal exist ?
Data rights for on-going observations are for the ISWT. Data rights for possible follow-up observations are public (unless TAC proposal exists, see text).
YES: Data rights for the on-going observation of the TOO event and for possible follow-up observations are for the successful proposer(s)
No: Data rights for the on-going observations are for the scientists having approved targets in the FOV ("serendipitous source"). Data from possible follow-up observations are public.
AO_4_too1.ppt
Note that for non-public data the standard proprietary period of one year applies.

Figure 1

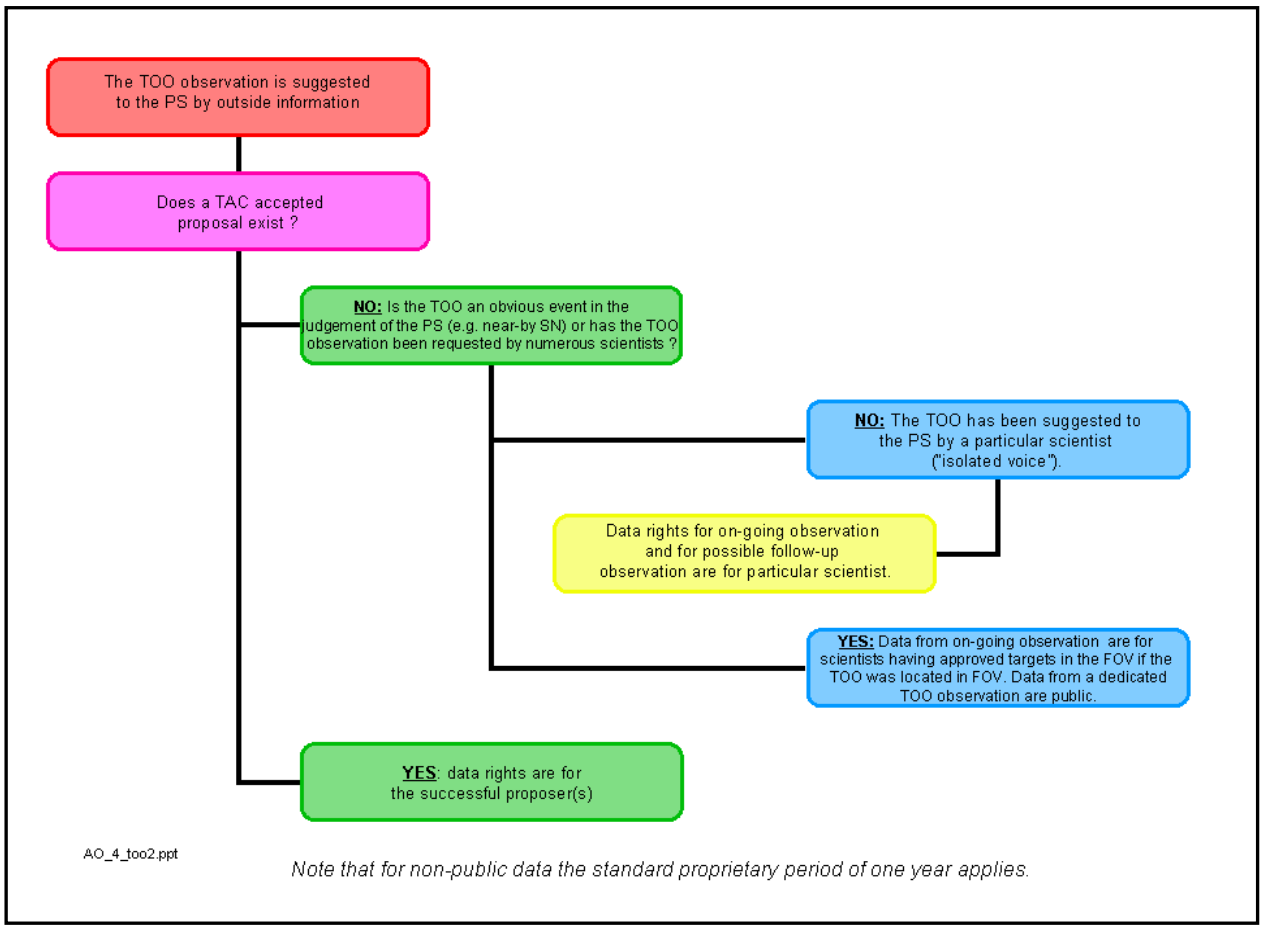
The TOO observation is suggested to the PS by outside information
Does a TAC accepted proposal exist ?
NO: Is the TOO an obvious event in the judgement of the PS (e.g. near-by SN) or has the TOO observation been requested by numerous scientists ?
NO: The TOO has been suggested to the PS by a particular scientist ("isolated voice").
Data rights for on-going observation and for possible follow-up observation are for particular scientist.
YES: Data from on-going observation are for scientists having approved targets in the FOV if the TOO was located in FOV. Data from a dedicated TOO observation are public.
YES: data rights are for the successful proposer(s)
AO_4_too2.ppt
Note that for non-public data the standard proprietary period of one year applies.

Figure 2

3.4 Gamma-ray bursts

In principle, gamma-ray bursts (GRB) are considered as a subset of TOO events and general rules/guidelines do apply as described in the previous sections (including Figures 1 & 2), see, however below for data rights. GRB do occur randomly in time and space, thereby naturally both inside and outside the coded FOV's of the instruments.

3.4.1 GRB inside the FOV of instruments

Data from these events will be contained in the science data of INTEGRAL instruments operating in the modes selected for the on-going observation. Typically one event per month is being observed[4] - consistent with pre-launch estimates - and the data rights on data obtained from the GRB event itself are described above as for TOOs in general, covering both existence and non-existence of TAC approved proposals.

Concerning GRB follow-up observations initiated from GRB events detected by INTEGRAL or suggested from the outside (see also Figure 2) it has to be kept in mind with the current knowledge on GRB, that these events are of rather short duration, covering a typical range of $\sim 10^{-2}$ sec to $\sim 10^{+2}$ sec, compared to other TOOs. Afterglow or counterpart observations with INTEGRAL to follow up a GRB detection are possible if (i) the GRB event occurs inside the FOV of the on-going observation and will be covered during the on-going nominal dithering manoeuvres, or (ii) if the event occurs outside the FOV but the spacecraft will dither onto that position during the nominal dithering manoeuvre of the observation during which the event occurred. An interruption of the on-going dither pattern in order to prevent the GRB location from moving out of the FOV and/or an extra near real-time slew manoeuvre onto the GRB position within a short time scale (of typically one hour) does not constitute the operational baseline of the mission for observation re-planning.

The ISDC routinely processes the near real-time science telemetry stream in order to detect and localize GRB events. Location information derived from this process will be broadcast by the ISDC to the scientific community at large via the IBAS alert system (Mereghetti[5] et al., 2005) and via GCN messages. This location information and its rapid (near real-time) dissemination to the scientific public is crucial for GRB follow up and afterglow observations at other wavelengths, and has been very successful in many cases during INTEGRAL operations. Scientists interested in receiving these alerts from INTEGRAL shall subscribe to the GRB alert mailing system by contacting the ISDC.

Concerning the GRB data rights, data on the GRB event itself (e.g. spectral data, event light curve data etc.) are treated, in principle, as TOO event: If TAC accepted proposals for GRB events in the FOV exist and a GRB is detected during an observation of the General Programme (including Key Programme observations[6]), then the successful proposer will receive the GRB event data, obtained during this on-going observation. However, and differing from TOO cases in general (see section 3.3), because of the short duration of the GRB event (~ seconds) compared to the duration of the on-going observation (~ $10^{5..6}$ sec), the GRB event data will be extracted within a contiguous time window (for instance the TAC recommended "duration" of

[4] *http://ibas.mi.iasf.cnr.it/IBAS_Results.html*
[5] *Proc 4th workshop ''GRB in the afterglow era'', eds. L Piro et al. 2005, Il Nuovo Cimento*
[6] *See AO Document on Key Programmes and associated observations*

GRB observation) from the data of the on-going observation (e.g. as a number of contiguous science windows) and those data only will be provided to the observer.

GRB locations and errors, and trigger times are, due to the nature of the rapid alert system, publicly available. In order to facilitate rapid follow-up observations (e.g. using XMM or Chandra), data describing the GRB peak flux (20 - 200 keV, 1 sec), fluence (20 - 200 keV), lightcurve (20 - 200 keV, plot only) and GRB duration (sec) are also publicly available, see[7] for further details and recent examples.

3.4.2 GRB outside the FOV of instruments

In this section, "GRB outside the FOV" are considered as events which trigger[8] the veto logic of the SPI instrument, the SPI anti-coincidence (ACS) subsystem, which acts as a nearly omni-directional GRB detector above ~ 75 keV. These triggers result in count rate light curves (time histories) from the SPI ACS with a time resolution of 50 ms. The event rate is about one GRB/day based on current instrument performance and 5σ detection significance[9]. These GRB light curve data from the SPI ACS are part of the instrument housekeeping/engineering data as provided by the ISDC and are therefore public data via the archive (see section 12 below on Instrument housekeeping data). However, the prime scientific need in the SPI ACS time history data from GRB lies in the photon arrival timing correlation with time histories obtained by other spacecraft constituting the Interplanetary Network (IPN). GRB locations obtained by the IPN often produce small GRB error boxes crucial for follow-up observations at other wavelengths. Therefore, GRB time histories as obtained from the SPI ACS will be provided in near real-time via the ISDC GRB rapid alert system (see above) to the scientific community. As such these data become public immediately.

Any scientific results using INTEGRAL data and involving the interplanetary network IPN should fully acknowledge the INTEGRAL Science Working Team ISWT.

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[7] *http:// ibas.mi.iasf.cnr.it /IBAS _Results.html*

[8] *Note that intense and hard GRB events which occur at large off-axis angles may also produce detectable effects on the photon detection planes of the high energy instruments (see 3.4.1), and these events are not considered in this section any further. However, applying Compton imaging techniques, it is possible to analyse those data from the IBIS telescope (e.g. R. Marcinkowski et al. A&A 452, 113, 2006, and AO-4 proposal 420103 (http://www.rssd.esa.int/index.php?project=INTEGRAL&page=Observing_Programme))*

[9] *http://www.mpe.mpg.de/gamma/instruments/integral/spi/acs/grb/trigger/ACSTriggerTab.html*

4 Core Programme observations and database

The Core Programme[10] (CP) will cover 25% of the total observing time during 2007 and 20% of the total observing time during 2008. The Core Programme alone will cover many of the principal scientific objectives of the INTEGRAL mission as stated in [1].

Following the INTEGRAL Science Management Plan [1], the ISWT has agreed on the procedure how the data are shared among the team members. This is described in detail in internal ISWT documents. Data on CP observations will be used by the ISWT as a common scientific database jointly optimising the scientific return of the mission. The common scientific analysis can exploit the detailed knowledge available in the instrument teams for the difficult in-depth studies of multi-instrument observations with short exposures and spread over long periods of time (up to years), i.e. analysis and interpretation of data across instrument boundaries to make maximum use of the payload complementarity of the mission. Also instrument specific research topics have to be addressed. An example of the latter is the construction of large-scale maps in selected line energies. Again, detailed knowledge of the instrumental behaviour in flight is required to successfully combine data collected in short exposures over long periods of time. The ISWT approach to analyse that scientific database is as follows:
a) establish a list of scientific topics to be addressed for the data analysis and subsequent publication
b) assign scientists to take responsibility for a scientific topic “from cradle to grave”, i.e. from data analysis to publication

It is to be noted that this approach is only valid for data analysis within the one-year proprietary period.

The ISWT defined the list of key scientific topics for analysis and research using CP data, and assigned one scientist or key responsible to each scientific topic. Details of these two steps are provided in an internal ISWT document. The scientific community is being informed, within this AO documentation package, about the scientific topics the ISWT is planning to study during the Core Programme (see *INTEGRAL Guaranteed Time*).

[10] *Details of the Core Programme are provided in the AO document on INTEGRAL Guaranteed Time.*

5 Multiple targets in the large instrument FOV, and serendipitous sources

5.1 Introduction

The INTEGRAL science objectives include e.g. the observations of the diffuse gamma-ray emission and galactic source populations in the Galactic Centre therefore leading to a design of the two main gamma-ray instruments (SPI and IBIS) driven by these requirements and incorporating large fields of view (8.3 × 8 deg [IBIS] and 16 deg [SPI], respectively). In addition, all four instruments are co-aligned with overlapping fields of view. The SPI requirement to "dither" the spacecraft X-axis (co-aligned with the pointing axis of all instruments) around the nominal target position[11] , results in an even larger sky coverage around the source position. Finally, the INTEGRAL Science Operations Centre may combine (amalgamate[12]) close-by targets in one "dithering" pattern in order to save slewing time and maximize observation efficiency (see *INTEGRAL Manual*).

These factors render the occurrence of multiple sources in the FOV highly probable, in addition serendipitous sources including TOO detections are to be expected. In general, there will be many observers having sources in the same field of view during (parts of) the observations.

This situation has not been addressed in the SMP [1] and this section summarizes the results of a case study and details necessary procedures.

We discuss here the policies to be applied when several targets are found in a single field of view during an INTEGRAL observation.

Basic principle: All the data relevant to an observation are given to the scientists with rights on any target approved for that observation.

Rationale: The data obtained by INTEGRAL are the result of the convolution of the sky field with the coded masks (except in the OMC case as treated in Section 5.). As a result, the information on any region of the sky is distributed onto the complete detector plane. Analysis can, therefore, only be done using all the available data. The observers must then receive the data relevant to targets on which they have no rights. Note that targets discussed in this section do also include TOOs as described in section 3.

5.2 More than one approved target in the field of view

In the case in which several targets, that are the objects of different approved proposals of an amalgamated observation, are in the field of view during one or several exposures (a case that could happen routinely), the Time Allocation Committee (TAC) will grant rights to publish the data related to the different targets to the respective different proposers. This includes the source and the surrounding background field. It is expected and understood as good scientific practice that the scientists (who will have gained knowledge on the other sources in the course of their analysis) will not attempt to publish data pertaining to other proprietary sources/targets during

[11] *See AO document INTEGRAL Manual for details*

[12] ***Amalgamation*** *of observations is a process performed by the ISOC, if deemed necessary to enhance observation efficiency, and combines several targets within one observation utilising the large FOV (see INTEGRAL Manual).*

the proprietary period. Any non-observance of this rule will be notified by the Project Scientist to the TAC who might take this into account for subsequent rounds of AO, and to the journal involved.

5.3 Serendipitous sources

These sources are those present in the data of a specific observation (either single or amalgamated) but not the object of any approved proposal for that observation. According to the basic principles of INTEGRAL data allocation, the data are distributed to all those scientists who have approved targets in the field of view for that observation. Any of the parties may publish serendipitous targets data during the proprietary period.

Sufficiently bright (serendipitous) sources will be detected by the Quick-Look Analysis system of the ISDC. The ISDC will inform those observers who have approved targets in the field of view for that observation about those serendipitous sources as soon as possible. Information concerning position and flux only of these sources will be made publicly available by the ISDC at the latest one week after the observer has been notified by the ISDC.

Concerning serendipitous sources contained in Key Programme observations, the reader is referred to the AO Document on *Key Programmes and associated observations* for details.

5.4 Several sources in Core Programme fields

All the data obtained during a Core Programme observation belong to the ISWT for the proprietary period.

5.5 OMC data

Proposers will get within their proprietary data the OMC data pertinent to their target gamma-ray source and all sources from the other OMC CCD subwindows**.**

5.6 Whole field images

Images of the complete field of view may be analysed by all the parties with data rights on any target. Discussion and details (e.g. source flux and spectrum) are, however, to be limited to the targets for which the authors have the rights according to Section 2.

5.7 General considerations

The Project Scientist will publish a list of targets for which there exist approved proposals. This list will be kept up to date and be distributed by the Project Scientist to the PIs of the accepted proposals. Proposers are reminded of the INTEGRAL source naming convention[13] defined elsewhere in the AO documentation.

[13] *see also http://integral.esac.esa.int/isoc/html/naming_conventions.html*

6 Key Programmes and associated observations

The general policy for AO-5, as outlined in this AO document on *Science Data Rights* is applicable.

The execution of a KP observation which, generally, provides data for the KP-PI, as well as for the approved targets from associated proposals for other PIs, can be considered as an "amalgamated" observation and the reader is referred for further details to Section 5 for general information on data rights for amalgamated observations.

In terms of data rights, the sky area associated with a KP observation is divided between N users including one PI for the KP and N-1 associated PIs, each having his/her own specific data rights associated with individual sources or areas of diffuse emission. In this context, associated observations can not duplicate the scientific objectives (with source ID's and data rights) of approved KP observations.

For further details the reader is referred to the AO-5 document on *Key Programmes and Associated Observations.*

7 Selection of subsets of INTEGRAL data

As stated in section 5 of the SMP [1], the data rights for observations performed during the General Programme and the Core Programme include in principle the delivery of data from all instruments to the proposer (here: proposer = General Observer for General Programme, and proposer = ISWT for Core Programme). This is a consequence of the complementary nature of the INTEGRAL scientific payload. Following common practice, to obtain data from any instrument require of course the scientific justification to be included in the proposal (General Programme and Core Programme).

On the other hand it shall be possible during the AO process and during the Core Programme planning by ISWT, that a proposer (i.e. General Observer and/or ISWT) will be able to specify any instrument(s) in which he/she is not interested in for the specific observation (see Proposal Generation Tool PGT).

Consequently, data from those instruments which have been "de-selected" by the proposer (General Observer and ISWT) a priori, will be made immediately publicly available so that these data can be used without delay.

8 Data rights for split observations

Typical INTEGRAL observations will have to be broken up into several exposures, separately scheduled, and consistent with constraints such as sun avoidance, times of ground station handovers, etc. Normally the exposures for one observation will be contiguous in time, as far as allowed by the constraints. But many proposers are expected to request such long observation times (several days to weeks), that a contiguous scheduling by ISOC is no longer possible or desirable.

The visibility constraints, and consequently the limited amount of time a certain area in the sky is visible, mean that the individual exposures that constitute one observation may not always be scheduled in consecutive orbits, they could even be scheduled months apart (this is especially true for areas of the sky with limited visibility, where a high concentration of observations is expected, such as the Galactic Centre). Also scheduling of Target of Opportunity (TOO) observations will often cause a re-scheduling of (parts of) pre-planned observations.

If there is no gap longer than about 6 weeks between consecutive exposures, the entire observation will be processed together by ISDC, resulting in one data set; the data rights will be for the usual proprietary period as described in section 2 of this document.

If, however, there is ever a gap of about 6 weeks or longer, then ISDC will process the data before and after the gap separately, at the earliest possible time, resulting in more than one data set. In other words the gap in the schedule does not cause a hold-up in the processing of the earlier data. Such a case is called a “split observation”, and the data rights for each data set will be as described in section 2, with each data set having its own public release date. Note that the data processing of parts of observations will be cumulative, i.e. when part N is processed, all previous (N-1) part(s) should in general be included (reprocessed) too.

9 Calibration data

In-flight calibration of the scientific payload

(i) has taken place during the commissioning phase (~5 weeks payload performance verification phase during 2002, out of a total duration of 2 months for commissioning following the launch and early operations phase), i.e. prior to the nominal operations phase,

(ii) has been performed about twice per year during nominal mission (Crab calibration) and,

(iii) will be continued and refined during the extended operations phase as required by instrument PI's. This is required to continuously assess, verify and to complete the database describing the scientific performance of the instruments, for instance after annealing of the SPI detectors or after strong solar flare events.

In what follows we will consider in-flight calibrations during the extended mission operations phase only.

9.1 Calibration during extended operations phase

This section describes data rights concerning calibration data taken during extended mission phase, i.e. after the commissioning and nominal mission phases (see also *INTEGRAL Manual* for details).

A detailed and thorough in-flight calibration of INTEGRAL instruments is a major challenge. Exposures of astronomical sources e.g. under different aspect angles and background conditions are needed. Other examples include re-calibration after each SPI annealing or after strong solar flares. Furthermore, a background data base of sufficient extent is needed to be able to understand trends and fluctuations of instrumental performance parameters, in particular response information. This knowledge can be used to substantially improve both the scientific performance of the instruments and the science quality of the observations throughout the entire mission.

9.1.1 Dedicated calibration observations

The targets and frequency of such dedicated in-flight calibration observations will be recommended by the PI instrument teams which also may use special instrument settings in order to achieve the objectives as laid down in the in-flight calibration plan. Following [1], observing time to be allocated for the Core Programme and General Programme does not contain time required for those calibration observations. However, because of the nature of the large field of view of the instruments, it is realistic to expect that, also depending on specific instrument parameters used for those dedicated calibration observations, very useful scientific data can be obtained from the calibration source itself or from any other source within the same field of view. Therefore all data obtained during dedicated in-flight calibration observations during the extended mission phase are treated as public data.

9.1.2 Calibration analysis using data from other observations

Data from any scientific observation obtained during the observing programme (i.e. Core Programme and General Programme observations) may be used within the proprietary period by

the instrument teams and/or by the ISDC team (through the PIs), and, if needed, supported by the ISOC/ESA team (through the ESA Project Scientist) for the mandatory and critical tasks of instrument health and performance control, engineering trend analysis and instrument (re-) calibration only. In particular, during the proprietary period, these data can never be used by those teams for scientific analysis and publication, if they are not owner (observers) of these data. The strict adherence to this rule will be closely monitored by ESA.

10 Data obtained during slews of the spacecraft

Science data will be obtained and downlinked during spacecraft slews, however they are of substantial complexity and difficult to analyse. Given the complexity, it is unlikely that ISDC's standard analysis tools will become readily, or at all, available for slew data.

There will be basically two different slew manoeuvres throughout the mission: (i) long slews from target A (after observation of A) to target B (prior to observation B) and (ii) shorter (typically 2 deg) slews during the dithering manoeuvres around the nominal target.

Data obtained during long slews (case i) will be made publicly available immediately, as they are not related to the previous or subsequent observation.

Dithering slew data (case ii) belong - for the usual proprietary period - always to the observer(s) of the target on which the dithering manoeuvre is being performed.

11 Re-processing of scientific data and additional data releases

11.1 Introduction

Routinely, data from any observations performed during the Core Programme or General Programme are processed and subsequently released by the ISDC to the observer (GO for General Programme and ISWT for Core Programme) after the data have successfully passed a number of quality checks performed at the ISDC. After release, these data will become public at the end of the proprietary period as described in 2.

Based on experience with previous scientific space observatories it is foreseeable, however, that at a given point in time after the original data have been released to the observer, the ISDC may take the decision to re-process these original data and subsequently release those re-processed data.

This section describes the policy for additional releases (so-called Δ-releases) of re-processed data. In what follows we discriminate between "soft" and "hard" releases.

11.2 Soft releases of re-processed data

Experience shows that a number of soft Δ-releases can occur: these could include e.g. data produced using updated/improved instrument responses and/or calibration information, improved software tools etc. It is expected that quite a number of soft releases may occur during mission lifetime. Soft Δ-releases always improve the quality of the scientific data products but still include flight data of good quality (see section 11.3, below).

Soft Δ-release(s) resulting from (several) re-processing(s) of the same original data set containing one observation do not lead to an update of the time stamp associated with the data released originally, that is, the proprietary period of all further soft Δ-releases of the same original data will always be shorter than one year, and the proprietary period of all soft Δ-releases resulting from the re-processing of the same original data will therefore terminate at that point in time which is valid for the original data (that is "the clock keeps ticking").

Soft Δ-releases of re-processed public data will always result in public data.

11.3 Hard releases of re-processed data

It can not be completely excluded that significant problems may be discovered in data which have already been released to the observer, or to the public. These problems are major anomalies and could for example be instrument specific, system wide (e.g. on-board timing) or severe s/w problems rendering wrong or corrupted data on ground. The observer (i.e. GO for General Programme or ISWT for Core Programme) has to provide strong evidence that the data are affected by these anomalies in a sense that the scientific objectives of the observation can not be achieved with the existing data. Only the re-processed data will improve the quality significantly such that these original goals can be achieved.

In this case, in consultation between the observer, the ISDC PI and the Project Scientist, the proprietary period of the original corrupted data can be extended for the re-processed data (hard Δ-release) in order to guarantee the proper proprietary period ("reset of clock"). Clearly these are individual decisions made on a case - by - case basis.

It is noted that a "clock reset" may be applicable only for data from individual instrument(s) manifesting significant problems.

Given the significance of these hard Δ-release events, they should normally be discovered during the proprietary period (i.e. within one year), and consequently hard Δ-releases of original data which became public after the proprietary period are highly unlikely, but should not be excluded a priori. Therefore, hard Δ-releases of re-processed data which have already become public may result in a new proprietary period for the original owner, rendering the existing public data largely obsolete.

Hard Δ-releases of data which, originally, have been made public immediately will always become public.

12 Instrument housekeeping data

The proprietary period for INTEGRAL data (see section 2 and [1]) is applicable for all scientific data. All instrument housekeeping data and other engineering data - derived at the ISDC - obtained during an observation, will be made available to the owner of that observation, together with the scientific data. Because of the need for instrument experts to routinely monitor and verify the state of health and technical performance of the instruments including long term trends, all instrument housekeeping and engineering data will be made publicly available. The public status is achieved once these data have been archived by the ISDC, which is typically 3 weeks after receipt of the near real-time telemetry from ESOC/MOC.

13 Data for public relation purposes

As outlined in the SMP [1], and in the ESA-RKA agreement, ESA, RKA and the Russian Academy of Sciences shall have the right to use any INTEGRAL scientific data in support of their respective responsibilities or for the sole purpose of public relations. In this context, they undertake not to violate the observer's rights.