INTEGRAL

Announcement of Opportunity for Observing Proposals (AO-2)

(Annexe)

INTEGRAL Science Data Rights

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I. 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. Applicable documents

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

II. 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, as approved through the budget, is two years following the end of in-orbit commissioning phase. The spacecraft design will allow for an extension of the lifetime to up to 5 years.

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 Core Programme uses 35% of the total observing time during the first year and 30% of the total observing time during the second year. 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 in detail by the ISWT and consists of 3 elements: (i) scans of the Galactic plane, (ii) a deep exposure of the Galactic central radian, and (iii) pointed observations. The final Core Programme is described in detail in the AO document *INTEGRAL Guaranteed Time*.

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 observations proposals (Announcement of Opportunity). This part of the programme uses 65% of the total observing time during the first year and 70% of the total observing time during the second year.

Following [1] 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.

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:

(i) targets of Opportunity (TOO),
(ii) Galactic plane scans and Galactic central radian deep exposure (both elements of the Core Programme),
(iii) multiple targets in the large instrument field-of-view (FOV), including serendipitous sources, and
(iv) pointed observations during the Core Programme

While data rights for these topics are covered in general terms in the SMP [1], case studies by the ISWT had to be performed and detailed procedures had to be defined in order to establish a

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

complete set of rules. These studies also investigated options and defined details of procedures as recommended in the SMP[1].

In addition, this document also covers the data rights for subsets of observation data, i.e.:

- selected subsets of data,
- split observations,
- calibration data,
- data obtained during slews,
- re-processed data,
- instrument housekeeping data, and
- data for public relation purposes.

III. Targets of Opportunity (TOO)

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 most of them will be covered during the scans of the Galactic plane, as part of the Core Programme. Other TOOs will be detected during the General Programme, during remaining parts of the Core Programme or will be reported from other space mission or ground based observatories.

It shall be noted that - as for other missions like Compton-GRO, BeppoSax and ISO - proposals for TOOs can be made in response to the AO. Once the event occurred and satisfied the TOO criteria as specified by the proposer, and the observation has been executed, the usual data right policy is applicable for these data as it is for any other source.

2. General rules/guidelines

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

3. The TOO Data Rights

The planned scans of the Galactic plane as part of the INTEGRAL Core Programme 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 field-of-views of the main instruments by performing the scans of the Galactic plane to monitor Galactic objects for potential TOO events. As a result most of the Core Programme time will be devoted to these scans, and the ISWT rightly has the data rights for any TOO event discovered in these scans. Therefore, proposers for a TOO observation should realize that if an event which matches their TOO criteria has to be discovered during the Galactic Plane Scans (GPS) or the Galactic Central Radian Deep Exposure (GCDE), the ISWT retains the data rights for the TOO discovery and possible follow-up observations (see below). If the TOO event is discovered during the General Programme or during a pointed observation from the Core Programme or the alert comes from an outside source, then the data rights will be assigned to the proposer.

One might expect that most TOO events will be detected during the Core Programme elements GPS and GCDE: this is one of the main reasons to perform the GPS and GCDE during the entire mission. TOO follow-up observations are scientifically important for INTEGRAL and a situation should be avoided where they can not be scheduled because a specific time allocation (e.g. CP pointed observations for TOO follow-up observations) has been formally exhausted. There-

fore, if at any time during an observation period of one year -- corresponding to one INTEGRAL AO cycle -- a TOO follow-up observation triggered by a detection in GPS and/or GCDE data will be scheduled and executed and if the CP allocated time for TOO follow-up observations is already exhausted, then the data of the entire field-of-view of that follow-up observation will be made publicly available immediately, unless a TAC accepted proposal exists (see also (1b) below). However, the scientific community should realize that the ISWT will have the duty and also the expertise to analyze the TOO source data as quickly and accurately as possible in order to inform the scientific community and to initiate and contribute to further multiwavelength studies.

For the INTEGRAL mission the main criteria determining TOO data rights[1] are:

- The TOO event is discovered in the INTEGRAL data of the General Programme, or the pointed observations of the Core Programme.
- The TOO event is discovered in the INTEGRAL data of the Galactic plane scans or the Galactic central radian deep exposure (both elements of the Core Programme).
- The TOO observation is suggested by outside information from other space missions or ground based observatories.
- There is a proposal accepted by the TAC, or the event is included in the ISWT list of CP pointed observations (see *INTEGRAL Guaranteed Time*).
- There is no accepted proposal, or the event is not included in the ISWT list of CP pointed observations.

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

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

(2) The TOO observation is suggested to the Project Scientist by outside information.

1. “Data rights” are understood following [1] as the usual one year proprietary period (see Section II)

<u>Case 1:</u> The TOO event is discovered in the routine scrutiny of the INTEGRAL data performed in the ISDC

(1a) The TOO event is detected during the General Programme or during a pointed observation in the Core Programme, **<u>and</u>**

i) it is covered by a TAC accepted observing proposal or the TOO event is included in the ISWT list of CP pointed observations (see *INTEGRAL Guaranteed Time*): 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 V on multiple sources in the FOV does also apply for TOO observations.

or

ii) it is not covered by an accepted proposal or the event is not included in the ISWT list of CP pointed observations: 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 V). 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 elements “Galactic plane scans (GPS)” or “Galactic central radian deep exposure (GCDE)”: The data rights for the (short) observation in which the event was detected as well as for possible TOO follow-up observations are for the ISWT, through organization and coordination by the PS. The PS, in consultation with the members of the ISWT, constitutes a science team for the analysis of the data of that TOO event. Those data from TOO (event and follow-up) observations which are property of the ISWT will be analysed as described in Section IV. The observing time for TOO follow-up observations will be drawn from the ISWT list of CP pointed observations which contains TOO candidate sources. If, however, no CP time is available anymore (see previous page) then the data of that follow-up observation will be made public, unless a TAC accepted proposal has been identified: in that case the data rights are for the successful proposer.

<u>Case 2:</u> The TOO observation is suggested to the Project Scientist by outside information

(2a) The TOO is covered by a TAC accepted observing proposal or the event is included in the ISWT list of CP pointed observations (published in the AO document *INTEGRAL Guaranteed Time*): The successful proposer has the data rights.

(2b) The TOO is not covered by an accepted observing proposal, or it is not included in the ISWT list of CP pointed observations, **<u>and</u>**

i) the TOO is an obvious event in the judgement of the PS (e.g. a Supernova, Cyg X-1 outburst), or the TOO observation is requested by numerous people: The data from a dedicated TOO

follow-up observation will directly 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.

or

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.

These combinations are shown in Figure 1 and Figure 2 below.

4. Gamma-ray bursts

In principle, gamma-ray bursts (GRBs) 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 (Section 4.1), for data rights. GRBs do occur randomly in time and space, thereby naturally both inside and outside the FOV's of the instruments.

4.1 GRBs 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 a few events per month would be expected 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 GRBs, 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 will routinely process 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, very similar to the successful GCN/BACODINE alert system being used for the CGRO mission. 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. Scientists interested in receiving these alerts

from INTEGRAL shall subscribe to the GRB alert mailing system by contacting the ISDC (see *INTEGRAL Manual* for details).

Concerning GRB data rights, data on the GRB event itself (e.g. spectra, event light curves etc.) are treated, in principle, as TOO event (Section 3.): If TAC accepted proposals for GRB events in the FOV exist and a GRB is detected during an observation of the General Programme or during a CP pointed observation, 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., case 1a, (i) above), because of the short duration of the GRB event compared to the duration of the on-going observation, the GRB event data will be extracted within a contiguous time window (for instance the TAC recommended "duration" of GRB observation) from the data of the on-going observation (e.g. as a number of contiguous science windows) and provided to the observer.

GRB locations 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), information on GRB flux and GRB duration will also be made publicly available.

4.2 GRBs outside the FOV of instruments

In this section, "GRBs outside the FOV" are considered as events which trigger[1] the veto logic of the SPI instrument, the SPI ACS subsystem. These triggers result in count rate light curves (time histories) from the SPI ACS with a time resolution of 50 ms. The expected event rate is about one GRB/day based on current instrument knowledge and 5σ detection significance. These GRB light curves 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 XII below on instrument housekeeping data). However, the prime scientific need in the SPI ACS time history data from GRBs 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[2].

1. 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 Section 4.1), and these events are not considered in this section any further.

2. Members of the ISWT are: J.-P. Roques/CESR Toulouse, V. Schönfelder/MPE Garching, P. Ubertini/IAS Rome, F. Lebrun/CE-Saclay, N. Lund/DSRI Copenhagen, M.Mas-Hesse/INTA Madrid, T. Courvoisier/Obs Geneva, J. Paul/CE-Saclay, G. Palumbo/U Bologna, W. Hermsen/SRON Utrecht, N. Gehrels/NASA-GSFC, S. Grebenev/IKI Moscow, R. Sunyaev/IKI Moscow, B. Teegarden/NASA-GSFC, C. Winkler/ESA-ESTEC

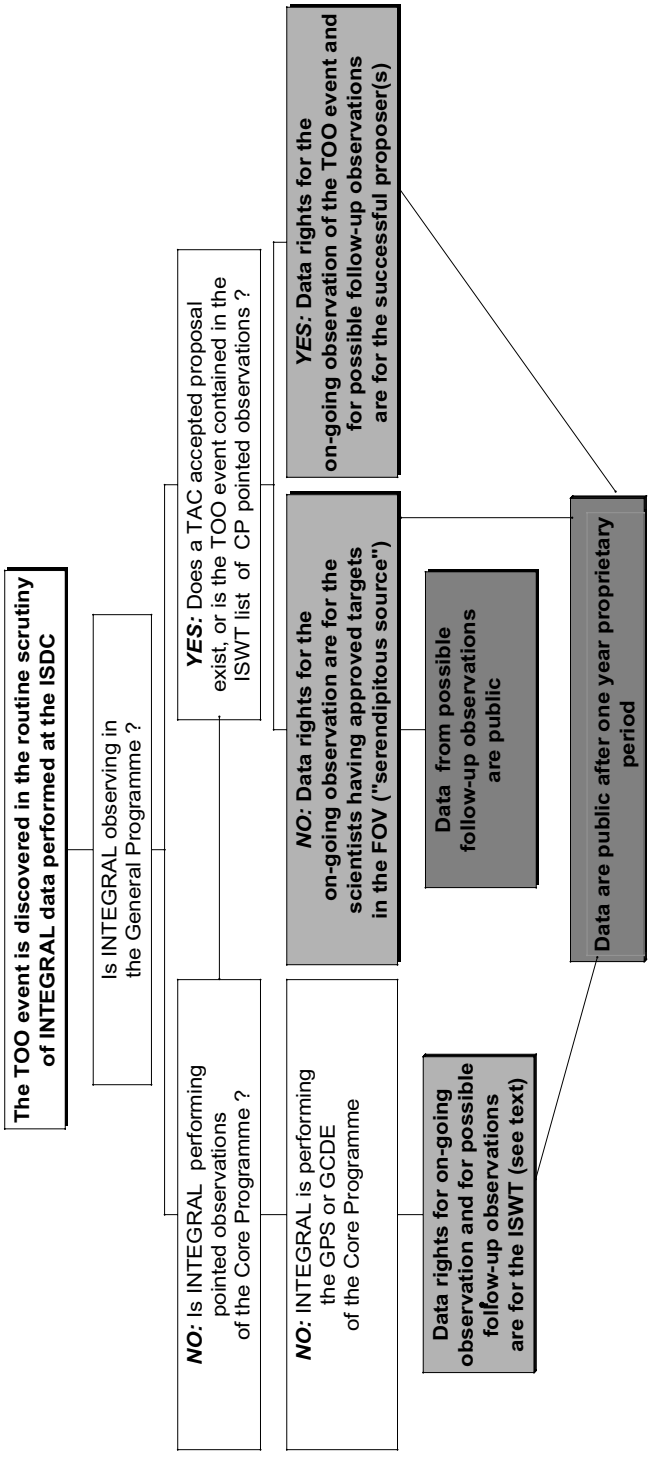
The TOO event is discovered in the routine scrutiny of INTEGRAL data performed at the ISDC
Is INTEGRAL observing in the General Programme ?
YES: Does a TAC accepted proposal exist, or is the TOO event contained in the ISWT list of CP pointed observations ?
YES: Data rights for the on-going observation of the TOO event and for possible follow-up observations are for the successful proposer(s)
NO: Data rights for the on-going observation are for the scientists having approved targets in the FOV ("serendipitous source")
Data from possible follow-up observations are public
NO: Is INTEGRAL performing pointed observations of the Core Programme ?
NO: INTEGRAL is performing the GPS or GCDE of the Core Programme
Data rights for on-going observation and for possible follow-up observations are for the ISWT (see text)
Data are public after one year proprietary period

Figure 1.

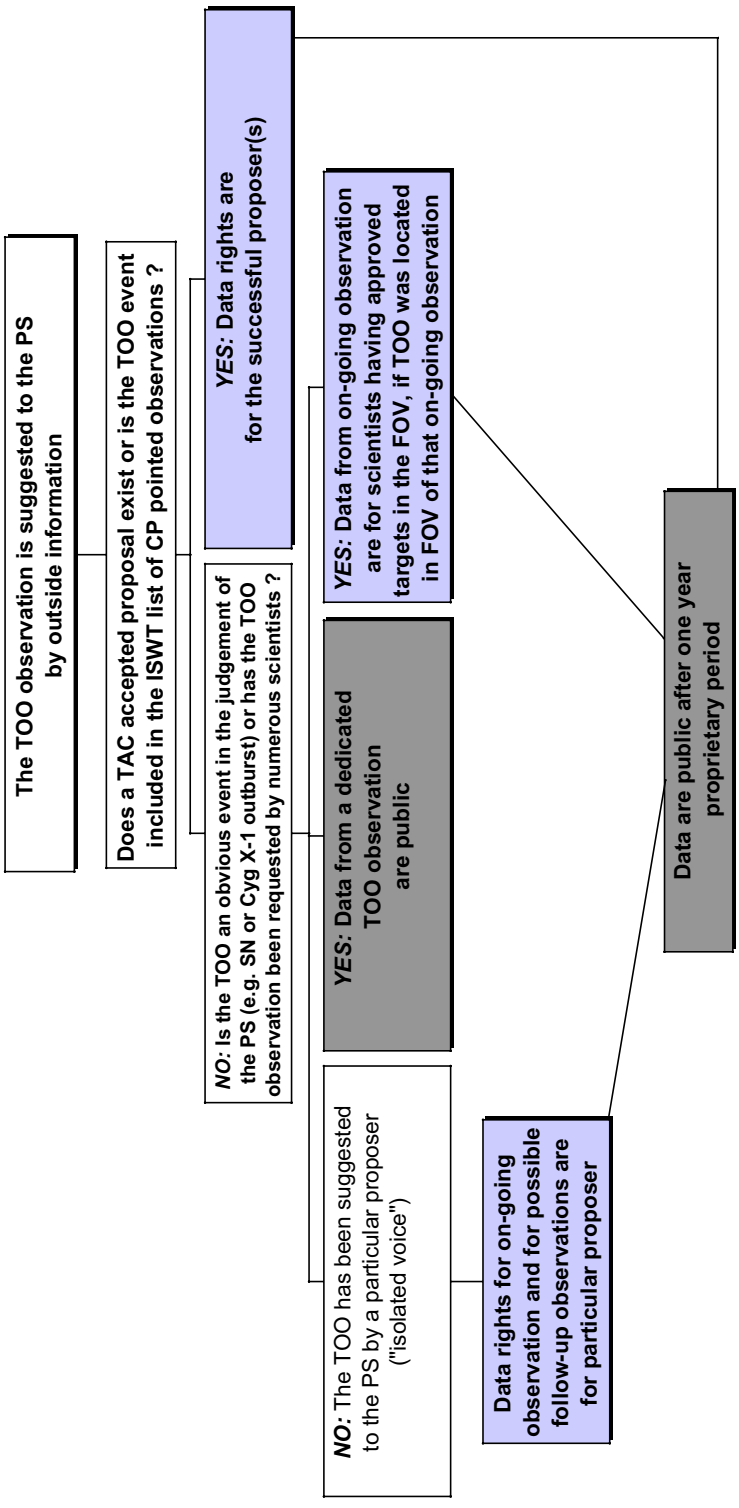
The TOO observation is suggested to the PS by outside information
Does a TAC accepted proposal exist or is the TOO event included in the ISWT list of CP pointed observations ?
YES: Data rights are for the successful proposer(s)
NO: Is the TOO an obvious event in the judgement of the PS (e.g. SN or Cyg X-1 outburst) or has the TOO observation been requested by numerous scientists ?
YES: Data from on-going observation are for scientists having approved targets in the FOV, if TOO was located in FOV of that on-going observation
YES: Data from a dedicated TOO observation are public
NO: The TOO has been suggested to the PS by a particular proposer ("isolated voice")
Data rights for on-going observation and for possible follow-up observations are for particular proposer
Data are public after one year proprietary period

Figure 2.

IV. Galactic plane scans and Galactic central radian deep exposure

The Core Programme[1] will cover 35% of the total observing time during the 1st year of the mission and 30% for the 2nd year. It will mainly consist of scans along the Galactic plane (Galactic Plane Scans, GPS) which will be performed regularly, and a survey of the central radian of the Galaxy (Galactic Central Radian Deep Exposure, GCDE). In addition, there will be a limited number of pointed observations selected by the ISWT.

The resulting survey of the Galactic plane and the deep exposure on the central radian will allow for detecting transients and for systematically measuring their duty cycles and luminosity function. The Core Programme alone will cover many of the principal scientific objectives of the INTEGRAL mission as stated in [1].

The two topics to be addressed in this section are therefore as follows:

1. Galactic Plane Scans (GPS), and
2. Galactic Central Radian Deep Exposure (GCDE)

Both main topics will cover: spectral analysis, timing analysis, source positions and distribution, diffuse emission and others. Data on the Galactic plane and central radian will be used by the ISWT as a common scientific database jointly optimising the scientific return of the mission. Deeper and higher resolution Galactic plane scans in comparison to previous ones, will be performed with the INTEGRAL instruments taking advantage of simultaneous observations over a wider energy range (3 keV-10 MeV).

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 GPS and GCDE 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 will be informed,

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

within the AO documentation package, about the scientific topics the ISWT is planning to study during the Core Programme (see *INTEGRAL Guaranteed Time*).

Individual scans[1] contributing to the entire GPS and GCDE data will be scheduled as individual observations. Therefore, data from these scans will be made publicly available - after the usual proprietary period of one year - in an incremental way (“scan - by- scan”) as each scan has its own time stamp. Any data products from GPS or GCDE, which result from the combination of many individual scans, will be assigned a time stamp corresponding to the date of their first derivation and will be publicly released one year thereafter.

1. A scan is defined here to be one scheduled group of exposures for GPS and GCDE in a particular revolution.

V. Multiple targets in the large instrument FOV, and serendipitous sources

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 field of views (9×9 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 positions by typically few (6 - 24) steps of 2 deg size during an observation, results in an even larger sky coverage around the source position. Finally, the INTEGRAL Science Operations Centre may combine (amalgamate[1]) 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 III.

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

1. **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*).

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 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.

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 ISWT (via the ISDC) at the latest one week after the observer has been notified by the ISDC.

4. Several sources in Core Programme fields

All the data obtained during a Core Programme observation (i.e Galactic plane scan, Galactic central radian deep exposure or pointed observations) belong to the ISWT for the proprietary period. However, when a pointed CP observation is amalgamated with (an) observation(s) of the General Programme, then this chapter does apply.

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.

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.

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 defined in the AO document on *Policies, Procedures and Forms*.

VI. Pointed observations during the Core Programme

The pointed observations of selected targets[1] is the third element of the Core Programme (besides the Galactic plane scans and the deep exposure of the Galactic central radian). The time allocated to each ISWT member for the pointed observations is defined by the agreed portions of the guaranteed observation time. Following the INTEGRAL Science Management Plan [1], the ISWT has agreed on the procedure how the data from the pointed observations are shared among the team members. This is described in detail in internal ISWT documents.

1. As described in *INTEGRAL Guaranteed Time*. The TOO data rights would be compliant with what has been described in Section III and Section V.

VII. 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.

VIII. 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 II 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 II, 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.

IX. Calibration data

In-flight calibration of the scientific payload will take place during the commissioning phase (~5 weeks payload performance verification phase out of a total duration of 2 months for commissioning following launch), i.e. prior to the nominal operations phase, and occasionally, also during the nominal operations phase. 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.

1. Calibration during commissioning phase

As outlined in [1], targets will be determined by instrument PIs (see also AO document *INTEGRAL Manual* for details). The observations during commissioning phase will be performed after the spacecraft and instrument functional check-out procedures and are crucial for the first assessment of the in-flight performance of the payload. All data collected during this period are property of the ISWT for the usual proprietary period.

2. Calibration during nominal operations phase

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

A detailed and thorough in-flight calibration of INTEGRAL instruments is a major challenge, and cannot be completed to full depth within the few initial weeks of the commissioning phase. Exposures of astronomical sources e.g. under different aspect angles and background conditions are needed. 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.

2.1 Dedicated calibration observations

The targets and frequency of such dedicated in-flight calibration observations will be determined 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 outside the commissioning phase are treated as public data.

2.2 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.

X. 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 belong (for the usual proprietary period) always to the observer(s) of the target on which the dithering manoeuvre is being performed.

XI. Re-processing of scientific data and additional data releases

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 Section II.

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.

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 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 (“the clock keeps ticking”).

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

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 (e.g. see cases in Section III) will always become public.

XII. Instrument housekeeping data

The proprietary period for INTEGRAL data (see Section II 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.

XIII. 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 the 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.