



## **Announcement of Opportunity for Key Programmes**

# **Policies and Procedures**

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## **Policies and Procedures**

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# Table of Contents

1. Introduction .....	1
1.1. Overview .....	1
1.2. Scope .....	1
1.3. Acronyms .....	2
2. Key Programmes AO package .....	3
2.1. AO documentation .....	3
2.2. AO tools .....	3
2.3. Associated documentation and tools .....	4
3. Key Programmes AO schedule .....	5
4. Observing time .....	6
4.1. Available observing time .....	6
4.2. Guaranteed and Open Time .....	6
4.3. Key Programme time .....	6
4.4. AOTs and AORs .....	7
4.5. Observing constraints .....	7
4.5.1. Scheduling strategy .....	7
4.5.2. Spacecraft 'slewing' overhead charges and time constrained observations .....	7
4.5.3. Duplicate observations .....	8
4.6. Targets of Opportunity .....	8
5. The 'Key Programme' concept .....	10
6. Phase 1 proposal submission .....	11
6.1. Submission procedures .....	11
6.2. Proposal contents .....	11
6.2.1. Cover sheet .....	12
6.2.2. Scientific justification .....	12
6.2.3. Astronomical Observation Requests .....	15
6.3. Proposal submission .....	15
7. Proposal evaluation and selection .....	16
8. Phase 2 data entry and reserved observations .....	18
9. Post-call modifications .....	19
10. Further calls for proposals .....	20
11. Data products, programme deliverables and proprietary rights .....	21

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# Chapter 1. Introduction

## 1.1. Overview

The Herschel Space Observatory (aka Herschel) will provide the astronomical community with a facility to carry out routine astronomical observations for a period of at least three years. General information about the Herschel mission, the observatory, its instruments, and the ground segment is provided in the ['Herschel Observers' Manual'](#).

The majority of Herschel's observing time will be made available to the astronomical community by the traditional route of calls for observing proposals, followed by peer review, in response to Announcements of Opportunity (AO), issued by the Herschel Science Centre (HSC). The observing time consists of Guaranteed Time (GT) and Open Time (OT). The GT (32% of the available time) is owned by contributors to the Herschel mission, mainly the science payload consortia. The remainder time is OT, that will be awarded in a standard competitive manner to investigators worldwide. All observing proposals will be reviewed by the Herschel Observing Time Allocation Committee (HOTAC).

This is the initial Herschel AO, in which we call for observing proposals soliciting time for Key Programmes (KPs), large programmes requiring observing time exceeding 100 hours. This AO concerns both GT and OT KPs. However, the call is divided into two parts. In the first part only GT KPs are solicited from GT holders. After closing the call for the GT holders, a scientific and technical evaluation of the proposed observations will be conducted by the HOTAC, assisted by the HSC, and a first list of 'reserved observations' will be generated.

The 'reserved observations' list will then be published and the second part, the solicitation for OT KP observing proposals will commence, open to all members of the astronomical community. After the closing of the OT KP call, a second HOTAC process will determine which OT KP proposals will be awarded observing time and how much time is allocated to every successful proposal.

Each of the above rounds (GT and OT KPs submission) will be a two-phase process. Responses to this call consist of so-called Phase 1 proposals. After peer review by the HOTAC, successful proposers will have the opportunity to update their observations under the technical advice of the HSC according to the recommendations made by the HOTAC entering them into the Herschel database in their final version (Phase 2).

Subsequent calls will be issued according to the schedule given in Chapter 10 and will be accompanied with corresponding policies and procedures documents.

## 1.2. Scope

The present version of this document provides the rules applicable to the second part of this AO and the procedures to be followed to apply for observing time with Herschel as a response to the call in this second round of submissions. All OT KP proposers are required to follow the policies and procedures described in this document.

A summary description of the contents of this document section by section is as follows.

The full AO package is described in Chapter 2, below.

The detailed AO schedule is provided in Chapter 3.

An overview of the observing time available is presented in Chapter 4.

The 'Key Programme' concept is further explained in Chapter 5.

Details of the Phase 1 proposal submission procedure and evaluation/selection processes are given in Chapter 6 and Chapter 7, respectively.

The entry of the final observation details, i.e. the Phase 2 process, and the reserved observations list

are described in Chapter 8.

Post-call modifications to approved proposals are addressed in Chapter 9.

A preliminary schedule of foreseen further calls is provided in Chapter 10.

Finally, Chapter 11 contains information on data products, programme deliverables and proprietary rights.

## 1.3. Acronyms

- AO : Announcement of Opportunity
- AOR : Astronomical Observation Request
- AOT : Astronomical Observation Template
- ESA : European Space Agency
- ESO : European Space Observatory
- FAQs : Frequently Asked Questions
- GT : Guaranteed Time
- HCNE : Herschel Confusion Noise Estimator
- HCSS : Herschel Common Science System
- HIFI : Heterodyne Instrument for the Far Infrared
- HOSS : Herschel Optical System Scientist
- HOTAC : Herschel Observing Time Allocation Committee
- HSC : Herschel Science Centre
- HSpot : Herschel observation planning tool
- HST : Hubble Space Telescope
- ISO : Infrared Space Observatory
- KP : Key Programme
- MS : Mission Scientist
- OT : Open Time
- PACS : Photodetector Array Camera & Spectrometer
- PDF : Portable Document Format
- PI : Principal Investigators
- SPIRE : Spectral and Photometric Imaging Receiver
- SST : Spitzer Space Telescope

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# Chapter 2. Key Programmes AO package

## 2.1. AO documentation

The Announcement of Opportunity (AO) for Key Programmes (KPs) package consists of the following documents:

- [Herschel Key Programme Announcement of Opportunity](#): This is the formal letter from the Director of the ESA Scientific Programme inviting the scientific community to apply for the Herschel Key Programme observing time.
- [Executive Summary](#): Summarises the document package, providing the reader with an overview and help on where to find the relevant information.
- Policies and Procedures (this document): The 'administrative' part of the call documentation, providing all necessary information about the policies adopted and the procedures to be followed.
- [Herschel Observers' Manual](#): Describes Herschel as an observatory facility, providing the background information that every proposer needs.
- [HIFI Observers' Manual](#): Provides instrument specific information and describes how to use HIFI to perform observations.
- [PACS Observers' Manual](#): Provides instrument specific information and describes how to use PACS to perform observations.
- [SPIRE Observers' Manual](#): Provides instrument specific information and describes how to use SPIRE to perform observations.
- [SPIRE/PACS Parallel Mode Observers' Manual](#): Provides specific information and describes how to use SPIRE and PACS simultaneously to perform so-called 'parallel mode' observations.
- [HSpot Users' Manual](#): Provides information about the Herschel observation planning tool HSpot and how to use it for the preparation of observing proposals.
- [Reserved Observations](#) : Information on the accepted set of GT KP proposals (proposal id, title, PI name and institution, and links to the abstracts) is provided in the AO web pages, together with instructions on how to access their associated AORs through HSpot as well as on how to search the database of Reserved Observations to avoid potential duplications.

Furthermore, there will be a special section of '[AO Latest News](#)', available through the web only. This will contain any late additions or corrections to the documentation package after the issue of the call for proposals. Proposers should consult these pages regularly.

## 2.2. AO tools

The AO package also includes the following tools:

- [HerschelFORM LaTeX package](#): This is the LaTeX package to be used for OT KP proposal generation. It consists of a template proposal form and several class and style LaTeX files to ensure that all proposals will share a standard format and follow the page limit rules defined in this document. It is based on the ESIFORM LaTeX package, originally developed by the ESO User Support System (USS) Department, adapted to Herschel needs.

- [Reserved Observations Search Tool](#): This is a java-based web tool developed at the HSC to search the so-called 'Reserved Observations List'. This is a list consisting of those observations already planned by GT KP proposers, which cannot be duplicated by OT KPs.
- [HSpot](#): This is the software tool for planning Herschel observations and submitting proposals, which has been built starting from the tool developed for the Spitzer Space Observatory called 'Spot', thus 'Herschel-Spot' or simply 'HSpot'. HSpot allows you to design, plan, and optimise an observation, and to determine how much time will be required to execute it. In addition, it also includes visualisation tools to permit the general observer to see how proposed Herschel observations will be laid out on the sky. The look and feel of this tool is that of the Spitzer tool, but it has been fully adapted for Herschel. It also performs background and confusion noise estimation. HSpot can be downloaded from the HSC web pages.

## 2.3. Associated documentation and tools

In addition to the main AO documentation and tools listed above, other complementary information and tools are also available through the HSC web pages. Among them:

- **Herschel Background Estimator**: This is the infrared background estimator provided in HSpot, which is an extended version of the tool developed for the Spitzer Space Observatory. The background estimator provides the total brightness at a given sky position, as well as the breakdown into its components over the entire Herschel wavelength range.
- **Herschel Confusion Noise Estimator (HCNE)**: The HCNE provides estimates for the confusion noise (i.e. uncertainty of flux determination due to the sky background) for the photometric bands of the Herschel PACS and SPIRE instruments. The confusion noise is specific for the selected observing mode and is derived considering the two main astrophysical components in the far-infrared: the Galactic cirrus and the cosmic infrared background.

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# Chapter 3. Key Programmes AO schedule

The sequence of dates for the Announcement of Opportunity (AO) for Herschel Key Programmes (KPs) is as follows:

- 1 February 2007 12:00 UT: The Herschel Key Programme Announcement of Opportunity is issued. Phase 1 Guaranteed Time Key Programme proposals can now be submitted.
- 4 April 2007 12:00 UT: Submission deadline for Phase 1 Guaranteed Time Key Programme proposals. Start of HOTAC process for these proposals.
- 30-31 May 2007: HOTAC meeting, after which the recommendation on Guaranteed Time Key Programme proposals was formulated and provided to ESA's Director of Science.
- 5-28 June 2007: Phase 2 data entry for the Guaranteed Time Key Programme proposals.
- 9 July 2007 12:00 UT: Announcement of Guaranteed Time Key Programme 'Reserved Observations'. Open Time Key Programme proposals can now be submitted.
- 25 October 2007 12:00 UT: Submission deadline for Open Time Key Programme proposals. Start of HOTAC process for these proposals.
- 18-20 December 2007: HOTAC meeting, after which the recommendation on Open Time Key Programmes will be formulated and provided to ESA's Director of Science.
- Mid-January to Mid-February 2008: Phase 2 data entry for the Open Time Key Programme proposals.
- 28 February 2008 12:00 UT: Announcement of accepted Open Time Key Programme proposals and observations.

Note that 12:00 UT refers to 12:00 hours (noon) Universal Time (UT=GMT). Central European Time (CET) is UT+1 hours, and Central European Summer Time (CEST) is UT+2 hours between 25 March and 28 October 2007.

After the call for Key Programmes there will be two additional rounds of calls for regular programmes both for GT and OT proposals, as specified in Chapter 10 below.

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# Chapter 4. Observing time

## 4.1. Available observing time

Herschel is designed to provide at least three years of routine science observations after the initial mission phases leading up to the science demonstration phase (see the [Herschel Observers' Manual](#)). Current plan is that after successful completion of the commissioning and performance verification phases a subset of the approved observations will be carried out following the recommendations made by the Herschel Science Team, in the so-called 'science demonstration' phase. Herschel capabilities will then be pushed to their limits in various aspects to evaluate and optimise the observation strategies (for sky coverage reasons, these observations will depend on the launch date).

Once the actual in-orbit performance of the instruments has been verified, it may be found that significant changes are needed in the definition of some observing modes. In that case, the PIs of the affected proposals will be required to update their observing plans to reflect the latest knowledge acquired in-orbit. When this last modification round will be completed, expected to happen around six months after launch, the routine science operations phase will start, and Herschel will then be made available for Key Programme (KP) observations both in the Guaranteed Time (GT) and Open Time (OT).

The total available observing time to be allocated to GT and OT observers in this minimum three year period of routine science observations is 19776 hours. This figure is obtained from 21 hours schedulable observing time per day for 3x365 days, minus 14% which has been reserved for observational calibration and engineering observations; i.e.  $(21 \times 3 \times 365) \times 0.86 = 19776$  hours.

Although there are many conceivable reasons for why the actual amount of available observing time may differ from this number, in both positive and negative sense, this nominally available observing time is adopted for conduction of the AO process.

## 4.2. Guaranteed and Open Time

As it has already been mentioned, the Herschel observing time is divided into Guaranteed Time (GT) and Open Time (OT). Of the total available observing time 32% is GT, i.e. 6328 hours for the 3 year mission. The remaining 68% of the time is awarded as OT, i.e. 13448 hours for the 3 year mission. A maximum of 4% of the Open Time can be allocated in programmes as discretionary time.

The GT holders and their allocated times are as follows:

- Instrument Principal Investigators (PIs) each own 30% of the GT, thus each instrument PI owns 1898 hours of GT.
- The Herschel Science Centre (HSC) owns 7% of the GT, thus the HSC owns 443 hours of GT.
- Mission Scientists (MSs) each own 0.6% of the GT, thus each MS owns 38 hours of GT.
- The Herschel Optical System Scientist (HOSS) owns the same amount of time as an MS, i.e. the HOSS owns 38 hours of GT.

## 4.3. Key Programme time

An important element of the Herschel mission is the concept of Key Programmes (see Chapter 5 below). The instrument PIs were required to spend a minimum of 50% of their GT on Key Programmes, although there was no specified maximum. There is no such requirement on the other GT holders. The current situation is that around 90% of the available GT time has already been distributed in the format of Key Programmes.

Regarding the OT, it is not possible to make predictions of the total amount of time that will be requested following this call, but the HOTAC will be allowed to distribute up to a maximum of 40% of the available OT in the format of Key Programmes.

Considered together, it is anticipated that the total time that will be allocated to Key Programmes as a result of this call for observing proposals will be about half of the total Herschel observing time.

## 4.4. AOTs and AORs

GT and OT proposers may apply to use any of the pre-defined instrument observing modes described in the Observers' manuals. These pre-defined observing modes or 'Astronomical Observation Templates' (AOTs) are made available through HSpot. Once an AOT has been chosen, the detailed observing parameters for that particular observing mode need to be entered using HSpot resulting in an 'Astronomical Observation Request' (AOR). AORs are the primary units of Herschel observing time.

## 4.5. Observing constraints

### 4.5.1. Scheduling strategy

Herschel observing will be conducted autonomously without real-time interaction. This means that observers are not expected to be present at the HSC while their observations are carried out. All observations have to be specified in full detail by the proposers using HSpot well in advance to the time when the observations will actually be executed. For a variety of reasons including efficiency, sky coverage and instrument operation constraints, Herschel mission planning will distribute the available observing time among accepted proposals on a 'per observation' (AOR) basis. This is the way other space-based facilities like the Spitzer Space Telescope (SST) or the Hubble Space Telescope (HST) operate, and it was also the case of Herschel's precursor, the Infrared Space Observatory (ISO). Similarly, it must be emphasised here that -for operational reasons- no guarantees can be given that any particular observation (AOR in the case of Herschel) within an accepted proposal will, in fact, be executed, although every attempt will be made to achieve this objective. Note that no grades are assigned to individual AORs accepted for execution. This means that the final scheduling sequence will be based solely on maximising the telescope observing efficiency.

### 4.5.2. Spacecraft 'slewing' overhead charges and time constrained observations

Slew times between observations are charged over all AORs as a flat 3 minutes overhead. This overhead time is automatically applied to all non-time constrained observations entered through HSpot.

However, time constrained observations can also be defined using HSpot. These are:

- All observations entered in HSpot using the timing constraints window.
- All observations entered in HSpot using the Group/Follow-on constraints, with the exception of concatenations
- Observations requesting an orientation constraint or a chopper avoidance angle.

Time constrained AORs reduce the flexibility of scheduling and the overall observing efficiency. For this reason they are further penalised, in terms of overhead charges, with a 10 minutes slew overhead in HSpot, instead of the 3 minutes applicable to non-constrained AORs. Programmes with heavily constrained AORs will need to be accompanied by a compelling justification.

Concatenated observations are charged 3 minutes overhead per AOR, unless observing the same target (no slew, see also below), then only 3 minutes overhead for the entire chain is charged.

If a concatenated chain is time constrained, then the overhead charge is 10 minutes for the first AOR, and 3 minutes for each following AOR, unless observing the same target, then only 10 minutes for the entire chain is charged.

Concatenation between 2 AORs is permitted:

- For scientific reasons as motivated in the proposal.
- For nearby targets. Two targets are nearby if they are separated in the sky by less than 1 degree. A target can be celestial (fixed position) or a solar system object (moving position).
- Using the same sub-instrument only: the applicable 'sub-instrument' definitions are:
  - The PACS photometer and spectrometer are separate 'sub-instruments';
  - The SPIRE photometer and spectrometer are separate 'sub-instruments';
  - The SPIRE PACS parallel mode is a separate 'sub-instrument';
  - The seven HIFI LO bands are separate 'sub-instruments';

### 4.5.3. Duplicate observations

In order to preserve the overall science efficiency of the observatory, duplicate observations will in general not be permitted. Checks for duplications will be made by the HSC during the processing of submitted proposals. First, among observations requested in GT Key Programmes and, at a later stage, among those requested in OT Key Programmes. The HOTAC will be informed of the existing duplications in each round of submissions and will assign priorities (and allocate time eventually) based on scientific arguments, if considered necessary. Otherwise, the duplicated observations will be blocked and the PI's of those proposals containing duplicated AORs will be contacted by the HSC. They will be informed about the identified duplications and recommended to adapt their observing programmes in the most efficient way to maximise the scientific return of the mission. This may imply the coordinated distribution of the duplicate observations among the proposals affected, saving time which can be used for including additional observations or deeper exposures of other targets; or sharing the data, if an agreement is reached by the corresponding PIs in this sense, increasing the synergies and/or complementarities between the observations originally proposed. Decisions adopted by the affected PIs must be communicated to the HSC before the observations are released for scheduling.

Duplications will be determined by consideration of the target observed, the observing mode used, the observation parameters (e.g. similar spatial coverage, size and depth of maps, considerable overlap between wavelength ranges when using the same instrument for spectra, same filters for photometric observations) and the scientific objective. The basic policy that will be followed to resolve duplication issues is that if the observation essentially duplicates the science, then it will be considered a duplicate observation.

Note that observations of the GT Key Programmes approved by the HOTAC will be reserved and the OT Key Programmes will not be allowed to duplicate any of these. The list containing the GT 'Reserved Observations' is available in the HSC web page and can be inspected by OT KP proposers using the [Reserved Observations search tool](#) so that they can avoid duplicating previously approved GT observations.

## 4.6. Targets of Opportunity

A Herschel target is considered a 'Target of Opportunity' (ToO) if the observations are linked to the occurrence of an event whose exact timing and/or location in the sky are unknown at the time of the proposal submission deadline. ToO targets include objects which can be identified in advance but which undergo unpredictable changes (e.g. some recurrent novae) as well as objects that can only be identified in advance as a class (comets, novae, supernovae, gamma ray bursts, etc.) Herschel proposals consisting of ToO targets in full or in part must present a detailed observing plan for the ob-

servations to be performed if the triggering event occurs. A generic name and dummy coordinates (if necessary) will be entered through HSpot for this purpose. Integration times will be estimated as a function of the brightness assumed for the event. Backup strategies can also be proposed (e.g. for not- so-bright comets). The triggering conditions and the reaction times necessary to accomplish the scientific goals proposed must be clearly described and justified in the proposal. The HOTAC may recommend the tentative allocation of observing time provided these conditions are met and the reaction times required are compatible with Herschel operational constraints. It will be the responsibility of the proposer to urgently submit a ToO activation request to Helpdesk in case the conditions approved by HOTAC are satisfied. He/she will provide as well all the necessary information to initiate the preparation of the observations updating the details of the observations originally included in HSpot, if needed, so that the observations can be programmed at the earliest possible time, considering the reaction times solicited in the proposal. In the event of a sudden phenomenon of a nature that could not have been anticipated, Herschel observations can also be requested through Director's Discretionary Time (DDT).

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# Chapter 5. The 'Key Programme' concept

The Key Programme concept has been introduced as a mechanism to ensure that large programmes requiring a great deal of observing time can be proposed, selected, and executed. This need relates to the science objectives of Herschel, in combination with the absence of a precursor mission for a large fraction of the Herschel spectral region.

It has been recognised that among the major scientific challenges to Herschel are topics which can best be addressed with large homogeneous programmes. These programmes form the survey type observations needed for follow-up studies in the second call for regular proposals. Also the Key Programme observations are expected to provide templates or examples for observations in the regular programme. In addition, the Key Programmes will form the foundation of Herschel's legacy, the data archive.

To be defined as a Key Programme an observing programme must have the following characteristics:

- exploit unique Herschel capabilities to address (an) important scientific issue(s) in a comprehensive manner;
- require a large amount of observing time (a minimum of 100 hours) to be used in a uniform and coherent fashion;
- produce a resulting well characterised dataset of high archival value.

It is clear that the scientific motivation for an observing programme needing a especially large amount of observing time has to be particularly high and well justified. The size of a Key Programme is foreseen to be in the range 100-1000 hours of observing time. While the lower limit is fixed and no smaller programmes should be proposed, there is no formal upper limit.

Key Programmes will involve a particularly large amount of observing time, much of it spent early in the mission, and will likely generate the need for follow-up observations. It is recognised that there are clear and legitimate science return interests for everyone, including the community at large, that:

- the data generated by these observations are reduced in a timely fashion;
- the resulting data products and the tools developed to produce them are made public.

Consortia proposing for Herschel observing time on the occasion of this AO need to demonstrate ability and commitment to perform data reduction and make products (at a 'publishable' level of quality) and related tools publicly available through the HSC at the end of the proprietary period.

Besides fulfilling their scientific goals, Key Programme consortia must provide data products which will:

- i) allow for early science exploitation by the community, based on the data products themselves;
- ii) provide the community with information usable as the basis of follow-up proposals for Herschel observing time during the mission.

The Key Programme consortia are also required to share the methods employed to generate the data products provided to the HSC. It is possible that these methods could be incorporated into or adapted for use in the standard HSC data processing software for public release.

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# Chapter 6. Phase 1 proposal submission

The response to this call for proposals is a two-phase process. Phase 1 is needed for every proposal while Phase 2 is only applicable to accepted proposals. In Phase 1, all proposals will go through peer review by the HOTAC, which will make a recommendation regarding the observations to be carried out to ESA's Director of Science who will take the formal decision about time allocation. During Phase 2, the final version of these observations will be entered by 'successful' proposers into the Herschel database following the recommendations made by the HOTAC under the technical advice of the HSC. In both cases (Phase 1 and Phase 2), Herschel proposals must be prepared using HSpot, the software tool provided by ESA. For OT KP proposals, it is mandatory that the PDF file uploaded through HSpot must be generated using the HerschelFORM LaTeX package distributed by the HSC. Proposals not generated using HerschelFORM will automatically be rejected.

The following subsections describe the procedures to be followed and forms to be used for Phase 1 proposal submission, as applicable for OT KP proposers.

## 6.1. Submission procedures

As described in the schedule in Chapter 3 the OT KP proposals are due in the period between 9 July and 25 October 2007. In order to be able to submit a proposal using HSpot, the Principal Investigator (PI) must be registered first in the HSC as a Herschel services user. This can be done by clicking the 'User Registration' button in the HSC web page and following the instructions there. By registering, users will also be joining Herschel e-mail distribution list(s) enabling us in the HSC to provide them with information as needed.

The HSC will provide support and answers to questions that may arise during the preparation of observing programmes through the [Herschel Helpdesk](#) web interface. Note that only registered Herschel services users are enabled to get support via the Helpdesk. To aid quick and accurate processing of queries, questions must be classified by the users according to pre-defined topics when they are submitted. Upon submission, they will receive an auto-generated e-mail with a ticket id (do not reply to this e-mail message!) which can be used to monitor the status of the query at any moment via the web interface. The expected timescale for reply is a few working days at most. A list of Frequently Asked Questions (FAQs) and answers, updated regularly, is also available from the Herschel Helpdesk web pages.

A valid proposal must be submitted using the HSpot tool and must request at least 100 hours of observing time to qualify as a Key Programme proposal. Remember that you need to be a registered Herschel services user to be able to do this. The latest HSpot version to be used for this AO can be downloaded from the 'AO documentation and HSpot tool' web page.

Registered users submitting proposals can verify that their proposals have successfully been received at the HSC using the [Proposal Handling](#) link under the Herschel User Services menu available from the HSC web pages. The user submitting the proposal is the proposal PI as seen by the system. The Proposal Handling System can be used by the proposal PI to define 'co-users' who can also view and update the proposal as many times as needed until the deadline. Only the proposal PI can define these 'co-users'. The actual updating and re-submitting of the proposal is done always using HSpot.

The submission of Open Time Key Programmes must be completed before 12:00 UT on 25 October 2007. Proposals (or updates of proposals) received after the deadline will not be considered.

## 6.2. Proposal contents

A Phase 1 proposal contains three parts which are all submitted simultaneously from HSpot, but can be updated separately. These are:

- The proposal 'cover sheet'
- The scientific justification file
- The observations as prepared with HSpot

The AORs and the cover sheet information are entered directly into HSpot while the scientific justification is a single PDF file which is generated with the HerschelFORM LaTeX package and submitted as an attachment to the proposal, as explained in Section 6.3 below.

The AORs and the cover sheet information created in HSpot can be saved to your local disk as text files and then reloaded in HSpot for further modifications as many times as needed prior to submission.

## 6.2.1. Cover sheet

The proposal cover sheet contains header-type information which is entered directly into HSpot by filling in the appropriate fields within the 'Proposal Submission Tool' window (under the 'Tools' menu in HSpot main window's toolbar).

- Select a concise title for your proposal
- Select the proposal type from the pull-down menu (either 'KPGT' or 'KPOT' for this AO, depending on whether the proposal is to be submitted to the 'Guaranteed Time Key Programme' call or to the 'Open Time Key Programme' call, respectively).
- Enter the total amount of time requested (in decimal hours) in the proposal as calculated by HSpot.
- Enter, one by one, the names, affiliations and e-mail addresses of your co-I's.
- Write a short abstract (no more than 2040 characters -including blank spaces-) describing the main features of your proposal.
- Choose one (and only one) among the science categories offered as a choice in HSpot into which you feel your proposal fits better from the broad Extragalactic, Galactic, or Solar System headings. This information will be used to distribute proposals to the panels for the review.
- Add any other text which you may consider convenient to be placed in the cover sheet (otherwise leave it blank).

Note that the PDF file containing the scientific justification of the proposal is not part of the cover sheet. It only needs to be uploaded at the precise moment when the proposal is being submitted.

## 6.2.2. Scientific justification

The 'scientific justification' part of the proposal must be contained in a separate PDF file which is ingested in HSpot as an additional input to the 'Proposal Submission Tool' window above described.

The PDF file must be generated using the HerschelFORM LaTeX style macros following a pre-defined template provided by the HSC. The class and style files, the template file itself and a Users' Manual containing all the information required to fill the template and generate the PDF file are all made available as part of the [HerschelFORM package](#) at the HSC web pages.

There is a strict limit in the number of pages allocated for each individual section of the proposal (see below). Please note that the text entered under a given section exceeding these page limits will not be visible in the output PDF file. Note as well that the maximum size of the resulting pdf file is 5 Mb (including figures). Any colour figure in the proposal should be interpretable even if printed with a black and white printer. The proposal contents and page limits (including figures and tables) are as follows:

### Science rationale (max 6 pages)

- Scientific goals. Proposals must indicate here the main science goals to be achieved and an explanation of why they cannot be met using other facilities or methods. A description of the relevance of the proposed science to astronomy should be given indicating why the Herschel capabilities are unique in advancing knowledge in the proposed area of research. This section should also clearly demonstrate that the proposed programme matches the three essential requirements for it to be defined as a 'Key Programme' (see Chapter 5).
- Science exploitation plan. This section should contain a brief description of the consortium plans to exploit the data from the scientific point of view in the first year after the observations have been made. The science plan should be readily comprehensible to broad-based scientists.
- Relation to observations with other facilities. If applicable, it should be outlined here how the proposed Herschel observations will be complemented by other data (past, present or future - Herschel or other facility), whether such other data are essential for the analysis and interpretation and how the Herschel observations may be followed up. Also details of any linked proposals with other observatories should be mentioned.

### Technical implementation (max 3 pages)

- Observing strategy. A detailed justification should be given here of the specific observing modes proposed and of the choice of observing parameters made. Arguments should be given here to support the overall observing strategy proposed. Information should be provided about criteria used for target selection, including quantitative descriptions of the expected target flux densities or surface brightness at the relevant wavelengths, required sensitivity, wavelength and coverage strategy (including redundancies).
- Observing time requirements. The total amount of time requested in the proposal should be justified here. The numbers provided should be based on the resource estimates calculated by HSpot. For Herschel OT KP proposals the full set of AORs must be submitted in Phase 1. The calculations presented should also demonstrate, if applicable, that the proposers have checked the background and confusion noise expected as derived from the available estimators, as well as the maximum expected flux densities or surface brightness in the fields of view or spectral apertures to be used.
- Other special requirements or constraints. Time constraints, concatenations, avoidance angles for chopper orientation, specific position angles for maps, or any other special requirement or constraint entered through HSpot should be justified here. In general, constraints are detrimental to overall mission planning efficiency. The lower efficiency is hidden in the longer average slewing times between observations. As already mentioned in Section 4.5.2, time constrained observations are charged for 10 minutes slew overhead instead of the 3 minutes applicable to non-constrained observations. The overheads applicable to every constrained observation entered through HSpot are automatically charged following the rules defined in Section 4.5.2).
- Robustness of the proposal against changes on instrument sensitivities. The impact of assuming different instrument sensitivities on timing needs should here be evaluated. In particular, the impact on the programme of sensitivity levels a factor of two better or worse than the nominal values should be outlined (corresponding to a factor of four in observing speed). This could involve decreasing/increasing the integration times or the number of sources/fields, or both. The arguments presented should be scientifically based, like e.g. the need to reach a particular photometric accuracy to arrive at scientifically valid conclusions. Note that if backup targets/fields are mentioned in this section, they will not be considered as reserved observations and can potentially be duplicated by other proposals at any moment during the Herschel mission lifetime as far as they do not become committed AORs.

### Data processing plans and archival value (max 2 pages)

- **Data processing and analysis plan:** for product generation, validation and delivery. The resources available to the Key Programme team on this area should be described here. The nature and scope of the data products and software tools will vary from one Key Programme to another, depending on the nature of the programme. It will be up to the applicants to specify in detail what they propose to provide and the benefits to the community.
- **Product generation methods.** In developing software for their own data-analysis purposes, Key Programme consortia are likely to employ a variety of coding languages, styles, levels of commenting and documentation, and platforms. It is required to provide clear documentation explaining and describing the assumptions, parameters, and algorithmic steps implemented in such a way that someone else could reproduce the results, detailed enough that the results can be independently verified. Use of HCSS, the Herschel specific software and data processing system is encouraged in order to make distribution and usage simple to other astronomers.
- **Archival value.** As emphasised in the concept definition of a Key Programme, the observational data are expected to have a long-lasting archival value. This means that the consortium will be expected to focus on certain aspects of the data and science case during the proprietary period, leaving other aspects for future exploitation open to the community. The baseline plans for data exploitation by the consortium are outlined in an earlier section. Here the envisaged archival value and long term benefits of the data set should be described. This should be based not only on the immediate data products which the consortium will provide at the end of the proprietary period, but on the final 'mature' products that are foreseen to be available eventually via subsequent more sophisticated data-processing and calibration.

#### **Management and Outreach plan (max 2 pages)**

- **Consortium resources and management plan.** This section should include an explanation of the strengths and track records of the team that make it appropriate for the project. It should contain a summary of staff and other resources that will be committed to the programme. Also the proposal should contain the consortium management and/or organisational structure and a brief summary of the project schedule and management plan.
- **Outreach activities.** This section should outline the team's plans on the publication and dissemination of the science results obtained with Herschel to a wider audience than the Herschel community itself. In particular, any systematic efforts planned on the area of sharing the new scientific knowledge provided by Herschel with the general public through outreach activities will be considered as a bonus in the evaluation process.

The following two sections are also required but not subject to page limitations.

#### **List of consortium members with associated roles**

- A list containing names, affiliation, status (i.e. professor, postdoc, student or else) and relevant qualifications (not full CVs!) of all investigators collaborating in the proposal. Particular emphasis should be made on the roles they are going to play in the work to be done, in connection with the management plan presented in the previous section. Here a list can also be given containing a small number of major publications made by the consortium members related to the proposed research.

#### **Observations summary**

- A few lines of text containing a high level, schematic description of the proposal observations indicating the kind of data that will be collected including the identification of sub-proposals (if such constituents can easily be identified). The text must be accompanied by a small summary table following the template provided in the HerschelFORM package.

### 6.2.3. Astronomical Observation Requests

These are the Astronomical Observation Requests (AORs) as prepared with HSpot, containing full details about the observing parameters which completely defines the way in which a given observation will be executed.

The submitted AORs should be the final ones you expect to have scheduled if the proposal is successful. In contrast to the KP GT part of this call, this time the entire set of AORs must be submitted already in Phase 1. No additional AORs, nor changes of targets or observing modes will be allowed in Phase 2, with the exception of those explicitly mentioned as backup targets/strategies in the original proposal. Otherwise, only the observation parameters of AORs already submitted in Phase 1 can be edited in Phase 2, if this is considered necessary by the proposer. Other changes will only be allowed if they have been recommended by the HOTAC, or by the HSC for technical reasons.

## 6.3. Proposal submission

Proposals must be submitted to the HSC electronically through HSpot, and shall be consistent with the page and format guidelines given in Section 6.2. Note that this is enforced by the usage of the HerschelFORM LaTeX package, which is mandatory.

When your proposal is ready to be submitted to the HSC you need to open a HSpot session and ensure that:

- your computer is connected to the Internet;
- the set of AORs loaded into the AOR window of HSpot are the ones associated to the proposal that you want to submit;
- the cover sheet information that you see in the 'Proposal Submission Tool' window is correct, including the total requested time consistent with the associated AORs;
- the PDF file to be uploaded containing the scientific justification file has correctly been chosen and corresponds to the proposal that you want to submit.

It is recommended to recompute all time estimates before proceeding with proposal submission. This will serve as an additional validation to ensure that the time requested on the cover sheet is consistent with the latest time estimation made by HSpot. If everything is OK, click on 'Submit proposal to the HSC' under the 'Submit' menu of the 'Proposal Submission Tool' window's toolbar. A new window will appear in your screen where you will be prompted to enter the username/password combination which is your identification as a Herschel services user (you have to be a registered user to be able to submit proposals!). Once this information is filled in, click 'OK' on this window and the submission process will start.

If the submission is successful an acknowledge window will appear with the message 'Your proposal was successfully submitted'. The proposal information (username and id assigned by the HSC to your proposal) will appear on the bottom of the Proposal Submission Tool window. However, this is not the final step in the process. Some time later, an e-mail message sent by the HSC to the submitter's e-mail address will confirm the successful reception and processing of the proposal at the HSC. Please check your e-mails to make sure that the submission process finalised without any problems. In case a problem is encountered during the processing of your proposal, the notification e-mail message will ask you to get in contact with the HSC Helpdesk.

Proposals must be submitted prior to the deadline. Please plan your submission early in advance to avoid any unexpected problem in the last minute.

If you have submitted an observing proposal, but have noticed that there are errors or parts of it which need to be revised or updated, there is no need to submit a 'new' proposal. You (or your co-users) can update the proposal by using the options 'Retrieve proposal from HSC' and 'Update proposal at HSC' under the 'Submit' menu of the 'Proposal Submission Tool' window's toolbar. After entering your username and password you can retrieve, update and re-submit your proposals (or those from your co-users) as many times as needed before the deadline.

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# Chapter 7. Proposal evaluation and selection

The proposals received by the submission deadline at the Herschel Science Centre (HSC) will be organised into four broad science topical areas based on the choice of 'science category' made by the proposer on the proposal coversheet. These Phase 1 proposals will then be made available to the Herschel Observing Time Allocation Committee (HOTAC) for evaluation.

The HOTAC will consist of 12 members plus the Chair, representing the science topical areas as follows:

- Cosmology (2 members)
- Galaxies (4 members)
- Interstellar Medium/Star Formation & Solar System (4 members)
- Stars & Stellar Evolution (2 members)

By having broad science topics and multiple members per topic HOTAC will be able to minimise potential institutional, professional and personal conflicts of interest.

For the Key Programmes (Guaranteed and Open Time) Announcement of Opportunity (AO) proposals the HOTAC will work as one single Committee under the leadership of the Chair. (For the later AOs the science topical areas above will correspond to a panel structure). All members of the HOTAC will have access to all the proposals electronically using the Herschel Proposal Handling System (PHS) tool.

The HOTAC will evaluate and recommend proposals for execution based on the following criteria:

- Science excellence and relevance of the proposed observations
- Uniqueness/need of Herschel observations to achieve the scientific goals proposed
- Technical merit/feasibility and robustness of the proposed observations
- Convincing plans for the data reduction and analysis
- Archival value and products to be delivered
- Consortium strengths and track records of individuals
- Outreach plan

During this process the HSC will assist HOTAC in the technical evaluation of the proposals, in particular regarding feasibility and duplication issues. After a reasonable time period the HOTAC members will be called to a formal meeting, where they will formulate a consolidated recommendation regarding which proposals be awarded observing time and how much. The Director of the ESA Scientific Programme will receive the HOTAC recommendations and take the final decision on which proposals will finally be accepted for execution.

The PI's of all proposals will be informed by electronic mail of the results of the proposal evaluation process. These results, as well as the comments made by the HOTAC during the meeting, will also be made available to the users through the Herschel PHS web pages where they (and their co-users) will be able to see the status of their proposals and AORs at any moment during the mission (submitted/accepted/rejected/scheduled/ executed/etc). Acceptance of a proposal may be conditional to e.g. modification/reduction of targets and/or observing modes in Phase 2. It has to be noted here

that -for operational reasons- no guarantees can be given that any particular AOR will, in fact, be executed, although every attempt will be made to complete all observations requests in accepted proposals.

The list of accepted proposals will be announced by the HSC through the web together with the overall statistics on the response and the results of the call. The information to be made public will contain only the following items:

- Principal Investigator
- Proposal title
- Abstract
- List of Reserved Observations associated to the proposal (as explained in the next section)

The remainder of the approved proposals, and the entirety of the proposals not selected, shall remain confidential to the extent allowed by the review process.

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## Chapter 8. Phase 2 data entry and reserved observations

The principal investigators of accepted proposals will be invited to Phase 2 of proposal preparation. Note that Phase 2 took place in June 2007 for the GT KP proposers and will take place mid-January to mid-February 2008 for OT KP proposers.

The purpose of Phase 2 is to finalise the proposed observations to committed observations. As already mentioned, change of targets or observing modes will in principle not be allowed, unless they were included in the original proposal as backups. Otherwise, only changes to the observation parameters of AORs already submitted in Phase 1 will be accepted. In case new observing modes become available between Phase 1 and Phase 2 the successful proposers will be informed of the kind of changes allowed to utilise the newly available modes.

The above rules are not applicable to those proposals where the acceptance by HOTAC was conditional to changes to the observations as they were submitted in Phase 1 or when technical problems were identified by the HSC which require observing mode changes to solve them. In this case, the required changes must be implemented in this Phase 2 and the HSC will ensure that they are consistent with the recommendations made.

The end result of Phase 2 is the list of committed observations which will also form the basis of the Reserved Observations list, which may not be repeated by proposers in further calls. Each call for proposals will be accompanied by a major update of the Reserved Observations List, where the new AORs will be added. While the OT KP call is open, no major changes will be permitted in the Reserved Observations List.

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# Chapter 9. Post-call modifications

Procedures are established to allow for these modifications if proposers consider there is a need to modify and refine approved observations after the call has been closed and prior-to-launch. They intend to allow some flexibility if the changes are oriented to maximise the scientific return of the mission. However, they will be restricted to the minimum, reviewed and approved by the HSC Community Support Group and requested through Helpdesk. The modifications made shall not alter the scientific content or intent of the original AOR and must be such that the programme stays within the originally allocated observing time. Major modifications will need to be reviewed and approved by the HOTAC.

It is very likely that the in-orbit performance will deviate from that anticipated prior to launch and that post-launch modifications will be needed in any case. Therefore the generic approach is not to modify pre-launch observation stepwise as the knowledge of the observing modes increases, but rather do the modifications in one go when the in-orbit performance is known.

Post-launch modifications will need to be made before the routine observations are started. This modification round will be initiated by the HSC according to guidelines provided at that stage. In case such a modification round results in abandoning some observations in the reserved observations list, those observations will be released for future proposals. This release will take place before the second call for guaranteed and open time regular programmes.

Note however that it may also happen that a significant change in observing modes occurs before the launch, making the proposed observations significantly outdated. In that case the HSC may request selected observations to be changed to reflect the latest knowledge prior to launch.

In cases where changes of the expected/verified in-flight performance of a given instrument or observing mode will result in seriously degraded scientific results for a given proposal (or a subset of proposals), the HOTAC may be consulted to evaluate the new observing conditions and take necessary actions.

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# Chapter 10. Further calls for proposals

After the call for the Key Programmes there will be two more rounds of calls for 'regular' proposals. Each round will consist of GT and OT parts.

The first round of regular GT programmes is planned to be completely defined before the routine observing phase of Herschel starts. The first round of regular OT programmes is planned to be announced after the in-orbit performance of Herschel is known.

The second call of regular programmes, GT and OT, is anticipated after about a year of routine operations. The exact timing will be decided later based on various mission aspects such as estimated lifetime, observing efficiency etc.

While the Key Programmes are specially designed to require large amounts of observing time with a 100 hour lower limit, there will be no restrictions regarding observing time attached to the the proposals submitted in response to the call for regular proposals.

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# Chapter 11. Data products, programme deliverables and proprietary rights

Generic Herschel data product levels are defined as following:

- Level-0 data products: Raw telemetry data as measured by the instrument, minimally manipulated and ingested into the mission data base/archive. Typically, readings are in binary units versus detector pixel number.
- Level-1 data products: Detector readouts calibrated and converted to physical units, in principle instrument and observatory independent. It is expected that level-1 data processing can be performed without human intervention.
- Level-2 data products: Further processed level-1 data to such a level that scientific analysis can be performed. For optimal results many of the processing steps involved to generate level-2 data may require human intervention, based both on instrument understanding as well as understanding of the scientific aims of the observation. These data products are at a publishable quality level and should be suitable for virtual observatory access.
- Level-3 data products: These are the publishable science products where level-2 data products are used as input. These are products not only from the specific instrument, but are usually combined with theoretical models, other observations, laboratory data, catalogues, etc. Their formats should be virtual observatory compatible and these data products should be suitable for virtual observatory access.

The data products are generated with HCSS, the Herschel specific data processing system. The Key Programme proposers should anticipate level-2 products to be provided by the HSC. The Key Programme deliverables must be beyond level-2 products and/or level-3 products as applicable for the particular project, such as for instance source lists or line lists.

All observations made in the first year of the routine phase will have proprietary times of 12 months, while for all observations made later, the proprietary time will be 6 months, with a simple 'bridging scheme' so that no observation will become public before observations that were executed earlier become public as well. The proprietary time applies to each observation individually, counted from the day when the data are made available to the initial data owner. However, a scheme will be put in place whereby the Herschel Project Scientist and the HOTAC Chair in consultation can grant additional proprietary time to certain large programmes, in order to prevent the release of improperly or inhomogeneously calibrated or processed data. Note that data resulting from routine calibration observations will generally enter the public domain immediately after they are processed unless duplicating a science observation.