HERSCHEL SPACE OBSERVATORY

Herschel Observation Planning Tool (HSpot) Changes in Version 4

HERSCHEL-HSC-DOC-0987, version 3.1 for HSpot v4.4
2009 October 8

Herschel Observation Planning Tool (HSpot) Changes in Version 4

Table of Contents

Chapter 1. Introduction

HSpot is a complex and evolving system to which improvements are being made through a series of planned new releases at key dates in the Herschel schedule. Many of these changes are essentially invisible to the vast majority of users (additional specialist functionality used only by the HSC or the expert users at the ICCs, cosmetic improvements, changes to the Spot core, improved characterisation of instruments, bug fixes, proposal handling changes, etc.), some though may have a significant impact on all users, particularly those related to time estimation.

The purpose of this document is to give a guide to the main changes that have been made in the Astronomical Observing Templates (AOTs) for each instrument since the release of the user version for the Science Demonstration Phase was made (HSpot v4.3). HSpot users who have prepared previously observations with HSpot should be aware that there are numerous changes that will affect already prepared Astronomical Observation Requests (AORs); these are detailed in this document. Time estimates that were previously prepared with HSpot v3.4 will be out of date and must be recalculated, although the differences are usually small.

Users are strongly recommended to read this document in conjunction with the relevant Observers' Manuals and the HSpot Users' Guide.

1.1. A note on changes made between HSpot v3.4 and v4.4

HSpot 4.4 is our routine operations version of HSpot. Now that we have launched and are entering routine operations, a whole slough of changes have been made to HSpot relative to the pre-launch version (3.4) to facilitate the post-launch updates of approved proposals, Science Demonstration Phase (SDP) proposal preparation and, eventually, Routine Time proposal preparation. At the same time, many updates have been made in the Spot Core that have been incorporated in these releases. However, the number of changes that general users will notice between the SDP version 4.3 and the latest release, 4.4, is relatively small.

No attempt is made to describe every single HSpot change. Here we describe only the major changes that will have a significant effect on the way HSpot works.

Chapter 2. General HSpot updates:

This section describes the main updates to HSpot, relevant to all users, which have been made since the release of the updated version for the Open Time Key Project was made (HSpot v3.4). Users are strongly recommended to read this document in conjunction with the HSpot Users' Guide.

2.1. General changes

- The Spot Core version incorporated into HSpot 4.4 is now 18.9.14, while HSpot 3.4 had 16.9.5. The Spot Core has thus advanced 35 versions since HSpot 3.4.

  - Implication for user: There are many small changes in the appearance of HSpot as well as new, or modified options. New text and screen shots have been incorporated into the HSpot Manual, where required.

- Windows Vista is now a supported HSpot platform.

  - Implication for user: Users with Windows Vista machines will now be able to install HSpot from the Windows installer.

- HSpot now runs on Java 1.6.

  - Implication for user: Users of Macs can only run HSpot 4.2 and later on machines with an operating system version of 10.5.1 or later, which, in turn, requires the machine that is used to have a duel core - this is effectively the case for Macs newer than about 3 years old, so it should only be an issue for users with older machines.

2.2. Time estimation changes

- All AORs in the HSC operational database have been Schema evolved from version 0.6 to version 0.7.

  - Implication for user: All time estimates for all AORs are now shown as out of date. AORs must be retrieved from the HSC database to be compatible with HSpot 4.2 and later. In general the time changes that will be observed will be trivial.

2.3. Visibility and display changes

- Target visibility rules have been updated

  - Implication for user: Shortly before launch it was decided to slightly reduce the area of sky visibility for Herschel. The new sky visibility is from 60.6 to 119.4 degrees solar elongation (previously 60 to 120 degrees). This has slightly reduced the visibility windows for targets near the ecliptic (typically by about 1 day) and has a somewhat larger effect close to the zone of permanent visibility.

- The AOR overlay bug has been fixed.

  - Implication for user: HSpot 4.2 and 4.3 would often refuse to display an AOR overlay unless an extremely large image was defined. This was an extremely irritating problem for users, although a workaround could be found. This bug has now been fixed and AOR overlays work correctly.

2.4. Proposal handling changes

- Science Demonstration Phase proposals are now visible to users.

  - Implication for user: PIs with a Science Demonstration Phase proposal will now be able to retrieve and modify it from the Proposal Submission Tool and submit updates.

Chapter 3. PACS-related HSpot updates:

This section describes the main updates to HSpot that are relevant to PACS users that have been made since the release of the updated version for the Open Time Key Project was made (HSpot v3.4). PACS users are strongly recommended to read this document in conjunction with the PACS Observers' Manual and the HSpot Users' Guide.

3.1. PACS Range Spectroscopy AOT, SED mode

The reference wavelength become a mandatory parameter in all SED modes. This will be used by the AOT logic to optimize the selection of the appropriate intergration capacitance and maximize the use of the available dynamic range.

- Implication for user: Observers are invited to provide flux estimates at reference wavelength for all PACS Range Spectroscopy observations. The coming AOT release (to be used for i.e. Science Demonstration Phase) will calculate the optimum use of detector dynamic range based on user input. In case flux estimates are not provided then the logic assumes high-continuum source and bright lines and will select the largest integration capacitor to prevent detectors from saturation. In this configuration a faint source could have reduced S/N even thought the integration time is properly adjusted. Please note, sensitivity estimates in HSpot assume the optimal use of dynamic range. Further information on flux ranges per integration capacitor will be provided in the PACS Users Manual once upon the completition of the Performance Verification Phase.

3.2. PACS Line Spectroscopy AOT, Wavelength switching mode

The wavelength switching observing mode has been re-designed, this option is made available only in mapping mode. Based on the latest ground calibration campaigns we expect strong signal transients in wavelength switching mode. This is due to i) strong gradients in the spectrometer relative reponse function over the scale of the switching amplitude, and ii) the spectral line itself could generate transients when switching on/off the profile. This instrumental effects could be eliminated on a satisfactory level if we measure the response of the system on an emission-free reference position using exactly the same technique as on-source. Data obtained on off-position is subtracted from on-target frames. This technique could be further refined during AOT validation in the PV Phase, especially for bright lines.

- Implication for user: In the last AOR update campaign (Phase2) HSC asked proposers to enter a 2x2 raster map in order to mimic the current scheme for an atomic observation (2x1 raster + 2 off-positions). Since Phase 2 the grating switching cycle has been updated as well, the atomic block durations are evolved as

- 3dither x 7switch x 3x0.25 sec plateau x 4 repetition = 63 sec sky time (Phase 2)
- 7dither x 5switch x 2x0.25 sec plateau x 4 repetition = 70 sec sky time (Phase 3)

Taking the example of the shortest observation, this 4 position raster had the duration of 724 sec (252s on-source, 163s calibration, 292s instrument overhead, 180s observatory overhead) in HSpot v3.4:

- 1x 63s rasterPoint1

- 1x 63s rasterPoint2
- 1x 63s rasterPoint3
- 1x 63s rasterPoint4
- 1x 180s observatory overhead
- 292s instrument overhead

  => 724 sec

In the new implementation the same AOR has a duration of 702 sec:

- 1x 70s rasterPoint1
- 1x 70s rasterPoint2
- 1x 70s rasterPoint3
- 1x 70s rasterPoint4
- 2x 70s offPosition
- 1x 180s observatory overhead
- 102s instrument overhead

  => 702 sec

Now, in Phase 3, the 2x2 raster can be reduced to 2x1 because the real off-position is implemented. This has the following implications on timing:

- 1x 70s rasterPoint1
- 1x 70s rasterPoint2
- 2x 70s offPosition
- 1x 180s observatory overhead
- 64s instrument overhead

  => 524 sec

Please note, in the auto-updated AORs the reference position is set to its defaults: zero degrees Ra/Dec offsets. A proper off-position has to be selected for each wavelength switching AORs by the observer. The slewing time to the off-position will increase the observation overhead, in the above example if the emission-free reference field would be 30 arcminutes away the total duration of the AOR would increase to 620 seconds. Concerning raster positions, for point-source observations a 2x1 raster can be specified with step size of few arcseconds (tipically 4-9"). In such a case the same sky position is seen twice and the corresponding rms sensitivity increases by sqrt(2).

3.3. Calibration block

The calibration block has been revised, a single key-wavelength grating scan is done in the same detector settings as optimized for the science block.

- Implication for user: The selection of key-wavelengths will be provided in the PACS Observers'

Manual.

Chapter 4. SPIRE-related HSpot updates:

This section describes the main updates to HSpot, relevant to SPIRE users, which have been made since the release of the updated version for the Guaranteed Time Key Project was made (HSpot v3.0.7). SPIRE users are strongly recommended to read this document in conjunction with the SPIRE Observers' Manual and the HSpot Users' Guide.

4.1. General changes to SPIRE AOTs

- There are no significant changes in the SPIRE front end in HSpot 4.2.

  - Implication for user: Users should find that time estimates only change due to the effects of the Schema evolution.

Chapter 5. HIFI-related HSpot updates:

This section describes the main updates to HSpot that have been made, which are relevant to HIFI users, implemented since the release of the updated version for the Open Time Key Project was made (HSpot v3.4). HIFI users are strongly recommended to read this document in conjunction with the HIFI Observers' Manual and the HSpot Users' Guide.

5.1. Major HSpot Front-end Changes

- Noise (and noise goals used by the time estimator) is now provided for COMBINED H and V polarisations of HIFI rather than a single polarisation.

  - Implication for user: For users who have choosen a noise goal for their observations, the time estimation will now be 30-40 percent shorter.

- All sensitivity and detector stability information has been updated to match on-ground instrument test values -- our best estimate of HIFI performance until we have in-flight measurements.

  - Implication for user: This will change time estimates to some degree, although in most cases only by a small amount.

- Several of the frequency ranges of HIFI bands have changed based on on-ground measurements.

  - Implication for user: The AORs have been updated in the operational database and in some cases, when close to a band edge, the measurement will have changed in the database from one sub-band to another. Where the range of a band has got larger or smaller, the time estimation for a full-range spectral scan will change by the corresponding amount.

- Warnings are now given of spurs in HIFI ranges.

  - Implication for user: The user will now get a warning if a chosen frequency may be affected by a spur and will receive basic advice on how to treat it.

- DBS overlays have been corrected.

  - Implication for user: There was a bug in HSpot that caused DBS overlays to be wrong in some circumstances; the correct overlays are now displayed.

- HIFI Beam sizes have been corrected in AOR overlays.

  - Implication for user: HIFI beams were incorrectly scaled in the visualisation tool; this has now been corrected and the overlaid beams are now the correct size.

Chapter 6. SPIRE PACS Parallel Mode-related HSpot updates:

This section describes the main updates to HSpot that have been made, which are relevant to SPIRE PACS Parallel Mode users, implemented since the release of the updated version for the Guaranteed Time Key Project was made (HSpot v3.0.7). Parallel mode users are strongly recommended to read this document in conjunction with the SPIRE PACS Parallel Mode Observers' Manual and the HSpot Users' Guide.

6.1. General changes to SPIRE PACS Parallel Mode AOTs

- There is a small change in the turnaround time for Scan Maps.

  - Implication for user: Users will find that time estimates increase by approximately one second per scan leg with respect to HSpot 3.0.7.