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## **Guidecam User Manual**

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all	Several updates due to the release of v2 (June 2017)
4.2.5, 6.4, 6.3	v2.1 Included AOF star selection, and MUSE and HAWK-I AO modes



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# 1. Scope

This document introduces the use of the Unified GuideCam tool, a Java-based observation preparation tool that aims to unify as many as possible, potentially all, ESO/VLT instrument-specific preparation tools in just one tool, the unified GuideCam tool. The public version of the unified GuideCam tool is described here and deals with VIMOS, VISIR, HAWK-I, and MUSE.

# 2. Related Documents

## 2.1 Applicable Documents

The following documents, of the exact version shown, form part of this document to the extent specified herein. In the event of conflict between the documents referenced herein and the content of this document, the content of this document shall be considered as superseding.

AD references shall be specific about which part of the target document is the subject of the reference.

AD	Document Nr.	Version	Document Title	Part / Section
AD1	VLT-MAN-ESO-3486		HAWKI User Manual	
AD2	VLT-MAN-ESO-3509		VIMOS User Manual	
AD3	VLT-MAN-ESO-3514		VISIR User Manual	
AD4	VLT-ESO-261650		MUSE User Manual	

## 2.2 Reference Documents

The following documents, of the exact version shown herein, are listed as background references only. They are not to be construed as a binding complement to the present document.

RD Nr.	Document Nr.	Version	Document Title
RD1	VLT-MAN-ESO-14610-3512		VISIR GuideCam User Manual

# 3. Introduction

This document describes the use of the Unified Guidecam tool (GUCT). GUCT is a highly interactive tool that unifies individual instrument-specific phase2 preparation tools, which



in previous ESO observing periods were offered only as stand-alone single tools. In the current version, GUCT is offered for HAWK-I, VISIR, VIMOS, and MUSE and replaces and unifies the VISIR specific GuideCam tool, the VIMOS specific GuideCam tool, as well as PILMOS. Furthermore, GUCT is strongly recommended to be used for observation preparation and the creation of finding charts for OBs designed for the above mentioned instruments. It is mandatory to use GUCT for the preparation of VIMOS imaging, pre-imaging, and PILMOS OBs. The tool uses the Aladin Sky Atlas (Aladin v9.0) for the visualization of the telescope and instrument fields. **If you do not have Aladin v9.0 already installed on your machine, it will be downloaded together with the GUCT tarball** (download from <http://www.eso.org/sci/observing/phase2/SMGuidelines/GUCT.generic.html>).

Also, GUCT can directly interact with P2PP (version 3.4.2 or higher), as well as with the new web-based p2 (<https://www.eso.org/sci/observing/phase2/p2intro.html>), in order to attach finding charts, to retrieve information on the instrument/mode setup or to propagate acquisition template parameters, such as guide star coordinates, to the OB.

### 3.1 Definitions, Acronyms and Abbreviations

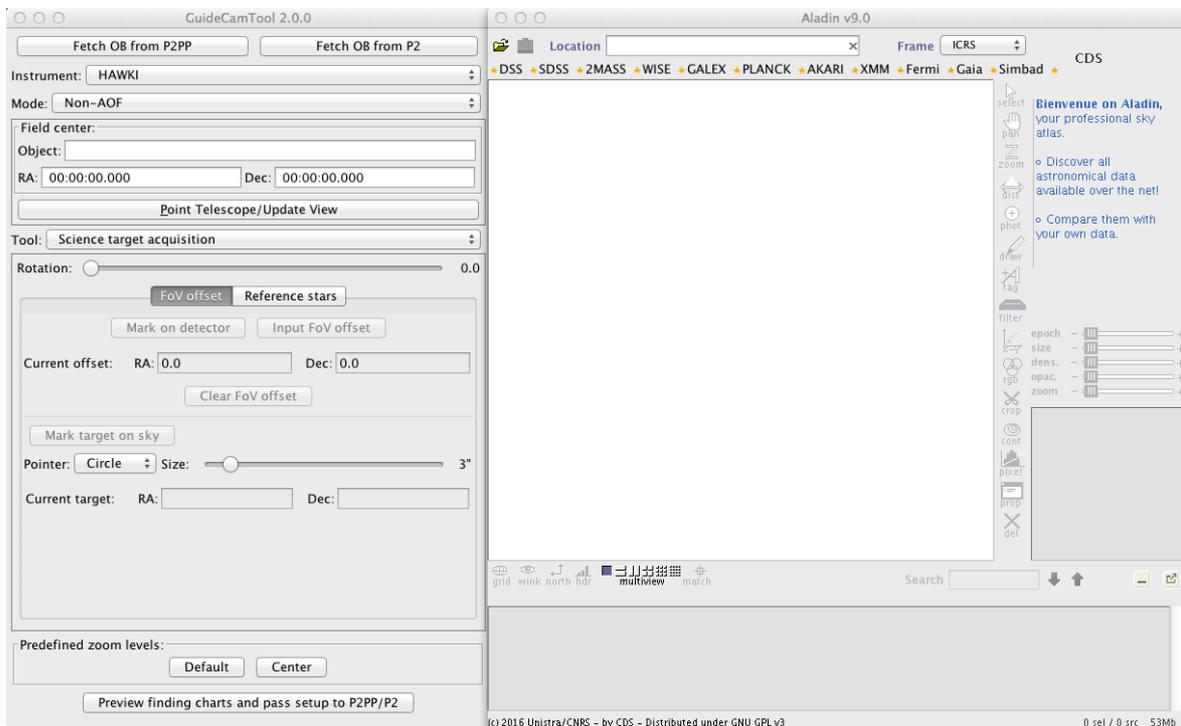
This document employs several abbreviations and acronyms to refer concisely to an item, after it has been introduced. The following list is aimed to help the reader in recalling the extended meaning of each short expression:

AO	Adaptive Optics
AOF	Adaptive Optics Facility
Dec	Declination
FoV	Field of View
FC	Finding Chart
GP	Guide Probe
GS	Guide Star
GUCT	Guide Cam Tool
OB	Observing Block
P2PP	Phase 2 Proposal Preparation
RA	Right Ascension
RS	Reference Star
TTS	Tip-Tilt Star
UCD	Unified Content Description
VLT	Very Large Telescope
WFS	Wave Front Sensor

## 4. Start up and common features

Using GUCT is relatively simple. After download and installation (see <http://www.eso.org/sci/observing/phase2/SMGuidelines/GUCT.generic.html>), issue the command `./GuideCamTool` in the `/bin` directory of the GUCT path. Figure 1 illustrates the two main panels which pop up:

1. the control panel (on the left) and
2. the Aladin window (on the right)



**Figure 1: Guidecam tool components. Control window on the left, and Aladin window on the right.**

When the GuideCamTool is started for the first time it automatically creates a configuration file called `default.json` under `~/GuideCamTool/preferences/`. This file should not be edited (!), but in case GUCT does not start up properly, one should remove `default.json` and start anew.

**From the GUCT control panel** the user defines the most important parameters that are relevant for the observation. The control panel consists of several parts:

1. Instrument and mode selector (see Sec. 4.1).
2. Target field selection (see Sec. 4.1).
3. The *Tool* box, which is a drop-down menu from which the user can select 'tasks' to perform the science target acquisition, the VLT guide star selection, design the offsets and jitter strategies, or select the AO and tip-tilt star set-up. Note that each instrument can have a slightly different set of 'tasks' that can be selected from the drop-down menu (see Sec. 4.2).

4. Pre-defined Aladin sky view zooms (see Sec. 4.3).
5. Finding Chart creation and parameter propagation to P2PP (or P2) (see Sec. 4.4).

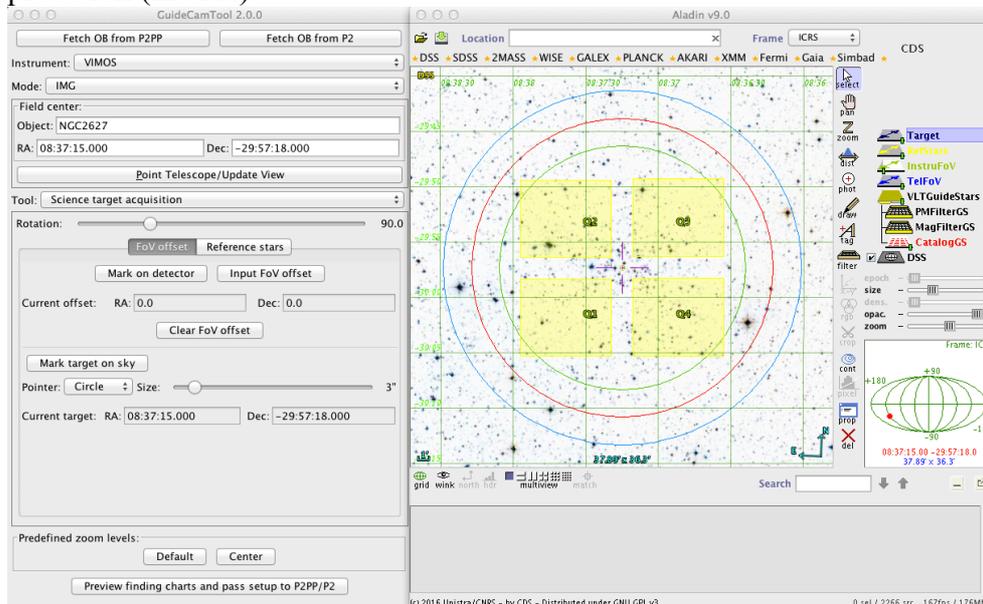
In the following we describe in detail these main parts offered by the GUCT control panel, which are mostly instrument independent. In Sec. 6 we describe the instrument-specific features.

## 4.1 Instrument selection and telescope pointing

From the instrument and mode drop-down menu the user first selects an instrument, and then an associated specific instrument mode. Alternatively, the instrument and mode can be retrieved from P2PP (or P2) using the “Fetch OB from P2PP” (or “fetch OB from P2”) button at the top of the GUCT control panel, **if P2PP is running** and an OB with at least an acquisition template has been defined within P2PP (or P2) and is selected.

Then, the next step is to point to a target, or target field, on sky. This is done either by entering the target coordinates (in J2000 and using the format hh:mm:ss.sss and dd:mm:ss.sss) in the RA and Dec fields of the ‘Field center’ section of the control panel, or by writing the target name in the ‘Object’ field (and pressing enter!), which will be resolved by Sesame using Simbad, NED and VizieR. You may also fetch the coordinates from P2PP (or P2) if you already have an OB with OB target coordinates defined.

When pressing the ‘Point Telescope/Update View’ button, GUCT will download either a respective DSS image (for optical instruments) or a 2MASS image (for near-infrared instruments). The image on sky will appear in the Aladin panel, together with some instrument specific features: the instrument field of view (in yellow), the un-vignetted and 10% vignettted telescope fields of view (in green and red, respectively), and the guide probe rail (in blue).



**Figure 2: The VIMOS imaging FoV outlined in yellow, superimposed on the DSS image shown in the Aladin sky view. In red is the radius corresponding to the maximum search radius for suitable guides stars.**



The example in Figure 2 is for VIMOS in imaging mode pointing to the Galactic star cluster NGC 2627. The target is located, by default, at the center of the field and shown as a red circle.

**Important note:** clicking “Point Telescope/Update View” button will erase most of your previous settings, e.g. chosen guide star or Tip-Tilt stars, blind offsets, observing offsets, etc. So, think twice before clicking it.

#### 4.1.1 Loading of user images into Aladin sky view

In order to use your own image (fits image with WCS information) for display in the Aladin sky view, you should first enter the approximate RA and Dec of the image center in the GUCT control panel and ‘Point the telescope’; the Aladin sky view will load the default catalog image for the chosen instrument. Only after the default image has been loaded you can ‘replace’ it with your own image by choosing from the Aladin menu: “File” → “Open local file”.

## 4.2 Tool box

The *Tool* box is a drop-down menu from which the user can select different tasks in order to define the detailed strategy of the observations. Note that each instrument can have a slightly different set of tasks. In the following we describe all of them.

#### 4.2.1 Science target acquisition

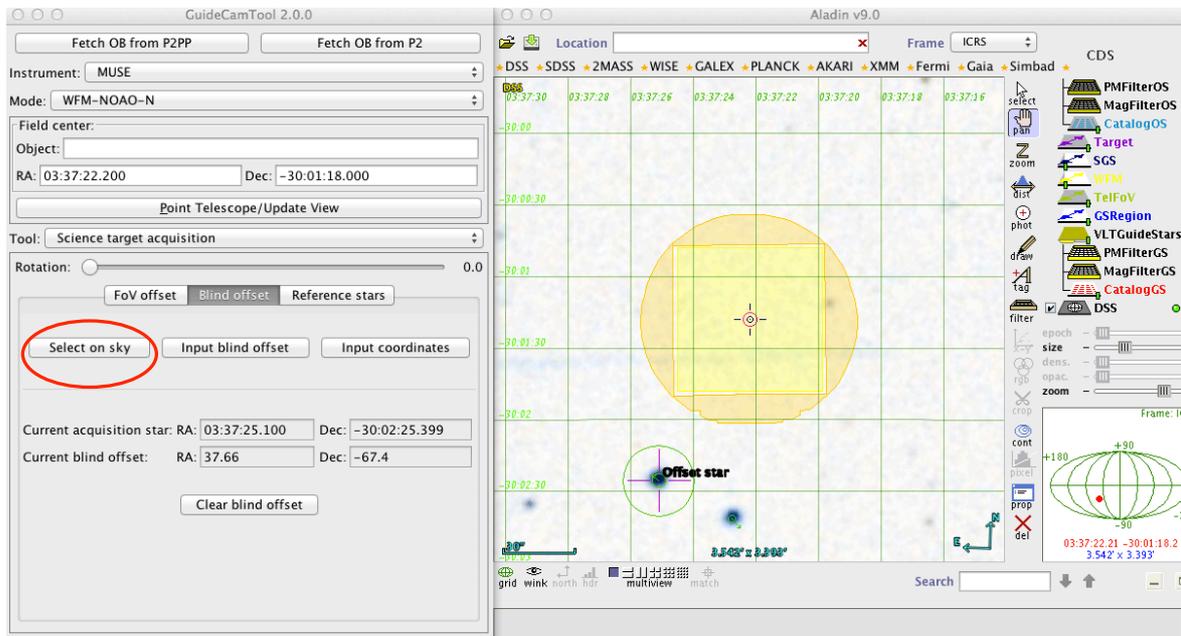
With this task you prepare everything that concerns the acquisition of your science target beyond the initial telescope pointing, such as the use of blind offset stars, any fine-tuning of the telescope pointing, as well as the graphical marking of the science target or of any additional reference stars on the Finding Chart.

In the control panel use the ‘Tool’ pull down menu and select ‘science target acquisition’. By default, the science target is the center of the chosen instrument FOV (target field center) and marked with a small red circle. The instrument FOV can be rotated using the rotation slider of the GUCT control panel (the resolution is 0.1 degrees) – simply click and drag it. The slider can also be adjusted with the up/down or left/right arrows. Double-clicking on the rotation slider sets rotation back to the default angle. Keeping the arrow keys of your keyboard pressed, the FOV rotation in the Sky view is continuously updated; this can be very useful when you want to bring a certain star into a detector gap, for example, or when setting the position angle for a binary star observation.

Next, you may want to define a *FOV offset* that is applied to the original pointing. This can be done either via interaction with the Sky view image (use “Mark on detector” tab) or by choosing the “Input FOV offset” tab which will bring up an input window to type in the offset for RA and DEC in arcseconds. Upon entering the offsets the view on sky will update and you can check if you are happy with the new FOV pointing. If not, simply use “Clear FOV offset” and try again.

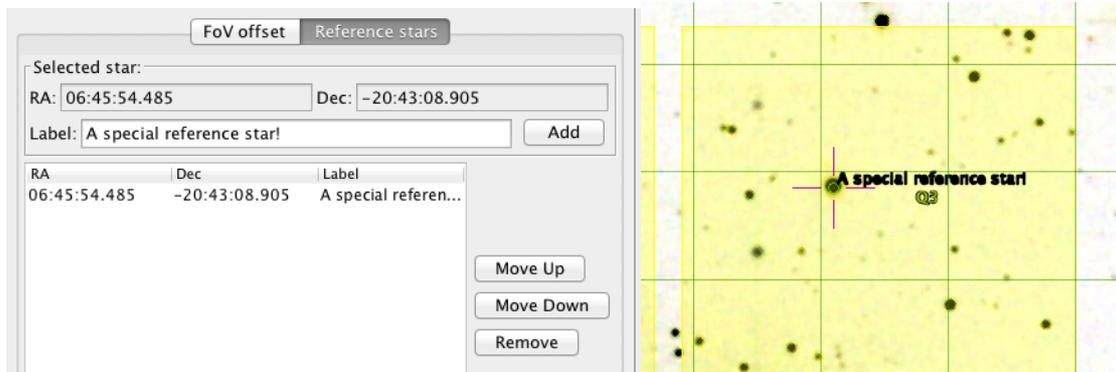
*Blind offsets* are offered for some instruments, e.g. in case the science target itself is too faint to be acquired directly. If you do not know a priori which star shall be used as the blind offset acquisition star, GUCT can be particularly helpful. Select the “Select on sky” tab under “Blind Offsets”. This will overplot suitable blind offset stars (green circles with proper motion vectors) on the Aladin sky view. To select an offset star, simply click on it. Its coordinates and distance to the FOV center will automatically be calculated and

displayed in the GUCT control window. An example for MUSE blind offset acquisition is illustrated in Figure 3.



**Figure 3 Example for MUSE blind offset star acquisition. The MUSE field (yellow area) is devoid of bright stars. Therefore, the user chooses to select on sky an acquisition star that is nearby and bright. Once the acquisition star is selected (by click) it is automatically encircled and marked with “Offset Star”. Its distance to the MUSE FOV center is reported in the control window (in this case the acq star is located roughly 38” to the East and 67” to the South of the MUSE field center).**

*Reference stars* are typically bright stars or features visible in the FOV that are marked by the user to bring it to the attention of the night observer. Reference stars can be used to control the pointing of the field (for example: “keep this star always on pixel 340/578”), or to point out any special feature. To specify a reference object and annotate it (with free text) in a finding chart, select the “Reference stars” tab. Then, click on the desired star/position (free selection) in the sky view, the coordinates will appear in the control panel. The user must then input a label and click on ‘Add’. The label and the reference star, marked with a circle, will appear in green in the Aladin panel (see figure 5); the reference star will also appear in the reference star list in the control panel, where the user can add up to three reference stars, re-order or remove them.



**Figure 4: Example of reference star selection**

The label of the reference star, once printed on the display, can only be edited by double clicking the text in the "Label" column.

Finally, please check if you have marked your science target properly. In case your science target is not in the center of the field, but somewhere else in the field, it should be marked, with your preferred choice of pointer symbol, in the following way:

- Click first on "FOV offset", then on "Mark target on sky" and click on the specific target object or feature in the Aladin window.

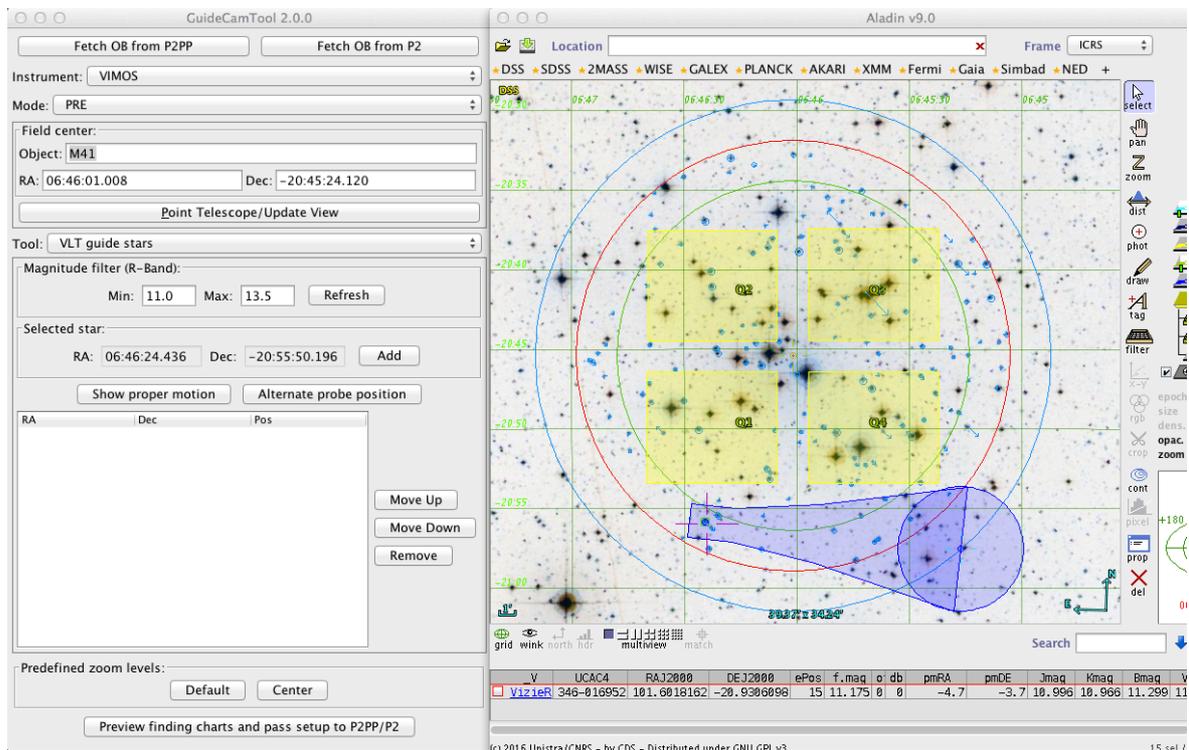
The science target's coordinates will appear in the bottom of the UGCT control window and later be saved in the Finding Chart metadata. The target can be indicated with a circle, arrow, slit, or resizable box using the pointer pull down menu, and will appear in red in the Aladin window.

#### 4.2.2 VLT Guide star (GS) selection

Selecting the 'VLT Guide stars' from the Tool drop-down, it is possible to define one or more telescope guide star(s). Candidate GSs are drawn from the UCAC4 catalog and shown in the Aladin panel as blue circles, with an arrow indicating the proper motion direction and its length being proportional to the proper motion value (but in arbitrary unit!). The radius of the circle is proportional to the stellar magnitude. Proper motion components can be toggled on/off by clicking the "Show proper motion" tab.

By default, the displayed GSs are within the magnitude range 11 to 13.5 mag, but the range can be changed by editing the 'magnitude filter' min/max values in the control window in case the standard mag range does not provide suitable GSs for a certain target field. The minimum and maximum permitted values are 10 and 14. With the faintest GSs, some degradation of the active optics correction might occur, depending on seeing, airmass, Moon, possible extinction by thin cirrus, and position of the GS in the field of view (vignetting beyond 11 arcminutes). To the extent this is possible, stars brighter than 13.5mag should be chosen. Stars close to the center of the field (without causing vignetting) are preferred. Too bright objects may result in poorer correction as well. How do you actually choose a GS? Simply select with a mouse click the desired GS, and the projected shadow of the telescope Guide Probe (GP) onto the telescope focal plane will show up, as illustrated in Figure 5. **Note:** the selection of a guide star is only possible if the select button is on in the right-hand side of the Aladin window (see Figure 6). Also, note that the selection is effective only when the mouse pointer turns into a hand symbol (it

might be necessary to zoom in a bit). The selected star will blink. Its coordinates, magnitudes at different filters, proper motion etc. are reported in the bottom part of the Aladin window. The GP can be positioned on a given guide star in 2 positions, called positive and negative (POS and NEG). The latter is referenced to as alternate position. By selecting the corresponding button ‘Alternate probe position’ in the GUCT control panel, the probe will be positioned on the same star on its alternate position. This option may allow to reduce or even remove the vignetting that may be present in the other position. Vignetting of the instrument FoV occurs whenever the GP shadow intercepts the instrument FoV (yellow rectangles).



**Figure 5: Example of Guide Star selection. The guide probe (GP) shadow and the GP rail are indicated in blue. The magnitude range of the shown GSs can be controlled via the ‘Magnitude filter’ in the control panel.**

Once a suitable GS has been identified the selection of the GS is finalized by pressing the ‘Add’ button next to the logged RA/Dec coordinate of the GS in the GUTC control panel. The GS coordinates and probe position will be added to the GS list. An additional (alternative) GS can be selected. The list (with max. 2 guide stars) can also be re-ordered. The coordinates of the first GS in the list will be transferred to P2PP (or P2) and automatically filled in to the respective OB acquisition template parameters via clicking the “Pass setup to P2PP/P2 (see Sec 4.4). Both, the first and second GS’s coordinates are saved in the metadata part of the finding chart.



Figure 6: Aladin select tool

### 4.2.3 Observing Offsets

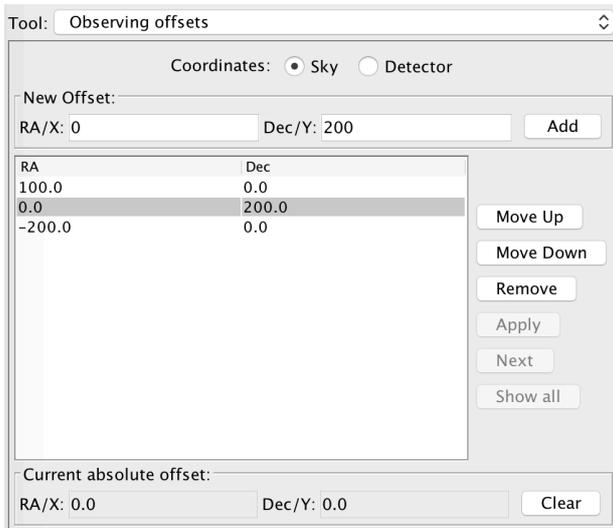
Select the ‘Observing Offsets’ tab in the ‘Tool’ pull down menu to enter offsets. This will allow you to visualize step-by-step the offsets that you plan to define in the science template(s) of the OB. It is particularly useful to check for large offsets if any of the shifted target fields will be affected by vignetting from the guide probe arm.

Offsets must be provided in arcseconds and are entered manually (see Figure 7). They can be either in the SKY or DETECTOR coordinate system, consistent with the offset convention of the respective instrument. The entered offset will appear in the GUCT offset list by clicking on the ‘Add’ button. By convention, offsets are always relative to the previous offset.

To apply an offset and see the instrument FOV shifted in the Aladin window, you can either double click on the row in the list or select it and click on ‘Apply’: the telescope pointing will shift by the corresponding amount in the Aladin sky view window.

It is possible to re-order the offsets list by selecting a row and clicking on “Move Up” or “Move Down”. To view the original position of the telescope you can click on ‘Clear’ (see Figure 7). Sending the list of offsets to the respective instrument science template of the OB is currently not possible. Therefore, it is recommended to take note of the offsets and insert them manually into the science template of the actual OB (don’t forget to choose in the OB the same offset coordinate system, SKY or DETECTOR, as you have selected in GUCT).

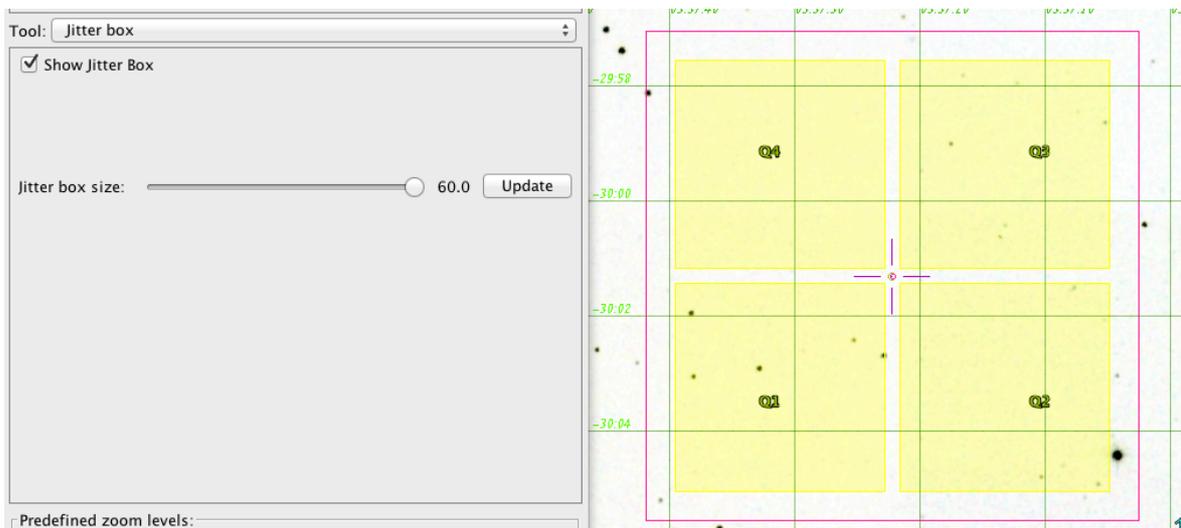
Finally, you may want to check the total field-of-view covered by the offsets altogether, which is visualized by clicking the ‘Show all’ button.



**Figure 7: Example of an observing offset list**

#### 4.2.4 Jitter box

The “Jitter Box” feature intends to show the user the maximum spatial extent, i.e. the borders of the box within which a science image could fall, if a jitter box is specified in a science template of an OB. To display the jitter box in the Aladin sky view window check the “Show jitter box” check box. A big pink square, surrounding the instrument FOV appears. The example in Figure 8 shows a jitter box of 60arcsec around a HAWK-I FOV. It can be seen that the bright star just outside the HAWK-I field, at the South-West edge, will most likely fall onto the HAWK-I detector during a jitter offset.

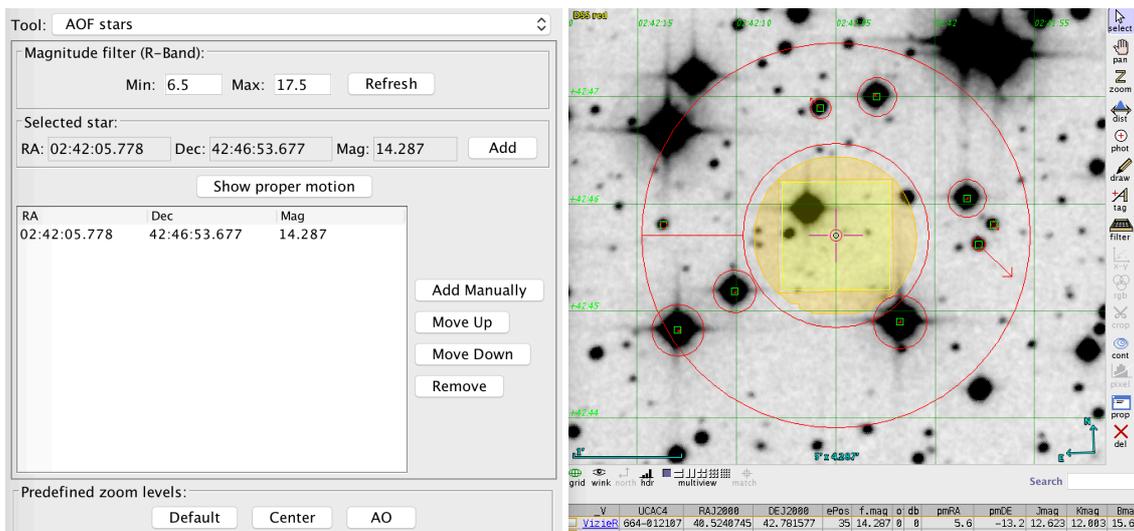


**Figure 8: Example of a jitter box (exterior pink box) of 60arcsec around a HAWK-I FoV (right hand side of the Figure). The bright star just outside the South-Western edge of the field will most likely fall onto the detectors during a jitter offset.**

#### 4.2.5 AOF stars

With the ‘AOF stars’ task one can easily select tip-tilt stars (TTS) or a natural wavefront sensing guide star for those instruments/modes using the Galacsi or Graal AO

modules. Upon selecting the ‘AOF stars’ task the Aladin sky window will show on your target field all suitable TTS marked with red circles and little green squares (see Figure 9, right). Two large concentric red circles refer to the region where suitable TTS must be located. Select a TTS by clicking on it in the Aladin window. Once its coordinates and magnitude appear on the GUCT control window click the ‘Add’ button (see Figure 9, left). Up to two TTS can be selected. It is advised to take into account the size of the offsets that you intend to define in the observing template, and to make sure that the TTS is not lost after a telescope offset.



**Figure 9: AOF star selection panels. Left: the AOF stars tool for MUSE AO observing modes. Right: the DSS-red image with suitable AOF stars overplotted as red circles.**

There is also the option to manually select a TTS (click button “Add Manually”) in case there are no suitable stars marked on the Aladin display. This could be the case for faint stars that are not present in the UCAC4 catalog, which is the reference source catalog used by GUCT.

### 4.3 Pre-defined zoom levels

Pre-defined zoom levels are implemented in order to provide the user with one click optimized views in the Aladin Sky view panel. The zoom levels either show the FOV with the position of the Guide Probe included (default zoom level), or are centered on the target, or show the full FOV, or the AOF star selection, for example. The pre-defined zooms are also the ones used by GUCT when the default set of finding charts is created.

### 4.4 Finding chart (FC) generation

At the end of the observation preparation with GUCT, i.e. after having completed all the mandatory and desired optional steps described in the previous sections, a finding chart should be created (for VIMOS imaging, pre-imaging and PILMOS the FC creation with GUCT is mandatory). In the finding chart metadata, GUCT saves the information of the



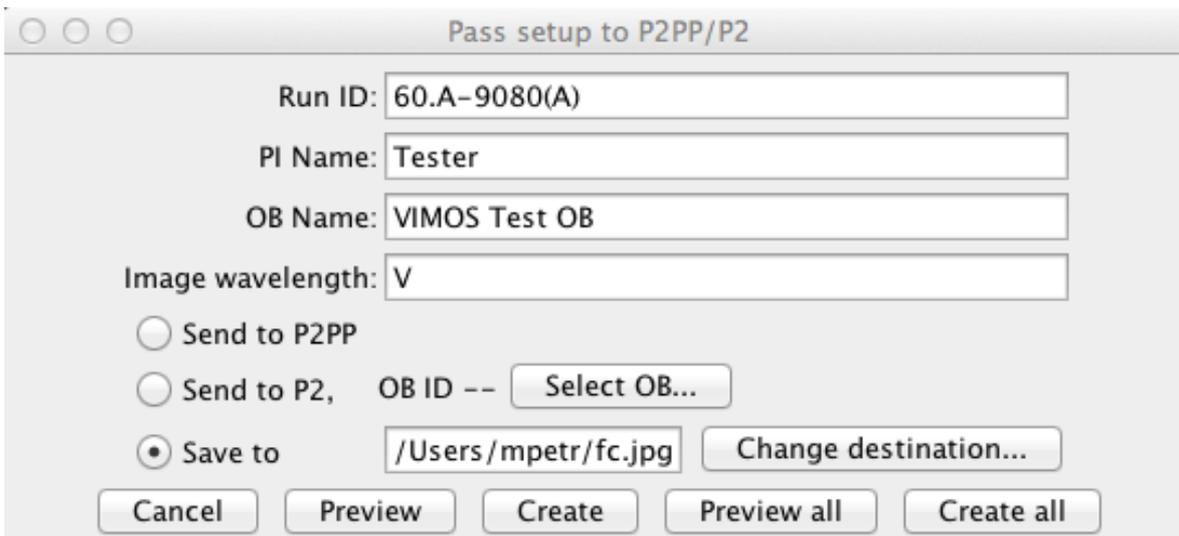
selected GS(s) (coordinates, probe position POS or NEG), the target field center, selected instrument rotation angle and further instrument-specific parameters. In order to benefit from the automatic updating of OB parameters, and ensuring the consistency between the attached FC and actual OB content, it is highly recommended to have P2PP/P2 running and the respective OB highlighted when saving the finding chart in GUCT. Generating and saving a FC without interfacing to P2PP/P2 is possible, but note that if the FC is then attached to an OB later, the automatic fill in of OB parameters or any check on instrument consistency will not work.

The “Preview finding charts and pass set-up to P2PP/P2” action at the bottom of the GUCT control window will open a pop-up window (Figure 10). Insert all the requested information; these will be saved in the FC metadata and also appear in the Finding Chart upper left corner. Alternatively, you can have RunID, PI name, OB name prefilled, if you do a “Fetch OB from P2PP/P2” from the GUCT control panel before clicking “Preview finding charts and pass set-up to P2PP/P2”. **But be careful**, in case the OB that is currently highlighted in P2PP does not have the same, e.g. target coordinates as your target field in GUCT or is for a different instrument, these parameters/settings will get overwritten in GUCT, and your preparatory work might be lost. So, better type in RunID, PI name, OB name by hand unless you have retrieved these info already at the beginning of your GUCT preparatory work, in which case it will appear already filled in. When all information are in place the buttons “Preview”/“Preview all” and “Create”/“Create all” will become enabled. You can check how the FC will look like by pressing the ‘Preview’ buttons.

Then, there are 3 options

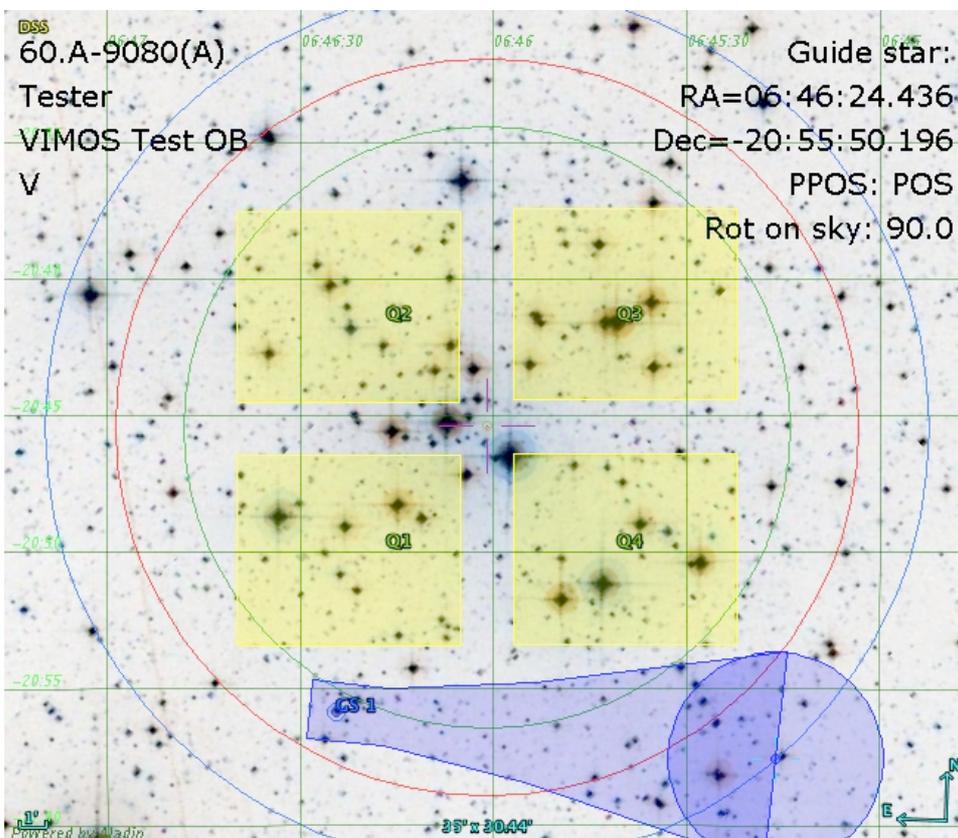
- 1) Send to P2PP: will create and attach the FCs to an OB in P2PP, as well as transfer acquisition relevant parameters to the OB acquisition template.
- 2) Send to P2: will create and attach the FCs to an OB in the web-based P2 tool, as well as transfer acquisition relevant parameters to the OB acquisition template.
- 3) Save to: will create and save the FCs, but not transfer parameters to P2PP/P2.

After you had chosen one of the options you should click on “Create” or “Create all”. The difference between these two is that either the current sky view is used for the FC (Create), or the default FC views required for the respective instrument are used (Create all).



**Figure 10: Pop-up window which prompts the user to insert mandatory information before the FC is created.**

An exception to this is VIMOS pre-imaging, for which the FC will always be centered in the telescope center and display the whole FOV of the telescope with the guide probe clearly shown; see example in Figure 11.



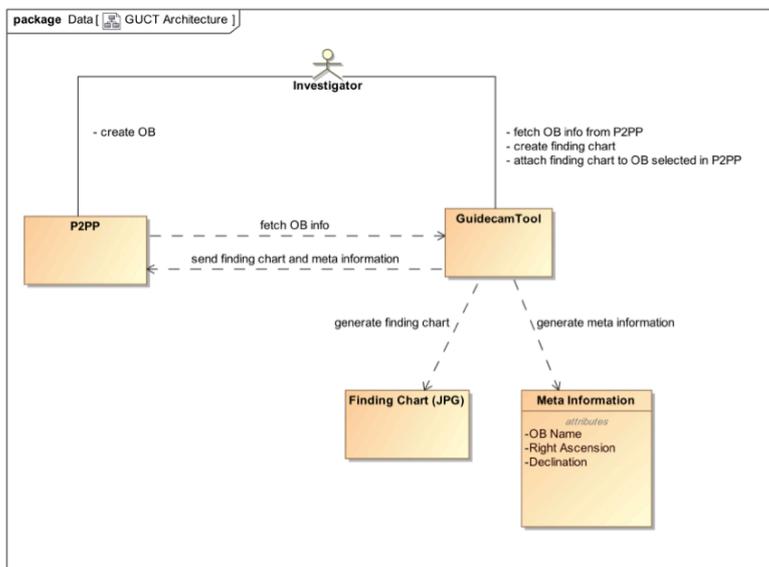
**Figure 11: Example of a VIMOS pre-imaging finding chart generated with GUCT.**

Some “good to know” reminders:

- Check that you have the correct OB highlighted in P2PP/P2 when sending the FC from GUCT to P2PP. A finding chart cannot be send to the wrong instrument but it could be send to the wrong instrument mode.
- FC names must be unique. It is not allowed to attach an additional FC to an OB if a FC with identical name is already attached to the same OB.
- Finding Charts are attached and added sequentially to one and the same OB as often as they are created and send by GUCT to the same OB, although the maximum current limit is 5 FCs per OB. Attention: if you have changed any settings/parameters, e.g. the target field center, in your second, third, ... FC that you are going to attach to the OB, then the OB parameters will also be updated when sending the second, third, ... FC to P2PP.
- GUCT will always save the FC before sending it to P2PP.
- GUCT creates FCs in JPEG format and with a maximum size of 1MB.

## 5. Interface with P2PP

The GuideCam tool can be used in tandem with P2PP (version 3.4.2 or higher) and the web-based P2. This is recommended, because it minimizes the user's efforts and possible mistakes. Figure 12 illustrates how the GuideCam tool is interfaced with the java desktop application P2PP3.



**Figure 12: Schematic of the unified GuideCam Tool - P2PP interface**

The recommended sequence of actions is as follows:

- In P2PP/P2, chose the appropriate run folder and create an OB, with at least the acquisition template defined. Assign an OB name.



- In P2PP/P2, select the OB.
- In the GUCT control panel, click on “Fetch OB from P2PP” or “Fetch OB from P2” (check the instrument specific information if your run should be prepared with P2PP3 or P2): the tool will retrieve all relevant information, including instrument, instrument mode, PI name, OB name, Run ID...
- In GUCT, insert the target field center coordinates of GUCT.
- For VIMOS img, pre-img, and pilmos, select the GS and the GP position.
- In the GUCT, perform all necessary actions to create a finding chart (Sect. 4.1 to 4.3) and click on “Preview finding charts and pass set-up to P2PP/P2”. The window shown in Figure 10 will pop up with all the relevant information already filled in: Run ID and PI Name are read only, the OB Name is editable and the bandpass of the catalog image in use in the present Aladin window must be entered manually. Select ‘Send to P2PP’ or ‘Send to P2’.
- Click on “Create”: the finding chart will be attached to the OB in P2PP/P2, and all the relevant information will be sent back to the acquisition template. See the Appendix for a list of the generic and instrument/mode dependent information that are transferred.

The unified GuideCam Tool exports all relevant parameters entered into the GUCT control panel to the metadata (EXIF section) of the FC. Thereby, these data become available to the external verification module (EVM) in P2PP, allowing further automatic checks on the correctness of the OB and the consistency with the FC. The metadata MUST NOT be edited.

## 6. Instrument specific features

### 6.1 VIMOS

The current version of GUCT incorporates four VIMOS modes:

- imaging (IMG),
- pre-imaging (PRE),
- integral field spectroscopy (IFU)
- pre-imageless multi-object spectroscopy (PILMOS)

Please see AD2 for additional details. These modes can be selected using the ‘Mode’ pull down menu. The default mode is PRE. Jitter offsets cannot be executed in any VIMOS templates and therefore the Jitter box tab is not available in the ‘Tool’ drop down menu.

#### 6.1.1 IMG and PRE

These modes are basically identical from the GUCT point of view. The only difference is that in PRE mode the generated finding chart is always centered in the telescope pointing center and displays the whole field of view ensuring that the guideprobe positioning is clearly visible. **The selection of at least one guide star is mandatory for IMG and PRE-imaging VIMOS OBs.** For PRE-imaging the default value of 90 degrees on sky rotation angle must not be modified unless a waiver is requested (note: for certain declinations also 0 degrees rotation angle is permitted). Since the VIMOS acquisition template for IMG and

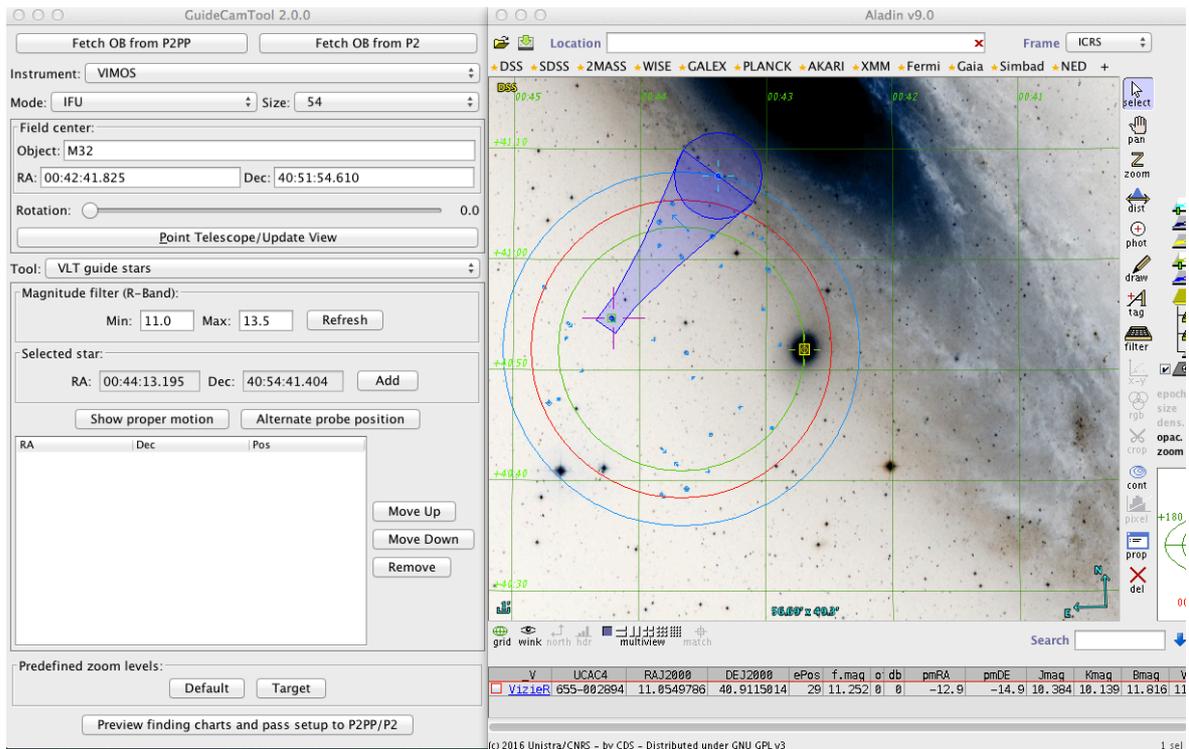


PRE-imaging is identical, GUCT cannot distinguish between the 2 modes when “Fetch from P2PP” is executed and by default sets the PRE mode. The user has to change it manually to IMG mode when one actually wants to prepare an observation for VIMOS IMG. Similarly, the default field rotation angle is 90 deg, which should be changed to the desired angle in case of IMG mode.

### 6.1.2 IFU

Figure 13 illustrates the GUCT realisation of the IFU mode. The target in this case is M32, and the tool points the telescope FOV center such that M32 is in the center of the IFU field of view. For VIMOS set at PA=0deg the center of the FoV of the IFU is located approximately 667 arcsec West, and 1.6 arcsec South of the telescope field center (see Figure 13 and please consult AD2 for more information). Again, in the GUCT control panel the target field center coordinates correspond to the center of the IFU, this is also consistent with the coordinates that should be specified in the VIMOS/IFU OB.

The guide star selection is optional, but in case it is specified it is recommended to choose a GS close to the telescope FOV center. A potential problem during IFU OB acquisition is that the target to be observed cannot be seen in an acquisition image once the IFU has been deployed. In this case, the telescope FOV usually helps the operator and/or the night astronomer to check whether or not the telescope is presetting to the desired position. For this reason, it is required to create a  $\sim 5$ arcmin x 5arcmin FC based on a DSS view of the field centered on the IFU target coordinates. The field of view of the chosen IFU mode is automatically drawn by GUCT on the Aladin sky window. Furthermore, it is mandatory to mark as a reference star, the closest visible star to the IFU center. The label given to the reference star shall give the distance in arcsec to the IFU FoV center. The requirement of using the DSS is mandatory, and motivated by the need to ensure that all the objects in the finding chart can be identified in the Guidecam display used at the telescope.



**Figure 14: Example of the IFU mode. The IFU FoV is indicated by the small yellow box located to the West of the telescope FoV center, almost on top of the green circle.**

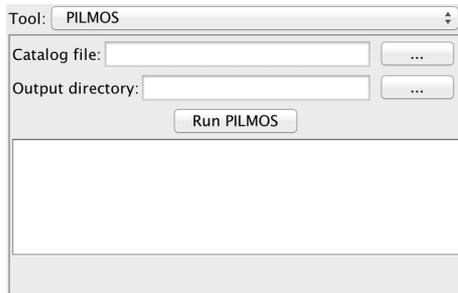
### 6.1.3 PILMOS

Users who want to take advantage of the pre-imagingless MOS mode should use the PILMOS application, which is now incorporated in the unified GuideCam tool. PILMOS has been offered to VIMOS users since June 2012 and allows to create VMMPS compliant catalogues and simulated pre-images from user supplied catalogs, which then serve as input to the MOS preparation software VMMPS. For a full description of PILMOS please see the PILMOS tutorial in the VIMOS User Manual. The following webpage: <http://www.eso.org/sci/observing/phase2/SMGuidelines/PILMOS.html> provides further recommendations and preconditions under which PILMOS can be used.

GUCT users who wish to use PILMOS must download and install the GUCT package appropriate for their operating system (supported systems: Mac OSX or Linux).

When you select the mode PILMOS in the GUCT control panel you'll see the 'External Tools' button labelled 'PILMOS' at the bottom of the GUCT control window. If you select it you will see the PILMOS panel in the control window (Figure 14). However, before running PILMOS you must select a suitable GS, by using the 'VLT Guide stars' option under the 'Tool' menu. Once the GS has been defined, and the associated finding chart saved, you can proceed with PILMOS:

In 'Catalog file', upload a contributed catalog that will be passed to PILMOS. This catalog should contain at least three columns: Object ID, RA and Dec, but can have additional columns; see the PILMOS tutorial of the VIMOS user manual for further information. Then, in 'Output directory' chose the name of the directory where PILMOS shall save the output simulated pre-images and catalogs. Finally, press 'Run PILMOS'.



**Figure 15: PILMOS panel in the control window**

Running PILMOS will take a few seconds during which no feedback is given on the screen, so please be patient. If everything goes smoothly, you should get four catalog files, named:

`pilmos_B.1_vm_1.cat`

`pilmos_A.2_vm_1.cat`

`pilmos_A.3_vm_1.cat`

`pilmos_B.4_vm_1.cat`,

and four simulated pre-images:

`pilmos_B.1_sim_1.fits`

`pilmos_A.2_sim_1.fits`

`pilmos_A.3_sim_1.fits`

`pilmos_B.4_sim_1.fits`,

which can then be used to run VMMPS.

## 6.2 VISIR

GUCT supports the two operation modes of VISIR:

- Imaging (**IMG**)
- Slit spectroscopy (**SPEC**)

VISIR is located at the VLT-UT3 Cassegrain focus, meaning that vignetting is not affecting the GS selection usable area, and therefore only the red circle (maximum search radius for guide stars) is indicated in the Aladin sky view, but not the green circle. The selection of a GS for VISIR observations is not mandatory, but very useful for the following reasons. Because the sky is extremely bright in the mid-IR which severely limits the sensitivity, plus the VISIR field of view is small, VISIR images can often appear empty in short to medium length exposures. However, objects may become visible in longer ones. Combining different exposures taken on different nights may be tricky if a proper astrometric alignment is not carried out. Since the overall astrometric accuracy of an image is actually limited by the accuracy of the GS coordinates, it is strongly recommended that all OBs of the same field use the same GS, in particular for faint objects. In addition, objects within (optically) dark molecular clouds may have very few suitable guide stars, such that the telescope operator will most likely have to spend some time for searching for a good GS. Considerable amount of telescope time will be saved if such cases are identified before an OB is started, and an appropriate GS is already specified in the OB.



### 6.2.1 IMG

In **IMG** mode, once the target has been selected and the field shows up in the Aladin panel, one can select a guide star. As mentioned above, the selection is optional. GUCT further allows to visualize the size of a jitter box (max. 10 arcsec) to check if an applied random jitter might cause problems with other bright nearby stars.

### 6.2.2 SPEC

In the case of **SPEC**, GUCT will draw the slit selected from the list provided in the “Size” pull down menu. The slit will appear in the Aladin window and is oriented in the North-South direction when the position angle on sky is 0. The position angle can be changed with the rotation slider. The selection of a GS is optional. Jitter is available for this mode, although only along the direction of the slit. The position of the science target is by default fixed at the slit center, hence the science target tab of the ‘Tool’ menu is disabled. If for whatever reason you don’t want your science target at the slit center at the start of the acquisition procedure, you should specify the appropriate RA/Dec coordinate in the GUCT target field center box which corresponds to the slit center.

## 6.3 HAWK-I

The current version of GUCT supports two different HAWK-I modes:

- **Non-AOF** (standard imaging without adaptive optics)
- **AOF** (adaptive optics assisted imaging)

Two further modes, **Non-AOF fast photometry** and **AOF fast photometry** will be added in future releases.

The present release of GUCT should be used only for the phase2 preparation of the non-AOF mode, as the AOF mode is not offered for general use yet.

### 6.3.1 Non-AOF

This is the straightforward imaging mode of HAWK-I without any adaptive optics support (please see details in AD1). The selection of a GS is optional. GUCT efficiently supports the observing preparation by allowing the user to check the field positions of any planned offsets (use the Observing Offsets tab in the ‘Tool’ drop down menu of the GUCT control window). HAWK-I service mode users should ensure that bright stars saturating the detector, won’t be present in any of the planned offset positions. Additional target field offsets, as part of the HAWK-I acquisition template in order to avoid a target to fall into the gaps between the detectors, can be applied and displayed in the Aladin Sky view (see section 4.2.1 – FOV offset).

### 6.3.2 AOF (without choosing a TTS)

The HAWK-I AOF mode uses 4 Laser Guide Stars to sense atmospheric distortions and compensates for the lowest layers of the atmospheric turbulence. The laser guide stars are pointed towards areas located just outside the HAWK-I FoV, and therefore telescope guide stars can only be selected outside 8.7 arcmin from the FoV center in order to avoid vignetting with the laser guide stars. This is being taken care of in GUCT when selecting the HAWK-I/AOF mode. It is not mandatory to choose a tip-tilt star (TTS) in the ‘AOF stars’ tool, in which case no TTS information is transferred to the HAWK-I LGS



acquisition template. This set-up is generally referred to as the ‘TTS-free mode’. Since the lasers follow every telescope offset, the preparation of ‘TTS-free’ OBs, in terms of observing offsets for example, is very similar to the non-AOF mode.

### 6.3.3 AOF (full AOF including TTS)

This mode is not offered yet, although it is included in the GuideCam tool. It allows to select up to two tip-tilt stars (TTS) besides the GS. The TTS should have a R-magnitude in the range 6-16.5 mag, and must be located at  $8.2' \pm 0.5'$  radial distance from the HAWK-I science target. Upon the TTS selection, GUCT automatically calculates the (binding!) FoV position angle associated with each selected TTS. The information on the TTS (Ra, Dec, position angle, etc.) can be transferred to the HAWK-I LGS acquisition template in P2PP/P2.

## 6.4 MUSE

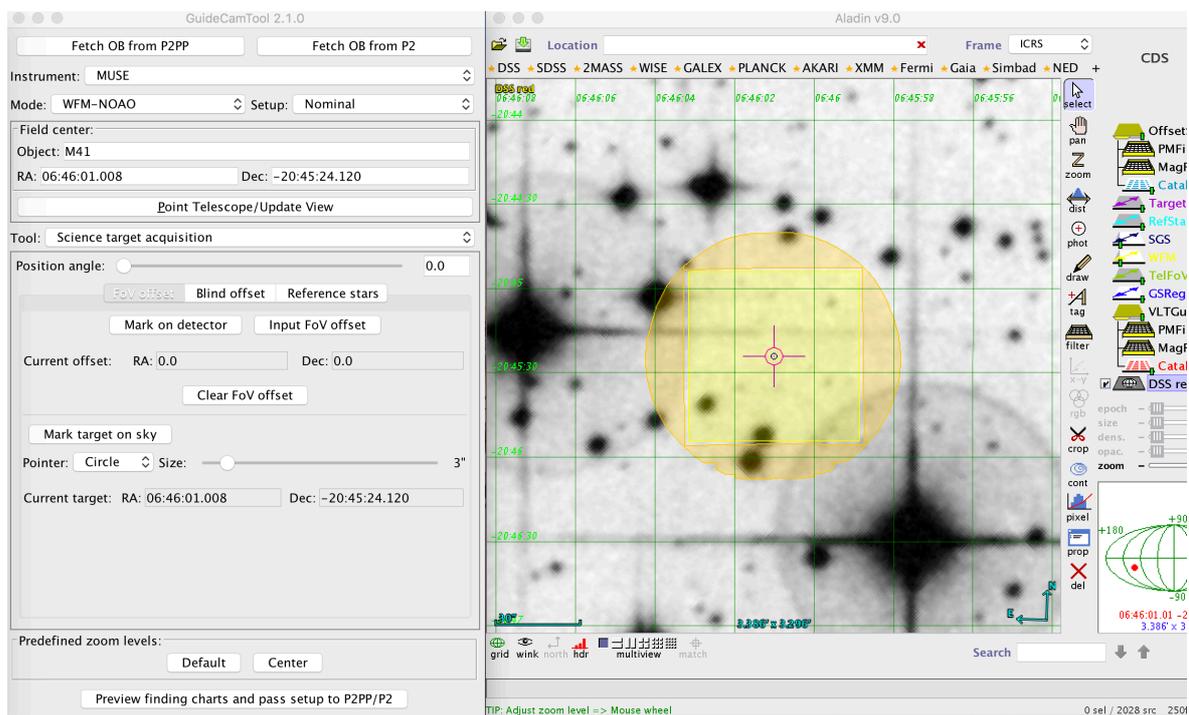
The current version of GUCT supports three different MUSE modes:

- **WFM-NOAO** (wide-field mode no adaptive optics)
- **WFM-AO** (wide-field adaptive optics supported mode with GALACSI)
- **NFM-AO** (narrow-field adaptive optics supported mode with GALACSI)

The present v2.1 release of GUCT should be used only for the phase2 preparation of the non-AOF mode and the WFM-AO mode. The narrow-field AO mode is not yet offered.

### 6.4.1 Wide-field mode noAO (WFM-NOAO)

The non-AOF mode WFM-NOAO has two setups, nominal and extended, which can be selected from the dropdown menu next to the mode selection. In terms of the preparation with GUCT, there is absolutely no difference in behaviour or functionality between the nominal and extended set-up. The only difference is in the OB acquisition template where the set-up must be defined. Figure 16 (right) shows the MUSE FoV footprint, where the light yellow indicates the actual science field-of-view and the darker yellow region is the Slow Guiding Sensor (SGS) area.



**Figure 16:** The GUCT control panel (left) with the MUSE WFM-NOAO mode selected and the FOV footprint targeting the M41 cluster (right). The outer dark yellow region represents the SGS area.

Specific to the MUSE part of the “Observing offsets” tool is that also the “rotator angle on sky” can be specified and is visualized in the sky view.

### 6.4.2 Wide-field mode AO supported (WFM-AO)

For operational reasons it would be very helpful that for all OBs where 2 TTS are defined, TTS1 is always brighter than TTS2. However, this is not a strict rule and PIs might have a good reason for assigning different priorities. It should also be noted that for all exposures tagged as ‘OBJ’ the TTS-AO loop must be obviously kept closed. To ensure this the selected TTS should be always located between 52” and 107” from the centre of the FoV. Offsets meant to take ‘SKY’ exposures are performed with the TTS loop open, therefore in those cases the distance of the FoV centre from the selected TTS does not matter.



## 7. Keyboard shortcuts

Here we provide the list of implemented shortcuts, to execute specific commands within the Guidecam tool. The keyboard modifier is cmd for OS X and CTRL for Linux. These are either displayed by underlining the first command letter, or by positioning the mouse on the corresponding tab.

- **F**: fetch from P2PP
- **P**: point telescope
- **T**: move to science target tab
- **G**: move to Guide star selection tab
- **R**: move to reference star selection tab
- **O**: move to offset tab
- **J**: move to jitter tab
- **S**: save finding chart

## 8. List of keywords passed to P2PP

The Guidecam tool interacts with P2PP and assigns or updates information in the acquisition template of a given OB. Some information are instrument/mode dependent, some others are generic.

The following information assigned or updated to a selected OB are generic:

<b>OB-level parameters</b>	
<b>Parameter</b>	<b>Value</b>
OB name	Name as input by user for FC generation
TEL.TARG.ALPHA	Target Right Ascension
TEL.TARG.DELTA	Target Declination

<b>generic acquisition template parameters</b>	
<b>Parameter</b>	<b>Value</b>
TEL.AG.GUIDES TAR	'SETUPFILE'
TEL.GS1.ALPHA	right ascension of 1 <sup>st</sup> guide star
TEL.GS1.DELTA	declination of 1 <sup>st</sup> guide star

In the following, instrument/mode dependent information are provided.



## 8.1 VIMOS

<b>VIMOS specific acquisition template parameters for IMG, PRE</b>	
<b>Parameter</b>	<b>Value</b>
TEL.GS1.PPOS	Guide probe position:[POS   NEG]
TEL.ROT.OFFANGLE	Rotator angle on sky

<b>VIMOS specific acquisition template parameters for IFU</b>	
<b>Parameter</b>	<b>Value</b>
TEL.ROT.OFFANGLE	Rotator angle on sky

## 8.2 VISIR

<b>VISIR specific acquisition template parameters for IMG</b>	
<b>Parameter</b>	<b>Value</b>
TEL.ROT.OFFANGLE	Rotator angle on sky

## 8.3 HAWK-I

<b>HAWK-I specific acquisition template parameters for non-AOF and AOF-TTS-free</b>	
<b>Parameter</b>	<b>Value</b>
TEL.TARG.OFFSETALPHA	Offset in RA in arcsec
TEL.TARG.OFFSETDELTA	Offset in Dec in arcsec
TEL.ROT.OFFANGLE	Rotator angle on sky

<b>HAWK-I specific acquisition template parameters for AOF</b>	
<b>Parameter</b>	<b>Value</b>
TEL.GS2.ALPHA	guide probe backup RA coordinate



TEL.GS2.DELTA	guide probe backup DEC coordinate
TEL.TTS1.ALPHA	RA of the TT star 1
TEL.TTS1.DELTA	DEC of the TT star 1
TEL.TTS2.ALPHA	RA of the TT star 2
TEL.TTS2.DELTA	DEC of the TT star 2
TEL.ROT1.OFFANGLE	Position Angle on Sky (deg) w.r.t. TTS1
TEL.ROT2.OFFANGLE	Position Angle on Sky (deg) w.r.t. TTS2
TEL.TARG.OFFSETALPHA1	Alpha offset for target (") w.r.t. TTS1
TEL.TARG.OFFSETDELTA1	Delta offset for target (") w.r.t. TTS1
TEL.TARG.OFFSETALPHA2	Alpha offset for target (") w.r.t. TTS2
TEL.TARG.OFFSETDELTA2	Delta offset for target (") w.r.t. TTS2
TEL.TTS1.RMAG	R mag of the TT star 1
TEL.TTS1.RCOLOR	R-I color of the TT star 1
TEL.TTS1.RADPOS	Radial position TTS1 arm (")
TEL.TTS2.RMAG	R mag of the TT star 2
TEL.TTS2.RCOLOR	R-I color of the TT star 2
TEL.TTS2.RADPOS	Radial position TTS2 arm (")

## 8.4 MUSE

<b>MUSE specific acquisition template parameters</b>	
<b>Parameter</b>	<b>Value</b>
TEL.GS1.DELTA	Guide star coordinate in delta
TEL.GS1.ALPHA	Guide star coordinate in alpha
INS.DROT.POSANG	Rotator angle on sky
INS.MODE	WFM-NOAO-E / or WFM-NOAO-N

--- End of document ---