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Very Large Telescope VISIR GuideCam User Manual

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Prepared

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1 Introduction

This document describes the Guidecam tool delivered to VISIR users for the preparation of observations. VISIR, the VLT Imager and Spectrometer for the mid-IR, is the instrument located at the Nasmyth B focus of UT3 (Melipal).

Sensitivity in the mid-IR for a ground based observatory is strongly limited by the sky brightness. In addition, the VISIR field is small compared to other VLT instruments. Therefore images of a field 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 on the coordinates of the guide star, it is strongly recommended that all OBs of a same field use the *same* guide star, in particular for faint objects.

In addition, objects within (optically) dark molecular clouds may have few or no suitable guide stars, at least in the catalogues currently used by the Telescope Control System: the Guide Star and the USNO-A1 catalogues. Alternatively, some bright nebulae may saturate the region of the digital sky surveys used by the telescope operator to select guide stars. Considerable amount of telescope time will be saved if such cases are identified *before* an OB is started. In these cases, examination of other catalogues, such as the USNO-B1.0, may provide suitable guide stars.

Providing the coordinates of a guide star in the acquisition template of an OB is therefore strongly recommended in a number of situations:

- observations of faint objects, hardly or not visible even after a long exposure, in particular, if this exposure has to be combined with other ones;
- observations of objects within (optically) dark molecular clouds where few suitable guide stars are expected;
- observations of objects within bright nebulae larger than the field of view accessible by the guide-probe that appeared saturated in the digital sky surveys (example: Orion);
- observations for astrometric accuracy is important.

In all these cases, the use of the guidecam tool for VISIR is strongly recommended and the coordinates of a suitable guide star should be inserted in the acquisition templates.

2 Release Notes

The information provided in this document applies to the ESO Period 77.

3 Policy

ESO applies the following policy regarding guide stars:

- In case of observation involving offsets, it is the responsibility of the user to check – with guidecam – that
 - the chosen guide star does not produce vignetting in any of the frame produced by the execution of the OB;
 - the chosen guide star stays within the field accessible by the guide probe during the whole execution of the OB.
- In case the selected guide star turns out to be unusable during the observations (because of change in the weather conditions), the telescope operator will try to select an alternative one and use it for the observations.
- The coordinates of the guide star fix the reference point for the World Coordinates system, as appearing in the FITS header of the files. However, the observatory does not guarantee the accuracy of the world coordinates systems (WCS) keywords in the FITS headers.

4 Using Guidecam

Once the binary file is downloaded, or each time you wish to use guidecam, execute the command

- `source setvars.tcsh` for tcsh;
- `source setvars.bash` for bash.

4.1 Getting started with Guidecam

Using Guidecam is fairly simple:

- Start Guidecam by issuing the command `guidecamLite`. This opens up a skycat GUI. Note the specific Guide-Probe pull-down menu. Figure 1 shows the main Guidecam panel.
- Select the `Settings` option of the Guide-Probe menu. This opens up the Guide Probe Settings panel which is represented in Figure 2
- Enter the coordinates of the target in the 'Telescope' section of the panel. Note that the coordinates have to be in J2000, and the format should be as indicated.

When pressing the **Apply** button, Guidecam will download from the ESO archive the DSS image of the field and open a panel `USNO at ESO` displaying the USNO star catalog of the field. This panel is represented figure 3. **Allow for a few seconds to a few tens of seconds for the image to be downloaded.** Note that for most situations, it is advisable to use instead the Guide Star Catalog, which unfortunately has in general a lower star density. This catalogue can be selected from the **Catalogs** menu. On the other hand, experience shows that magnitudes of USNO(-A.2) stars are more accurate than GSC-2 stars.

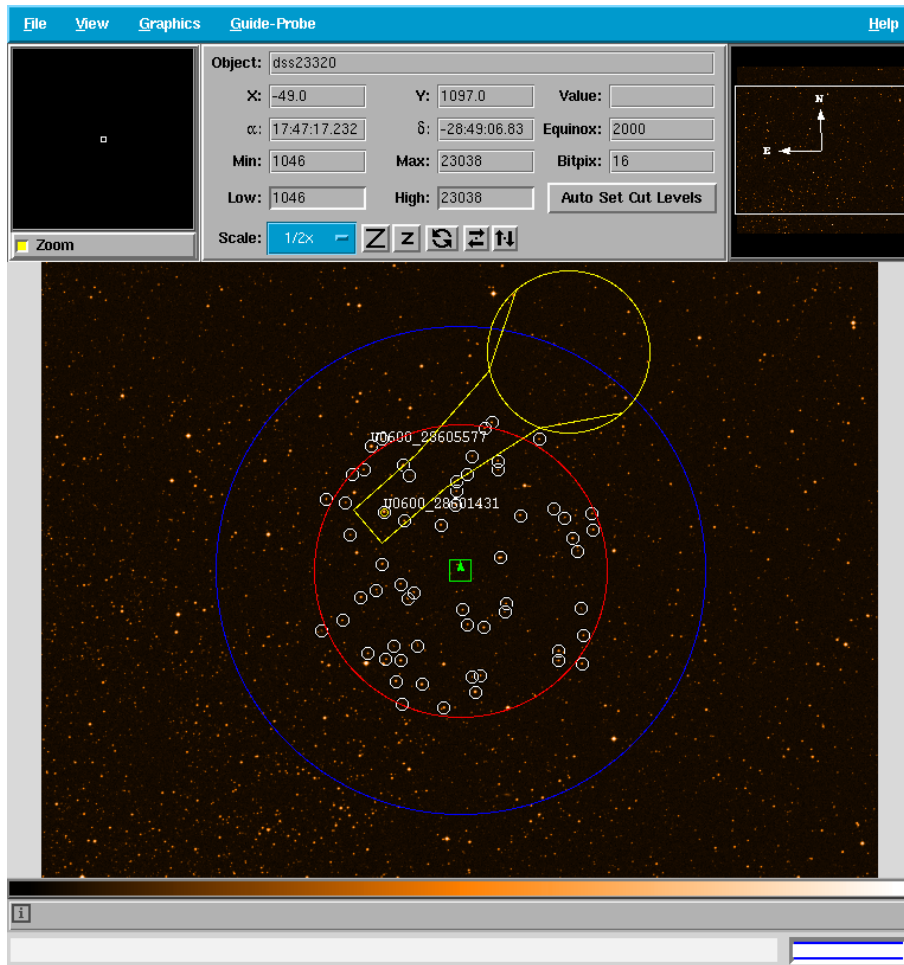


Figure 1: Guidecam: main panel (skycat). Superimposed to the DSS image of the field, the projected shadow of the Telescope Guide Probe appears in yellow. The VISIR field of view appears in green. In red, the 7.4 arcminute radii corresponding to the maximum search radius for guide stars

- At this point on, it is possible to position the Guide Probe on the available catalog stars and to evaluate if vignetting occurs. Bright stars close to the center of the field (without causing vignetting) are preferred.

4.2 The main 'Guidecam' GUI

The Guidecam GUI (figure 1) displays:

- the image of the field
- the projected shadow of the Telescope Guide Probe (yellow) onto the telescope focal plane
- the VISIR field of view (green), with the arrow pointing to the N
- a circle of 7.5 arcminute radius (red) corresponding to the maximum search radius for guide stars

Figure 2: Guidecam: the Guide Probe Settings panel

- in blue the possible location of the rotation axis of the Guide Probe arm
- the position of the USNO or GSC stars selected in the USNO or GSC at ESO panel (figure 3). The stars are indicated with white circles for USNO stars and squares for GSC ones.

4.3 The 'USNO at ESO' and 'Guide Star Catalog at ESO' panels

The USNO and Guide Star Catalog at ESO panel (figure 3) provide the following entries:

- Search radii (min and max). The default value for the maximum radius is 7.5 arcminutes. (The indicated max value of 13.5 corresponds to the maximum for an instrument at the Nasmyth focus and should not be considered for VISIR).
- Magnitude range. The default minimum and maximum values are 11 and 13.5 whereas the minimum and maximum permitted values are 10 and 14. With the faintest guide stars, some degradation of the active optics correction might take place, depending on seeing, airmass, Moon, possible extinction by thin cirrus, and position of the guide star in the field of view (vignetting beyond 11 arcminutes). To the extent this is possible, stars brighter than 13.5 magnitude should be chosen. Too bright objects may result in poorer correction as well.
- The the maximum number of objects can be changed to either limit or increase the number of stars to be displayed

Note : whenever a value is changed and entered a new search takes place and the results are displayed on the images while the updated list of stars appears on the Search Results panel. Pressing the **Search** button after changing more than one value will also start a new search and display the results.

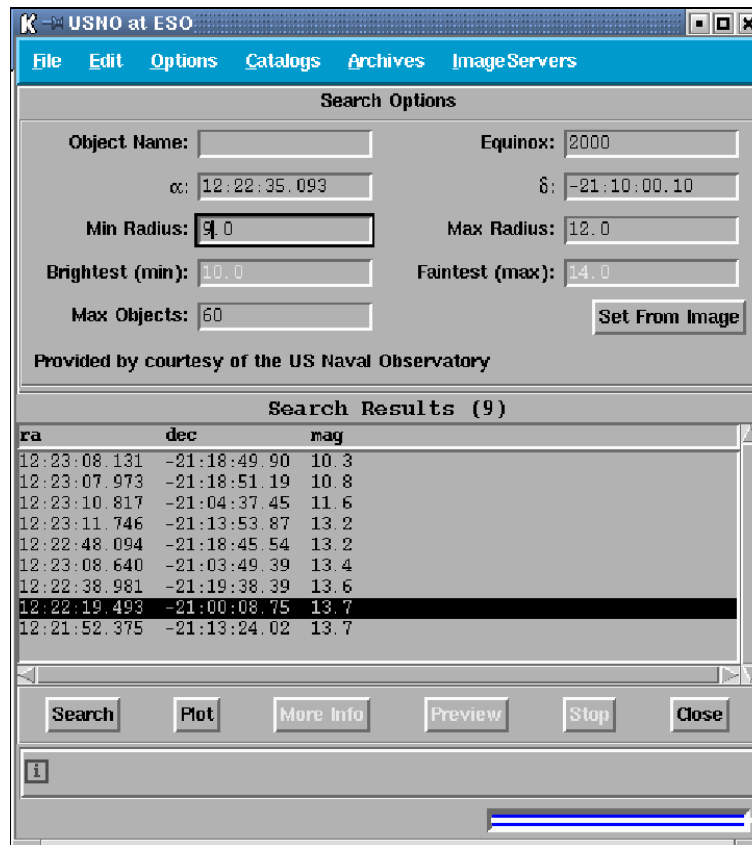


Figure 3: GuideCam: the USNO at ESO panel

4.4 Selecting the Guide Star

To select a guide star:

- Click with the left mouse button on one of the white squares (GSC) or circles (USNO) identifying the guide star.
- This opens a small panel asking **Move to the selected guide star?**. Pressing **Accept** will move the guide probe to the star. Vignetting of the VISIR field of view takes place whenever the guide probe (yellow) intercepts the VISIR field of view (green rectangle). If there is vignetting, it is possible to select another star and to repeat the operation, until a suitable guide star is found.
- The guide probe 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 in the Guide Probe Settings panel (figure 2) and pressing the **Apply** button, the guide 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.
- Once a suitable guide star has been identified, you can take note of its position by pressing the **Get Guide Star Coords** of the Guide Probe Settings panel. This pops up an information panel containing the RA and DEC of the selected guide star and indicating whether the position of the guide probe is positive or negative (alternate position). These coordinates should be noted and further entered manually into P2PP

in the corresponding fields: Guide Star RA, Guide Star DEC of the VISIR acquisition template. Finally, the Get Guide Star From should be set to **SETUPFILE**.

References

- [1] VISIR User Manual for P77, Phase 2 <http://www.eso.org/instruments/visir>

A Abbreviations and Acronyms

AT	Acquisition Template
BOB	Broker of Observation Blocks
GUI	Graphical User Interface
IMG	Imaging Mode
OB	Observing Block
P2PP	Phase II Proposal Preparation
TIO	Telescope Instrument Operator
TSF	Template Signature Files
VISIR	VLT Imaging and Spectrograph for the mid-IR