GuideCam tutorial for MUSE SV observations

This tutorial provides a step-by-step example of the preparation of [MUSE](#) OBs for WFM-AO mode by using the Unified GuideCam tool (GUCT). The specifics of this tutorial pertain to the preparation of OBs for Science Verification (SV) **only**.
To follow it, you should have:
- A P2PP ([version 3.4.2](#)) installation on your computer and familiarity with the essentials of the use of the software. Please refer to the [instructions](#) in order to install it, and to the [P2PP3 User Manual](#) for a general overview of P2PP and generic instructions on the preparation of OBs and scheduling containers.
- A GUCT (version r204547[1]) installation on your computer and familiarity with its essential capabilities, a guide for which can be found in the [GUCT User Manual](#)[2].

Getting started

One of the advantages of using GUCT to prepare ESO compliant finding charts (FCs) is that GUCT is capable of retrieving information stored in the acquisition template of a given OB, as well as propagating to the OBs a set of relevant parameters defined during the FC creation. This two-way communication is possible only if GUCT and P2PP are both running. Therefore:

- Start P2PP by typing *$PATH/p2pp-3.4.2/bin/p2pp* from your terminal
- Log in by using your ESO User Portal credentials (username and password)
- Select your SV run ID from the P2PP main GUI then, as usual, select the option *Download/Refresh Obs. runs* from the *File* pull-down menu you find at the top left corner of the P2PP main GUI
- Start GUCT by typing *$PATH/GuideCamTool-XXX-trunk-r204547/bin/ GuideCamTool* from your terminal (where XXX = *osx* or *linux* depending on your operating system). The GUCT control and Aladin windows should then pop up.

OBs preparation

Under your SV run create a new OB, name it, and enter the coordinates (Right Ascension and Declination) of your target in the P2PP target information window.

---

[1] This version, for MAC OS or linux, is available from the [MUSE SV web page](#)

[2] Note that the online GUCT User Manual refers to the public release for P100 MUSE observations as such it does not contain references to the AO mode. Therefore, it should be consulted to learn the basic software capability such as the standard tasks (i.e. "*Science target acquisition*", "*VLT guide stars*", and "*Observing offsets*") performed through the Tool box available from the GUCT control window.

For MUSE WFO-AO observations the only available acquisition template is MUSE_wfm-ao_acq_movetopixelLGS, therefore load it into the new OB.

From now on you will be working with GUCT and not P2PP, so in the GUCT control window, select MUSE from the *Instrument* drop-down menu and define your desired *Mode* (i.e. WFM-AO-N or WFM-AO-E) depending whether you want to perform observations with the Nominal or Extended filter.

Note that in doing so GUCT will return a pop-up window with the message "*Mode not offered*" (see Fig.1, left panel). Simply acknowledge the message by clicking on the OK button.

Click on *Fetch OB from P2PP* button to retrieve the OB target coordinates, which should now appear in the *RA* and *Dec* fields under the Field centre sub-panel (see Fig. 1, right panel).
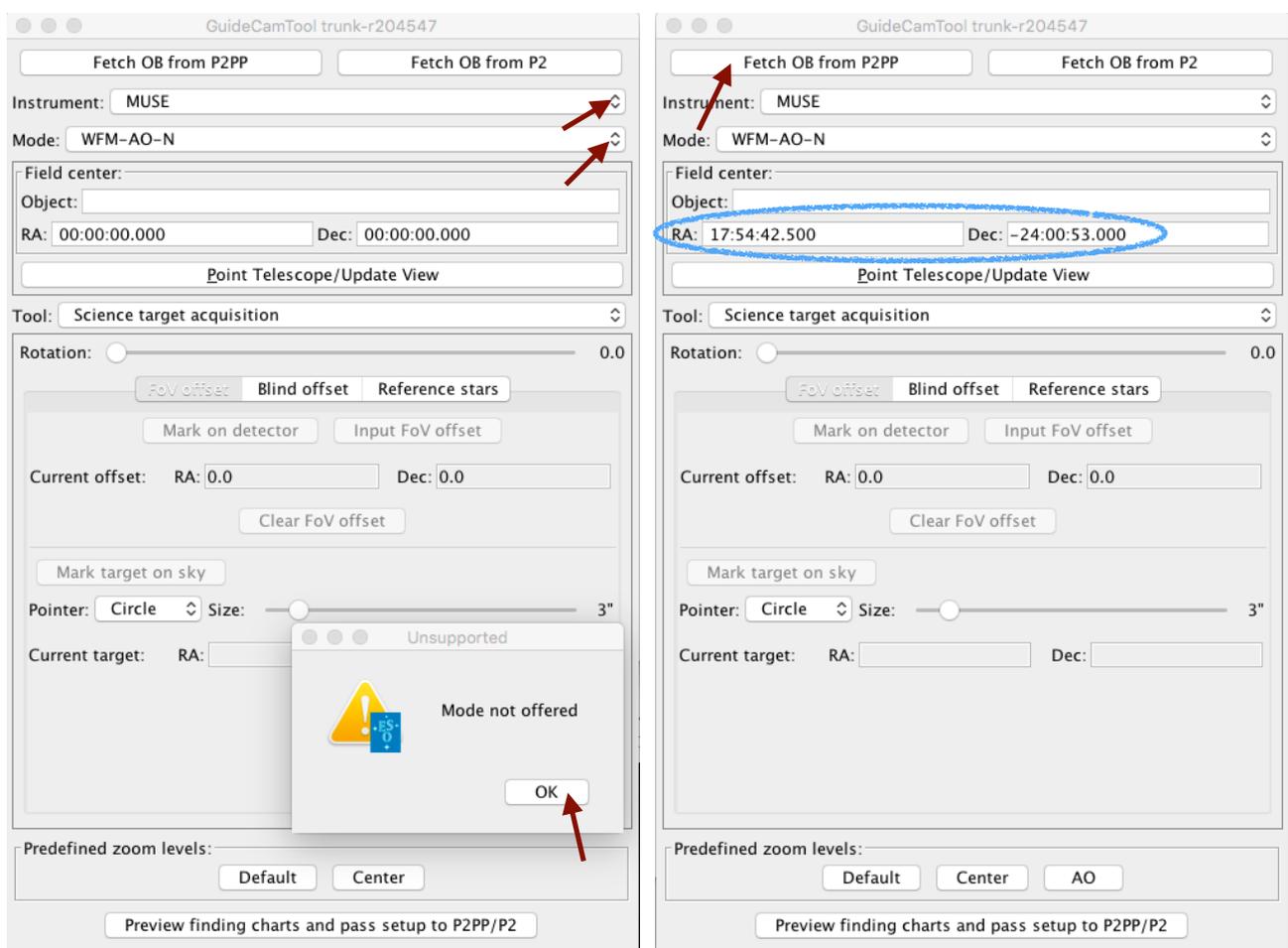
Fig.1: GUCT Control window

By clicking on *Point Telescope/Update View* button the tool will load a DSS image centred on the defined OB coordinates on the GUCT Aladin window. At this point, if you wish/need to fine-tune the OB pointing, select a star for a blind offset, and/or select one or more reference stars[3] you can do it by following the instructions in the

---

[3] Note that in this context the Reference star is not related to the AO mode, but it should be just as simply source within the MUSE FoV that you may want to highlight in your FC.

online GUCT User Manual because all these tasks are standard for all MUSE modes.

Now the next important step is to select suitable stars (up to 2) to be used by the AO system GALACSI for tip-tip correction. These are referred to below as TTS. In the GUCT control window, select AOF stars from the Tool drop-down menu and click on the *AO* button (see Fig.2, left panel). In the Aladin window you should now see a ~5'x5' image of your target field, where the suitable TTS are marked with red circles and little cyan squares (see Fig.2, right panel). The two big concentric red circles refer to the region where suitable TTS must be located.
Select a TTS by clicking on one of the stars circled in red in the Aladin window, once its coordinates and magnitude appear on the GUCT control window click the *Add* button (see Fig.2, left). Up to two TTS can be selected.
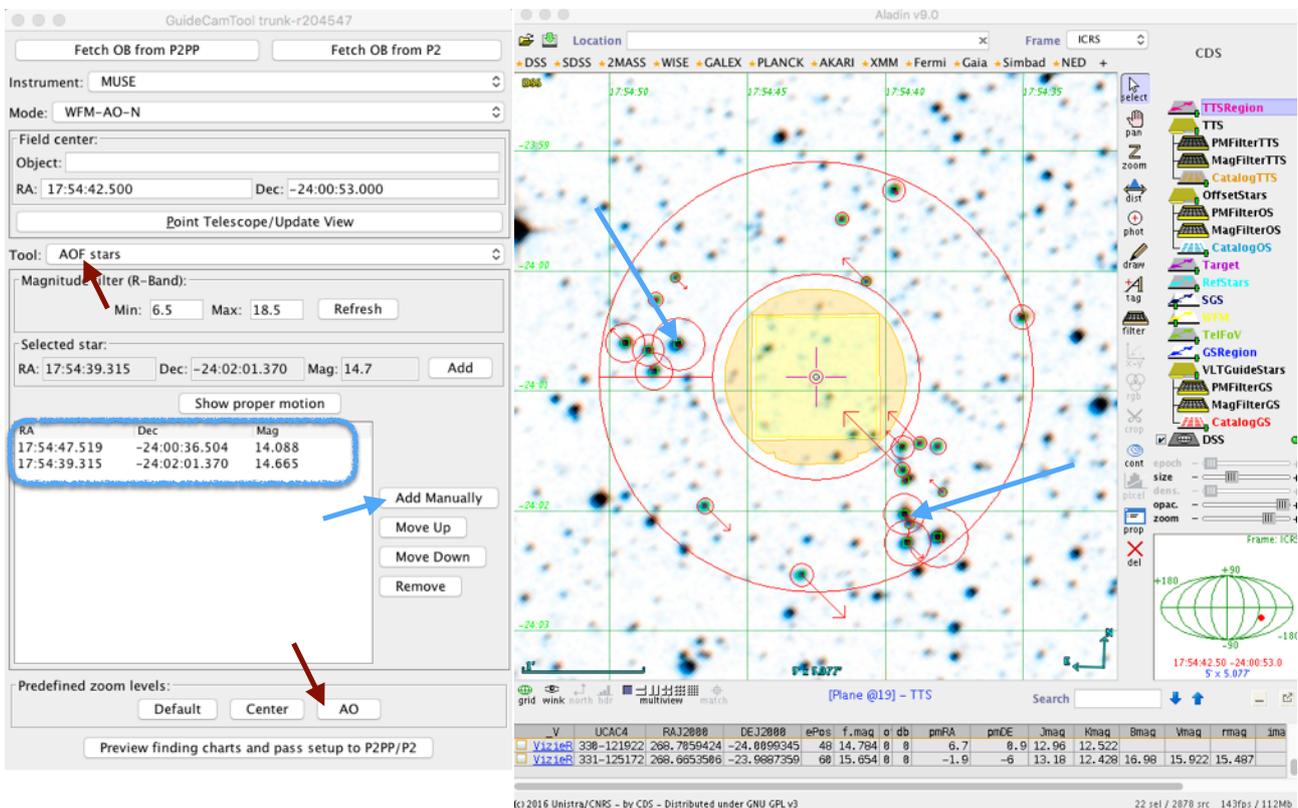
Fig.2: *Left* - GUCT Control window. *Right* - Aladin window (right) showing with small red circles the possible TTS. The region where the TTS should be selected from is the ring defined by the two big concentric red circles, whereas the yellow square refers to the MUSE FoV. The 4 banana-shaped regions adjacent to the MUSE FoV mark the Slow Guiding System area.

During the TTS selection, we strongly advise to take into account the size of the offsets that you intend to define in the observing template. The offsets pattern defined in the observing template will anyway be checked by the P2PP verification software (i.e. once you select the *Verify* option from the *Report* pull-down menu in the upper bar of the main P2PP GUI), however that step is usually performed once

the OB is ready, in other words after you have worked with GUCT. Therefore, if you don't want to waste time you should plan ahead during the TTS selection process. Note that, during all exposures tagged as 'OBJ' the TTS-AO loop must be obviously kept closed, but to do so 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.

GUCT provides you with the option to manually select a TTS in case there are no suitable stars marked in Aladin. This could be the case for faint stars that might not be present in the UCAC4 catalog, which is the reference source catalog used by GUCT. Should that be the case, then click on the *Add Manually* button to access a pop-up window where you are requested to enter the RA and Dec of the star.
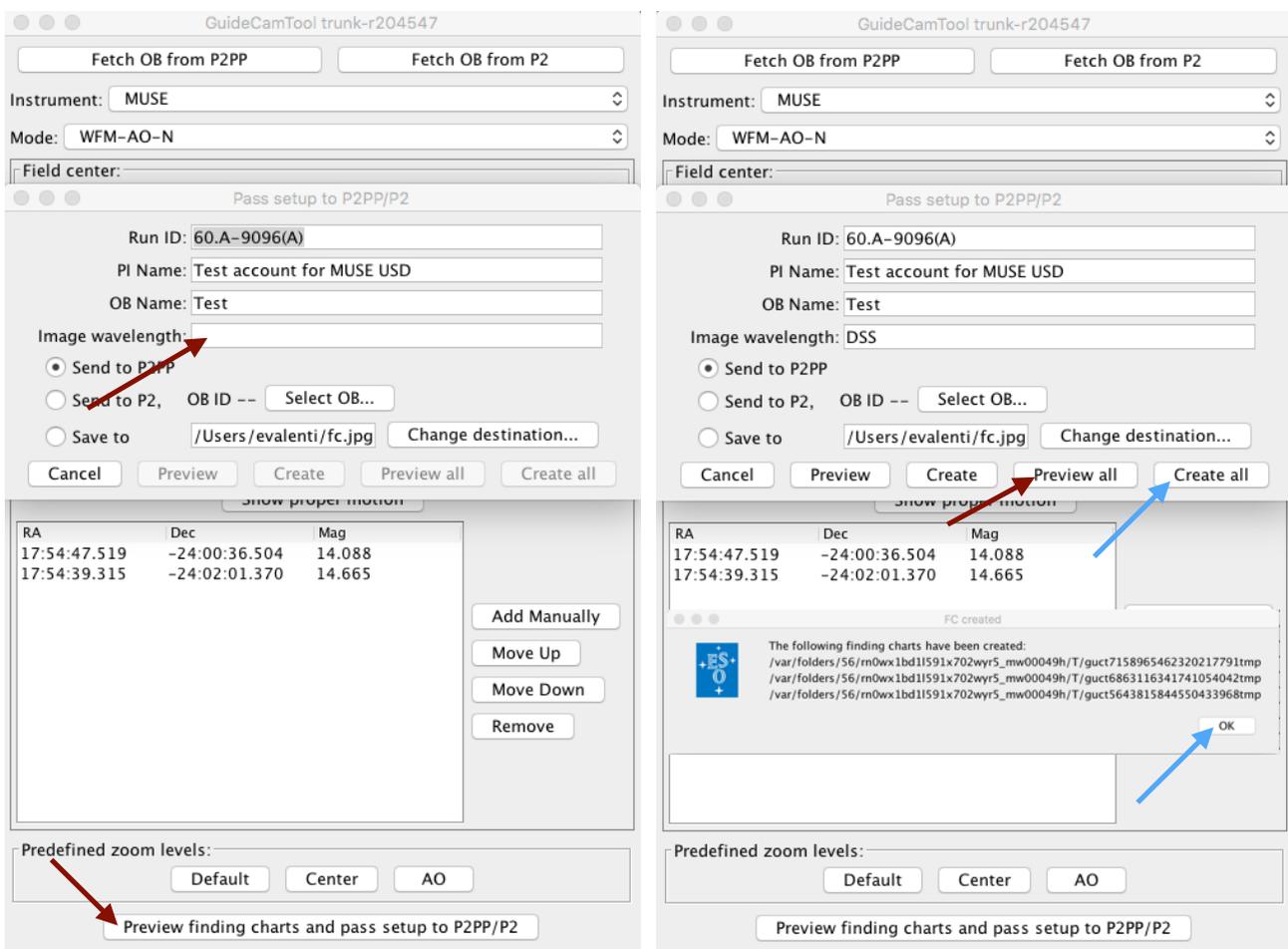
Fig.3: GUCT Control window

Once you are happy with the TTS selection you can move forward by either optionally choosing the VLT guide star (see GUCT User Manual for instructions), or moving to the final step of creating the FCs and sending the relevant information back to P2PP.

In this specific case we will not select the VLT guide star as we will let the telescope operator to do so for us, according to the the conditions present at the time our OB is executed.

In the GUCT control window, click on the *Preview finding chart and pass setup to P2PP/P2* button, which will result in a pop-up window (see Fig.3, left panel) where some fields, relevant to the FC (i.e. PI Name etc..) have been automatically filled in by using the information from your P2PP. Once you fill the field *Image wavelength* all the functional buttons (*Preview, Create, Preview all, Create all*) at the bottom of the pop-up window will become active (see Fig.3, right panel).
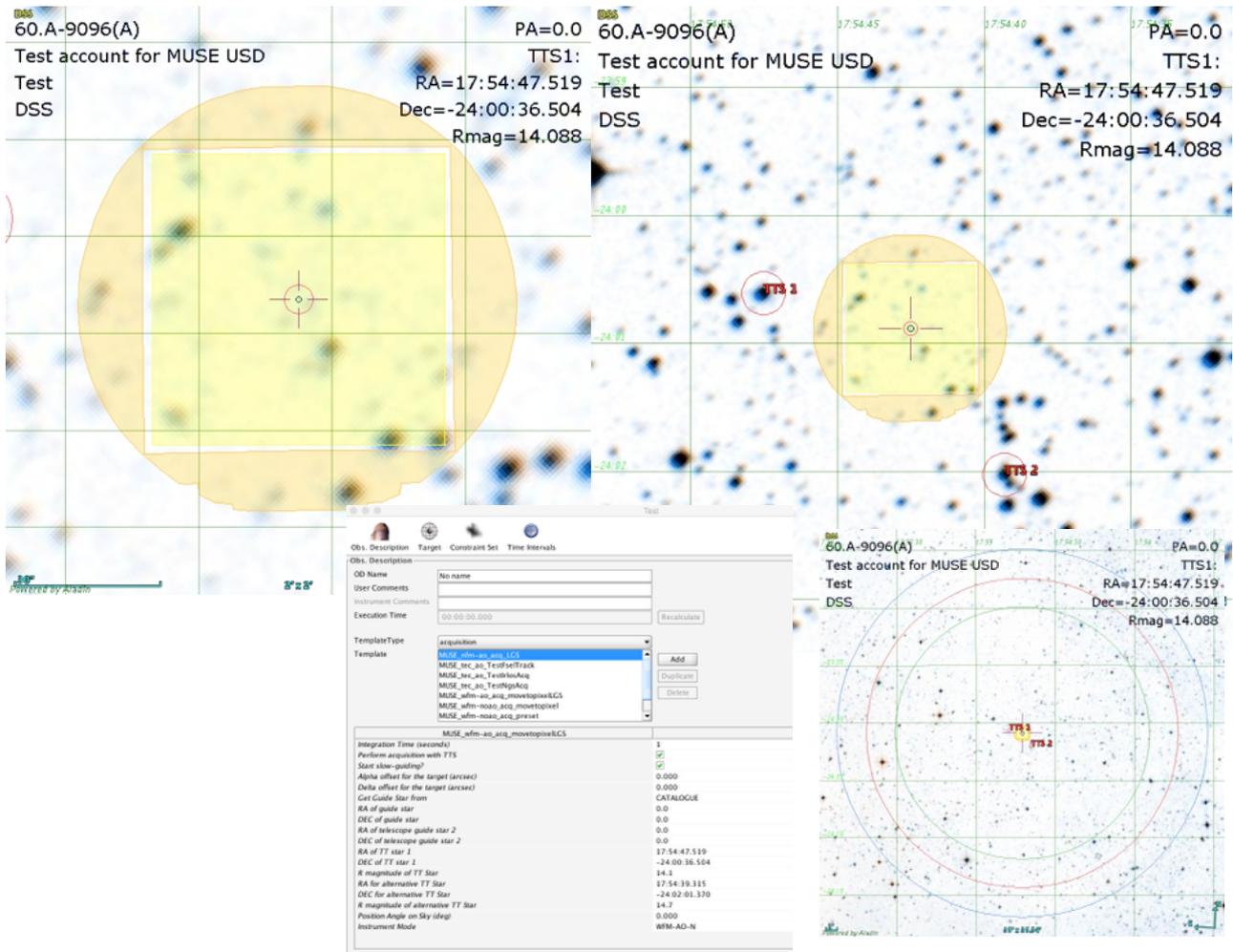
Fig.4: Example of the FCs created by GUCT (3 different zoom) and automatically attached to the OB in P2PP. In the lower left corner a snapshot of the OB acquisition template shows the fields filled automatically by GUCT at the time of FCs creation.

Note that for WFM-AO mode observations GUCT creates 3 FCs (4 if you use the blind-offset option, see Fig.3 in GUCT User Manual) with different zoom levels: i) the *default* zoom level shows the instrument FoV and the maximum search radius ~13.5') for suitable VLT guide star; ii) the *center* zoom level shows only the MUSE FoV; iii) the *AO* zoom level shows the MUSE FoV and the position of the selected TTS.

If you wish to preview the FCs you must click on the button *Preview all*, otherwise press the *Create all* button that will result in a second pop-up window (see blue arrow in Fig. 3, right panel) to let you know that the FCs have been created. As soon as you acknowledge the message by clicking on *OK* the FCs are automatically attached to your OB. You will also note that GUCT has propagated to your OB some relevant information defined during the preparation of the FCs. Specifically, the coordinates of the selected TTS and their magnitude appear now in the corresponding acquisition template fields (see Fig. 4).

In case you have selected a VLT guide star or used a star for blind offset centring then you should also see that GUCT had propagated that information (i.e. VLT guide star RA and Dec, and blind offsets RA and DEC) in the corresponding acquisition template fields.

The creation of the FCs is the last step for GUCT, therefore you can now close GUCT and go back to the P2PP to continue the preparation of your OB (i.e. adding the observing template etc..).

Finally, we are fully aware that this document does not contain an exhaustive description of the GUCT functionality in case of MUSE-AO. But it does provide basic instructions that, nevertheless, should be enough to produce compliant FCs for SV OBs. Should you have remaining doubts or questions, please do not hesitate to contact the User Support Department by sending an email to usd-help@eso.org. We will be happy to help you.