

Standard Operating Procedure

TANSPEC for Observers

Authors	
	Name
Original draft by	Saurabh Sharma (ARIES), D K Ojha (TIFR) Douglas Toomey (MKIR, Hawaii)
Prepared by	Ashish Devaraj and Geeta Rangwal
Approved by	Dr Saurabh Sharma

Change records		
Issue	Date	Remarks
1	20 May 2025	Release of the First version.

Scope

This document provides the standard operating procedure for operating the TIFR-ARIES Near Infrared Spectrometer (TANSPEC) instrument on the 3.6m Devasthal Optical Telescope.

Contents

1	Standard parameters	2
2	Checklist for starting the Telescope	2
3	Starting the TANSPEC instrument	3
4	Configuring the WTI switches	4
5	Starting the TANSPEC Software	5
6	Observing with TANSPEC	7
6.1	Pointing an object	7
6.2	Imaging with TANSPEC	8
6.3	Spectroscopy with TANSPEC	10
6.4	Acquiring lamps spectrum	11
7	Shutting down TANPEC	12

1 Standard parameters

TANSPEC: standard parameters	
Parameter	Name/Values
Telescope port	Main port
Secondary focus number	20600 - 21000
Rotator offset (Imaging)	120 degrees
Rotator offset (Spectroscopy)	-30 degrees (disabled rotator ONLY for full wavelength coverage)
Operating temperature	75 - 80 K
Compressor pressure	120 - 150 PSI
Minimum Read out time of the array H1RG	1.877 s
Minimum Read out time of the array H2RG	5.263 s
WTI switch server	http://10.0.1.10
TANSPEC PC IP address	192.168.0.21

2 Checklist for starting the Telescope

- In the evening of observation, switch ON the fans on the telescope floor to thermalise the telescope dome structure.
- Open the slit of the dome and put the dome on auto-tracking mode.
- Select the main port in TCS software. This is done since TANSPEC is mounted on the Main port.
 1. On TCS software, select in the command panel as **512-Port selection** control. See blue box in Figure 1.
 2. Click the **Main Port** button. See red box in Figure 1.

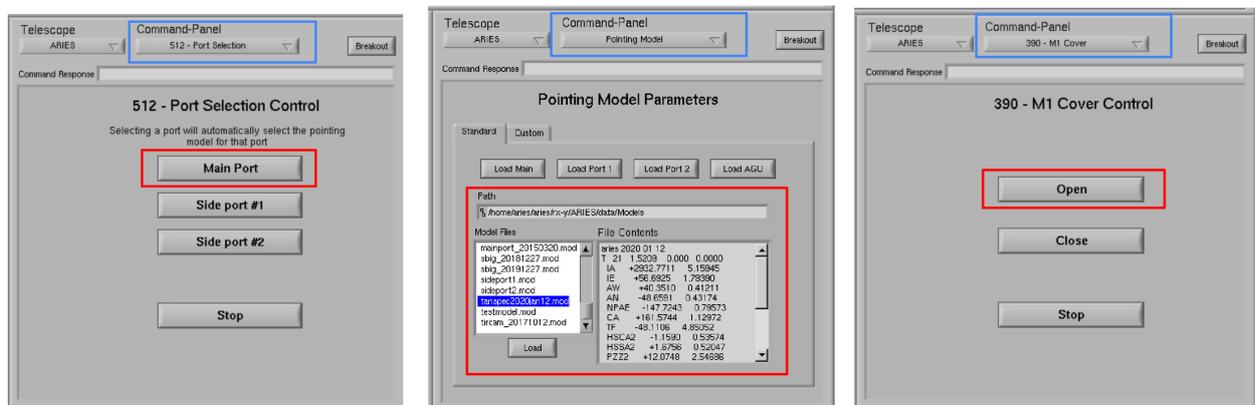


Figure 1: Main port selection panel, pointing model selection panel, and M1 mirror cover panel on TCS main window.

- Selecting the TANSPEC pointing model in TCS and initialising the telescope.

1. Select the latest pointing model of TANSPEC from the command panel. See the blue box in Figure 1.
 2. Select the pointing from path - `/home/aries/aries/rx-y/ARIES/data/Models`. See red box in Figure 1.
 3. select the Model file (use the latest best model available) and click Load.
- Open the telescope mirror flap through TCS software.
1. Select **390 - M1 cover** in the command panel. See the blue box in Figure 1
 2. Select **Open** shown in red box in Figure 1.
- Adjust the secondary mirror (M2) of the telescope for focusing.
1. Open the Active Optics System (AOS) window in AOS PC.
 2. Adjust the focus between 20600-21000 (See Figure 2). This also depends on the current weather conditions.
 3. The focus needs to be verified by pointing a star in the sky (typically of 10-11 mag) and measuring the FWHM. We need to achieve the best FWHM by changing the M2 focus values.

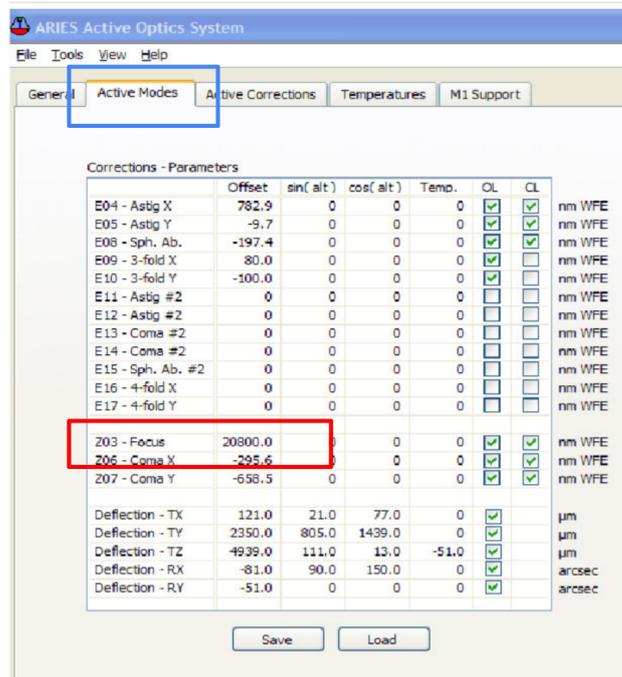


Figure 2: Panel to change M2 focus available on the AOS PC.

3 Starting the TANSPEC instrument

- Make sure TANSPEC was always powered ON before observation. This is to maintain its temperature between 75-80 K.
- Check the temperatures of TANSPEC at Lakeshore controller in the electronics rack on TANSPEC (at the telescope). All the **temperatures should be around 75-80 K.**



Figure 3: The Temperature display panel on the electronics rack of TANSPEC.

- Make sure the compressor, chiller and cryo-cold head are running. The pressure for the compressor **should be around 120-150 PSI**.



Figure 4: Image of Brooks high voltage model 9600 Compressor (left) and the distilled water-based Chiller (right).

- Check that the Helium line on the telescope floor is well arranged and not in a tangled state.
- When the cooling is happening, these will consistently have a pumping sound to be heard near the instrument.
- Power On the hard switches (8 switches) of the Hall sensor, Motor, Arrays, and Lamps. The switches are shown in Figure 5
- With this, the instrument is made sure to be ON and prepared for observations.

4 Configuring the WTI switches

- The software of the TANSPEC instrument is installed in the TANSPEC CENTOS-based PC (IP address: ##). The operator will provide the logging ID and password.
- On the web browser, open the WTI software switches at <http://10.0.1.10>. The operator will provide the logging ID and password.



Figure 5: Image of the switches in the electronic rack on the TANSPEC instrument.

- In the left panel of the main window, click "plug control". The interface shown in Figure 6 will appear. These are software switches to control TANSPEC instrument.
- Power-ON the (1) Spectro-array-power, (2) Guider-array-power, (3) Fan-power-rack-chiller, (4) Hall sensor, (5) Fan-power-rack-chiller2 and (6) Motor-power from the WTI switch. Select the Action drop-down for each of these and then confirm the actions.
- CAUTION! Never turn OFF the LAKESHORE and Ethernet-switch.**

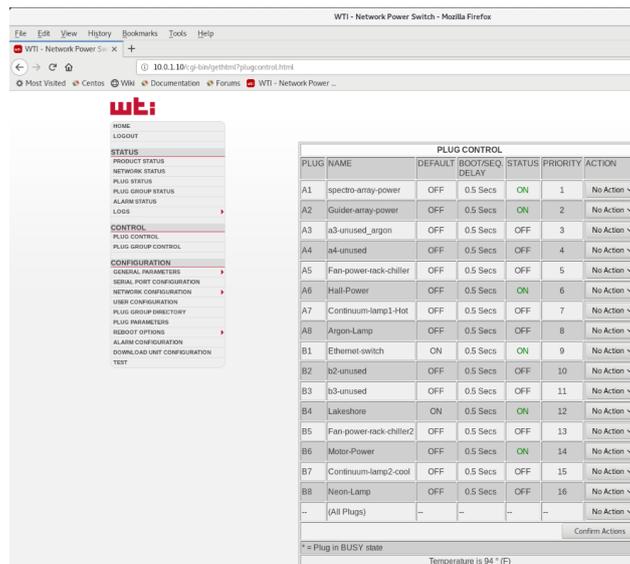


Figure 6: Online interface for WTI switches. [GIVE WHICH PC IT IS in]

5 Starting the TANSPEC Software

We can start the TANSPEC software in two ways:

By using the TANSPEC Software shortcut (Recommended).

- Double click on the TANSPEC launcher in the desktop of TANSPEC shown in Figure 7. Make sure that the terminals open in the fashion shown in Figure 7. If its opens any otherwise, close all the terminals and double click the launcher again.
- The launcher will start the GUI of TANSPEC and the DV, which is used to visualize the image/spectrum during observation.

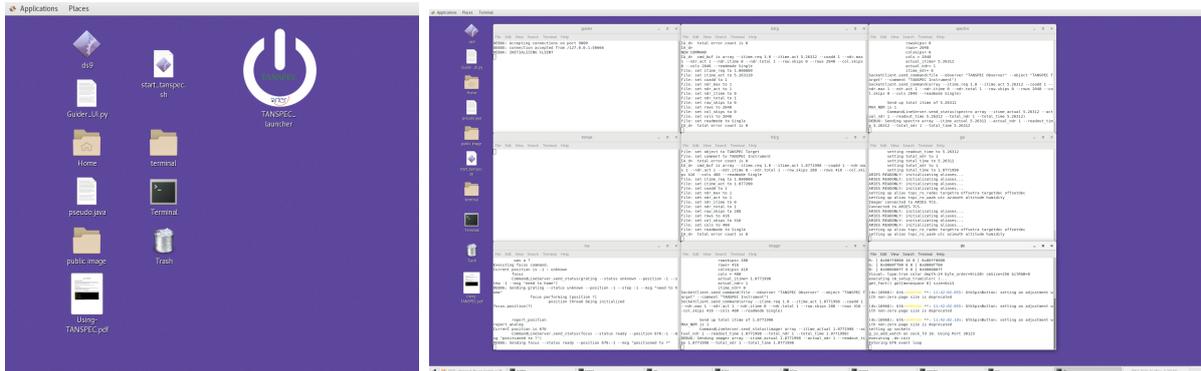


Figure 7: The left panel shows the tanspec launcher. Right panel show the terminals nine terminals opened when GUI is getting initiated.

To configure the DataViewer (DV)¹.

- Press open of the DV window. This will launch the file opening window of the DV.
- Then press "8" on the Active Display section of the DV software. This will launch a new window where the spectrum/image can be displayed. The user may resize the window size according to convenience by using the Mouse.
- Press "A" in buffer, which will set the image/spectrum to be opened in buffer "A" window.

To configure the TANSPEC GUI.

- The very first thing while configuring the GUI is to **HOME - CALMIR, SLIT WHEEL, GUIDER FILTER WHEEL and GRATING WHEEL..** This is mandatory as not doing this may cause wrong selection of filters/slits while observing.
- To configure the spectrograph, check the SIF checkbox (to save intermediate files) and select Readout Mode as SUR.
- To configure the imager/guider, check the SIF checkbox and select Readout Mode as SUR.
- Make sure that the Auto-save option is ON for both the imager and spectrograph.
- Fill in the necessary details on the "Save info" of both the spectrograph and imager. The instructions on filenames to be used while saving have to be in the format.
For imager: **Objectname_Filter_ProposalCode**
For spectrograph: **Objectname_Mode_Slit_ProposalCode**

Once both TANSPEC GUI and DV are configured. The PC display should be like shown in Figure 8.

¹Data viewer by NASA Infrared Telescope Facility (IRTS), Hawaii, USA

3.6m Devasthal Optical Telescope

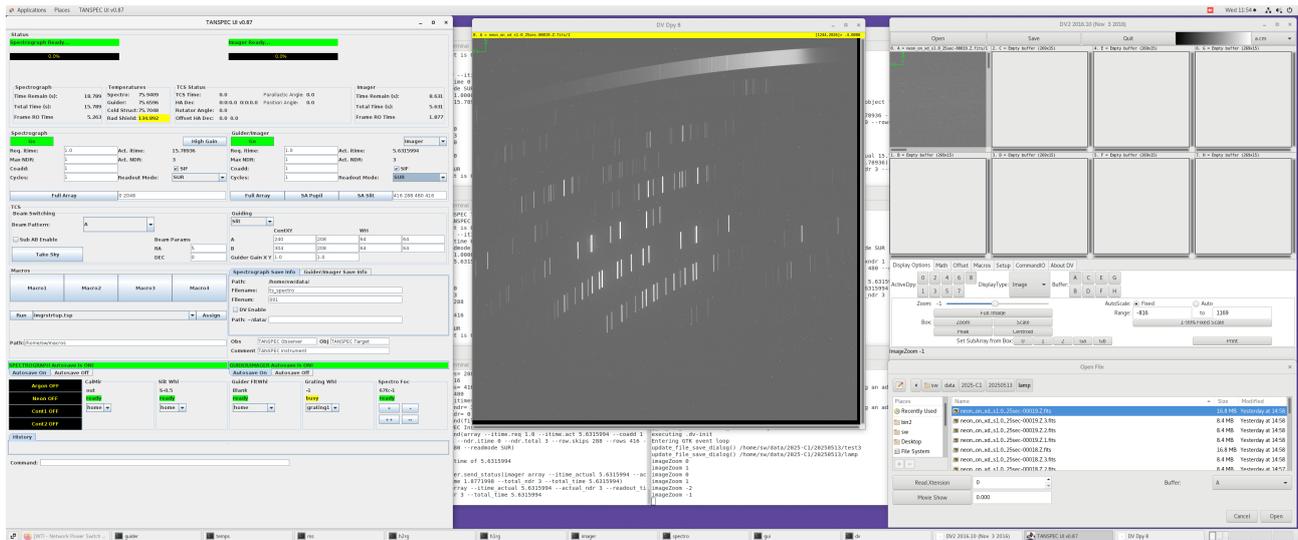


Figure 8: TANSPEC PC display after configuring both the TANSPEC GUI and DV.

Starting TANSPEC processes individually using multiple terms (Not recommended)

- Open up 8 individual xterm.
- Run the following 8 commands individually in each term.
 1. startguider
 2. starttemps
 3. startms
 4. h2rg_server
 5. h1rg_server
 6. startimageric (complete previous processes to run)
 7. startspectroic (complete previous processes to run)
 8. startgui (complete previous processes to run)
- Type “dv -l” in a new xterm to initialize the DV.

6 Observing with TANSPEC

6.1 Pointing an object

- In the TCS window, open the **Target** command panel as shown in the left panel of Figure 9.
- Enter Name, RA, DEC and Epoch of the target.
- We recommend taking a test image before actual exposure to ensure the pointing is correct and the instrument interface works as intended. Once the images are taken, they are automatically sent to DV.

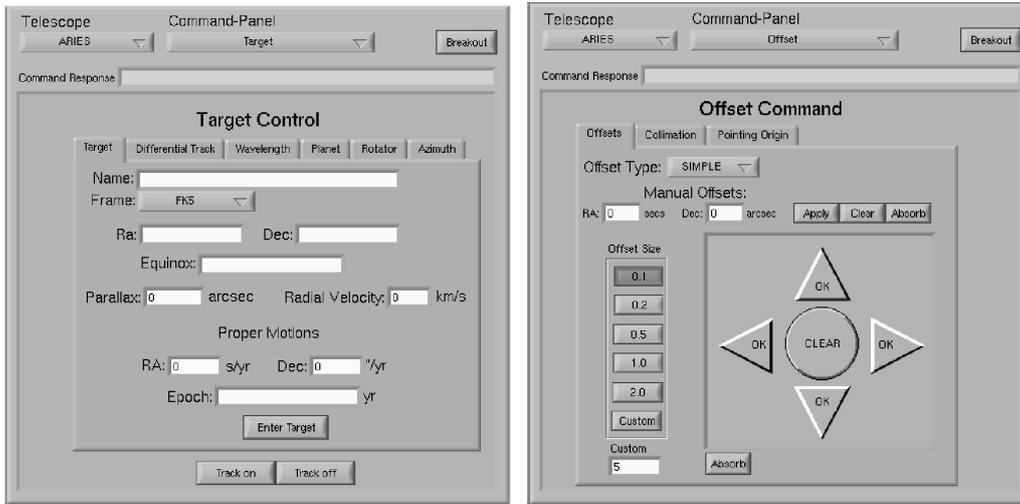


Figure 9: TCS command panel to enter target (left panel) and apply offsets manually (right panel) to coordinates.

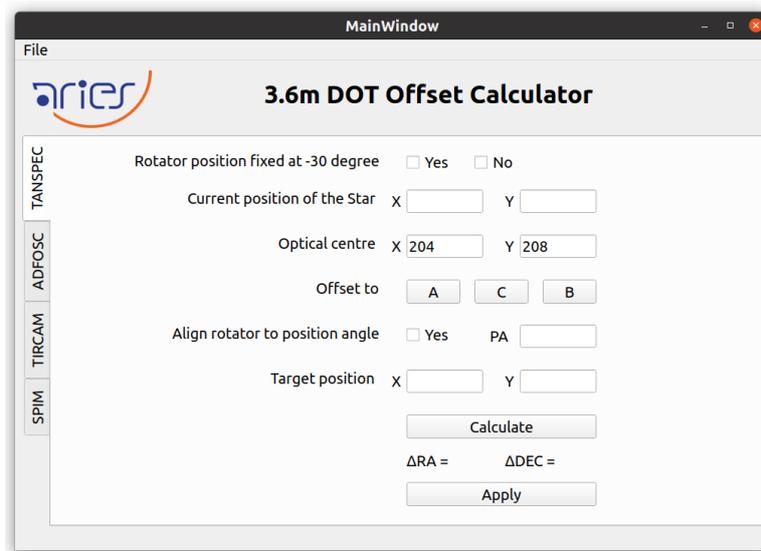


Figure 10: TANSPEC offset calculator

- If there is an offset in pointing (or the target is not within the slit for spectroscopy). The offset calculator software (shown in Figure 10) for DOT can be used to apply. Refer to the offset calculator manual to understand how to use it.
- The offsets can be applied manually as well. This can be done using the "Offset command panel" in the TCS window as shown in the right panel of Figure 9.

6.2 Imaging with TANSPEC

- For imaging, give the offset of 120 degrees to the rotator in the TCS. This is to match the sky to a north-up and east-right configuration.
 1. Select **Target** in the command panel. See the blue box in Figure 11
 2. Select **Rotator** shown in red box in Figure 11.

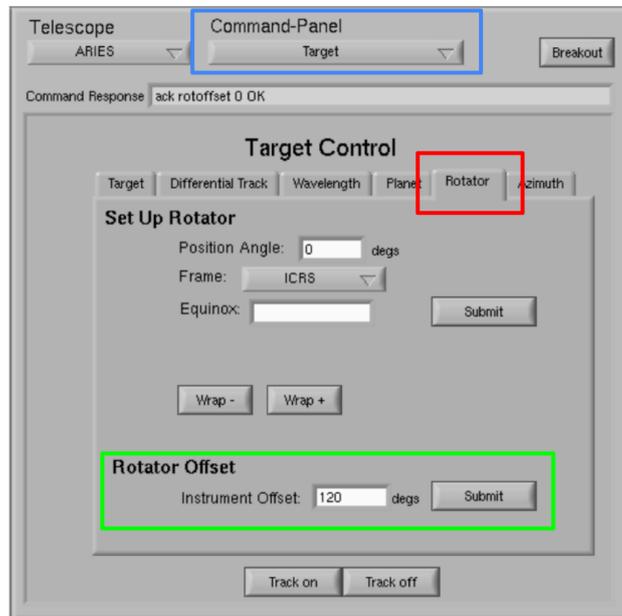


Figure 11: Panel to provide rotator offset for TANSPEC imaging on TCS main window.

3. Enter **120 degree** in Rotator offset shown in green box in Figure 11.

- Configuration of the wheels during Imaging
 - CALMIR should be "**OUT**".
 - Select **the Mirror** in slit wheel.
 - Select the required **Filter** in the filter wheel.
 - **Grating wheel can be left as it is** since it does not have any effect on the imaging.
 - Details on the available configurations are shown in Table 1
- The Array readout configuration panel is shown in Figure 8. This helps us control the observation parameters.
- Req. time:** This is the integration time in seconds.
- Max NDR:** This is the maximum number of readouts to perform for the pedestal or signal data collection in SINGLE or DOUBLE readout mode.
- Coadd:** This is the number of co-additions to acquire and sum to create the final image product in SINGLE and DOUBLE mode.
- Cycles:** The number of times to repeat the imaging sequence.
- SIF:** Check this box to write the individual frames read out from the controller to disk.
- Readout Mode:** Select the mode for reading out and handling the data collected from the array. SINGLE and DOUBLE modes are available.
- Imager/Guider Selection** In Imager mode, the Imager is used to collect science images. In Guider mode, the Imager is used to collect guide images, which are then sent to the GUIDER.

- Interacting with the TCS** The TANSPEC software will interact with the ARIES TCS via the GUIDE Server.
- Full Array H2RG** provides windowing in Y-axis.
- Go** This button starts the exposure. The user should be cautious while using this button, as the exposure once begun cannot be stopped in between.

Table 1: Gratings, filters, slits and lamps in available on TANPEC for observation.

Wheel	Values
Grating	Grating-1 (cross dispersion mode, higher resolution) Grating-2 (prism mode, low resolution)
Filter	Blank, Ks, H, J, Y, Ip, Pupil, Rp, Br-Gamma and H2_1-0S(1)
Slits	S-0.5, Mirror, S-0.75, S-1.0, S-1.5, s-2.0, S-0.4, Pupil L-4.0, L-1.5, L-1.0, L-0.5
Lamps	Argon, Neon, Continuum 1 and Continuum 2

6.3 Spectroscopy with TANSPEC

- Spectroscopy can be done in two telescope configurations. One is to keep all axes of the telescope free. The next is by disabling the rotator axis at -30 degrees.
- Keeping all the telescope axes free would not require any additional configuration. This mode, however, gives slightly lesser wavelength coverage, but the **Auto guiding unit can be engaged (as per the availability of guide stars)**. This enables the user to go for very long exposure times, ideal for faint sources.
- Disabling the **rotator at -30 degree** in the TCS would give complete wavelength coverage. However, **the use of Auto guiding will NOT be possible**. Hence, longer exposures will not be possible.
- Disabling can be done as follows:
 1. Select **Main Axis** in the command panel. See the blue box in Figure 12
 2. Enter **-30 degree** in the Angle shown in the red box in Figure 12.
- Configuration of the wheels during spectroscopy
 - CALMIR should be **"OUT"**.
 - Select the **required slit size** in slit wheel.
 - Keep filter wheel in **Blank**. Only include a filter if the users science case demands.
 - Select the **grating on the grating wheel**. grating1 is the cross-dispersion mode (higher resolution) and grating2 is the prism mode (low resolution).
- The imaging mode can be used in parallel to the spectroscopy, as both are different detectors.

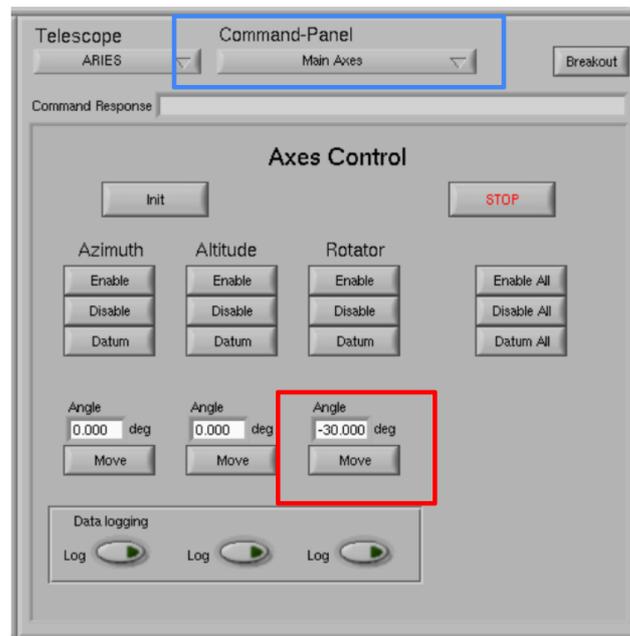


Figure 12: Panel to provide rotator offset for TANSPEC spectroscopy on TCS main window.

- Imaging mode along with the offset calculator can be used to put the object in the slit.
- The Array readout configuration panel is shown in Figure 8. This helps us control the observation parameters.
- Req. time:** This is the integration time in seconds.
- Max NDR:** This is the maximum number of readouts to perform for the pedestal or signal data collection in SINGLE or DOUBLE readout mode.
- Coadd:** This is the number of co-additions to acquire and sum to create the final image product in SINGLE and DOUBLE mode.
- Cycles:** The number of times to repeat the imaging sequence.
- SIF:** Check this box to write the individual frames read out from the controller to disk.
- Readout Mode:** Select the mode for reading out and handling the data collected from the array. SINGLE and DOUBLE modes are available.
- Full Array** H1RG provides windowing in both the axis.
- Go** This button starts the exposure. The user should be cautious while using this button, as the exposure once begun cannot be stopped in between.

6.4 Acquiring lamps spectrum

- Lamp spectra are obtained for wavelength calibration. It is ideal to obtain the lamps in the same telescope orientation used for observing the object on the same night. This helps to maintain the same configuration and conditions while obtaining both the object and lamp.

- There are three lamps in TANSPEC. (1) Argon, (2) Neon, and (3) Continuum.
- Each of the lamps can be switched ON or OFF from the TANPSEC GUI shown in Figure 8.
- The procedure to obtain lamps is as follows
 - CALMIR should be "IN".
 - Select the same slit size as we use for the object in Slit wheel
 - Filter wheel should be kept in "Blank"
 - Turn on the required Lamp
 - Expose in the spectrograph section.
 - Argon and continuum lamp require a 30-second exposure time. And the Neon lamp requires 25 seconds.
 - All the lamps should be taken in both ON and OFF conditions.
- The lamps are shown in Figure 13.



Figure 13: The calibration lamps obtained from TANPEC are shown in the figure. Left panel shows Argon, middle panel shows Neon, and right panel shows Continuum.

7 Shutting down TANPEC

- Shutting down TANSPEC starts by closing the GUI. The user should **HOME - CALMIR, SLIT WHEEL, GUIDER FILTER WHEEL and GRATING WHEEL** before closing the GUI.
- Once the GUI is closed. Each of the nine terminals should be closed by terminating the process running within it. This is done by pressing **Ctrl+c** in each window and then closing them.
- Once all the software is closed. We should turn off all the software switches from the WTI interface.
- The hard switches on TANSPEC electronic bay (see Figure 5) should be switched OFF.

3.6m Devasthal Optical Telescope

- Complete shutdown of TANSPEC requires stopping the cooling. This will not be carried out every time during the observation night. TANSPEC will be kept ON through out the observation cycle.