

## **1.3-m DFOT: OPERATION MANUAL**

### **(A) OPENING THE OBSERVATORY:**

#### **BUILDING**

1. Open all the windows (11 on Telescope floor and 9 on ground floor hall).
2. Switch off all the lights using control switch located on the ground floor hall near UPS room.
3. Shutdown all the PC's and close heat convectors, pillars, geysers etc.

#### **ROLL OFF ROOF:**

1. Open the motorized south shutter by using the switch key. Open the motorized roof with Blue push button.
2. If south shutter motor is non-functional, lift the shutter up manually.

### **RA and DEC lock pins must be detached before any operation on the telescope**

#### **TELESCOPE (Assuming Vertical parking position)**

- 1) Make it sure transformer switch in the left side of the TCS desk is ON. It should be kept permanently in ON position.
- 2) Telescope control room: Switch on the MTR drive chassis, Drive and the Halt Motor button in that order. It should be noted that Halt motor is dark when it is ON and illuminated when it is OFF.
- 3) Telescope floor: Make it sure that Drive motors are activated by checking the sound when telescope is slightly pushed, otherwise push the Telescope tube gently up by hand until Drive Motors are activated (listen the sound). Use the hand-set to slew the Telescope to South until it looks into Zenith.
- 4) Telescope control room: Switch ON the Track (2<sup>nd</sup> from left side). Note that one other Track toggle switch (1<sup>st</sup> from left side) should always be in Track mode not in auxiliary Track mode.
- 5) In order to use 2kx2k or 512x512 CCD camera, switch on the cooler power, CPU and Monitor.
- 6) As a precaution, move the computer trolley away from the Telescope so that it does not obstruct the Telescope movements.

#### **Observing Floor:**

- 1) On the Telescope control room, click on 'Shortcut to DFMTCS.bat' and 'TheSky6'. DFMTCS will open the TCS window which is used to control the telescope and target the field. TheSky6 will open a sky window.
- 2) Click the 'Tight VNC Viewer/VNC Viewer' which connects TCS computer to Andor CCD computer on the telescope floor. It will connect to 192.168.2.91 and its password is 'password'. Here are two options for the CCDxon for 512x512 CCD and DV-DZ for 2kx2k CCD. Click in the option as per the mounted CCD. Now, go to 'Hardware' button at the top and press the 'temperature' and change the temperature to -85 degree C.
- 3) To open the Mirror door, first open the 'MIRROR DOORS' button at the left side of the console. Then go to miscellaneous button of the DFMTCS window:  
Telescope→Miscellaneous→Switches/Mirror doors  
Click on the 'open mirror doors' at the start of the observations and 'Close mirror doors' at the end of the observations.
- 4) In Telescope→Miscellaneous→Ffocus  
Note that for different filters and instruments, focus value is different. Target position should be fixed as per Focus position of the corresponding filter.

5) In Options→Hand Paddle

It will give you a hand paddle on the TCS monitor. One can change it Guide Speed (slowest), Set Speed (moderate) and Slew Speed (Fast) as per requirement. In general, it should be at 'Set Speed'

6) To pointing the telescope in exact right direction, we need to synchronize the telescope.

First link the telescope with sky6

Telescope-->Link-->Establish

Select a bright star in the sky6. Put cursor on it. Click on the star. Press the 'slew telescope' symbol at the bottom of the 'Object Information' window. Take the image of the star (with very small exposure time) in Andor SOLIS terminal. If star is not at the center, move the star (i.e. telescope) with the hand paddle in such a way that bright star comes into the center of the CCD. Then click on 'Sync' button in the sky6 window.

Telescope-->Sync

It will synchronize the telescope with the given coordinate of the star.

7) To set your coordinate in the DFM control system, go to:

- i. Telescope→movement→slew position
- ii. Put your RA, DEC with slew epoch 2000. Press 'APPLY'.
- iii. Press 'START SLEW'.

8) Do not disturb RA offset and DEC offset. It should be initialized at 0,0.

9) If you have a list of objects to observe, then you can add their

Object name, RA, DEC, Epoch at

Telescope→movement→Mark/move table

Click on each object and press 'Start Slew'

10) Do not disturb DOME initialization.

11) In Telescope→Rates→Track Rates

Set Track rates RA rate should be 15 arcsec/sec. One need NOT to change it except for nearby objects like observations of comets, asteroids etc.

12) In Telescope→Rates→Handpaddle Rates

Following values should be fixed at: set Rate 100 arcsec/sec and Guide Rate 5 arcsec/sec.

### Acquisition of frames:

A list of targets can be prepared and saved in the Telescope control software (TCS) PC as mark (.mrk) file during the day time.

1. In Andor SOLIS window: Take the signal by pressing the button

Acquisition--> Set-up acquisition

Then set the exposure time in imaging mode and single scan mode.

2. Now press the button 'Take Signal'. It will acquire the target frame.

3. Images can also be taken in Kinematic mode where number of maximum frames (up to ~100 for 2kx2k and ~500 for 512x512) with given exposure time can be acquired by giving the no. of frames in the option 'kinetic length series'. It will save all the images in one single data cube. This data cube can be split into individual frames using IRAF software.

**Precaution:** If observation is halted in the middle, whole image cube will be lost.

4. Note that images should be stored in either 16-bit or 32-bit mode.

5. Each time we save the frame, we NEED to close the saved frame window and keep only Acquisition window.

### Auto-guider Issue:

1. Open the CCDops5 in the Andor CCD computer.

2. Open the grab image.

Camera-->grab (here give exposure time, say 5-10 sec)

3. Focus should be OK, otherwise we may need to push or pull the SBIG camera little bit mounted on the telescope floor in order to adjust the focus.

4. Once image is focused, select the bright isolated star by pointing the mouse over the star and press the right button then click on 'show crosshair'
5. On Track → Autoguider parameter → Aggressiveness, put its value 5 or less.
6. Press the 'Track and Accumulate' option.
7. Once track is working fine, press the 'Autoguide' button. Here we have to give exposure time and DEC value for the target star. Now, autoguider assembly will work

### **[B] Closing the Observatory Instruments (2K ANDOR Camera):**

1. Using the hardware tab of the camera control software, first temp should be set to +5 (or 10) C and once it acquires that temperature, switch off the cooler in the hardware tab.
2. Take the backup of the data.
3. Switch off the cooler power, coolant, PC and Monitor.

### **TELESCOPE parking position:**

1. Telescope floor:

Using Telescope control software(TCS), slew the Telescope to Zenith. For this go to:  
Telescope → movement → offset/zenith

Apply set zenith position.

Push Track switch down (OFF) at the right side of the telescope control.

Then START Slew

2. Telescope control room: Switch off the Mirror doors using TCS

Telescope → Miscellaneous → switch off mirror door

3. Once Mirror door is closed, 'CLOSE' the mirror door button on the right side of the telescope control.
4. Using the hand-set match the RA pin hole in the telescope floor.  
Now, gently pull the Telescope tube down and match the DEC pin holes.
5. Put in RA and DEC lock pins completely.
6. Telescope control room: Switch off the Motor, Drive and MTR Drive chassis in that order.

### **ROLL OFF ROOF:**

1. Close the motorized roof with Blue push button.
2. Close the motorized south shutter with switch key.
3. If south shutter motor is non-functional, pull the shutter down manually.

### **BUILDING:**

1. Close all the windows (11 on Telescope floor and 9 on ground floor).

In general, Focus for R band (512x512 CCD) ~ 1547

R band (2kx2k CCD) ~ 1828

V band (2kx2k CCD) ~ 1830-1835

Balancing values for different assemblies are as follows:

Eyepiece + adaptor = 170

2kx2k CCD + DFM auto-guider + cooling system + controller = 300

512x512 CCD + DFM auto-guider + cooling system + controller = 300