NATIONAL OBSERVATORY OF ATHENS

Institute for Astronomy, Astrophysics Space Applications and Remote Sensing

HELMOS OBSERVATORY

COOKBOOK

for

andor2k ccd

(Andor iKon-L936 BV)

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1.1 Overview

To use the `andor2K` camera installed at *Aristarchos* telescope, users need to follow the procedure outlined below:

1. Turn on andor2k-pc [username: ANDOR2K, password: andor2K]
2. Check that the SFM is the default position (port number: 0)
3. Open 3 terminal windows
4. setup connection between the `andor2k-pc` and the camera (1.2)
5. initialize the `andor2k-daemon` (1.3)
6. start-up the `andor2k-client` Graphical User Interface (GUI) (1.4)
7. focus with IRAF (1.5)

Once the use is done, the *shutdown* of the system is performed via the `andor2k-client` GUI.

1.2 Starting Up `VirtualHere Client`

`VirtualHere Client` is a program that enables a virtual usb connection between the `andor2k-pc` and the camera (mounted on the telescope). The connection should be maintained throughout the time period between the initialization and shutdown of the `andor2k-daemon`.

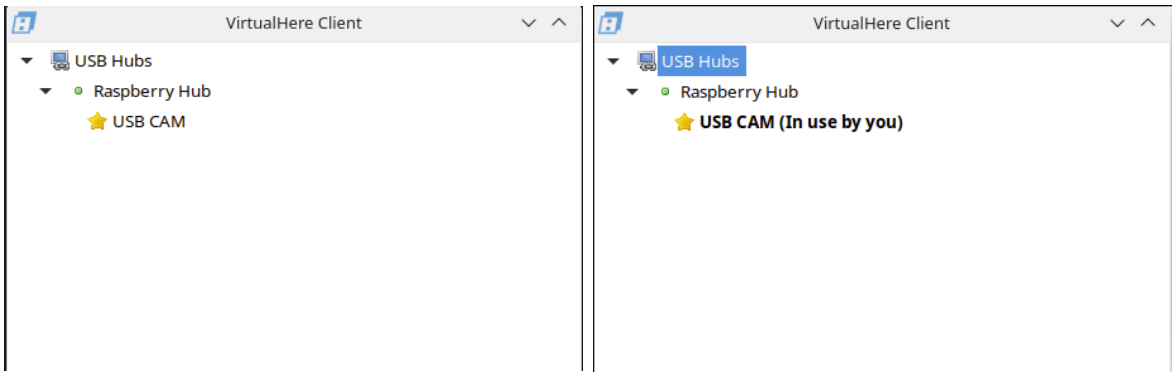
The *executable* is named **vhuit64** and located in the `Desktop` folder. To establish the connection, perform the following:

1. start `VirtualHere Client`; on the **1st terminal** window type the command:

   ```
   $ cd ~/Desktop && sudo ./vhuit64
   ```

   On success, a GUI should appear, as the one shown in 1.1a
   Note that a pop-up window may appear, with information on the current version of the software; just ignore it (hit `OK`).

2. right-click on the `Raspberry Hub` option and select `Auto Use all on this Hub` (in case it not already checked). On success, a `USB CAM (In use by you)` should appear, in bold text, as shown in 1.1b



(a) `Before connection to camera.` (b) `After connection to camera.`

Figure 1.1: `VirtualHere Client`

The USB connection to the camera must be active at all time during the observations; hence DO NOT close the terminal or terminate the `VirtualHere Client`.

1.3 Starting Up `andor2k-daemon`

To use the camera, you need to "enable" the `andor2k-daemon`. To do this, on the **2st terminal** window type:

```
$ andor2kd
```

This step might take a while to complete, due to the camera cooling-down process. Approximately 10 minutes may be needed to reach the target start-up temperature of $-90°C$. Relevant log is written on the terminal. Once this step is completed, you should see the message `"Service is up and running ... waiting for input"`.

Users do not directly interact with this program (this is done via the `andor2k-client` program). However, during camera usage, the "daemon" will write out log messages describing execution steps.

In case the user cannot connect to the deamon (via `andor2k-client`), or the connection is lost, e.g. due to internet failure, the daemon can be shutdown using the `SIGINT` signal, aka hiting the `Ctrl+C` combo.

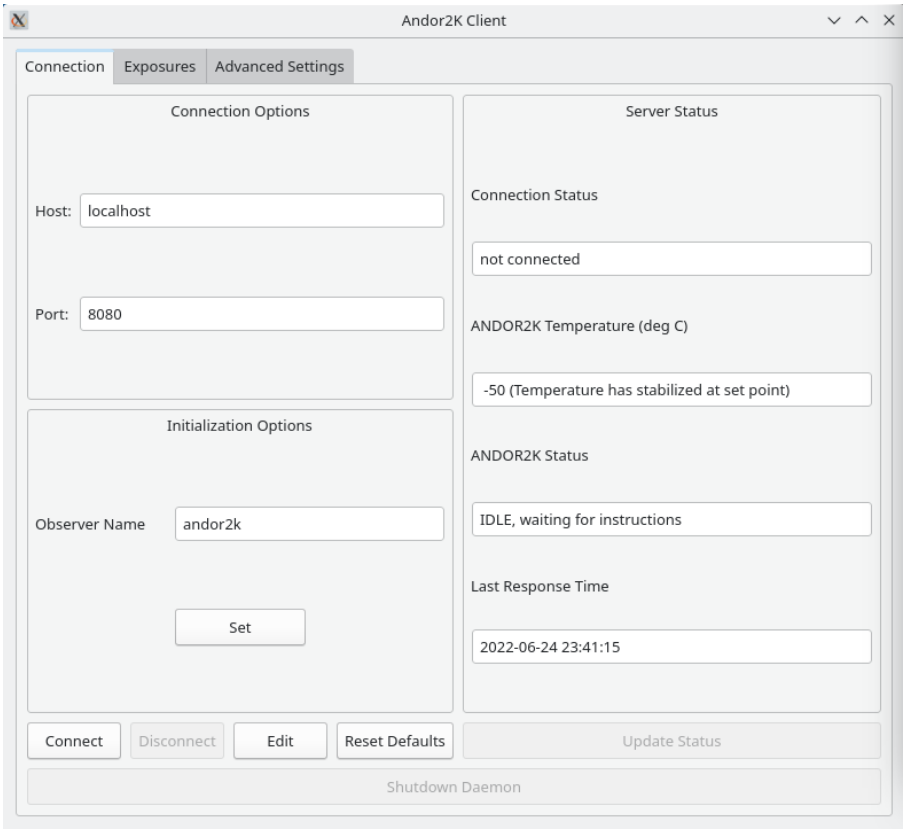


Figure 1.2: `andor2k-client`-GUI Connection Tab

1.4 Camera usage via `andor2k-client`

To use the camera and acquire images, open the `andor2k-client` program. A shortcut of the program is placed on the `Desktop` folder; double-clicking it and a GUI window will pop up (resembling the one in 1.2).

Click, first, the `Connect` button to establish a connection and start using the camera. If the connection is successful, the `Connect` button should be disabled, and the `Disconnect` button enabled (at the bottom of the panel). On the right part of the panel, information on the camera status will be written.

The camera is now ready for use.

1.5 Basics of `andor2k-client`

The user interacts with the camera via `andor2k-client`.
Note that when placing your mouse cursor above any text field, a help message will appear with information on the field.

The program has three main tabs, namely (1) the `Connection Tab`, (2) the `Exposure Tab` and (3) the `Advanced Tab` (see Figures 1.2, 1.3 and 1.4). All images are saved in the folder namely "fits"(*path: home>fits*).

1.6 Focus using IRAF

To find the best focus of the camera, IRAF can be used following the steps/commands below:

- open a terminal and type "xterm &", and a new window will pop up,
- In this new window, the iraf27 environment has to be activated. Type the command "conda activate iraf27", (see Figure 1.5, panel (a))
- type the command "cd iraf", to move to the folder namely "iraf",
- to use IRAF, type ''cl",
- type "!ds9 &",

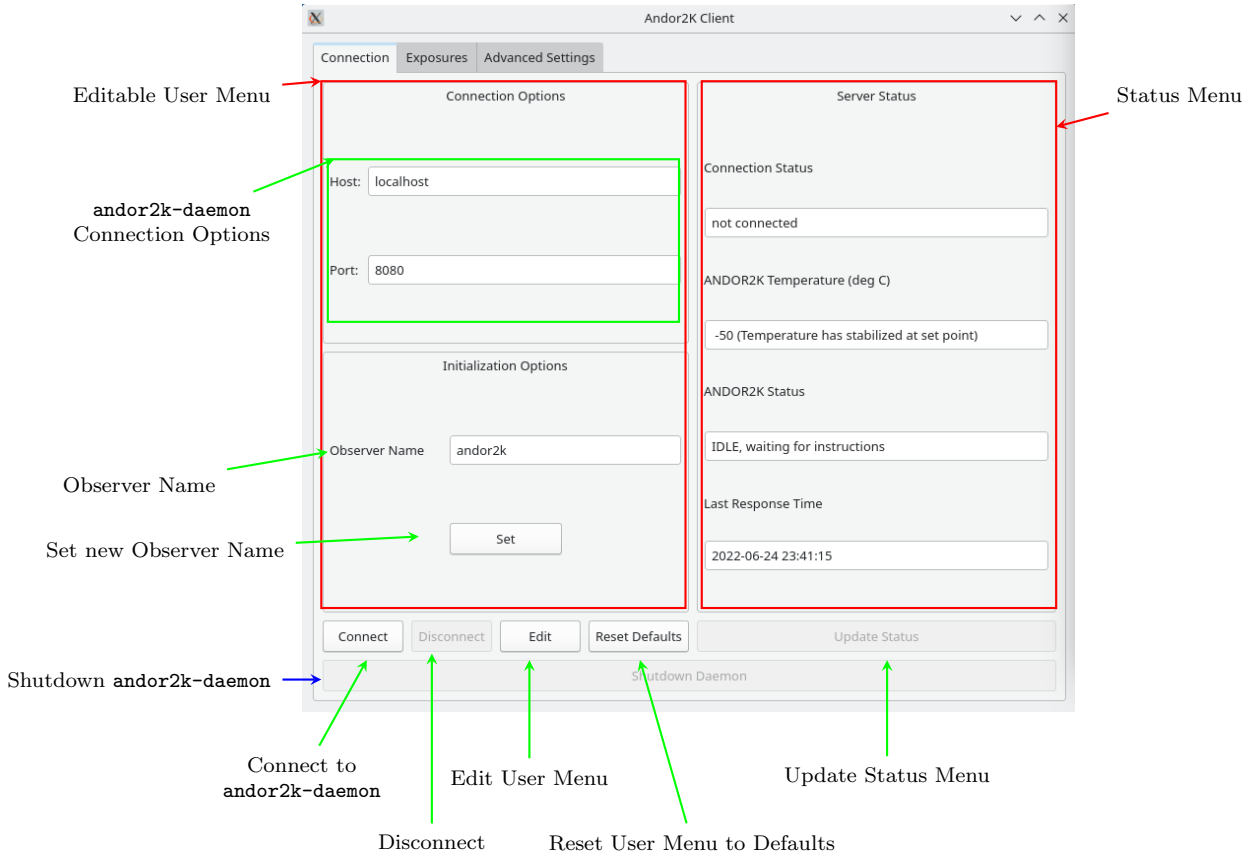


Figure 1.3: Detailed view of `andor2k-client`'s `Connection Tab`

- type "display image_name.fits". The fits image will be displayed in ds9. All the exposures are saved in the folder namely "fits" (*path: home>fits*).

- type imexam",

- put the cursor on top of a star and type the keys "j", or "k". A new window will pop up, and it will display the distribution of the emission in lines or columns, respectively. (see Figure 1.5, panel (b)). FWHM is given in pixels units (the pixel scale of the camera is 0.13"/pix. NOTE: if a specific binning mode is used, the pixel scale is changed. e.g. for 2x2 binning, the pixel scale is 2*0.13"/pix).

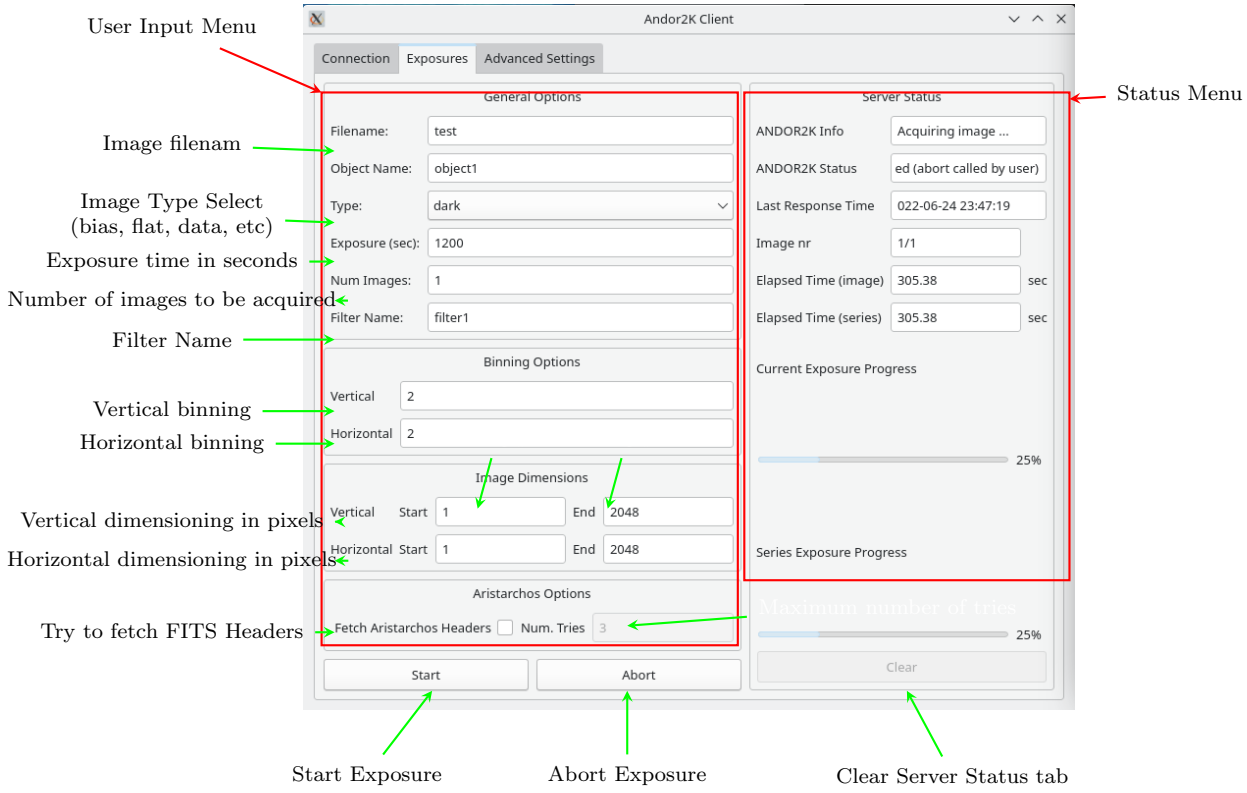


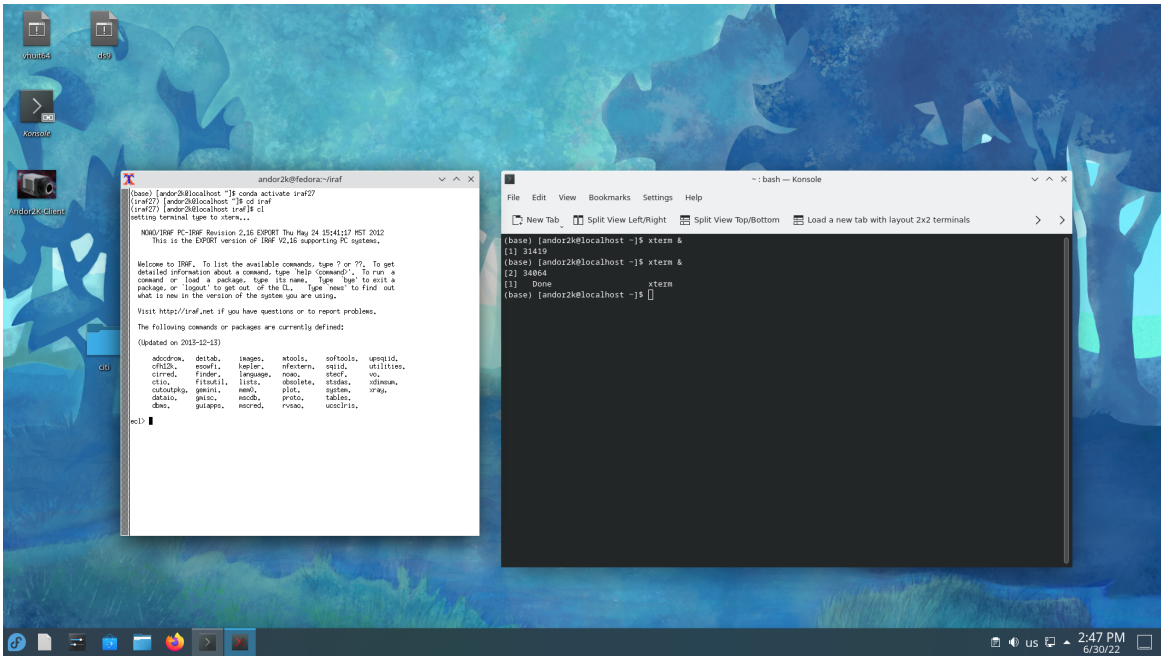
Figure 1.4: `andor2k-client` detailed view of `Exposure Tab`

1.7 Shutdown the camera

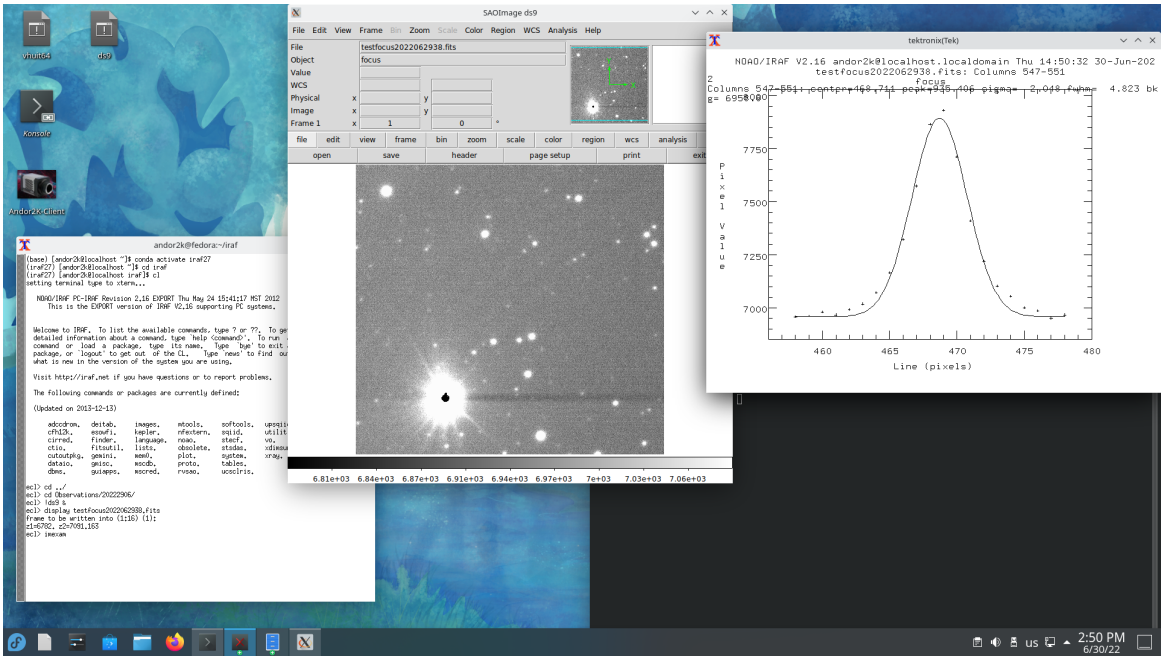
To shutdown the system, click the `Disconnect` button and the camera will automatically start to heat-up. After the end of the observations, move all the images from the folder "iraf"to a new folder namely **yearmonthday** in the "(e.g. 20220701 for 01 July 2022) Observations" folder (*path home>Observations*).

1.8 System specification

- Pixel Scale: 0.16"/pixel (unbinned), 0.32"/pixel (binned 2x2)
- Fiedl of view: 5.5' x 5.5'
- Orientation of the images is North-East (NE) to ds9 after "invert" and "rotate 90"



(a) Activate the iraf27 environment and open IRAF



(b) Display an image through IRAF and get the FWHM

Figure 1.5: Activate and use IRAF.