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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



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 $-90^{\circ}C$. 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.

<			Andor2	Andor2K Client					
Connection	Exposures	Advanced Settings	5						
	Conr	nection Options		Server Status					
Host: localhost				Connection Status					
				not connected					
Port: 808	0			ANDOR2K Temperature (deg C)					
				-50 (Temperature has stabilized at set point)					
Initialization Options Observer Name andor2k				ANDOR2K Status IDLE, waiting for instructions					
				Last Response Time					
Set				2022-06-24 23:41:15					
Connect	Disconne	ct Edit	Reset Defaults	Update Status					
			Shutdown	Daemon					

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).

User Input Menu	Andor2K Client V ^ X							
	Connection Exposures Advanced Settings							
	General Options				Server Status			ഺ Status Menu
Imaga filenam	Filename:	test			ANDOR2K Info	Acquiring image		
innage menani —	Object Name:	object1			ANDOR2K Status	ed (abort called by	user)	
Image Type Select	Туре:	dark		~	Last Response Time	022-06-24 23:47:19		
(bias, flat, data, etc)	Exposure (sec):	1200			Image nr	1/1		
Exposure time in seconds -	Num Images:	1			Elapsed Time (image)	305.38	sec	
Number of images to be acquir	ed ← Filter Name:	filter1			Elapsed Time (series)	305.38	sec	
Filter Name	Binning Ontions							
	Vertical 2				Current Exposure Prog	gress		
Vertical binning —	Horizontal 2				=			
Horizontal binning —				25%				
	Vertical Star	t 1	End 2048					
Vertical dimensioning in pixel	Is vertical start 1 End 2048							
Horizontal dimensioning in pixe					Series Exposure Progress			
	Aristarchos Options			Maximum number of tries				
Try to fetch FITS Headers								
	Start Abort				Clear			
Start Exposure Abort Exposure Clean Server Status tab								

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"



 $\left(a\right)$ Activate the iraf27 environment and open IRAF



 $\left(b\right)$ Display an image through ${\rm IRAF}$ and get the FWHM

Figure 1.5: Activate and use IRAF .