Guide to Using the SRT

1. ## If you are outside the JHU Firewall:

    a. If you don't already have "Pulse Secure", the JHU VPN, visit my.jh.edu. There should be a Quicklink labelled "VPN" in the left column where you can download and install the VPN.

    b. Log into the VPN. This puts you inside the JHU firewall, where you can access the computer.

    c.

2. ## Accessing the SRT webcams.

    a. <u>Viewing the telescope</u>. Using Firefox, Opera, or Chrome, navigate to <u>srtmonitor.pha.jhu.edu</u> (128.220.122.28). Certain browsers, like Safari have difficulty displaying the image. You should get a login screen. Login with username: student and password: g@laxy_$1420MHz. Alternatively, using VLC media player; go to file → Open Network... For the URL, type rtsp:// 128.220.122.28, and Open RTP/UDP stream. In either case, you should see a view of the telescope from a nearby building, looking north.

    b. <u>Telescope point of view</u>. Navigate to <u>Srtviewpoint.pha.jhu.edu</u> (128.220.122.29) with the same parameters as above. This is the view from a camera mounted onto the telescope itself. When you look through the circular washer mounted on the dish mesh, you are looking in the direction that the telescope is pointing.

3. ## Procedure to log onto the SRT computer.

    ## Mac OS X:

    a. Go to the Finder, and select Connect to Server... from the Go menu.

    b. Under Server Address enter: vnc://victor.pha.jhu.edu:5901 - and then Connect

    c. When you are asked for a password, enter: g@laxy_$1420MHz

    d. You should see the desktop. You may need to login to CentOS if desktop is logged or timed out. (username: **student** password: **g@laxy_$1420MHz)**

    e. To log out, close the VNC/screen sharing window.

    ## Windows:

a. Download and install RealVNC Viewer from https://www.realvnc.com/download/viewer. This is an executable that can be run without installing. Startup VNC. At the top, where this is a line for an address, type victor.pha.jhu.edu:5901 and then press enter.

b. A dialog box may pop up saying "the connection to this VNC server will not be encrypted", which you should remember but disregard. Click Continue, and then enter the password g@laxy_$1420MHz when prompted and click OK. You should now be connected to the desktop. If the student had logged or timed out, you may need to login again to the CentOS desktop.

c. If you are unhappy with the size of the vnc viewer window, open up a terminal window inside the vnc viewer (i.e., on victor) and type xrandr. This will produce a list of N options for screen resolutions ordered from 0 to N-1. To select for example the third option in the list, type xrandr -s 2.

d. To end the session, close the VNC window, and close the VNC Viewer window as well.

4. Using the Linux terminal:

a. Open a Terminal by going to Applications > Favorites > Terminal in the top left of the screen.

b. The terminal allows you to type in commands in BASH script. A few useful commands are:

    i. Change directory (cd)

        1. Syntax: >> cd directory_name

        2. Typing "cd /home/student/srt" will take you to the directory where the SRT software is compiled.

        3. One period (.) is the current directory. Two periods (..) is the directory one level up. The root directory is '/'. The student home directory is '/home/student/' or in shorthand '~'.

    ii. List files in directory (ls)

        1. Syntax: >> ls <directory name>

        2. Typing "ls /home/student/srt" lists all of the files in that directory.

        3. If you don't put a directory down, the files in the current directory are listed.

        4. If you type "ls –l" the –l option tells the computer to list detailed information on each file, including when it was created.

    iii. Make a new directory (mkdir):

        1. Syntax: >> mkdir <directory_name>

2. Data for your observations can be saved for future use in "/home/student/data/group_name/"

iv. Move a file to another directory (mv)

1. Syntax: >> mv current_file_path new_file_location

2. Example: "mv /home/student/srt/your_plot.ps /home/student/data/your_group/test_file.txt" will move the file "your_plot.ps" from the srtnver2 folder to your group's personal data folder.

v. Identify the directory you are currently in:

1. Syntax: >> pwd

2. Identifies path to current working directory.

c. For more information on common BASH commands read http://tldp.org/LDP/abs/html/basic.html

5. Using the SRT software:

a. Once you have used the VNC Viewer to remotely access the SRT computer and once you are in the folder: /home/student/srt/ run the command "./srtn". Note the period and slash before the name of the executable. This will open the SRT software.

b. The SRT software will pop up a graphical user interface (GUI) that allows control of the SRT along with data-taking.

c. Commands are input to the SRT using the buttons at the top of the GUI window, by clicking on the map of the sky, or through a series of commands from the file "/home/student/srt/cmd.txt." The latter is most convenient when a series of measurements are to be made.

d. You will want to change the destination file names in the command file to match a directory that you have created for your data (in /home/student/data/). If you don't create the directory first (using the "mkdir" command), the program will fail to create data files there.

e. Once a command file is ready, you can run it by clicking on the "cmdfl" button in the GUI window. If you need to stop the current data run, you can click on "cmdfl" again to cancel your observations.

f. You should always take a reference data file somewhere far from the galaxy. The map in the software is a good way to find a clean patch of sky.

g. The last command in the file should be a stow command. Once the instrument is in the stow position, you can exit the program using the button at the top right of the window. The program won't exit if you are not in the stow position. If the command file didn't stow the telescope, you can click on the "stow" button, then the "exit" button once the telescope is done moving.

h. To get a spectrum of part of the galactic plane manually:

    i. Click on the relevant coordinate on the map, such as 'G50' for galactic longitude 50 degrees. You will see the current position of the SRT as a red '+' sign. The SRT will take a little time to get to a new position. You can monitor its progress by looking at the webcam.

    ii. Click the "clear" button to clear the current averaged spectrum and start taking new data.

    iii. Allow the spectrum to average for at least 5 minutes.

    iv. Click on the average spectrum window. A plot will pop up. Choose the "save to postscript file" and click okay. This will save a file with the current date and time in the name.

    v. Repeat for each point on the galaxy that is accessible to you – at least G20 out to G90 in 10-degree steps.
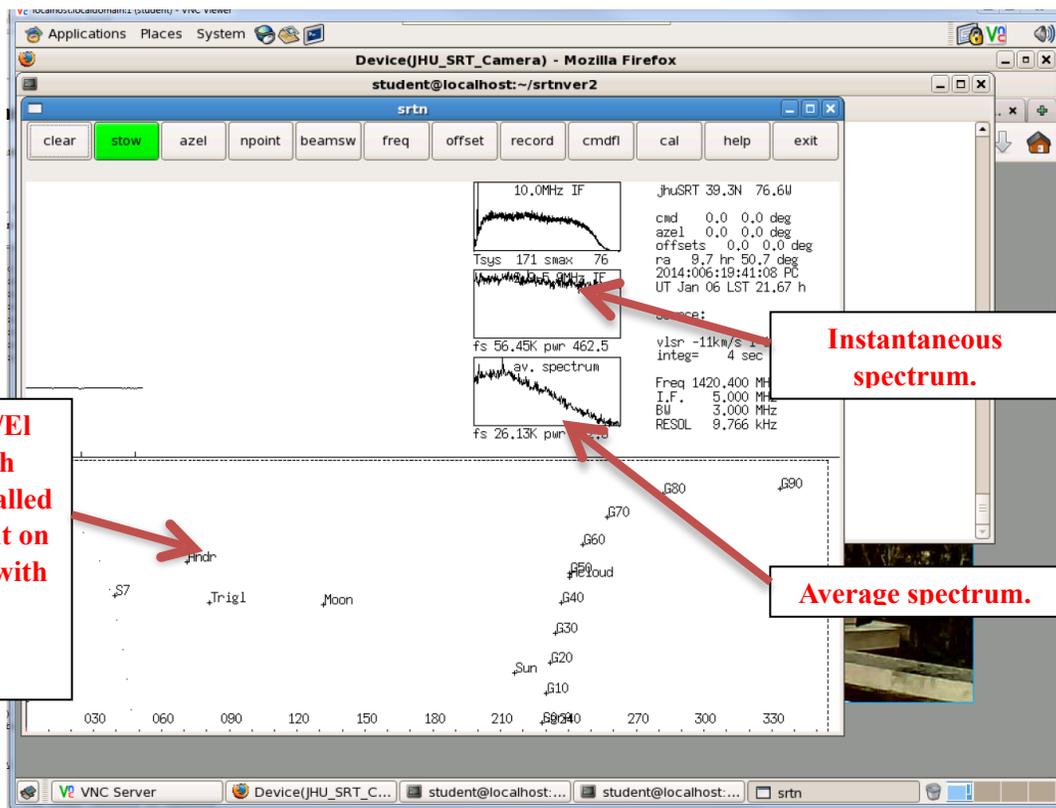
6. Finishing up:

a. When you are done taking data, stow the telescope and exit:

    i. Hit the "stow" button to move the telescope to 0 degrees in azimuth and elevation. It may take a minute for the SRT to move to the stow position.

ii. When this is done and the telescope has stopped moving, hit the "exit" button to close the program. You will not be able to exit the program if it's not in the stow position (the stow button will be lit green in this case).

b. Clean up and organize your data:

i. Move any data that you created in /home/student/srt to your directory with the "mv" command.

ii. Upload your files to your own computer. You can do this by opening a browser and uploading the files to the cloud or by emailing them to yourself.

iii. You may want to review your data files with a text editor to make sure that your data is present!

7. Constructing the cmd.txt file:

a. File should be named *cmd.tx*t and created in your */home/student/data/yourgroup* directory.

b. Once ready, move the file to the /srt directory.

c. Execute file by clicking the cmdfl button in the srt window and entering the filename in the form: *../data/yourgroup/cmd.txt*. File contains a list of commands, each beginning with a colon.

d. There is a space between each colon and the command, except for the wait command.

e. File ends with the command to stow the telescope (: stow).

f. Useful Comands

i. : sourcename (G10 or Sun, for example)

ii. : azel *az_deg el_deg* where *az_deg* (*el_deg*) is the azimuth (elevation) in degrees.

iii. : galactic *glat_deg glong_deg*

iv. *:* offset *azoff_deg eloff*

v. : clearint (clears the integration of data)

vi. : record *home/student/data/groupname/filename.dat* Starts recording data to *filename.dat*. Note the filename extension .dat and its location in your home directory. Give the file a descriptive name, like G80.dat

vii.:*time_sec* (waits for *time_sec*, used for recording data) [no space between colon and time_sc]

viii.: roff (stop the recording of data).

ix. : stow

g. Create and edit this file with the nano editor (once inside */home/student/data/yourgroup*, type *nano cmd.txt* in Terminal.) Pressing the control key and "x" will exit the program and ask you if you want to save any changes made.

Examples:

: az el 150 45	(move to azimuth 150 degrees, elevation 45 degrees)
: record /home/student/data/groupname/azel_150_45.dat	(record datafile azel_150_45.dat in data subdirectory)
:600	(wait ten minutes while recording)
: roff	(stop recording data to file)
: stow	(move the telescope to the stow position)

Notes: When the first data file is written, the program might ignore your specified filename and write it instead into the /home/student/srt directory in the form year_date_number.rad (e.g. 2017_098_10.rad). Subsequent files are written to the location you specify.

If you hover your cursor over the cmdfl button in the srt program window, a popup message eventually appears that shows what file is being used.The current line of code being executed is shown in green beneath the av. spectrum plot in the srt window.