

Documentation

Goodman HTS Manual

<http://www.ctio.noao.edu/soar/content/goodman-hts-manual>

Goodman Overview

<http://www.ctio.noao.edu/soar/content/goodman-spectrograph-overview>

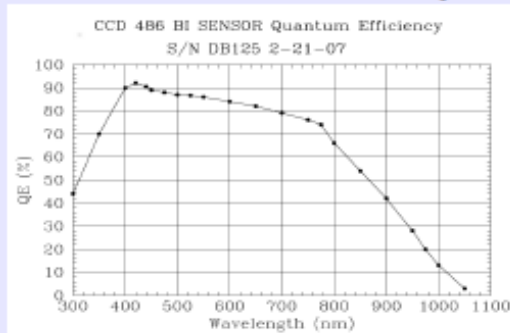
Goodman Spectrograph Observer's Cheat Sheet - 1



CCD Characteristics

Read Rate	Analog ATTN	Gain (e-/ADU)	Read Noise (e-)	50% Full Well (ADU)
50 kHz	0	0.25	3.33	279600*
	2	0.47	3.35	148723*
	3	0.91	3.41	76813*
100 kHz	0	0.56	3.69	124821*
	2	1.06	3.72	65943*
	3	2.06	3.99	33932
200 kHz	0	1.4	4.74	49928
	2	2.67	5.12	26179
	3	5.67	8.62	12328

* Digital saturation reached before 50% full well



Other Info:
 Digital saturation: 65,536 e-
 Single Pixel Full Well: 139,800 e-
 Linearity: 0-80% Full Well
 Dark Current: 0.0003 e-/pixel/sec
 Pixel size: 15 microns

Mode	Binning	Serial Origin	Serial Length	Parallel Origin	Parallel Length	Approx. Image Size
Imaging 1x1	1x1	516	3096	500	3096	19 Mb
Imaging 2x2	2x2	516	1548	500	1548	5 Mb
Imaging 3x3	3x3	516	1032	500	1032	2 Mb
Spec 1x1	1x1	0	4142	1100	1896	16 Mb
Spec 2x2	2x2	0	2071	1100	948	4 Mb
Spec 3x3	3x3	0	1381	1100	632	2 Mb
Slit Imaging /alignment	1x2	1250	1200	1100	948	800 Kb

Note: Origins are given in un-binned, absolute pixels, lengths are given in binned pixels

Spectroscopic Info

Grating (lines/mm)	Dispersion (Å/pixel)	Coverage (Å)	Max R @ 550nm (3pix with 0.46" slit)	Blocking Filter
400	1.00	M1: 300-705 M2: 500-905	1850	- GG-455
600	0.65	UV: 301-569 Blue: 350-616 Mid: 435-702 Red: 630-893	2800	-- GG-385 GG-495
930	0.42	M1: 300-470 M2: 385-555 M3: 470-640 M4: 555-725 M5: 640-810 M6: 725-895	4450	-- GG-385 GG-495 GG-495 OG-570
1200	0.31	M0: 302-436 M1: 350-485 M2: 420-550 M3: 490-615 M4: 555-685 M5: 625-750 M6: 695-815 M7: 765-880	5880	-- GG-455 GG-455 GG-495 OG-570
1800	0.19	800	9610	As needed
2100	0.15	630	11930	As needed
2400	0.12	510	14280	As needed

Order sorting filters: GG385, GG455, GG495, OG570, S8612

Field of View: 7.2' diameter circle

Pixel scale: 0.15"/pixel

Approximate exposure times in imaging mode required to achieve a SNR=100 on a star of V=16 and V=20, for a Moon Phase=7 days, Seeing=1", Airmass=1.2

Available Filters:

- Johnson UBV, Kron-Cousins Rc (round 4" diameter)
- UBVRI (Bessell; 4"x4")
- SDSS ugriz (4"x4")
- H α (4"x4")
- Other filters per request. Contact the instrument scientist

Imaging Info

Filter	Exp (s) V=16	Exp (s) V=20
U	7	650
B	1	50
V	1	48
R	0.6	42
I	1.5	110

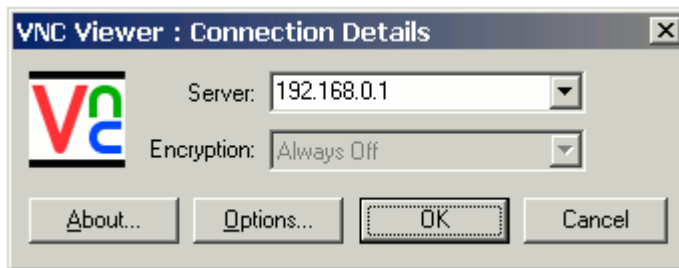
<http://www.goodman-spectrograph.org/>

Virtual Network Computing (VNC) enables to remotely control other computers.



For Windows machines, we suggest either the *Real VNC Viewer* or the *Ultra VNC Viewer* client.

Webpages: www.realvnc.com and <http://www.uvnc.com/>

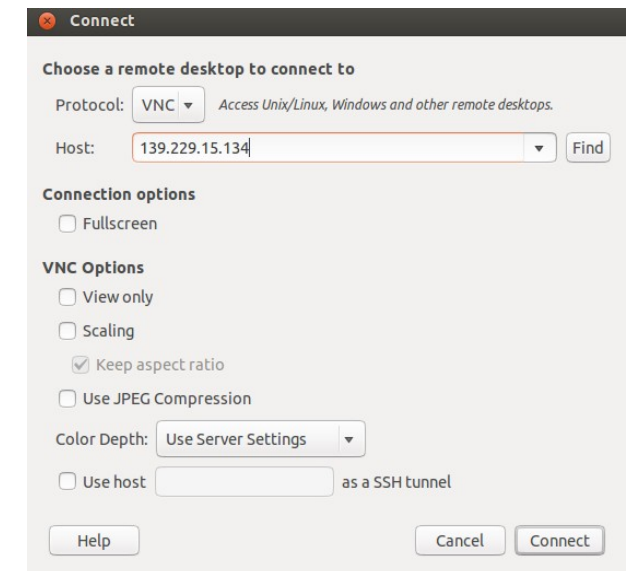


For GNU/Linux and Mac OSX machines, we suggest the *Real VNC Viewer* client. The VNC viewers *Remmina*, *Vinagre*, and *vncviewer* that come installed by default in several Linux distributions also work correctly.



For Mac OSX machines there is also a *Real VNC* client, do not use *Chicken VNC*.

Vinagre



1) The Goodman data acquisition computer (GUI) is accessed with the command:

```
vncviewer -Shared soaric4.ctio.noao.edu
```

or

```
vncviewer -Shared 139.229.15.134
```

2) The Goodman data data analysis computer (IRAF) is accessed with:

```
vncviewer -Shared soaric7.ctio.noao.edu:<N>
```

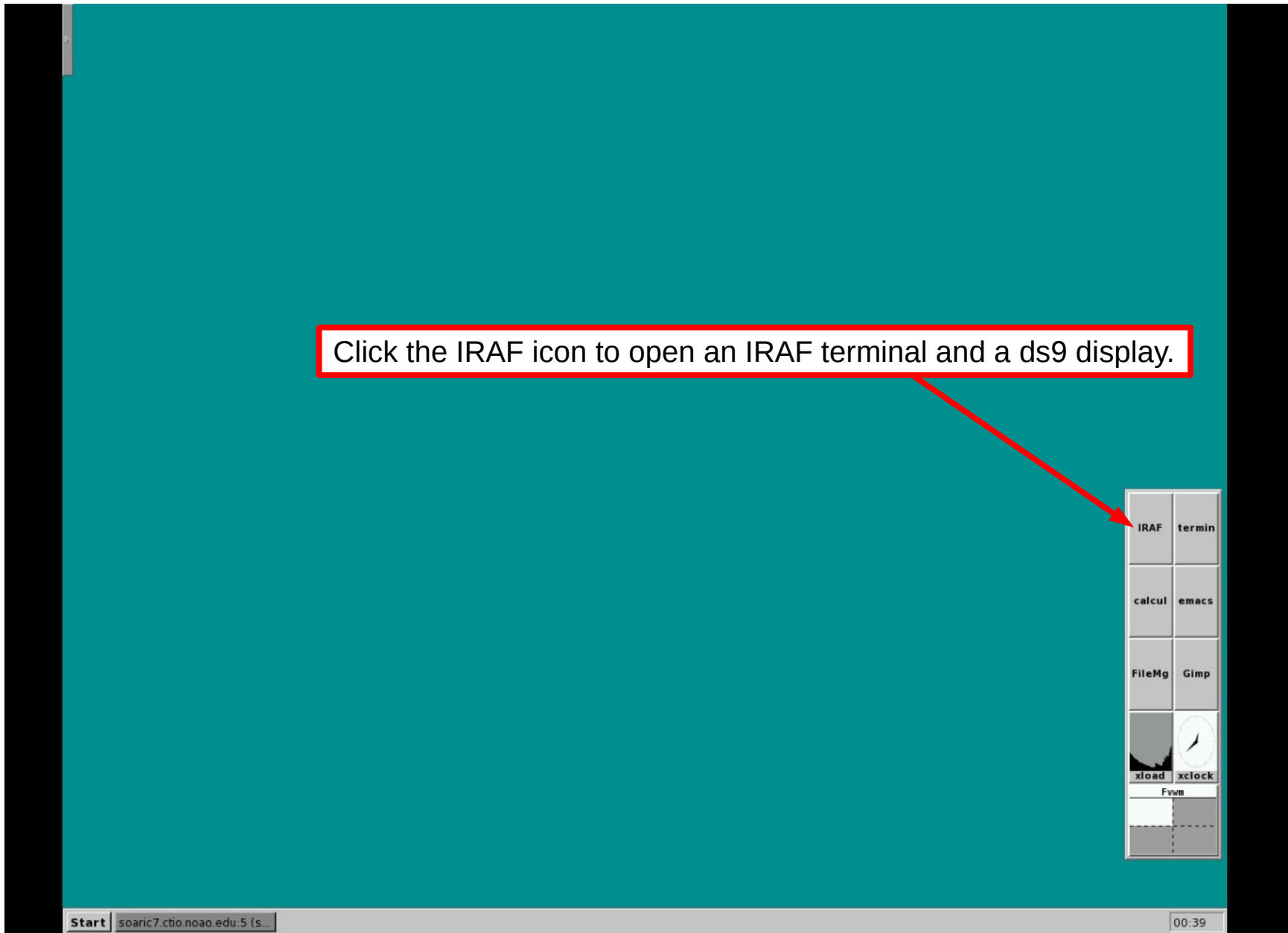
or

```
vncviewer -Shared 139.229.15.137:<N>
```

N is the display number of the respective SOAR partner.

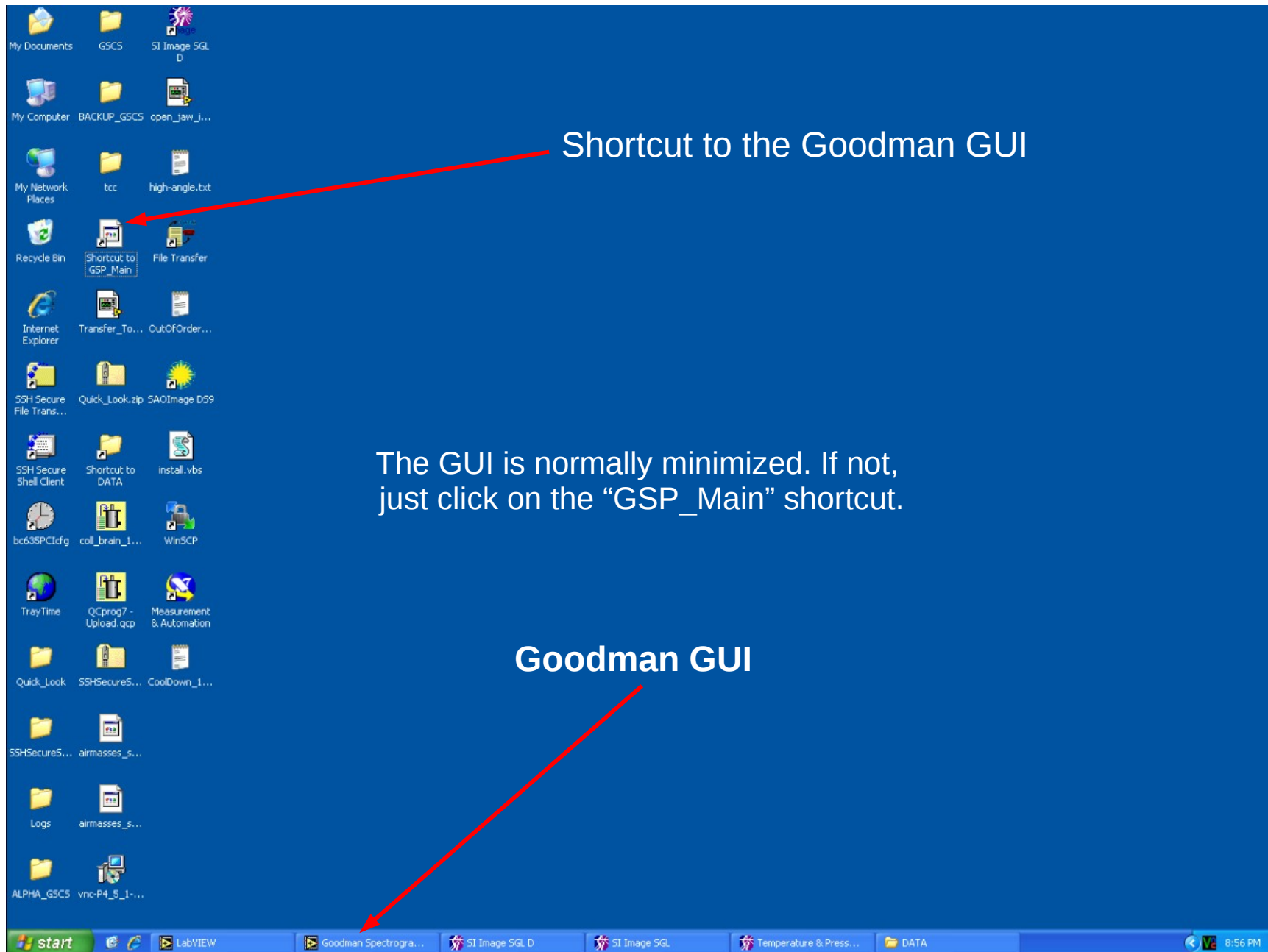
If you have obtained time through NOAO or the Chilean TAC, please contact Cesar Briceño (cbriceno@ctio.noao.edu) or Sean Points (spoints@ctio.noao.edu) to get the password information.

If you have time through the Brazil TAC, contact David Sanmartim (dsanmartim@ctio.noao.edu) or Bruno Quint (bquint@ctio.noao.edu)



The screenshot displays a VNC session with two main windows. The top window is a terminal titled "SOAR-Brasil" showing the IRAF environment. The terminal text includes: "Welcome to IRAF. To list the available commands, type ? or ??.", "The following commands or packages are currently defined:", and a list of packages such as "apropos", "dimsum", "gemini", "msched", "plot", "system", etc. The terminal prompt is "ec1> cd /home3/observer/today/". A red box highlights the text "Images acquired with Goodman are transferred in real time to /home3/observer/today/" with a red arrow pointing to the terminal's current directory. The bottom window is the "SAOImage ds9" software interface, which has a menu bar (File, Edit, View, Frame, Bin, Zoom, Scale, Color, Region, WCS, Analysis, Help) and a toolbar with buttons for file operations, zoom, scale, color, region, wcs, and help. A small coordinate system icon is visible in the top right of the software window. On the right side of the desktop, there is a vertical dock containing icons for "IRAF termin", "calcul emacs", "FileMg Gimp", "xload xclock", and "Fvwm". A system clock at the bottom right shows "00:40".

Images acquired with Goodman are transferred in real time to /home3/observer/today/

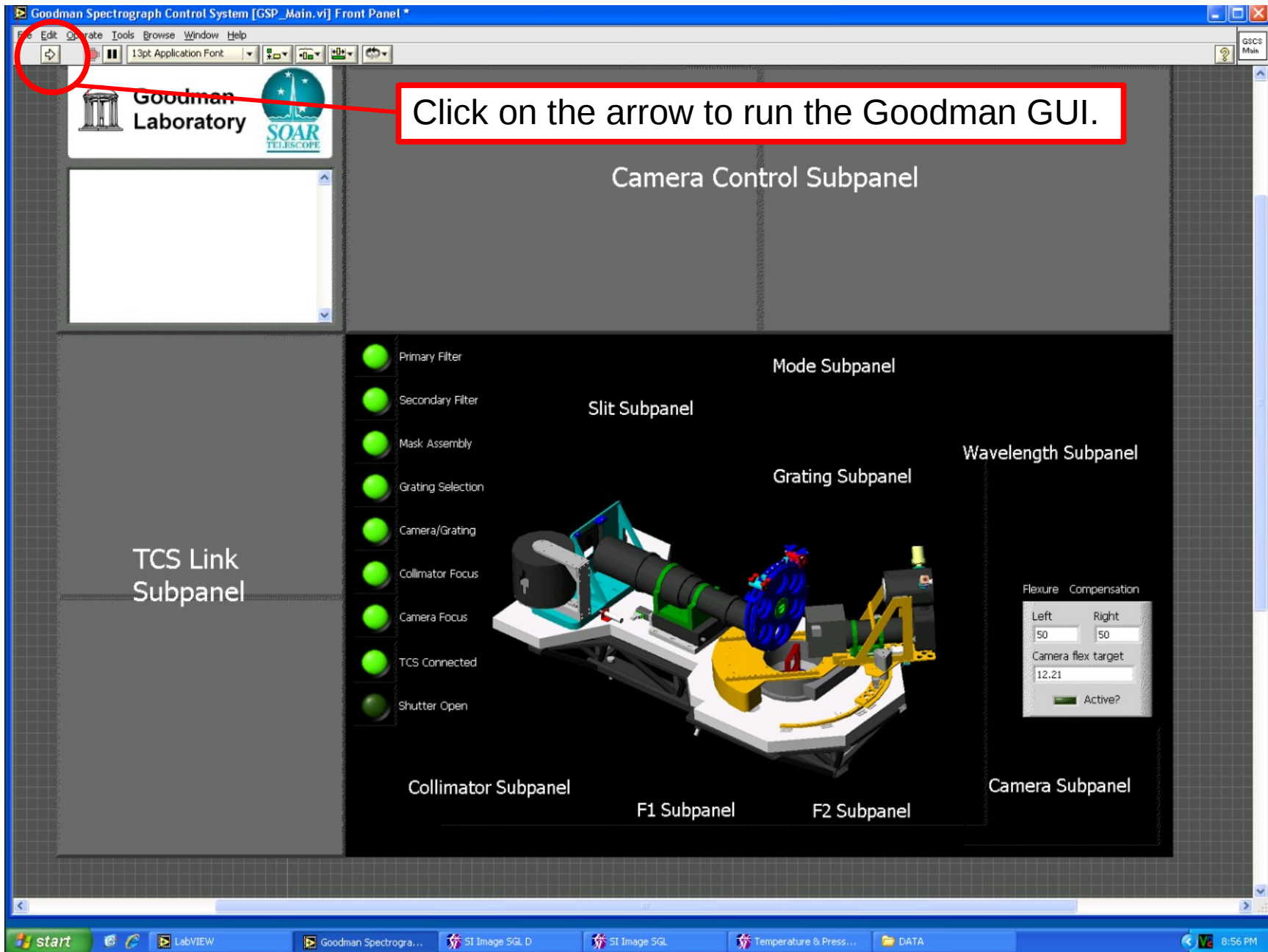


Shortcut to the Goodman GUI

The GUI is normally minimized. If not, just click on the "GSP_Main" shortcut.

Goodman GUI

Starting the Goodman GUI

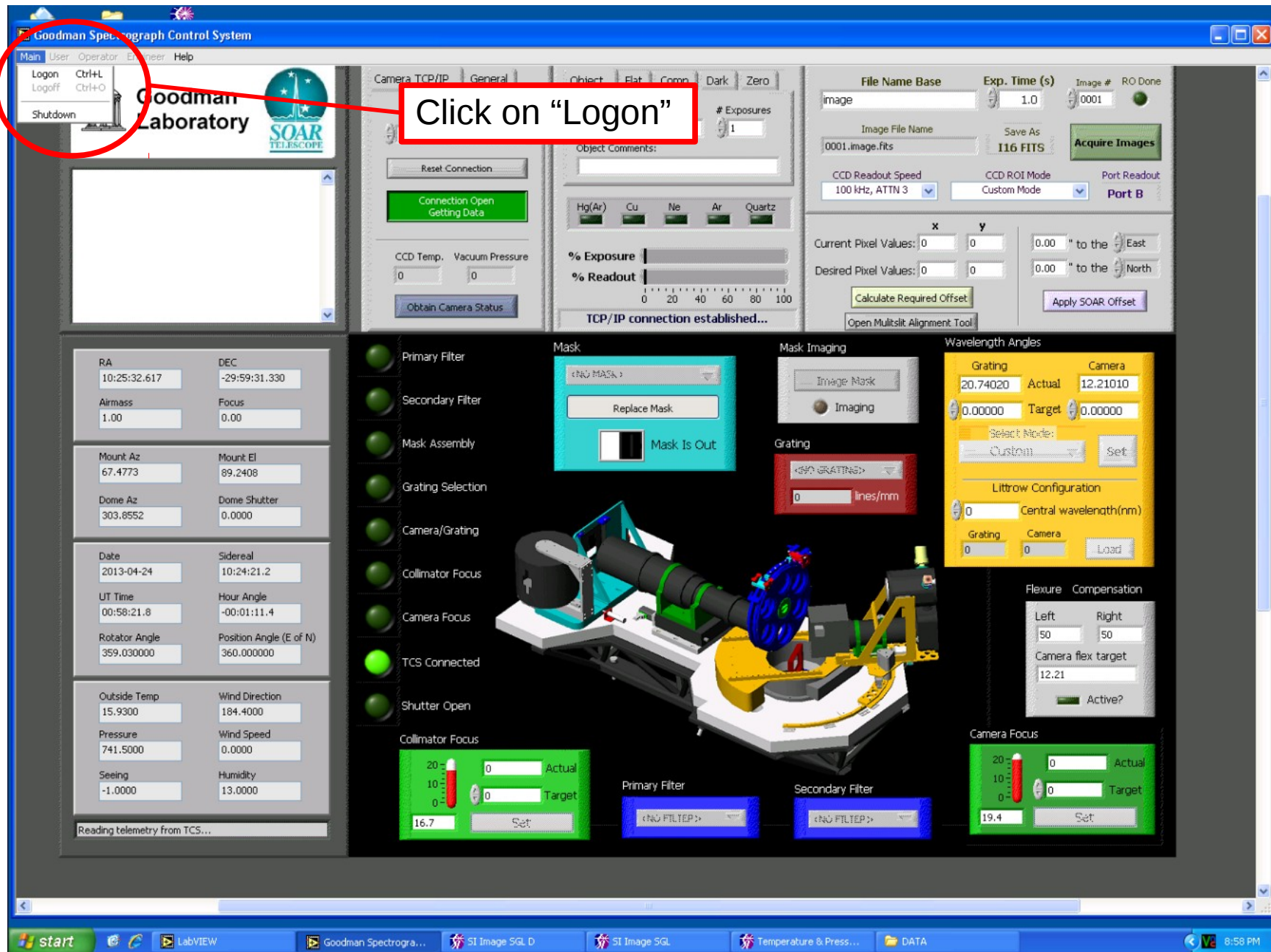


To log in...

The screenshot shows the Goodman Spectrograph Control System interface. At the top left, the 'Main' menu item is circled in red, with a red arrow pointing to a text box that says "Click on 'Main'". The interface is divided into several sections:

- Top Left:** Goodman Laboratory logo and SOAR Telescope logo.
- Top Center:** Camera TCP/IP, General, Object, Flat, Comp, Dark, Zero tabs. Includes a "Reset Connection" button, a green "Connection Open Getting Data" button, and "Obtain Camera Status" button.
- Top Right:** File Name Base (image), Exp. Time (s) (1.0), Image # (0001), RO Done (green dot). Includes "Image File Name" (0001.image.fits), "Save As" (116 FITS), and "Acquire Images" button. Also includes "CCD Readout Speed" (100 kHz, ATTN 3), "CCD ROI Mode" (Custom Mode), and "Port Readout" (Port B).
- Middle Left:** RA (10:25:03.992), DEC (-29:59:31.718), Airmass (1.00), Focus (0.00), Mount Az (67.4773), Mount El (89.2408), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (10:23:52.5), UT Time (00:57:53.2), Hour Angle (-00:01:11.4), Rotator Angle (359.030000), Position Angle (E of N) (360.000000), Outside Temp (15.9300), Wind Direction (184.4000), Pressure (741.5000), Wind Speed (0.0000), Seeing (-1.0000), Humidity (13.0000). A "Reading telemetry from TCS..." status bar is at the bottom.
- Middle Center:** Mask selection (NO MASK), Replace Mask button, Mask Is Out indicator, Grating Selection (NO GRATINGS), lines/mm (0).
- Middle Right:** Wavelength Angles section with Grating (20.74020), Actual (12.21007), Camera (12.21007), Target (0.00000), and Litrow Configuration (Central wavelength(nm) 0).
- Bottom Left:** Collimator Focus gauge (16.5), Primary Filter (NO FILTER), Secondary Filter (NO FILTER).
- Bottom Right:** Camera Focus gauge (19.4).
- Center:** 3D model of the spectrograph.
- Bottom:** Windows taskbar showing LabVIEW, Goodman Spectrogra..., SI Image SGL D, SI Image SGL, Temperature & Press..., DATA, and system clock (8:57 PM).

To log in...



To log in...

The screenshot shows the Goodman Spectrograph Control System interface. A 'User Login' dialog box is open in the center, with a red box highlighting the text: "Select the partner (brazil, noao, unc, msu, etc) and enter the password that was provided to you by the Support Scientist". A red arrow points from this text to the 'brazil' dropdown menu in the dialog. The background interface includes various control panels for camera settings, telescope alignment, and environmental data.

User Login Dialog Box:

Welcome to the Goodman Spectrograph Control System. Please Select your username to the right or enter a new name and press "OK"

Username: brazil

Password: [masked]

Buttons: Logon, select user, enter password

Homing the systems

Goodman Spectrograph Control System

Menu: User Operator Engineer Help

Save Configuration
Home Systems

Goodman Laboratory
SOAR TELESCOPE

Camera TCP/IP General Object Flat Comp Dark Zero File Name Base Exp. Time (s) Image # RO Done

1.0 0001

Save As 116 FITS Acquire Images

CCD Readout Speed 100 kHz, ATTN 3 CCD ROI Mode Custom Mode Port Readout Port B

Current Pixel Values: x y 0.00 " to the East
Desired Pixel Values: x y 0.00 " to the North

Calculate Required Offset Apply SOAR Offset

Open Multislit Alignment Tool

CCD Temp. Vacuum Pressure 0 0 Obtain Camera Status

Hg(Ar) Cu Ne Ar Quartz

% Exposure % Readout 0 20 40 60 80 100

TCP/IP connection established...

Primary Filter Mask Mask Imaging Wavelength Angles

Secondary Filter

Mask Assembly

Grating Selection

Camera/Grating

Collimator Focus

Camera Focus

TCS Connected

Shutter Open

Collimator Focus

Primary Filter Secondary Filter

Reading telemetry from TCS...

RA 10:28:21.968 DEC -29:59:29.171
Airmass 1.00 Focus 0.00
Mount Az 67.4773 Mount El 89.2408
Dome Az 303.8552 Dome Shutter 0.0000
Date 2013-04-24 Sidereal 10:27:10.9
UT Time 01:01:11.8 Hour Angle -00:01:11.0
Rotator Angle 359.030000 Position Angle (E of N) 360.000000
Outside Temp 15.8800 Wind Direction 208.3000
Pressure 741.6000 Wind Speed 5.1000
Seeing -1.0000 Humidity 13.2000

start LabVIEW Goodman Spectrogra... SI Image SGL D SI Image SGL Temperature & Press... DATA 9:01 PM

First click on the "User" menu tab and then on "Home Systems"

Homing the systems

Click on "Select All" and then on "Home Selected".

WARNING: Before you home systems, make sure the Goodman electronics has been powered on by the Telescope Operator (TO), and that the rotator angle is at 0 deg. Check with the TO.

The screenshot shows the Goodman Spectrograph Control System interface. The main window displays various system parameters and controls. The Initialization dialog box is open, showing a list of systems to be homed. The systems listed are:

- Wavelength Assembly
- Grating Translation
- Slit Assembly
- Filter Wheel #1
- Filter Wheel #2
- Collimator Focus
- Camera Focus

The dialog box also includes a "Select All" button, a "Select None" button, and a "Home Selected" button. A red box highlights the "Select All" and "Home Selected" buttons. A red arrow points from the text "Click on 'Select All' and then on 'Home Selected'" to the "Select All" button. Another red arrow points from the text "WARNING: Before you home systems..." to the "Home Selected" button.

Homing the systems

Yellow lights indicate that the mechanisms are moving.

RA: 10:29:10.808, DEC: -29:59:28.569
 Airmass: 1.00, Focus: 0.00
 Mount Az: 67.4773, Mount El: 89.2408
 Dome Az: 303.8552, Dome Shutter: 0.0000
 Date: 2013-04-24, Sidereal: 10:27:59.8
 UT Time: 01:01:59.8, Hour Angle: -00:01:11.0
 Rotator Angle: 359.030000, Position Angle (E of N): 360.000000
 Outside Temp: 15.8800, Wind Direction: 222.8000
 Pressure: 741.5000, Wind Speed: 5.1000
 Seeing: -1.0000, Humidity: 13.0000

Primary Filter: <NO FILTER>
 Secondary Filter: <NO FILTER>
 Mask: <NO MASK>, Mask Is Out
 Grating: <SD GRATING>, 0 lines/mm
 Wavelength Angles: Grating 21.01420, Actual 12.26390, Target 12.21000
 Camera Focus: 19.4 Actual, 0 Target

Homing the systems

The screenshot displays the Goodman Spectrograph Control System interface. A red box highlights the text: "Green lights indicate that the systems are homed." A red arrow points from this box to a vertical column of green status lights on the left side of the interface. The interface includes several control panels:

- Top Panel:** Includes menu options (Main, User, Operator, Engineer, Help), camera settings (Camera TCP/IP, General, Object, Flat, Comp, Dark, Zero), and acquisition parameters (Exp. Time, Image #, RO Done, Save As, Acquire Images).
- Left Panel:** Displays RA (10:29:58.045), DEC (-29:59:27.989), Airmass (1.00), Focus (0.00), Mount Az (67.4773), Mount El (89.2408), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (10:28:47.1), UT Time (01:02:47.0), Hour Angle (-00:01:10.9), Rotator Angle (359.030000), Position Angle (E of N) (360.000000), Outside Temp (15.8600), Wind Direction (183.9000), Pressure (741.5000), Wind Speed (5.4000), Seeing (-1.0000), and Humidity (13.0000).
- Center Panel:** Features a 3D model of the spectrograph and various control buttons like "Reset Connection", "Connection Open Getting Data", "Obtain Camera Status", "Mask", "Mask Imaging", "Grating", "Wavelength Angles", "Flexure Compensation", and "Camera Focus".
- Right Panel:** Contains "Wavelength Angles" (Grating: 20.74010, Actual: 12.20990, Target: 12.21000) and "Flexure Compensation" (Left: 50, Right: 50, Camera flex target: 12.21).

The bottom of the interface shows a Windows taskbar with the start button, LabVIEW, Goodman Spectrogra..., SI Image SGL D, SI Image SGL, Temperature & Press..., DATA, and a system clock showing 9:02 PM.

Initial settings

The screenshot shows the Goodman Spectrograph Control System interface. A large red-bordered box in the center contains the text "Attention!!" and "Do not forget to turn on flexure compensation." Below this, a smaller red-bordered box points to a green indicator light in the "Flexure Compensation" section, with the text "Click here to activate" and "Light green: turned on / Dark green: turned off". The interface includes various control panels for telescope parameters, camera settings, and filter/grating selection.

Attention!!
Do not forget to turn on flexure compensation.

Click here to activate
Light green: turned on
Dark green: turned off

Initial settings

Attention!!

The collimator focus must to be adjusted to “1000”

Enter 1000 in the target control box and click on “Set”.
Wait until the collimator reaches the position 1000 in the actual indicator box

The screenshot shows the Goodman Spectrograph Control System interface. The main window displays various control panels and status indicators. The 'Collimator Focus' control panel is highlighted, showing a red arrow pointing to the 'Target' input field, which is set to 1000. The 'Actual' value is currently 16.6. The 'Set' button is visible below the input fields. The interface also shows other control panels for 'Camera Focus', 'Flexure Compensation', and 'Shutter Open'.

GUI Layout

The screenshot shows the Goodman Spectrograph Control System interface. Several panels are highlighted with red boxes and labels:

- CCD Communication:** Located at the top center, it includes fields for Port (2055) and Server Address (localhost), a 'Reset Connection' button, and a green 'Connection Open Getting Data' button. It also shows CCD Temp. (0) and Vacuum Pressure (0) with an 'Obtain Camera Status' button.
- Image Acquisition Control:** Located at the top right, it features tabs for Object, Flat, Comp, Dark, and Zero. It includes fields for Object Name, # Exposures (1), Object Comments, File Name Base (image), Exp. Time (s) (1.0), Image # (0001), and RO Done. It also has fields for Image File Name (0001.image.fits), Save As (116 FITS), and an 'Acquire Images' button. Below these are settings for CCD Readout Speed (100 kHz, ATTN 3), CCD ROI Mode (Custom Mode), and Port Readout (Port B). A section for 'Offsets' includes 'Current Pixel Values' and 'Desired Pixel Values' for x and y coordinates, with 'Calculate' and 'Apply SOAR Offset' buttons.
- TCS Status:** Located on the left side, it displays a table of telescope status parameters:

RA	DEC
10:35:20.901	-29:59:24.444
Airmass	Focus
1.00	0.00
Mount Az	Mount El
67.4773	89.2408
Dome Az	Dome Shutter
303.8552	0.0000
Date	Sidereal
2013-04-24	10:34:10.6
UT Time	Hour Angle
01:08:09.6	-00:01:10.2
Rotator Angle	Position Angle (E of N)
359.030000	360.000000
Outside Temp	Wind Direction
15.9100	175.3000
Pressure	Wind Speed
741.6000	2.4000
Seeing	Humidity
-1.0000	13.0000

At the bottom of the TCS Status panel, it reads 'Reading telemetry from TCS...'. The main central area is labeled **Instrument Status** and contains a 3D model of the telescope with various control panels:

- Mask:** A cyan panel with a dropdown menu set to '<NO MASK>' and a 'Replace Mask' button. A status indicator shows 'Mask Is Out'.
- Mask Imaging:** A grey panel with an 'Image Mask' button and an 'Imaging' radio button.
- Grating:** A red panel with a dropdown menu set to '<NO GRATINGS>' and a 'lines/mm' input field.
- Wavelength Angles:** A yellow panel with 'Grating' (20.74010) and 'Camera' (12.20979) fields, 'Actual' and 'Target' values, and a 'Set' button. It also includes a 'Litrow Configuration' section with 'Central wavelength(nm)' and 'Load' buttons.
- Flexure Compensation:** A grey panel with 'Left' (0) and 'Right' (0) input fields, a 'Camera flex target' (12.21) field, and an 'Active?' checkbox.
- Collimator Focus:** A green panel with a vertical scale (0-20), 'Actual' (1001) and 'Target' (1000) values, and a 'Set' button.
- Primary Filter:** A blue panel with a dropdown menu set to '<NO FILTER>'.
- Secondary Filter:** A blue panel with a dropdown menu set to '<NO FILTER>'.
- Camera Focus:** A green panel with a vertical scale (0-20), 'Actual' (1) and 'Target' (0) values, and a 'Set' button.

The bottom of the screen shows a Windows taskbar with the 'start' button, several application icons (LabVIEW, Goodman Spectrogra..., SI Image SGL D, SI Image SGL, Temperature & Press..., DATA), and the system clock showing 9:08 PM.

Setting the CCD Readout Speed

Adapted by D. Sanmartim from L. Fraga's Guide

Click on the "CCD Readout Speed" pull-up menu and select the desired readout mode

Goodman Spectrograph Overview

Read Rate	Analog ATTN	Gain (e/ADU)	Noise (e)	Read Out Time (sec) Imaging/Spectroscopic
400 kHz	0	5.67	8.62	24/20
200 kHz	0	1.40	4.74	48/40
	2	2.67	5.12	
100 kHz	0	0.56	3.69	96/79
	2	1.06	3.72	
50 kHz	3	2.06	3.99	192/157
	0	0.25	3.33	
	2	0.47	3.35	
	3	0.91	3.41	

The screenshot shows the Goodman Spectrograph Control System interface. A red box highlights the 'CCD ROI Mode' pull-up menu, which is currently open, showing options: Imaging, 1x1; Imaging, 2x2; Imaging, 3x3; Spectroscopic, 1x1; Spectroscopic, 2x2; Spectroscopic, 3x3; Slicer; Slit Imaging/Alignment; Set user-defined ROI...; and Custom Mode. A red arrow points to the 'Set user-defined ROI...' option. The interface includes various control panels for camera settings, mask assembly, grating selection, and wavelength angles. A central 3D model of the telescope spectrograph is visible.

Click on the "CCD ROI Mode" pull-up menu and select the region of interest (ROI)

Selecting the image type

Goodman Spectrograph Control System

Main User Operator Engineer Help

Goodman Laboratory SOAR TELESCOPE

Camera TCP/IP General **Object** Flat Comp Dark Zero

Port: 2055 Server Address: Localhost

Object Name: Object acq # Exposures: 1

Object Comments:

File Name Base: SO2013B-000_2704

Exp. Time (s): 3.0

Image #: 0001

RO Done:

Image File Name: 0001_SO2013B-000_2704.fits

Save As: 116 FITS

Acquire Images

CCD Readout Speed: 400 KHz, ATTN 0

CCD ROI Mode: Spectroscopic, 1x1

Port Readout: Port B

Current Pixel Values: x: 0, y: 0

Desired Pixel Values: x: 0, y: 0

Calculate Required Offset

Apply SOAR Offset

Obtain Camera Status

DONE: New ROI mode set

Open Multislit Alignment Tool

RA: 10:58:26.781 DEC: -29:59:14.185

Airmass: 1.00 Focus: 0.00

Mount Az: 67.4772 Mount El: 89.2408

Dome Az: 303.8552 Dome Shutter: 0.0000

Date: 2013-04-24 Sidereal: 10:57:19.4

UT Time: 01:31:14.6 Hour Angle: -00:01:07.3

Rotator Angle: 359.030000 Position Angle (E of N): 360.000000

Outside Temp: 15.7700 Wind Direction: 279.1000

Pressure: 741.6000 Wind Speed: 1.5000

Seeing: -1.0000 Humidity: 12.9000

Reading telemetry from TCS...

Primary Filter: Mask Is Out

Secondary Filter: Mask Is Out

Mask Assembly: Mask Is Out

Grating Selection: Mask Is Out

Camera/Grating: Mask Is Out

Collimator Focus: Mask Is Out

Camera Focus: Mask Is Out

TCS Connected: Mask Is Out

Shutter Open: Mask Is Out

Collimator Focus: 20 - 1000 Actual: 1001 Target: 1000

16.7 Set

Primary Filter: <NO FILTER>

Secondary Filter: <NO FILTER>

Grating: <NO GRATING> 0 lines/mm

Wavelength Angles

Grating	Actual	Camera
20.74010	Actual	12.20983
20.74000	Target	12.21000

Select Mode: Custom Set

Litrow Configuration

Central wavelength(nm): 0

Grating: 0 Camera: 0 Load

Flexure Compensation

Left	Right
0	0
Camera flex target	12.21

Active?

Camera Focus: 20 - 1000 Actual: 1 Target: 0

19.4 Set

start LabVIEW Goodman Spectrogra... SI Image SGL D SI Image SGL Temperature & Press... DATA 9:31 PM

Select the type of image you will take. This information will go into the image header Keyword OBSTYPE.

Enter the "File Name Base"

Selecting the slit

The screenshot shows the Goodman Spectrograph Control System interface. A red box highlights the 'Mask' dropdown menu, which is open and showing a list of options. The text 'Click and select the slit' is written in white on a red background, pointing to the dropdown menu.

Mask Selection List:

- <NO MASK>
- ✓ <NO MASK>
- 0.46" long slit
- <EMPTY>
- <EMPTY>
- 1.0" 77" image slicer
- <EMPTY>
- <EMPTY>
- 0.84" long slit
- 3.0" spot
- <EMPTY>
- Out of service
- Out of service
- 1.03" long slit
- 0.46" Pinholes
- <EMPTY>
- <EMPTY>
- 1.35" long slit
- <EMPTY>
- <EMPTY>
- <EMPTY>
- <EMPTY>
- 1.68" long slit
- <EMPTY>
- 1.00" long slit new
- <EMPTY>
- 3.0" long slit
- <EMPTY>
- 1.07" long slit new
- <EMPTY>
- 10.0" long slit
- <EMPTY>
- <EMPTY>
- <EMPTY>

Other Interface Elements:

- Camera TCP/IP:** Port 2055, Server Address Localhost.
- Object:** Object Name: acq, # Exposures: 1.
- File Name Base:** SO2013B-000_2704.
- Exp. Time (s):** 3.0.
- Image #:** 0001.
- Image File Name:** 0001.SO2013B-000_2704.fits.
- Save As:** 116 FITS.
- CCD Readout Speed:** 400 kHz, ATTN 0.
- CCD ROI Mode:** Spectroscopic, 1x1.
- Port Readout:** Port B.
- Grating:** <NO GRATING>.
- Wavelength Angles:** Grating 20.74010, Actual 12.20986, Target 12.21000.
- Flexure Compensation:** Left 0, Right 0, Camera flex target 12.21.
- Camera Focus:** Actual 1, Target 0.

Selecting the slit

The screenshot displays the Goodman Spectrograph Control System interface. A red box highlights the 'Mask Assembly' status indicator, which is currently yellow. A red arrow points from a text box stating 'This process takes ~ 2 min' to this indicator. The interface includes various control panels for camera settings, object information, filter selection, and grating configuration. A 3D model of the spectrograph is visible in the center, showing the internal optical path and components like the collimator, camera, and filters.

Mask Assembly Status:

- Primary Filter: Green
- Secondary Filter: Green
- Mask Assembly: Yellow
- Grating Selection: Green
- Camera/Grating: Green
- Collimator Focus: Green
- Camera Focus: Green
- TCS Connected: Green
- Shutter Open: Green

3D Model Labels:

- Primary Filter: <NO FILTER>
- Secondary Filter: <NO FILTER>
- Collimator Focus: 16.8 (Actual), 1000 (Target)
- Camera Focus: 19.4 (Actual), 0 (Target)

Selecting the grating

The screenshot shows the Goodman Spectrograph Control System interface. A red box highlights the grating selection dropdown menu, which contains the following options:

- <NO GRATING>
- SVZY_400
- RALC_1200
- KOSI_600

The text "Click and select the grating" is written in a red box with an arrow pointing to the dropdown menu.

Other visible interface elements include:

- Goodman Laboratory SOAR TELESCOPE** logo and navigation menu (Main, User, Operator, Engineer, Help).
- Camera TCP/IP** section with Port (2055) and Server Address (Localhost).
- Object** section with Object Name (acq) and # Exposures (1).
- File Name Base** (SO2013B-000_2704) and **Exp. Time (s)** (3.0).
- Image File Name** (0001_SO2013B-000_2704.fits) and **Save As** (116 FITS).
- CCD Readout Speed** (400 kHz, ATTN 0) and **CCD ROI Mode** (Spectroscopic, 1x1).
- Wavelength Angles** section with Grating (20.74020) and Camera (12.20990).
- Mask** section with a dropdown set to "0.46" long slit" and a "Replace Mask" button.
- Mask Imaging** section with "Image Mask" and "Imaging" buttons.
- Flexure Compensation** section with Left (0) and Right (0) values.
- Collimator Focus** section with a slider set to 1001 and a "Set" button.
- Primary Filter** and **Secondary Filter** dropdowns, both set to "<NO FILTER>".
- Camera Focus** section with a slider set to 1 and a "Set" button.
- Telemetry** section on the left showing RA, DEC, Airmass, Focus, Mount Az, Mount El, Dome Az, Dome Shutter, Date, Sidereal, UT Time, Hour Angle, Rotator Angle, Position Angle, Outside Temp, Wind Direction, Pressure, Wind Speed, Seeing, and Humidity.

Selecting the grating

The screenshot shows the Goodman Spectrograph Control System interface. A red circle highlights the 'Grating Selection' button in the central control panel, with a red arrow pointing to a text box that reads 'This process takes ~ 1 min'. The interface includes various control panels for camera settings, object information, and telescope parameters.

Camera TCP/IP

Port	Server Address
2055	localhost

Object

Object Name:	# Exposures
Object acq	1

File Name Base

File Name Base	Exp. Time (s)	Image #	RO Done
SO2013B-000_2704	3.0	0001	<input type="checkbox"/>

Grating Selection Panel

Grating	Camera
20.74010 Actual	12.20997
20.74000 Target	12.21000

Collimator Focus

20	1001 Actual
10	1000 Target
0	16.8 Set

Camera Focus

20	1 Actual
10	0 Target
0	19.6 Set

Setting the camera and grating angles

Adapted by D. Sanmartim from L. Fraga's Guide

Click and select one of the predefined modes

Wavelength Angles

Grating	Actual	Camera
20.74020		12.20986
20.74000	Target	12.21000

Select Mode:

- Custom
- Imaging
- 300 All
- 600 UV
- 600 Blue
- 600 Mid
- 600 Red
- 1200 m0
- 1200 m1
- 1200 m2
- 1200 m3
- 1200 m4
- 1200 m5
- 1200 m6
- 1200 m7
- 1200 RESOLVE

Setting custom angles:

- 1) Select the "Custom" option in the "Select Mode" drop-down menu;
- 2) Insert the desired grating and camera angles in "Target";
- 3) Click the "Set" button.

Setting camera and grating angles for the desired λ_c :

- 1) Insert the desired λ_c in "Central Wavelength";
- 2) Click the "Load" button and then "Set".

The interface includes the following sections:

- Goodman Laboratory SOAR TELESCOPE** logo and navigation (User, Operator, Engineer, Help).
- Camera TCP/IP** and **General** settings (Port: 2055, Server Address: Localhost).
- Object** and **Flat** settings (Flat Name, # Flat Exposures: 1, Quartz Intensity: 50%).
- File Name Base** and **Exp. Time (s)** (3.0).
- Image File Name** (0026.image.fits) and **Save As** (116 FITS).
- Acquire Images** button.
- CCD Readout Speed** (400 kHz, ATTN 0) and **CCD ROI Mode** (Spectroscopic, 1x1).
- Port Readout** (Port B).
- Current Pixel Values** (x: 0, y: 0) and **Desired Pixel Values** (x: 0, y: 0).
- Calculate Required Offset** and **Apply SOAR Offset** buttons.
- Wavelength Angles** dialog box (highlighted in red):

Grating	Camera
9.49680 Actual	18.99107
9.49723 Target	18.99447

 Select Mode: Custom | Set
 Litrow Configuration
 Central wavelength(nm): 550

Grating	Camera
9.49723	18.9945

 Load
- Grating** selection (KOSI_600, 600 lines/mm).
- Mask Imaging** and **Image Mask** options.
- Mask Is In** indicator.
- Grating Selection** (600 lines/mm).
- Camera/Grating** status.
- Collimator Focus** (15.8, 1001 Actual, 1000 Target, Set).
- Primary Filter** (<NO FILTER>).
- Secondary Filter** (GG385).
- Camera Focus** (18.3, 998 Actual, 1000 Target, Set).
- Flexure Compensation** (Left: 1, Right: 1, Camera flex target: 18.9913, Active?).
- Telemetry** (Air mass, Focus, Mount Az/EI, Dome Az/Shutter, Date, Sidereal, UT Time, Hour Angle, Rotator Angle, Position Angle, Outside Temp, Wind Direction, Pressure, Wind Speed, Seeing, Humidity).
- 3D Model** of the telescope and spectrograph.

Centering the object on the slit

Procedure to center the target on the slit:
1) Click the "Withdraw Mask" button to remove the mask from the optical path;

The screenshot displays the Goodman Spectrograph Control System interface. A red box highlights the "Withdraw Mask" button in the Mask section. A red arrow points to the "Secondary Filter" button. The interface includes several control panels:

- Top Left:** RA (11:00:50.465), DEC (-29:59:13.508), Airmass (1.00), Focus (0.00).
- Top Middle:** Mount Az (67.4772), Mount El (89.2408), Dome Az (303.8552), Dome Shutter (0.0000).
- Top Right:** Date (2013-04-24), Sidereal (10:59:43.4), UT Time (01:33:38.2), Hour Angle (-00:01:07.0), Rotator Angle (359.030000), Position Angle (E of N) (360.000000).
- Bottom Left:** Outside Temp (15.7000), Wind Direction (271.3000), Pressure (741.5000), Wind Speed (1.3000), Seeing (-1.0000), Humidity (13.0000).
- Bottom Middle:** Collimator Focus (16.8, 1001 Actual, 1000 Target, Set).
- Bottom Right:** Camera Focus (19.8, 1 Actual, 0 Target, Set).

Centering the object on the slit

Adapted by D. Sanmartim from L. Fraga's Guide

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode;

The screenshot shows the Goodman Spectrograph Control System interface. The interface is divided into several panels:

- Top Left:** Status and environmental data panels, including RA (11:17:01.991), DEC (-29:59:10.331), Airmass (1.00), Focus (0.00), Mount Az (67.4772), Mount El (89.2408), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (11:15:57.1), UT Time (01:49:49.2), Hour Angle (-00:01:04.9), Rotator Angle (359.030000), Position Angle (E of N) (360.000000), Outside Temp (15.6300), Wind Direction (261.9000), Pressure (741.5000), Wind Speed (2.9000), Seeing (-1.0000), Humidity (13.1000).
- Top Center:** Mask and Readout controls, including % Exposure, % Readout, and buttons for "Reset Connection", "Connection Open Getting Data", "Obtain Camera Status", and "DONE: New ROI mode set".
- Top Right:** Acquisition and alignment controls, including Exp. Time (3.0), Image # (0001), RO Done, Save As (116 FITS), Acquire Images, CCD Readout Speed (400 kHz, ATTN 0), CCD ROI Mode (Spectroscopic, 1x1), Port Readout (Port B), Current Pixel Values (x: 0, y: 0), Desired Pixel Values (x: 0, y: 0), Calculate Required Offset, and Apply SOAR Offset.
- Center:** A 3D model of the telescope's optical path, showing the primary filter, secondary filter, mask assembly, grating, and camera.
- Bottom Left:** Collimator Focus control, showing a slider from 0 to 20, with Actual (1001) and Target (1000) values, and a Set button.
- Bottom Center:** Filter selection controls, including Primary Filter (<NO FILTER>) and Secondary Filter (<NO FILTER>).
- Bottom Right:** Camera Focus control, showing a slider from 0 to 20, with Actual (1) and Target (0) values, and a Set button.

The "Mask Imaging" panel is highlighted with a red box, and the "Image Mask" button is highlighted with a red arrow. The "Mask" dropdown menu is set to "0.46\" long slit".

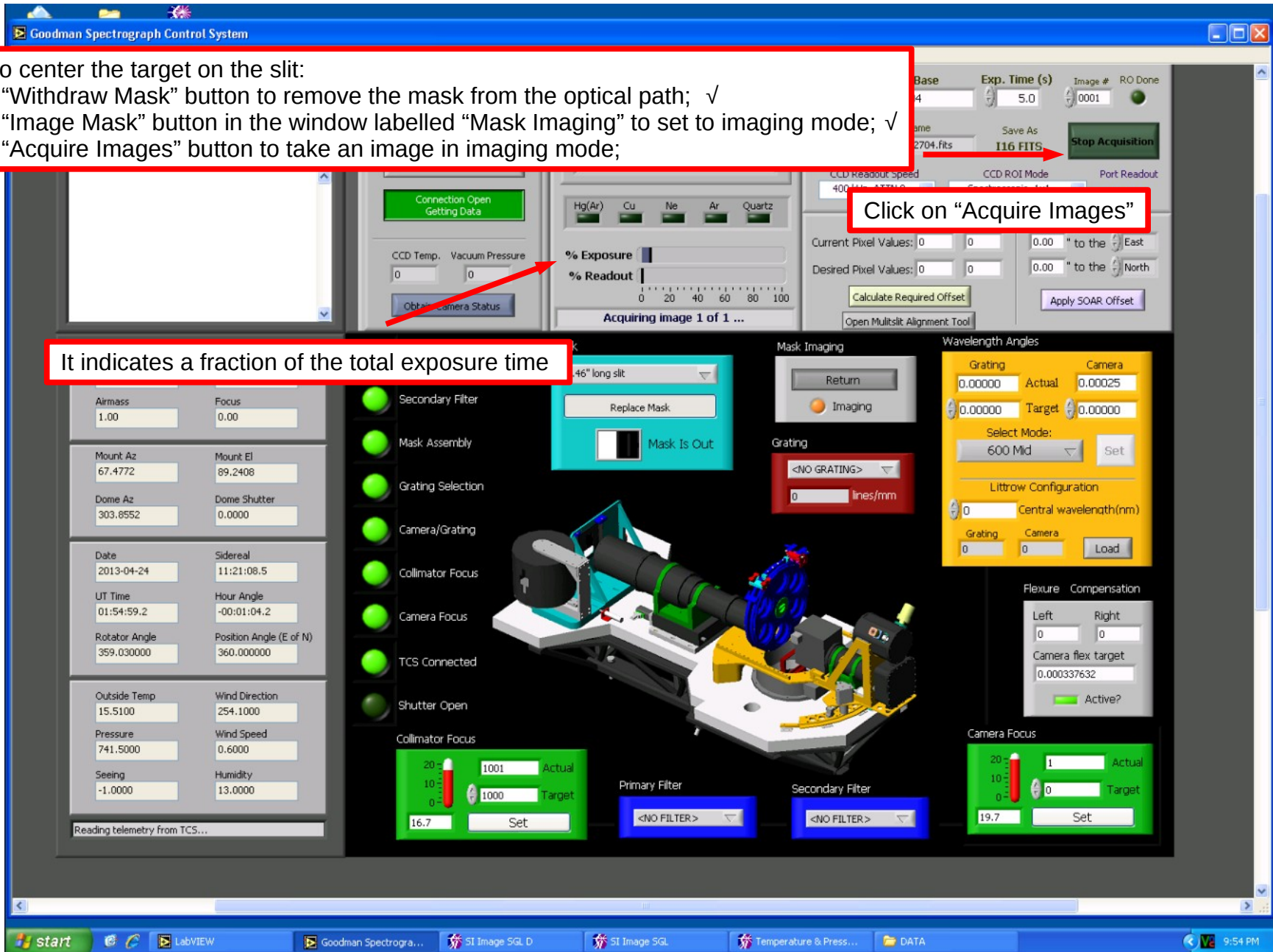
Centering the object on the slit

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode;

Camera and grating angles are being moved towards zero

Centering the object on the slit



- Procedure to center the target on the slit:
- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
 - 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
 - 3) Click the "Acquire Images" button to take an image in imaging mode;

It indicates a fraction of the total exposure time

Click on "Acquire Images"

Centering the object on the slit

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (Xc,Yc);

SAOImage ds9

File Edit View Frame Bin Zoom Scale Color Region WCS Analysis Help

File 0001.SO2013B-000_2704.fits

Object V0595Cen

Value >589.383

WCS

Physical X 2109.749 Y 920.852

Image X 2109.749 Y 920.852

Frame 1 Zoom 0.402 Angle 0.000

file edit view frame bin zoom scale color region wcs help

about open save image header page setup print exit

SOAR-Brasil

```

ecl> display 0001.SO2013B-000_2704.fits
frame to be written into (1:16) (1):
z1=483, z2=589,3834
ecl> imexam
display frame (1:) (1):
# COL LINE COORDINATES
# R MAG FLUX SKY PEAK E PA BETA ENCLOSED MOFFAT DIRECT
2110.16 921.04 2110.16 921.04
35.13 9.15 2.175E6 530. 12903. 0.10 72 19.8 11.18 11.44 11.7

```

Using "imexam", place the cursor over the object and type "a" to measure its centroid. Note the values of the centroid (Xc=2110.2, Yc=921.0).

SOAR-Brasil

xload xclock

Fvwm

SOAR-Brasil

00:55

Centering the object on the slit

Adapted by D. Sanmartim from L. Fraga's Guide

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (X_c, Y_c); ✓
- 5) Click on "Replace Mask" in the window labelled "Mask" to place back the slit in the optical path and then click on "Acquire Images" to take an image of the slit in imaging mode;

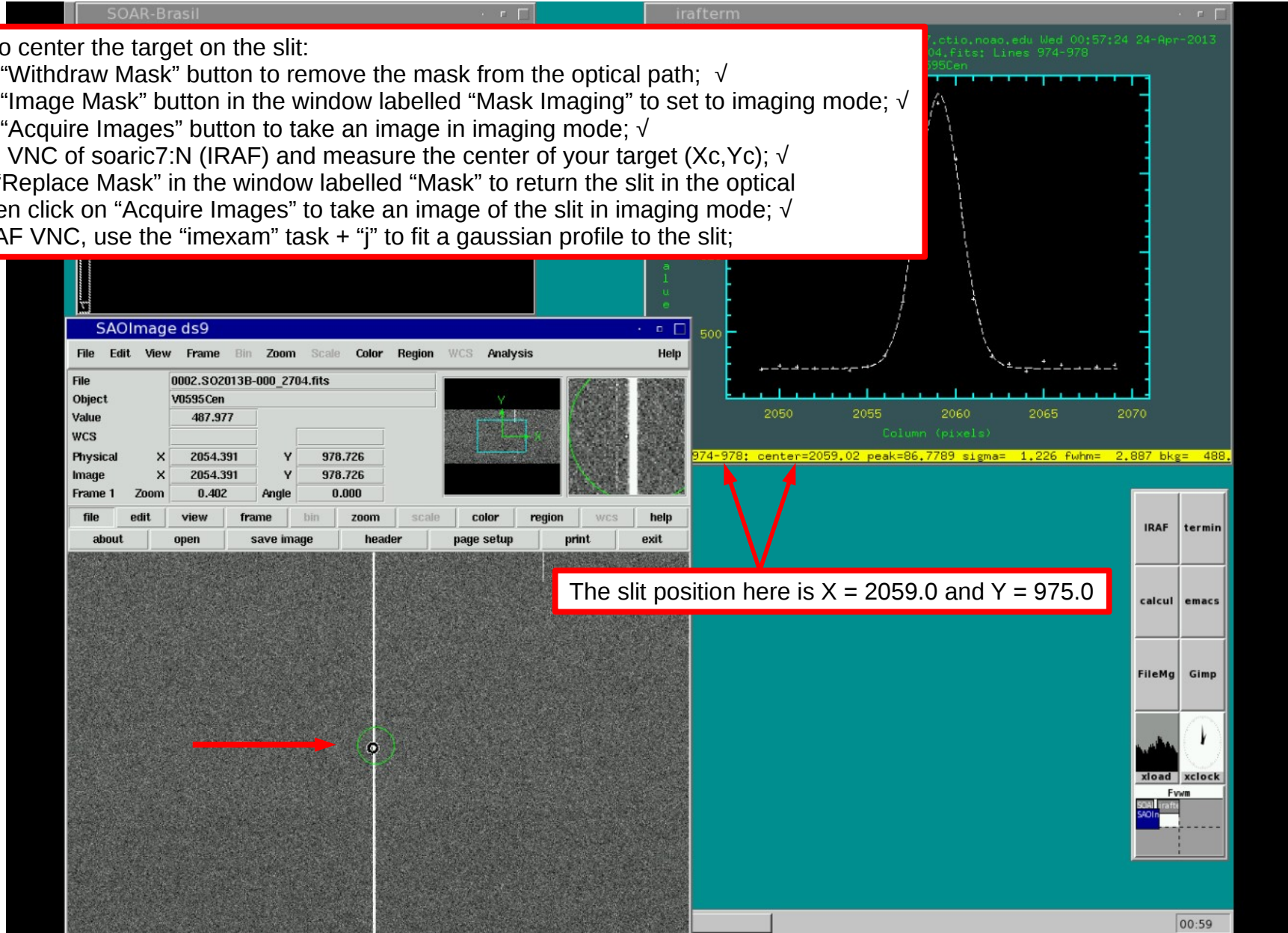
Click on "Acquire Images"

The screenshot displays the Goodman Telescope control interface. The central panel shows a 3D model of the telescope with various control panels around it. The 'Mask' panel is highlighted with a red box, showing a dropdown menu set to '0.46" long slit' and a 'Withdraw Mask' button. A red arrow points to the 'Secondary Filter' panel. The 'Mask Imaging' panel is also highlighted with a red box, showing a 'Return' button and an 'Imaging' radio button. The 'Stop Acquisition' button in the top right panel is highlighted with a red box. The 'Mask Is In' status in the 'Mask' panel is highlighted with a red box. The interface includes various data panels for RA, DEC, Airmass, Focus, Mount Az, Mount El, Dome Az, Dome Shutter, Date, Sidereal, UT Time, Hour Angle, Rotator Angle, Position Angle (E of N), Outside Temp, Wind Direction, Pressure, Wind Speed, Seeing, Humidity, CCD Temp, Vacuum Pressure, % Exposure, % Readout, Desired Pixel Values, and Wavelength Angles. The bottom of the screen shows the Windows taskbar with the start button and several open applications.

Centering the object on the slit

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (X_c, Y_c); ✓
- 5) Click on "Replace Mask" in the window labelled "Mask" to return the slit in the optical path and then click on "Acquire Images" to take an image of the slit in imaging mode; ✓
- 6) In the IRAF VNC, use the "imexam" task + "j" to fit a gaussian profile to the slit;



Centering the object on the slit

Adapted by D. Sanmartim from L. Fraga's Guide

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (X_c, Y_c); ✓
- 5) Click on "Replace Mask" in the window labelled "Mask" to return the slit in the optical path and then click on "Acquire Images" to take an image of the slit in imaging mode; ✓
- 6) In the IRAF VNC, use the "imexam" task + "j" to fit a gaussian profile to the slit; ✓
- 7) Enter the centroid of the object in "Current Pixel Values" and the coordinates of the slit in "Desired Pixel Values";

The screenshot shows the Goodman Spectrograph Control System interface. The 'Mask Imaging' window is active, displaying the following parameters:

- File Name Base: SO2013B-000_2704
- Exp. Time (s): 5.0
- Image #: 0003
- RO Done: (Green indicator)
- Image File Name: 0003.SO2013B-000_2704
- Save As: I16 FITS
- Acquire Images: (Green button)
- CCD Readout Speed: 400 kHz, ATTN 0
- CCD ROI Mode: Spectroscopic, 1x1
- Port Readout: Port B
- Current Pixel Values: x=2110.2, y=921
- Desired Pixel Values: x=2059, y=975
- Calculate Required Offset: (Yellow button)
- Apply SOAR Offset: (Purple button)
- Open Multislit Alignment Tool: (Grey button)

Centering the object on the slit

Adapted by D. Sanmartim from L. Fraga's Guide

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (Xc,Yc); ✓
- 5) Click on "Replace Mask" in the window labelled "Mask" to return the slit in the optical path and then click on "Acquire Images" to take an image of the slit in imaging mode; ✓
- 6) In the IRAF VNC, use the "imexam" task + "j" to fit a gaussian profile to the slit; ✓
- 7) Enter the centroid of the object in "Current Pixel Values" and the coordinates of the slit in "Desired Pixel Values"; ✓
- 8) Click on "Calculate Required Offset";

The screenshot displays the SOAR Telescope control interface. A red box highlights the 'Calculate Required Offset' button, which is the final step in the procedure. The interface shows the following data:

Field	Value
File Name Base	SO2013B-000_2704
Exp. Time (s)	5.0
Image #	0003
RO Done	Green indicator
Image File Name	0003.SO2013B-000_2704
Save As	116 FITS
Acquire Images	Green button
CCD Readout Speed	400 kHz, ATTN 0
CCD ROI Mode	Spectroscopic, 1x1
Port Readout	Port B
Current Pixel Values: x	2110.2
Current Pixel Values: y	921
Desired Pixel Values: x	2059
Desired Pixel Values: y	975
Offset: East	7.48"
Offset: South	7.88"
Calculate Required Offset	Yellow button
Apply SOAR Offset	Purple button

Centering the object on the slit

Adapted by D. Sanmartim from L. Fraga's Guide

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (Xc,Yc); ✓
- 5) Click on "Replace Mask" in the window labelled "Mask" to return the slit in the optical path and then click on "Acquire Images" to take an image of the slit in imaging mode; ✓
- 6) In the IRAF VNC, use the "imexam" task + "j" to fit a gaussian profile to the slit; ✓
- 7) Enter the centroid of the object in "Current Pixel Values" and the coordinates of the slit in "Desired Pixel Values"; ✓
- 8) Click on "Calculate Required Offset"; ✓
- 9) Tell the telescope operator (TO) you will move the telescope. Click the "Apply SOAR Offset" button to offset the telescope;

Check if the values are suitable before applying the "offsets"

Field	X	Y	Offset	Direction
Current Pixel Values	2110.2	921	7.48	to the East
Desired Pixel Values	2059	975	7.88	to the South

Buttons: Calculate Required Offset, Apply SOAR Offset

Other visible fields: File Name Base (SO2013B-000_2704), Exp. Time (s) (5.0), Image # (0003), CCD ROI Mode (Spectroscopic, 1x1), Port Readout (Port B).

Centering the object on the slit

Adapted by D. Sanmartim from L. Fraga's Guide

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (X_c, Y_c); ✓
- 5) Click on "Replace Mask" in the window labelled "Mask" to return the slit in the optical path and then click on "Acquire Images" to take an image of the slit in imaging mode; ✓
- 6) In the IRAF VNC, use the "imexam" task + "j" to fit a gaussian profile to the slit; ✓
- 7) Enter the centroid of the object in "Current Pixel Values" and the coordinates of the slit in "Desired Pixel Values"; ✓
- 8) Click on "Calculate Required Offset"; ✓
- 9) Tell the telescope operator (TO) you will move the telescope. Press "Apply SOAR Offset" button to offset the telescope; ✓
- 10) Click on "Acquire Images" to check if the object is aligned on the slit.

The screenshot displays the Goodman Telescope control interface. On the left, there are several data panels: Mount Az (67.4772), Mount El (89.2408), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (12:24:57.4), UT Time (02:58:38.2), Hour Angle (-00:00:56.3), Rotator Angle (359.030000), Position Angle (E of N) (360.000000), Outside Temp (15.4900), Wind Direction (178.3000), Pressure (741.4000), Wind Speed (7.6001), Seeing (-1.0000), and Humidity (14.5000). A central 3D model shows the telescope structure with various components labeled. On the right, there are control panels for Mask Assembly, Grating Selection, Camera/Grating, Collimator Focus, Camera Focus, TCS Connected, Shutter Open, Collimator Focus (Actual 1001, Target 1000, Set 16.9), Primary Filter (<NO FILTER>), Secondary Filter (<NO FILTER>), Camera Focus (Actual 19.8, Target 0, Set), Wavelength Angles (Grating 0.00010, Camera 0.00050, Target 0.00000, Select Mode: 600 Mid, Litrow Configuration: 0 Central wavelength(nm), Grating 0, Camera 0, Load), and Flexure Compensation (Left 0, Right 0, Camera flex target 0.000337632, Active?). A red box highlights the "Acquire Images" button in the top right panel.

The screenshot displays the IRAF environment. On the left, a terminal window shows the following commands and output:

```

ec1> display 0001.S02013B-000_2704.fits
frame to be written into (1:16) (1):
z1=483, z2=589,3834
ec1> inexam
display frame (1:) (1):
# COL LINE COORDINATES
# R MAG FLUX SKY PEAK E PA BETA ENCLOSED HOFFAT DIRECT
2110.16 921.04 2110.16 921.04
35.13 9.18 2.175E6 530. 12903, 0.10 72 19.8 11.18 11.44 11.71
ec1> inexam 0002.S02013B-000_2704.fits
display frame (1:) (1):
z1=483, z2=497,782
ec1> display 0003.S02013B-000_2704.fits zs= zr= z1=450 z2=900
frame to be written into (1:16) (1):
z1=450, z2=900,
ec1>
    
```

The central window shows the SAOImage ds9 interface with the file `0003.S02013B-000_2704.fits` and object `V0595Cen`. The bottom panel shows a slit image with a red arrow pointing to the object. A text box at the bottom provides a tip and a command to center the object on the slit:

Tip: Use the options `zrange-` and `zscale-` to display the slit image
`cl> display 0003.S02013B-000_2704.fits zs- zr- z1=450 z2=900`

The right window shows a profile plot of the slit image. The x-axis is labeled "Column (pixels)" and ranges from 2050 to 2070. The y-axis is labeled "Pixel Value" and ranges from 500 to 575. A dashed line shows a peak at approximately 2059 pixels. A text box at the bottom of the plot provides the following parameters:

```

974-978: center=2059.02 peak=86.7789 sigma= 1.226 fwhm= 2.887 bkg= 488.
    
```


Centering the object on the slit

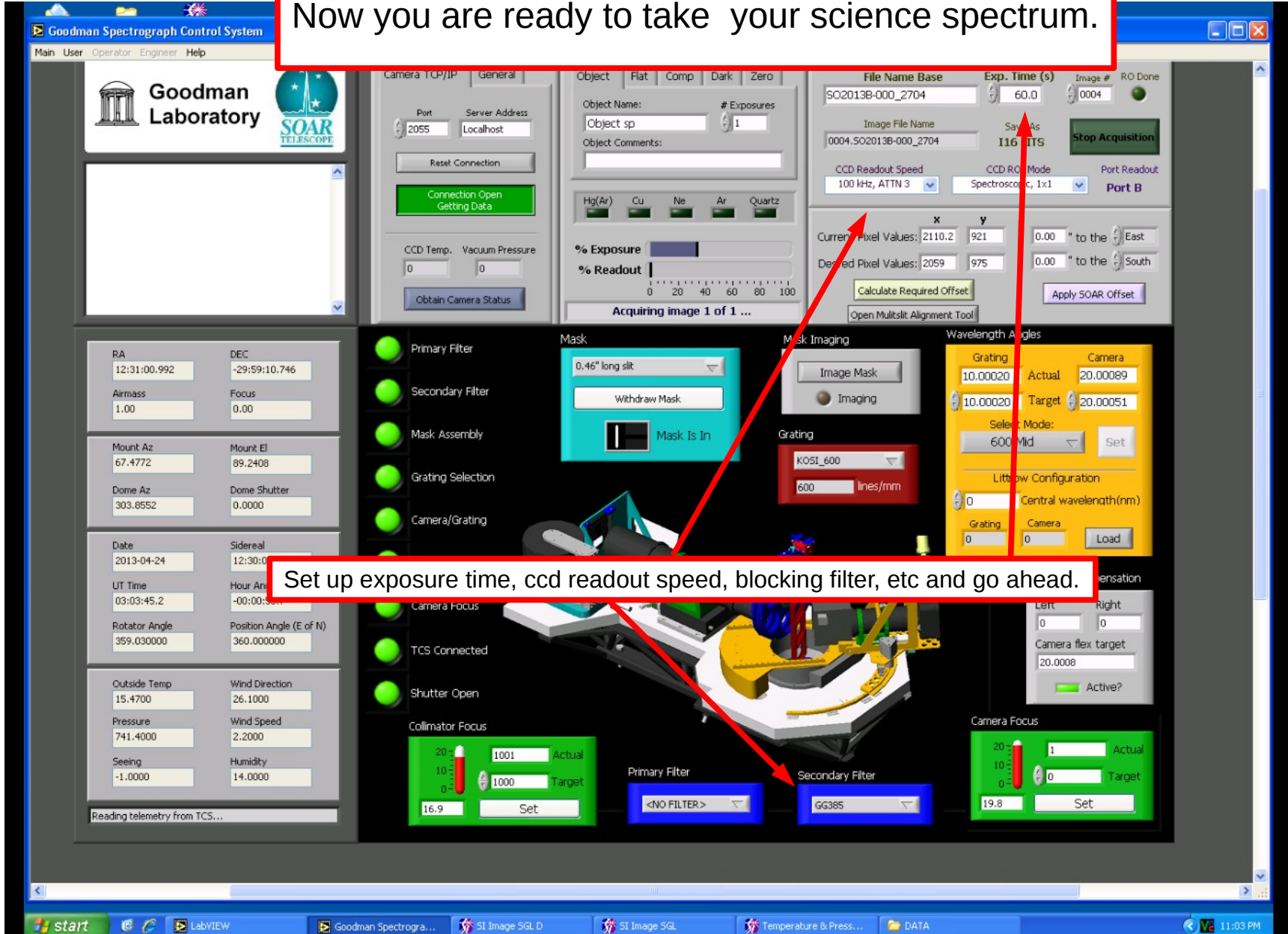
Adapted by D. Sanmartim from L. Fraga's Guide

Procedure to center the target on the slit:

- 1) Click the "Withdraw Mask" button to remove the mask from the optical path; ✓
- 2) Click the "Image Mask" button in the window labelled "Mask Imaging" to set to imaging mode; ✓
- 3) Click the "Acquire Images" button to take an image in imaging mode; ✓
- 4) Go to the VNC of soaric7:N (IRAF) and measure the center of your target (Xc,Yc); ✓
- 5) Click on "Replace Mask" in the window labelled "Mask" to return the slit in the optical path and then click on "Acquire Images" to take an image of the slit in imaging mode; ✓
- 6) In the IRAF VNC, use the "imexam" task + "j" to fit a gaussian profile to the slit; ✓
- 7) Enter the centroid of the object in "Current Pixel Values" and the coordinates of the slit in "Desired Pixel Values"; ✓
- 8) Click on "Calculate Required Offset"; ✓
- 9) Tell the telescope operator (TO) you will move the telescope. Press "Apply SOAR Offset" button to offset the telescope; ✓
- 10) Click on "Acquire Images" to check if the object is aligned on the slit. ✓
- 11) Click the "Return" button in the window "Mask Imaging" to return to spectroscopic mode.

The screenshot displays the Goodman Telescope control interface. On the left, there are several data panels including Airmass (1.00), Mount Az (67.4772), Dome Az (303.8552), Date (2013-04-24), UT Time (03:00:30.2), Rotator Angle (359.030000), Outside Temp (15.4700), Pressure (741.4000), Seeing (-1.0000), Focus (0.00), Mount El (89.2408), Dome Shutter (0.0000), Sidereal (12:26:49.7), Hour Angle (-00:00:56.1), Position Angle (E of N) (360.000000), Wind Direction (199.5000), Wind Speed (3.9000), Humidity (14.4000), and a 'Reading telemetry from TCS...' status bar. The central area features a 3D model of the telescope with various control buttons like 'Withdraw Mask', 'Mask Is In', 'Grating Selection', 'Camera/Grating', 'Collimator Focus', 'Camera Focus', 'TCS Connected', and 'Shutter Open'. On the right, there are control panels for 'Grating' (KOSI_600, 600 lines/mm), 'Wavelength Angles' (Grating: 10.00020 Actual, 10.00020 Target; Camera: 20.00089 Actual, 20.00051 Target), 'Litrow Configuration' (0 Central wavelength), and 'Camera Focus' (Left: 0, Right: 0; Camera flex target: 20.0008). A red arrow points to the 'Return' button in the 'Mask Imaging' window, which is highlighted by a red box with the text: 'Click the "Return" button to move to spectroscopic mode.'

Now you are ready to take your science spectrum.

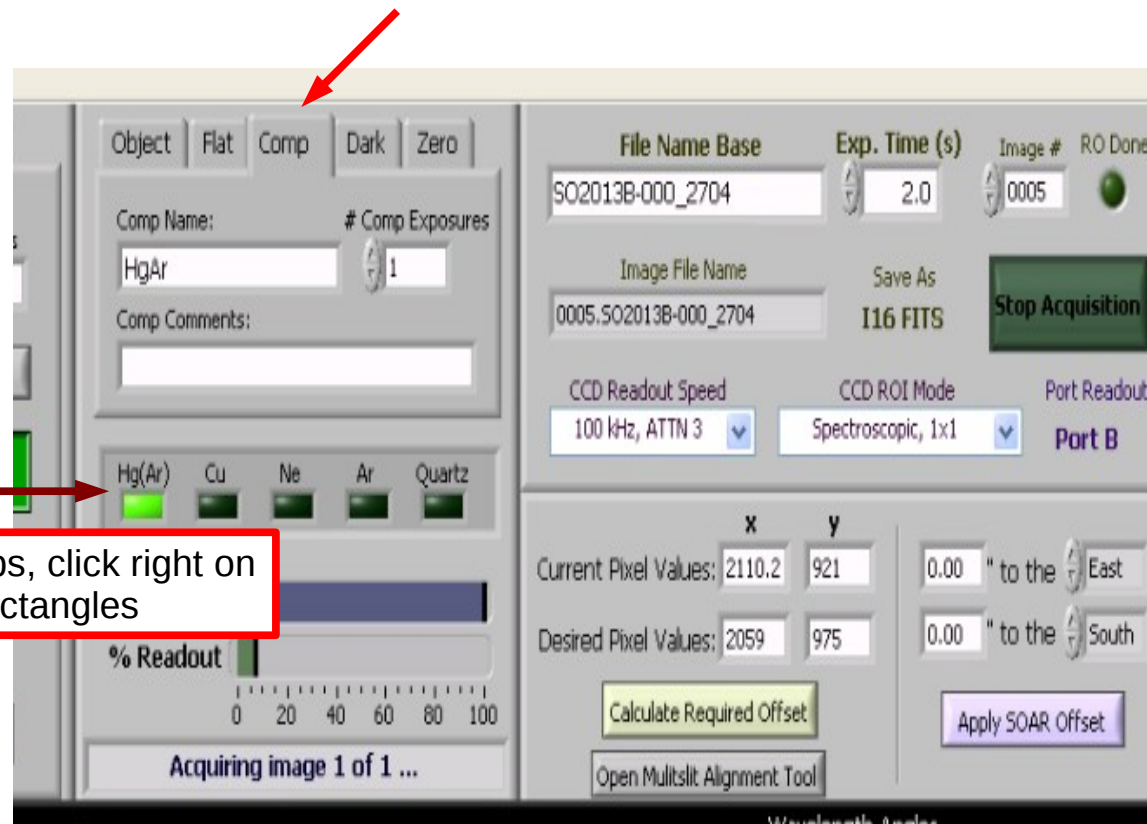


Set up exposure time, ccd readout speed, blocking filter, etc and go ahead.

Taking comparison lamps

To obtain a comparison lamp spectrum:

- 1) Ask the TO to stop guiding and to put the comparison mirror in the optical path;
- 2) Select the tab "Comp";
- 3) Turn on the desired lamp (or ask the TO to). Ex.: HgAr. More at [Goodman Comparison Lamps](#)
- 4) Go ahead and click on "Acquire Images".

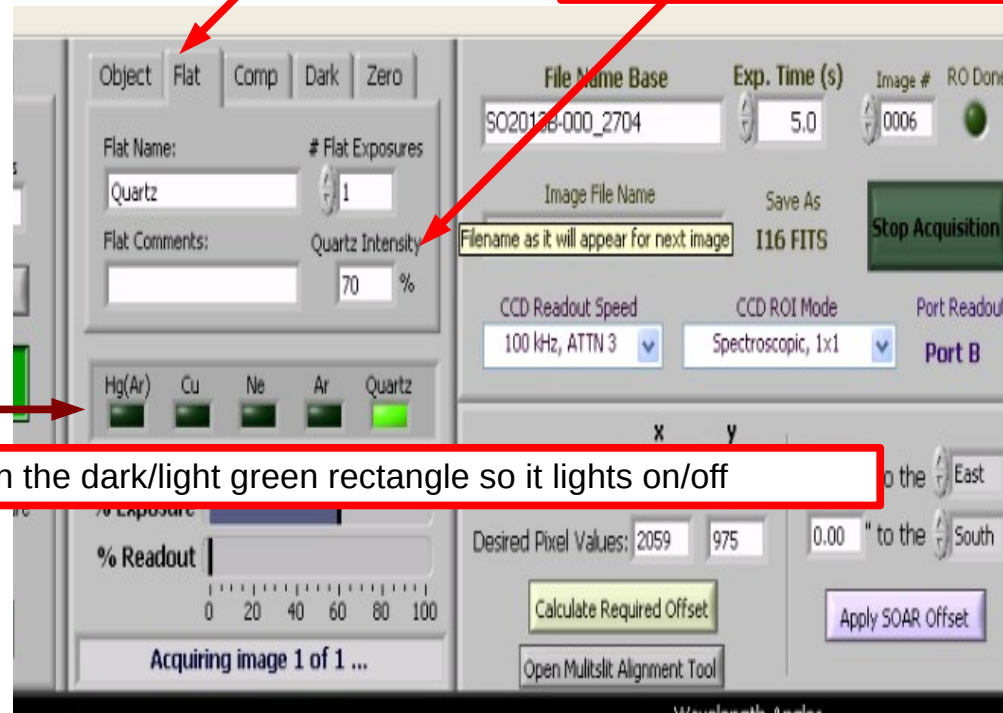


To turn on/off the lamps, click right on the dark/light green rectangles

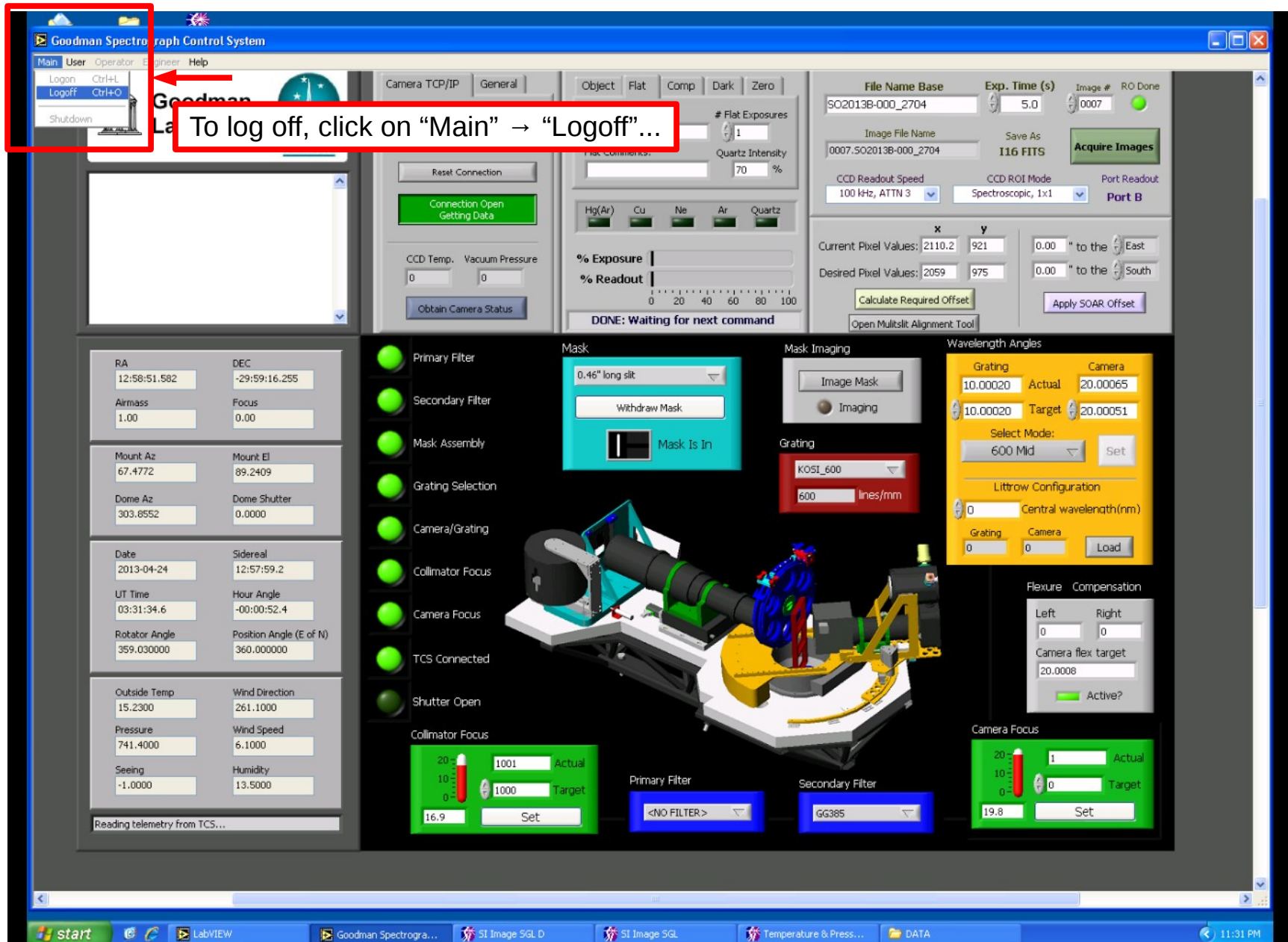
To obtain a flat-field lamp:

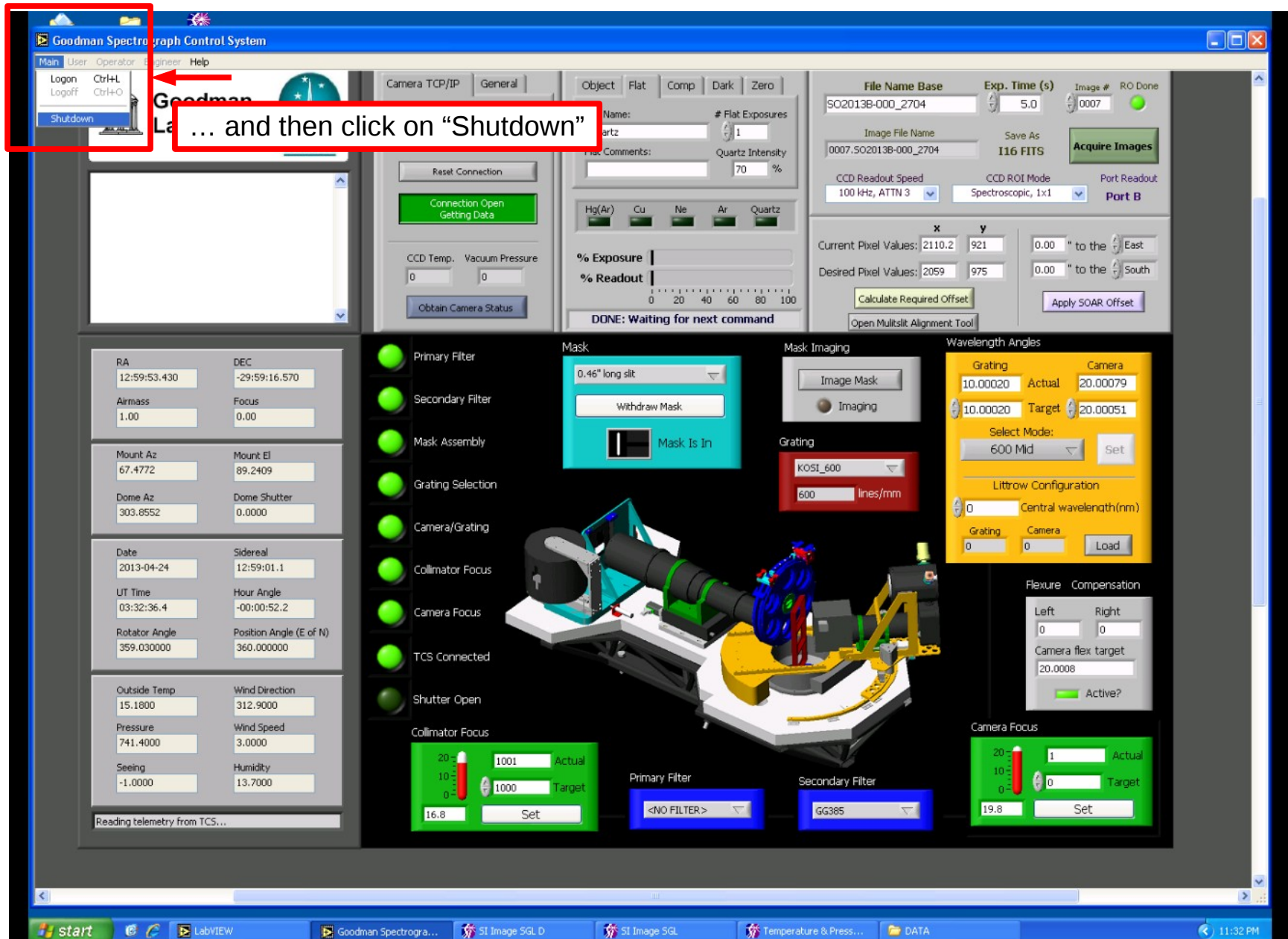
- 1) Ask the TO to stop guiding and to put the comparison mirror in the optical path;
- 2) Select the tab "Flat";
- 3) Adjust the intensity and then turn on the Quartz lamp (or ask the TO to).
- 4) Go ahead and click on "Acquire Images".

Adjust the intensity of the quartz lamp **before** turning it on.



To turn on/off the lamps, click on the dark/light green rectangle so it lights on/off





Shutdown almost done!

The screenshot displays the Goodman Spectrograph Control System interface. A central dialog box titled "Shutdown" is active, showing a list of components being shut down: Wavelength Assembly, Grating Translation, Slit Assembly, Primary Filter Wheel, Secondary Filter Wheel, Collimator Focus, Camera Focus, TCS Link, Logger, SI Camera Module, and TCPServer. The dialog also includes a progress bar and a 3D model of the telescope's internal components.

Shutdown Dialog Box:

- Systems are shutting down. Mechanical systems are returning to safe configurations. The program will terminate automatically when the shutdown is complete.
- Progress bar: [-----]
- Component list:
 - ✓ Wavelength Assembly
 - ✓ Grating Translation
 - ✓ Slit Assembly
 - X Primary Filter Wheel
 - X Secondary Filter Wheel
 - X Collimator Focus
 - X Camera Focus
 - X TCS Link
 - X Logger
 - X SI Camera Module
 - X TCPServer

Main Interface Panels:

- Camera TCP/IP:** Port: 2055, Server Address: Localhost. Status: Waiting for TCP/IP Connection at designated port.
- General:** Object: Flat, Comp: Dark, Zero: Zero. Flat Name: Quartz, # Flat Exposures: 1. Quartz Intensity: 70%.
- File Name Base:** SO2013B-000_2704. Exp. Time (s): 5.0. Image #: 0007. Image File Name: 0007.SO2013B-000_2704. Save As: 116 FITS. Acquire Images button.
- Current Pixel Values:** x: 2110.2, y: 921. Desired Pixel Values: x: 2059, y: 975.
- Wavelength Angles:** Grating: 11.75080 (Actual), 20.74000 (Target). Camera: 18.96342 (Actual), 12.21000 (Target). Select Mode: 600 Mid.
- Collimator Focus:** Actual: 1001, Target: 1000. Set button.
- Primary Filter:** <NO FILTER>
- Secondary Filter:** GG385
- Camera Focus:** Actual: 19.8, Target: 0. Set button.

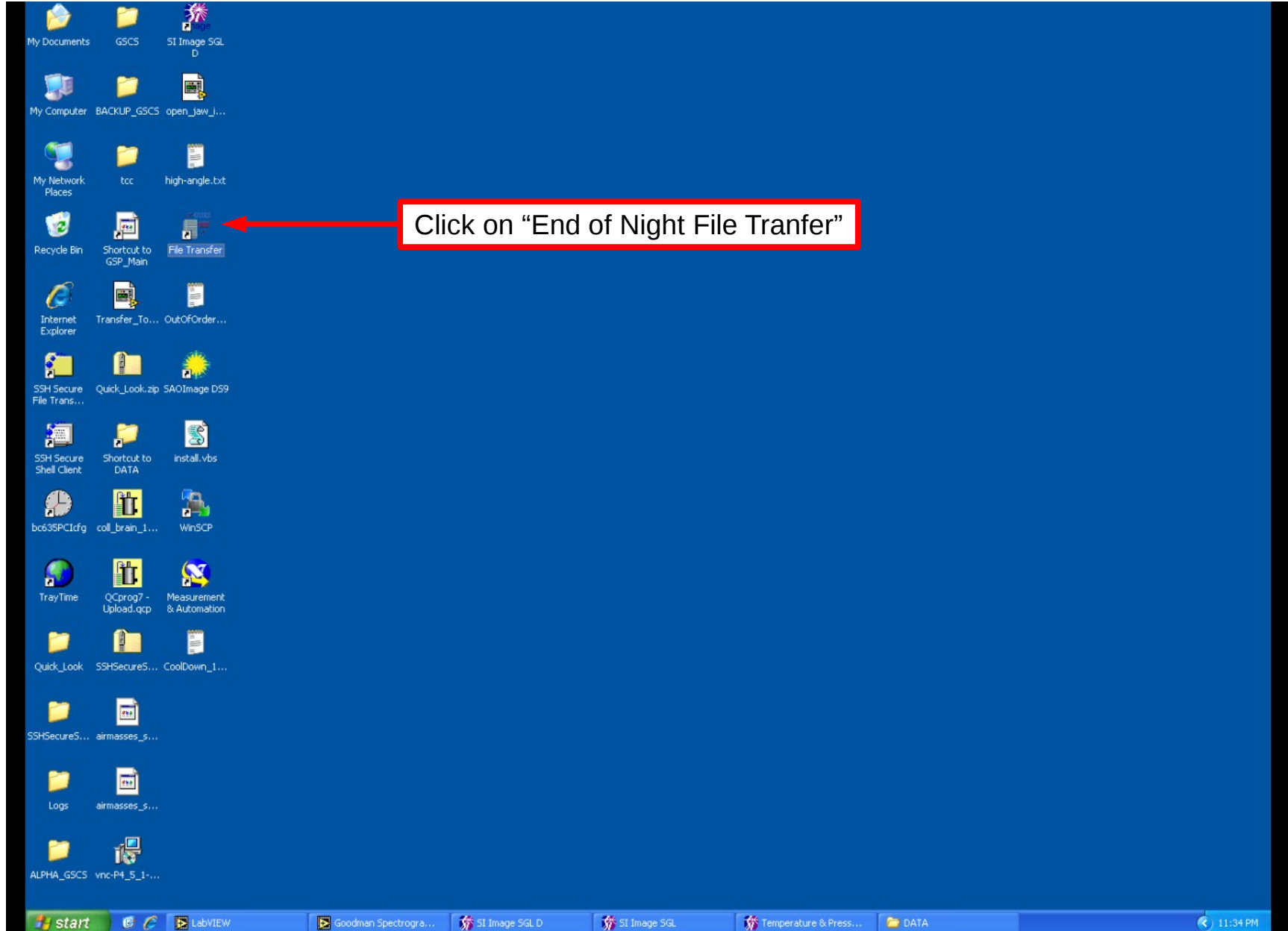
System Status (Left Panel):

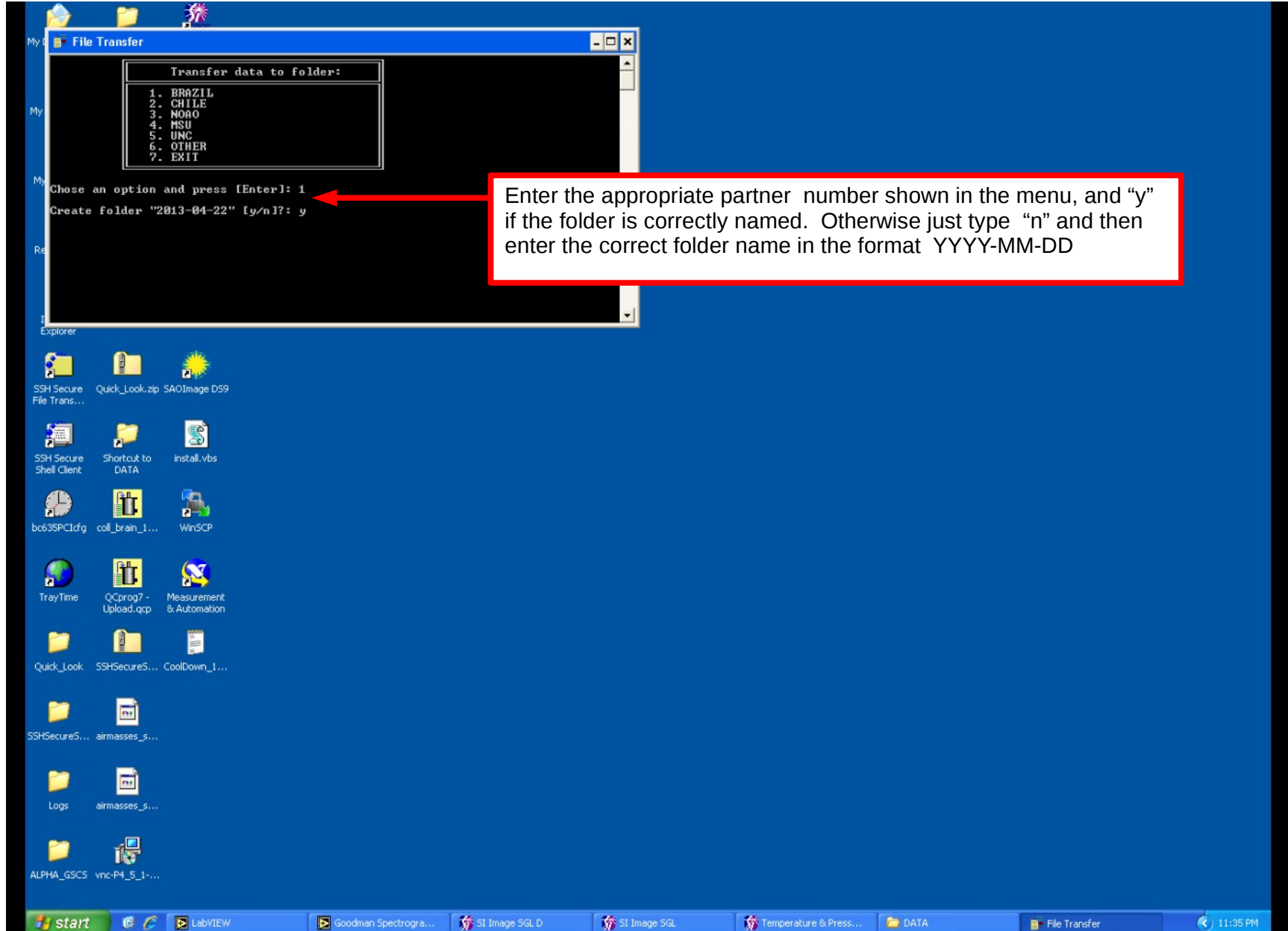
- RA: 13:00:26.659
- Airmass: 1.00
- Mount Az: 67.4772, 89.2409
- Dome Az: 303.8552, Dome Shutter: 0.0000
- Date: 2013-04-24, Sidereal: 12:59:34.4
- UT Time: 03:33:09.6, Hour Angle: -00:00:52.2
- Rotator Angle: 359.030000, Position Angle (E of N): 360.000000
- Outside Temp: 15.1500, Wind Direction: 168.8000
- Pressure: 741.4000, Wind Speed: 0.0000
- Seeing: -1.0000, Humidity: 13.7000

System Status (Bottom Panel):

- Grating Selection: [Green]
- Camera/Grating: [Green]
- Collimator Focus: [Green]
- Camera Focus: [Green]
- TCS Connected: [Green]
- Shutter Open: [Green]

Taskbar: start, LabVIEW, Goodman Spectrogra..., Shutdown, SI Image SGL D, SI Image SGL, Temperature & Press..., DATA, 11:33 PM





- Red light on the Goodman GUI shown in one or more mechanisms.
- How to abort an acquisition properly.
- The shutter does not close after stopping data acquisition.
- Light trails in bright stars in imaging mode.
- Images are not being transferred to the right folder on soaric7

The screenshot shows the Goodman Spectrograph Control System interface. A red light is illuminated on the 'Mask Assembly' indicator in the status bar on the left. The main panel displays various control panels including RA/DEC, Mount Az/El, Dome Az/Shutter, Date/Sidereal, UT Time/Hour Angle, Rotator Angle/Position Angle, Outside Temp/Wind Direction, Pressure/Wind Speed, Seeing/Humidity, Mask, Mask Imaging, Grating, Camera, and Flexure Compensation. A red arrow points from the text box to the red light on the Mask Assembly indicator.

When red lights are being shown in one or more mechanisms:

- 1) Report the problem to the TO and ask him to move the rotator to angle equal zero;
- 2) Log off/Shut down;
- 3) Ask the TO to turn off the Goodman Camera Electronics and wait ~5s to turn on it again;
- 4) Log in/Home the systems again.

If the problem persists, repeat the procedure described above. If a second attempt does not fix the problem, call the Support Scientist

The screenshot shows the Goodman Spectrograph Control System interface. The window title is "Goodman Spectrograph Control System" and the user is logged in as "Main User Operator Engineer Help". The interface is divided into several panels:

- Top Left:** Goodman Laboratory logo and SOAR TELESCOPE logo.
- Top Center:** Camera TCP/IP settings (Port: 2055, Server Address: localhost) and a "Connection Open Getting Data" button.
- Top Right:** Acquisition parameters including File Name Base (image), Exp. Time (s) (10.0), Image # (0001), and a "Stop Acquisition" button. A red arrow points to this button.
- Middle Left:** Object selection (Flat, Comp, Dark, Zero) and exposure/readout progress bars.
- Middle Right:** CCD Readout Speed (400 kHz, ATTN 0) and CCD ROI Mode (Spectroscopic, 1x1).
- Bottom Left:** Telemetry data including RA, DEC, Airmass, Focus, Mount Az, Mount El, Dome Az, Dome Shutter, Date, Sidereal, UT Time, Hour Angle, Rotator Angle, Position Angle, Outside Temp, Pressure, and Seeing.
- Bottom Center:** Mask and Grating selection panels.
- Bottom Right:** Wavelength Angles and Flexure Compensation panels.

A red box highlights the "Stop Acquisition" button with the following text:

To abort an acquisition...

- 1) Click the "Stop Acquisition" button during an exposure.

The screenshot displays the Goodman Spectrograph Control System (GSCS) interface. A central dialog box with a red 'X' icon and the title 'Error 57 occurred at TCP Read in Send TCP-IP Cmd and Get Ackn 3.vi->SIcamera_Manager.vi' is overlaid on the main control panel. The dialog box contains the text 'Possible reason(s): LabVIEW: The network connection is busy.' and two buttons: 'Continue' (highlighted with a red arrow) and 'Stop'. The background interface includes various control panels for camera settings, object selection, file naming, and telescope parameters. A 3D model of the telescope is visible in the lower center.

To abort an acquisition...

- 1) Click the "Stop Acquisition" button during an exposure.
- 2) You will get an error message. Click on "**Continue**".

The screenshot displays the Goodman Spectrograph Control System interface. A central dialog box with a red 'X' icon and the title 'Error 57 occurred at TCP Read in Send TCP-IP Cmd and Get Ackn 3.vi->SIcamera_Manager.vi' is open. The message reads: 'Possible reason(s): LabVIEW: The network connection is busy.' A red arrow points to the 'Continue' button. The background interface includes various control panels for camera settings, object selection, file naming, and telescope parameters. A 3D model of the telescope is visible at the bottom center.

To abort an acquisition...

- 1) Click the "Stop Acquisition" button during an exposure.
- 2) You will get an error message. Click on "**Continue**".
- 3) A second error message will appear. Click on "**Continue**" again.

Warning: this procedure should be used only if you really need to!

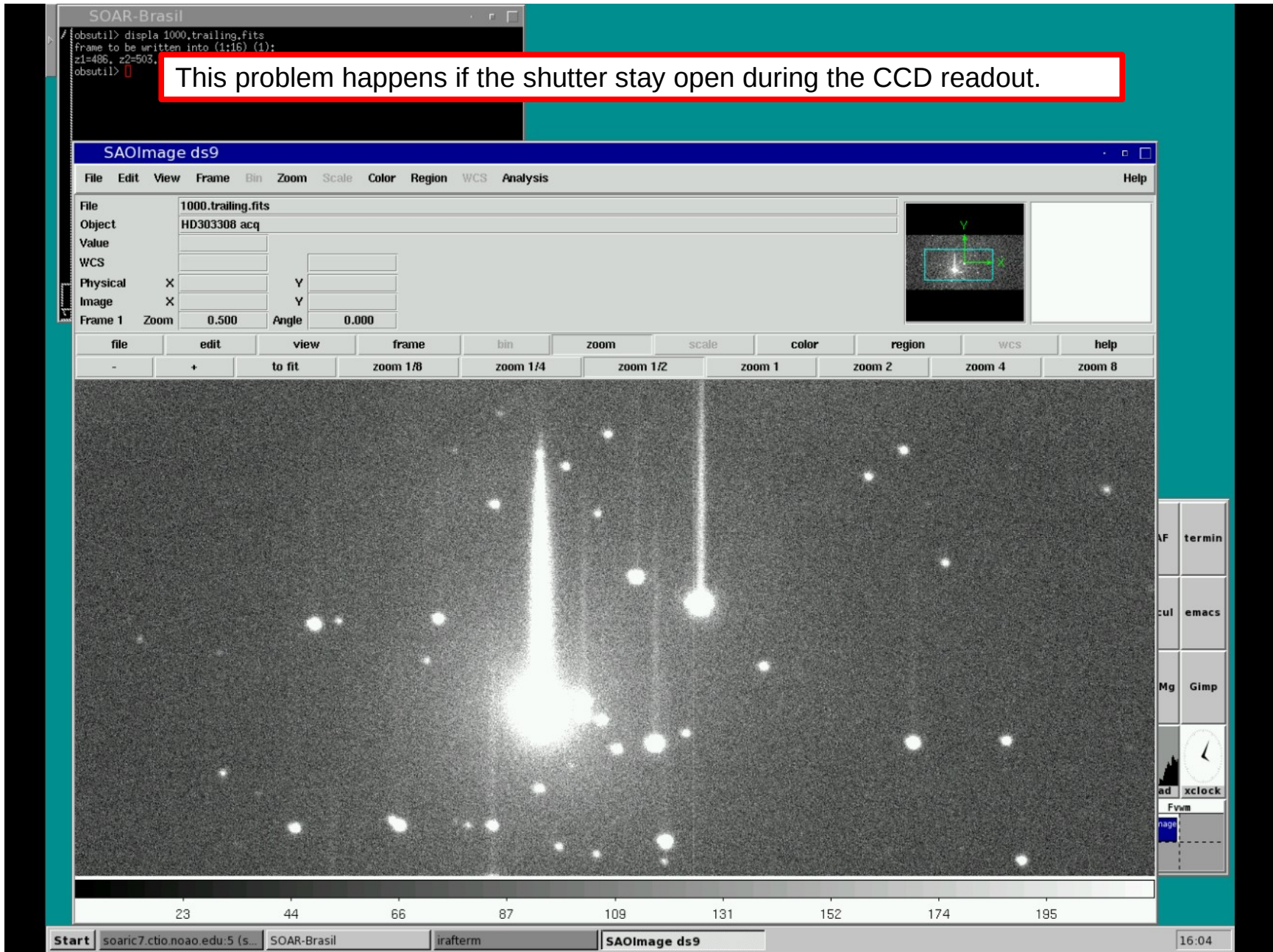
Never click on "Stop" in the small error pop-up window. If you do, the GUI will get frozen and you will have to do a full shutdown and exit of the GUI, and start it up again.

If the shutter does not close after stopping the data acquisition, just take one short exposure to force the shutter to close.

The screenshot shows the Goodman Laboratory SOAR Telescope control interface. Key sections include:

- System:** Camera TCP/IP (Port: 2055, Server Address: Localhost), Connection Open/Getting Data.
- Object:** Object Name, # Exposures (1), Object Comments.
- File Name Base:** image, Exp. Time (s): 10.0, Image #: 0002, RO Done.
- Grating:** 20.73950 Actual, 12.20997 Camera, 20.74000 Target, 12.21000 Camera.
- Shutter Status:** Shutter Open (indicated by a green light).
- Collimator Focus:** 15.7 Actual, 0 Target.
- Primary/Secondary Filter:** <NO FILTER>.
- Camera Focus:** 18.3 Actual, 0 Target.
- Environmental Data:** Outside Temp (10.9900), Wind Direction (329.1000), Pressure (736.9000), Wind Speed (44.5004), Seeing (-1.0000), Humidity (27.8000).

This problem happens if the shutter stay open during the CCD readout.



To fix the problem, check if the shutter is working in "Triggered Acq." mode on the SI Image SGL software.

Select "Triggered Acq." and acquire another image.

Light Exposure
Dark Exposure
Test Image
✓ Triggered Acq.

Acquire Image 1

Acquire Image 2

Acquisition Mode
Single Image

Image 1: 0014.focus_600m.fits

Image 2:

Region Statistics	Max	5968.00
Red Cursor	Min	479.00
X Offset	P-P	5489.00
Y Offset	Mean	1170.54
	RMS Noise	1521.09

SI Image SGL

Cur	0	1	2	3	4	5	6	7	8	9	10
Cur 0	1.0	0.0	484.0								
Cur 1	199.0	0.0	485.0								

Continuous: Off

Acquire Image 1: Triggered Acq.

Acquire Image 2: Light Exposure

Exposure Time: 01.000

Acq. Time: 02:06.6

Acquisition Mode: Single Image

Display: Image 1

Image 1: 0014.focus_600m.fits

Image 2:

Region Statistics	Max	Min	P-P	Mean	RMS Noise
Red Cursor	5968.00	479.00	5489.00	1170.54	1521.09
X Offset	50				
Y Offset	50				

If the problem persists, follow the "Starting SI Image SGL D" procedure as described in [Goodman Startup/Shutdown Guide](#)

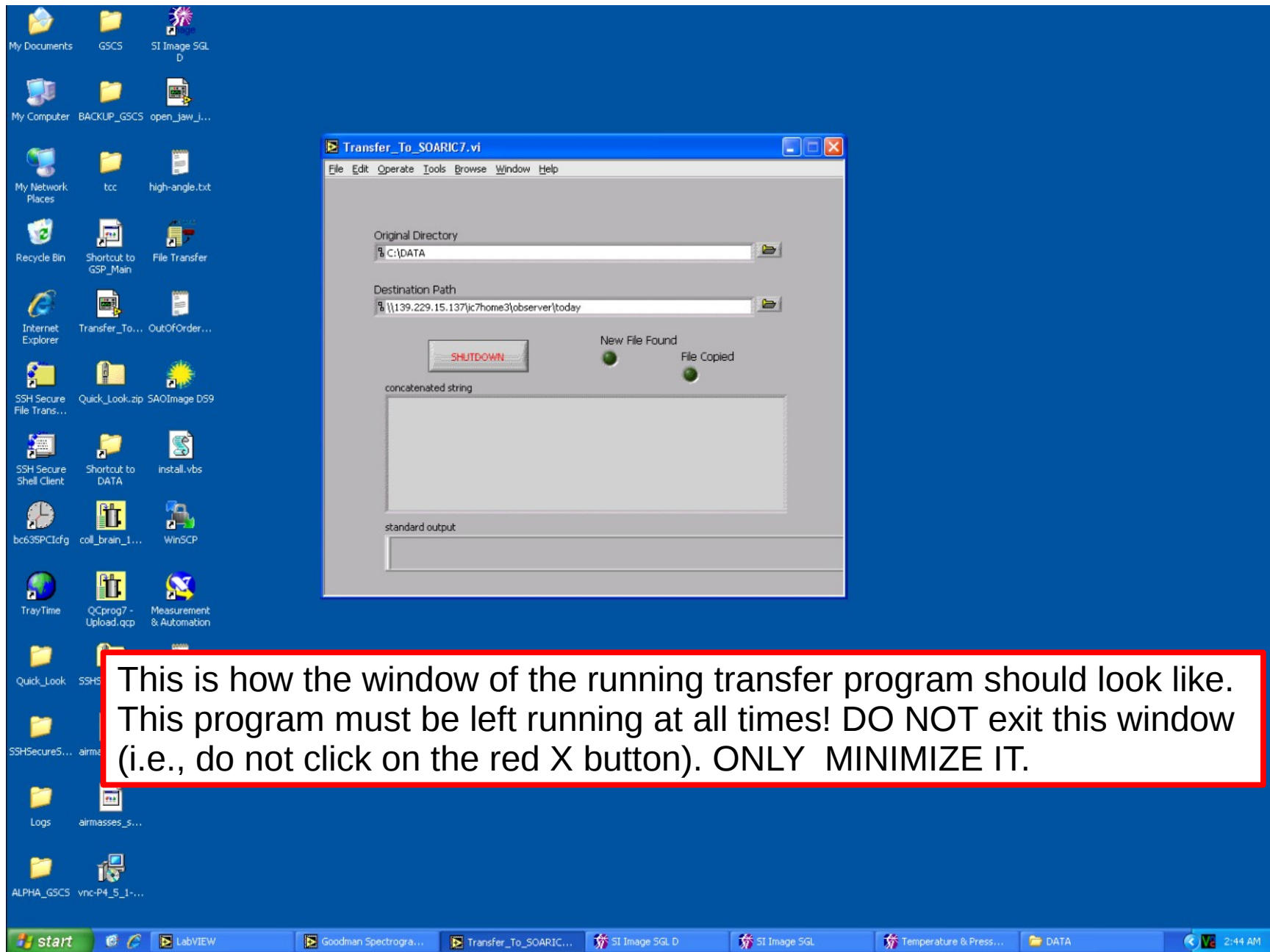
WARNING: DO NOT close the “SI Image SGL D” window. Only minimize the window, **NEVER** click on the red X, or Exit in the “File” menu.

The screenshot shows the 'SI Camera CCD Settings' dialog box. The 'Configuration' tab is selected, and the 'Cooler ON' button is highlighted with a red arrow. The dialog box also includes sections for 'Camera Settings' (Serial, Parallel, CCD ROI), 'Readout Mode' (Mode 8: 400 KHz - Attn 0), and 'Power On Defaults' (Read EEPROM, Write to EEPROM). The background shows a Windows desktop with various icons and a taskbar with several open applications, including 'SI Image SGL D'.

This program controls the CCD cooling so it must be always running

If images are not been trasferred to /home3/observer/today/ on soaric7:

- 1) Click the "Transfer_To..." icon on Desktop;
- 2) Click the run button (white arrow) on the "LabVIEW" window.



Focus sequence in spectroscopic mode

Adapted by D. Sanmartim from L. Fraga's Guide

Suggested setup:

- CDD Readout Speed of "400 kHz, ATTN 0";
- Put the "CCD ROI Mode" in "Spectroscopic, 1x1";
- Use the narrowest slit (0.46");

The screenshot displays the SOAR Telescope control software interface. A red box highlights the suggested setup parameters: CDD Readout Speed of "400 kHz, ATTN 0", CCD ROI Mode in "Spectroscopic, 1x1", and the narrowest slit (0.46").

Key interface elements include:

- Top Panel:** Object selection (Flat, Comp, Dark, Zero), File Name Base, Exp. Time (s), Image #, and RO Done status.
- Configuration Panel:** CCD Readout Speed (400 kHz, ATTN 0), CCD ROI Mode (Spectroscopic, 1x1), and Port Readout (Port B).
- Mask Panel:** Mask selection (0.46" long slit) and Mask Imaging controls.
- Wavelength Angles Panel:** Grating selection (600 Mid) and Littrow Configuration.
- Flexure Compensation Panel:** Left and Right flexure compensation controls.
- Camera Focus Panel:** Camera focus controls with a 3D model of the telescope.
- Primary Filter Panel:** Primary Filter selection (<NO FILTER>).
- Secondary Filter Panel:** Secondary Filter selection (GG385).
- Collimator Focus Panel:** Collimator focus controls with a 3D model of the telescope.
- Telemetry Panel:** RA, DEC, Airmass, Focus, Mount Az, Mount El, Dome Az, Dome Shutter, Date, Sidereal, UT Time, Hour Angle, Rotator Angle, Position Angle (E of N), Outside Temp, Wind Direction, Pressure, Wind Speed, Seeing, Humidity.

Goodman Spectrograph Control System

Main User Operator Engineer

Goodman Laboratory SOAR TELESCOPE

Port: 2055 Server Address: localhost

Reset Connection

Connection Open Getting Data

CCD Temp.: 0 Vacuum Pressure: 0

Obtain Camera Status

Comp Name: # Comp Exposures: 1

Comp Comments:

Hg(Ar) Cu Ne Ar Quartz

% Exposure: 0 % Readout: 0

Image File Name: 0001.image.fits Save As: 0001

CCD Readout Speed: 400 kHz, ATTN 0

Current Pixel Values: 0 Desired Pixel Values: 0

Calculate Required Offset Apply SOAR Offset

Imaging, 1x1
Imaging, 2x2
Imaging, 3x3
✓ Spectroscopic, 1x1
Spectroscopic, 2x2
Spectroscopic, 3x3
Slicer
Slit Imaging/Alignment
Set user-defined ROI...
Custom Mode

RA: 03:14:34.520 DEC: 18:31:04.593

Airmass: 13.37 Focus: 0.00

Mount Az: 67.4770 Mount El: 1.5649

Dome Az: 303.8552 Dome Shutter: 0.0000

Date: 2013-04-24 Sidereal: 22:10:14.8

UT Time: 12:42:19.8 Hour Angle: -05:04:19.6

Rotator Angle: 359.029000 Position Angle (E of N): 360.000000

Outside Temp: 16.0500 Wind Direction: 81.9000

Pressure: 741.1000 Wind Speed: 0.0000

Seeing: -1.0000 Humidity: 14.4000

Reading telemetry from TCS...

Primary Filter: 0.46" long slit

Secondary Filter: Withdraw Mask

Mask Assembly: Mask Is In

Grating Selection: KOST_600

Camera/Grating: 600 lines/mm

Collimator Focus: 15.9

Camera Focus: 18.7

Wavelength Angles: Grating: 10.00000 Actual: 19.99988 Target: 20.00000

Flexure Compensation: Left: 0 Right: 0 Camera flex target: 20

Collimator Focus: 20 Actual: 1001 Target: 1000

Primary Filter: <NO FILTER>

Secondary Filter: GG385

Camera Focus: 20 Actual: 0 Target: 0

Aiming to save time we can read a smaller region of the CCD by using a central ROI of 200 pixels. In "CCD ROI Mode" select "Custom Mode".

Customizing the CCD ROI to a central region of ~200 pixels.

- 1) In "CCD ROI Mode" select "Custom Mode";
- 2) Edit the "Parallel Origin" and "Parallel Length" to 1900 and 200, respectively;

The screenshot shows the Goodman Spectrograph Control System interface. A dialog box titled "CCD Format Parameters" is open, prompting the user to enter CCD Formatting Parameters. The dialog box contains the following fields and options:

- Serial Origin: 0
- Parallel Origin: 1100
- Serial Length: 4142
- Parallel Length: 1896
- Serial Binning: 1
- Parallel Binning: 1
- Buttons: Lock to Imaging Region, Lock to Spectral Region, Lock ROI Around Coord., Set Parameters, Cancel
- ROI Preview: A dashed yellow circle on a black background.
- Options: Overlay Imaging Field, Overlay Spectral Region, Image Overlap Possible In Serial Direction

The background interface includes various control panels and a 3D model of the telescope. The top right panel shows "CCD ROI Mode" set to "Custom Mode". The bottom right panel shows "Camera Focus" controls with a target of 18.8 and an actual value of 18.8.

Customizing the CCD ROI to a central region of ~200 pixels.

- 1) In "CCD ROI Mode" select "Custom Mode";
- 2) Edit the "Parallel Origin" and "Parallel Length" to 1900 and 200, respectively;
- 3) Click on "Set Parameters" to confirm the new parameters.

The screenshot displays the Goodman Spectrograph Control System interface. A central dialog box titled "Please enter CCD Formatting Parameters:" is open, showing fields for Serial Origin (0), Parallel Origin (1900), Serial Length (4142), Parallel Length (200), Serial Binning (1), and Parallel Binning (1). A "ROI Preview" window shows a dashed green circle and a solid black horizontal bar representing the ROI. Red arrows point to the "Parallel Origin" and "Parallel Length" fields. The background interface shows various control panels, including "Wavelength Angles", "Flexure Compensation", and "Camera Focus".

Customizing the CCD ROI to a central region of ~200 pixels.

- 1) In "CCD ROI Mode" select "Custom Mode";
- 2) Edit the "Parallel Origin" and "Parallel Length" to 1900 and 200, respectively;
- 3) Click on "Set Parameters" to confirm the new parameters.

The screenshot displays the Goodman Spectrograph control software interface. Key components include:

- Top Right Panel:** Acquisition parameters such as File Name Base (image), Exp. Time (1.0 s), Image # (0001), and CCD ROI Mode (Set user-defined ROI...). It also shows current and desired pixel values for x and y coordinates.
- Center Panel:** A 3D model of the spectrograph with various control buttons and indicators. The "Mask" section shows "0.46" long slit" and "Mask Is In". The "Grating" section shows "KOSI_600" and "600 lines/mm".
- Bottom Right Panel:** Camera focus and flexure compensation controls. The "Camera Focus" section shows "Actual" (18.8) and "Target" (18.8) values. The "Flexure Compensation" section shows "Left" (0) and "Right" (0) values.
- Left Panel:** Status and environmental data, including RA (03:15:32.212), DEC (18:31:04.965), Airmass (13.37), Focus (0.00), Mount Az (67.4770), Mount El (1.5649), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (22:11:12.6), UT Time (12:43:17.4), Hour Angle (-05:04:19.6), Rotator Angle (359.029000), Position Angle (E of N) (360.000000), Outside Temp (16.1100), Wind Direction (106.9000), Pressure (741.1000), Wind Speed (0.0000), Seeing (-1.0000), and Humidity (14.4000).

To do the focus sequence start by setting the camera focus value to -2000. On the "Camera Focus" panel enter -2000 in "Target" and click on "Set". Wait until "-2000" appears in the "Actual" indicator box.

The screenshot displays the Goodman Spectrograph Control System interface. A red box highlights the instructions for the focus sequence. The interface includes several control panels:

- Top Panel:** Includes fields for Name Base, Exp. Time (s) (1.0), Image # (0001), and RO Done. There is an "Acquire Images" button and a "Save As" field with "116 FITS".
- Left Panel:** Contains a list of status indicators: Primary Filter, Secondary Filter, Mask Assembly, Grating Selection, Camera/Grating, Collimator Focus, Camera Focus, TCS Connected, and Shutter Open.
- Center Panel:** Features a 3D model of the telescope and spectrograph. Below it are controls for Primary Filter (set to "<NO FILTER>") and Secondary Filter (set to "GG385").
- Right Panel:** Includes "Wavelength Angles" with Grating (600 Mid) and Camera (20.00000) settings. It also has a "Flexure Compensation" section with Left and Right values (0 and 0) and a "Camera Focus" section with a Target of -1500 and an Actual of -1494.
- Bottom Panel:** Shows a Windows taskbar with the start button, LabVIEW, Goodman Spectrogra..., Transfer_To_SOARIC..., SI Image SGL D, SI Image SGL, Temperature & Press..., and DATA. The system clock shows 8:44 AM.

Focus sequence in spectroscopic mode

Adapted by D. Sanmartim from L. Fraga's Guide

Turn on the comparison lamp (HgAr) and take an image sequence by varying the camera focus value in steps of 300.

The screenshot displays the Goodman Spectrograph Control System interface. Key sections include:

- Top Panel:** Object selection (Flat, Comp, Dark, Zero), File Name Base (focus_600m), Exp. Time (2.0), Image # (0001), and a Stop Acquisition button.
- Left Panel:** RA (22:20:26.928), DEC (-29:46:57.582), Airmass (1.00), Focus (0.00), Mount Az (67.4766), Mount El (88.2522), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (22:15:29.9), UT Time (12:47:34.0), Hour Angle (-00:04:57.0), Rotator Angle (359.029000), Position Angle (E of N) (360.000000), Outside Temp (15.9600), Wind Direction (88.1000), Pressure (741.1000), Wind Speed (0.0000), Seeing (-1.0000), Humidity (14.4000).
- Center Panel:** A 3D model of the spectrograph with various components labeled: Primary Filter, Secondary Filter, Mask Assembly, Grating Selection, Camera/Grating, Collimator Focus, Camera Focus, TCS Connected, Shutter Open, Collimator Focus (Actual: 1001, Target: 1000), Primary Filter (<NO FILTER>), Secondary Filter (GG385), Camera Focus (Actual: -1495, Target: -1500).
- Right Panel:** Wavelength Angles (Grating: 10.00000, Actual: 19.99995, Target: 20.00000), Select Mode (600 Mid), Littrow Configuration (Central wavelength(nm): 0), Flexure Compensation (Left: 0, Right: 0, Camera flex target: 20, Active? checkbox).

Using "display" or "implot" check if the first image is ok (it should show emission lines with high signal.)

The screenshot displays a multi-panel software interface for astronomical spectroscopy. At the top left, a terminal window titled "SOAR-Brasil" shows the following commands and output:

```

ecl> display 0001.focus_600m.fits
Frame to be written into (1:16) (1):
z1=481, z2=510,6233
ecl> implot 0001.focus_600m.fits
    
```

To the right, a plot window titled "irafterm" shows a spectrum plot. The x-axis is labeled "Column (pixels)" and ranges from 0 to 4000. The y-axis ranges from 0 to 6000. The plot shows several sharp emission lines, with a prominent one around 2000 pixels. A vertical red line is drawn at approximately 2000 pixels, and a horizontal red line is drawn at approximately 3000 units on the y-axis.

Below the terminal, a window titled "SAOImage ds9" is visible. It has a menu bar (File, Edit, View, Frame, Bin, Zoom, Scale, Color, Region, WCS, Analysis) and a toolbar with buttons for file, edit, view, frame, bin, zoom, scale, color, region, wcs, and help. The main area shows a zoomed-in view of the spectrum with a green circle highlighting a specific emission line.

At the bottom right, there is a taskbar with several application icons: IRAF, termin, calcul, emacs, FileMg, Gimp, xload, xclock, and a "Fwrm" icon.

The screenshot shows two main windows: SOAR-Brasil and irafterm. The SOAR-Brasil window displays a table of focus and width values for various images, with the best focus identified as 398. The irafterm window shows a plot of Profile Width vs. Focus, with a red arrow pointing to the minimum width at a focus of 455. Below the plot is a grid of 15 profile plots, each labeled with its corresponding focus and width values. A red box highlights the profile at focus 398 with a width of 3.27.

Image	Focus	Width
0001, focus_600m.fits	-1.E3	8.29
0002, focus_600m.fits	-1.E3	8.20
0003, focus_600m.fits	-1.E3	8.00
0004, focus_600m.fits	-999.	7.64
0005, focus_600m.fits	-798.	7.04
0006, focus_600m.fits	-599.	6.24
0007, focus_600m.fits	-398.	5.31
0008, focus_600m.fits	-199.	4.52
0009, focus_600m.fits	0.	3.92
0010, focus_600m.fits	200.	3.54
0011, focus_600m.fits	398.	3.29
0012, focus_600m.fits	597.	3.36
0013, focus_600m.fits	797.	3.67
0014, focus_600m.fits	998.	4.29

Best FWHM in 455 with width of 3.27

Using "specfocus" in the "obsutil" package we can estimate the Best Average Focus of the instrument. On IRAF:

```
cl> obsutil
cl> specfocus *.focus_600m.fits focus="CAM_FOC" slit1=50 slit2=150
```

For the 0.46 arcsec wide slit you should expect a FWHM~3 pixels at the best focus.

The screenshot displays the Goodman Spectrograph Control System interface. The top bar includes the title 'Goodman Spectrograph Control System' and user roles 'User Operator Engineer Help'. The interface is divided into several functional areas:

- Top Left:** Goodman Laboratory logo and SOAR Telescope branding.
- Top Center:** Camera TCP/IP settings (Port: 2055, Server Address: Localhost) and a 'Connection Open Getting Data' button.
- Top Right:** Acquisition parameters including File Name Base (focus_600m), Exp. Time (2.0 s), Image # (0015), and an 'Acquire Images' button.
- Middle Left:** CCD Temp. and Vacuum Pressure readouts.
- Middle Center:** Object selection (Flat, Comp, Dark, Zero), Comp Name, and exposure/readout percentage sliders.
- Middle Right:** CCD Readout Speed (400 kHz) and CCD ROI Mode (Set user-defined ROI...).
- Bottom Left:** Telemetry data including RA (22:29:43.197), DEC (-30:10:24.104), Airmass (1.00), Focus (0.00), Mount Az (67.4769), Mount El (89.2345), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (22:28:55.9), UT Time (13:00:57.8), Hour Angle (-00:00:47.2), Rotator Angle (359.029000), Position Angle (360.000000), Outside Temp (16.3800), Wind Direction (15.7000), Pressure (741.2000), Wind Speed (0.0000), Seeing (-1.0000), and Humidity (14.3000).
- Bottom Center:** A 3D model of the telescope and spectrograph assembly.
- Bottom Right:** Wavelength Angles (Grating: 10.00000, Camera: 20.00005) and Flexure Compensation (Left: 0, Right: 0, Camera flex target: 20).

A red callout box with a white background and black text is overlaid on the interface, pointing to the 'Camera Focus' control. The text reads: "Go back to the position -2000 and then enter the **Best Average Focus: 455**." The 'Camera Focus' control shows an 'Actual' value of -1495 and a 'Target' value of 455.

The screenshot displays the Goodman Spectrograph Control System interface. At the top left, there is a logo for Goodman Laboratory and SOAR Telescope. The main interface is divided into several sections:

- Top Left:** Goodman Laboratory and SOAR Telescope logos.
- Top Center:** Camera TCP/IP and General settings, including Port (2055) and Server Address (localhost). A green button indicates "Connection Open Getting Data".
- Top Right:** Object, Flat, Comp, Dark, Zero tabs. Comp Name and # Comp Exposures (1) are visible. File Name Base (focus_600m), Exp. Time (2.0), and Image # (0015) are set. An "Acquire Images" button is present.
- Bottom Left:** Telemetry data including RA (22:31:11.470), DEC (-30:10:24.914), Airmass (1.00), Focus (0.00), Mount Az (67.4769), Mount El (89.2345), Dome Az (303.8552), Dome Shutter (0.0000), Date (2013-04-24), Sidereal (22:30:24.1), UT Time (13:02:25.8), Hour Angle (-00:00:47.3), Rotator Angle (359.029000), Position Angle (E of N) (360.000000), Outside Temp (16.2200), Wind Direction (39.4000), Pressure (741.2000), Wind Speed (0.0000), Seeing (-1.0000), and Humidity (14.3000).
- Bottom Center:** A 3D model of the telescope and spectrograph assembly.
- Bottom Right:** Wavelength Angles panel with Grating (KOSI_600, 600 lines/mm) and Camera (19.99995) settings. A "Litrow Configuration" section shows Central wavelength (nm) at 0. Flexure Compensation and Camera Focus panels are also visible.

Annotations on the image include:

- A red box with the text "Don't forget!!" pointing to the "Hg(Ar)" button in the "Comp" section.
- A red box with the text "When you finish the the focus sequence don't forget to turn off the comparison lamp!" pointing to the "Hg(Ar)" button.

Focus sequence in imaging mode

Adapted by D. Sanmartim from L. Fraga's Guide

Run a focus sequence just as explained for spectroscopy mode (varying focus in steps of 300), but using the imaging mode configuration with the slit in the optical path.

Use the "Slit Imaging/Aligmente" CCD ROI Mode!

The screenshot shows the Goodman Laboratory SOAR Telescope control interface. The interface is divided into several sections:

- Top Left:** Goodman Laboratory logo and SOAR TELESCOPE logo.
- Top Center:** Camera TCP/IP settings (Port: 2055, Server Address: Localhost) and a "Connection Open Getting Data" button.
- Top Right:** File Name Base (focus_Img), Exp. Time (3.0), Image # (0022), and an "Acquire Images" button. The CCD ROI Mode is set to "Slit Imaging/Alignment".
- Middle Left:** Object, Flat, Comp, Dark, Zero settings. Flat Name, # Flat Exposures (1), Flat Comments, and Quartz Intensity (50%) are visible. The Quartz lamp is turned on.
- Middle Right:** CCD Readout Speed (400 kHz, ATTN 0) and Port Readout (Port B).
- Bottom Left:** RA (05:19:32.101), Airmass (1.00), Mount Az (67.4764), Date (2013-04-24), UT Time (19:49:20.8), Rotator Angle (9.140000), Outside Temp (17.5300), Wind Direction (325.4000), Pressure (740.5000), Wind Speed (8.3001), Seeing (-1.0000), Humidity (35.8000).
- Bottom Center:** Masking controls including "0.46" long slit" and "Mask Is In".
- Bottom Right:** Grating Selection (set to "<NO GRATING>"), Littrow Configuration (Central wavelength: 0 nm), Flexure Compensation (Left: 1, Right: 1, Camera flex target: -0.00316808), and Camera Focus (Actual: -1494, Target: -1000).

Callouts and annotations:

- "Use the 'Quartz' lamp!" points to the Quartz lamp indicator.
- "Use the '0.46" slit" points to the slit selection dropdown.
- "Run one focus sequence for each filter you are using in your science!" points to the filter selection dropdowns.
- "Put the instrument in imaging mode!" points to the Grating selection dropdown.
- "Use the 'Slit Imaging/Aligmente' CCD ROI Mode!" points to the CCD ROI Mode dropdown.

GUI setup for a focus sequence in imaging mode

The screenshot displays the Goodman Laboratory SOAR Telescope control interface. The top left features the Goodman Laboratory logo and the SOAR Telescope name. The main interface is divided into several functional areas:

- Camera TCP/IP:** Shows port 2055 and localhost server address. Includes buttons for 'Reset Connection', 'Connection Open Getting Data', and 'Obtain Camera Status'.
- Object/Flat/Comp/Dark/Zero:** Controls for flat field exposures, including flat name, number of exposures (set to 1), and quartz intensity (set to 50%).
- File Name Base/Exp. Time (s):** Shows 'focus_img' as the base name and 3.0 seconds as the exposure time. Includes an 'Acquire Images' button.
- Current/Desired Pixel Values:** Displays x and y coordinates for current and desired pixel positions, with options to move 'to the East' or 'to the North'.
- Masking Section:** Includes a 'Mask' dropdown set to '0.46" long slit', a 'Withdraw Mask' button, and a 'Mask Is In' indicator. Below it is a 'Mask Imaging' section with an 'Image Mask' button and a 'Grating' dropdown set to '<NO GRATING>'.
- Wavelength Angles:** A yellow panel showing 'Grating' values (Actual: 0.66090, Target: 0.66100) and 'Camera' values (Actual: 0.00008, Target: 0.00000). Includes a 'Select Mode' dropdown set to 'Imaging' and a 'Litrow Configuration' section for central wavelength.
- Flexure Compensation:** A section for adjusting left and right flexure, with a 'Camera flex target' set to -0.00316808 and an 'Active?' checkbox.
- Camera Focus:** A green panel showing 'Collimator Focus' (Actual: 1001, Target: 1000) and 'Camera Focus' (Actual: 998, Target: 1000) with 'Set' buttons.
- Primary/Secondary Filter:** Blue panels showing filter selection dropdowns set to '<NO FILTER>' and 'y'.
- Telemetry and Status:** A left sidebar displays various parameters like RA, DEC, Airmass, Focus, Mount Az, Mount El, Dome Az, Dome Shutter, Date, Sidereal, UT Time, Hour Angle, Rotator Angle, Position Angle, Outside Temp, Wind Direction, Pressure, Wind Speed, Seeing, and Humidity. A central status bar shows 'DONE: Waiting for next command'.

The Windows taskbar at the bottom shows the 'start' button and several open applications: LabVIEW, Goodman Spectrogra..., Transfer_To_SOARIC..., SI Image SGL D, SI Image SGL, Temperature & Press..., and DATA. The system clock shows 3:53 PM.

SOAR-Brasil

```
obsutil> imexan 002*.focus_img.fits
display frame (1): (1):
z1=479, z2=497, 6413
z1=479, z2=497, 4296
z1=479, z2=496, 4322
z1=477, z2=495, 9937
z1=479, z2=496, 0951
```

irafterm

```
NDAO/IRAF V2.14.1 soar_brazil@soaric7.ctio.noao.edu Wed 16:55:55 24-Apr-2013
0025.Focus_Img.fits: Lines 955-959
```

Pixel Value

Column (pixels)

955-959: center=201.028 peak=1369.44 sigma= 1.301 fwhm= 3.063 bkg= 485.

SAOImage ds9

File Edit View Frame Bin Zoom Scale Color Region WCS Analysis Help

File 0025.focus_img.fits

Object

Value >496.095

WCS

Physical X 201.164 Y 959.924

Image X 201.164 Y 959.924

Frame 1 Zoom 0.153 Angle 0.000

file edit view frame bin zoom scale color region wcs help

- + to fit zoom 1/8 zoom 1/4 zoom 1/2 zoom 1 zoom 2 zoom 4 zoom 8

23 44

Start soaric7.ctio.no

IRAF termin

calcul emacs

FileMg Gimp

xload xclock

Even

We can estimate the best average focus also by using the “specfocus” from “obsutil”.
On IRAF type:
cl> obsutil
cl> specfocus *.focus_img.fits focus="CAM_FOC" slit1=900 slit2=1000