



# TripleSpec 4.1

*Sean Points*  
*NSF's NOIRLab*

# TripleSpec 4.1 Overview



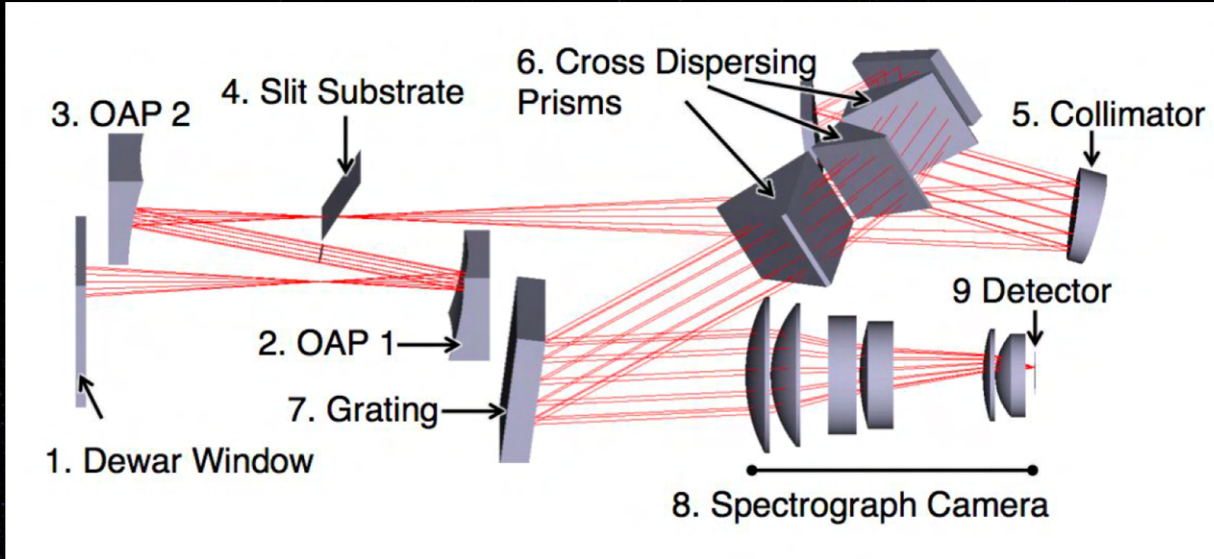
# TripleSpec 4.1 Overview



- Cross-Dispersed NIR Spectrograph
  - Covers ~4.5 orders
- Spectral Range:  $0.95\mu\text{m} - 2.45\mu\text{m}$ 
  - Instrument optics can cover  $0.8\mu\text{m} - 2.45\mu\text{m}$
  - Cutoff by NIR Nasmyth ISB dichroic
- Spectral Resolution ( $\lambda/\Delta\lambda$ ): ~3500
- Slit-viewing (SV) camera for acquisition
  - J band
  - 4'x4' FOV

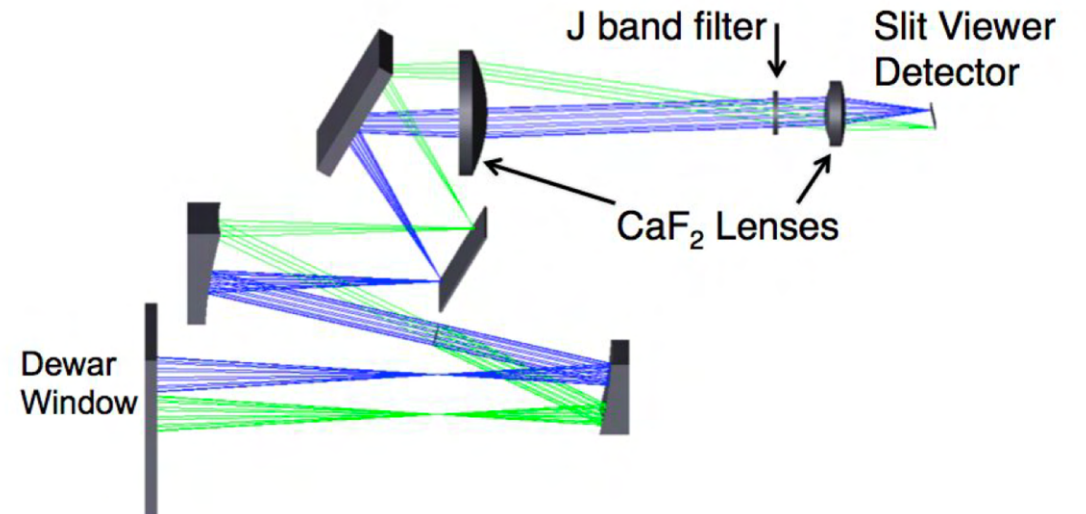


# TripleSpec 4.1 Optics



## Spectrograph Optics

## SV Optics

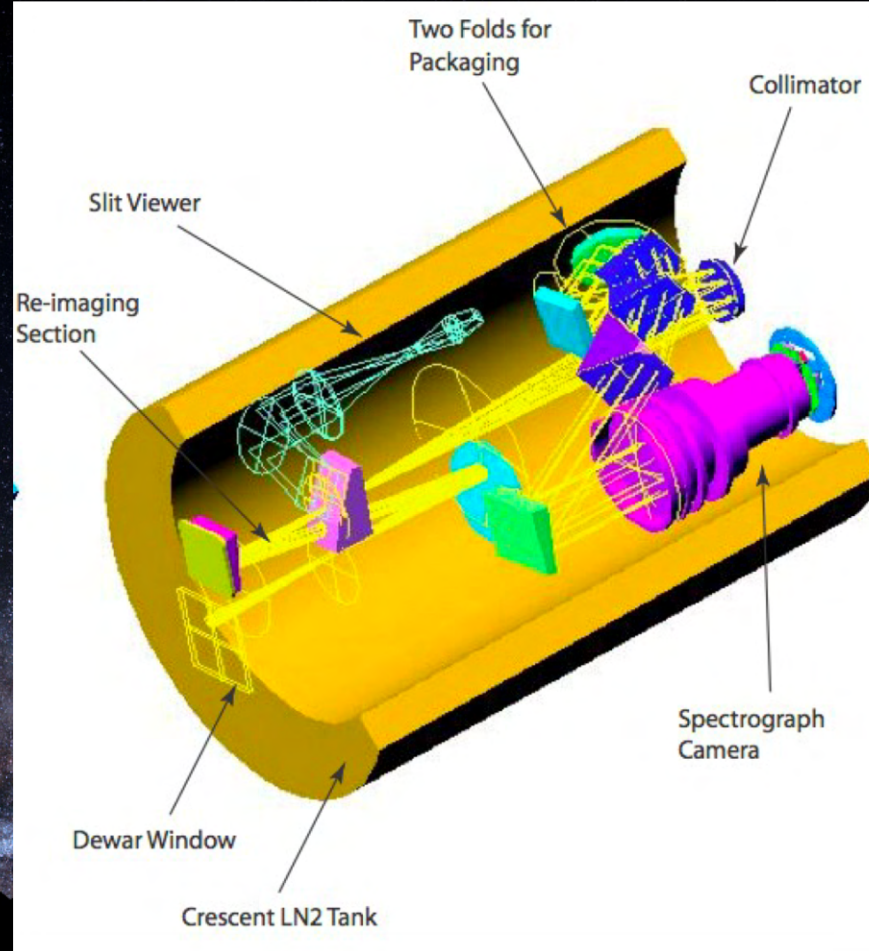




# TripleSpec 4.1 Optics

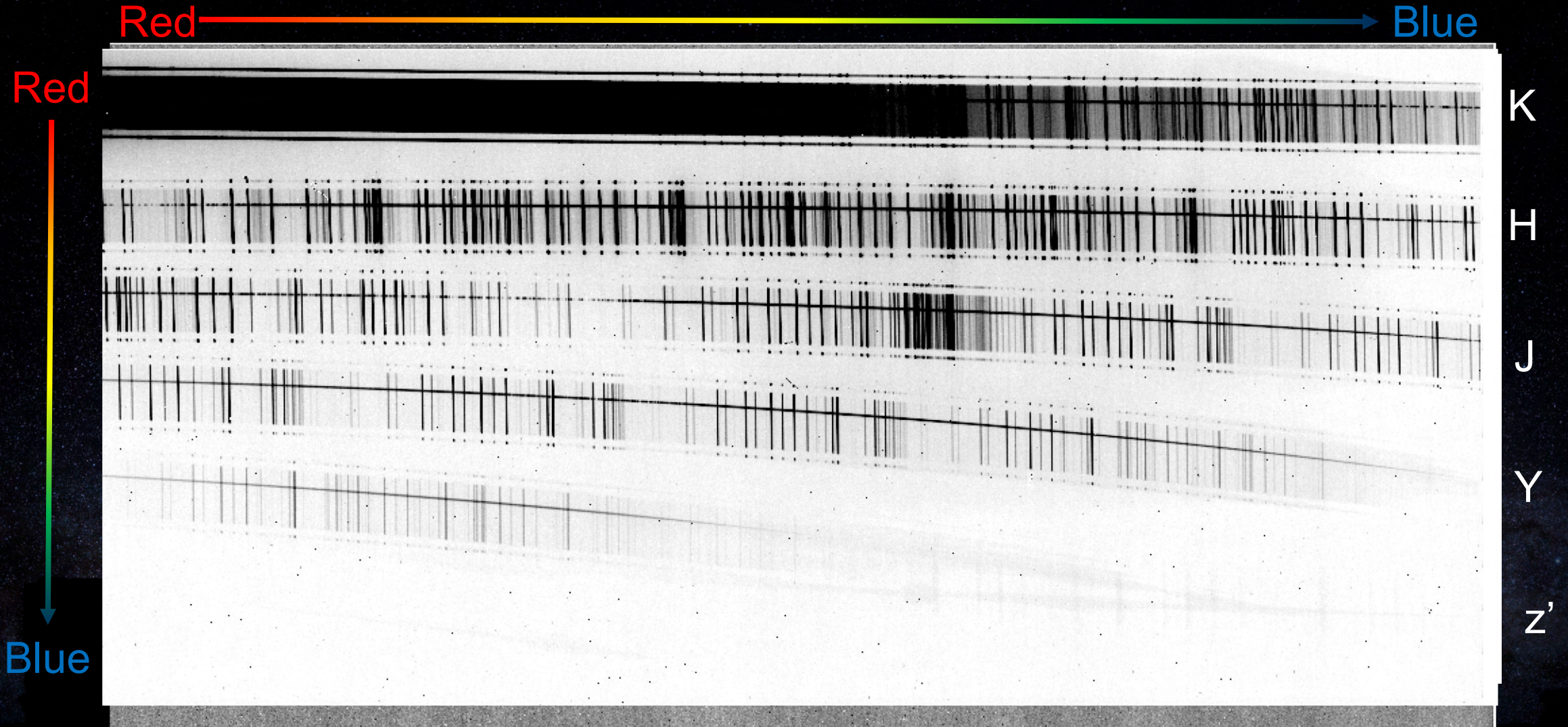


## Dewar Layout





# TripleSpec 4.1 Data



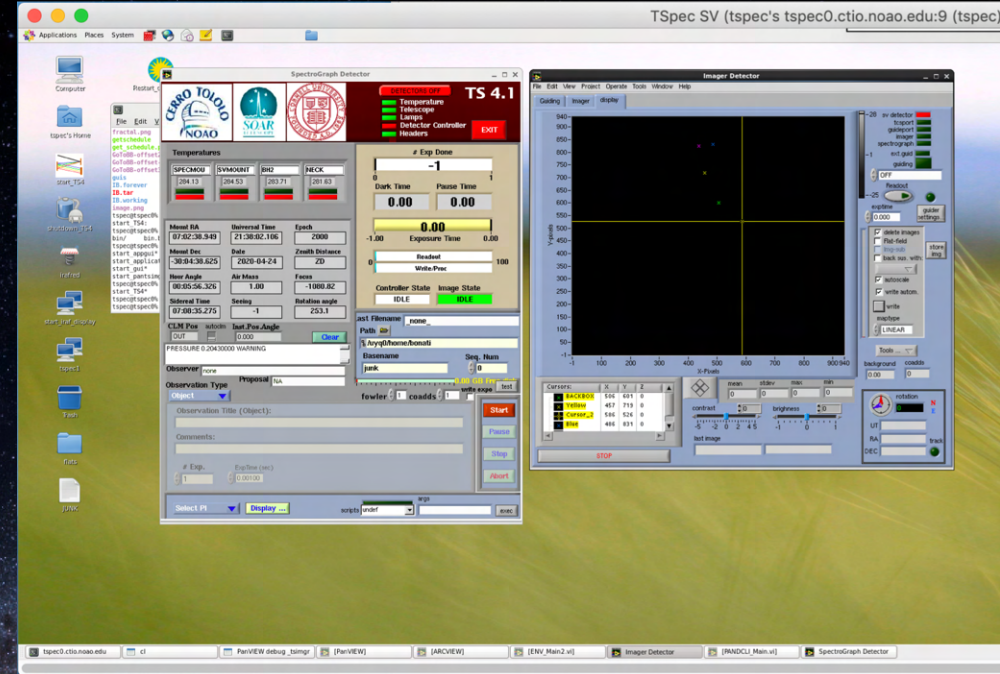
# TripleSpec 4.1 Startup



# TripleSpec 4.1 Startup



- Two VNC viewers
  - 139.229.15.70:2109 (SV Camera)
  - 139.229.15.70:2208 (Spectrograph Camera)
- SV VNC
  - Click icon “start\_TS4” or
  - Open Terminal
    - /home/tspec/app/bin/start\_TS4







# TripleSpec 4.1 Startup



- Spectrograph VNC
  - DS9 opens on startup
    - Automatic updates display
  - Make sure IRAF is open
  - Change IRAF directory

The screenshot shows a VNC session titled "TSpec Spectra (tspec1.ctio.noao.edu:8 (tspec)) - VNC Viewer". It displays several windows:

- Terminal (cl):** Lists FITS files for observation 0071 through 0088, including flat-field files (e.g., SPEC\_Dflat\_0071.fits) and science files (e.g., SPEC\_NG2596\_0225.fits).
- Terminal (irafterm):** Shows the IRAF prompt and a command to display a spectrum: `noao disp1 SPEC_Dflat_0081.fits 1 z*`. Below the prompt is a plot of a spectrum with flux on the y-axis (0 to 4000) and wavelength on the x-axis (0 to 250). The plot shows a noisy continuum with several emission lines.
- SAOImage ds9:** A window showing a flat-field image (SPEC\_Dflat\_0030.fits) with a grid overlay and various analysis tools.

The taskbar at the bottom shows the VNC viewer and several terminal windows.



# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
  - Telemetry
  - Setup
  - Readout
  - Observations
    - Object
    - Flats
    - Arcs
  - Telescope Focus

The screenshot shows the SpectroGraph Detector GUI with the following sections:

- Header:** CERRO TOLOLO NOAO, SOAR TELESCOPE, and CENTRAL UNIVERSITY logos. Status: DETECTORS OFF, TS 4.1. A red EXIT button is present.
- Temperatures:** A table with columns SPECMOU, SVMOUNT, BH2, and NECK. Values: 284.13, 284.52, 283.68, 281.61.
- Mount RA:** 07:07:40.797
- Universal Time:** 21:43:03.228
- Epoch:** 2000
- Mount Dec:** -30:04:29.944
- Date:** 2020-04-24
- Zenith Distance:** ZD
- Hour Angle:** 00:05:56.424
- Air Mass:** 1.00
- Focus:** -1080.82
- Sidereal Time:** 07:13:37.221
- Seeing:** -1
- Rotation angle:** 253.1
- CLM Pos:** OUT
- Inst.Pos.Angle:** 0.000
- Pressure:** 0.20430000 WARNING
- Observer:** [Empty field]
- Observation Type:** Proposal
- Object:** [Dropdown menu]
- Observation Title (Object):** [Text field]
- Comments:** [Text field]
- # Exp.:** 1
- ExpTime (sec):** 0.00100
- ast Filename:** \_none\_
- Path:** /home/simager/images
- Basename:** basename
- Seq. Num:** 0
- Controller State:** IDLE
- Image State:** DISABLE
- Buttons:** Start, Pause, Stop, Abort
- Footer:** Select PI, Display ..., scripts undef, exec



# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
  - Telemetry
  - Setup
  - Readout
  - Observations
    - Object
    - Flats
    - Arcs
  - Telescope Focus

The screenshot shows the SpectroGraph Detector GUI with the following sections:

- Header:** CERRO TOLOLO, SOAR, and UNIVERSITY OF ARIZONA logos. A red circle highlights the status indicators: DETECTORS OFF, Temperature (green), Telescope (green), Lamps (green), Detector Controller (red), and Headers (green). An EXIT button is also visible.
- Status Panel:** A red arrow points to the 'Status' label. Below it are four temperature gauges: SPECIMOU (284.13), SVMOUNT (284.52), BH2 (283.68), and NECK (281.61).
- Mount Information:**

Mount RA	Universal Time	Epoch
07:07:40.797	21:43:03.228	2000
Mount Dec	Date	Zenith Distance
-30:04:29.944	2020-04-24	ZD
Hour Angle	Air Mass	Focus
00:05:56.424	1.00	-1080.82
Sidereal Time	Seeing	Rotation angle
07:13:37.221	-1	253.1
- Control Panel:** Includes a pressure warning (0.20430000), observer name, observation type (Proposal), object name, observation title, and comments. It also features a 'Start' button and a 'Display ...' button.
- Exposure Control:** Shows exposure time (0.00), readout, and write/proc progress. The controller state is 'IDLE' and the image state is 'DISABLE'.
- File Management:** Fields for ast filename, path (/home/simager/images), basename (basename), and sequence number (0).



# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
  - Telemetry
  - Setup
  - Readout
  - Observations
    - Object
    - Flats
    - Arcs
  - Telescope Focus

The screenshot shows the SpectroGraph Detector GUI with the following components:

- Header:** Logos for Cerro Tololo, SOAR, and the University of Arizona. Status indicators for Temperature, Telescope, Lamps, Detector Controller, and Headers are shown as green bars. A red "DETECTORS OFF" button and "TS 4.1" are also present.
- Temperatures:** A table showing temperatures for SPECIMOU (284.13), SVMOUNT (284.52), BH2 (283.68), and NECK (281.61).
- Telemetry:** A red-bordered box containing a table of mount and observation parameters:
 

Mount RA	Universal Time	Epoch
07:07:40.797	21:43:03.228	2000
Mount Dec	Date	Zenith Distance
-30:04:29.944	2020-04-24	ZD
Hour Angle	Air Mass	Focus
00:05:56.424	1.00	-1080.82
Sidereal Time	Seeing	Rotation angle
07:13:37.221	-1	253.1
- Observation Controls:** Includes fields for # Exp Done (0), Dark Time (0.00), Pause Time (0.00), Exposure Time (0.00 to 1.20), Readout, and Write/Proc. Controller State is IDLE, and Image State is DISABLE.
- File Management:** Fields for ast Filename, Path (/home/simager/images), Basename (basename), and Seq. Num (0).
- Observation Type:** Object selected, with fields for Observation Title, Comments, # Exp. (1), and ExpTime (sec) (0.00100).
- Buttons:** Start, Pause, Stop, Abort, and Display ...



# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
  - Telemetry
  - **Setup**
  - Readout
  - Observations
    - Object
    - Flats
    - Arcs
  - Telescope Focus

The screenshot shows the SpectroGraph Detector interface. At the top, there are logos for Cerro Tololo, SOAR, and the University of Arizona, along with a status bar indicating 'DETECTORS OFF' and 'TS 4.1'. The interface is divided into several sections:

- Temperatures:** A table showing temperatures for SPECIMOU (284.13), SVMOUNT (284.52), BH2 (283.68), and NECK (281.61).
- Mount Information:** Fields for Mount RA (07:07:40.797), Universal Time (21:43:03.228), Epoch (2000), Mount Dec (-30:04:29.944), Date (2020-04-24), Zenith Distance (ZD), Hour Angle (00:05:56.424), Air Mass (1.00), Focus (-1080.82), Sidereal Time (07:13:37.221), Seeing (-1), and Rotation angle (253.1).
- Observation Parameters:** Fields for CLM Pos (OUT), Inst. Pos. Angle (0.000), and a 'Clear' button.
- Observer and Proposal:** Fields for Observer and Proposal (Proposal), with a 'Setup' label and arrows pointing to these fields.
- Object and Observation Title:** A dropdown menu for Object and a text field for Observation Title (Object).
- Comments and Exposure Settings:** A text field for Comments, and fields for # Exp. (1) and ExpTime (sec) (0.00100).
- File and Path Information:** Fields for ast Filename (\_none\_), Path (/home/simager/images), Basename (basename), and Seq. Num (0).
- Control Buttons:** A 'Start' button, a 'Pause' button, a 'Stop' button, and an 'Abort' button.
- Footer:** A 'Select PI' dropdown, a 'Display ...' button, and a 'scripts undef' field with an 'exec' button.



# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
  - Telemetry
  - Setup
  - Readout
  - Observations
    - Object
    - Flats
    - Arcs
  - Telescope Focus

The screenshot shows the SpectroGraph Detector GUI with the following sections:

- Header:** CERRO TOLOLO, SOAR TELESCOPE, and UNIVERSITY OF ARIZONA logos. Status: DETECTORS OFF, TS 4.1. Indicators for Temperature, Telescope, Lamps, Detector Controller, and Headers are shown as green bars. An EXIT button is present.
- Temperatures:** A table with columns for SPECIMOU, SVMOUNT, BH2, and NECK, each with a value and a green/red indicator bar.
- Mount RA, Dec, Angle, etc.:** Fields for Mount RA (07:07:40.797), Universal Time (21:43:03.228), Epoch (2000), Mount Dec (-30:04:29.944), Date (2020-04-24), Zenith Distance (ZD), Hour Angle (00:05:56.424), Air Mass (1.00), Focus (-1080.82), Sidereal Time (07:13:37.221), Seeing (-1), and Rotation angle (253.1).
- Readout:** A red arrow points to the Readout section, which includes a progress bar for # Exp Done (0/100), Dark Time (0.00), Pause Time (0.00), Exposure Time (0.00/1.20), and a Readout/Write/Proc progress bar.
- Controller State:** IDLE and DISABLE buttons.
- File Management:** Fields for Path (/home/simager/images), Basename (basename), and Seq. Num (0).
- Observation Type:** Object dropdown, Observation Title (Object), and Comments fields.
- Exp. Control:** # Exp. (1) and ExpTime (sec) (0.00100) fields.
- Buttons:** Start, Pause, Stop, and Abort buttons.
- Footer:** Select PI, Display ... button, scripts undef, and an exec button.



# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
  - Telemetry
  - Setup
  - Readout
  - **Observations**
    - Object
    - Flats
    - Arcs
  - Telescope Focus

The screenshot shows the SpectroGraph Detector GUI. At the top, there are logos for Cerro Tololo, SOAR, and the University of Arizona, along with a status bar indicating 'DETECTORS OFF' and 'TS 4.1'. Below this, there are several panels:
 

- Temperatures:** A table showing temperatures for SPECIMOU (284.13), SVMOUNT (284.52), BH2 (283.68), and NECK (281.61).
- Mount RA/Dec/Time/Date/Epoch/Date/Zenith Distance/Hour Angle/Air Mass/Focus/Sidereal Time/Seeing/Rotation angle:** A grid of input fields for telescope parameters.
- CLM Pos/Inst.Pos.Angle:** Fields for camera position and angle.
- Observer/Proposal/under:** Fields for user and proposal information.
- Observation Type/under:** A dropdown menu for observation type.
- Observation Title (Object):** A text field for the object name.
- Comments:** A text area for notes.
- # Exp. / ExpTime (sec):** Input fields for the number of exposures and exposure time.
- Start/Pause/Stop/Abort:** Control buttons for the observation process.

 A red box highlights the 'Observations' dialog box, which is currently open and displays the word 'Observations' in red text. The background of the slide features a starry sky with the Milky Way and silhouettes of telescope domes.



# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
  - Telemetry
  - Setup
  - Readout
  - Observations
    - Object
    - Flats
    - Arcs
  - Telescope Focus

The screenshot shows the 'SpectroGraph Detector' application window. At the top, it displays logos for Cerro Tololo, SOAR, and the University of Texas at Austin, along with a status bar indicating 'DETECTORS OFF' and 'TS 4.1'. The main interface is divided into several sections:

- Temperatures:** A table showing temperatures for SPECIMOU (284.13), SVMOUNT (284.52), BH2 (283.68), and NECK (281.61).
- Mount Information:** Fields for Mount RA (07:07:50.825), Universal Time (21:43:13.231), Epoch (2000), Mount Dec (-30:04:29.656), Date (2020-04-24), Zenith Distance (ZD), Hour Angle (00:05:56.427), Air Mass (1.00), Focus (-1080.82), Sidereal Time (07:13:47.252), Seeing (-1), and Rotation angle (253.1).
- Observation Type:** A dropdown menu with options: Object (checked), Dflat, and Calibration.
- Control Panel:** Includes buttons for Start, Pause, Stop, and Abort.
- File Management:** Fields for Basename (basename) and Seq. Num (0).
- System Status:** A red 'EXIT' button and a 'CONTROLLER STATE' indicator showing 'IDLE' and 'IMAGE STATE' showing 'DISABLE'.





# TripleSpec 4.1 Startup



- SV VNC
- Main Application GUI
  - Status
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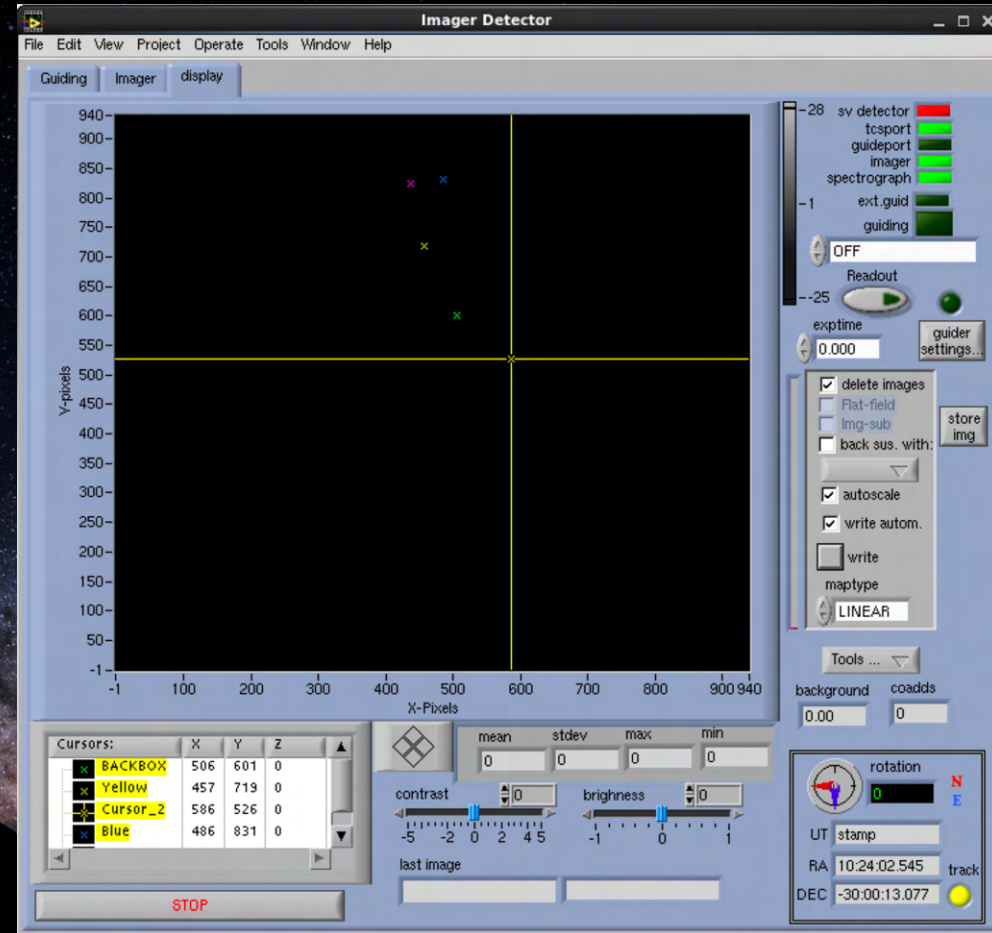




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
  - 4'x4' FOV
  - J band
  - Readout and Exp. Time
    - 0.75s – 20.0s
  - Display Orientation
  - Display Cursors

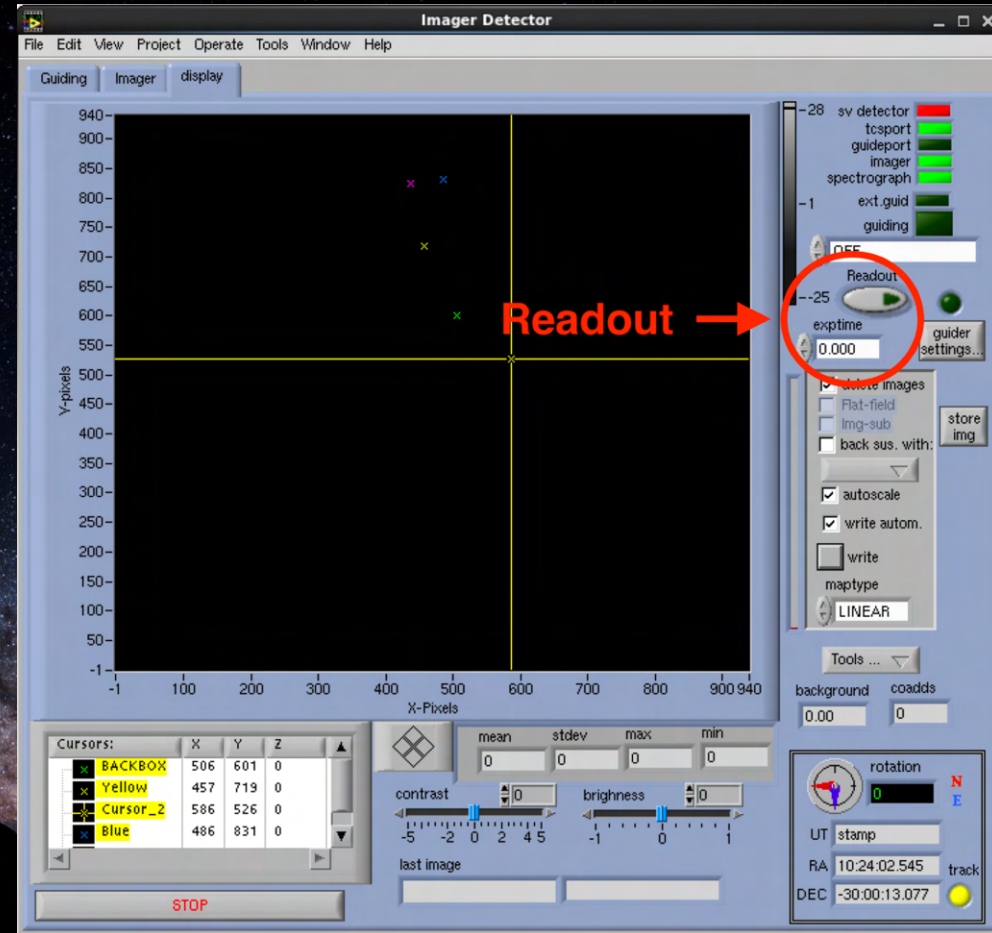




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
  - 4'x4' FOV
  - J band
  - **Readout and Exp. Time**
    - 0.75s – 20.0s
  - Display Orientation
  - Display Cursors

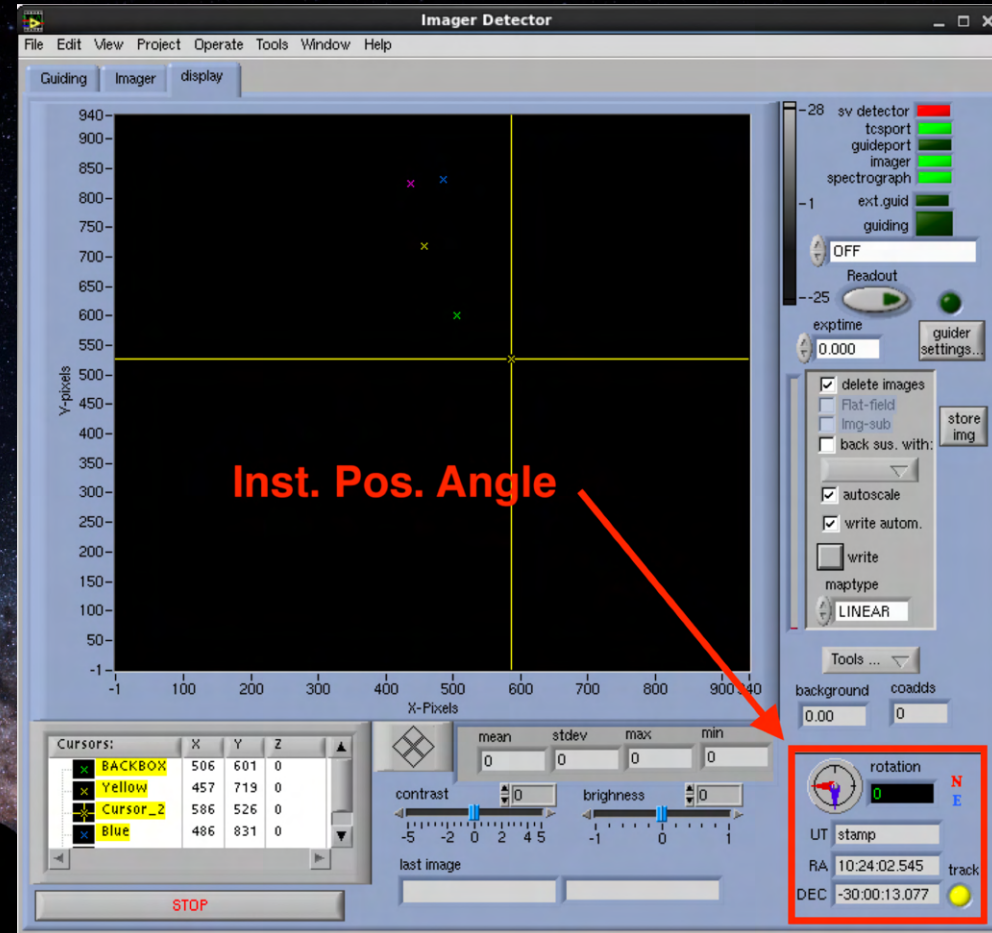




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
  - 4'x4' FOV
  - J band
  - Readout and Exp. Time
    - 0.75s – 20.0s
  - Display Orientation
  - Display Cursors

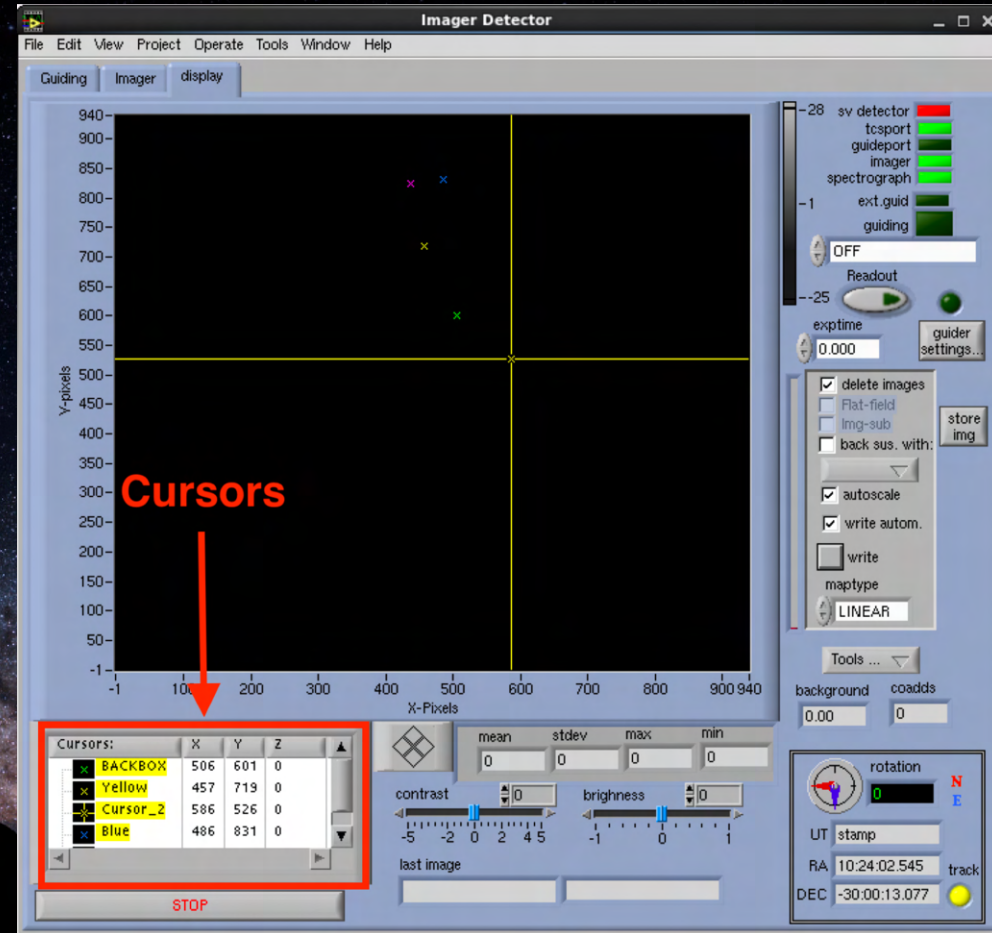




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
  - 4'x4' FOV
  - J band
  - Readout and Exp. Time
    - 0.75s – 20.0s
  - Display Orientation
  - **Display Cursors**

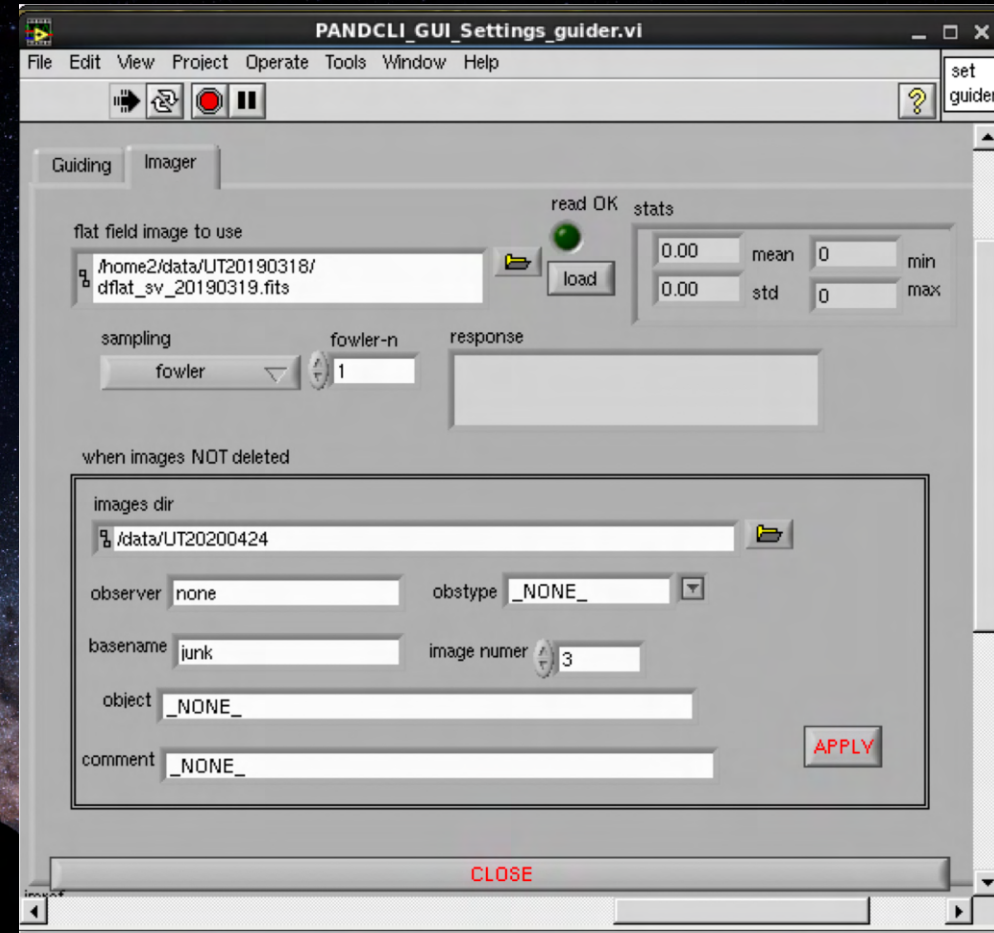




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- **Guider Settings**
  - Load SV flat-field
  - SV observations
  - Apply Flat

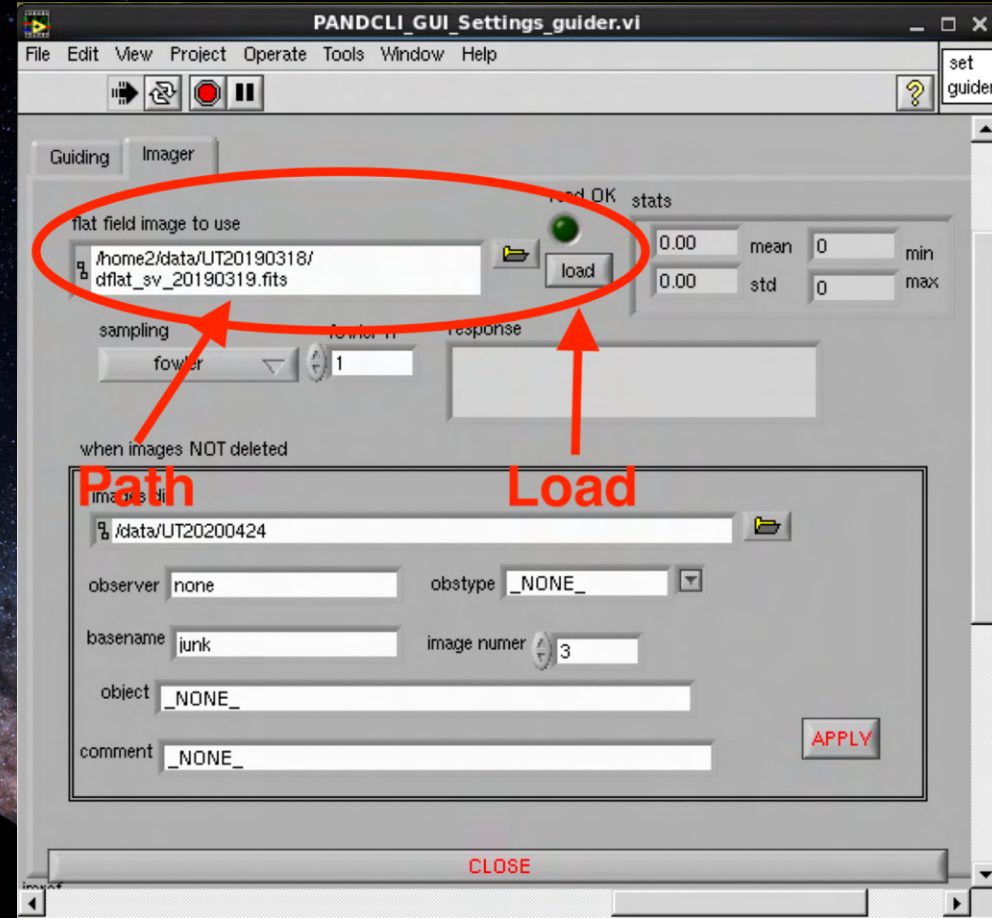




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Guider Settings
  - Load SV flat-field
  - SV observations
  - Apply Flat

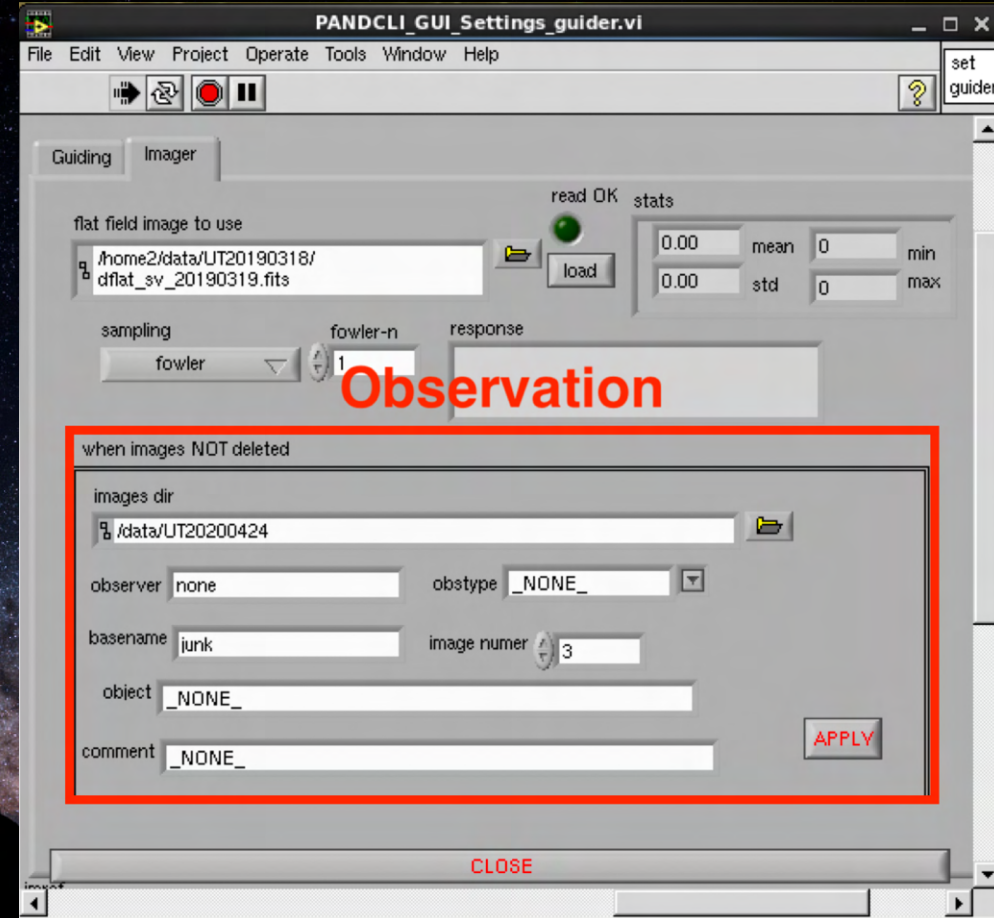




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Guider Settings
  - Load SV flat-field
  - **SV observations**
  - Apply Flat



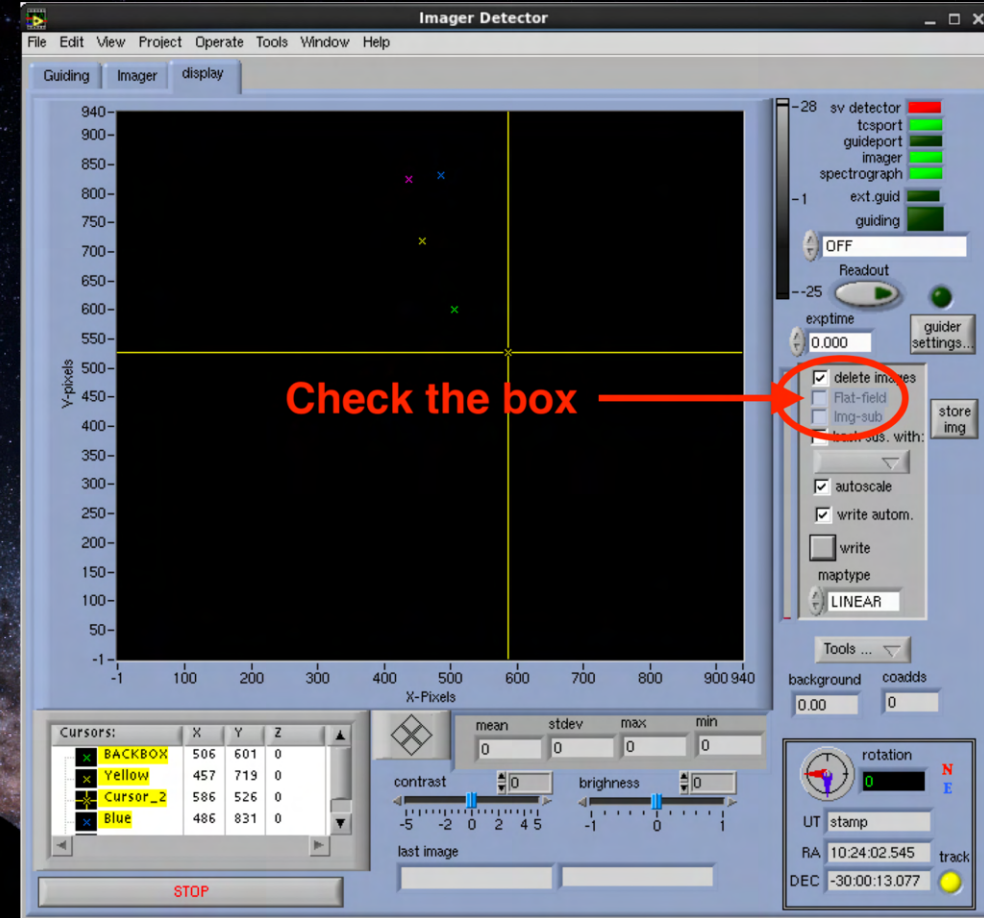




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Guider Settings
  - Load SV flat-field
  - SV observations
  - **Apply Flat**

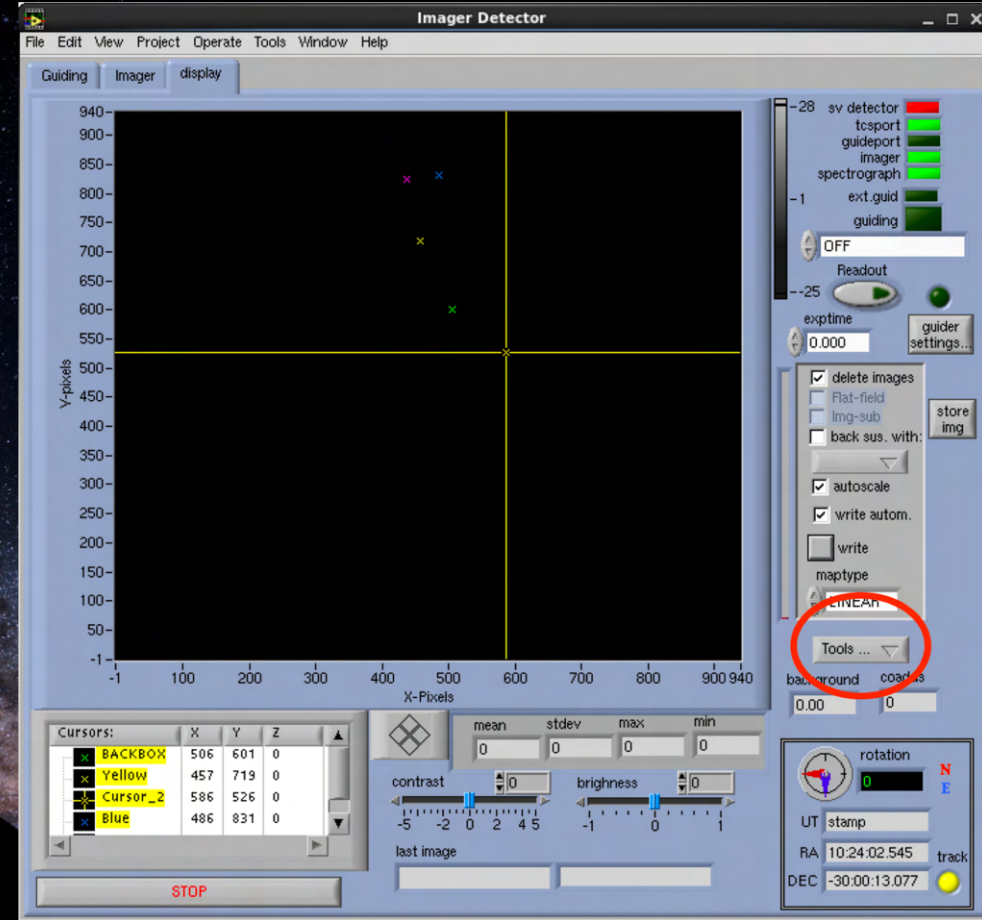




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - Grid
  - Offset
  - Zoom Windows
  - Zoom Guider

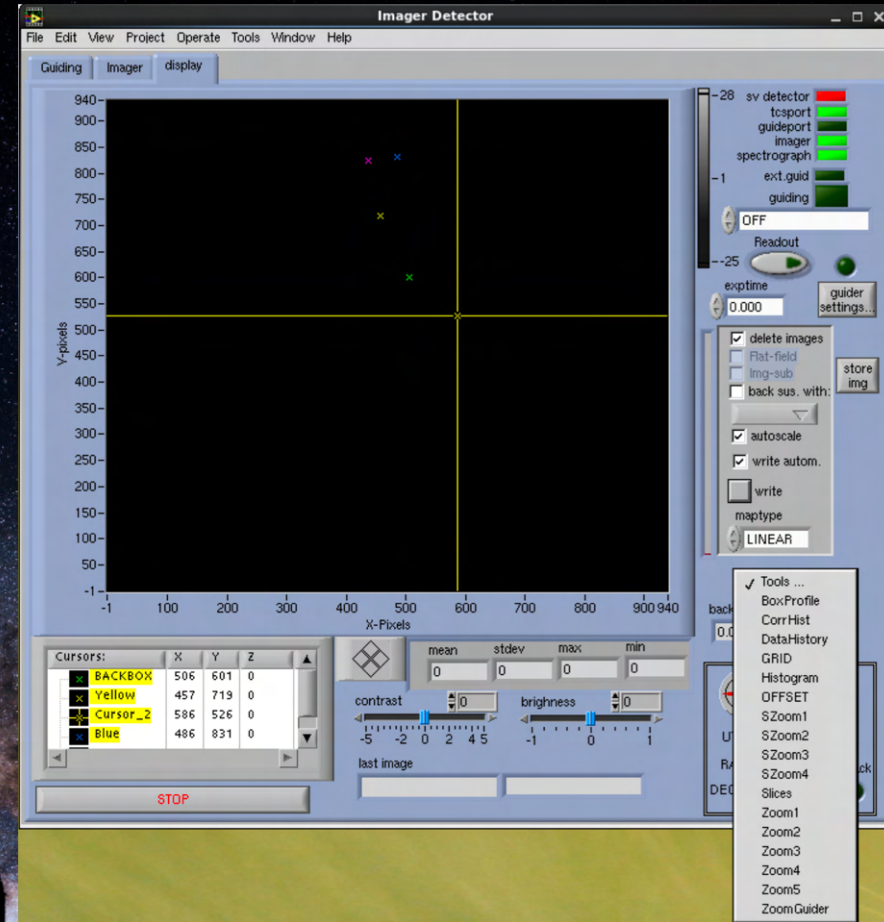




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- **Tools**
  - Box Profile
  - Grid
  - Offset
  - Zoom Windows
  - Zoom Guider

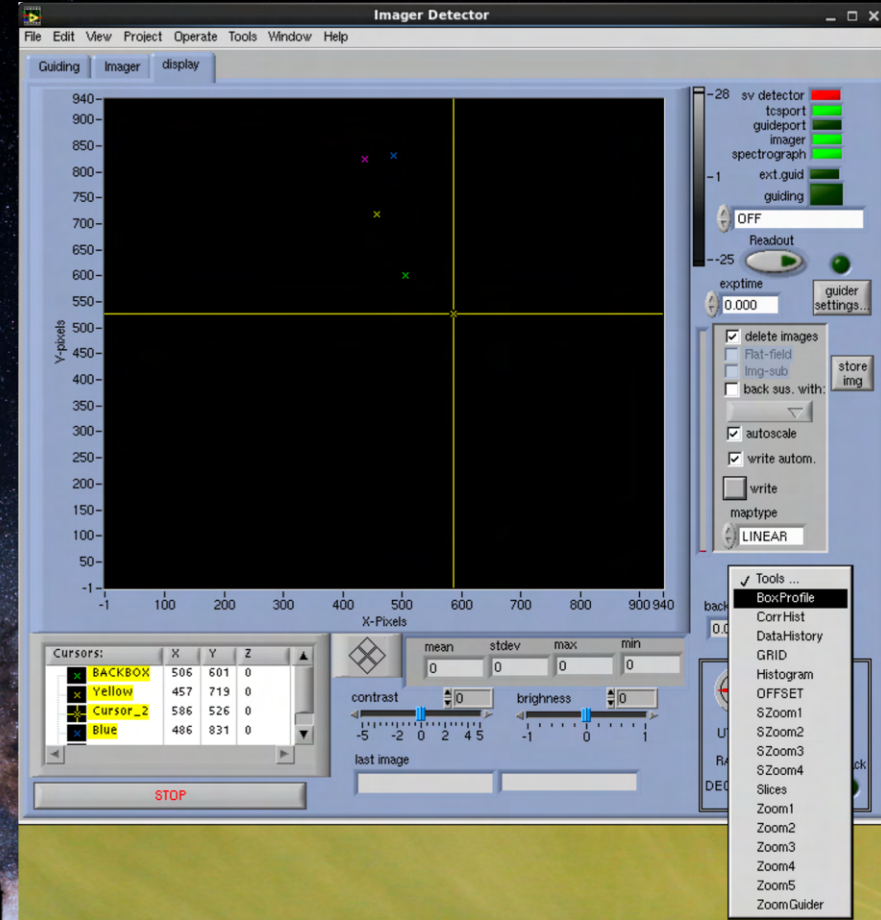




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - **Box Profile**
  - Grid
  - Offset
  - Zoom Windows
  - Zoom Guider

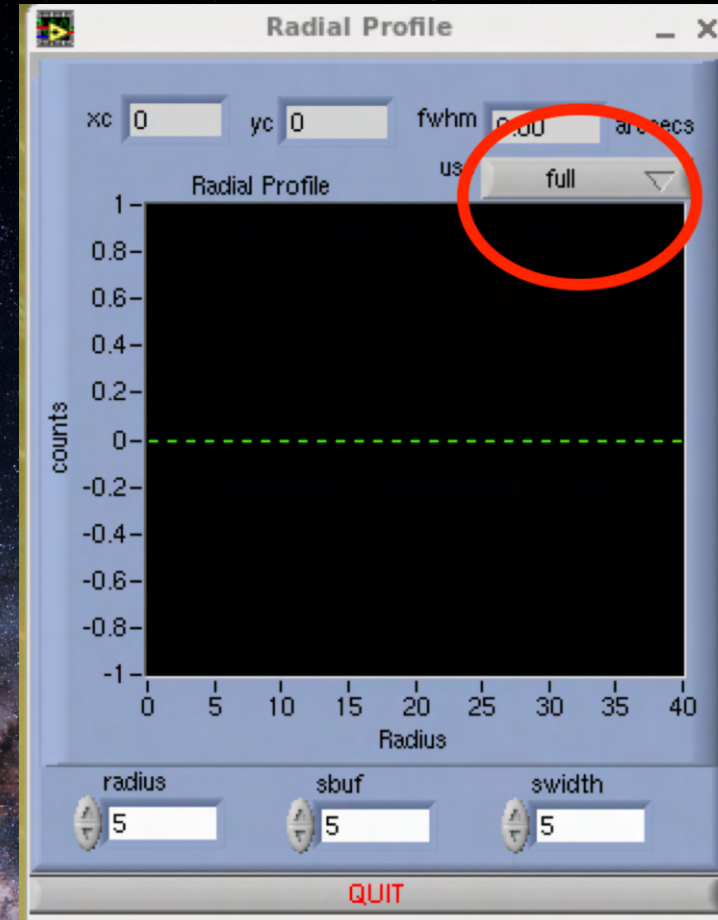




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - **Box Profile**
  - Grid
  - Offset
  - Zoom Windows
  - Zoom Guider

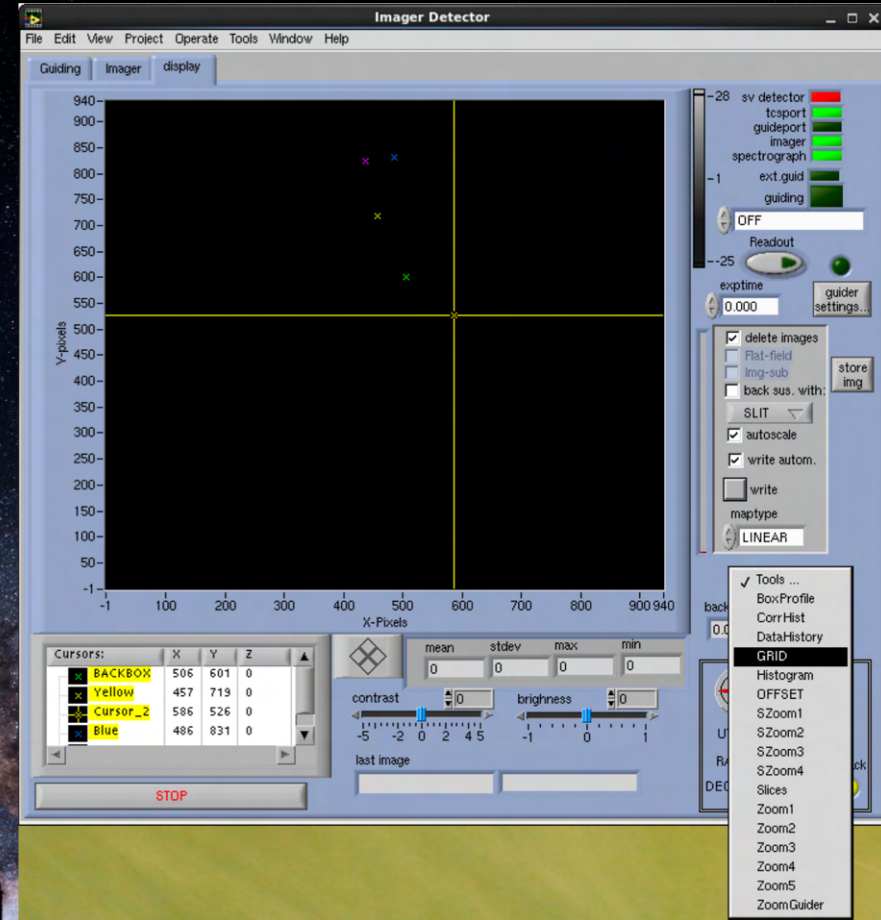




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - **Grid**
  - Offset
  - Zoom Windows
  - Zoom Guider

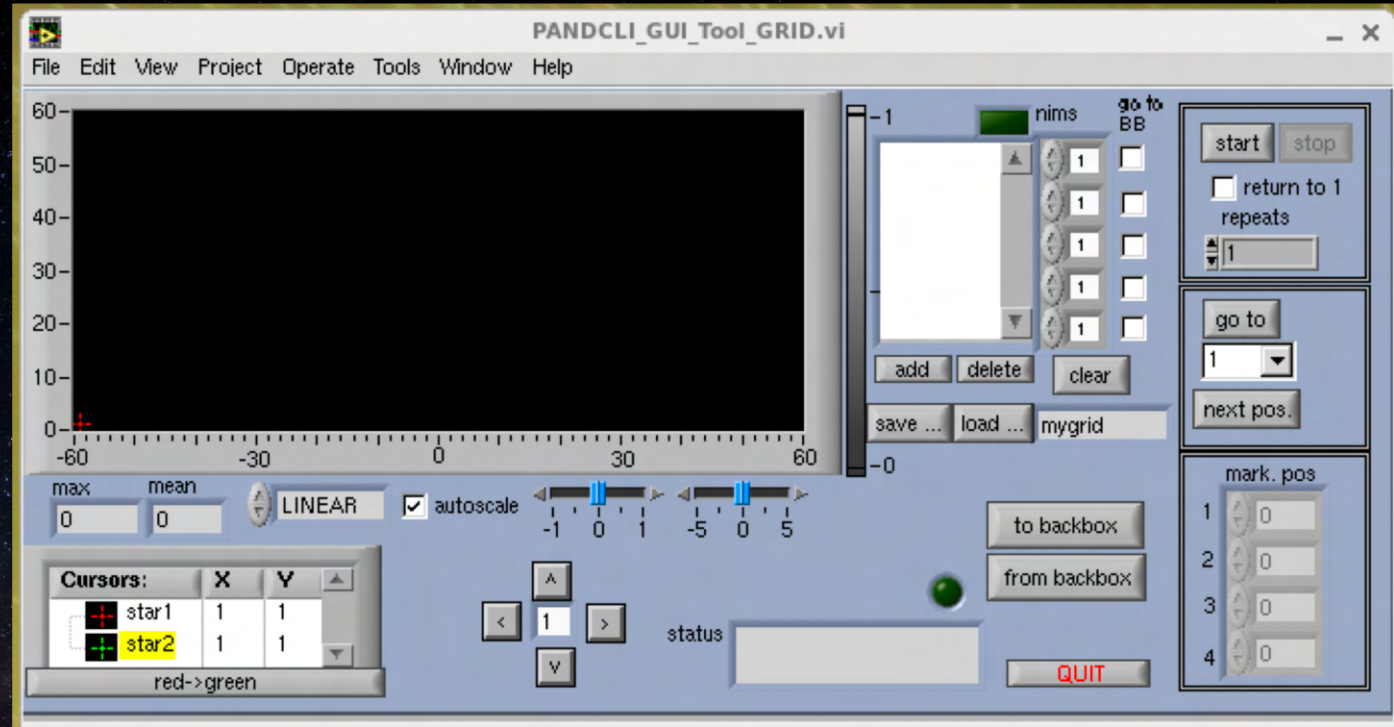




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - **Grid**
  - Offset
  - Zoom Windows
  - Zoom Guider

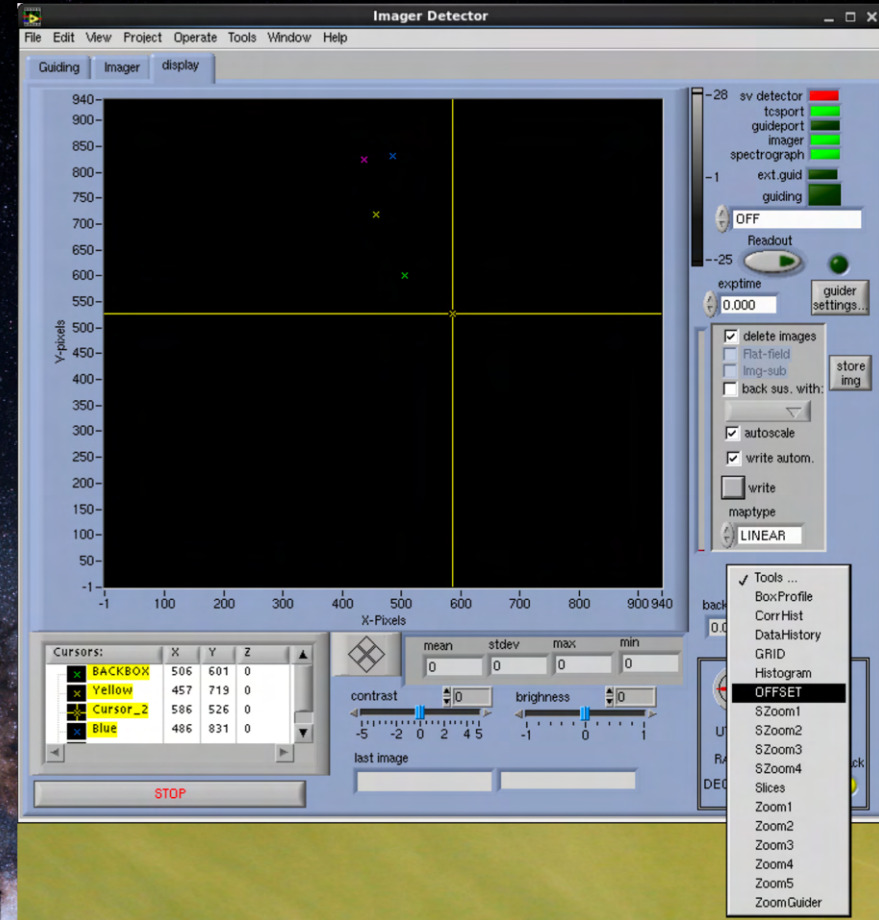




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - Grid
  - **Offset**
  - Zoom Windows
  - Zoom Guider



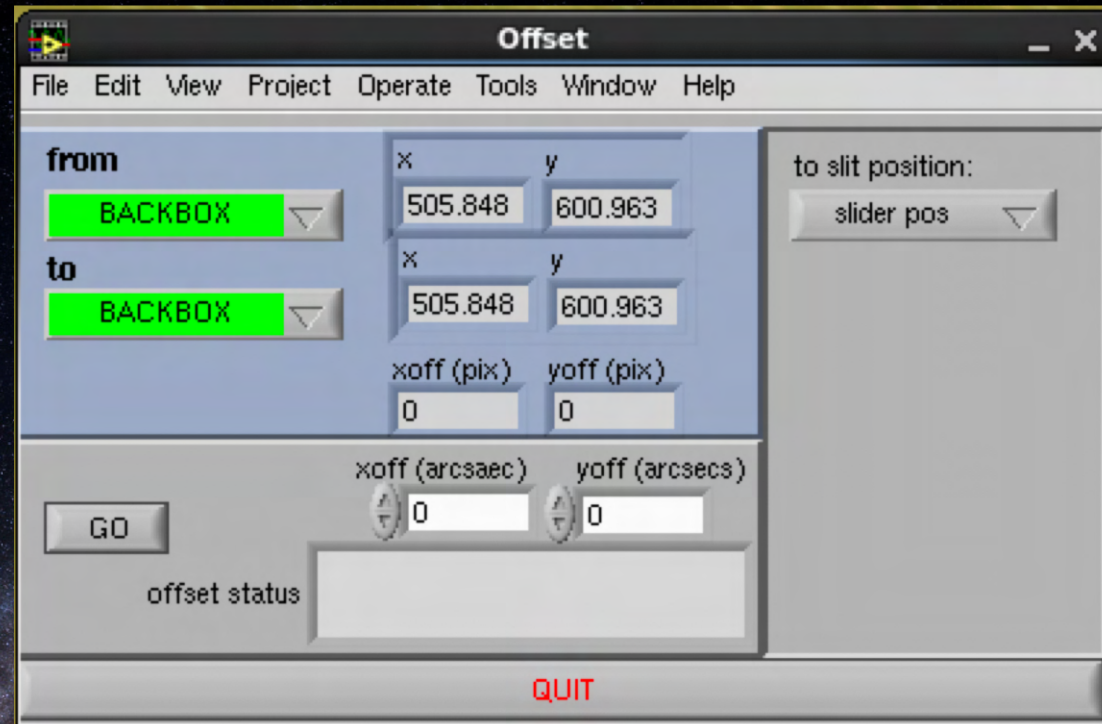




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - Grid
  - **Offset**
  - Zoom Windows
  - Zoom Guider

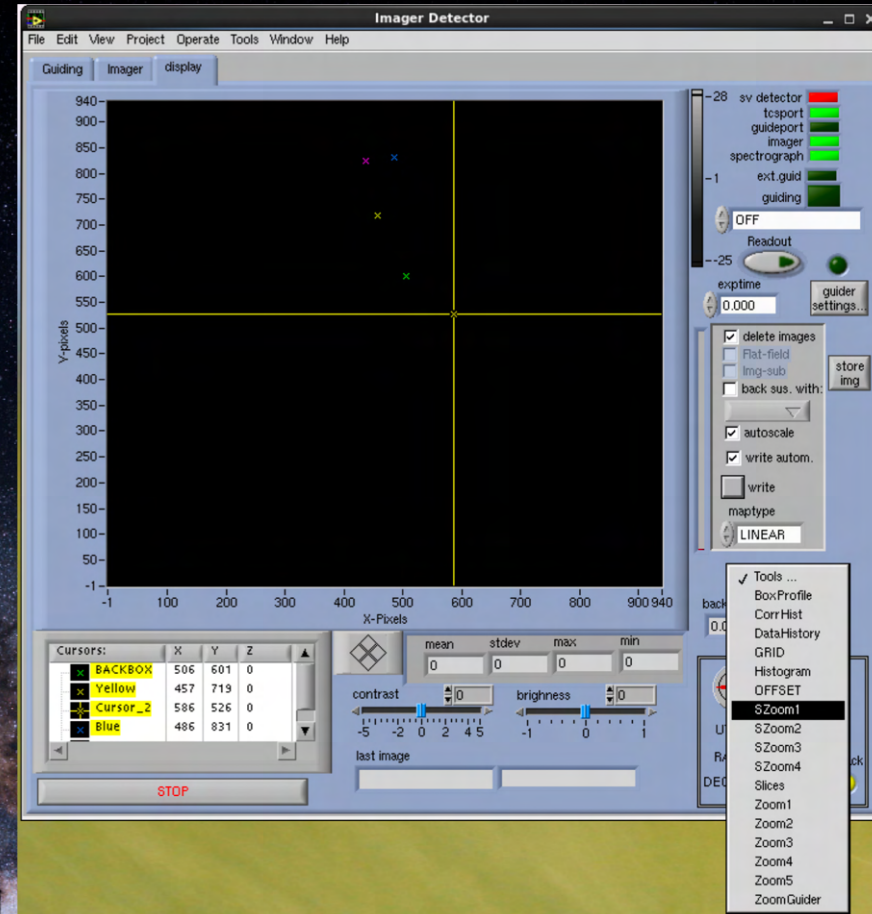




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - Grid
  - Offset
  - Zoom Windows
  - Zoom Guider

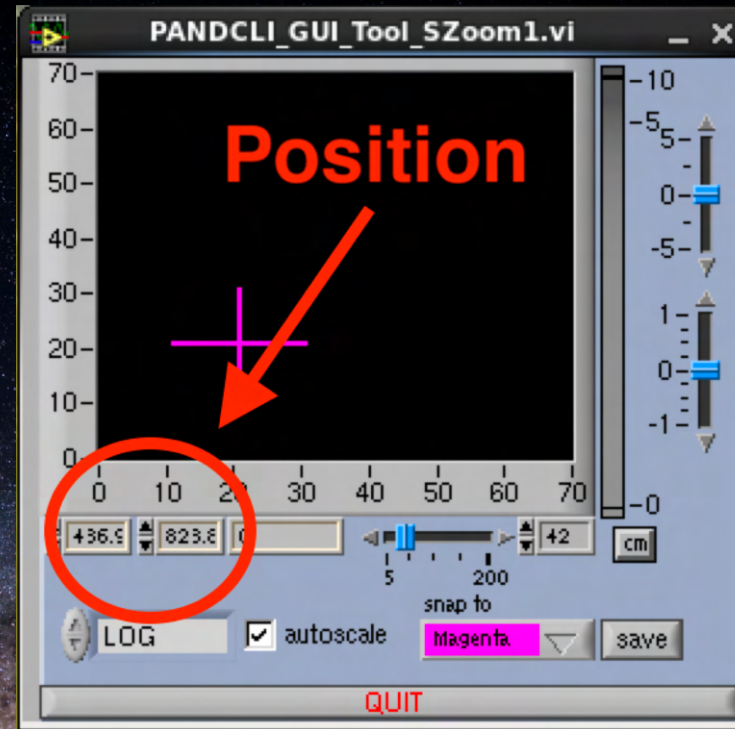




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - Grid
  - Offset
  - **Zoom Windows**
  - Zoom Guider

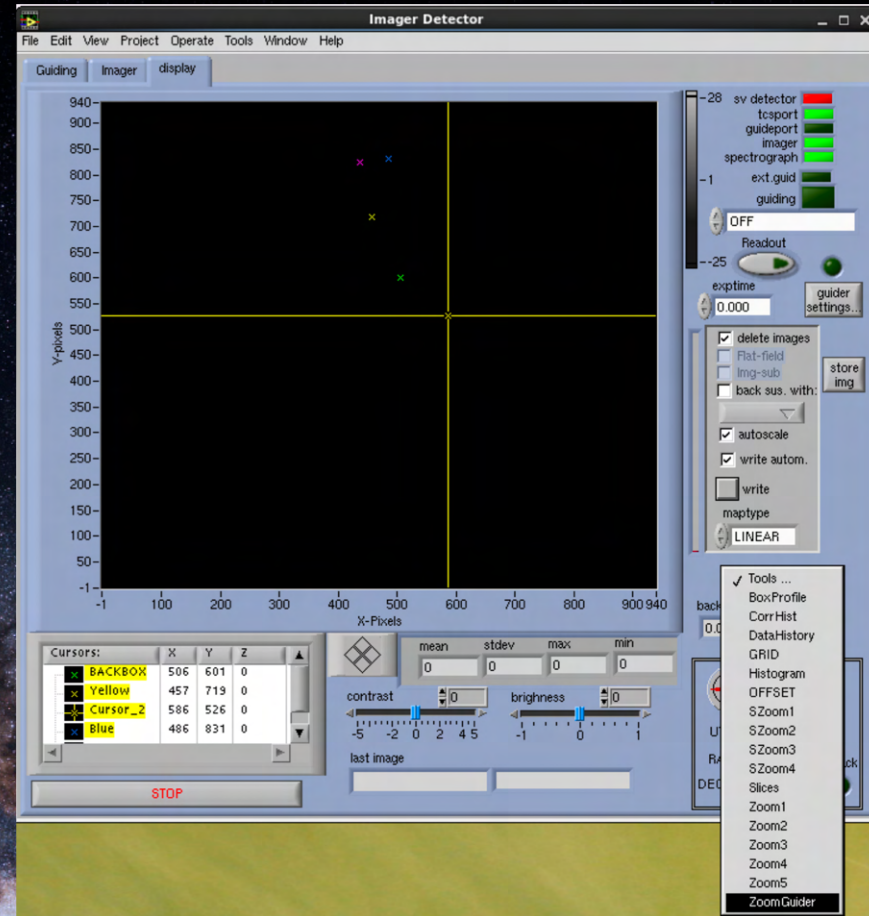




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - Grid
  - Offset
  - Zoom Windows
  - **Zoom Guider**

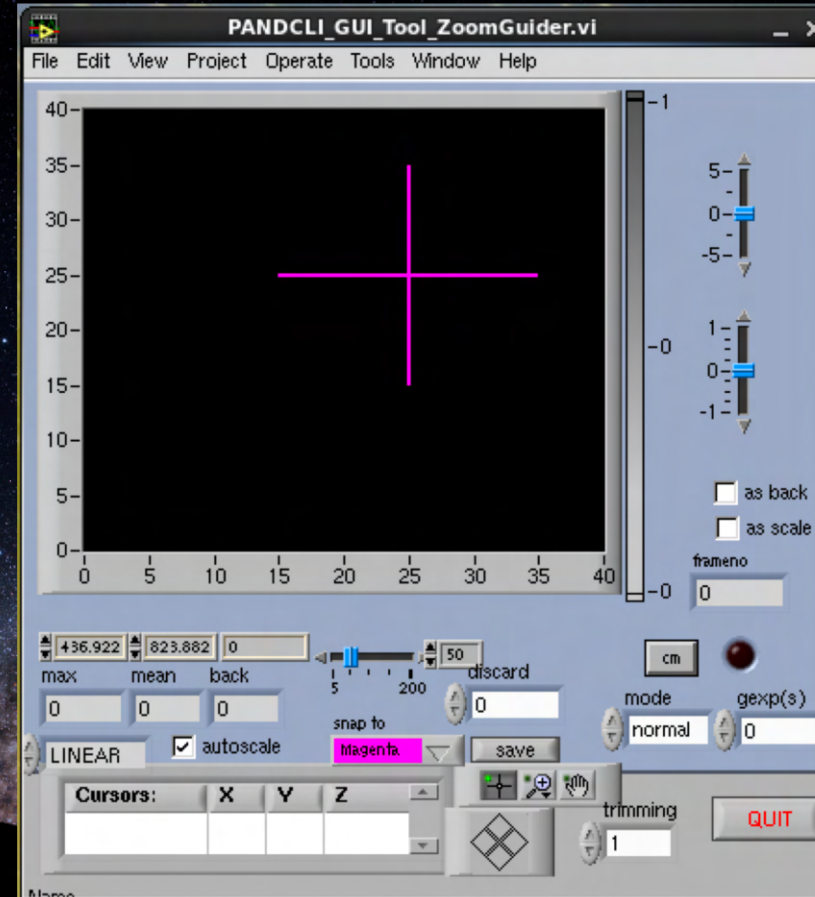




# TripleSpec 4.1 Startup



- SV VNC
- Image Detector
- Tools
  - Box Profile
  - Grid
  - Offset
  - Zoom Windows
  - **Zoom Guider**



# TripleSpec 4.1 Observations

Calibrations



# TripleSpec 4.1 Calibrations



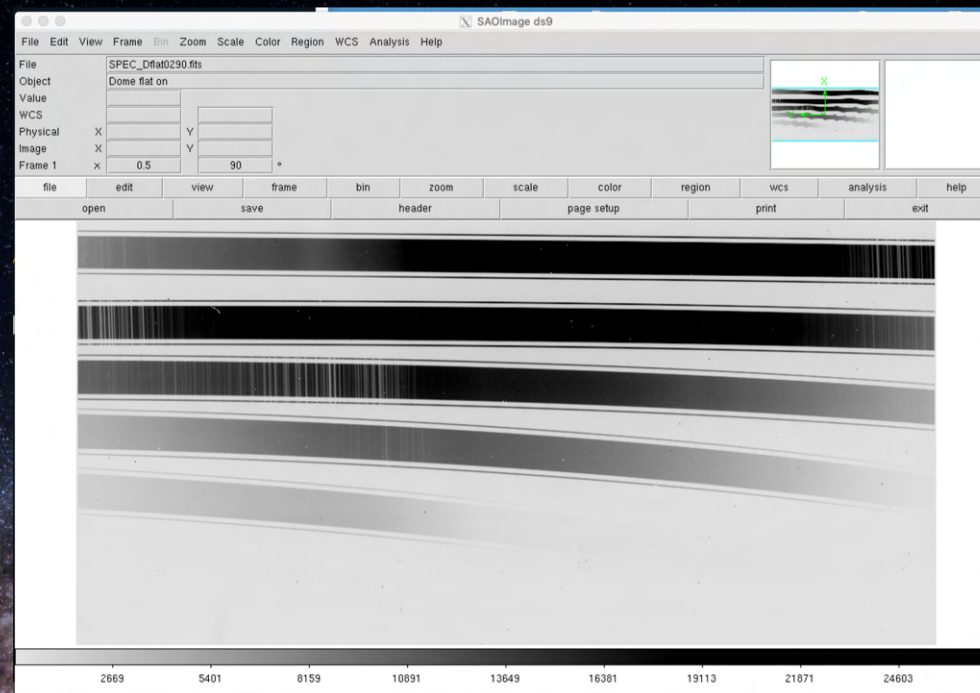
- Turn off SV detector
- Flats On
  - Obs. Type: Dflat
  - CLM Pos: OUT
  - Set Obs. Title
  - Exp. Time: 2s
  - Set # Exposures: 51
  - Set Filename: FLAT\_
  - Dome Lamps: 40%
- Flats Off
  - Same setup as Flats On
  - Dome Lamps: 0%
- Arc
  - Obs. Type: Calibration
  - CLM Pos: IN
  - Set Obs. Title
  - Lamp: Hollow Cathode
  - Exp. Time: 2s
  - Set Filename: ARC\_
  - 5 On
  - 5 Off



# TripleSpec 4.1 Calibrations



Dome Lamps On



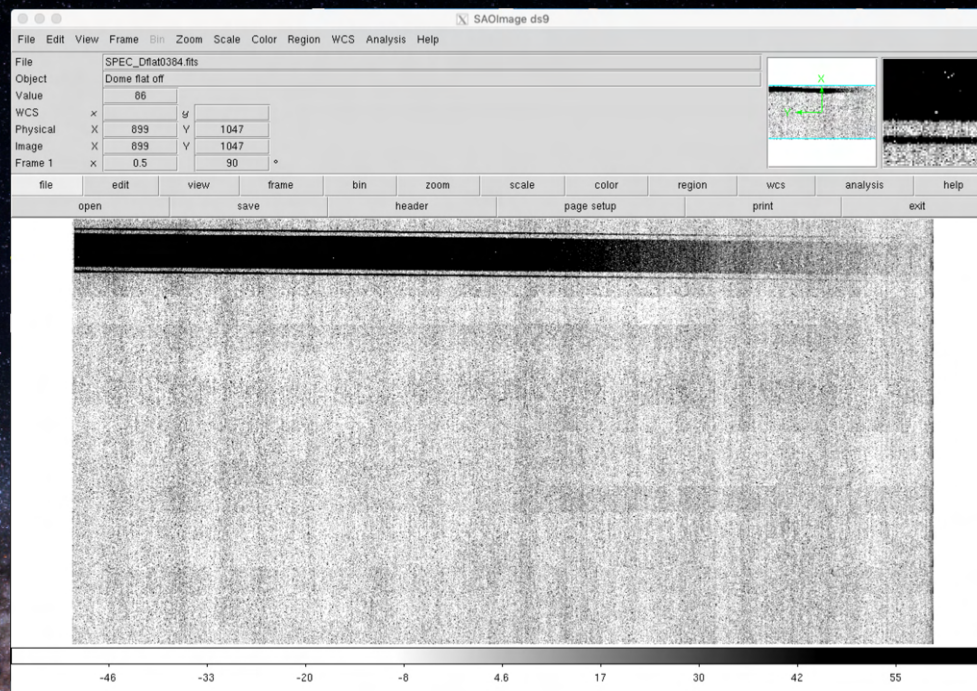




# TripleSpec 4.1 Calibrations



Dome Lamps Off

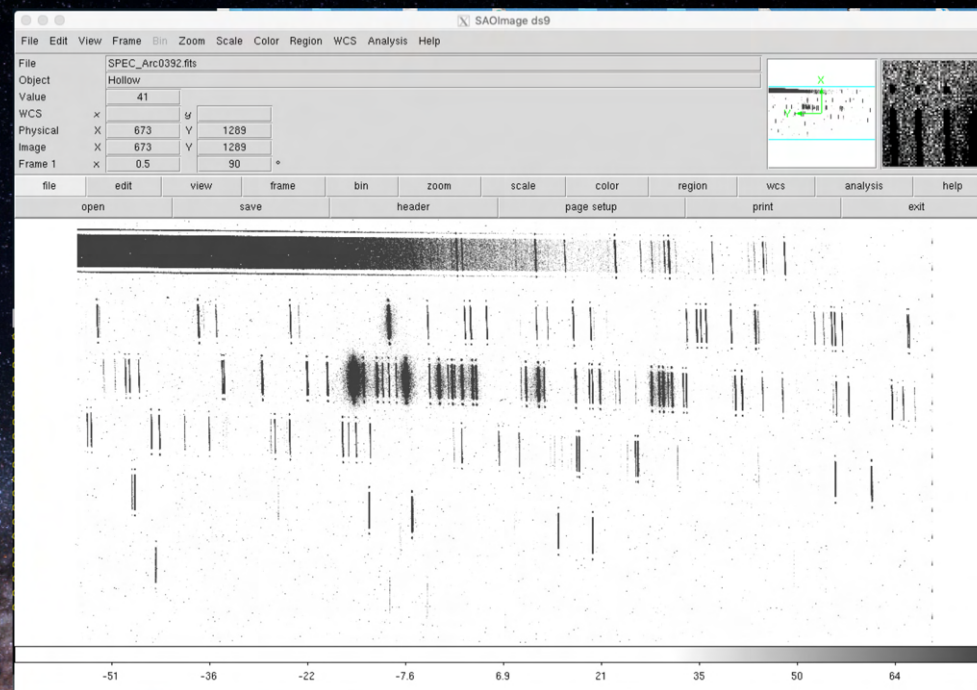




# TripleSpec 4.1 Calibrations



Arc Lamps On

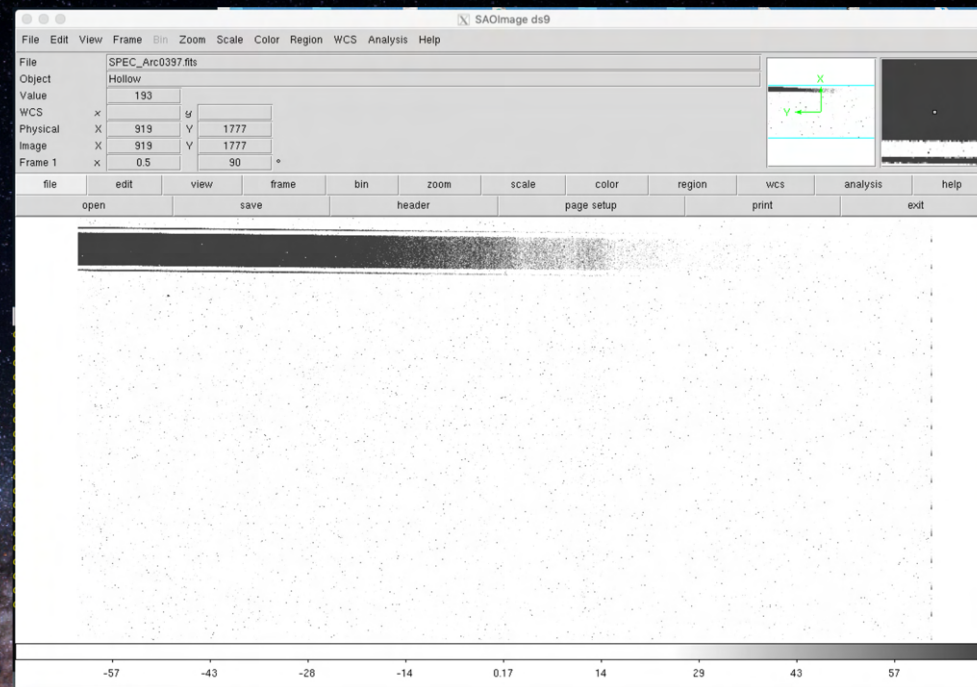




# TripleSpec 4.1 Calibrations



Arc Lamps Off





# TripleSpec 4.1 Observations

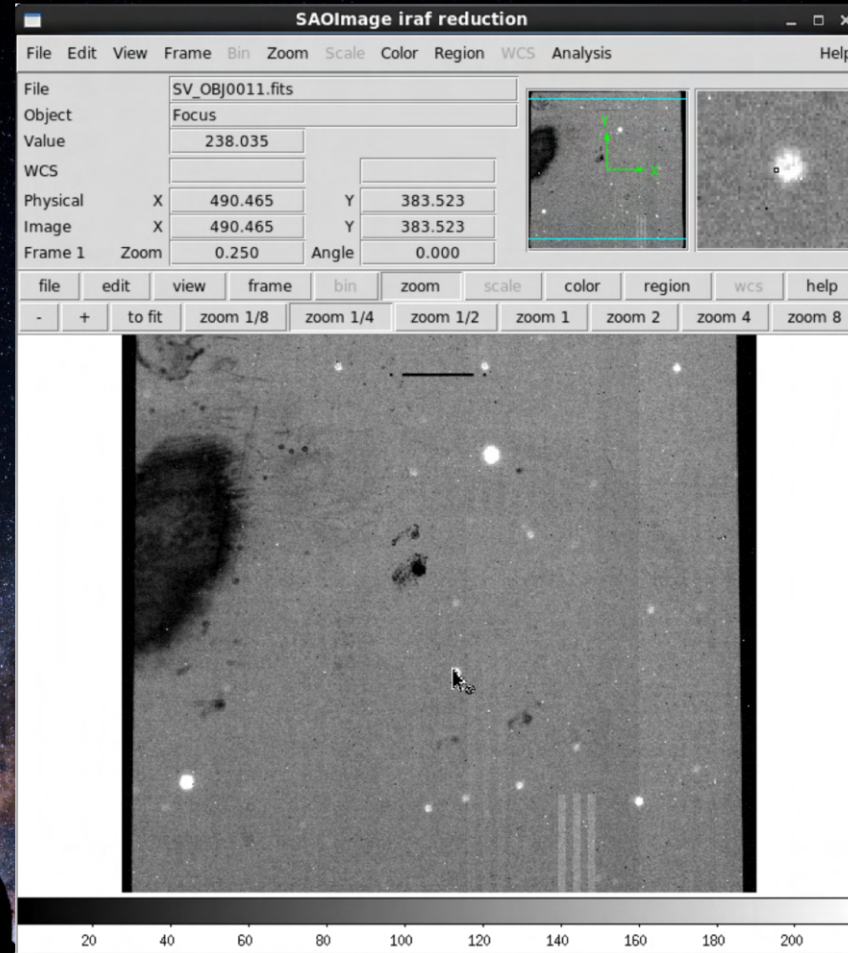
Telescope Focus



# TripleSpec 4.1 Tel. Focus



- **Move to field**
- Set SV Exp. Time:  $\geq 2s$
- Select Focus Wide Script
  - Set middle focus value
  - Click Exec to start
- In IRAF run ts4focus
  - Mark stars

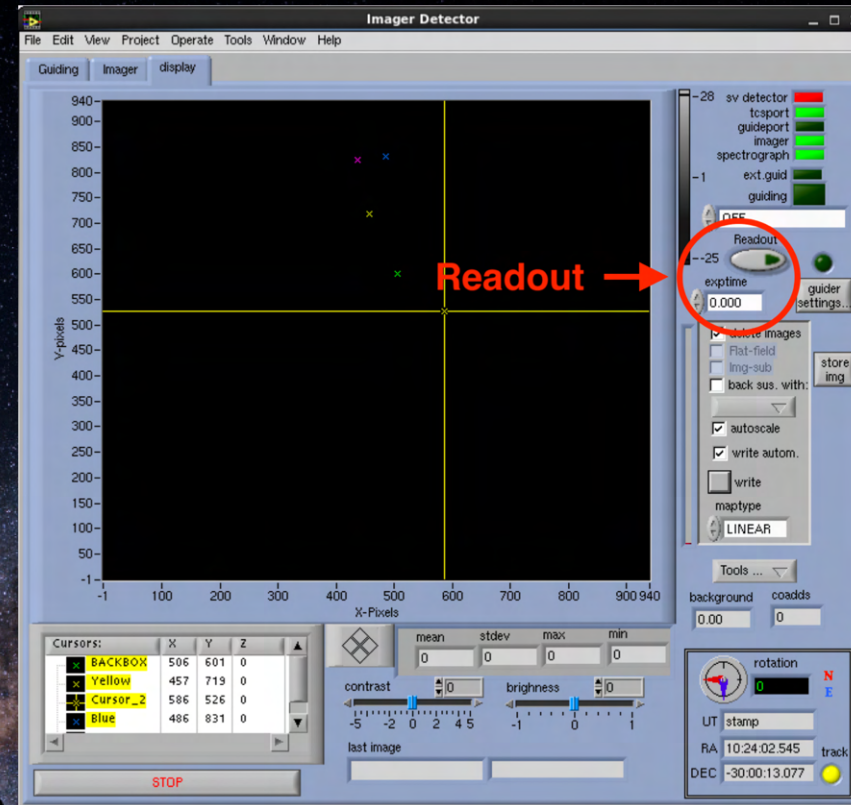




# TripleSpec 4.1 Tel. Focus



- Move to field
- **Set SV Exp. Time:  $\geq 2s$**
- Select Focus Wide Script
  - Set middle focus value
  - Click Exec to start
- In IRAF run ts4focus
  - Mark stars

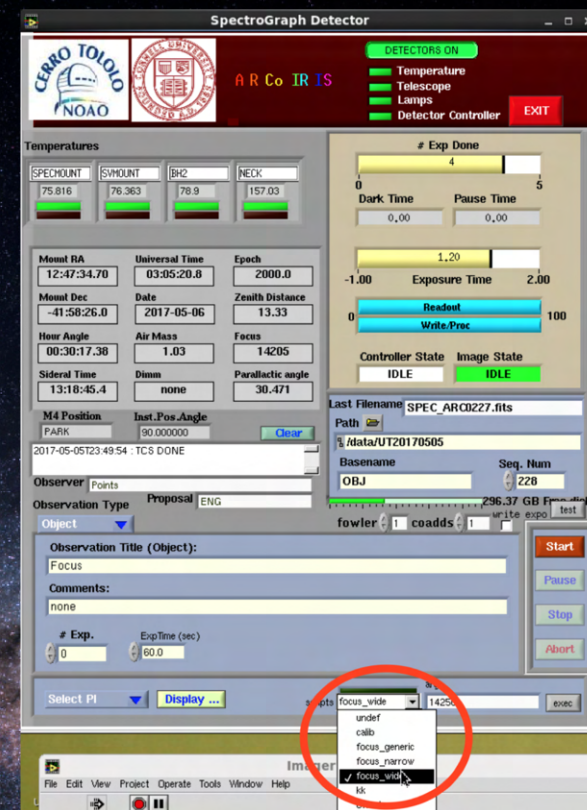




# TripleSpec 4.1 Tel. Focus



- Move to field
- Set SV Exp. Time:  $\geq 2s$
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# TripleSpec 4.1 Tel. Focus



- Move to field
- Set SV Exp. Time:  $\geq 2s$
- Select Focus Wide Script
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  - Click Exec to start
- In IRAF run ts4focus
  - Mark stars



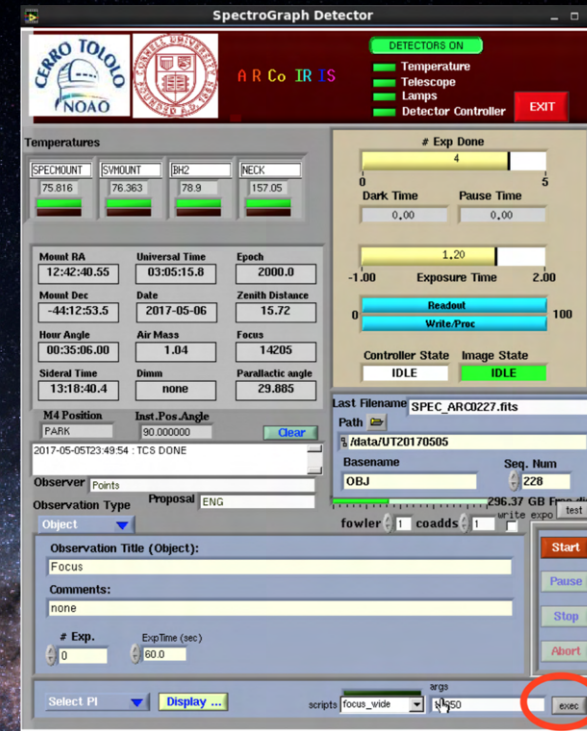




# TripleSpec 4.1 Tel. Focus



- Move to field
- Set SV Exp. Time:  $\geq 2s$
- Select Focus Wide Script
  - Set middle focus value
  - **Click Exec to start**
- In IRAF run ts4focus
  - Mark stars

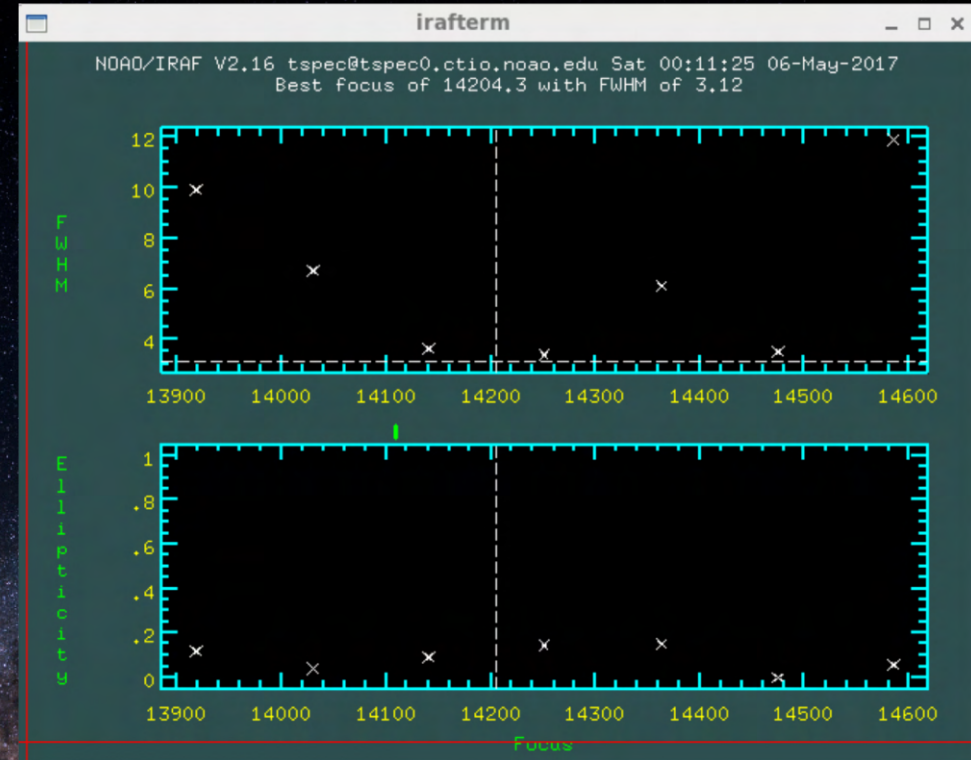




# TripleSpec 4.1 Tel. Focus



- Move to field
- Set SV Exp. Time:  $\geq 2s$
- Select Focus Wide Script
  - Set middle focus value
  - Click Exec to start
- In IRAF run **ts4focus**
  - **Mark stars**



# TripleSpec 4.1 Observations

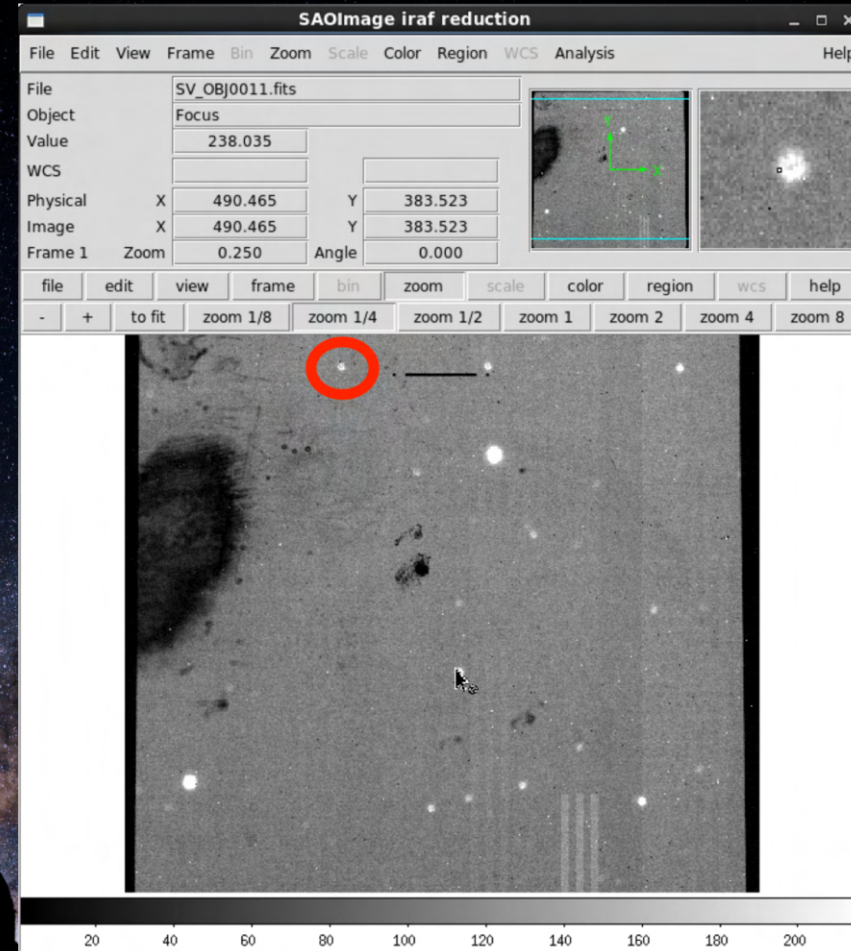
Acquisition



# TripleSpec 4.1 Acquisition



- Find target in field
- Move Cursor to Obj
  - Center Obj with CM
- Set Grid
  - Set ABBA pattern
  - Set # repeats
  - Return to Start

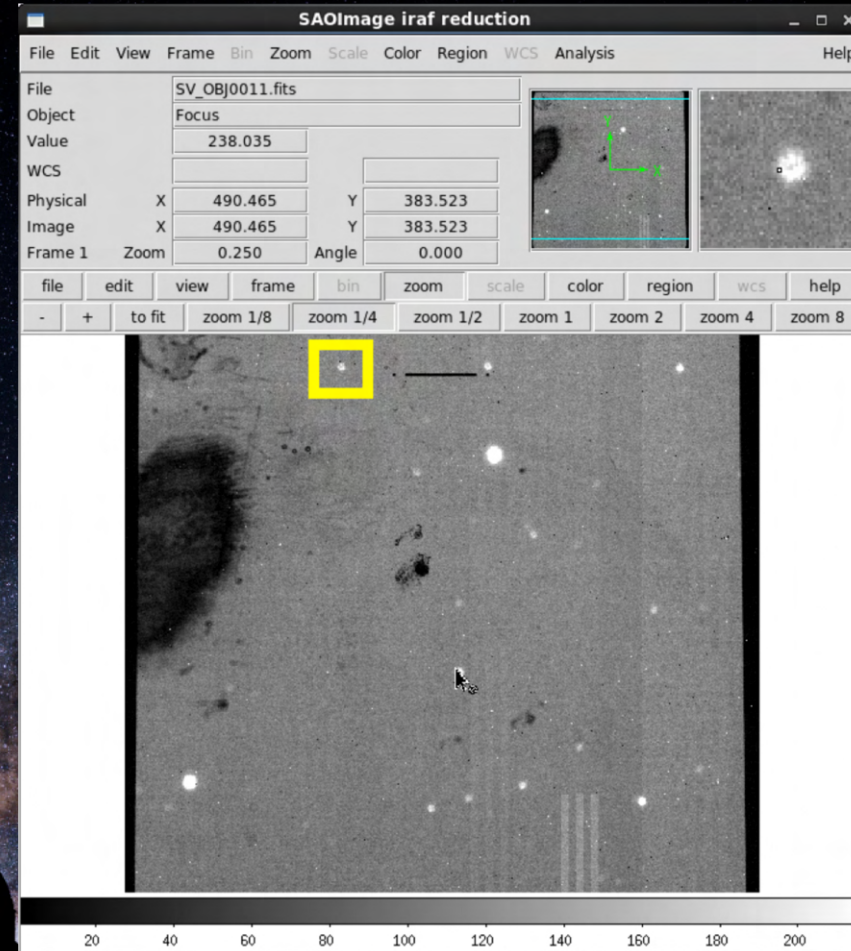




# TripleSpec 4.1 Acquisition



- Find target in field
- **Move Cursor to Obj**
  - Open Zoom for Cursor
  - Center Obj with CM
- Set Grid
  - Set ABBA pattern
  - Set # repeats
  - Return to Start

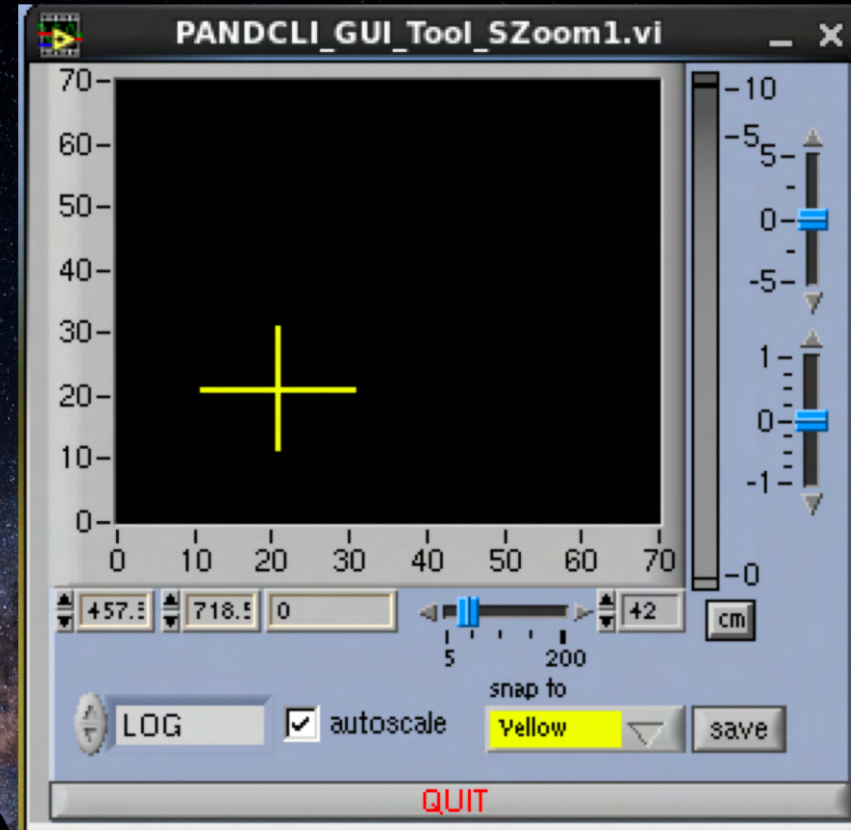




# TripleSpec 4.1 Acquisition



- Find target in field
- Move Cursor to Obj
  - **Open Zoom for Cursor**
  - Center Obj with CM
- Set Grid
  - Set ABBA pattern
  - Set # repeats
  - Return to Start

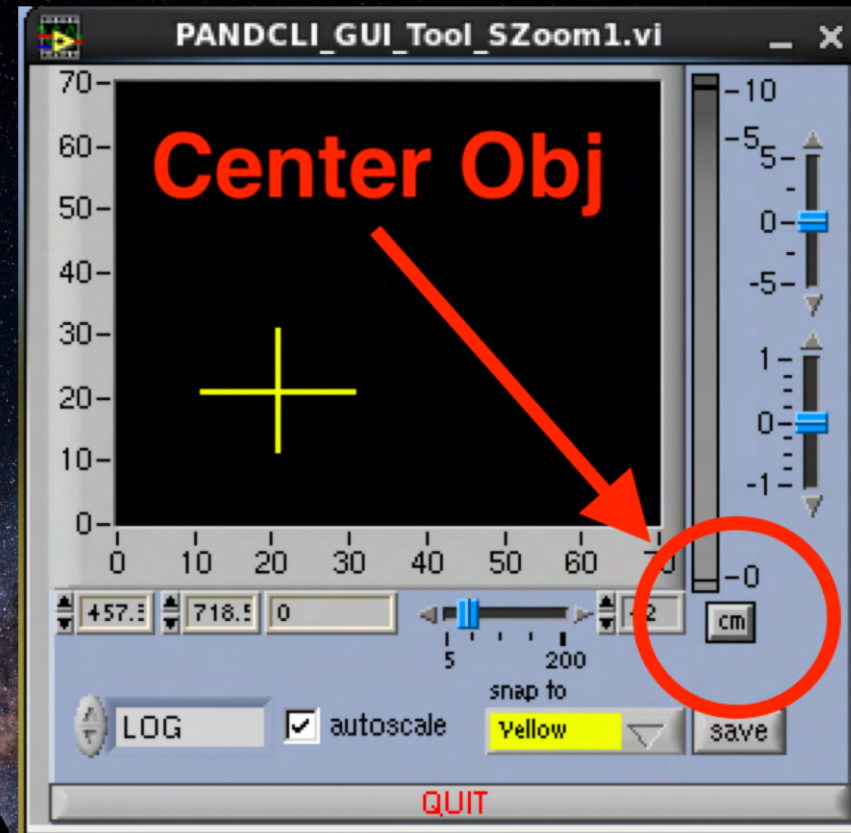




# TripleSpec 4.1 Acquisition



- Find target in field
- Move Cursor to Obj
  - Open Zoom for Cursor
  - **Center Obj with CM**
- Set Grid
  - Set ABBA pattern
  - Set # repeats
  - Return to Start





# TripleSpec 4.1 Acquisition



- Find target in field
- Move Cursor to Obj
  - Open Zoom for Cursor
  - Center Obj with CM
- **Set Grid**
  - Set ABBA pattern
  - Set # repeats
  - Return to Start



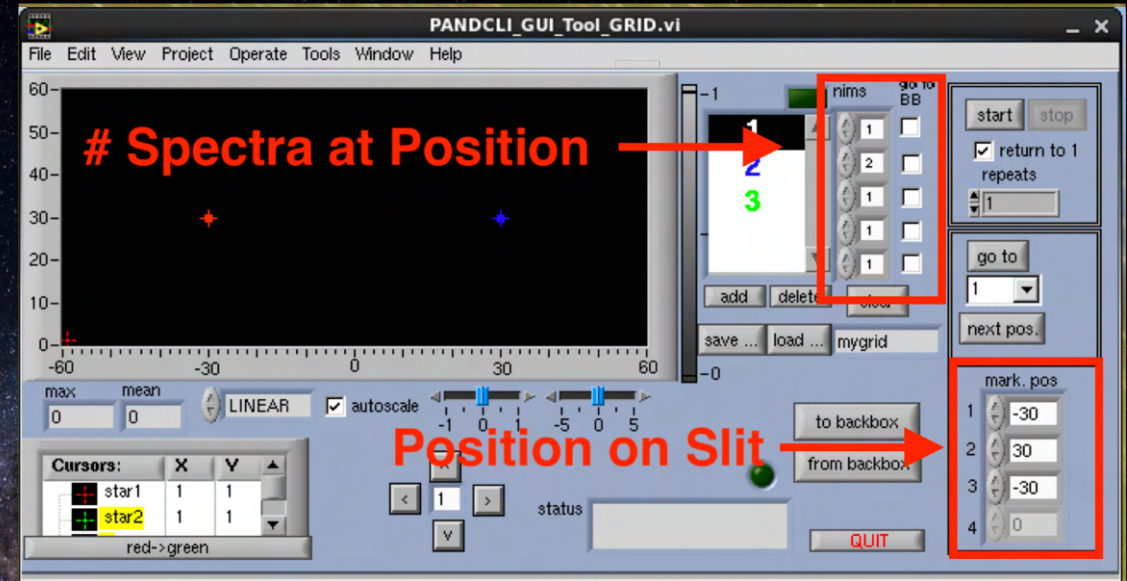




# TripleSpec 4.1 Acquisition



- Find target in field
- Move Cursor to Obj
  - Open Zoom for Cursor
  - Center Obj with CM
- Set Grid
  - **Set ABBA pattern**
  - Set # repeats
  - Return to Start

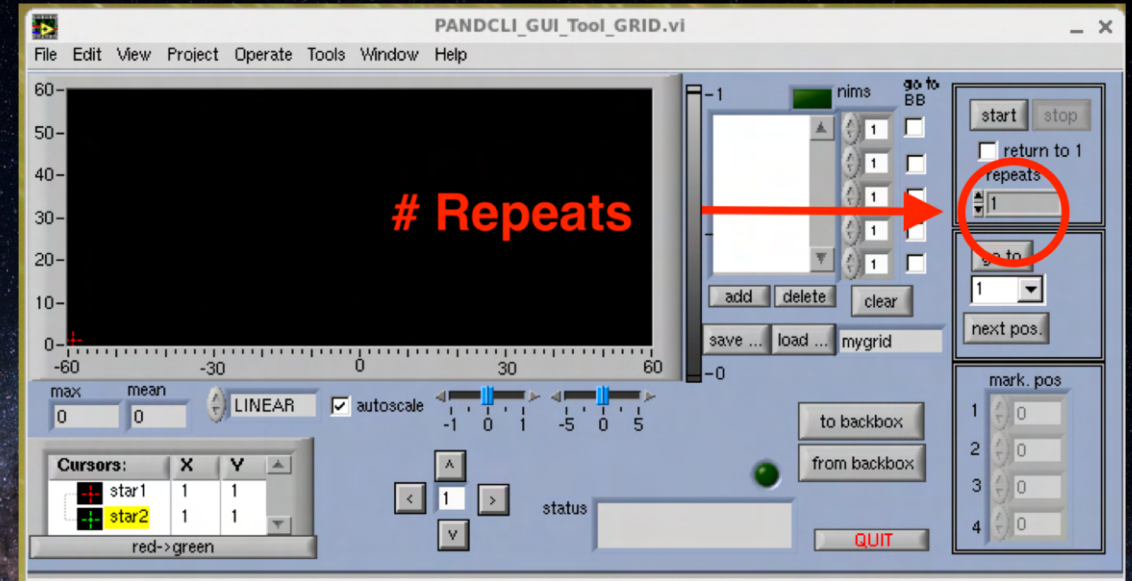




# TripleSpec 4.1 Acquisition



- Find target in field
- Move Cursor to Obj
  - Open Zoom for Cursor
  - Center Obj with CM
- Set Grid
  - Set ABBA pattern
  - **Set # repeats**
  - Return to Start





# TripleSpec 4.1 Acquisition



- Find target in field
- Move Cursor to Obj
  - Open Zoom for Cursor
  - Center Obj with CM
- Set Grid
  - Set ABBA pattern
  - Set # repeats
  - **Return to Start**

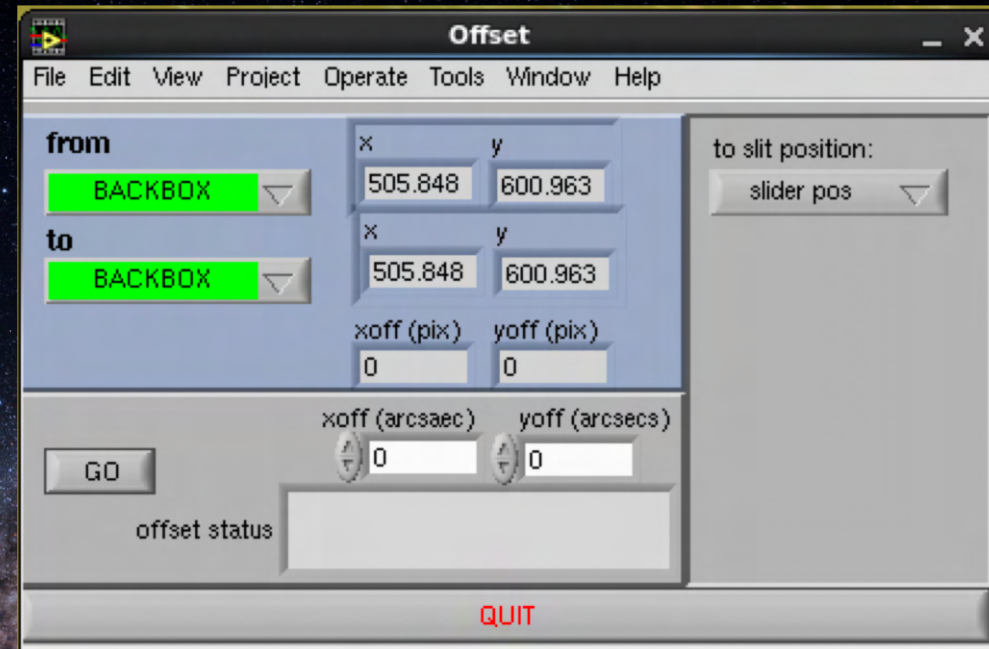




# TripleSpec 4.1 Acquisition



- **Perform Offset**
  - From Box
  - To Slit
  - Position of 1st A
  - Fine adjustment

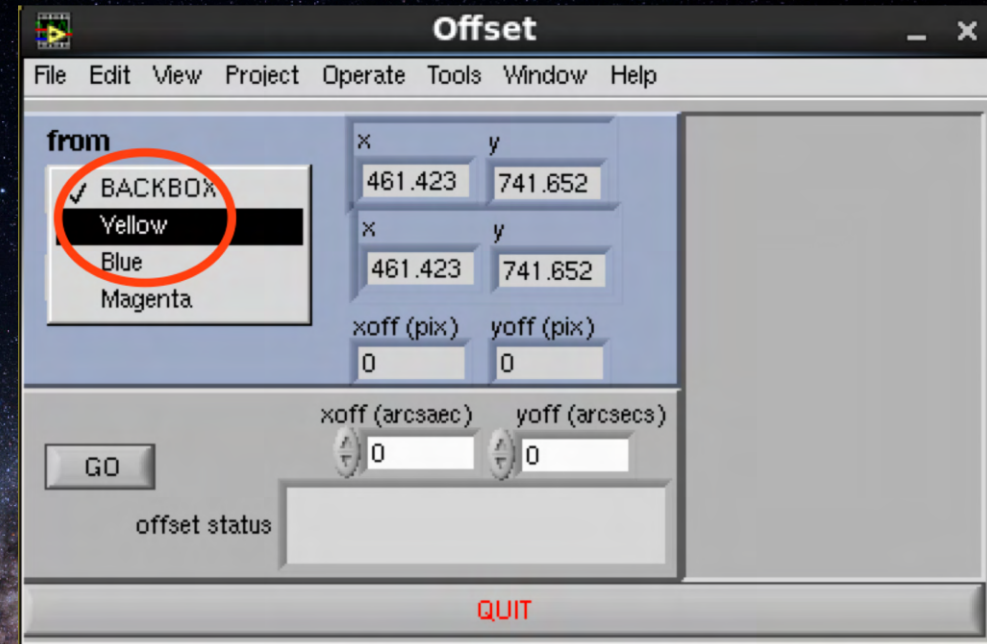




# TripleSpec 4.1 Acquisition



- Perform Offset
  - From Box
  - To Slit
  - Position at 1st A
  - Fine adjustment

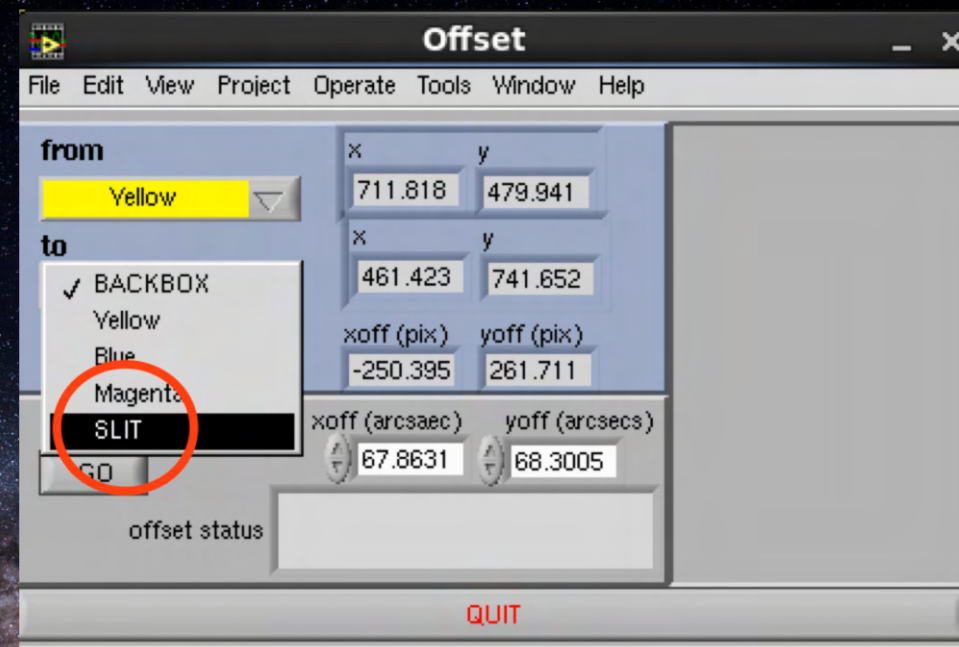




# TripleSpec 4.1 Acquisition



- Perform Offset
  - From Box
  - **To Slit**
  - Position at 1st A
  - Fine adjustment

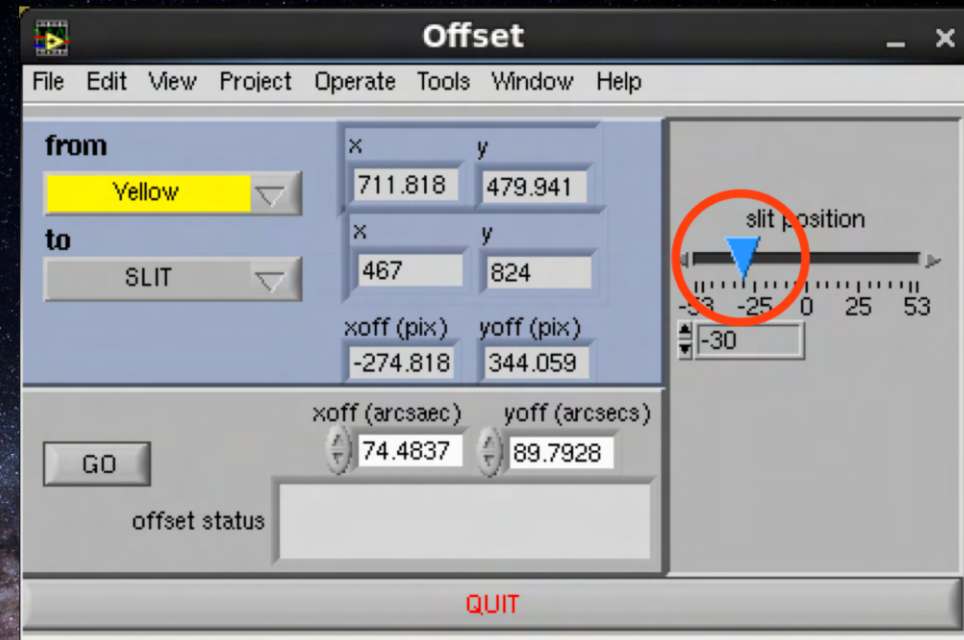




# TripleSpec 4.1 Acquisition



- Perform Offset
  - From Box
  - To Slit
  - **Position at 1st A**
  - Fine adjustment

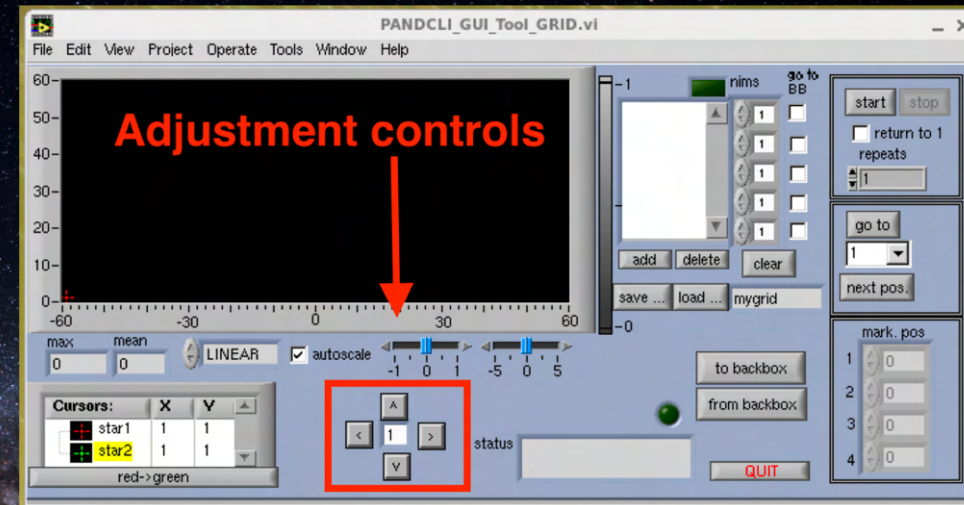




# TripleSpec 4.1 Acquisition



- Perform Offset
  - From Box
  - To Slit
  - Position at 1st A
  - **Fine adjustment**





# TripleSpec 4.1 Observations

Spectra



# TripleSpec 4.1 Spectra



- Set Obs Info in Main App
  - Object Name
  - Exp. Time
  - Filename
  - Coadds
  - Fowler Sample

The screenshot shows the SpectroGraph Detector interface with the following fields and annotations:

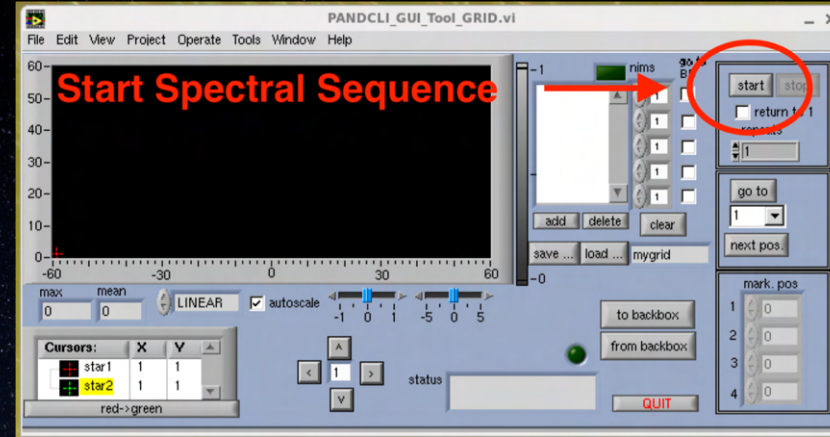
- Filename:** An arrow points from the red text "Filename" to the "Observer" field, which contains "Proposal".
- Fowler:** An arrow points from the red text "Fowler" to the "Object" field, which contains "fowler".
- Object:** An arrow points from the red text "Object" to the "Object Title (Object):" field, which is empty.
- # Coadds:** An arrow points from the red text "# Coadds" to the "# Coadds" field, which contains "1".
- Exp Time:** An arrow points from the red text "Exp Time" to the "ExpTime (sec):" field, which contains "0.00100".



# TripleSpec 4.1 Spectra



- Start Obs Sequence

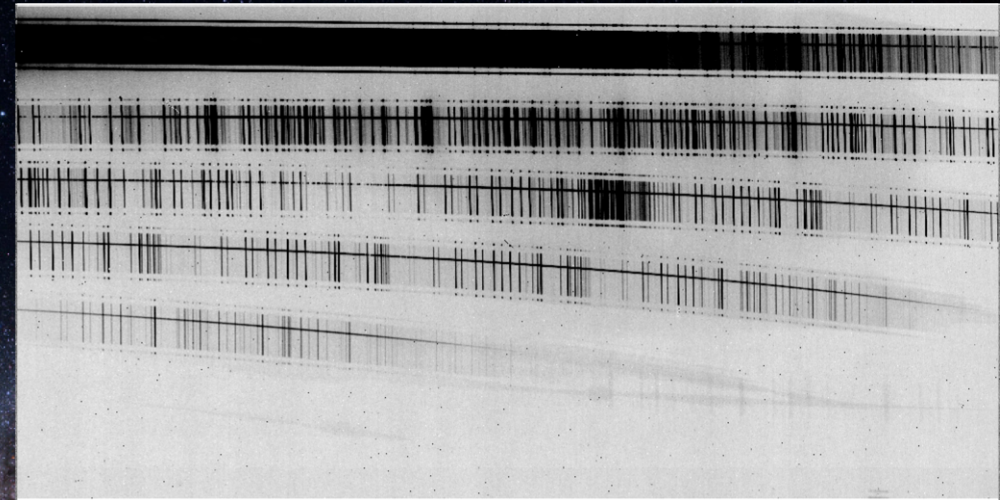




# TripleSpec 4.1 Spectra



- Take Calibrations
  - Arc lamps?
    - May not be necessary
    - Can use sky lines
  - Telluric Standard
    - Nearby A0V or G2V
    - Remove atmospheric absorption lines
    - [http://irtfweb.ifa.hawaii.edu/cgi-bin/spex/find\\_a0v.cgi](http://irtfweb.ifa.hawaii.edu/cgi-bin/spex/find_a0v.cgi)



# TripleSpec 4.1 Data Redx



# TripleSpec 4.1 Data Redx



- Runs on soardata2 (139.229.15.173)
- VNC access
- Data Reduction
- Find Data Dir
- Set Paths
- Start IDL
- Start xspextool

Terminal

```
Updating paths...
% Compiled module: MC_CFILE.
% Compiled module: MC_CPATH.
% Compiled module: MC_FINDPREFIXE
Loading bad pixel mask...
% Compiled module: READFITS.
% Compiled module: SXPARG.
% Compiled module: VALID_NUM.
Setup complete.
IDL>
Updating paths...
IDL>
Updating paths...
IDL>
```

Spextool 4.1 for TS4\_SOAR

File Read Mode: < File Name < Index

Input Prefix: SPEC\_Ar

Output Prefix: Spectra

Output File Name(s): I

Paths | Cals | Combine Images | Point Source | Extended Source | Other | Help

Raw Path: /home/tspec/Data\_Reduction/UT20200316/RAW/ Clear

Cal Path: /home/tspec/Data\_Reduction/UT20200316/CAL/ Clear

Proc Path: /home/tspec/Data\_Reduction/UT20200316/PROC/ Clear

7 CENTOS

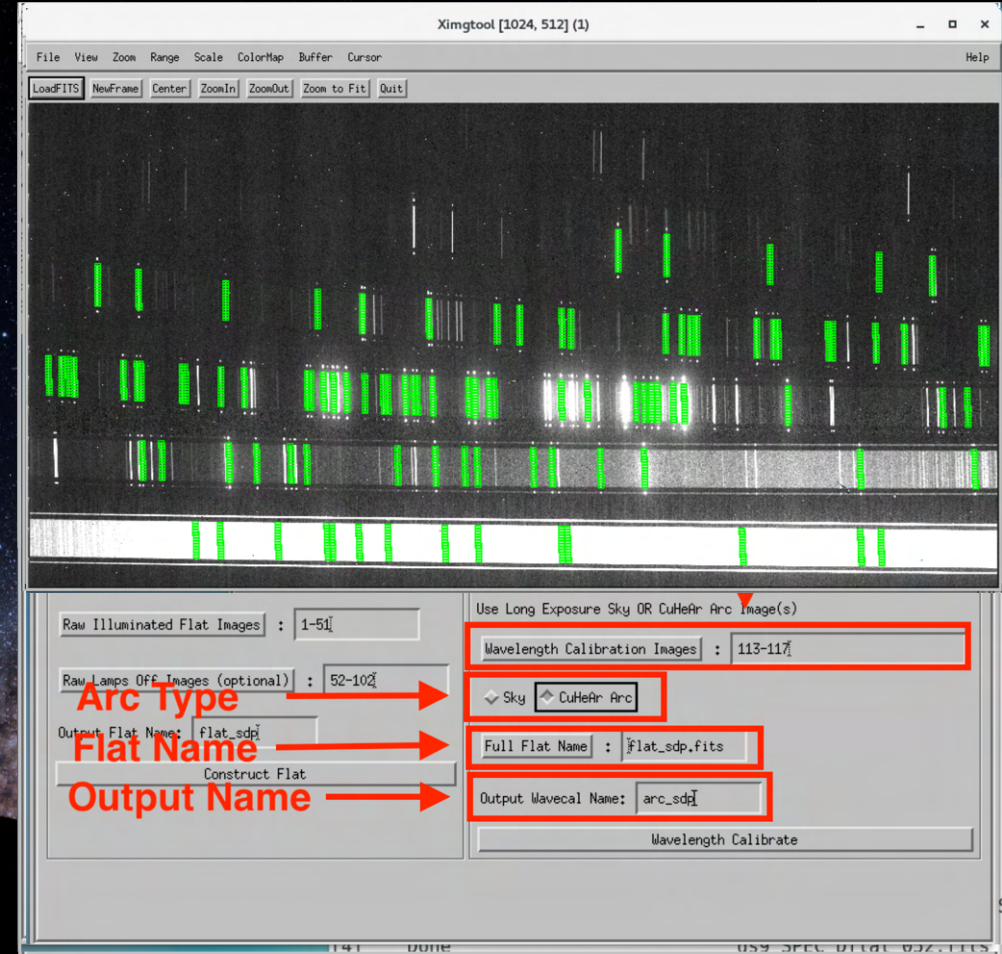
Terminal | Spextool 4.1 for TS4\_SOAR | 1 / 4



# TripleSpec 4.1 Data Redx



- XSpextool
  - Process Cals
    - Construct Flat
    - Construct Arc

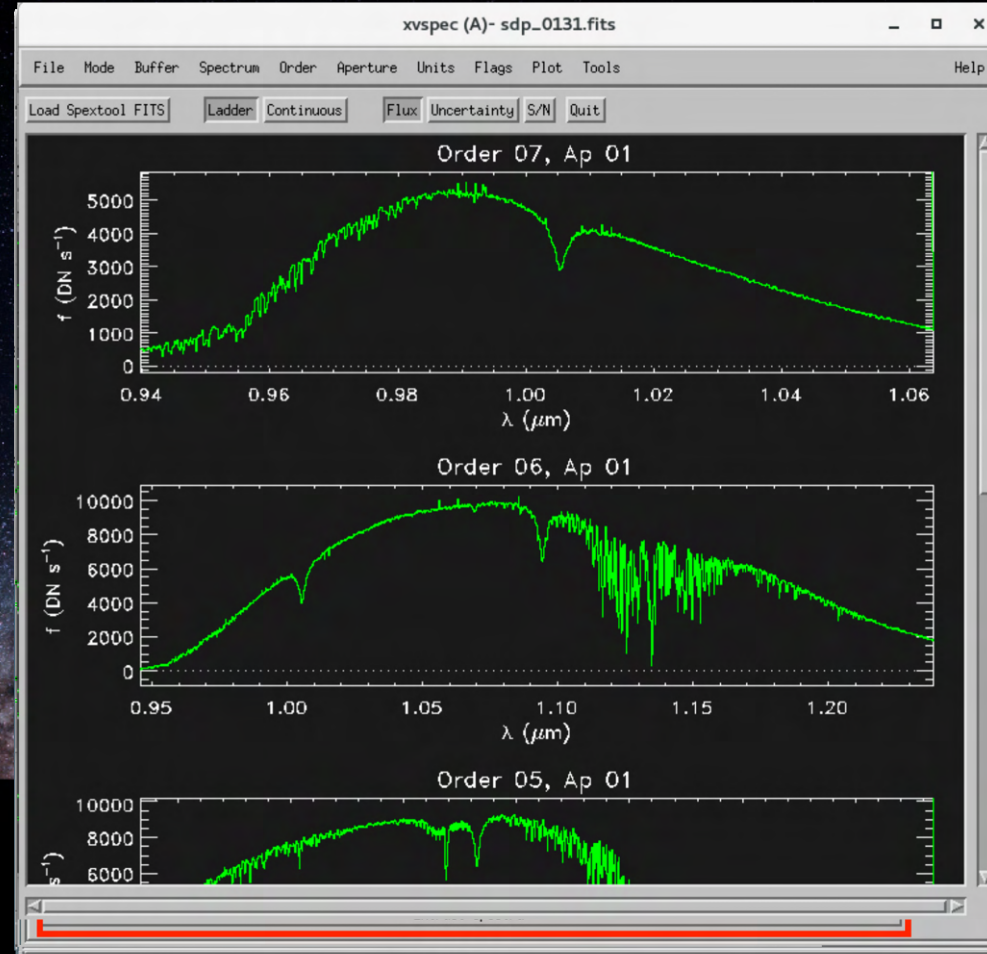




# TripleSpec 4.1 Data Redx



- XSpextool
  - Extract Spectra
  - Point Source
    - Setup Files
    - Load Image
    - Make Spatial Profile
    - Store Aperture Position
    - Trace Objects
    - Show Aperture
    - Extract Spectra



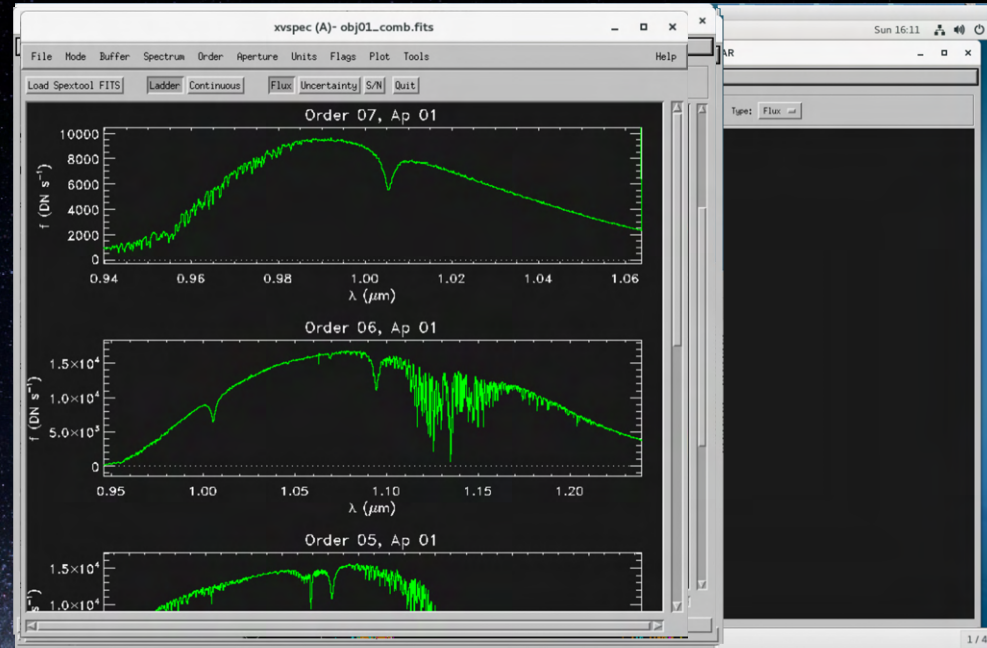




# TripleSpec 4.1 Data Redx



- Combine Spectra
  - xcombspec
  - Prepare data
  - Load spectra
  - Scale Spectra
  - Remove Bad Pixels
  - Combine





# TripleSpec 4.1 Data Redx



- Flux-calibrate
  - xtellcor
  - Load data
  - Construct Kernel
  - Construct Telluric
  - Calculate Shifts
  - Write File
  - Examine Spectrum

