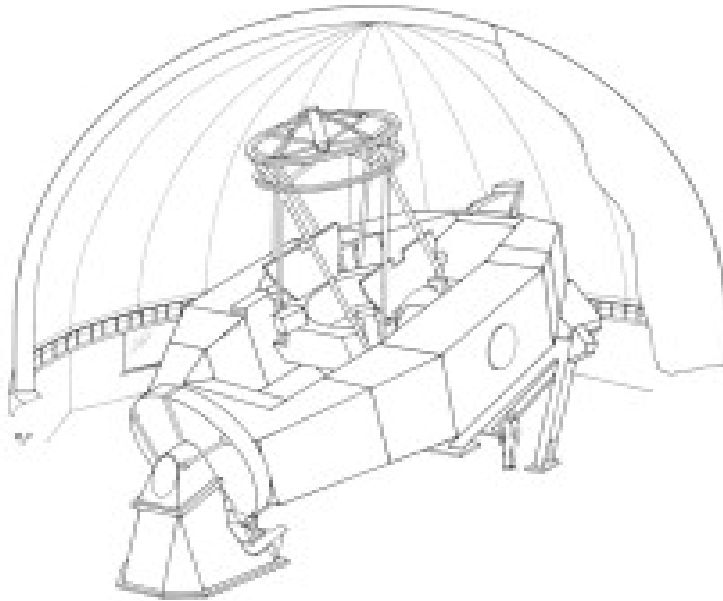


# Focus Collimation Tool User's Manual

FCT v2106



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# Table of Contents

1. Introduction.....	2
2. Starting FCT.....	2
3. Focus Procedures.....	3
4. Restarting the FCT, or what to do if FCT crashes.....	7
5. Focus File Button.....	7
Appendix A – Focus Fit file.....	8
Appendix B – Evaluation methods.....	9
Appendix C – FCT SQL Table.....	10

## 1. Introduction

The focus Collimation Tool (FCT) is an IDL application to assist the Telescope Operators with the focusing of the Telescope.

## 2. Starting FCT

The user account, fct, is used to run the FCT.

A vnc session on stefan:10 should exist using the fct user account. These instructions show how to connect to the vnc session and start the FCT application.

1. Connect the fct vnc session  
\$ vncviewer stefan:10
2. Start a terminal window in the vnc session
3. Start IDL and FCT in the terminal window (bold letters are typed by the user)

```
start_fct
```

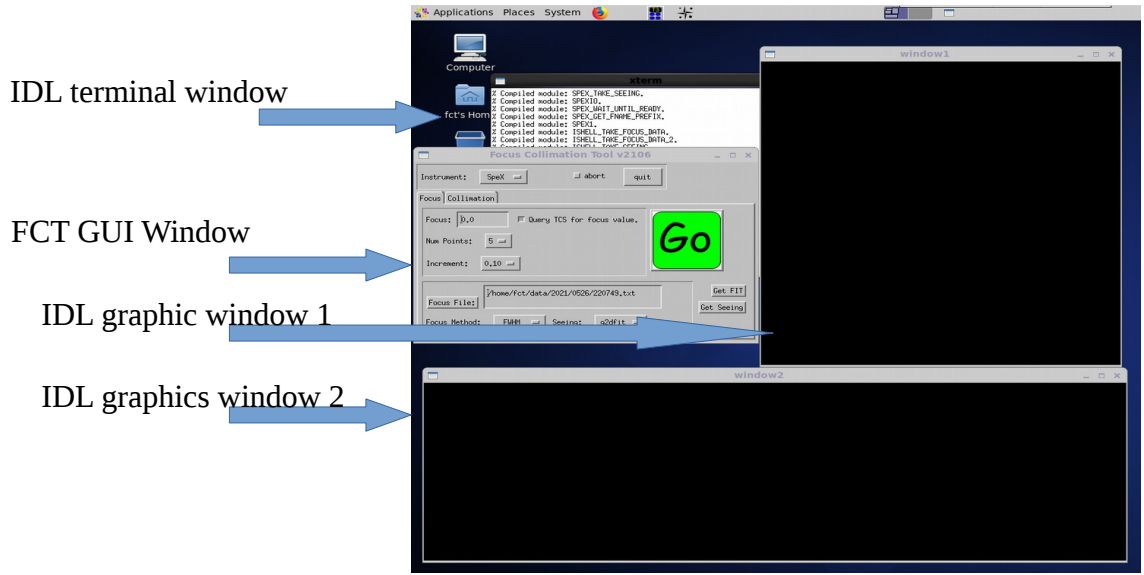
```
or run from idl:
```

```
% idl
```

```
IDL> @fcts
```

4. The application can be left running the VNC session.

At this point you should see this in the VNC session:



### 3. Focus Procedures



1. Insure the focus tab is selection. And bring up the VNC session of the instrument used.
2. Inspect the input parameters

- Instrument:** Select the instrument used.
- Focus:** Enter the center for focus in the text widget, or check the “Query TCS for Focus value” to have FCT query the TCS for the center of focus.
- Num Points** – Number of Focus data points (images) to take.
- Increment:** Focus increment between each point.
- Focus Method:** The focus algorithm to be used. The IRTF standard is 'FWHM'

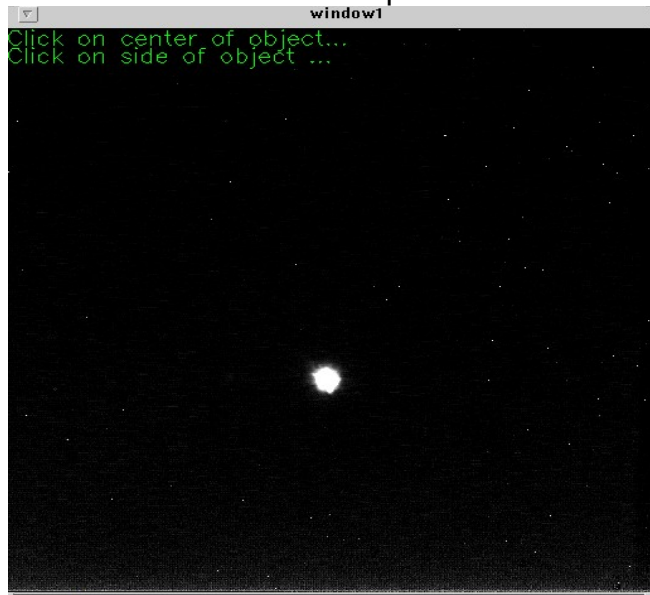
**Seeing:** The Seeing algorithm to be used. The IRTF standard is 'g2dfit'

3. Select GO.

4. If you press the abort button after selecting GO, the FCT program will abort it run. Just click it once, and be patience, it will abort before taking the sky or object data. The abort is not immediate.

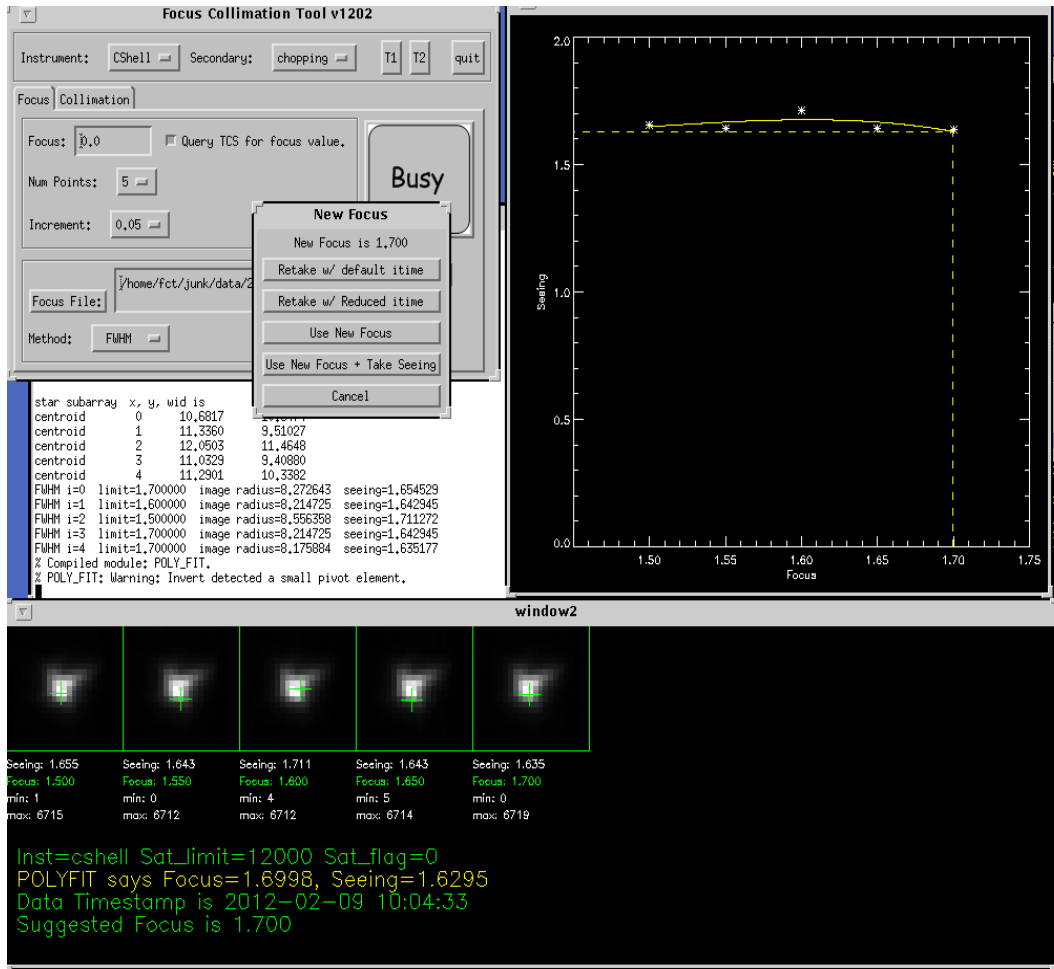
5. Monitor the FCT GUI and instrument GUI to insure the data taken correctly.

6. After data is taken, you are asked to right click on the center and outside of the star. This identifies the sub array in which the focus fit will take place:



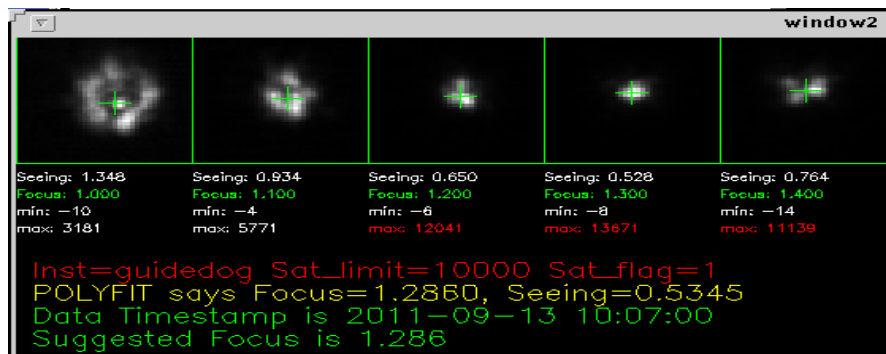
Use the right button to click in the center, and then just off the side of the star.

7. After the fits is done, you will see:



Window1 shows the seeing measurement (white) and the Fit (yellow)  
 Window 2 shows the sub images with it's seeing and focus values. The POLYFIT results, time stamp, and suggested focus is displayed.

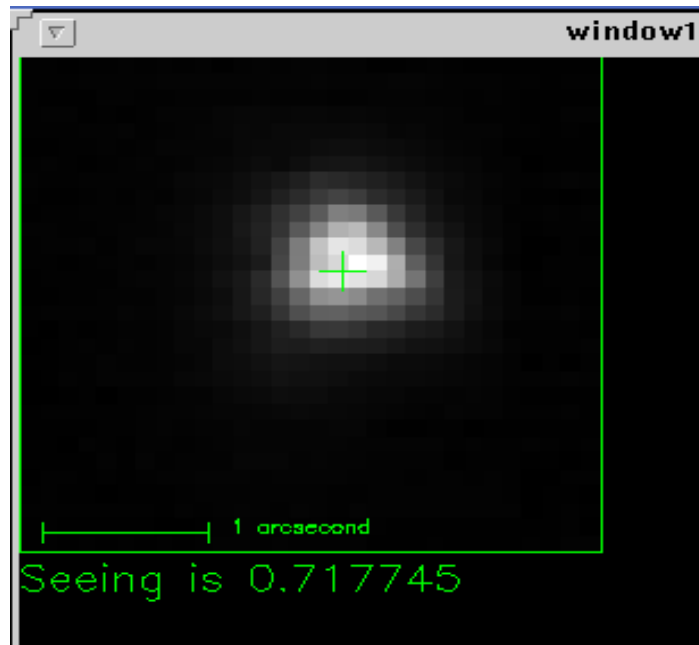
Note: If any of the images are saturation, the max value and Sat\_limit line will show red, as such. The star is too bright for the standard itime. You can just go with the data, retake the data with reduced itime, or find a more appropriate star. There is an example of window2 show saturated images.



7. The "New Focus" Dialog box provide you with 4 choices

1. Retake Data w/ default itime – Re do the image acquisition the the standard itime and fit.
2. Retake Data w/ Reduced itime -Re-do the image acquisition with half the standar itime and fit.
3. Use New Focus – Move TCS to Suggested Focus and Stop
4. Use New Focus & Take Seeing – Move TCS to Suggested Focus and take a seeing image and measurement. This seeing measurement is archived.
5. Cancel– Stop the focus routine.

8. If you select 'Use New Focus & Take Seeing', the FCT will take another image. Using a Gaussian fit, a seeing measurement is provided:



This seeing values provide by the Gaussian fit algorithm should be recorded in the trouble log.

9. You are done.

## 4. Restarting the FCT, or what to do if FCT crashes

Normally the **Quit** button exits the FCT. Click on the Quit button and the FCT gui should disappear. Leaving you with the xterm you used to start FCT.

If the application crashes, the GUI may stay on the desktop, but not response. Check the terminal. If you see the IDL prompt. Exit IDL and re-start the GUI. A few suggestion:

Type exit if you see the IDL prompt. This should return to to the shell.

```
IDL> exit
```

or

Cntl-C in the terminal may work to kill the IDL session and return to the shell prompt.

Once you are at the shell prompt, do a 'start\_fct' to restart the FCT application.

You can also kill the terminal window by clicking the 'X' on the top-right of the terminal window. Then start another xterm.

**IMPORTANT:** if the FCT crashes in the middle of the focus procedure, Please logout of the guider before returning it to the observer. If FCT crashes, it will not 'restore' the original observer's parameter so the instrument setting will be incorrect (ie path, autosave). The only sure way is to logout, and then login in to the guider's XUI to reset all the parameters.

These 2 error messages on the XUI alerts you the the restore may not have works. If you see these message on the XUI, have the observer logout of the XUI, and login back in:

Data Archive mode is OFF!

Non standard path is used! - please fix!

## 5. Focus File Button

On the focus Tab, the focus file button allow you to read and do the focus or seeing measurements on previous taken data. Clicking on the **Focus File:** button will bring up a file selection dialog box. Select a FCT .txt file.

The **Get FIT** button to run the Focus Fit procedures. The pull down menu Focus Method allows you to select the Focus Evaluation method

The **Get Seeing** button will run the Seeing evaluation procedure. The pull down menu **Seeing** allows you to select the Seeing Evaluation method

## Appendix A – Focus Fit file.

The focus procedures image acquisition produces a .lst file providing information on the data set taken. This is a text file. Its format can be illustrated by looking at an example:

```
obj sgd.2021A999.210601.013115.00002.a.fits -1.778000
obj sgd.2021A999.210601.013115.00003.a.fits -1.678000
obj sgd.2021A999.210601.013115.00004.a.fits -1.578000
obj sgd.2021A999.210601.013115.00005.a.fits -1.478000
obj sgd.2021A999.210601.013115.00006.a.fits -1.378000
sky sgd.2021A999.210601.013115.00001.b.fits
timestamp 1622547075
seeing_filename sgd.2021A999.210601.013115.00007.a.fits
seeing_value 0.912170
new_focus -1.673600
```

Each line has a format of a keyword, followed by 1 or more data fields. The fields are delimited by spaces.

The '**obj**' keyword identifies the object data files. 2 fields are provided: the name of the FITS file, then the focus value.

The '**sky**' keyword identifies the sky data file. On the line, the name of the FITS file, is provided.

The '**timestamp**' keyword provides the time of the data acquisition. The time is formatted as unix seconds.

**seeing\_filename** is the seeing FITS data used for the seeing measurement.

**seeing\_value** is the seeing value calculated.

**new\_focus** is the resulting focus value.



## Appendix B – Evaluation methods.

FCT support the following evaluation methods

- FWHM – Algorithm developed by M.Connelly. The quality is determined by counting the number of pixel above a threshold
- g2dfit – used the IDL gauss2dfit() function in its evaluation.
- gfit – uses the IDL gaussfit( NTERMS=4) function in its evaluation
- Peak – The maximum values is used as its evaluation
- Peak99% - The 99<sup>th</sup> percent max value is used as its evaluation

For more information view the source file ffit.pro.

## Appendix C – FCT SQL Table

The taking data, the fct application save the time, seeing value, focus, sat\_flag, and instrument name in the irttf sql database. The follow script ( in ~fct/current) describes the database fields, and shows some sample data:

```
#!/bin/sh
#
# mysql_seeing_show.sh
#
# show the seeing table data.
# examples:
#     "mysql_seeing_show.sh
#
mysql --host=irtfweb.ifa.hawaii.edu --user=irtf --password='XXXXX' -t <<STOP
USE fct;
SHOW tables;
DESCRIBE seeing;
#SELECT from_unixtime(tv_sec), tv_sec, seeing, focus from seeing order by tv_sec limit 100;
# 86400 is 1 day
# 604800 is 7 days
# 2592000 is 30 days
# 15768000 is 6 months
# 31536000 is 1 year
#
SELECT from_unixtime(tv_sec), tv_sec, seeing, focus, sat_flag, instr FROM seeing
WHERE tv_sec > (UNIX_TIMESTAMP()-86400)
ORDER BY tv_sec
\q
STOP
```

Sample output is:

```
+-----+
| Tables_in_fct |
+-----+
| seeing        |
+-----+
+-----+-----+-----+-----+-----+
| Field        | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| tv_sec       | bigint(20)    | NO   | MUL | 0        |       |
| seeing       | float         | YES  |     | NULL     |       |
| focus        | float         | YES  |     | NULL     |       |
| sat_flag     | int(11)       | NO   |     | 0        |       |
| instr        | varchar(20)   | NO   |     |          |       |
+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+-----+
| from_unixtime(tv_sec) | tv_sec      | seeing | focus | sat_flag | instr |
+-----+-----+-----+-----+-----+-----+
| 2012-08-29 19:25:55 | 1346304355 | 1.26338 | 1.405 | 0        | guidedog |
| 2012-08-30 00:06:16 | 1346321176 | 1.6167  | 1.227 | 0        | guidedog |
+-----+-----+-----+-----+-----+-----+
```