

# VIRUS-P User Manual

From VENGA

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## Virus-P User Manual

This manual was written by the VENGA team (GB, AH, IM, TW), and hence it is focused on how to observe nearby galaxies with VIRUS-P under the instrumental setups used by the VENGA survey. It is still a good resource (probably the best available) for any VIRUS-P observer, but just keep in mind that some steps might be different depending on the nature of your targets, and the instrumental setup you are using.

VENGA observers are welcome to edit this page (make me user friendly!!!)

Read this old document regarding VIRUS-P Calibrations

See also the Quickstart manual for the 2.7m TCS on the McDonald Observatory website:

[http://nexus.as.utexas.edu/obs\\_sup/man/manuals/TCS/tcs\\_quick\\_guide.html](http://nexus.as.utexas.edu/obs_sup/man/manuals/TCS/tcs_quick_guide.html)

## STARTUP (Before you start observing)

**Login in to Oberon, Charon, and Mimas**

computer account: name = vp    password = Ly\_1216

**On Oberon:**

### 1) Start ICEX

Open ICE (Instrument Control Environment) by clicking icon on bottom toolbar.

In ICE:

```

ICE> icex           ;OPENS icex PACKAGE
ICE> mytasks        ;LOADS VIRUS-P OBSERVING SCRIPTS
ICE> status         ;CHECKS STATUS OF THE CCD, AND LOADS MICROCODE IF IT IS NOT ALREADY LOADED

```

- if this is the first time the microcode is being loaded you will need to do the following to overcome a weird Clock Driver bug (don't ask!!)

```

ICE> unload
ICE> status
ICE> flush 5

```

- if the CCD is not responding when doing status, two things might be happening:

a) the CCD is powered down, in which case you can power it up by doing:

```

ICE> v2 V2p=1      ; OR EQUIVALENTLY POWER IT DOWN WITH V2p=0

```

and repeat the above commands.

b) the link fibers in the box on the left-most rack are swapped. Fix it and repeat the above commands.

- if the pressure is not being reported when doing "status", the Vacuum Gauge might be off. Turn it on by doing:

```

ICE> v2 VGp=1      ; OR EQUIVALENTLY POWER IT DOWN WITH VGp=0

```

## 2) Check that you can readout frames.

- Open DS9 by clicking icon on toolbar.

- Create of folder on which you will save tonight's data by typing:

```

ICE> tonight

```

this will create a folder for tonight's data on /data2/oberon/vp/YYYYMMDD and cd into it. If the folder already exists it will only cd into it (Do this before you start observing every night, and remember that DD is given by UT time, not local time).

- Once in tonight's directory, test that you can read a frame by taking a test bias:

```

ICE> test
      Number of exposures (1:)(1): 1
      Image type (object|zero|dark|flat|comp|focus|ir) (zero): zero

```

If you get a nice looking bias frame displayed you are on the path towards successful observing.

## 3) Setup "obspars" and "detpars", and check the read-noise.

## Edit "observer parameters"

```
ICE> epar obspars
```

set the name of the observer, and the frames prefix and sequence number.

## Edit "detector parameters"

```
ICE> epar detpars
```

set the binning (1x1 for all VENGA observations), and the integrator (2 for all VENGA observations).

Check the read-noise level by typing:

```
ICE> bias
```

this will take a bias frame, compute and report the readnoise in both electrons and ADU in a set of horizontal sections of the frame. The read-noise should be around 3.7e. If it is much higher than that, something might be wrong and you might need to contact Phillip McQueen. Also, if you have bad readnoise with integrator 2, try using integrator 1 (The readout time is painfully long with integrator 1 in 1x1 binning so try to avoid it unless absolutely necessary).

**4) Start a log sheet in data directory: /data2/oberon/vp/log\_venga\_YYYYMM**

The log must have the following columns (you can find examples in /data2/oberon/vp/log\_graveyard/):

```
Frame_name
UT
Image Type
Exposure Time (seconds)
Binning
Temperature,
Focus
FWHM
Fiducial_Ref coords
Airmass
Comments
```

```
Example:
Frame_name = venga0666
UT = 21:50
Image Type = Bias/ NeCd / Twilight_Flat/ Feige34-D5 / NGC5194-P1-D1
Exposure Time (seconds) = 1200
Binning = 1x1
Temperature = 10'C
Focus = 26834
Fiducial_Ref = 388,146
Airmass = 1.17
Comments
```

**On Charon:****5) Open Telescope Control System (TCS) GUI by typing "/opt/local/bin/tcsgui" on a terminal**

```
-click active
-Tools -> Handpaddle
-View -> Sky plot
```

**On Mimas:****7) Open Auto-guider Software (AGDR):**

On the home directory create a folder called VENGA\_guider\_YYYYMM, and cd into it. From inside that directory start the guider software (AGDR) by typing:

```
> ~pso/agdr-1.11
```

the AGDR main window will open.

Under 'Expose' menu:

click 'Guider' to open up the Guider Window. This is the main window from which you control AGDR.  
click 'Setup' to open exposure setup. Set AUTOSAVE ON, and set it to save by TIME (one frame every 100 frames). Also set guider frames prefix and sequence number.

Under 'View' menu:

click 'Setup' to adjust scale (zscale is usually OK)

In the Guider Window:

click 'History Window' to display the guider log.  
click 'Display Charts' to open strip charts, click on Magnitude and FWHM tabs, and set proper scaling.  
click 'Specify fiducial', to open window used to enter the guide star pixel coordinates, set box to 50 pixels, then click "go" (this creates a box of 50 pixels with a cross hair centered at the given coordinates).

Under 'Marker' menu, click "load" to load red circle denoting VP IFU center (after 540"N move). If you are 560" North, the object will fall close to the center of the IFU.

Finally, in the Guider Window, click start to start exposing. From this window you can set the exposure correction to use, turn on and off the autoguiding, etc.

**8) Filling the Dewar (do this every 24hrs.)**

```
With telescope in Stow position.
Raise platform to instrument level.
Roll liquid nitrogen tank near the dewar.
Connect hose to the dewar and slowly turn lever to start flow of liquid nitrogen.
Once the hose hardens, open flow to max level.
Keep filling until you see liquid nitrogen leaking from the side relief hose.
Wait until hose softens and take it out.
Lower the platform.
```

# OBSERVING

## 1) On Oberon: Open daily night report by clicking icon (xreport)

```
Fields to enter:
  observers
  dome opening time
  instrument = VIRUS-P
  detector = FI-1
  guider = alta0/agdr-1.11
  software used = ICEX
  Day hours, Night hours
  cloud cover = report cloud cover fraction on scale 0->10 sky coverage,
                check 3 times each night and record the seeing
```

## 2) Calibrations:

Take 11 bias, 11 arcs, and 11 twilight flats at the beginning and at the end of each night. For further guidance, see document on Calibrations at the top of this page.

```
In winter, start this ~40 minutes before dinner
In summer, start this after dinner (~few hrs before twilight)
```

### 2.1) Take bias frames using ICEX task 'zero' (Dome must be dark.)

```
ICE> zero
      number of frames = 11
      frame title = bias
```

### 2.2) Take arc lamp frames.

On the TCS:

```
Point telescope to AZ=180, ALT=20
Tools -> Enable Telescope Automation (so the dome slit follows the telescope.)
```

On dome handpaddle:

```
Raise the lower windscreen high enough to completely cover the telescope aperture.
```

On the dome console:

```
Open the mirror cover by holding down button until light turns on.
```

Arc lamps are located upstairs on the southern platform.

**\*\*If you need to change the bulbes, do NOT touch barehanded use gloves\*\***

=>Use Ne+Cd for the red low-resolution VENGA setup (4500-6800 Å).  
=>Use Hg+Cd for the blue low-resolution VENGA setup (3600-5800 Å).

Turn on lamps by turning on power sources. Ne lamp is stubborn, can take a few tries to turn lamp on. Wait ~2 minutes for lamps to warm up, and then take arc lamp frames by using task 'comp'

```
ICE> comp
      11 frames
      20 seconds each for low-resolution VENGA setup.
```

### 2.3) Take Twilight Flats:

In the dome console:

Open the dome by holding down button.

On dome handpaddle:

Clear upper and lower windscreens.

On the TCS:

```
Point the telescope to => dusk:  AZ= 90, ALT = 80
                       => dawn:  AZ= 270, ALT = 80
```

Run a test exposure of 0.5s (60s) at dusk (dawn):

```
ic> test
     0.5 (60) second
     image type = flat
```

If you see ~10,000 counts in peak of the fibers, then it is dark enough (bright enough) to start taking the flats.

Take flats using the task 'autotwi':

```

ICE> epar autotwi
set integration time to your best guess (based on the previous test) in order to get ~25000 cts.
set the "sense":
=>beginning of night, dusk = 0
=>end of night, dawn = 1
also set:
  month = decimal of current month (e.g., 1.5 for January 15th, 9.3 for September 10th, 12.1 for Dec)
  target = number of desired counts (25000 is recommended)
  max_t = 300s      (autotwi will stop when next integration is longer than this)
  min_t = 0.1 s     (autotwi will stop when next integration is shorter than this)
  tot_num = 11      (number of frames to attempt)
save epar autotwi with :q and run.

```

```

ICE> autotwi

```

### 3) Check the Telescope Pointing on a Bright Star, and set TCS Zero-Points

- Point towards a bright star near zenith (On the TCS, under the "Next" Menu click "Bright Stars Near Zenith").
- Once you are pointing at the star, move the telescope 540" South. The bright star should fall in the center of the IFU.
- Center the star on the red circle (which you loaded in step 7 of the STARTUP Section).
- Move the telescope 540" North, so the star is now in the center of the IFU.
- If you want, you can take a science frame to see that the central fibers in the IFU show the star's position. (This is not necessary, this procedure works!!)
- Zero the telescope in the TCS.

### 4) Telescope Focus

Focusing with VIRUS-P is a very hard and messy procedure. Good focusing requires patience, but you must keep in mind that precise focusing is not terribly important since we have 4.3" diameter fibers.

Set the guider to expose for 3s. Draw a box around a bright guide star, and check the FWHM on the strip chart. Telescope Focus is set with hand paddle. Change the focus on steps of ~100 counts and let the guider to take ~7 frames. Try to average the FWHM of the last 7 frames by eye, and keep on changing focus until you reach a minima in FWHM.

### 5) Observing Standard Stars

This site is a very useful resource showing spectra and findercharts for all the standard stars used in VENGA:

```

http://www.ing.iac.es/Astronomy/observing/manuals/html\_manuals/tech\_notes/tn065-100/workflux.html

```

Point the telescope to your standard star. Once on it, move 540" South. You should be able to recognize the standard star field from the finder chart on the guider (remember the guider is flipped in x). Once you find the star, center it on the red circle marking the IFU center and move 540" North, so the star falls on the IFU. Draw a guide box around any star in the guider and start autoguiding.

Take 6 subdithers on the standard star using task 'vp2\_subdither':

```

ICE> vp2_subdither
      title: Star's Name
      single frame exp.time: 120s for red -low-resolution setup
                           200s for blue high resolution steup
      number of exposures at each position: 1
      delay after nod for agdr to settle: 20 ;THIS IS A DELAY AFTER DITHERING TO
                                           ALLOW THE GUIDE STAR TO SETTLE ON THE FIDUCIAL

```

## 6) Observing Objects

Pointing of science targets is based on the finder charts produced by the "finder\_code" software. For each science target you should have 3 files:

TARGET\_tot.ps : Shows both the IFU science field and the Guider field on sky.

TARGET\_field.ps: Shows the IFU field on sky. The coordinates on the top of this plot are what you should

TARGET\_guider.ps: Shows the Guider field on sky, and marks the pixel coordinates that guide stars must h  
is precisely on the desired coordinates.

- Point the telescope to the coordinates printed in the upper part of TARGET\_field.ps.
- If the pointing is decent, you should be able to recognize the field shown in TARGET\_guider.ps on the Guider (TARGET\_guider.ps is already flipped in x, so it should match the Guider frames as it is.)
- If the pointing is not decent, and you are lost it is worth pointing to a nearby bright star and zeroing the telescope as described in 3). An easier and quicker solution is to move 540" South and see if you can find the galaxy. If you do, center the position on the galaxy at which you are pointing on the red circle marking the IFU center, and move back 540" North. (Zero the TCS at this point).
- Once you have aquired the field, choose a bright isolated guide star, and enter its pixel coordinates (as given in TARGET\_guider.ps) in the "Specify Fiducial" winodw (see 7 in the STARTUP section).
- Start Autoguiding.
- If the guide star is exactly on the pixel coordinates given in TARGET\_guider.ps, you have the IFU pointing exactly at the coordinates given in TARGET\_field.ps, which correspond to Dither 1 (All the VIRUS-P dithering scripts assume that you always start at Dither 1).
- Now you can start observing using the VENGA dithering script: 'venga\_onoffdither'. In this script you specify how many frames of what exposure time you want to get on each of the 3 dither positions, and also you specify an exposure time for the sky frame, which are obtained in between science frames by offsetting the telescope 30' North from the target.

Running the observing script:



```

cl> venga_onoffdither
      object name = your object (e.g. NGC7479-P2)
      science frames exp time (seconds)
      sky frame exp time (seconds) => 300s for the red low-resolution setup
                                   => 800s for the blue high-resolution setup

      # of exposures at Dither 1:
      # of exposures at Dither 2:
      # of exposures at Dither 3:
      delay = 20 seconds

```

- **IMPORTANT!!!!**: The script always starts by moving 30' North and taking a sky frame. Then it comes back to the science target and waits for the user to recenter the guide star on the fiducial and hit return before it continues with the next exposure. This recentering **HAS** to be made everytime the script returns from taking a sky frame.

- **IMPORTANT!!!!**: While the script is running, you can always abort (A), pause (P) or readout (R) frames on ICEX. The script will smoothly continue with the next frames. You might find this useful if you want to skip the first sky frame for example. If you want to stop the whole script while it is running you can ctrl+C **ONLY WHILE THE TELESCOPE IS DITHERING**, so you must abort (A) the frame, and let the telescope start dithering before you hit ctrl+C. If you hit ctrl+C while exposing or while reading out **BAD THINGS HAPPEN**, and you might need to log out of ICE and repeat the steps in the **STARTUP** Section.

## END OF THE NIGHT PROCEDURE

- Stop the guider camera in the morning.
- Tar and gzip your guider frames for the night and send them to Austin. (Mimas sometimes is short on space and you might find yourself having to remove previous nights guider frames, so it is good to be careful about this.)
- Save and close daily night report.
- Close dome and the mirror cover and lower the upper windscreen to cover the telescope.
- Stow the telescope and park the Dome.
- E-stop when completely parked.
- Close doors and louvers.

## OTHER HELPFUL PROCEDURES

### Programming coordinates

```

a) Set programmed position in computer:
   --Next -> Choose one of many options: manual entry, Alt/Az...
   --Click Next Object on console
   --Move telescope to programmed coordinates by holding auto slew button

```

## How to create a finder chart

Software is on media107 computer (use same vp account)

```
> cd finder_code_delta/scripts/
=>find_gen.csh (program that creates finder chart)
run program:
> find_gen.csh RA DEC object name (optional: region file)
example:
find_gen.csh 10:45:58 11:42:15 NGC3351_P1
(P1 is for pointing 1)
=> if required, move fiber regions around to center where you want to point
```

```
print finder chart:
> cd ../images
> lpr-P laser107 NGC3351_P1.ps
```

```
If you have more than one pointing on your galaxy,
find the region file to overplot on the finder chart for your second pointing
> cd ../regions
> emacs NGC3351.reg (this is a region file for a box covering VP field of view)
=> enter in central coordinates from P1 finder chart and save
> cd ../scripts
run script again loading in region file you created:
> find_gen.csh RA DEC object name region file
```

## How to use Autoguider

```
--on Guider gui, exptime = 3s (can change); start tracking to see
non-streaks
--set exptime w/ arrow buttons, open history window for log of what
guider is doing; good exptime is 3.0s; 0.5 is exposure delay; radius
of gaussian =5
--click display button; open magnitude, FWHM. Push scale button to set
axes scales
--autoguider button; turns on/off correction
--click start to start taking guider exposures, push stop to stop
--after specify fiducial, the chosen star must be moved to the
box with a To/From Movement
--To/From marker:
--Marker -> Load to load default marker symbols
--Create -> To = where target position; From = current star position
Move Scope to execute change
--Marker -> Create -> Guider if error in drawing Guider box
=====
--to track, draw box around chosen star and push guide
--for display chart gui: Choose Magnitude tab on top and FWHM on bottom.
A dip in magnitude means clouds. FWHM tab can measure focus state
--must enable auto guiding
--note min vs max possible correction and fraction of correction applied
--View -> Setup; change how exposure frame looks; works like ds9
```

## Emergency procedures

- ```

a) Hit Emergency Stop one of many places to immediately halt telescope + dome
   movement. Hit reset button + re-enable hydraulics + servo drives in
   control room off to the side. Also must hit Reset again to disengage
   the brakes (clicking sound will indicate brakes have turned off).
b) When system shuts down, hit Reset on Colossus control panel in side
   control room.
c) Detector parameters:
   --epar detpar
   can change : integrator = 2, binning = 1x1, use full ccd
d) Observer parameters:
   --epar obspar
e) In case of power output:
   --control ccd:
   v2 V2p=0 for turn off
   v2 V2p=1 for turn on; + run status command to load ccd micro-code
   --control vacuum gauge:
   v2 VGp=0 (to turn off)
   v2 VGp=1 (to turn on)

```

## Troubleshooting

### Autoguider

```

-- if alta0 ever blinks red, power down usb box, close software, re-power
   box, and restart software.

```

DS9 displays image w/ counts = 32768 ... something is up w/ the CCD

```

run a test:
tic> test

```

Tracking issues: try starting and stopping tracking under "Next" on TCS

### Pointing problems

- ```

a) If guide star disappears completely after sky dither, click Go Next Again
   in tcsgui to move back to the right field. Then put the star back in the box.
b) Reset telescope calibration
   --Next -> BSC Stars Near Zenith or Nearby BSC Stars
   --pick star and go there
   --go to guider, move 540" south to image star; may need to manually slew
   by small amount to find star; when star is found; center in To circle
   --Then move back North 540"
   --Then push Zero button on tcsgui and apply offsets
c) try restarting collosus in old control room, in TCS-> special->reboot TCS computer?

```

### Random notes (help me become less chaotic)

Behind on log sheet? ic> hsel \*.fits \$I,object,UT,airmass yes

*et voila!*

Dip in guide star magnitude? go to magnitude chart, count number of points in dip, multiply that by guider exposure time, record this on log sheet as flux lost.

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