

ULTRASPEC Camera @ TNT
HiPERCAM pipeline reduction software
User guide

Every user using ULTRASPEC is required to follow this instruction

If you have any question or need help:

Contact: puji.irawati@narit.or.th or visit the following webpage:

http://www.vikdhillon.staff.shef.ac.uk/ultraspec/userman/uspec_userman.html#Looking%20at%20data

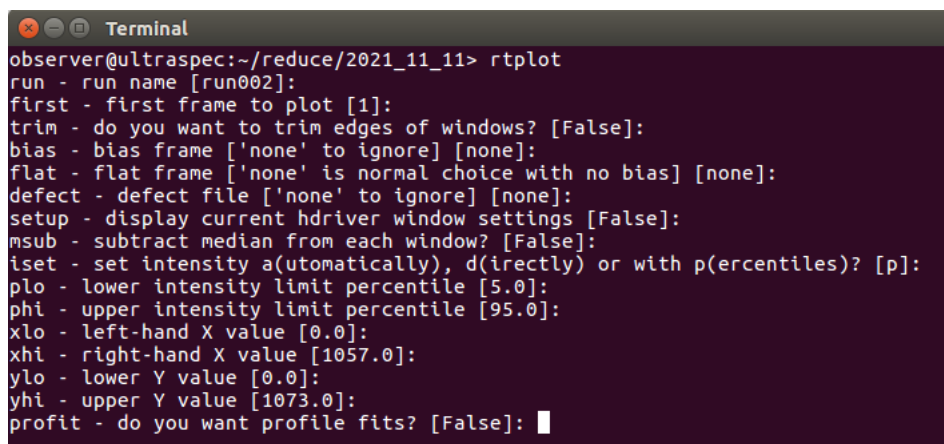
<http://deneb.astro.warwick.ac.uk/phsaap/hipercam/docs/html/>

Create a working folder [one folder / night]

1. Open terminal on the **DRPC** computer (or go to desktop and double click icon 'drpc')
* If you are working remotely from AstroPark or using your own computer, please make sure that you are already connected to NARIT VPN and vncviewer (see TNO Remote Control Manual here https://indico.narit.or.th/category/19/attachments/47/614/2021_11_10_remote_control_manual.pdf)
2. Go to folder: /home/observer/reduce/
`observer@ultraspec:~> cd /home/observer/reduce/`
Check if there is already an existing folder with your starting date of observation. If YES, then navigate to that folder.
If NOT, then create a new folder
`observer@ultraspec:~reduce> mkdir YYYY_MM_DD` (starting date of your observation night)
and go to this folder. Please ensure that you are working from this location.

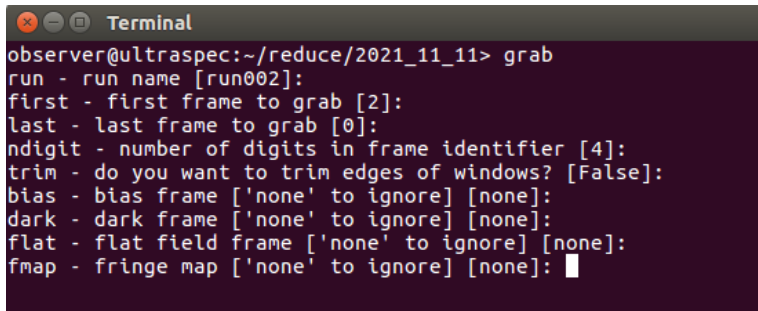
Displaying your data

3. You will need 'rtplot' command to display your data
<http://deneb.astro.warwick.ac.uk/phsaap/hipercam/docs/html/commands.html#hipercam.scripts.rtplot>
`observer@ultraspec:~> rtplot`
It will ask you to input the information of the run number and other details as needed



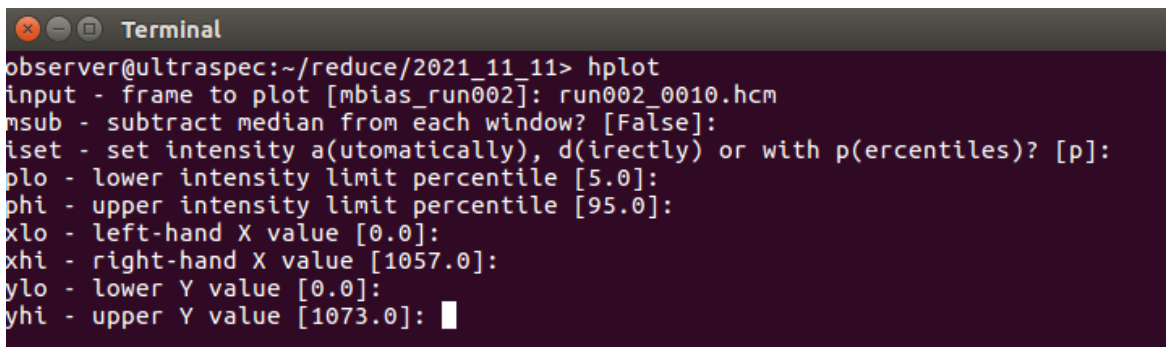
```
Terminal
observer@ultraspec:~/reduce/2021_11_11> rtplot
run - run name [run002]:
first - first frame to plot [1]:
trim - do you want to trim edges of windows? [False]:
bias - bias frame ['none' to ignore] [none]:
flat - flat frame ['none' is normal choice with no bias] [none]:
defect - defect file ['none' to ignore] [none]:
setup - display current hdriver window settings [False]:
msub - subtract median from each window? [False]:
iset - set intensity a(utomatically), d(irectly) or with p(ercentiles)? [p]:
plo - lower intensity limit percentile [5.0]:
phi - upper intensity limit percentile [95.0]:
xlo - left-hand X value [0.0]:
xhi - right-hand X value [1057.0]:
ylo - lower Y value [0.0]:
yhi - upper Y value [1073.0]:
profit - do you want profile fits? [False]: █
```

4. You will need '**grab**' command to grab a frame or several images into individual ".hcm" files.



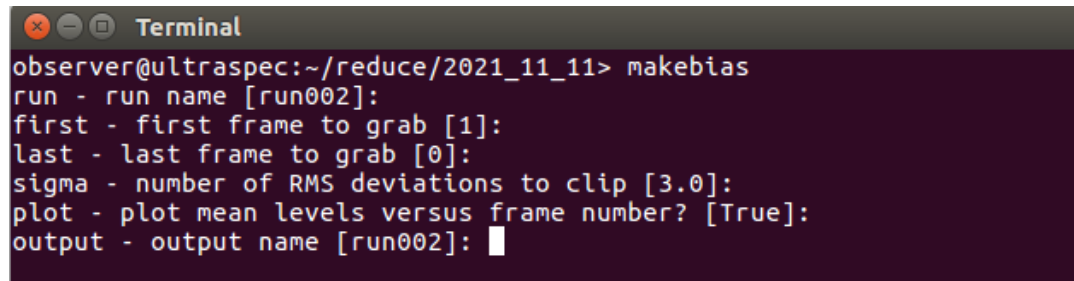
```
observer@ultraspec:~/reduce/2021_11_11> grab
run - run name [run002]:
first - first frame to grab [2]:
last - last frame to grab [0]:
ndigit - number of digits in frame identifier [4]:
trim - do you want to trim edges of windows? [False]:
bias - bias frame ['none' to ignore] [none]:
dark - dark frame ['none' to ignore] [none]:
flat - flat field frame ['none' to ignore] [none]:
fmap - fringe map ['none' to ignore] [none]:
```

5. You can use '**hplot**' command to display the individual hcm file and to check the image

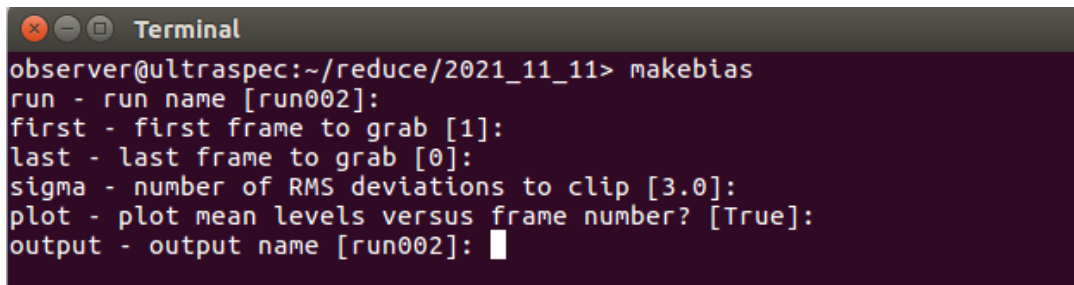


```
observer@ultraspec:~/reduce/2021_11_11> hplot
input - frame to plot [mbias_run002]: run002_0010.hcm
msub - subtract median from each window? [False]:
iset - set intensity a(utomatically), d(irectly) or with p(ercentiles)? [p]:
plo - lower intensity limit percentile [5.0]:
phi - upper intensity limit percentile [95.0]:
xlo - left-hand X value [0.0]:
xhi - right-hand X value [1057.0]:
ylo - lower Y value [0.0]:
yhi - upper Y value [1073.0]:
```

6. You can use '**makebias**', '**makedark**' and '**makeflat**' commands to create a master image by combining several bias, dark, or flat images



```
observer@ultraspec:~/reduce/2021_11_11> makebias
run - run name [run002]:
first - first frame to grab [1]:
last - last frame to grab [0]:
sigma - number of RMS deviations to clip [3.0]:
plot - plot mean levels versus frame number? [True]:
output - output name [run002]:
```



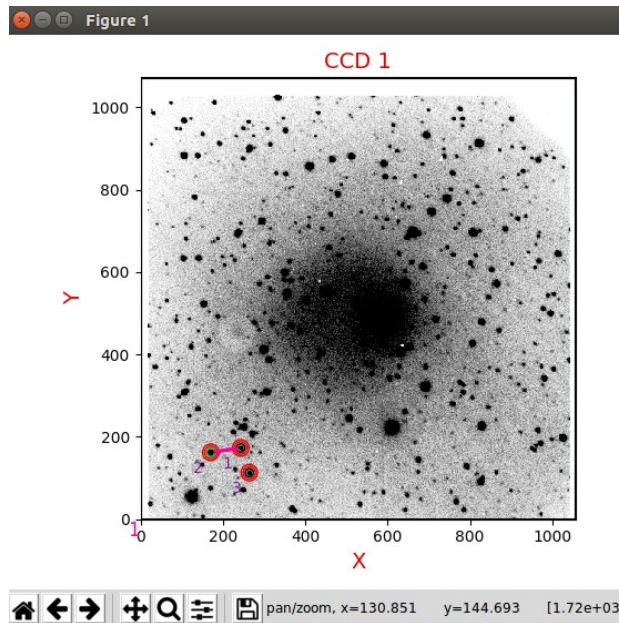
```
observer@ultraspec:~/reduce/2021_11_11> makebias
run - run name [run002]:
first - first frame to grab [1]:
last - last frame to grab [0]:
sigma - number of RMS deviations to clip [3.0]:
plot - plot mean levels versus frame number? [True]:
output - output name [run002]:
```

7. You will need '**setaper**', followed by '**genred**' and '**reduce**' to perform realtime photometry on your data

```
Terminal
irawati:reduce> setaper
mccd - frame to plot [run018]:
aper - name of aperture file [run018]: aper018
No file called aper018.ape exists; will create from scratch
rtarg - target aperture radius [unbinned pixels] [4.0]:
rsky1 - inner sky aperture radius [unbinned pixels] [8.0]:
rsky2 - outer sky aperture radius [unbinned pixels] [12.0]:
msub - subtract median from each window? [False]:
iset - set intensity a(utomatically), d(irectly) or with p(ercentiles)? [p]:
plo - lower intensity limit percentile [10.0]:
phi - upper intensity limit percentile [95.0]:
a(dd), b(reak), c(entre), d(elete), e(xtra) h(elp), l(ink), m(ask), p(rofit), q(uit), r(
eference), C(opy):
```

It will display the image/frame where you will need to add an aperture on your target star or any comparison star(s). You need to choose and press the key as indicated in the terminal with the choices: a(dd), b(reak), c(entre), d(elete), e(xtra) h(elp), l(ink), m(ask), p(rofit), q(uit), r(eference), C(opy)

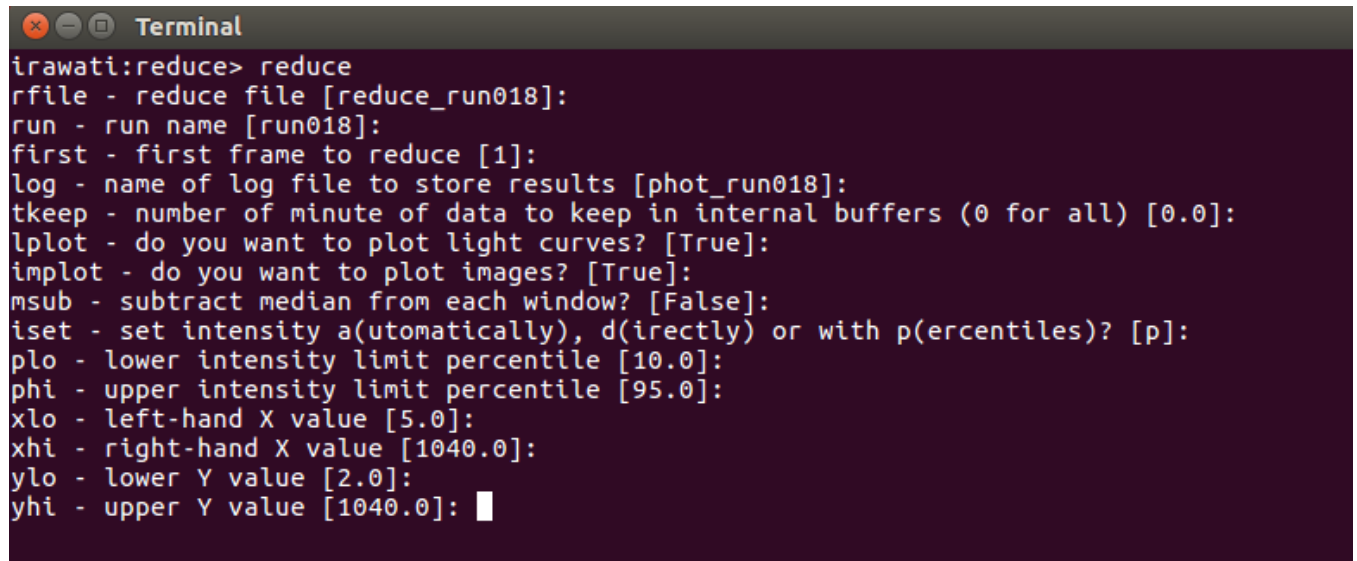
An example of a finished aperture image is shown below. The red circles mark the location of three selected apertures and the numbers (1-3) indicate the aperture number



Then using 'genred' you will be able to generate a new reduce file based on the aperture that you have just created.

```
Terminal
irawati:reduce> genred
apfile - aperture input file [aper018]:
rfile - reduce output file [reduce_run018]:
comment - user comment to add [<cr> for newline to get multilines] []:
bias - bias frame ['none' to ignore] [none]:
flat - flat field frame ['none' to ignore] [none]:
dark - dark field frame ['none' to ignore] [none]:
linear - linear light curve plot? [True]:
Reduce file written to reduce_run018.red
irawati:reduce>
```

The last and the most important step to run the realtime photometry pipeline is to use the '**reduce**' command.

A terminal window titled "Terminal" with a dark background and light text. The prompt is "irawati:reduce> reduce". Below the prompt, a list of options for the 'reduce' command is displayed, each followed by a default value in square brackets. The options are: rfile, run, first, log, tkeep, lplot, implot, msub, iset, plo, phi, xlo, xhi, ylo, and yhi. The cursor is at the end of the last line.

```
irawati:reduce> reduce
rfile - reduce file [reduce_run018]:
run - run name [run018]:
first - first frame to reduce [1]:
log - name of log file to store results [phot_run018]:
tkeep - number of minute of data to keep in internal buffers (0 for all) [0.0]:
lplot - do you want to plot light curves? [True]:
implot - do you want to plot images? [True]:
msub - subtract median from each window? [False]:
iset - set intensity a(utomatically), d(irectly) or with p(ercentiles)? [p]:
plo - lower intensity limit percentile [10.0]:
phi - upper intensity limit percentile [95.0]:
xlo - left-hand X value [5.0]:
xhi - right-hand X value [1040.0]:
ylo - lower Y value [2.0]:
yhi - upper Y value [1040.0]: █
```

Please refer to the HiPERCAM pipeline userguide for more details

http://www.vikdhillon.staff.shef.ac.uk/ultraspec/userman/uspec_userman.html#Looking%20at%20data

<http://deneb.astro.warwick.ac.uk/phsaap/hipercam/docs/html/>