

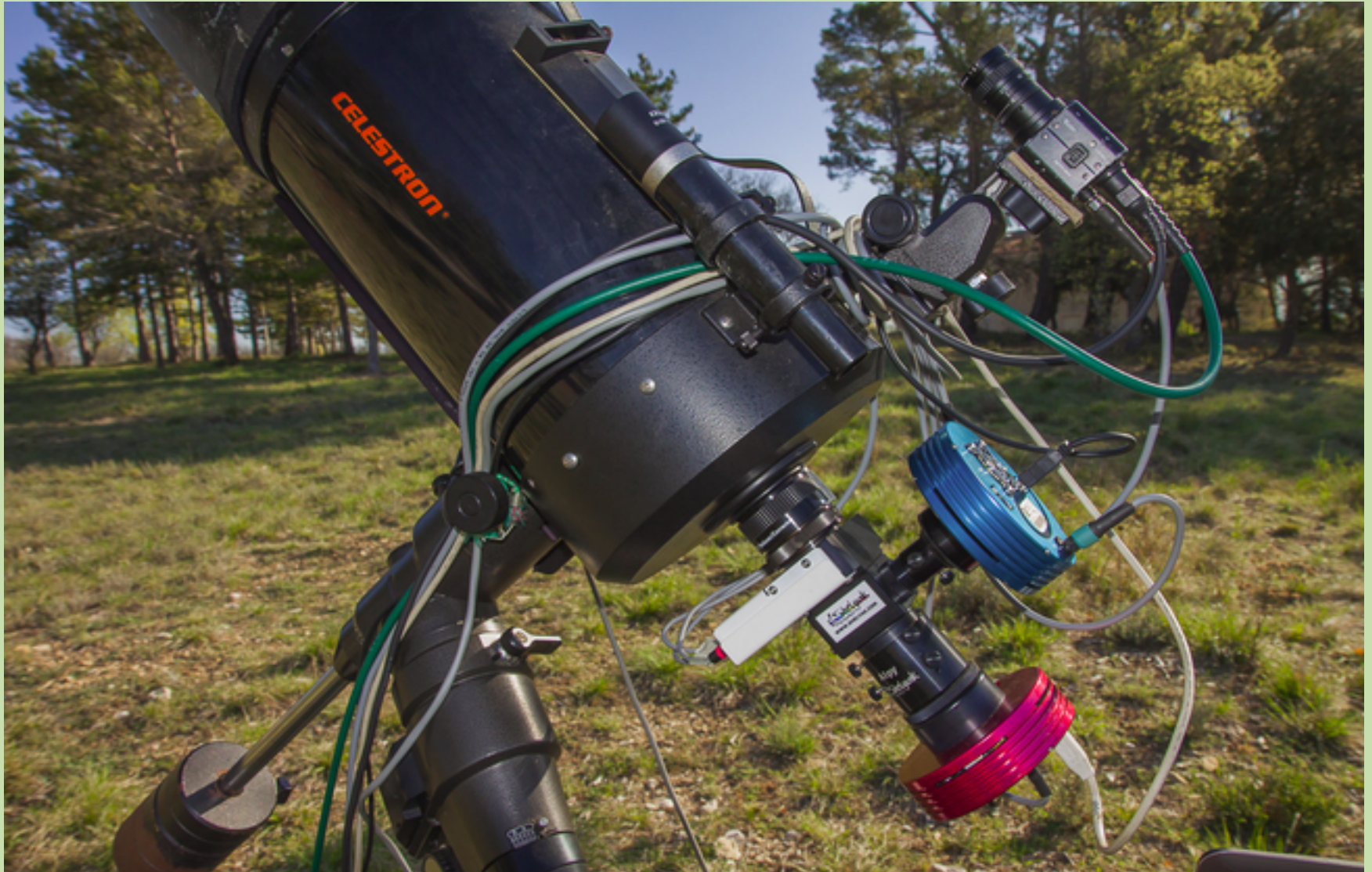


What equipment do I need for spectroscopy?

Sacramento Mountains Spectro Workshop - 2
February 22nd - 24th, 2019

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The instrument



- Equipment
 - Hardware
 - Software
- In the field
 - Recommendations
 - Polar alignment
 - Pointing at a star

- Telescope (mount + tube)
- Spectroscope
- Acquisition caméra
 - *Chip size*
 - *Pixel size*
 - *Spectral response*
 - *Efficiency*
- Guiding camera
 - Field of view
- Pointing system
- Computer

And also...

- Adapters & rings
- Cables
- Power supply
- Table & chair

- *Acquisition software*
 - *Compliant with your acquisition camera*
 - *Full control of the image*
- *guiding software*
 - *Compliant with your guiding camera*
 - *Compliant with the mount*
 - *Full control of the guiding*
- *Sky map software*
 - *Must be able to connect Internet*
- *Data reduction software*
 - *Demetra, ISIS, Rspec, Bass*

+ Python !

Point at a star

- Easy... goto function (NO!)
 - Flexions, atmospherical refraction, alignment error
- Guiding field is small
- Find any star coordinates
 - CDS, Simbad
- Sky map software

Your target: CH Cyg



CH Cyg

A deep-sky photograph showing a dense field of stars against a black background. A yellow arrow points from the text 'CH Cyg' to a specific star in the upper right quadrant. The star is relatively bright and appears as a small white dot. The arrow is a solid yellow line with a triangular head pointing towards the star. The text 'CH Cyg' is written in a bold, yellow, sans-serif font, positioned above the arrow's tail. The overall image has a high-contrast, grainy appearance typical of astronomical photography.

CH Cyg

simbad.u-strasbg.fr/simbad/sim-id?ident=CH+Cyg&Nbident=1&Radius=2&Radius.unit=arcmin&submit=submit+id

Shelyak Base Bugs SRL 1&1 Dropbox-SPOX Serveur Fripon BeSS & co Banque Radio

Portal Simbad VizieR Aladin X-Match Other Help

CH Cyg

other query modes : Identifier query Coordinate query Criteria query Reference query Basic query Script submission TAP Output options Help

Query : CH Cyg submit id

C.D.S. - SIMBAD4 rel 1.5.12 - 2018.02.10CET10:51:45

Available data : Basic data Identifiers Plot & images Bibliography Measurements External archives Notes Annotations

Basic data :

V* CH Cyg -- Symbiotic Star

Other object types:

ICRS coord. (ep=j2000) : 19 24 33.06773 +50 14 29.1263 (Optical) [7.55 6.16 90] A 2007AGA...474..653V

FK5 coord. (ep=j2000 eq=2000) : 19 24 33.068 +50 14 29.13 [7.55 6.16 90]

FK4 coord. (ep=B1950 eq=1950) : 19 23 14.17 +50 08 31.4 [43.66 35.54 90]

Gal coord. (ep=j2000) : 001.8500 +15.5799 [7.55 6.16 90]

Proper motions mas/yr : -7.09 -19.93 [0.70 0.86 0] A 2007AGA...474..653V

Radial velocity / Redshift / cz : V(km/s) -59.74 [0.46] / z(-) -0.000199 [0.000002] / cz -59.73 [0.46] A 2009AGA...490..6279

Parallax (mas): 4.12 [0.67] A 2007AGA...474..653V

Spectral type: M7IIIab+Be C 2015ARep...35...315

Fluxes (7) :

U 8.14 [-] C 2002yCat..2237....00

B 8.77 [-] C 2002yCat..2237....00

V 7.00 [-] C 2002yCat..2237....00

I 5.345 [-] D 2009A(A...59...33P

J 0.76 [-] C 2002yCat..2237....00

H -0.35 [-] C 2002yCat..2237....00

K -0.70 [-] C 2002yCat..2237....00

SIMBAD query around with radius 2 arcmin

Interactive AladinLite view

2MASS DSS SDSS

VizieR photometry viewer

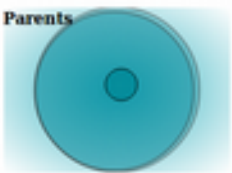
Search within radius Max 30 arcsec

Hierarchy : number of linked objects
whatever the membership probability is (see description here) :

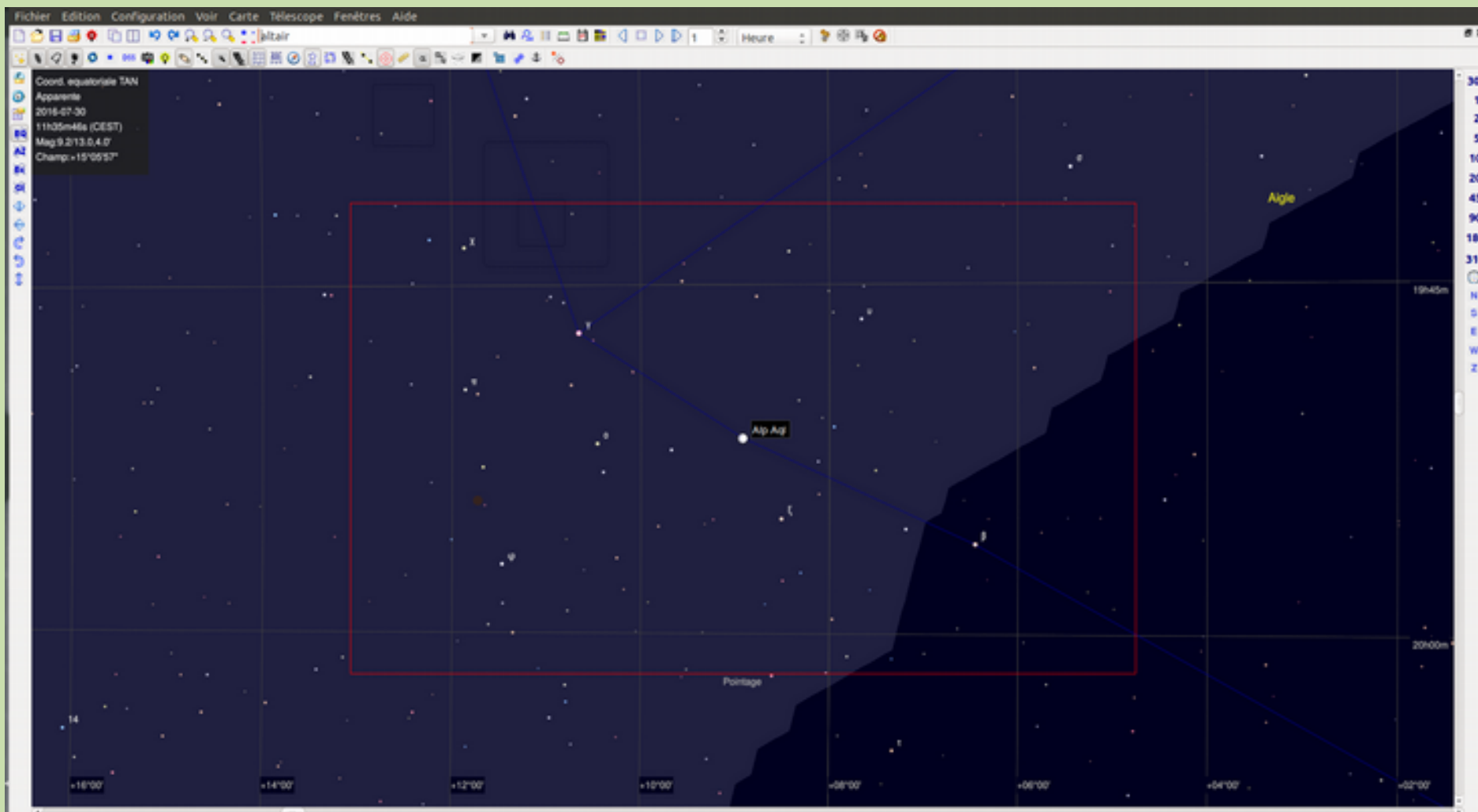
parents : 1

Display criteria : All

Parents



Sky map



Recommendations

- Back to basics, always
- **Make your first spectra on a bench**
- Control your telescope without spectroscope
- Train yourself to point any star
- **An observation is a consistent set of images**
- Process your data quickly
- Images are made to fit the data reduction process
- Never let your computer make the decisions for you
- Observe regularly (even in city center)
- Continuous improvement (a small step every day)
- Share your results !
- Join collaborative programs



Your night mission is...

**Put as much light
as possible in the slit**

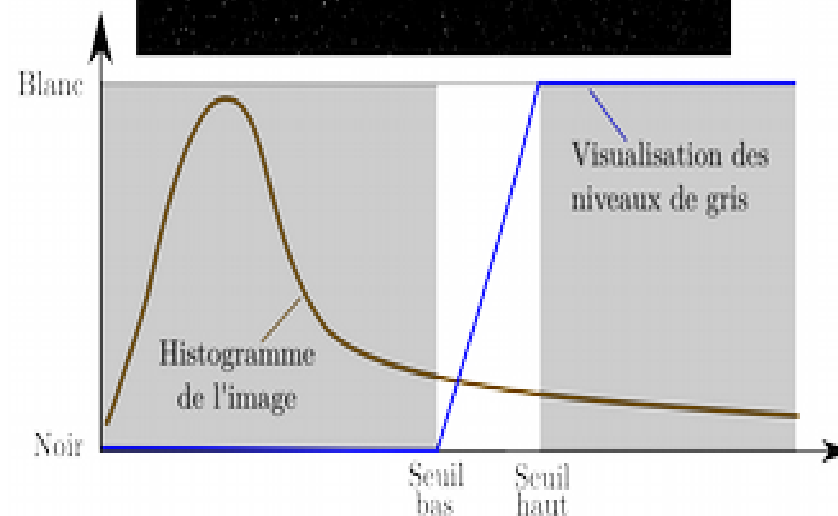
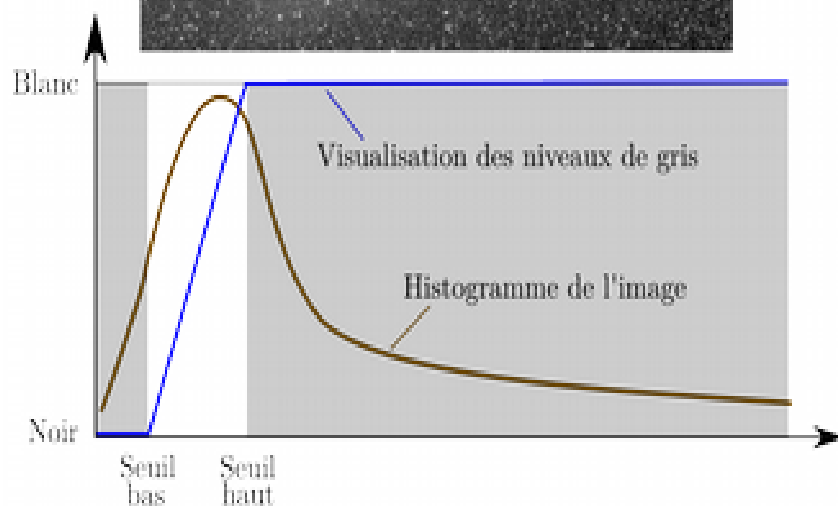
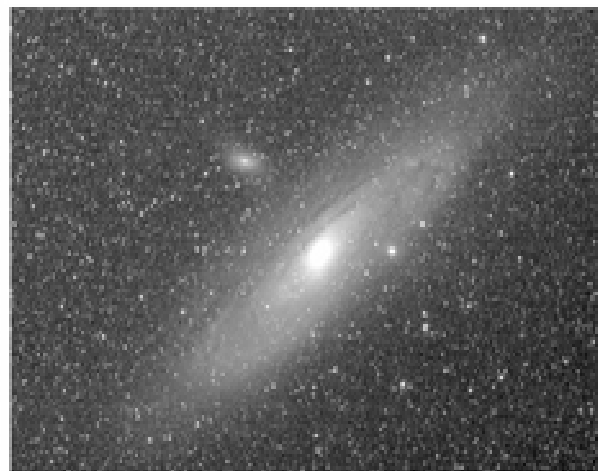
- Firmly put on the ground
- Polar alignment : several methods
 - Polar finder, King, Bigourdan, mount software
 - Which precision level ?
- Tighten locking screws
- PC connection
 - RS232 / ST4

Attaching the spectro

- *Adpater rings*
- *RIGID attachement*
- Orientation of elements
- *Balancing*
- *Cables management*
- *Remote control*
 - Don't touch at the spectro during the night*
- If it works, don't fix it !

Cable management

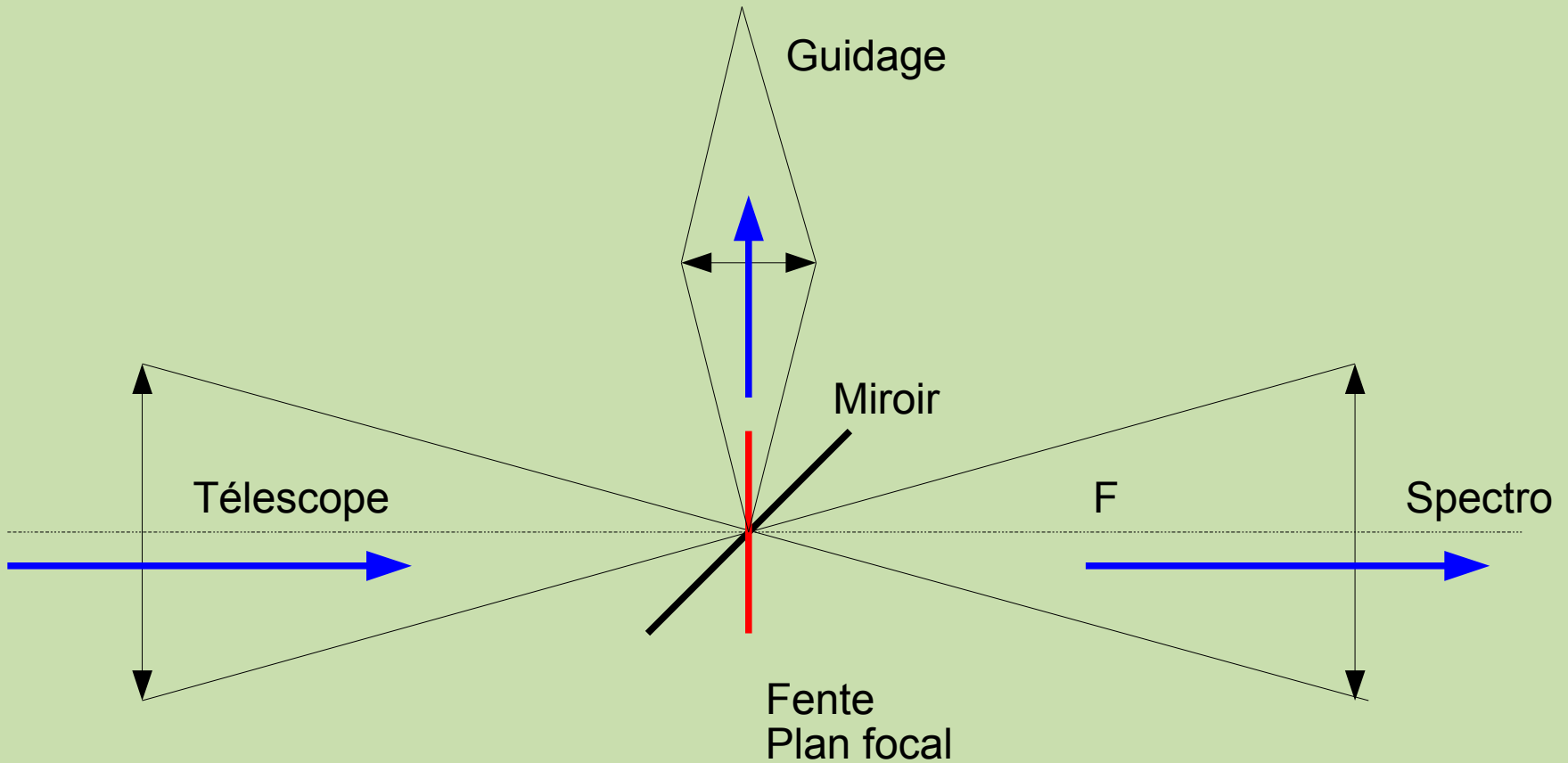




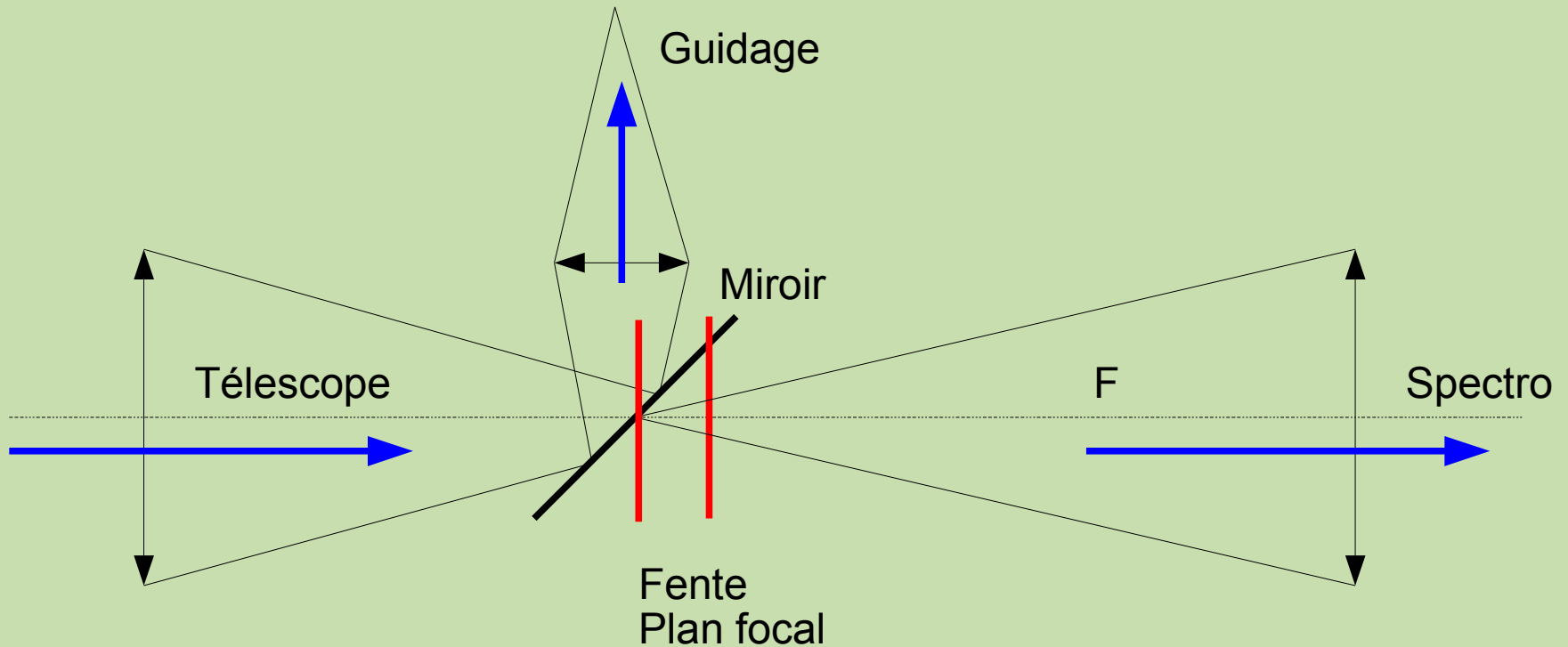
Focusing order

- Spectroscope,
 - Then guiding,
 - Then telescope
-
- Exp time optimisation
 - Prevent saturation
 - Displaying 1:1, binning 1:1
 - *Measure the FWHM*
 - *Star disappears in slit*

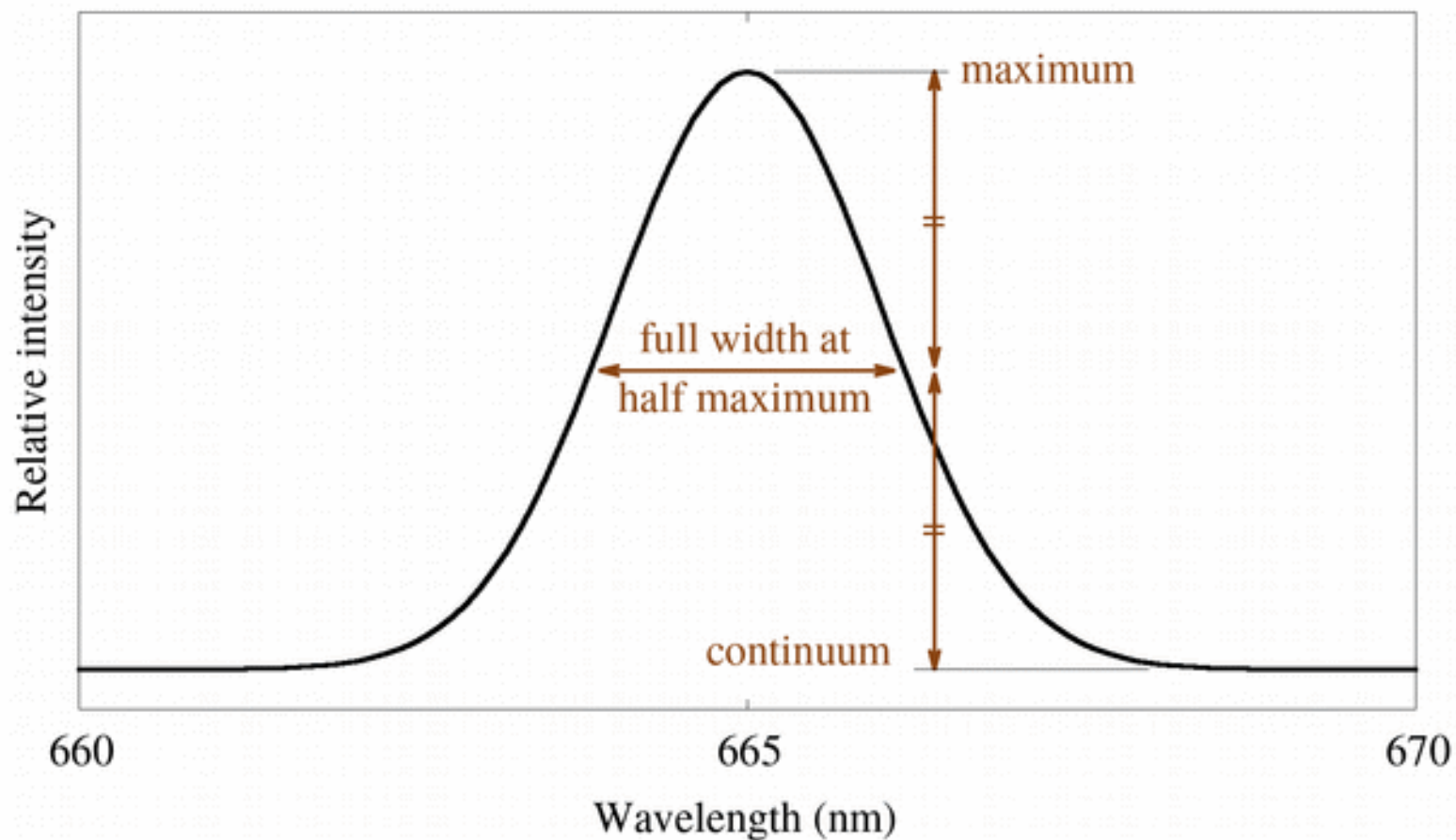
Focalisation(s) (*focusing*)



Focalisation(s) (*focusing*)



FWHM



Your mission is...

Star image

Spectroscope
slit



Star properly focused



Star badly focused

Star image

Spectroscope
slit

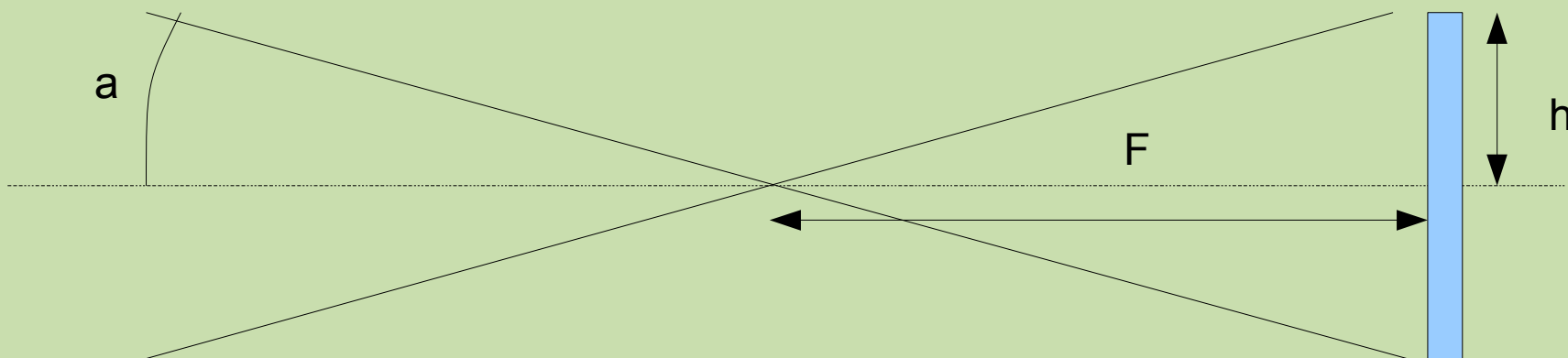


Star properly aligned

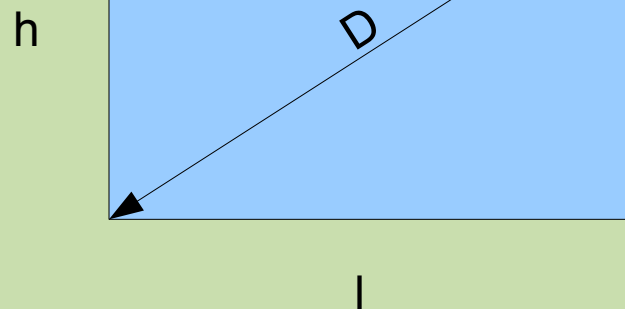


Star badly aligned

Calculate the field of view



$$\text{tg}(a) = h/F$$



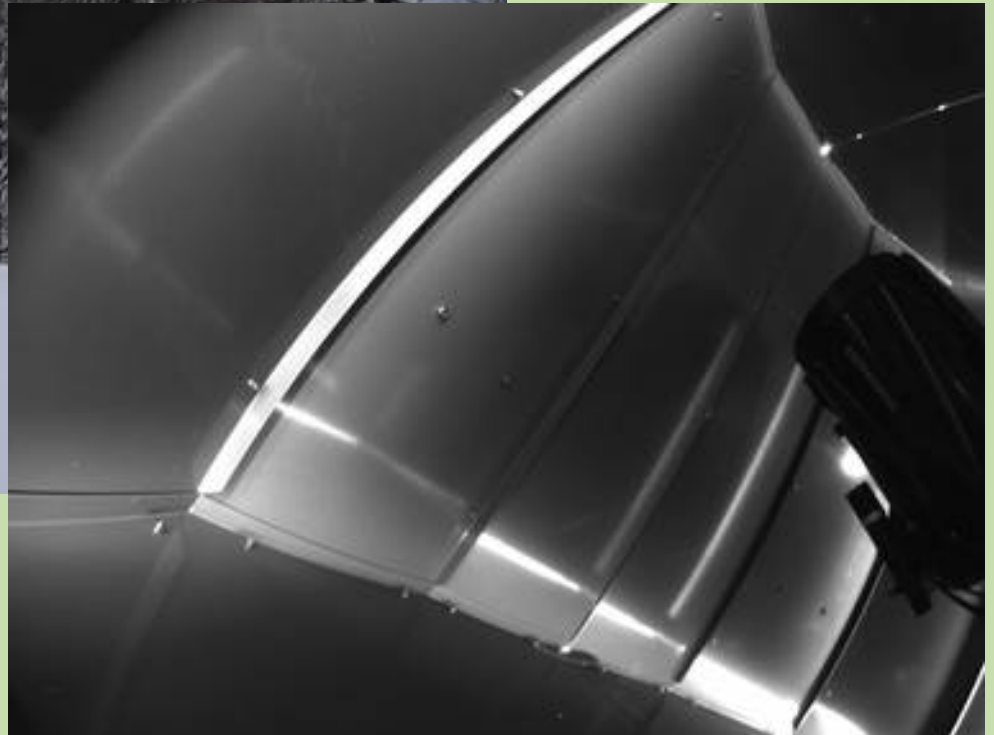
Telescope shelter



Telescope shelter

- Compact, for a small instrument
 - Useful diameter 1.15m
- Remote opening & closing
 - Python script
- No moving part inside the shelter
- Possible to close whatever the telescope position
- Controlled by Arduino & Raspberry
 - 4 stepper motors
- All parts in stainless sheet metal or painted aluminium
- All moving parts use ball bearings
- Only flat or small parts : easy shipment
- Easy assembly (one day)

Abri télescope



OHP Spectro star Party



Every year in July / August



Merci !

*Vous ne verrez
plus les étoiles
comme avant !*

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