

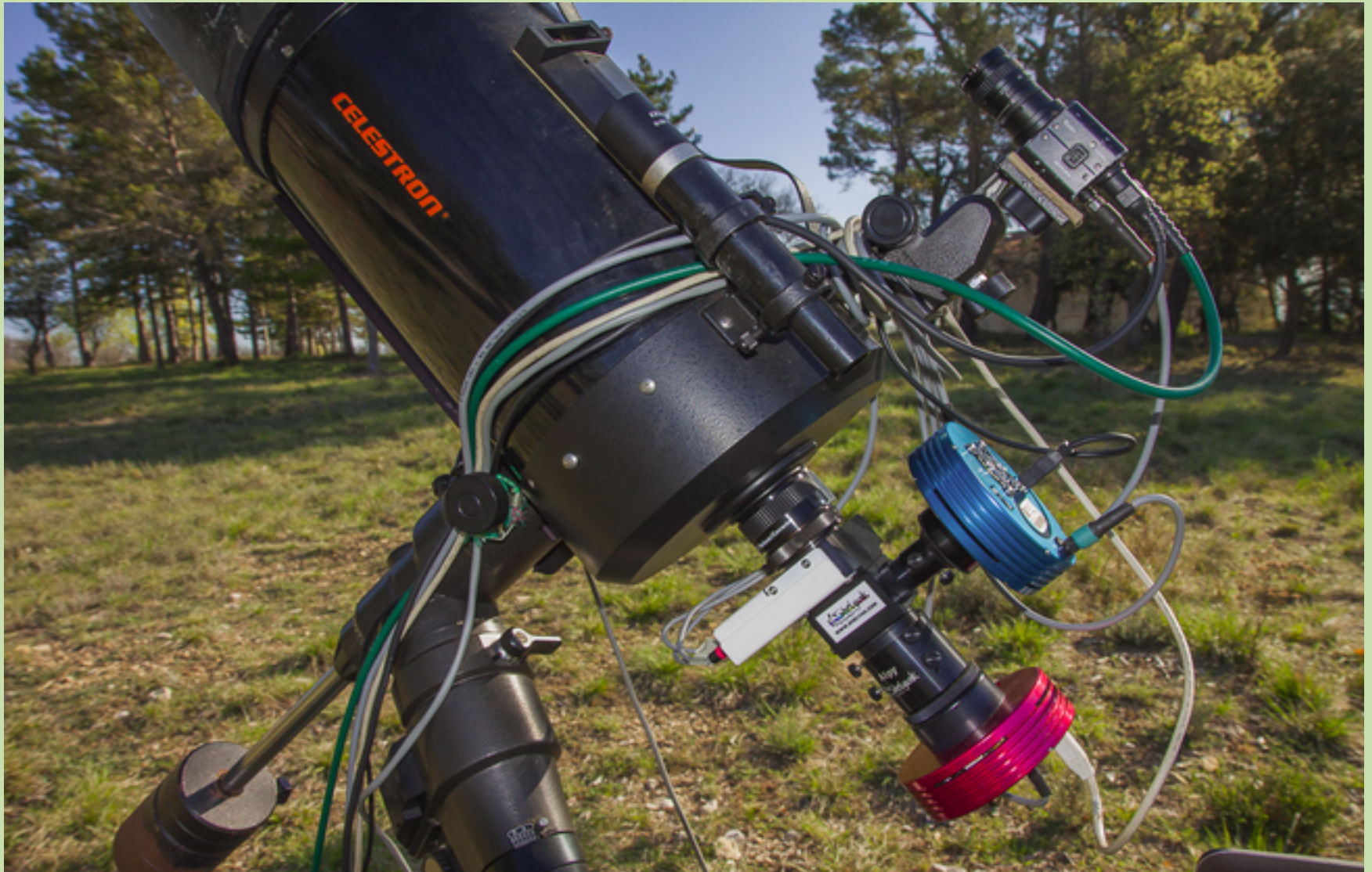


# Spectroscopy instruments

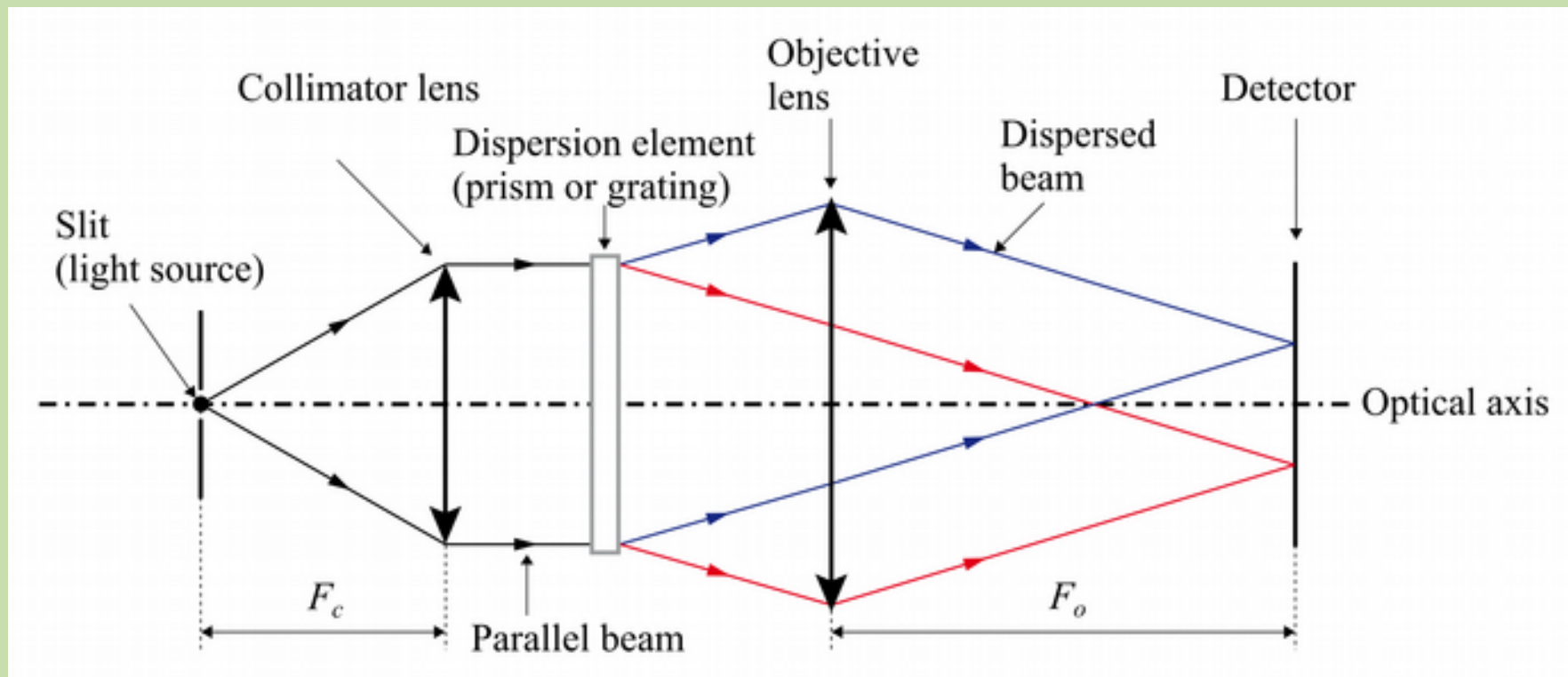
*Sacramento Mountains Spectro Workshop - 2*  
*February 22<sup>nd</sup> - 24<sup>th</sup>, 2019*

**François Cochard**  
francois.cochard@shelyak.com

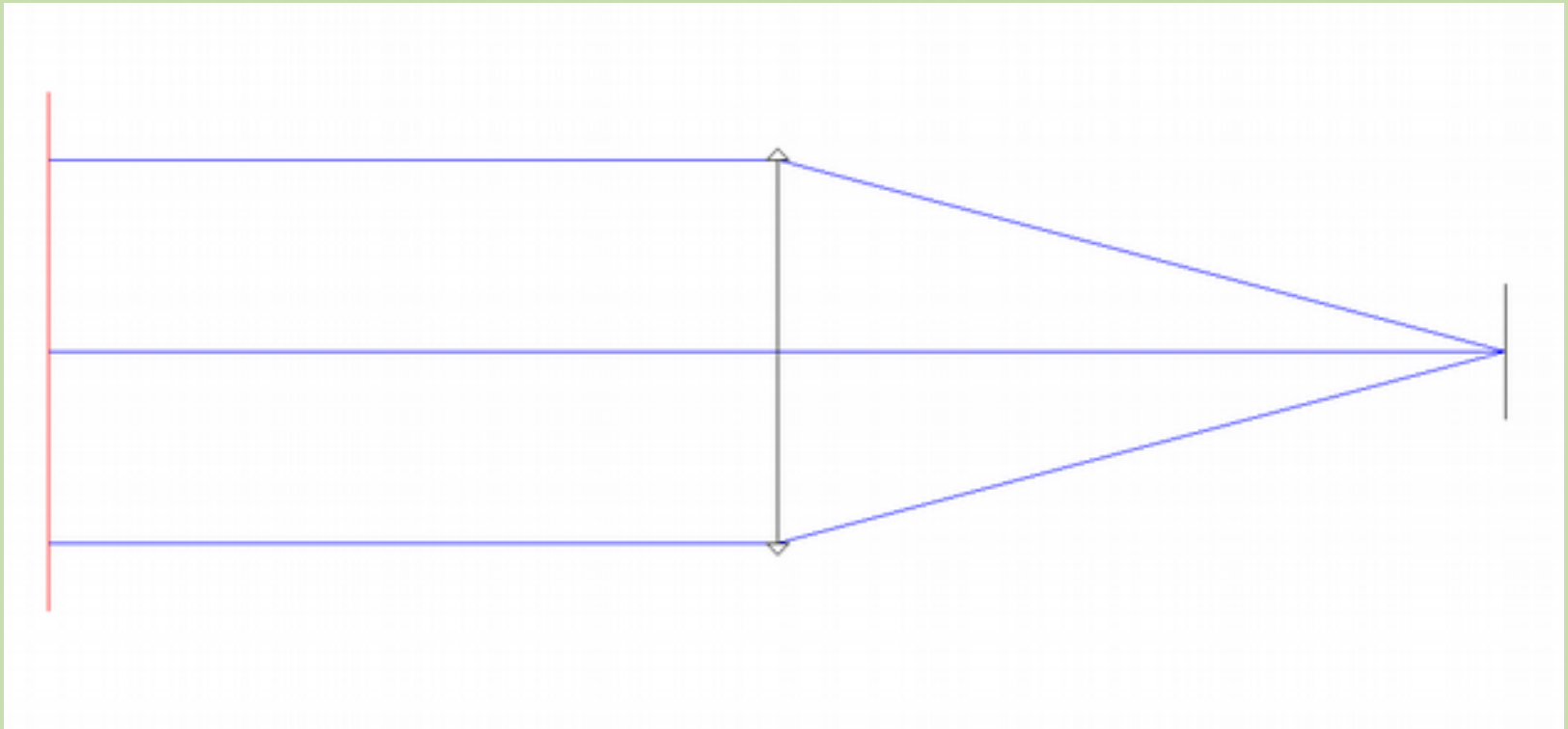
# The instrument



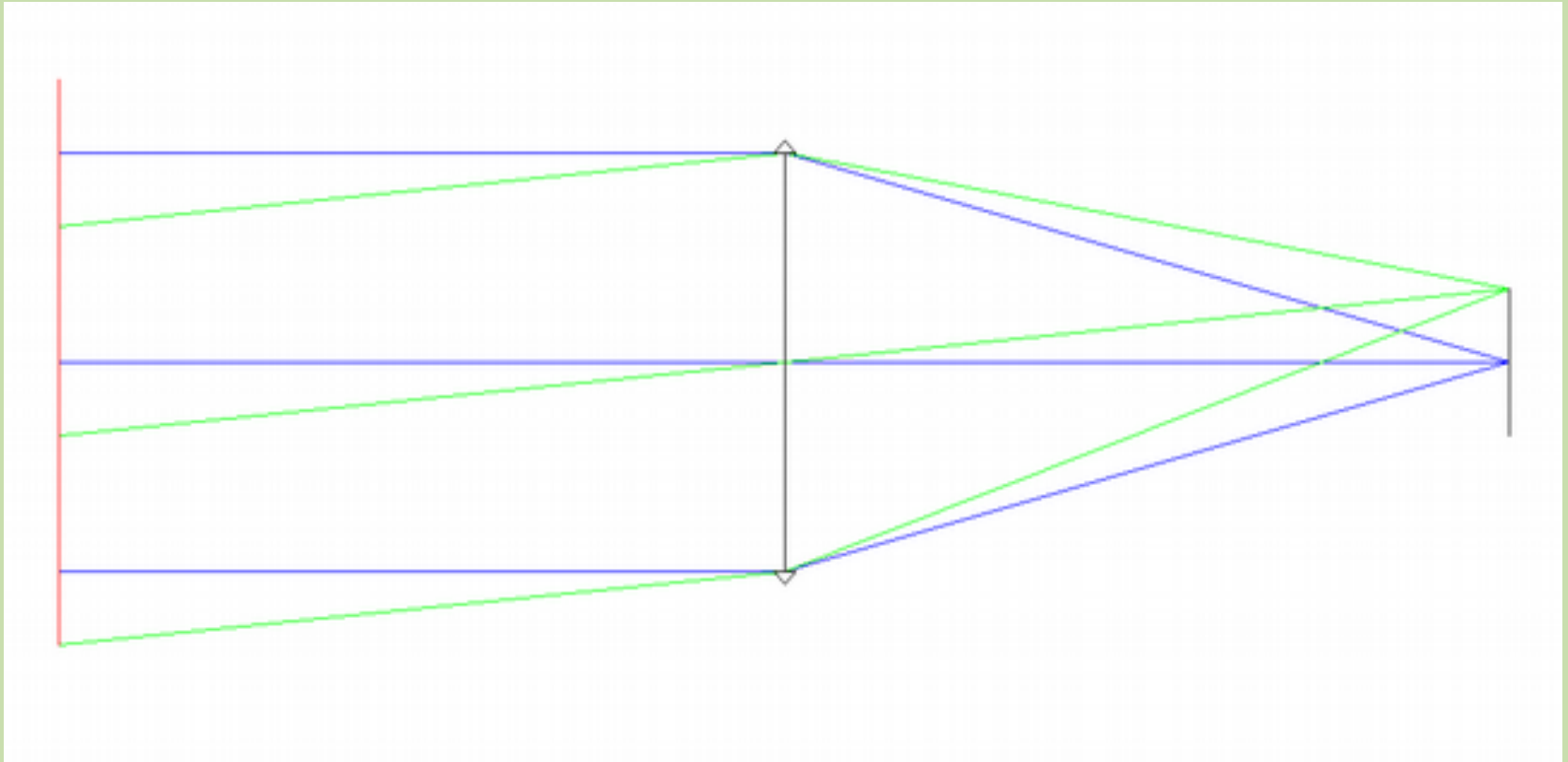
# Spectroscope principle



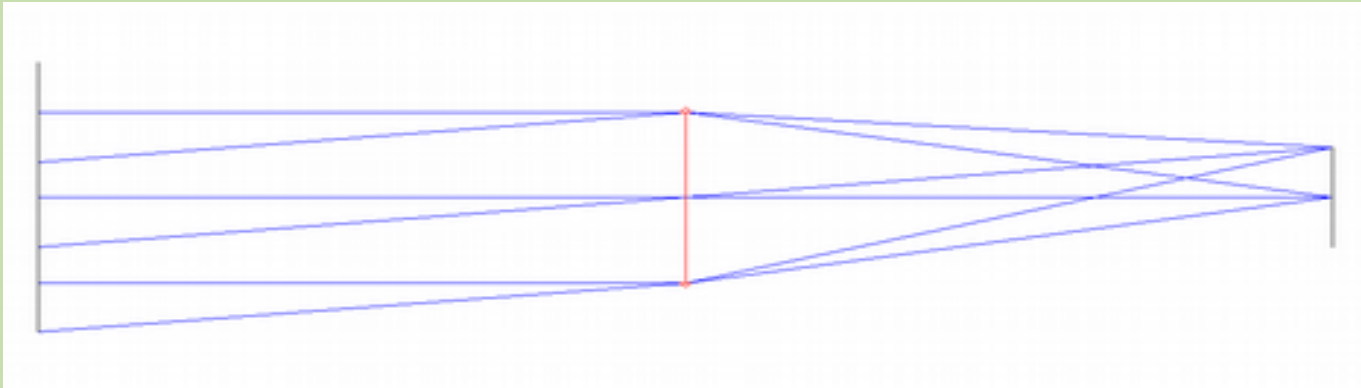
# A simple lens



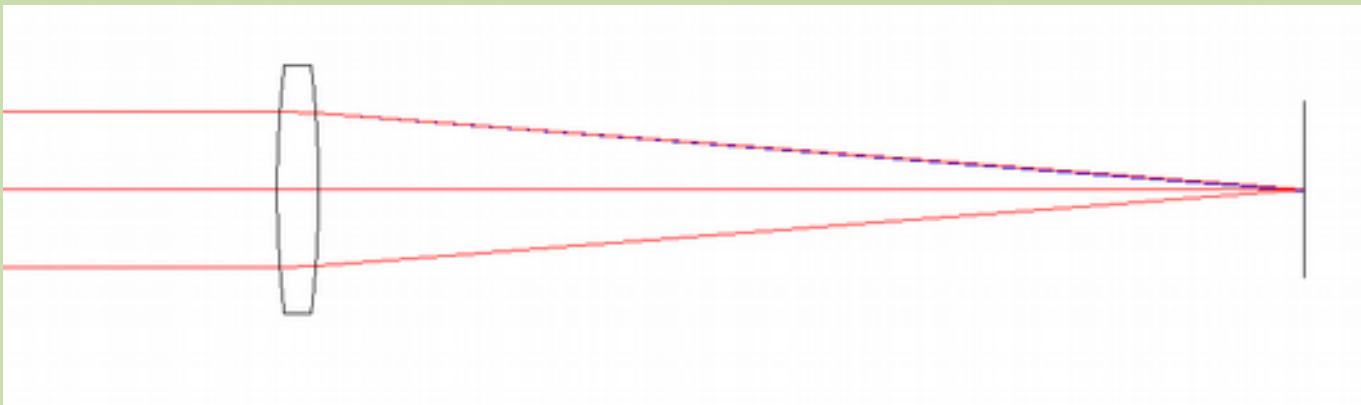
# A simple lens



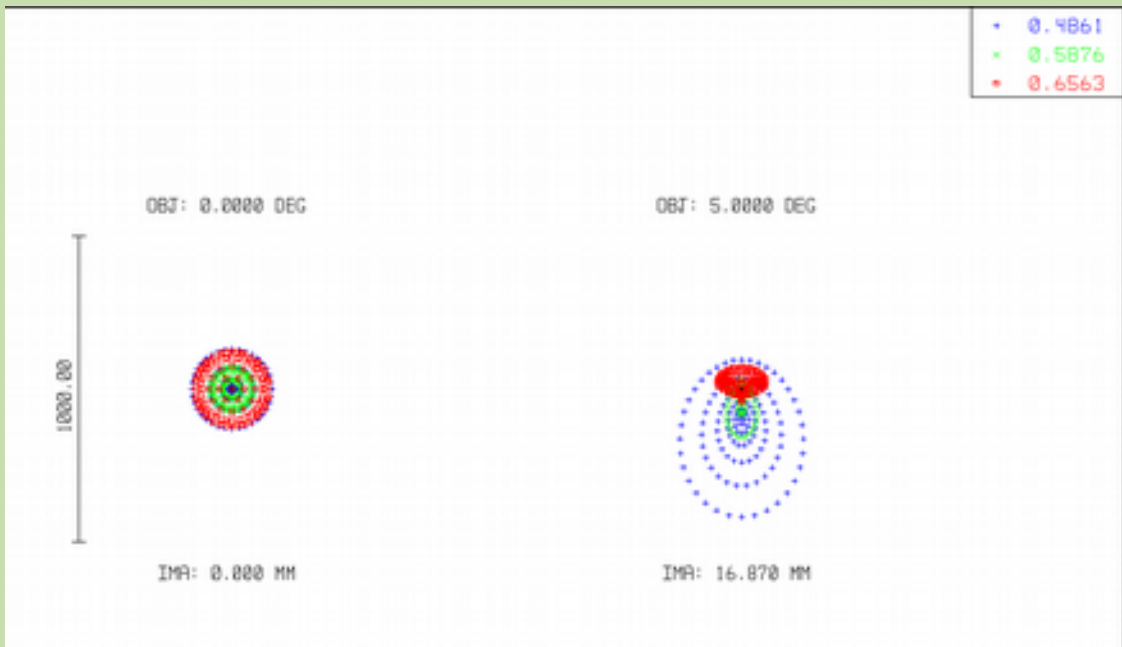
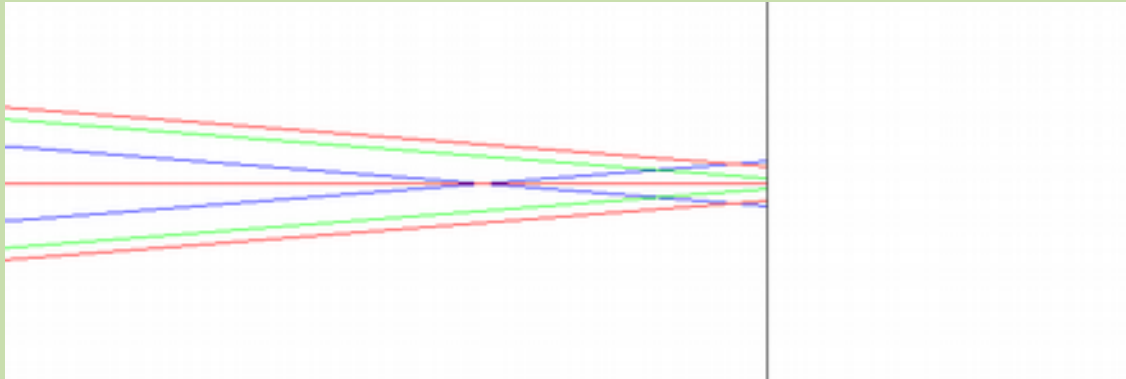
# Chromatism & aberrations



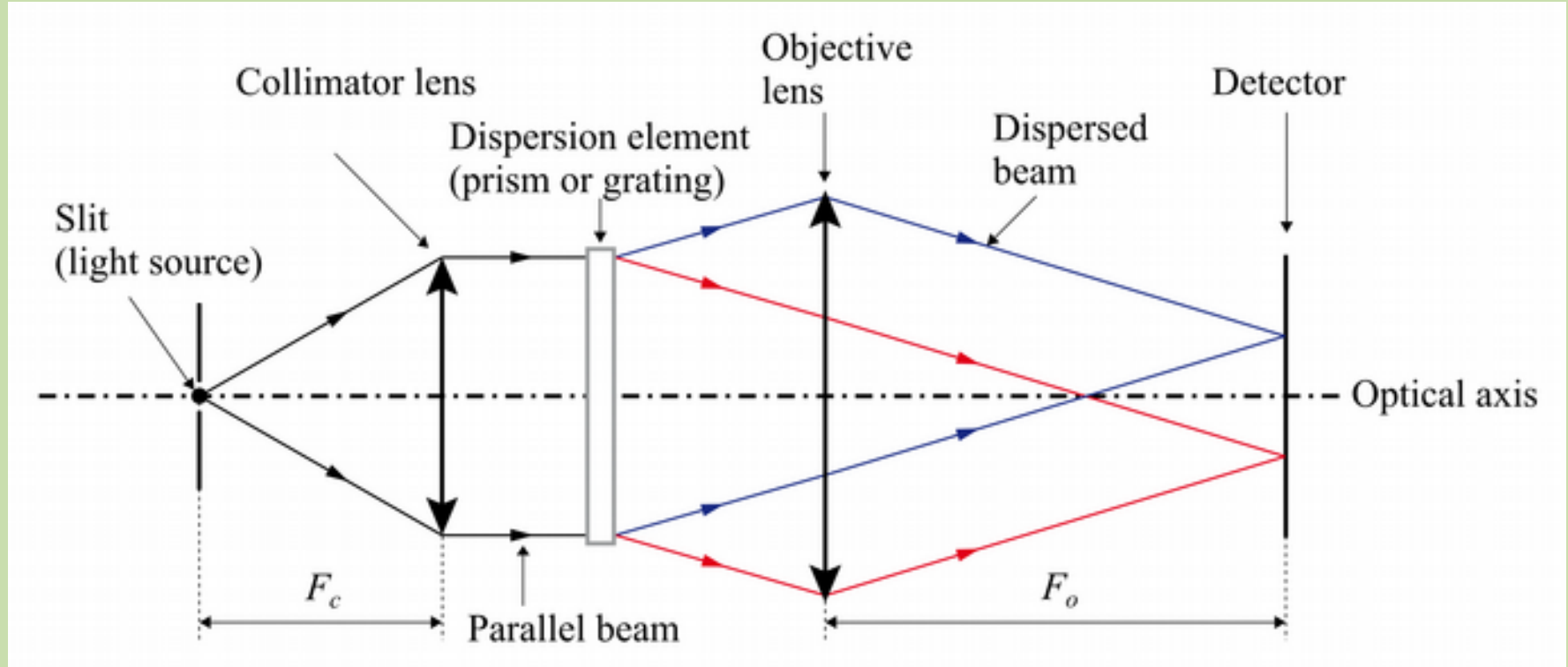
$D = 30\text{mm}$   $F = 200\text{mm}$



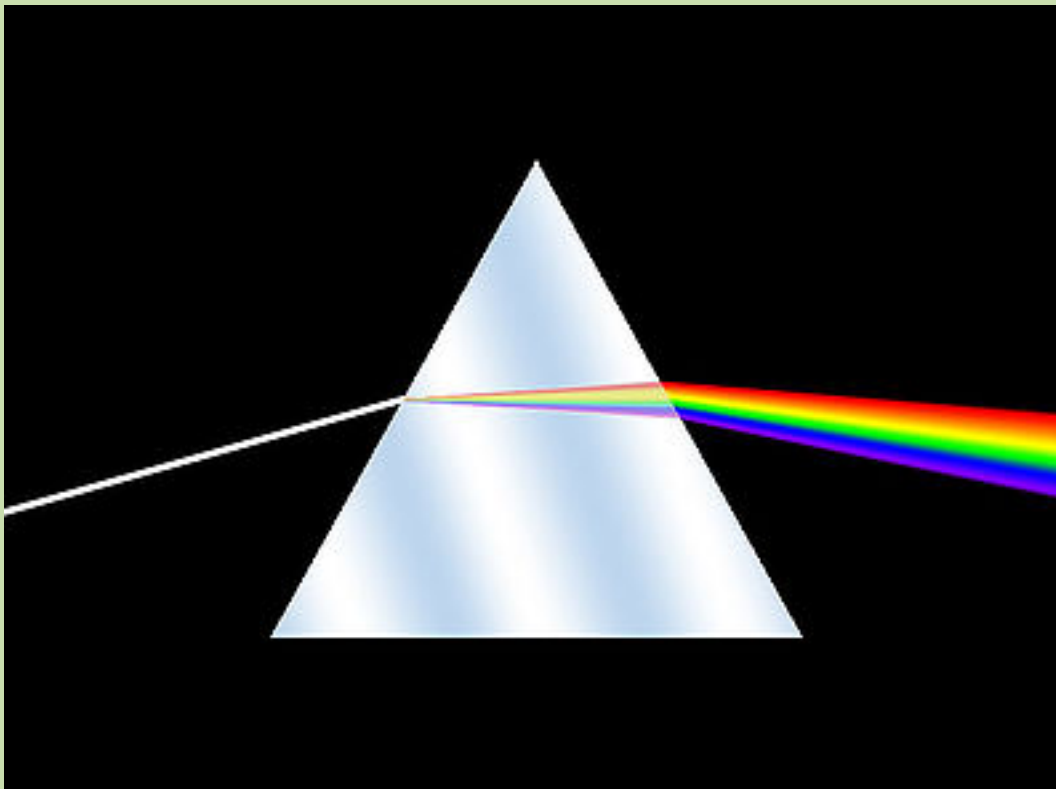
# Chromatism & aberrations



# Spectroscope principle





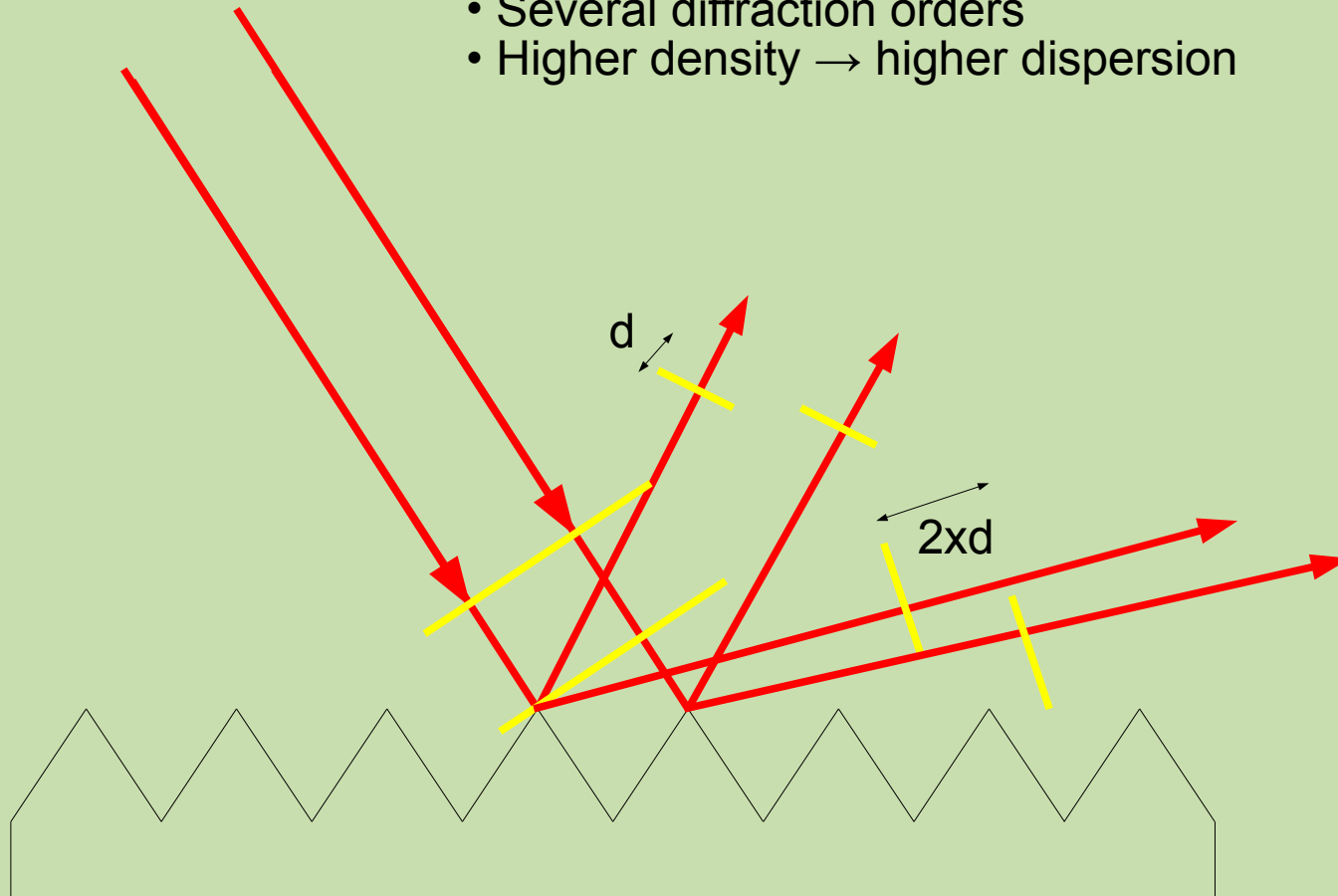


Non-linear dispersion

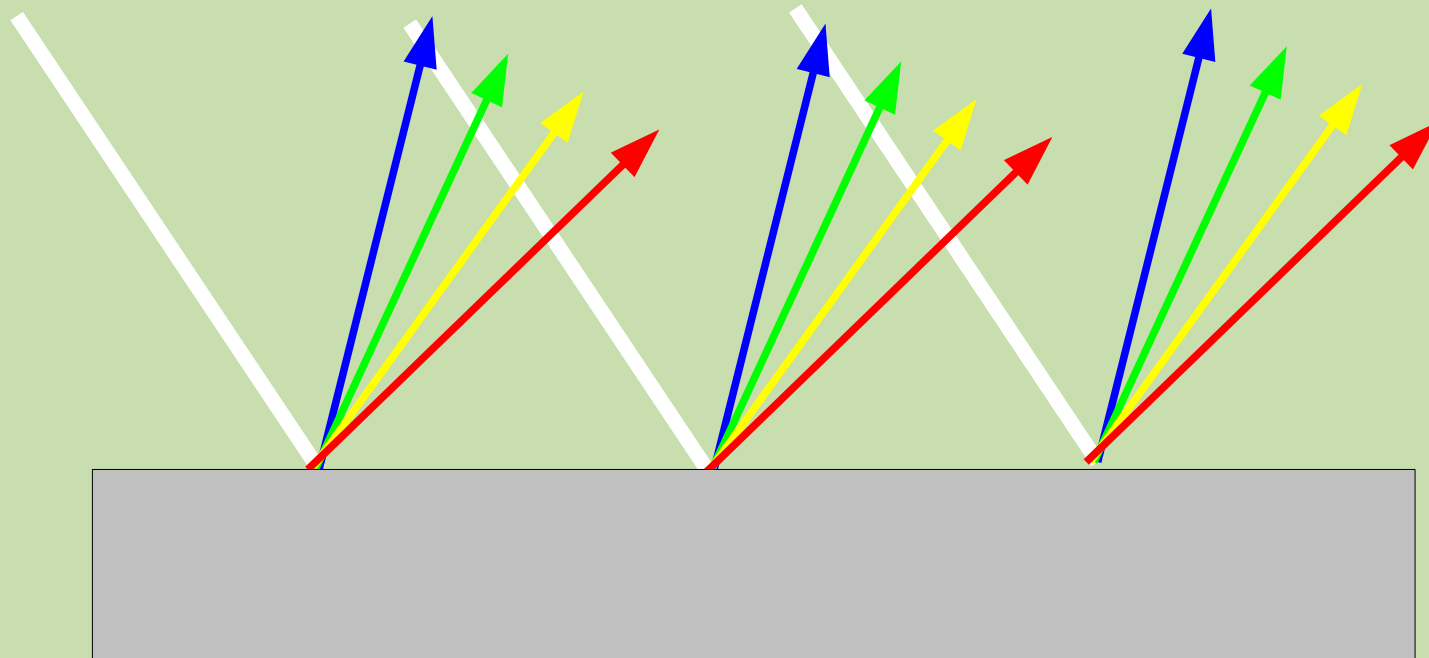
High efficiency

# Diffraction grating

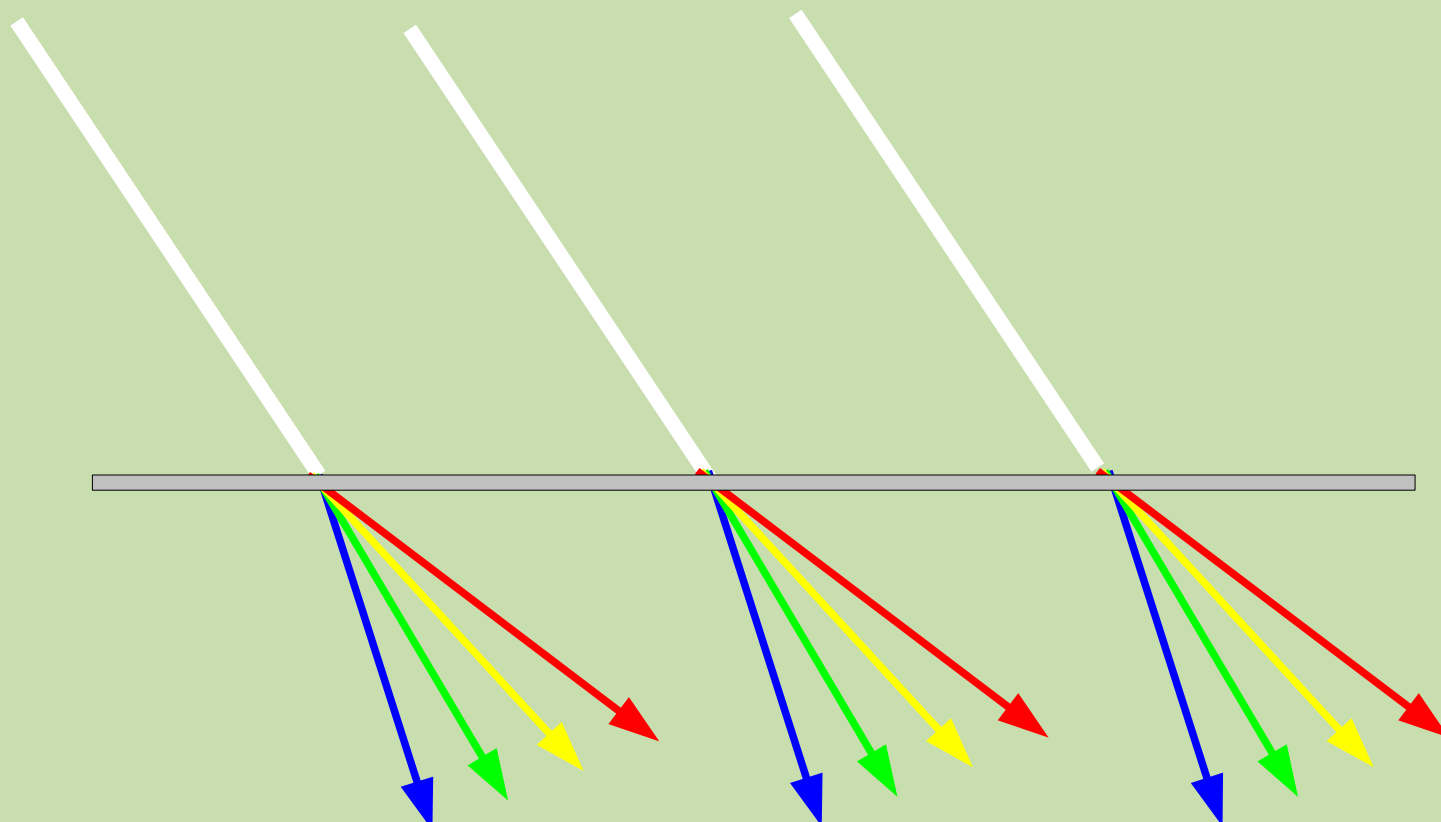
- High dispersion
- ~linear dispersion
- Several diffraction orders
- Higher density  $\rightarrow$  higher dispersion

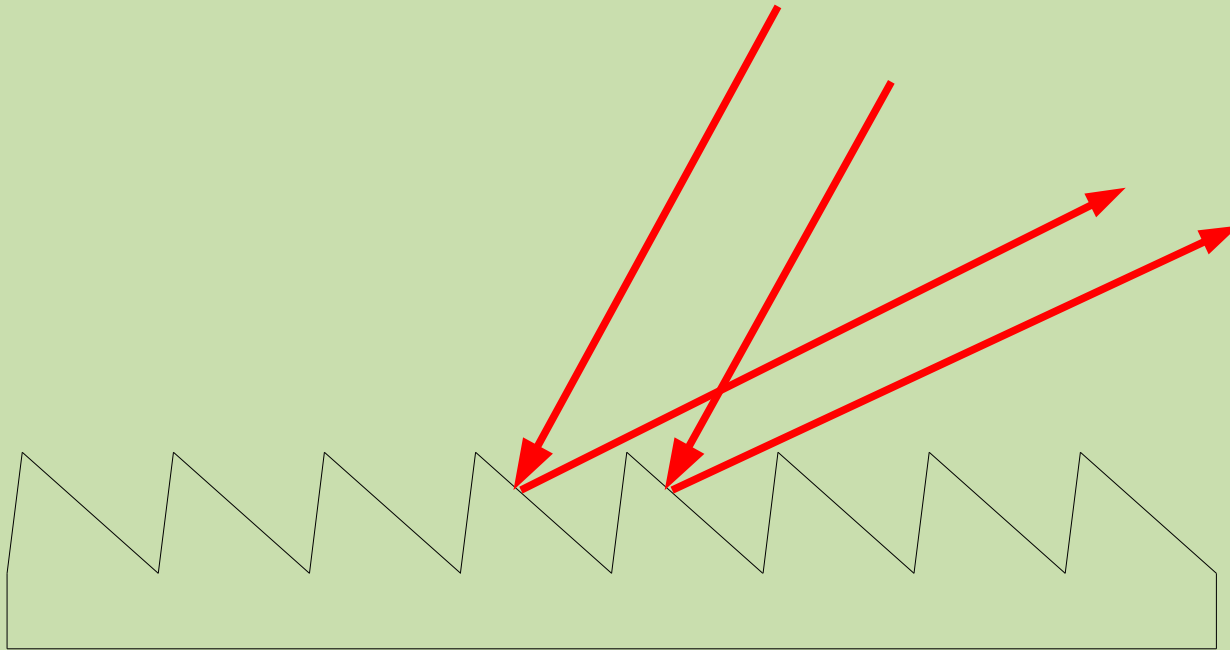


# Reflexion grating

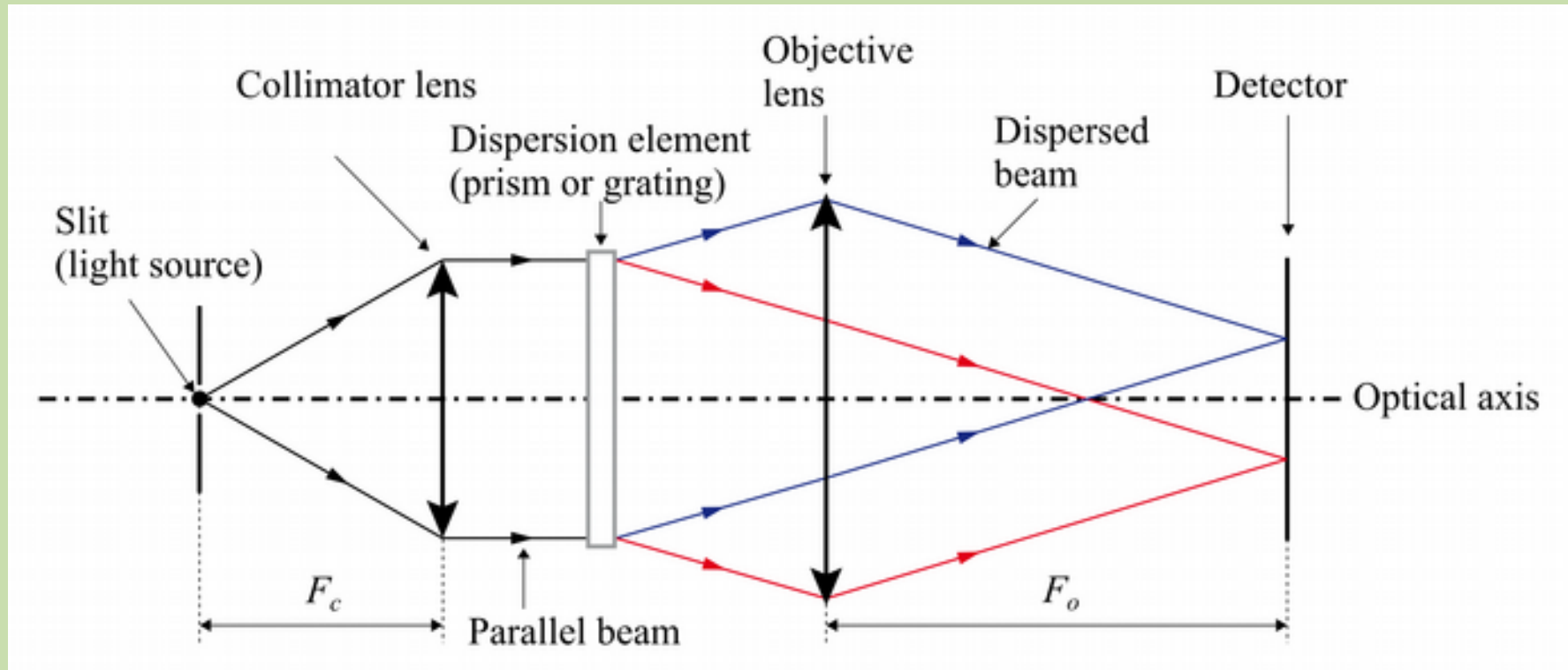


# Transmission grating



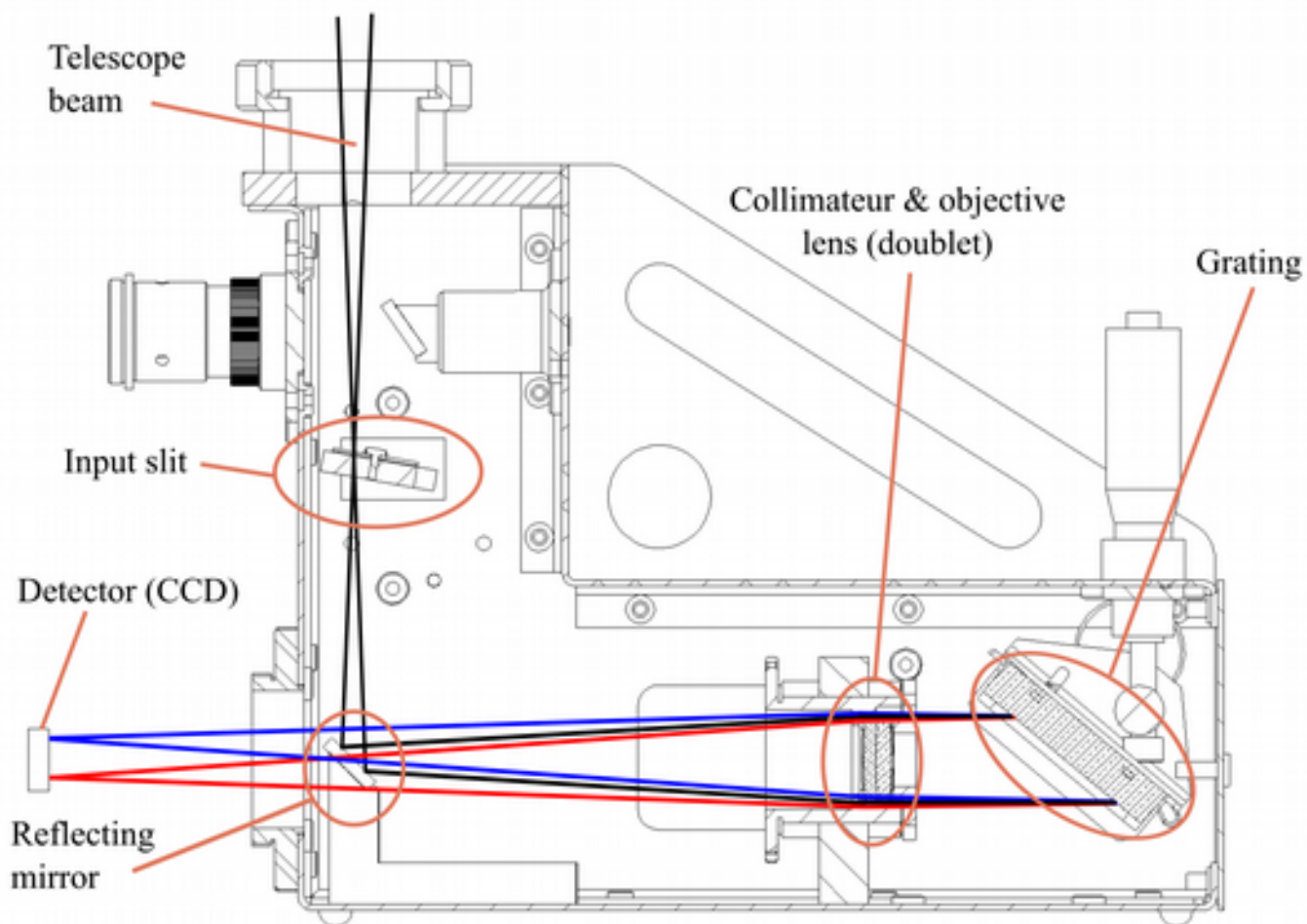


# Spectroscope principle





# Lhires III architecture

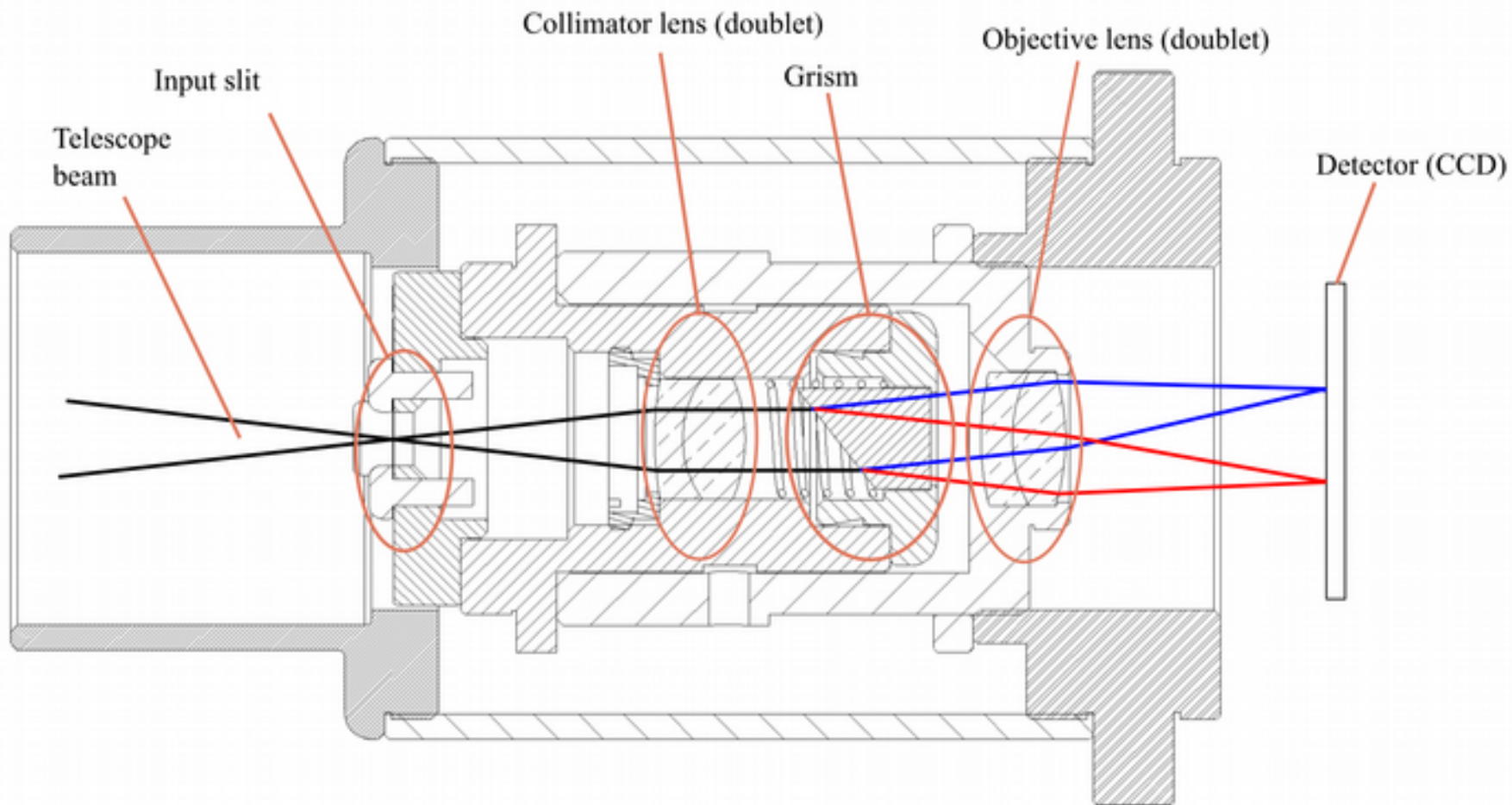


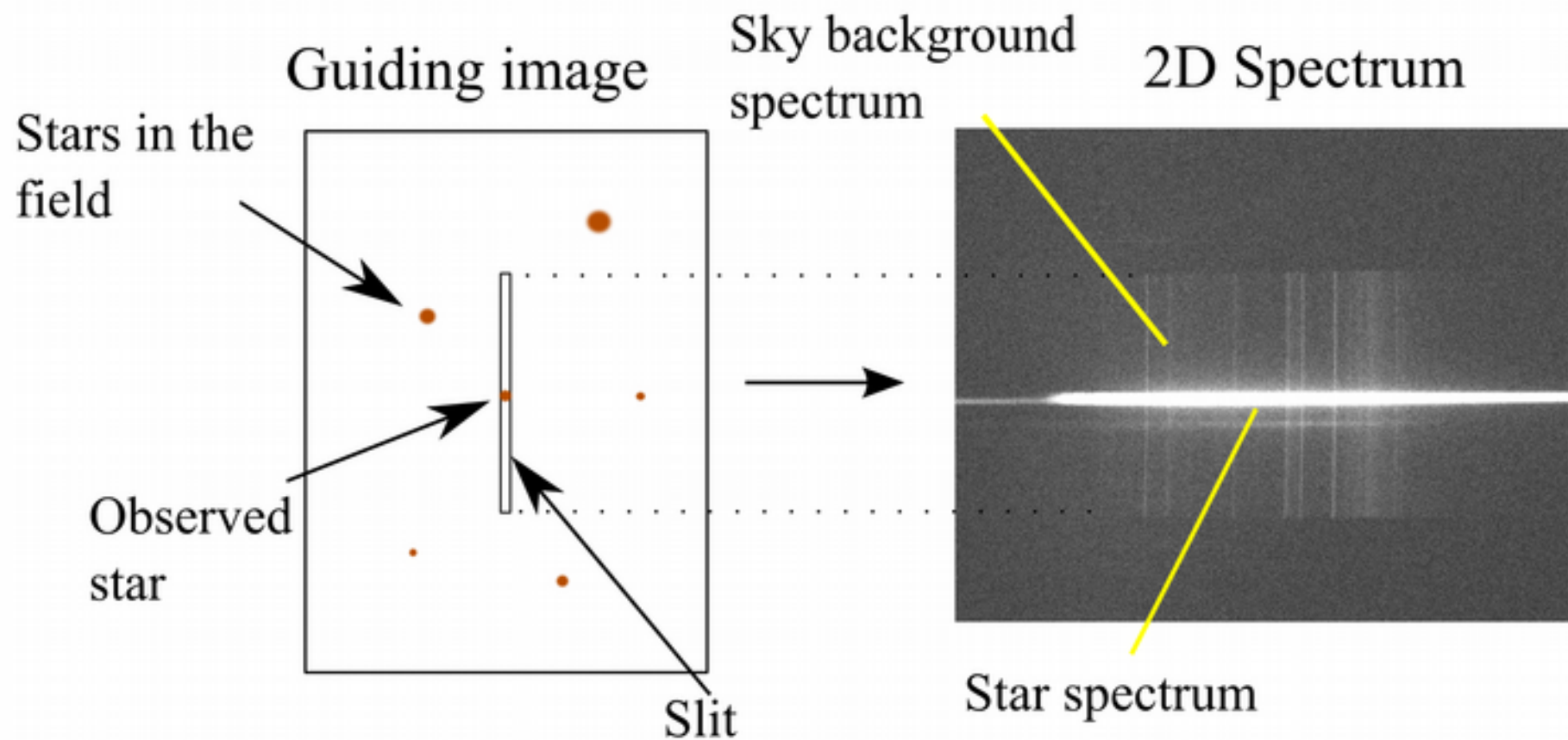


# A spectroscope: Alpy 600

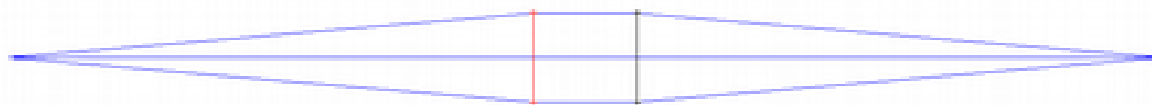
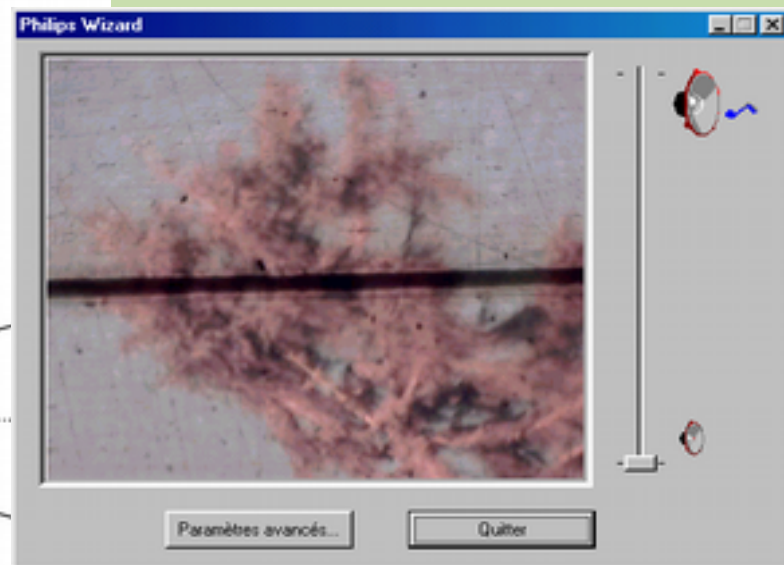
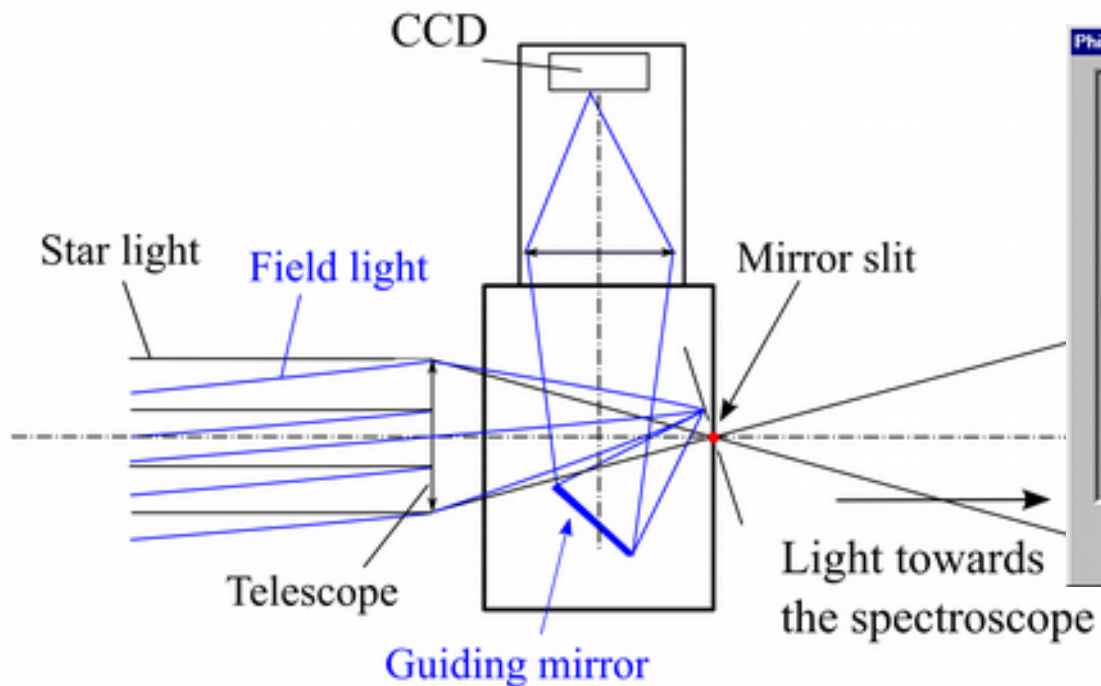
- Modular
- Compact & robust
- Low resolution : whole visible spectrum
- Slit spectroscope







We look at the slit with a 2nd camera

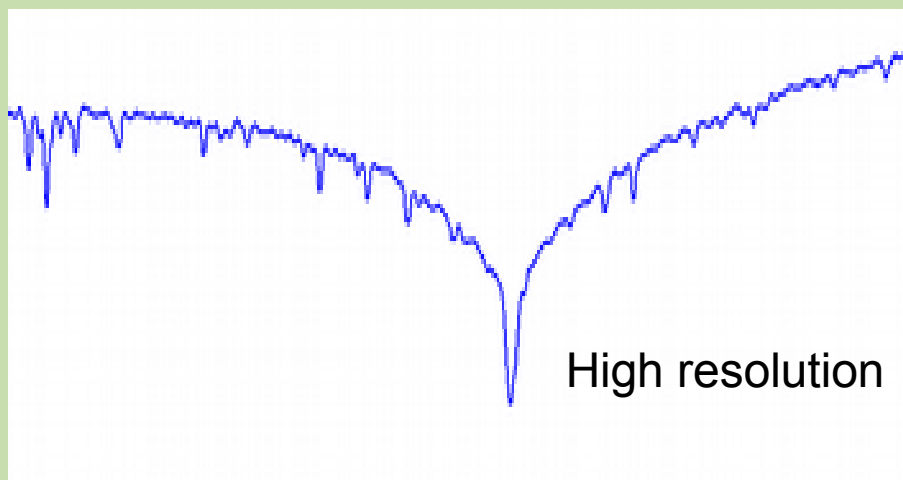
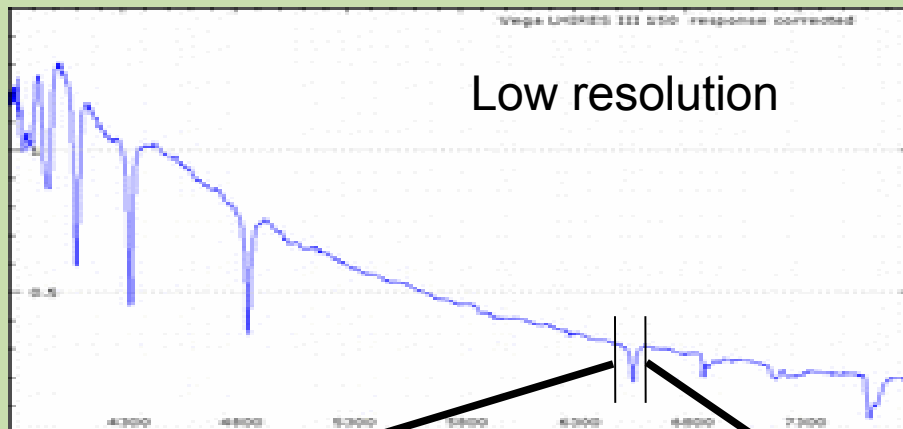


Transport d'image



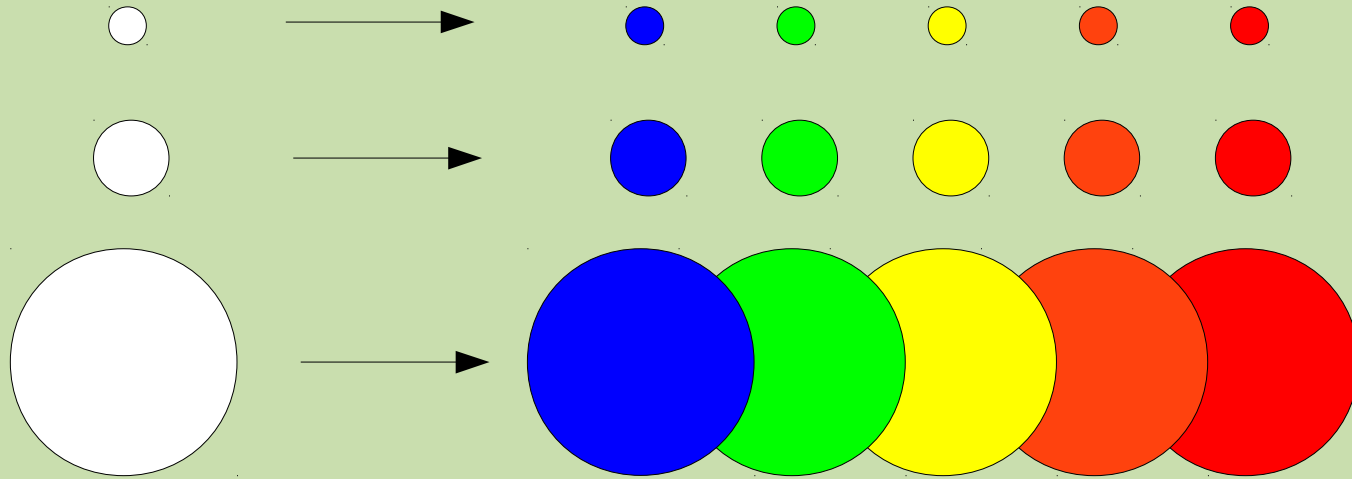
# Key parameters

- **Resolution : ability to distinguish details**
  - **Do not mix with dispersion**
- **Spectral domain coverage**
- **Slit size**
- **F-ratio (luminosity)**
- **Backfocus (mechanics)**

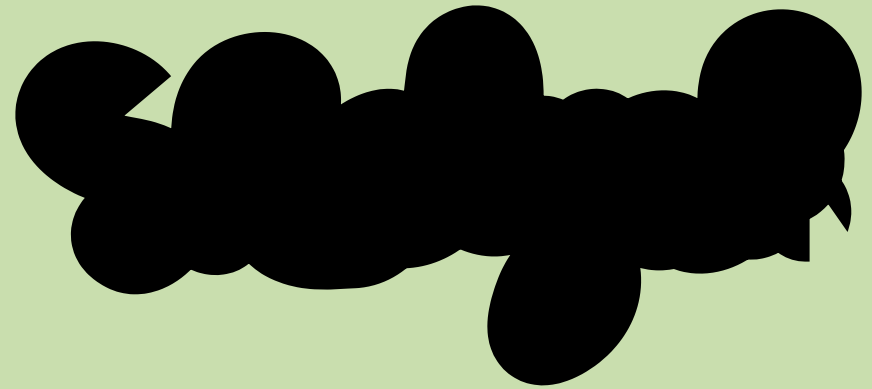


**Which resolution  
is better ?  
Low or High ?**

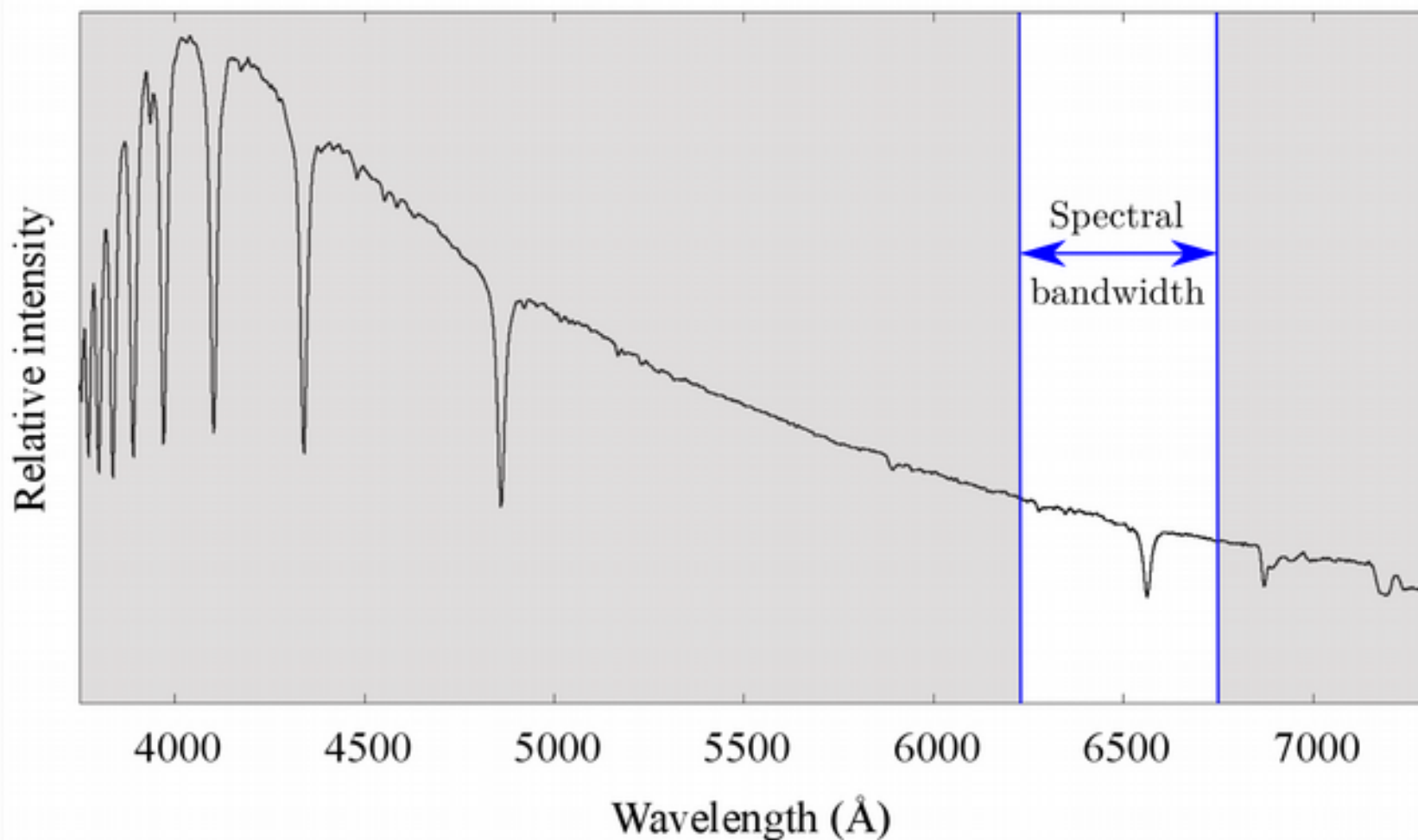
# Resolution vs Dispersion



Shelyak

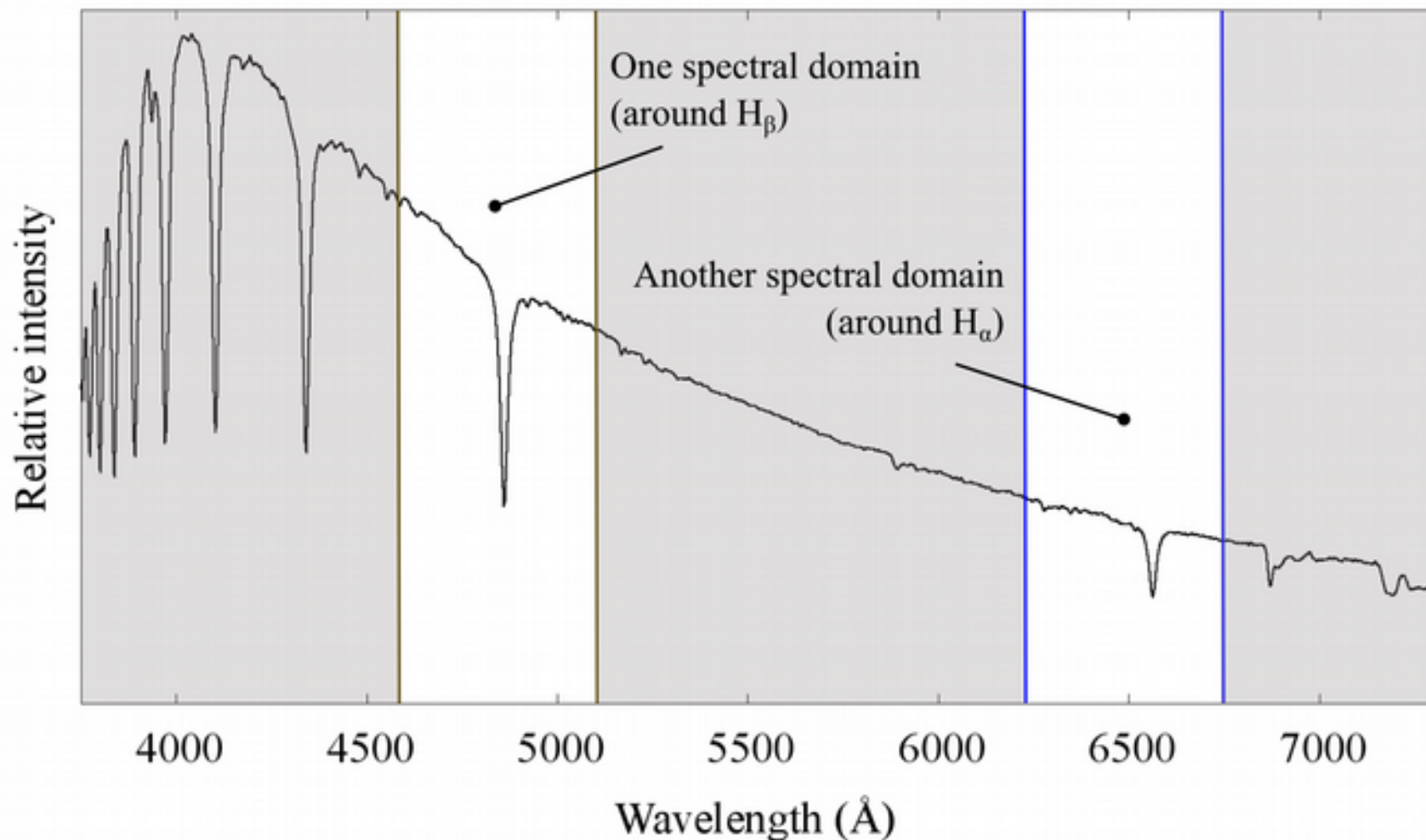


21 Lyn - Apr 18th, 2015 - F. Cochard - Alpy 600 C8 Atik314L+





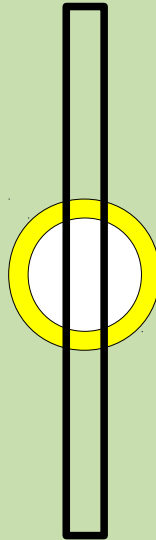
21 Lyn - Apr 18th, 2015 - F. Cochard - Alpy 600 C8 Atik314L+





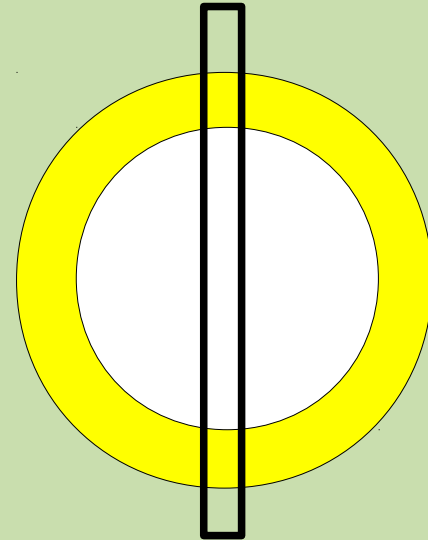
T200mm  
F/10

F = 2 m



T600mm  
F/10



F = 6 m



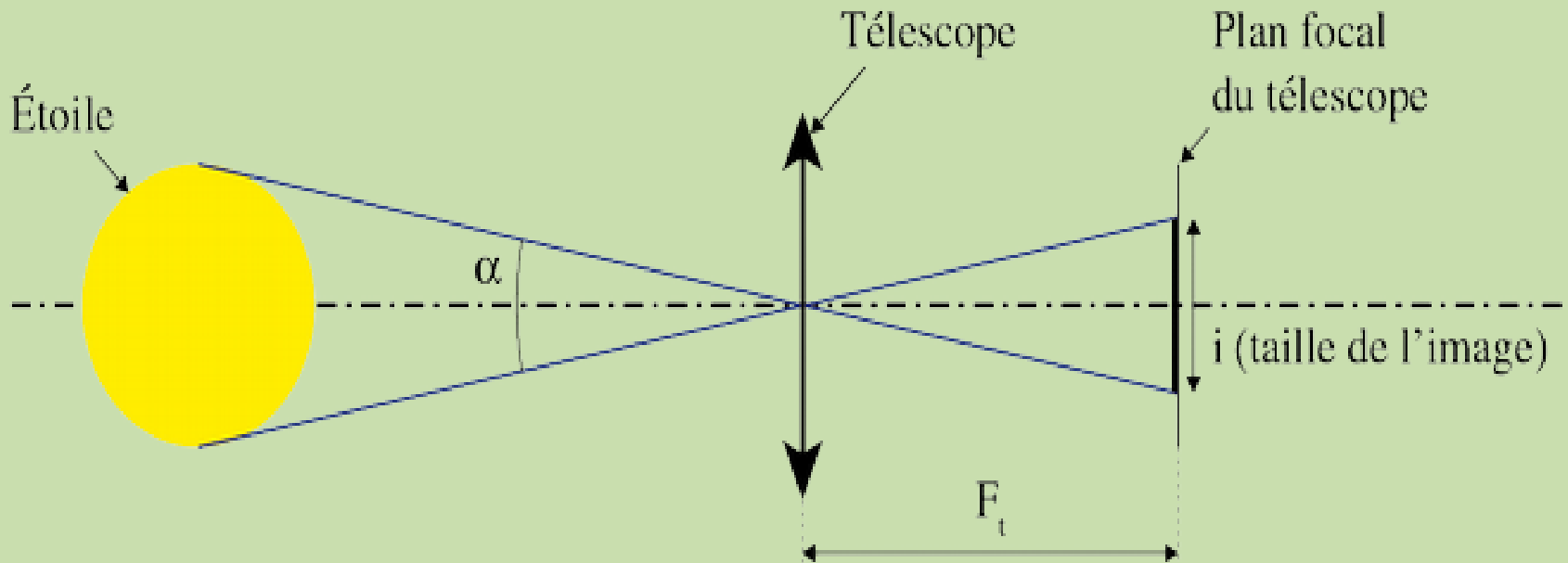
T2000mm  
F/10

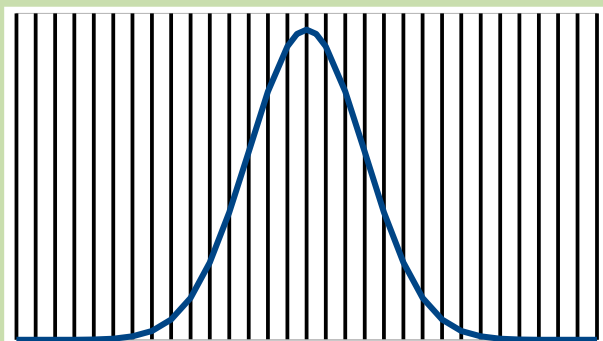
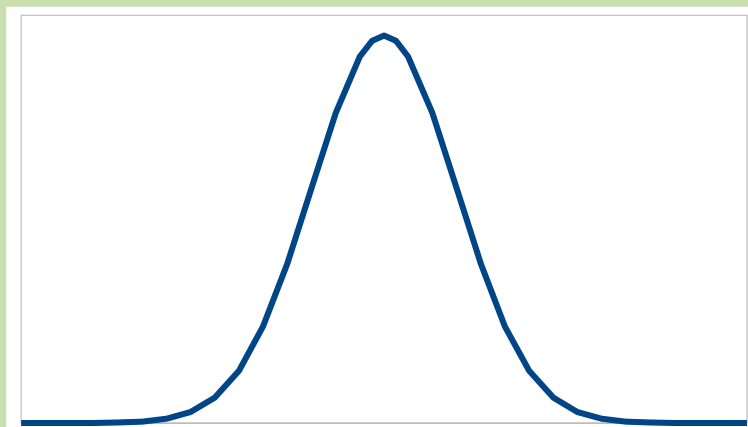
F = 20 m

## Slit $\sim 20\mu\text{m}$

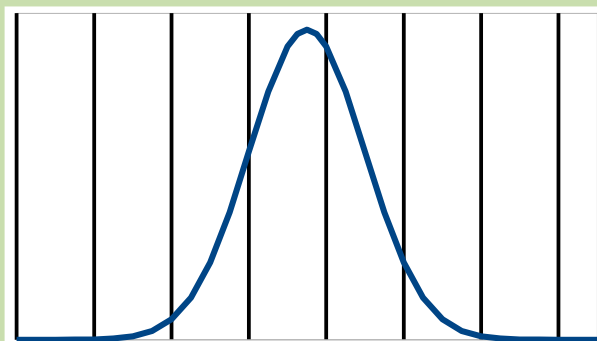
-  Bon seeing ( $\sim 1,5$  arcsec)
-  Mauvais seeing (4 arcsec)

# Star Size

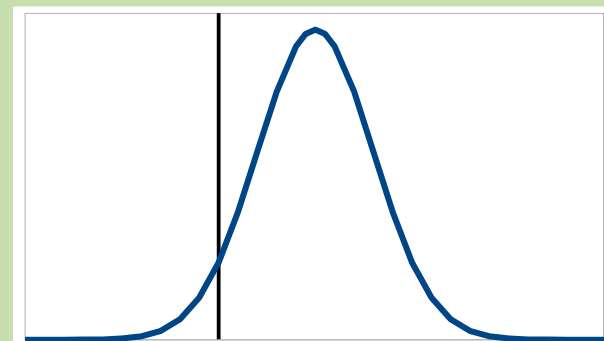




sur-échantillonné

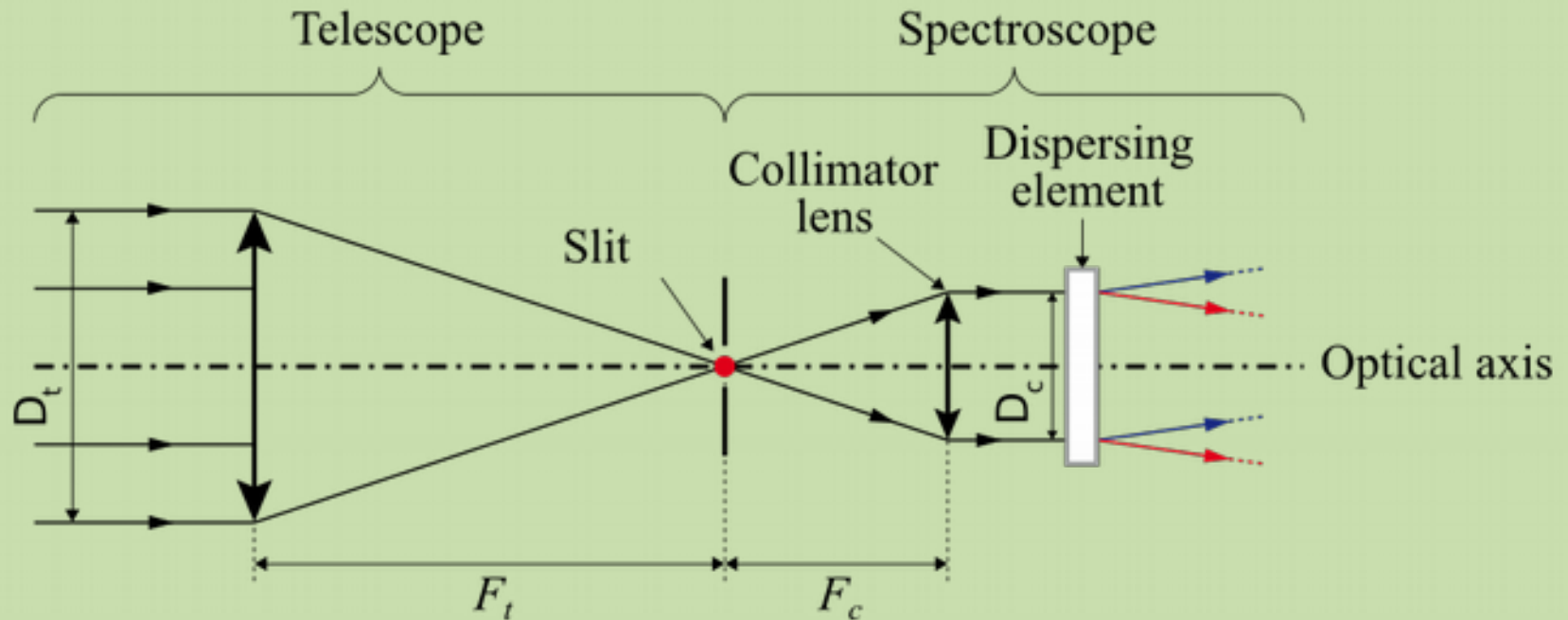


correct

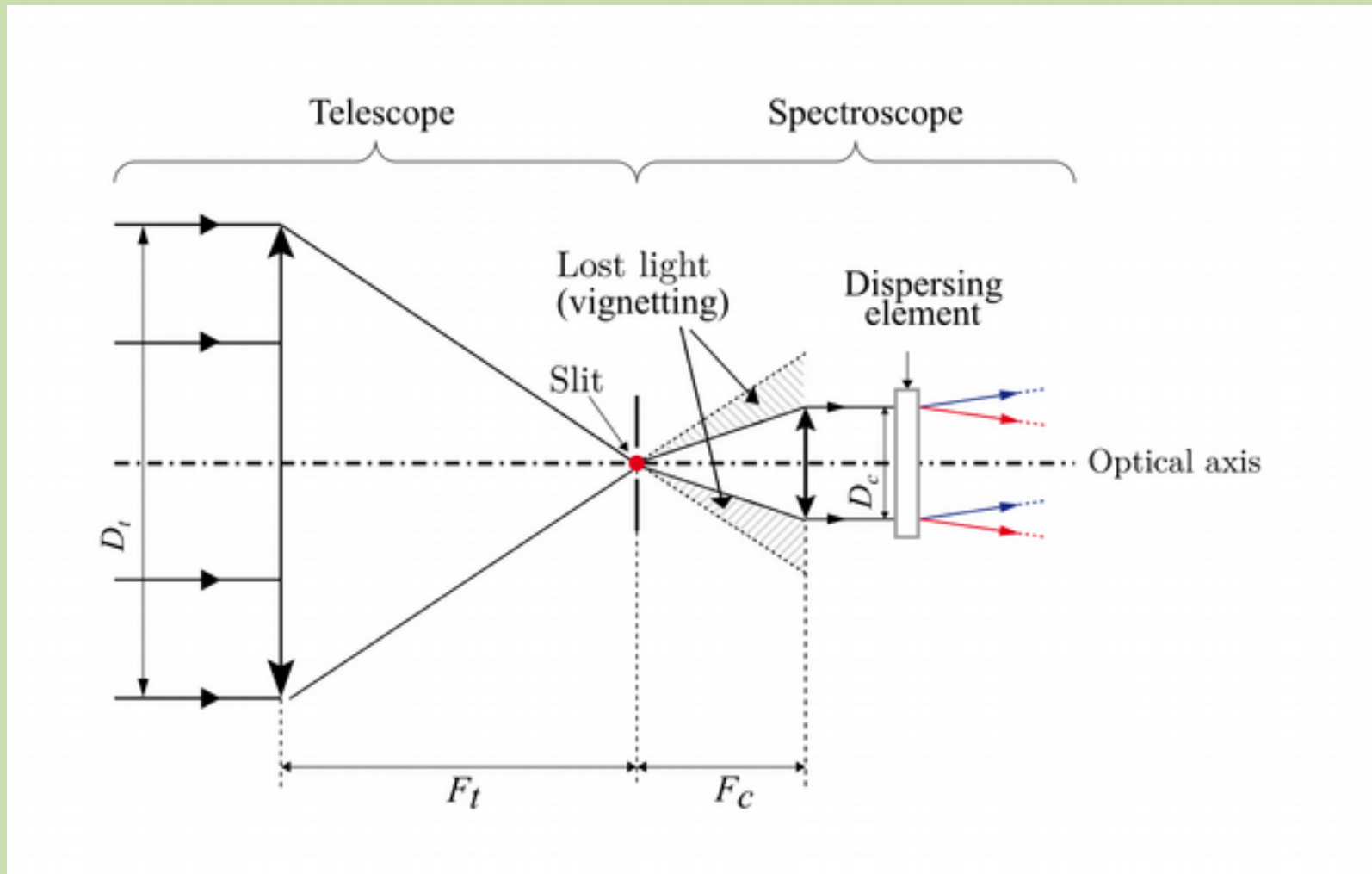


sous-échantillonné

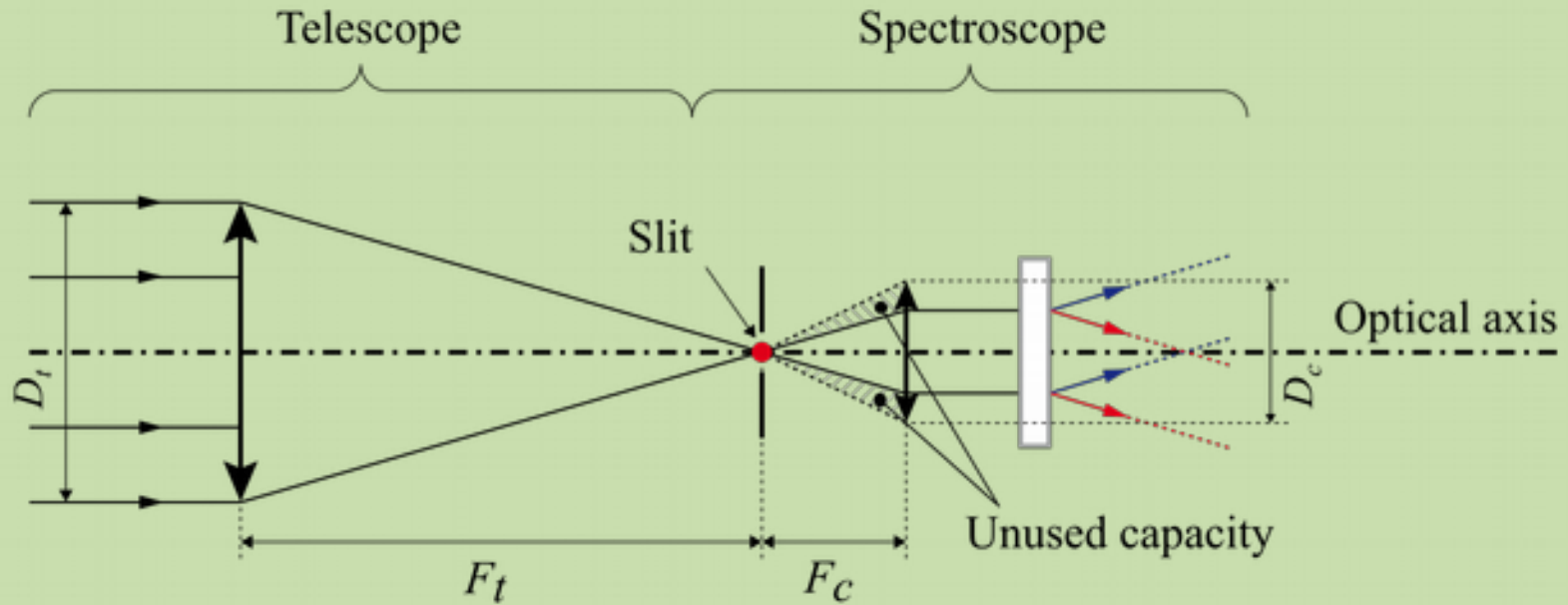
# Aperture (F-ratio)



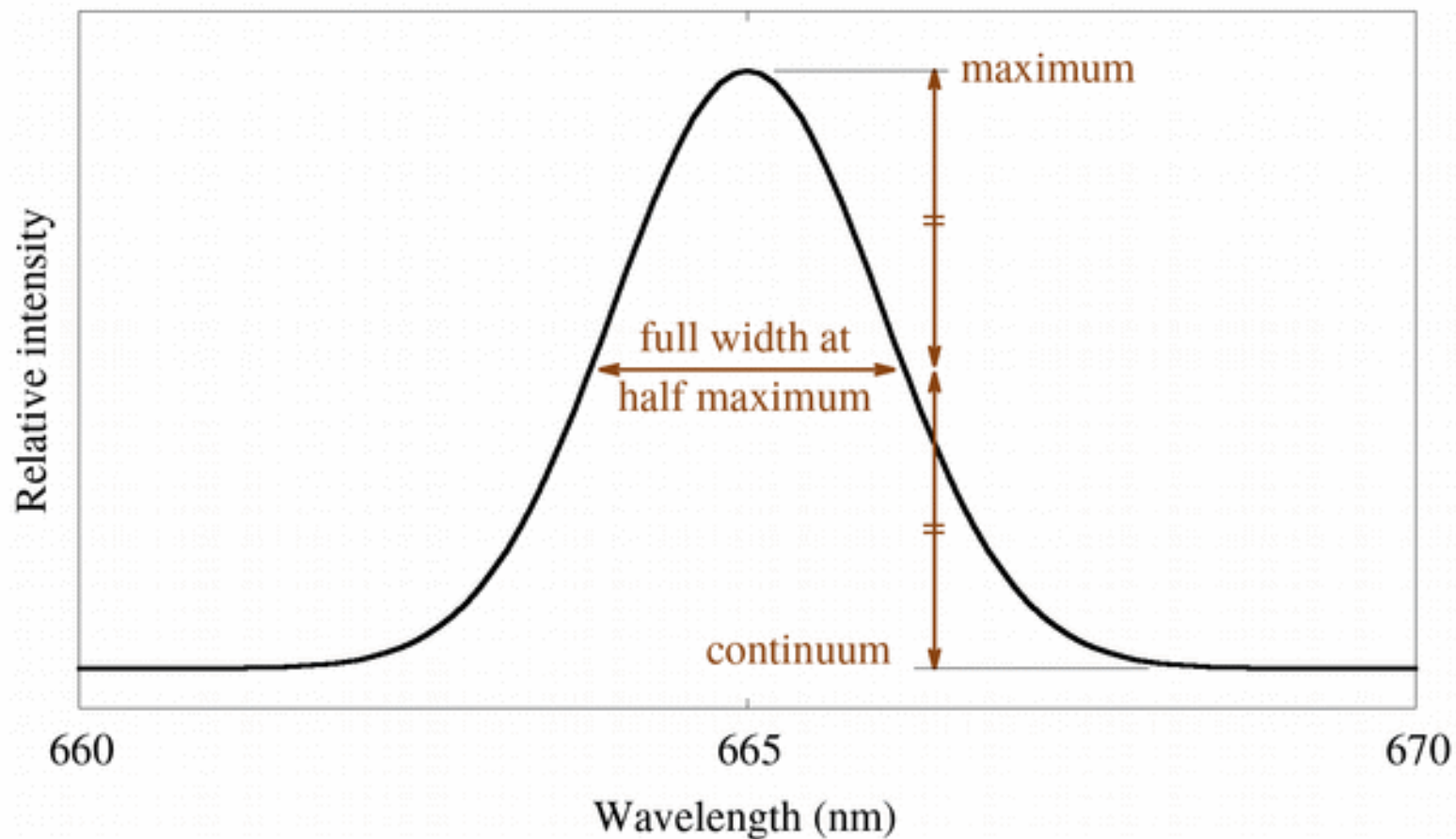
# Ouverture F/D (*aperture*)



# Ouverture F/D (*aperture*)



# FWHM





Flat

A continuous spectrum showing a smooth gradient of colors from violet on the left to red on the right, with no discrete lines.

LED blanche

A spectrum showing a broad, continuous band of light with a slight dip in the blue region, characteristic of a white LED.

Soleil

A continuous spectrum similar to the "Flat" spectrum, showing a smooth gradient of colors from violet to red.

Néon

A spectrum consisting of several sharp, discrete vertical lines of light against a dark background, characteristic of a neon discharge.

Lampe éco

A spectrum showing several sharp, discrete vertical lines of light, including a prominent yellow-green line and a red line, characteristic of an energy-saving lamp.

Argon néon (étalonnage)

A spectrum showing several sharp, discrete vertical lines of light, including a prominent yellow-green line and a red line, characteristic of an argon-neon calibration lamp.



# Merci !

*Vous ne verrez  
plus les étoiles  
comme avant !*

**Shelyak Instruments**

Tél. : 04.76.41.36.81

<http://www.shelyak.com>

Email :

francois.cochard@shelyak.com