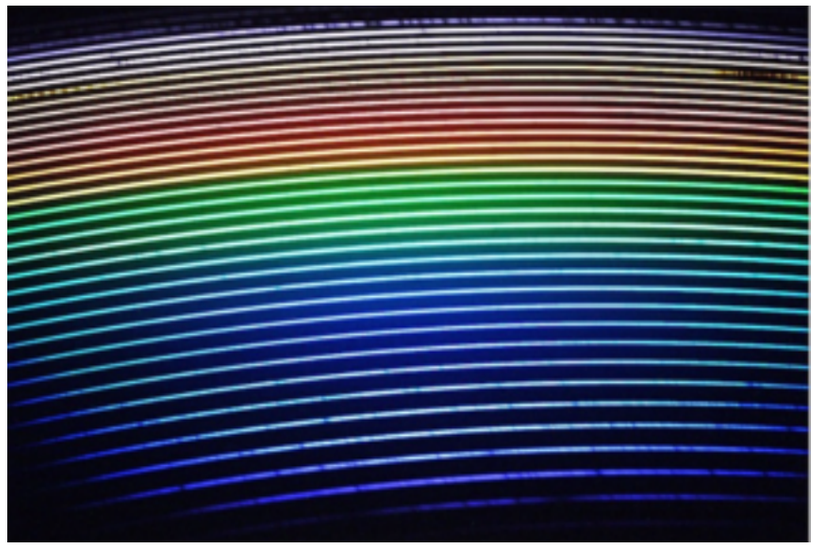
Be stars: Information from other wavelengths than Halpha…

Christian Buil

- **Observation toward the IR and toward the UV : The technical point of view**
- **The astrophysical interest of the spectral domain coverage extension ?**
- **Recommandation for BeSS observer and strategy**

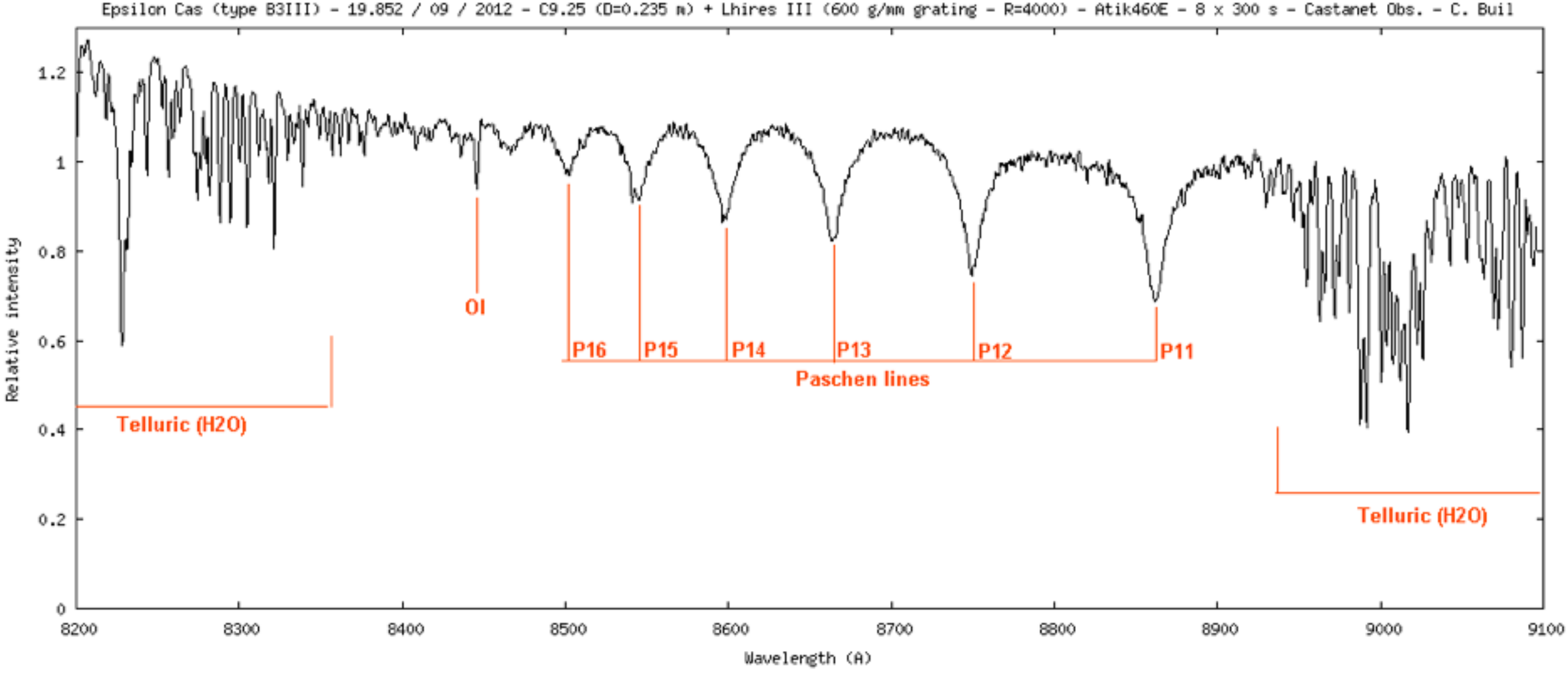


Extend the spectral coverage toward the red…

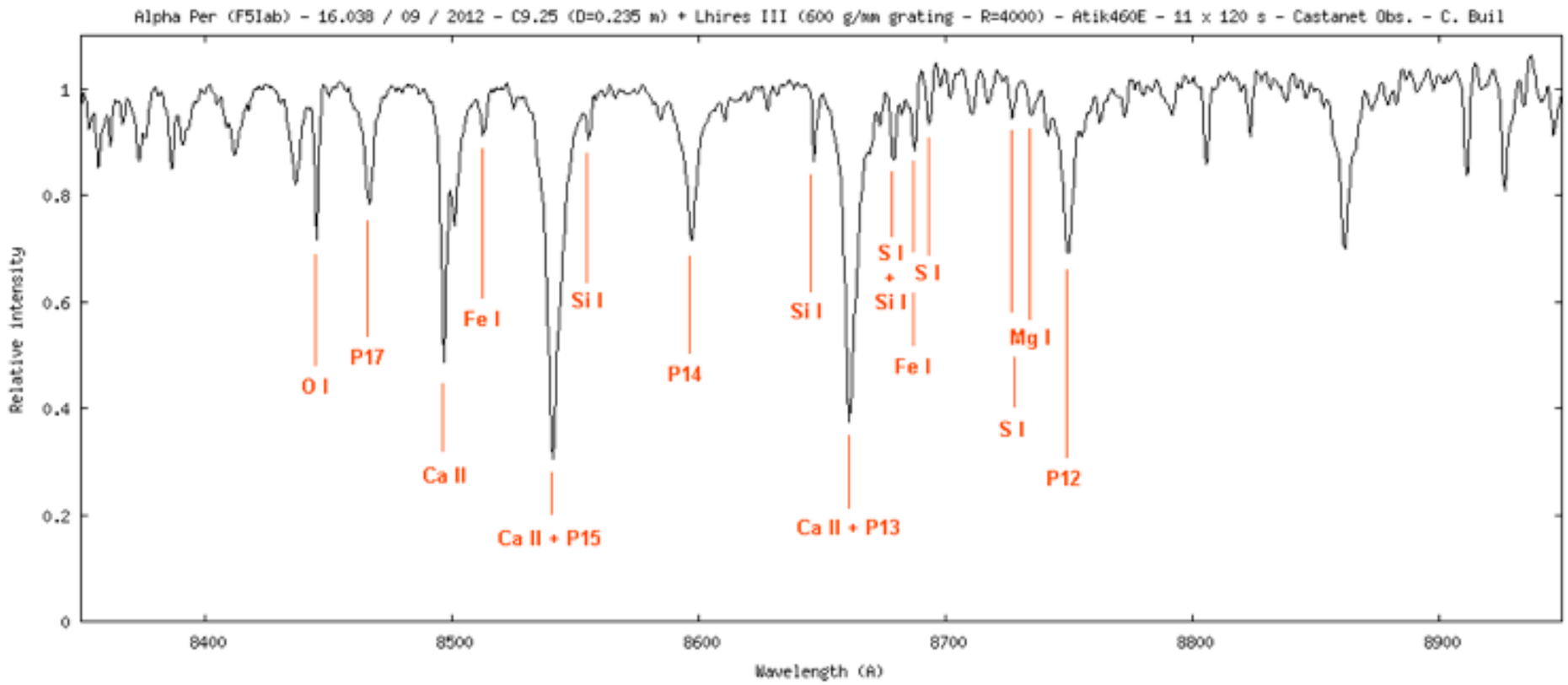
An efficient setup : The LHIRES III spectrograph on a f/10 telescope (SCT) + a 600 grooves grating (ideally, the 800 nm blazed version)

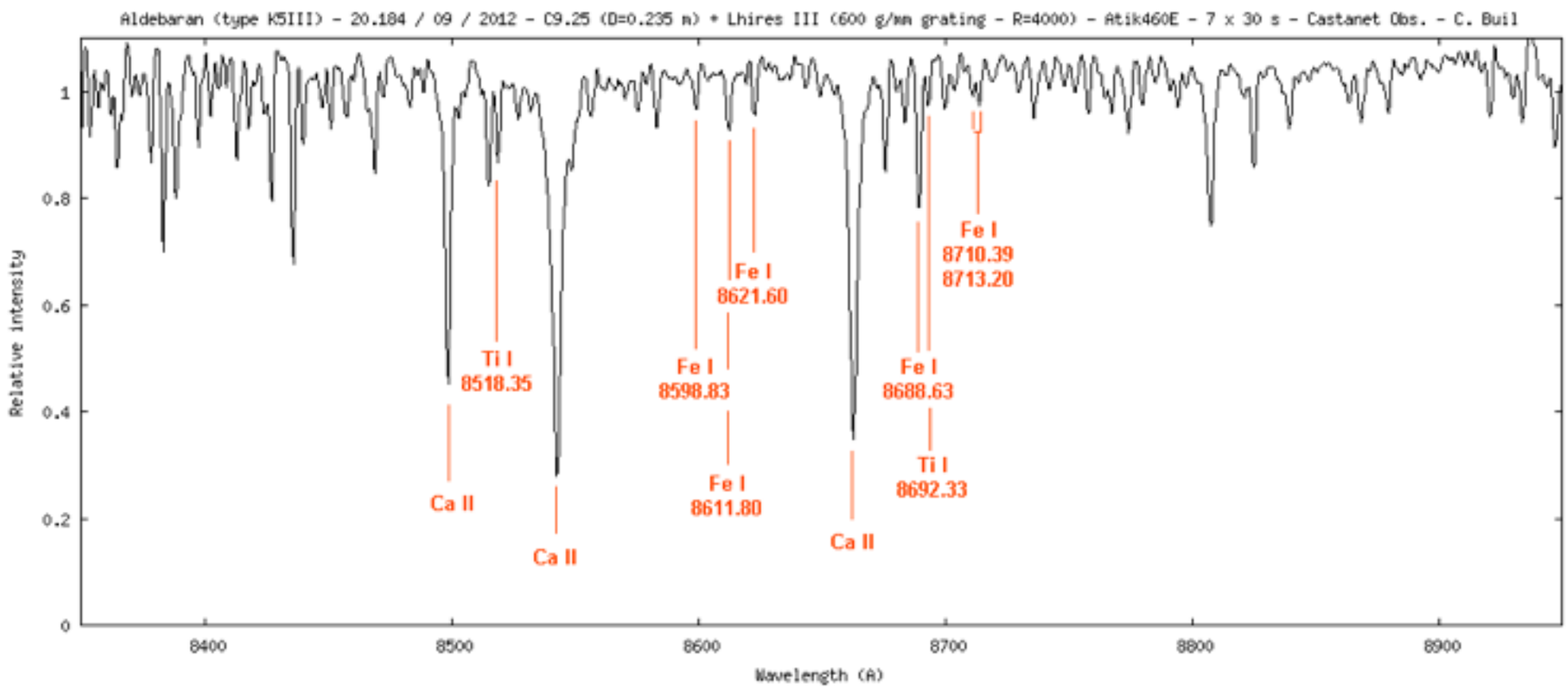
Spectral resolution power - R = 4000

Access to Pashen series…



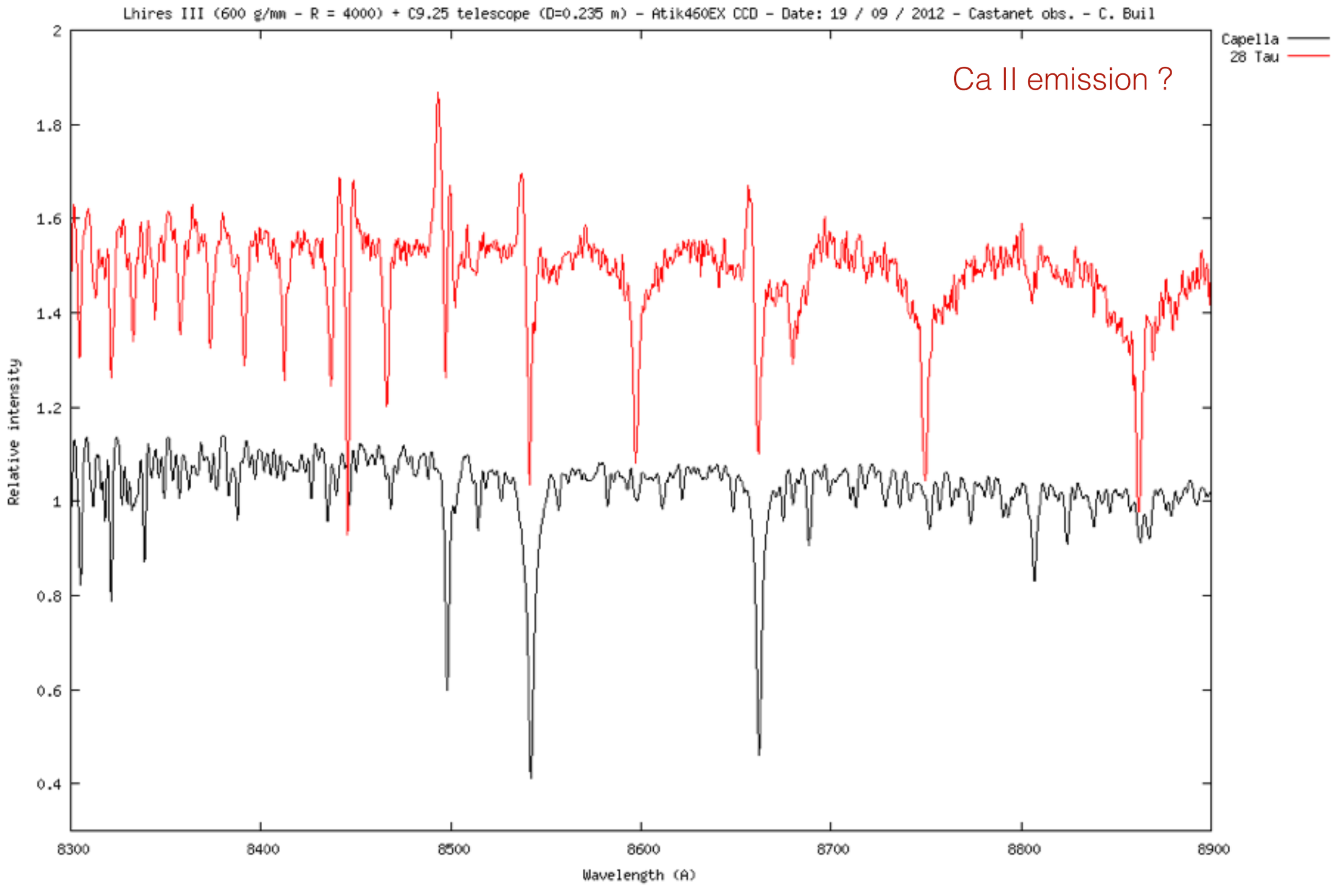
IR Ca II triplet on cool stars



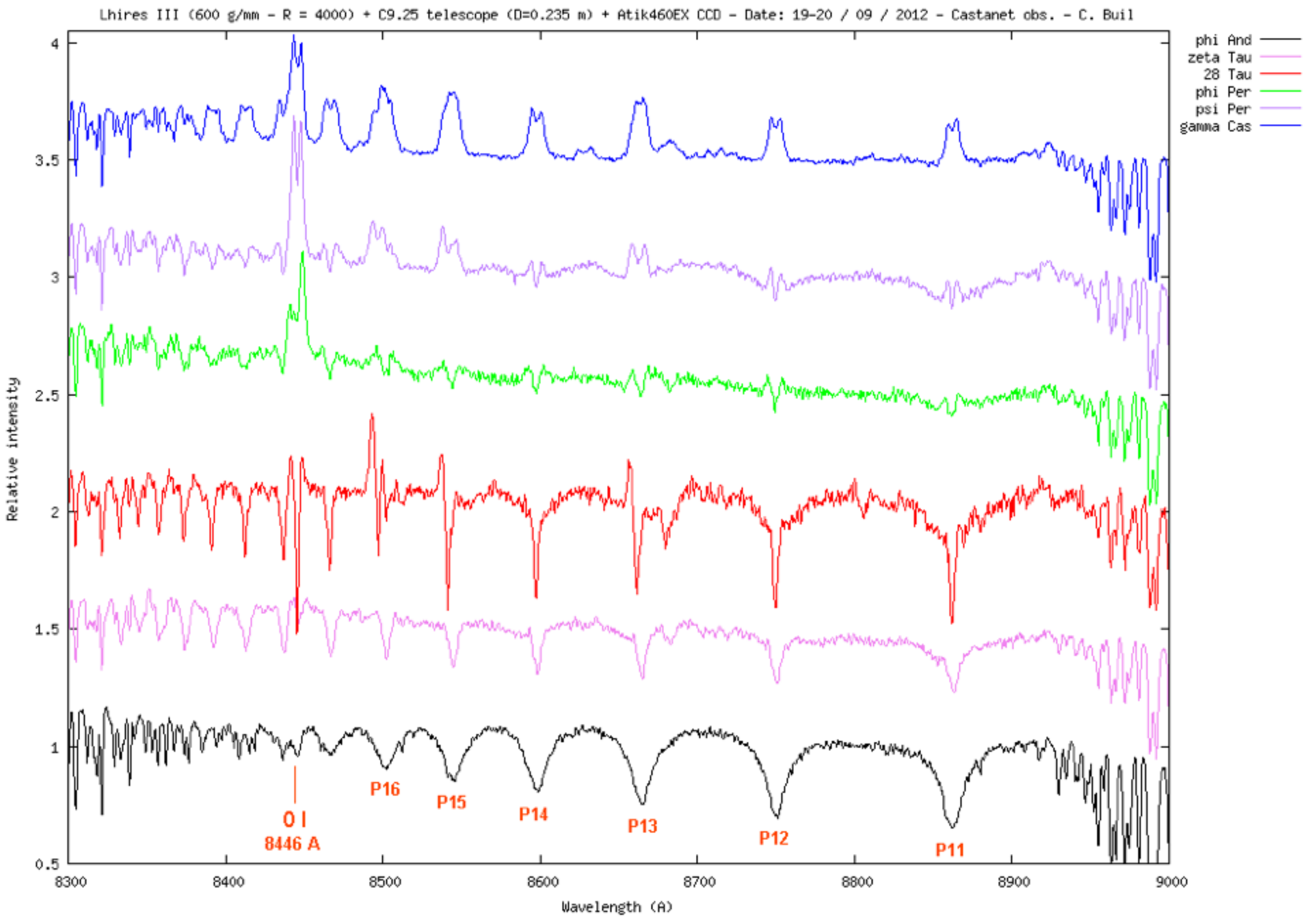


Be star observations at 860 nm

The exemple of 28 Tau

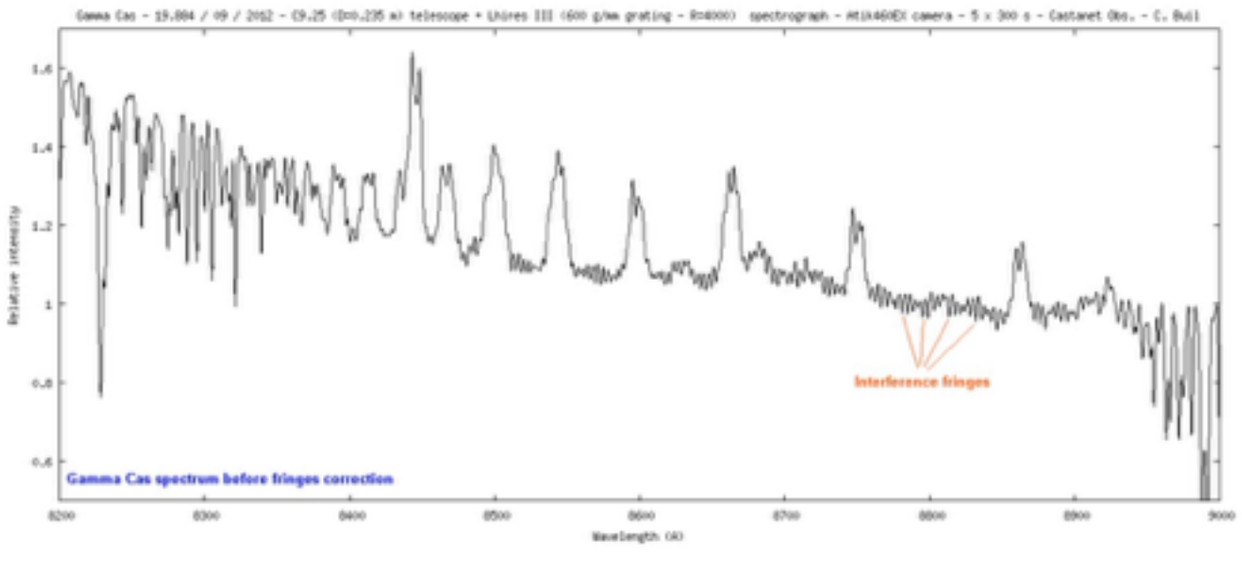


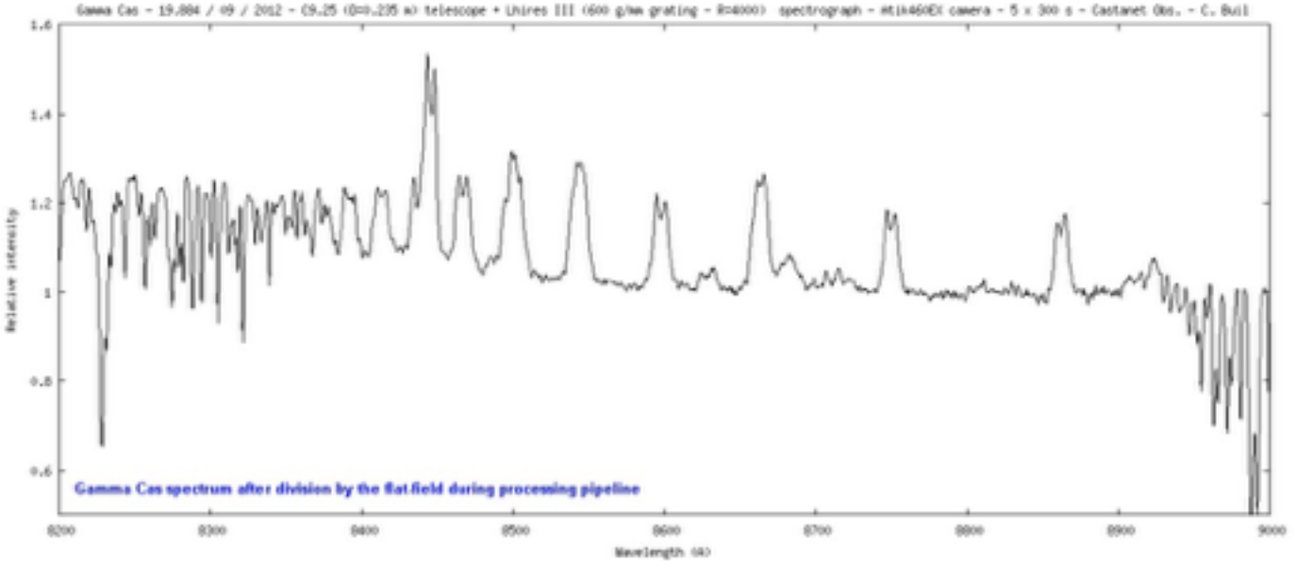
A collection of near-IR Be star spectra…



A typical instrumental problem:

NIR fringes phenomena
High quality flat-field mandatory



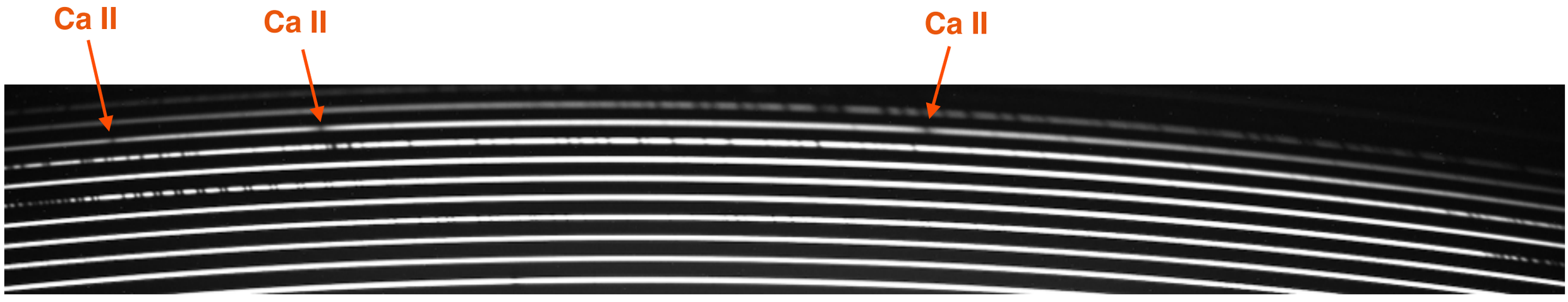


Before

After

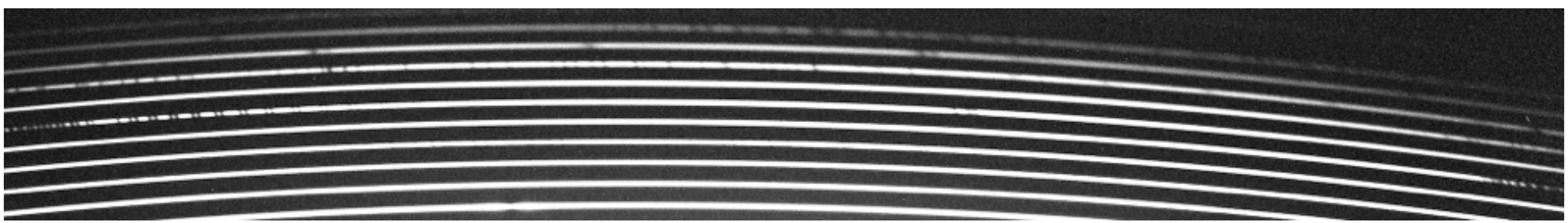
Echelle NIR observation : access to Pashen lines

Use of a modified eShel spectrograph (Samyang 135 mm f/2 lens = eShel(2))



Moon spectrum

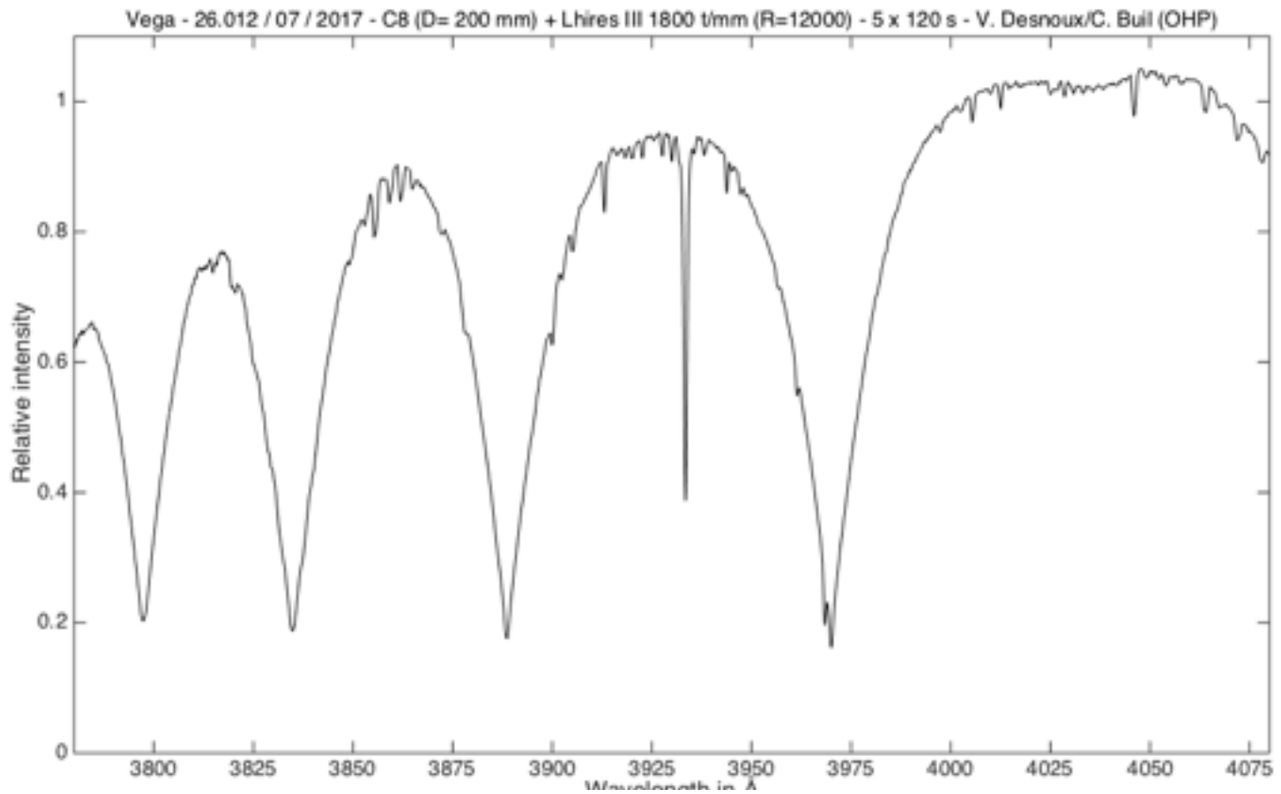
gamma Cas spectrum



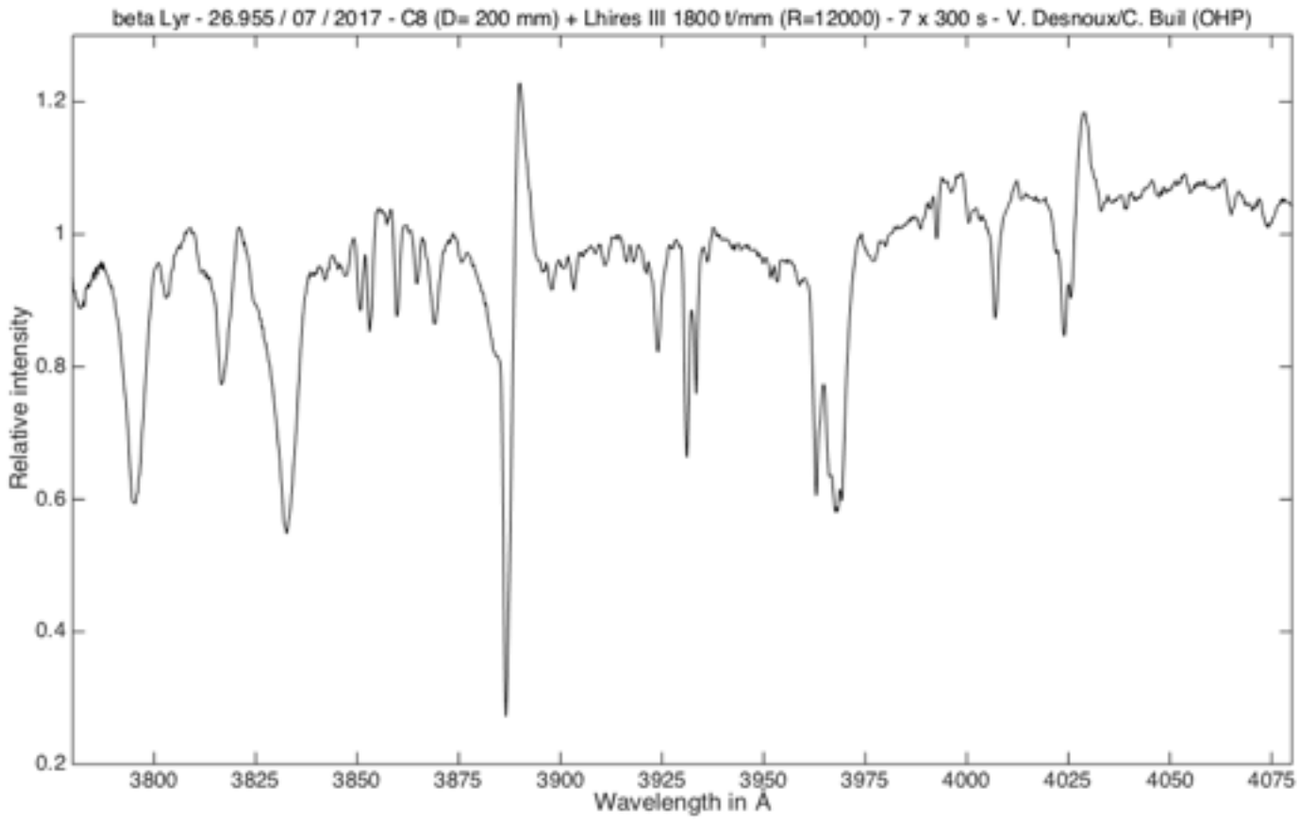
28 Tau spectrum (October 2017)

LHIRES III and near-UV

Severe instrumental chromatism, but excellent result at the conditions of a fine tuning and narrow band observation…



Vega spectrum at R=12000



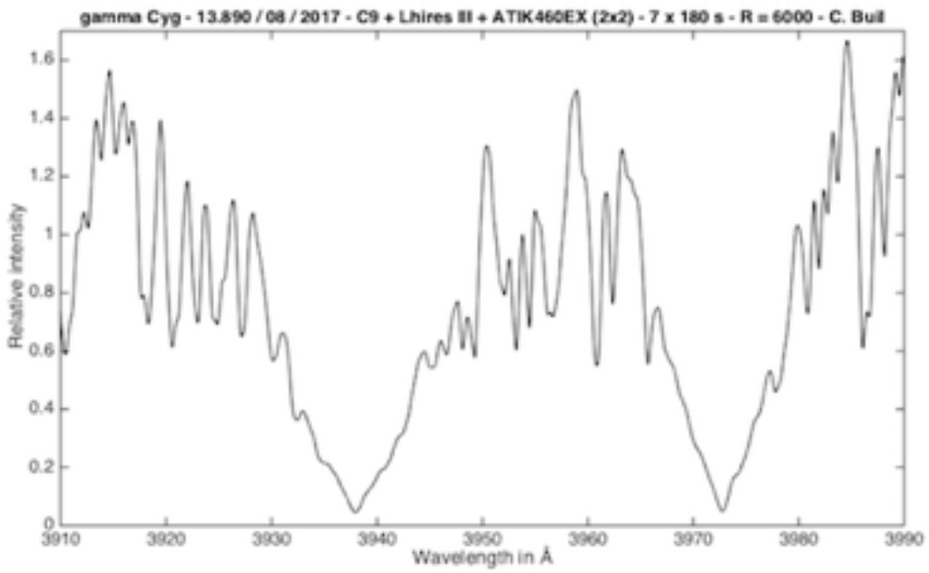
beta Lyrae at R=12000

The UV interest…

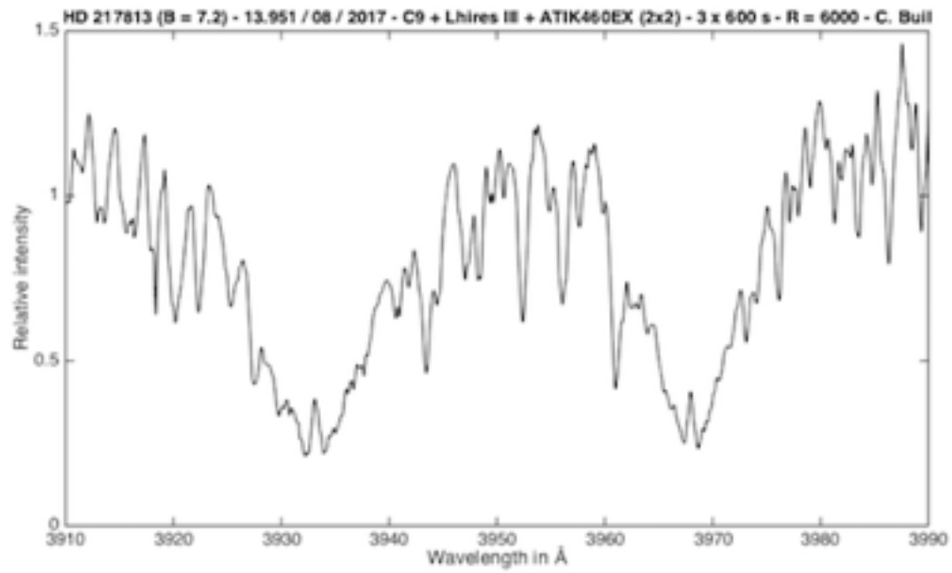
From a proposition of Alexandre Santerne : Survey of active chromospheric stars

H&K Active Stars Survey program (HKASS)

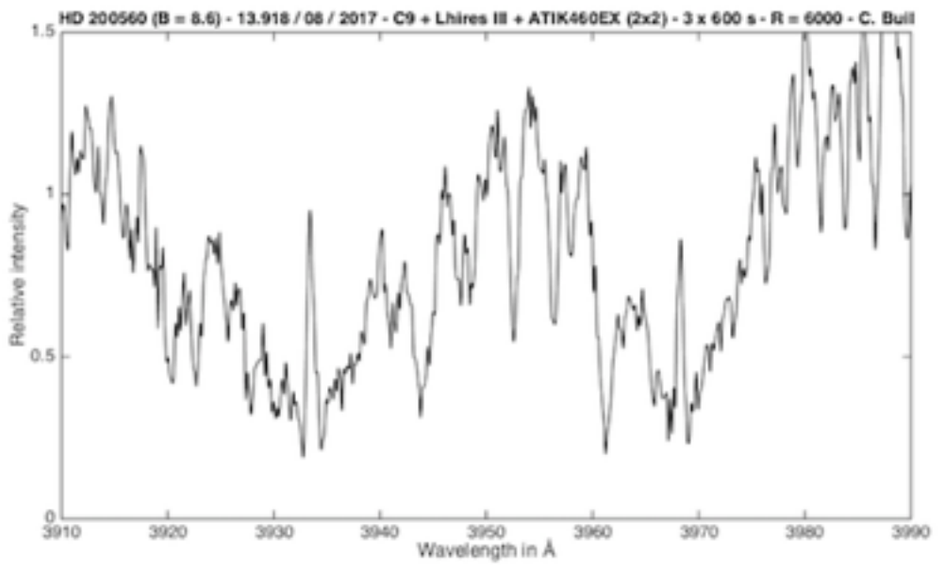
Results



gamma Cyg : C9.25 + LHIRES III 2400 l/mm - ATIK460EX
Exposure time: 7 x 180 sec. (1260 sec.)
Computed RSB per sample: 540
Computed RSB per resolution element: 1100



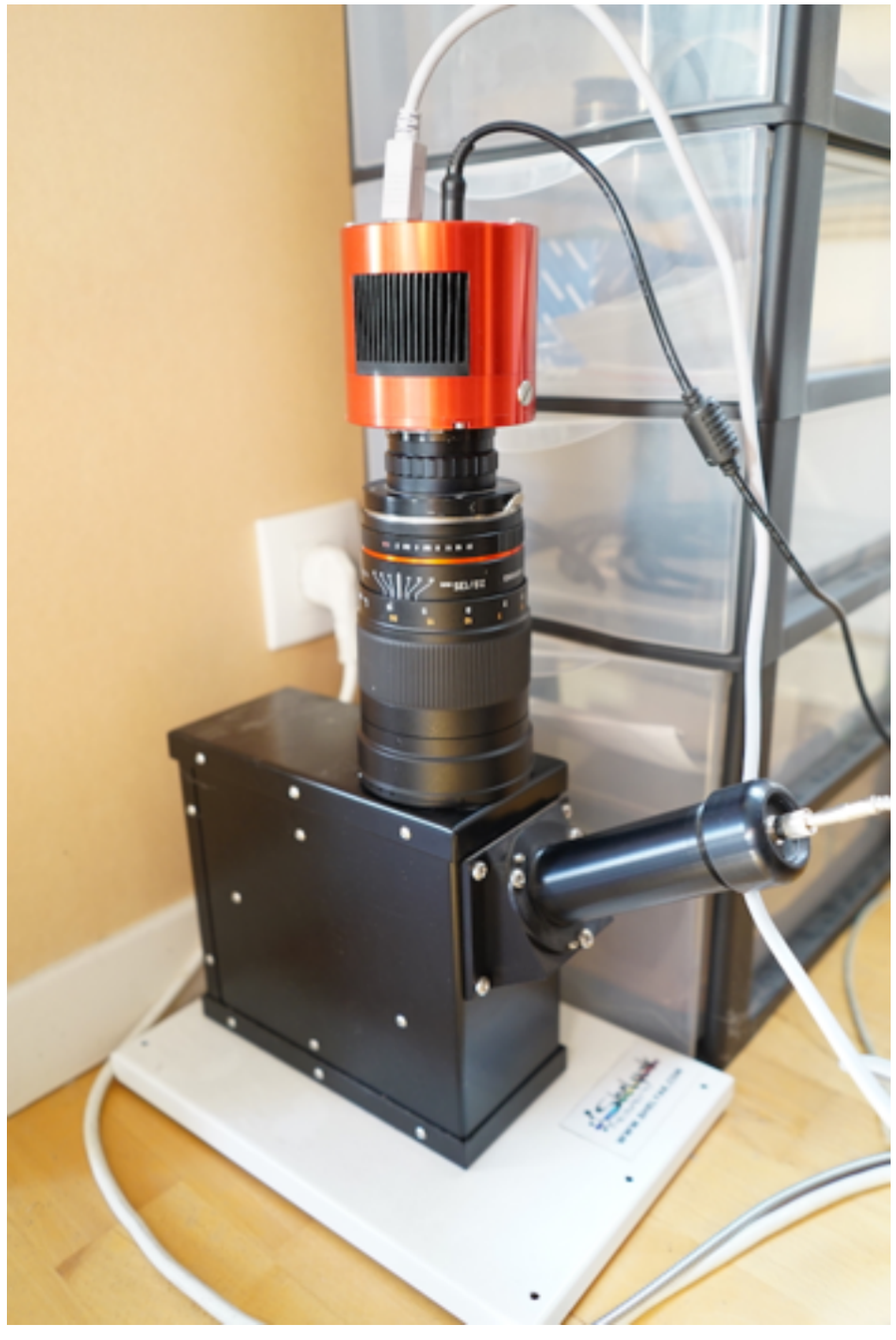
HD 217813 : C9.25 + LHIRES III 2400 l/mm - ATIK460EX
Exposure time: 3 x 600 sec. (1800 sec.)
Computed RSB per sample: 75
Computed RSB per resolution element: 150



HD 200560 : C9.25 + LHIRES III 2400 l/mm - ATIK460EX
Exposure time: 3 x 600 sec. (1800 sec.)
Computed RSB per sample: 37
Computed RSB per resolution element: 75

Near-UV observation of Be stars

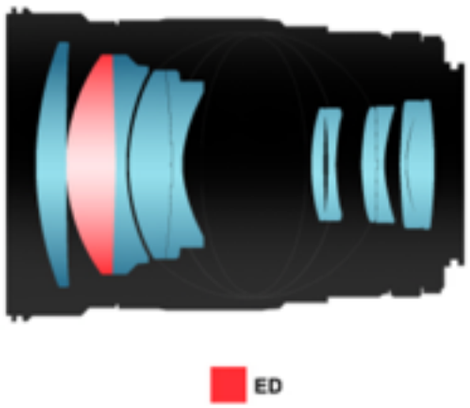
Improvement of eShel spectrograph - eShel(2)



Low noise / large format CMOS camera (ASI1600MM)
Readout noise : 1.4 e- (0.6 e- after optimal processing)

All mirror telescope (GSO 254 mm f/8)
Optimal UV transmission and no chromatism

High UV optical transmission
fiber (high -OH)

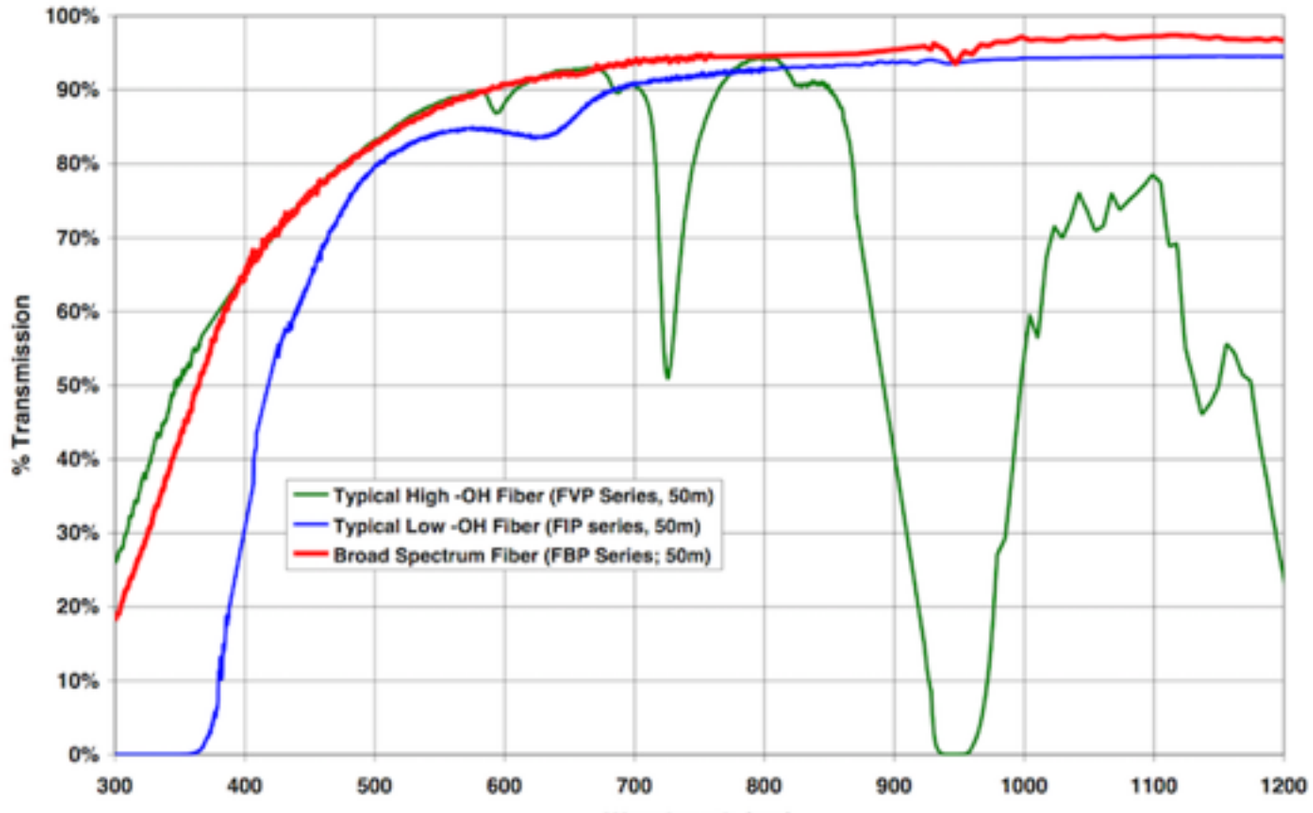


Well corrected modern objective lens
(Samyang 135 mm f/2)

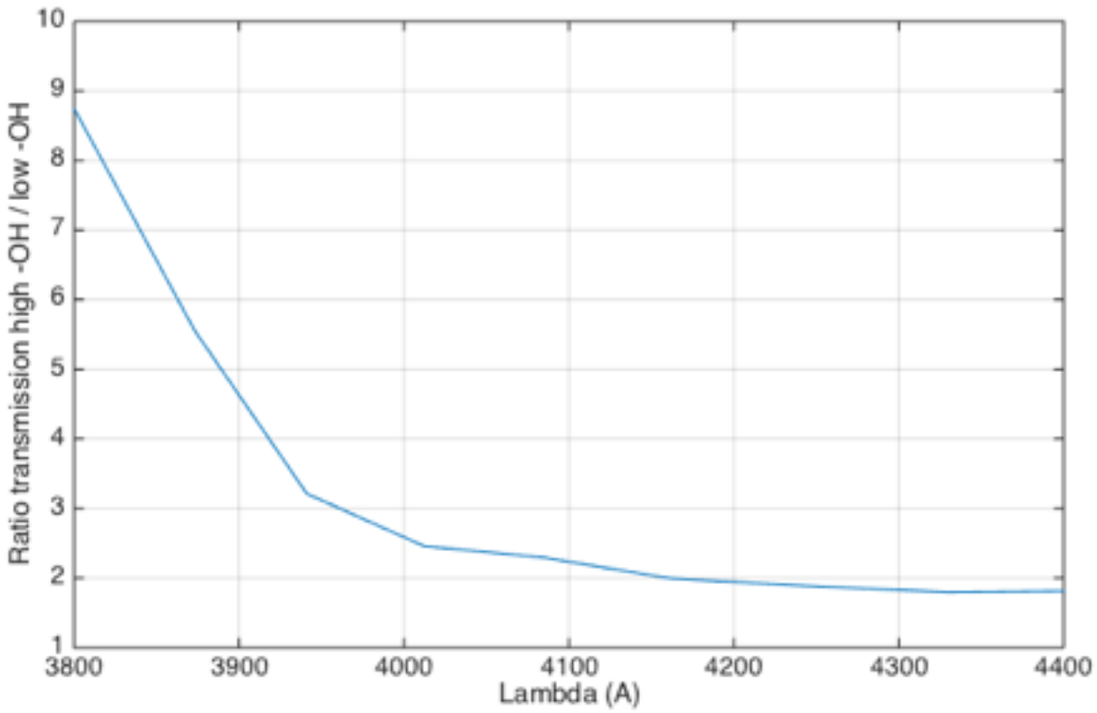
High temperature halogen lamp (4700 K) for calibration

Improvement of eShel spectrograph

UV-transmission of optical fiber



Polymicro document

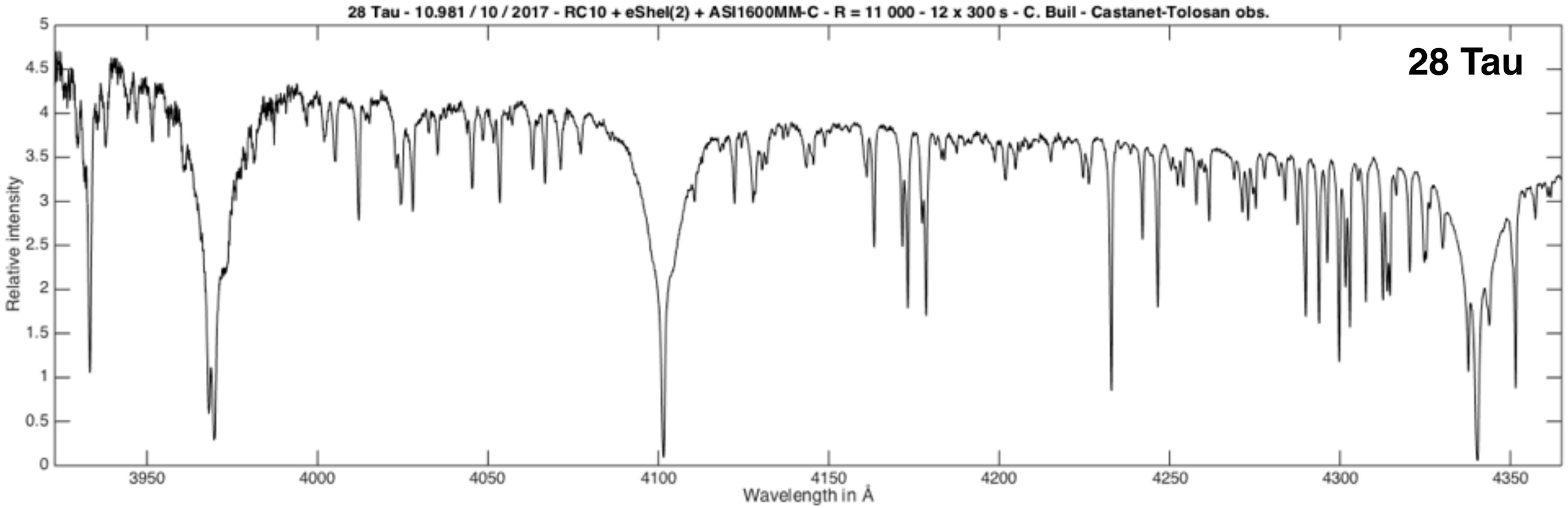


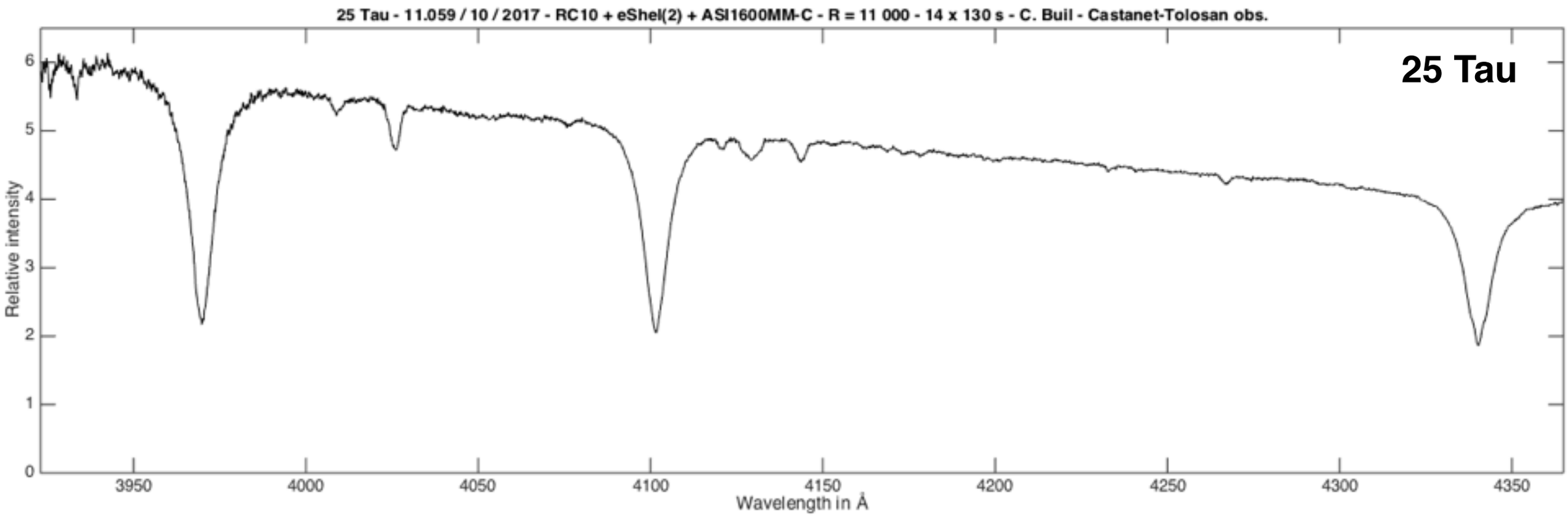
Measured performance

Note: High -OH optimal for UV, not optimal for NIR

Near-UV observation of Be stars (1/2)

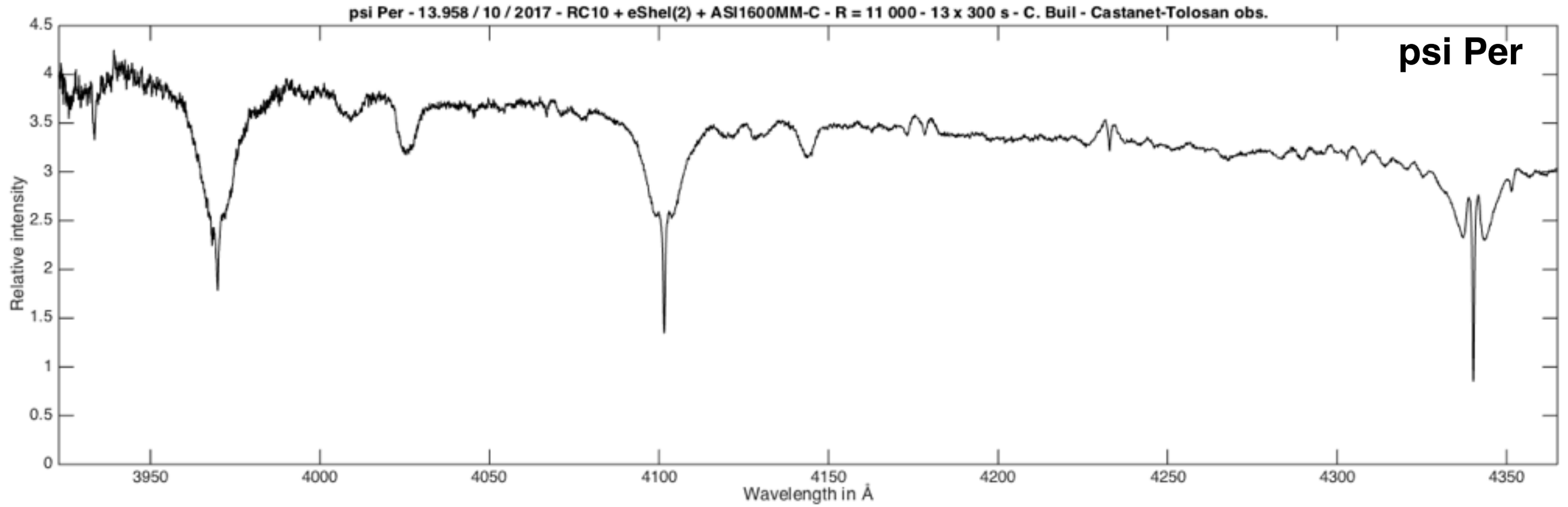
Actual UV cutoff : 3923 A

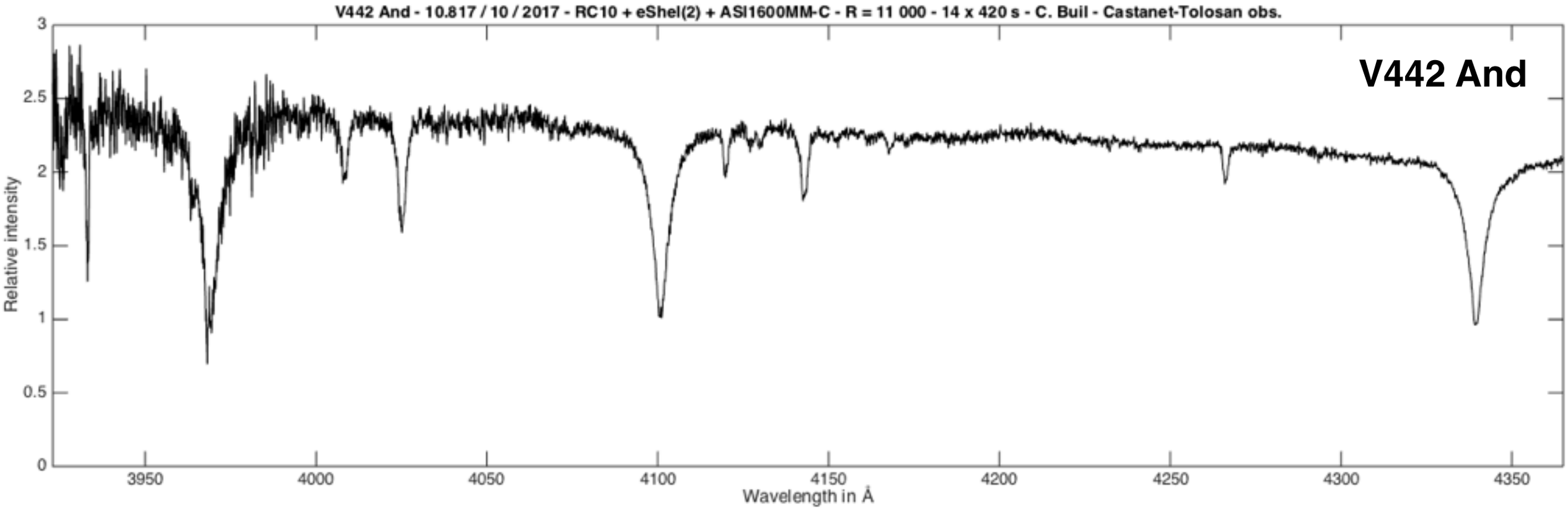




Near-UV observation of Be stars (2/2)

Actual UV cutoff : 3923 A

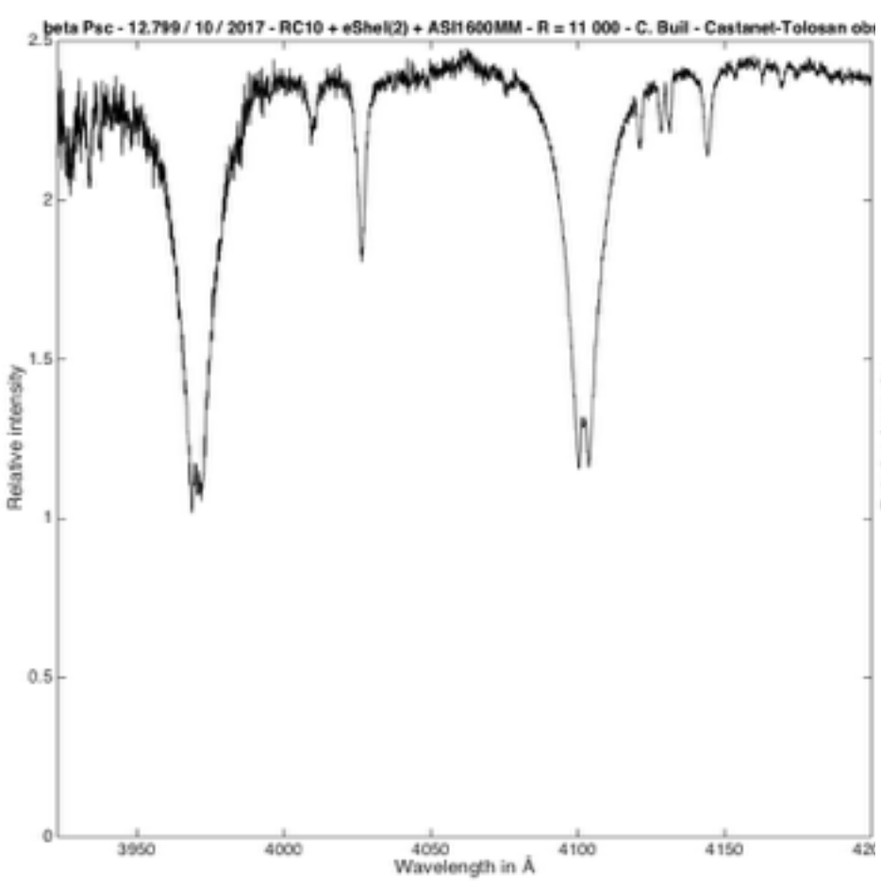


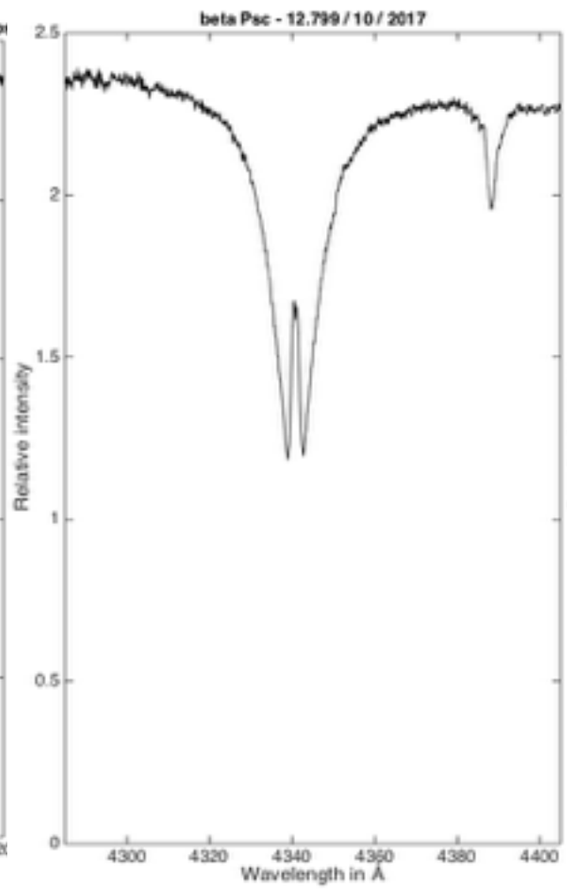


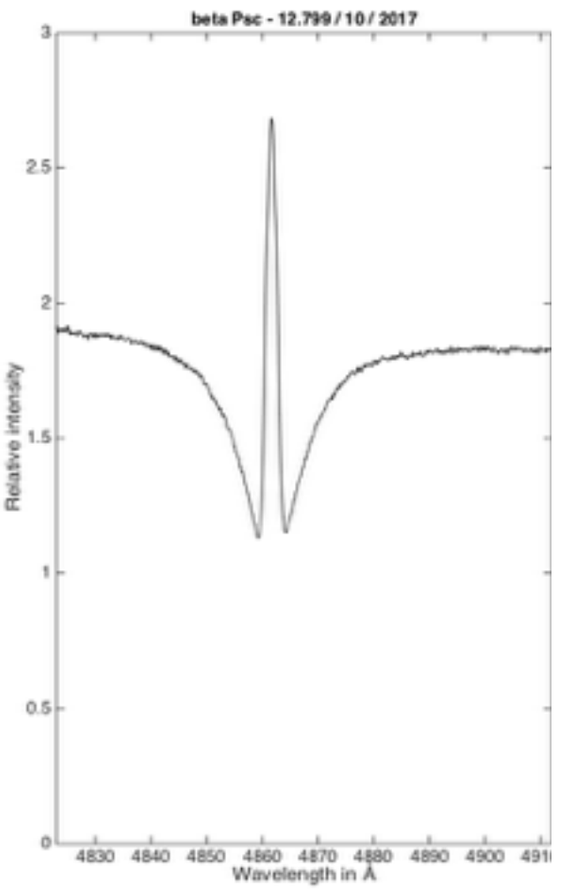
Wide spectral range observation of Be stars

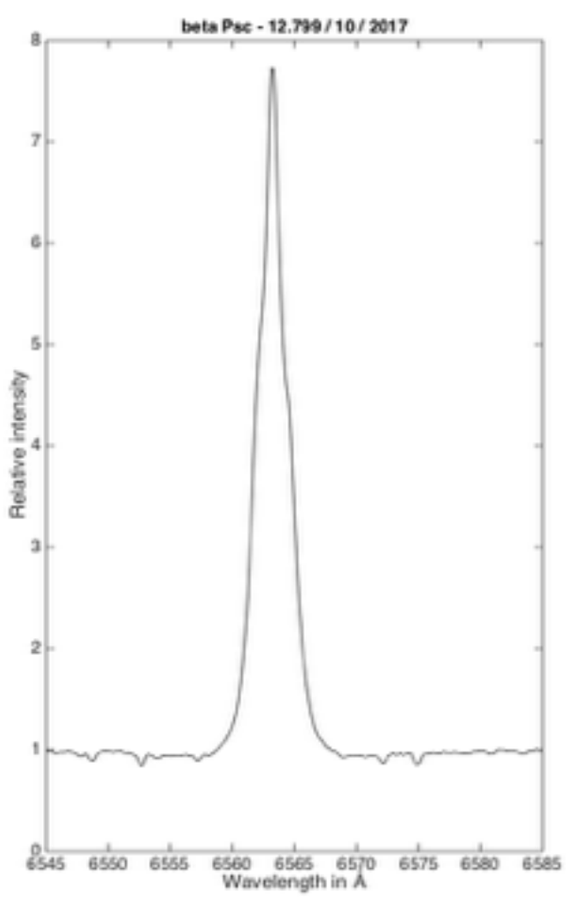
(echelle performance: presently 3920 A - 8900 A)

The example of beta Psc



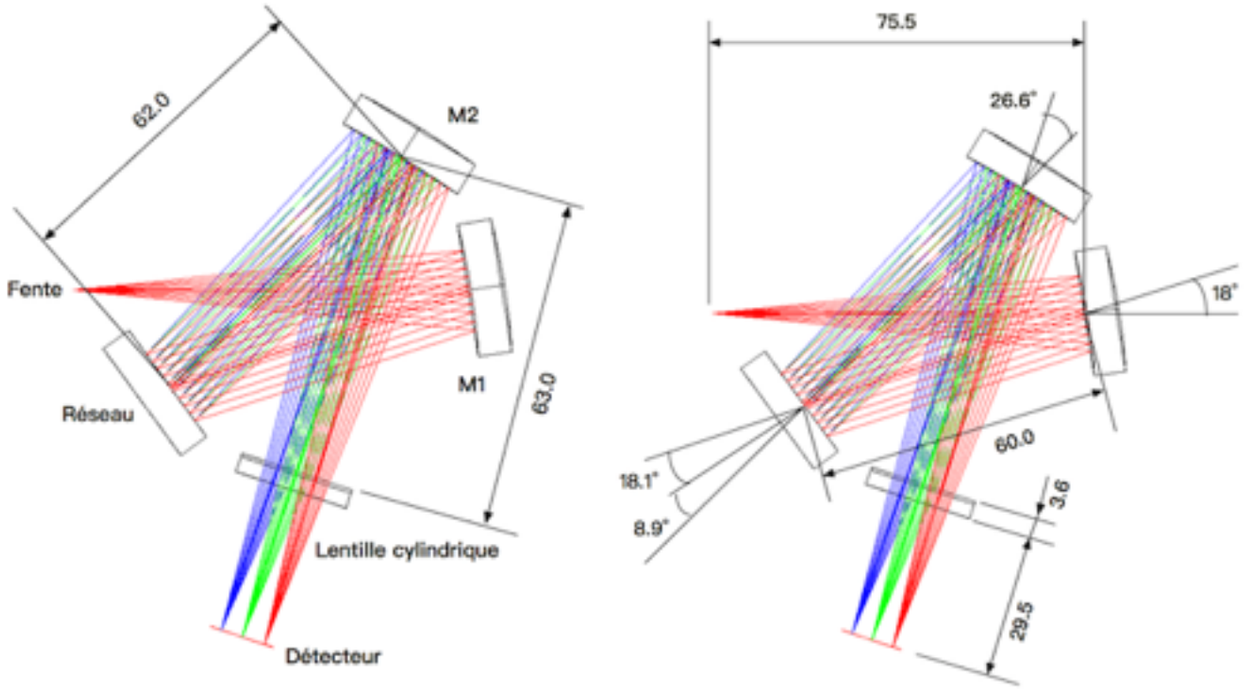


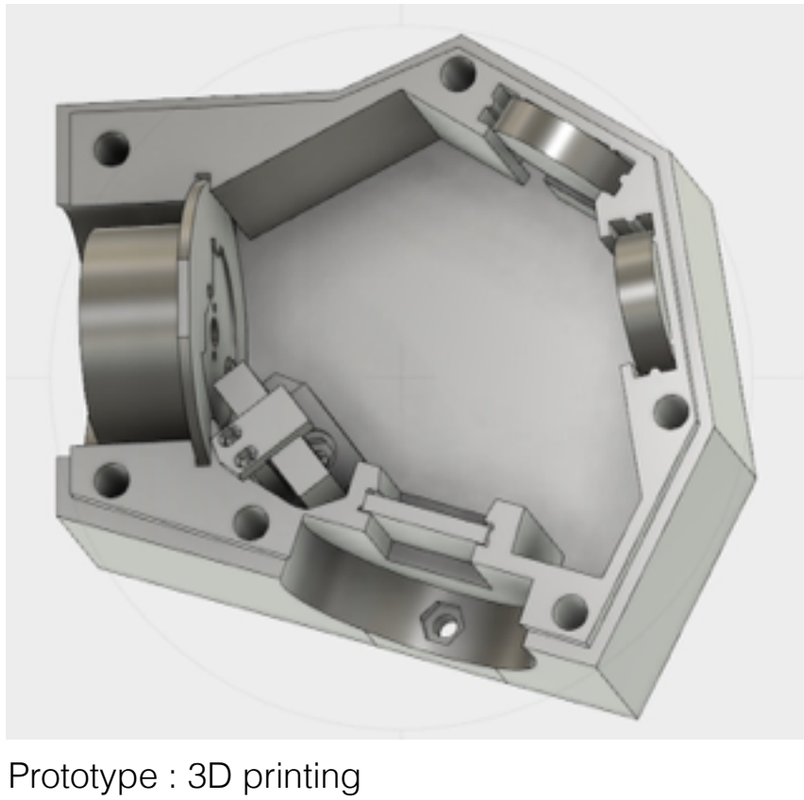




UltraViolet EXplorer spectrograph (UVEX project)

Classical Czerny-Turner, but addition of a cylindric lens for correct astigmatism





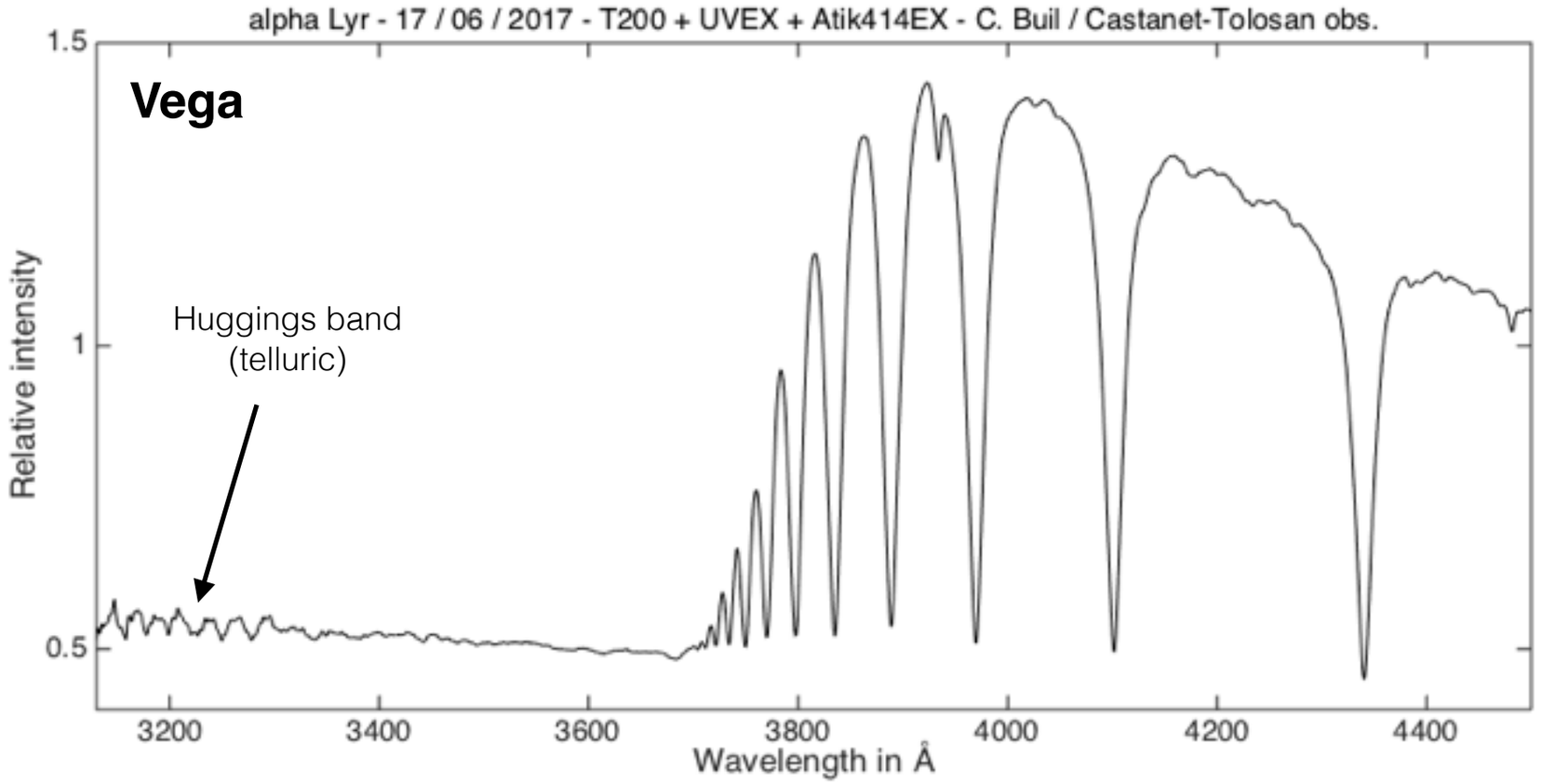
Prototype : 3D printing

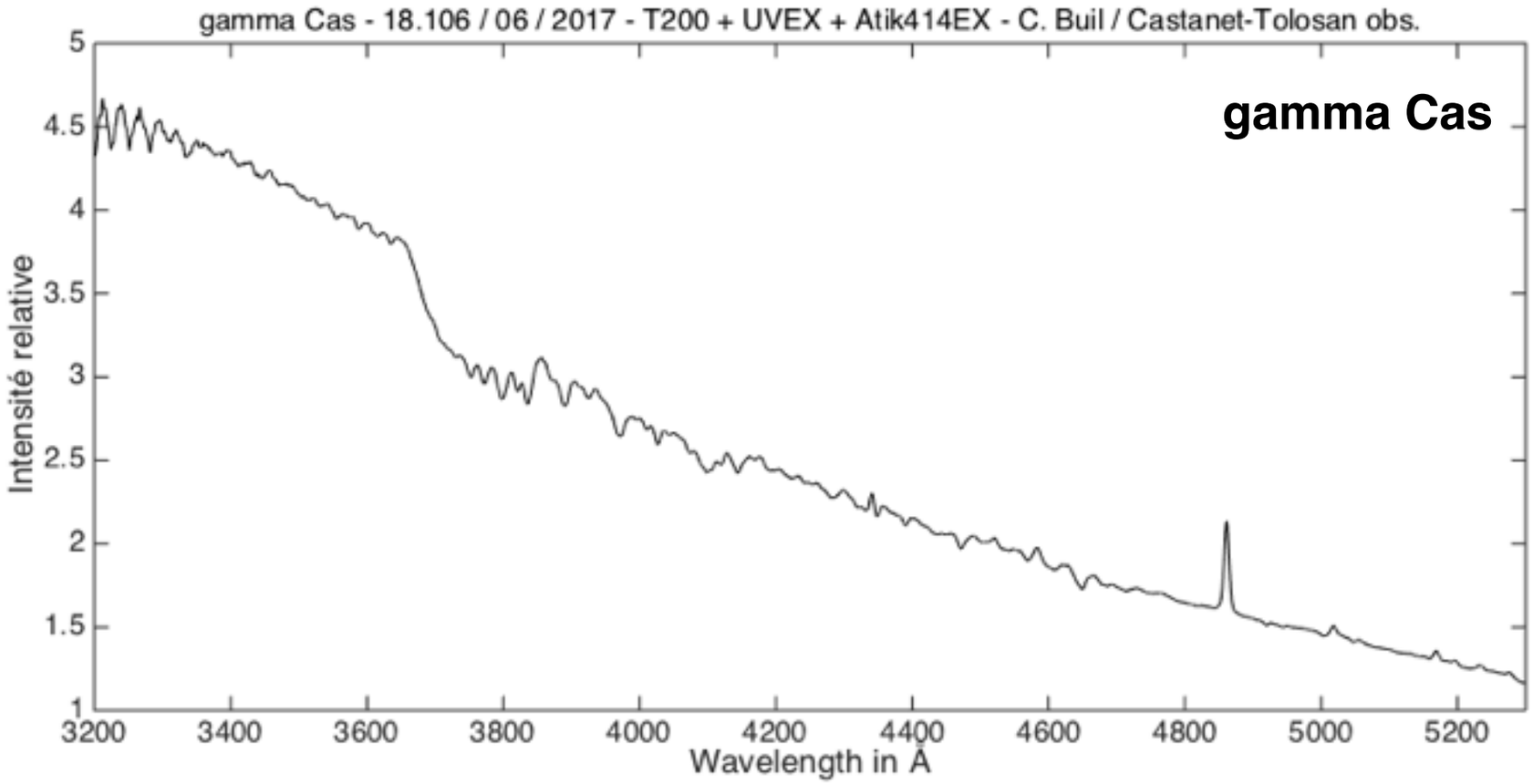
Simple concave spherical mirrors

« Standard components » (ThorLab)

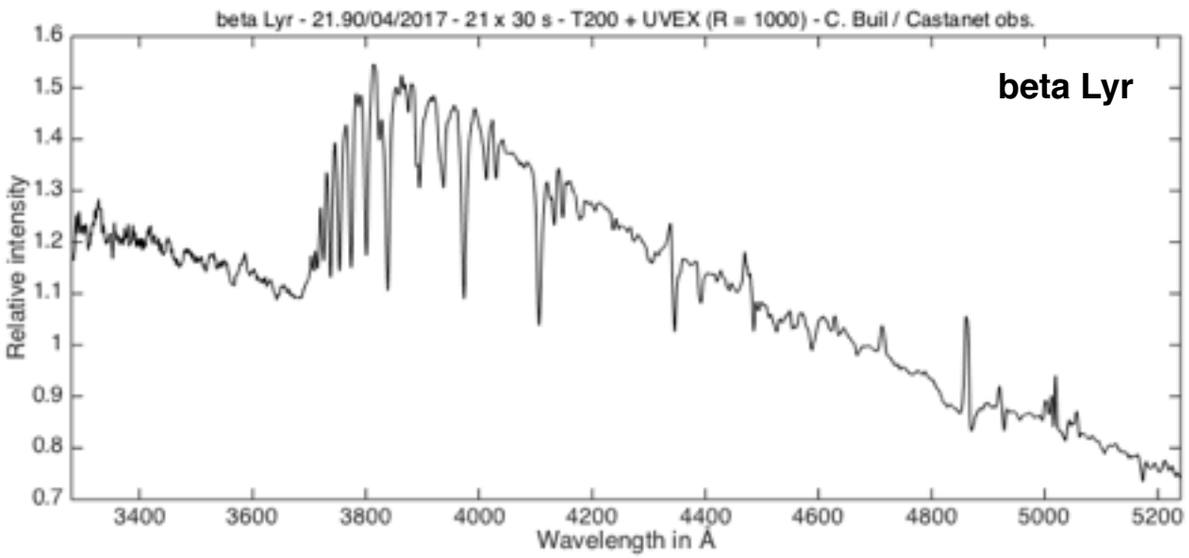
Newton telescope

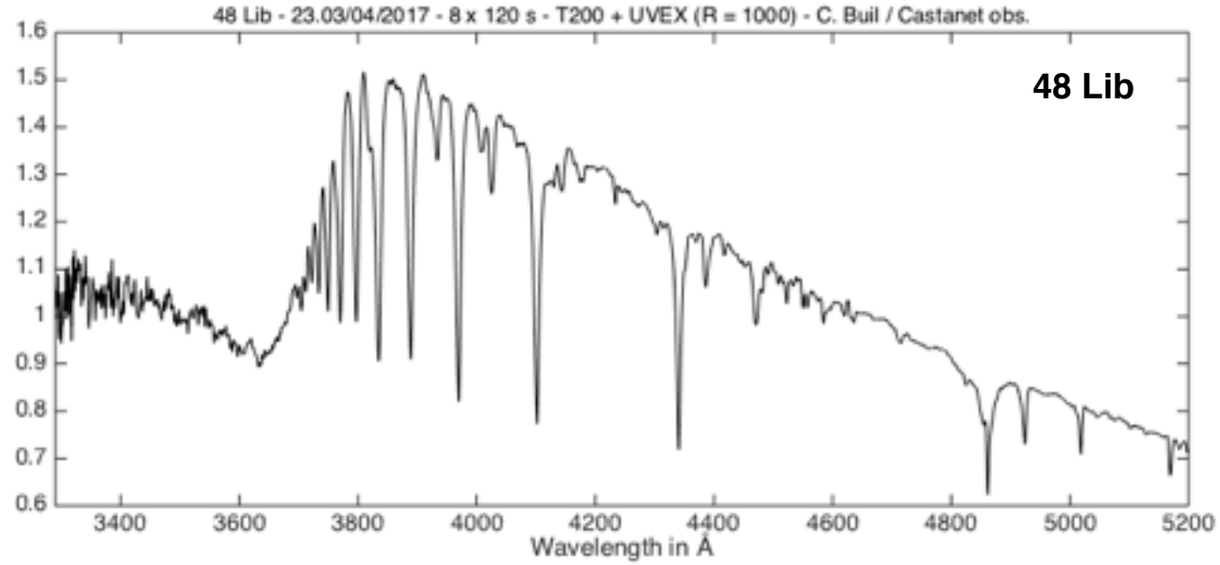
UVEX project - Detection of 3200 A ozone Huggins band (Castanet-Tolosan observatory)

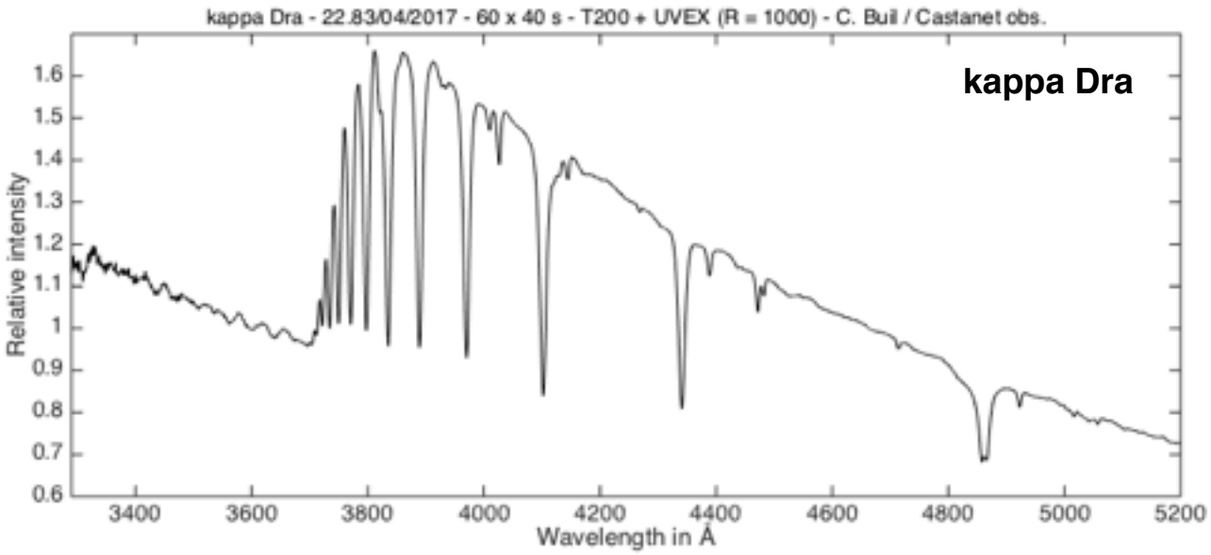


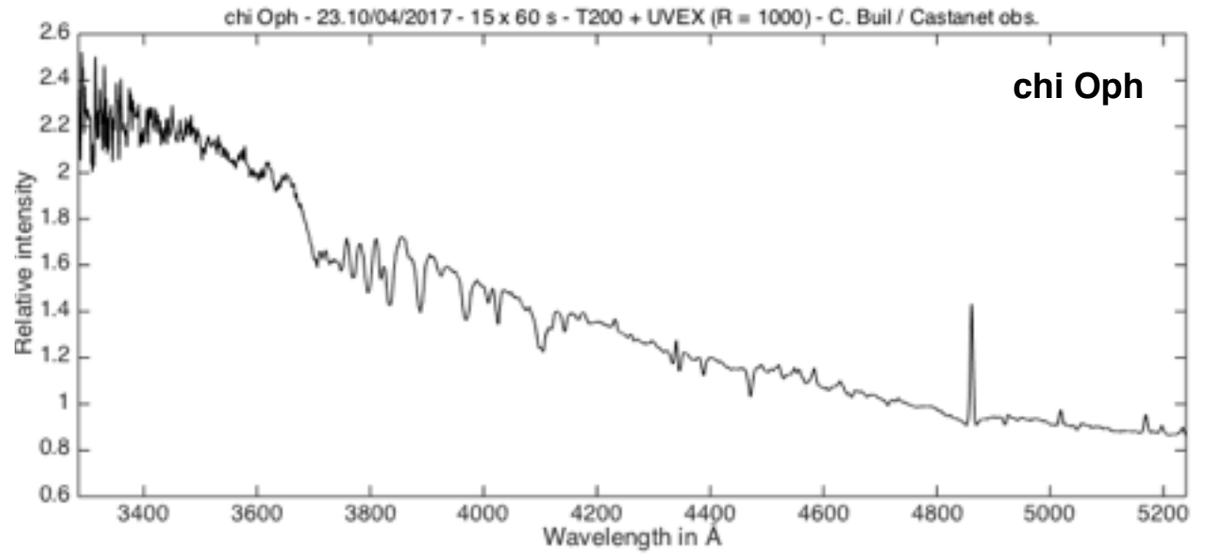


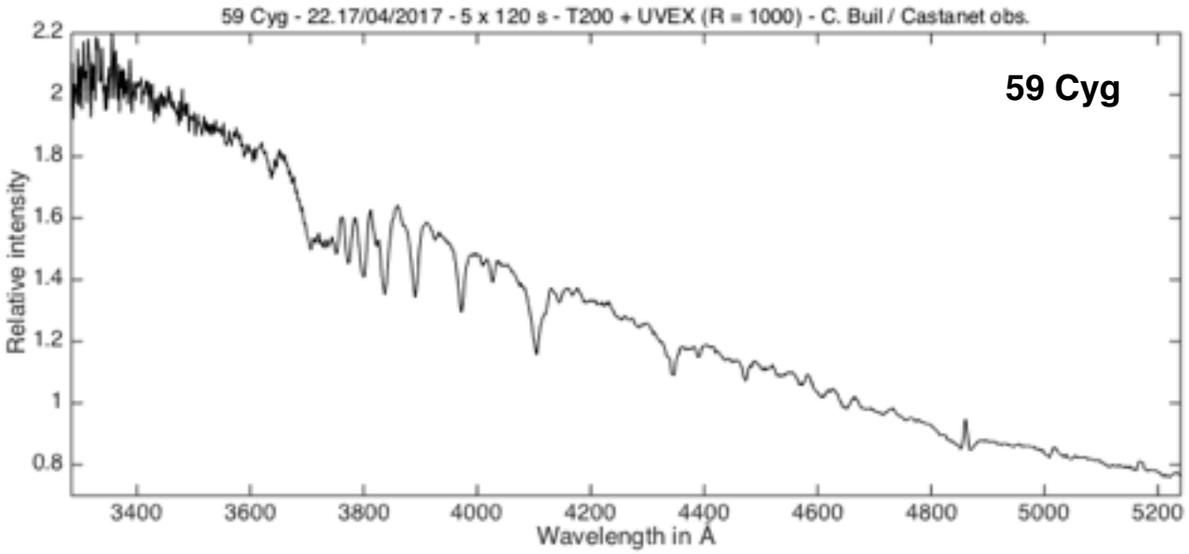
UVEX project - A Be stars session

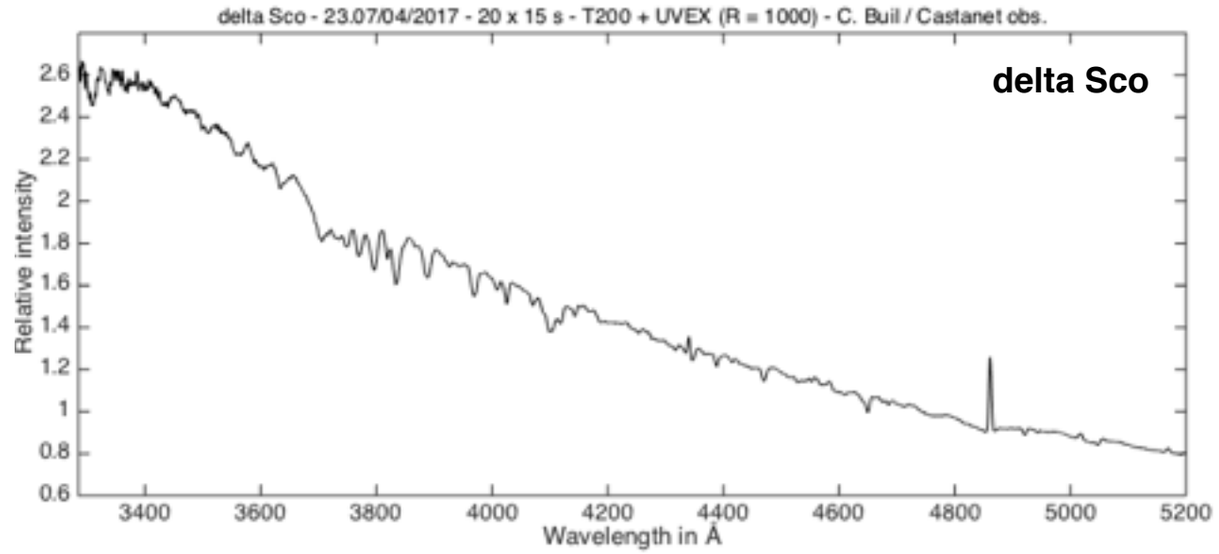




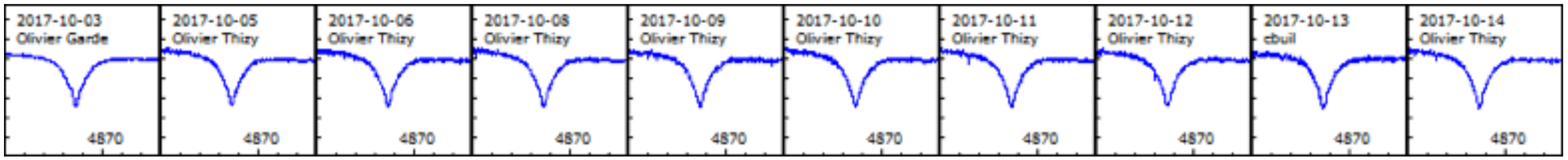




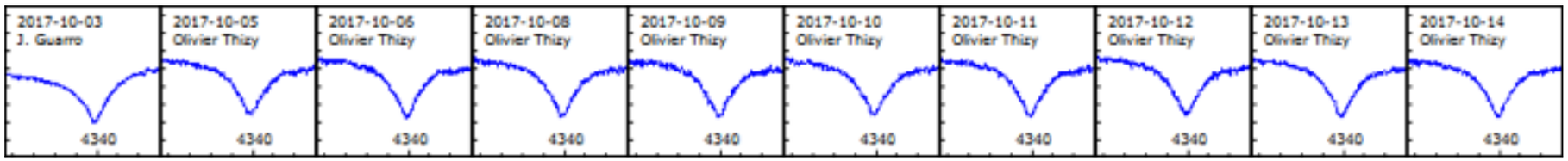




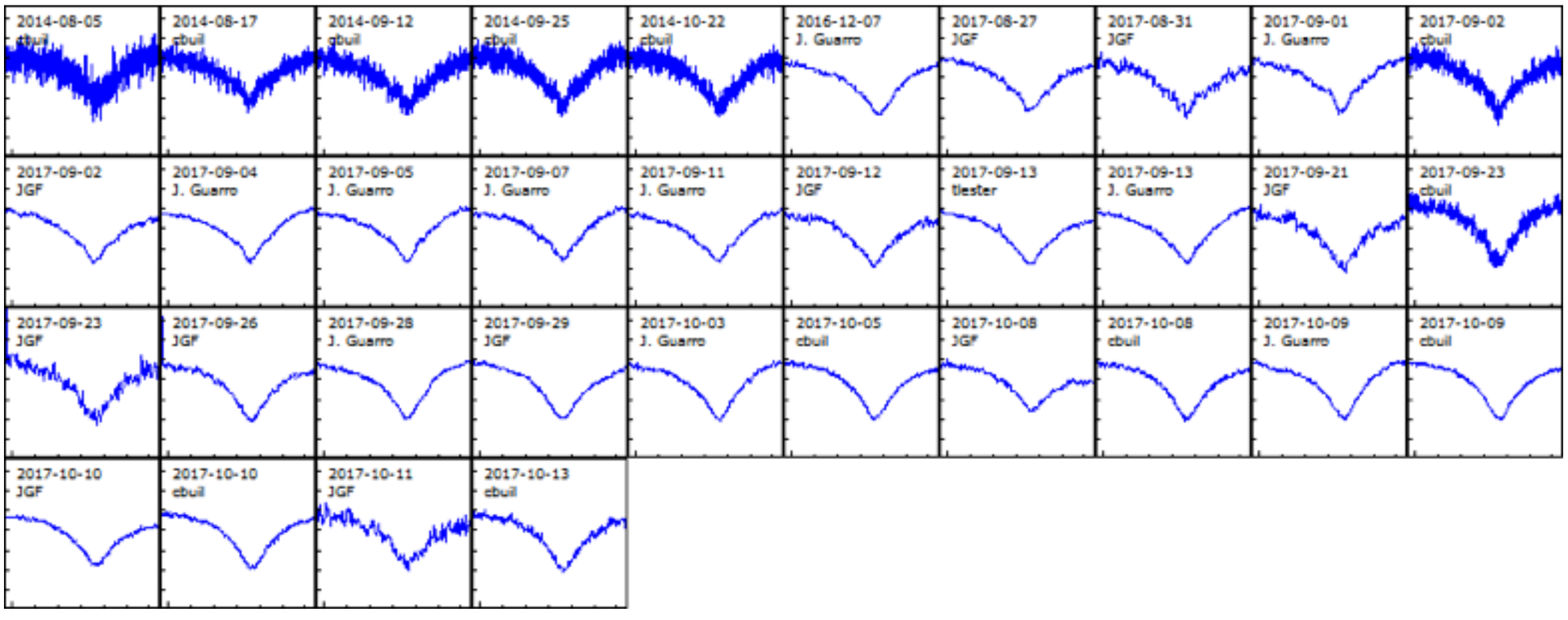
BeSS data base and blue/UV observations (V442 And)



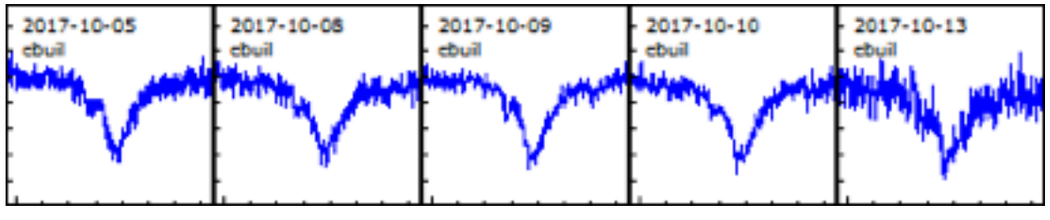
Hbeta



Hgamma



Hdelta



Hepsilon

OPEN QUESTIONS

- **The astrophysical interest of the spectral domain coverage extension ?**
- **Recommandation for BeSS observer ?**