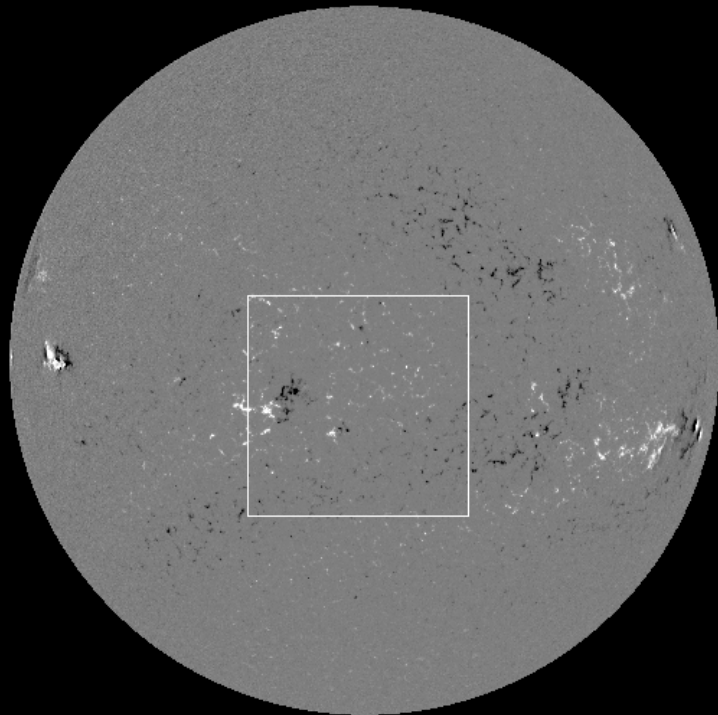


Mesurer les champs magnétiques stellaires

Pascal Petit

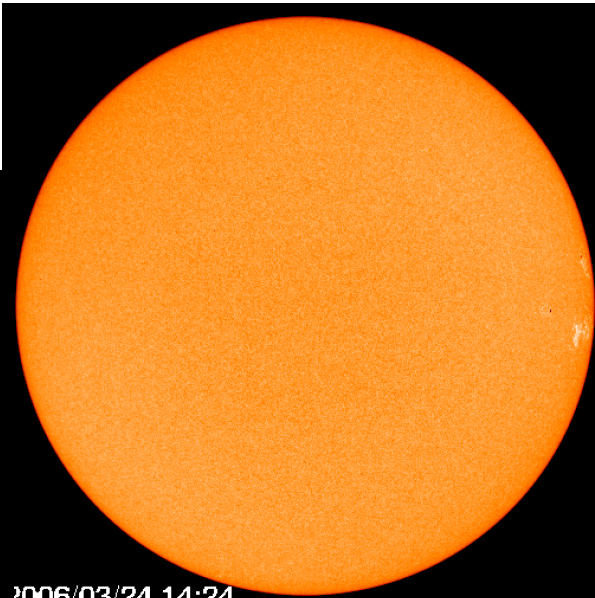
SOHO/MDI Magnetogram

17-Mar-2004 12:53

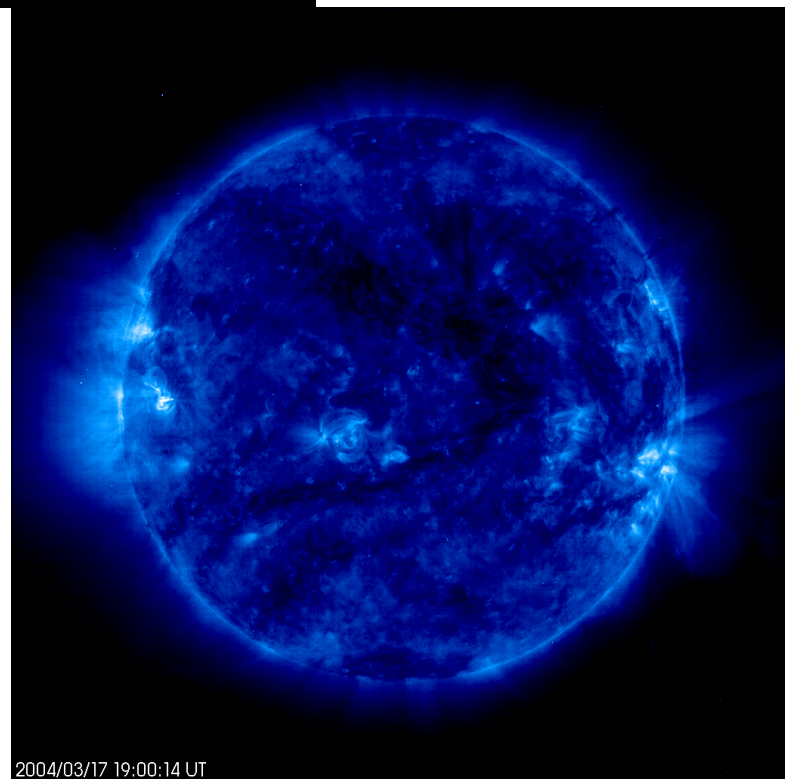


SOI / MDI

Stanford Lockheed Institute for Space Research

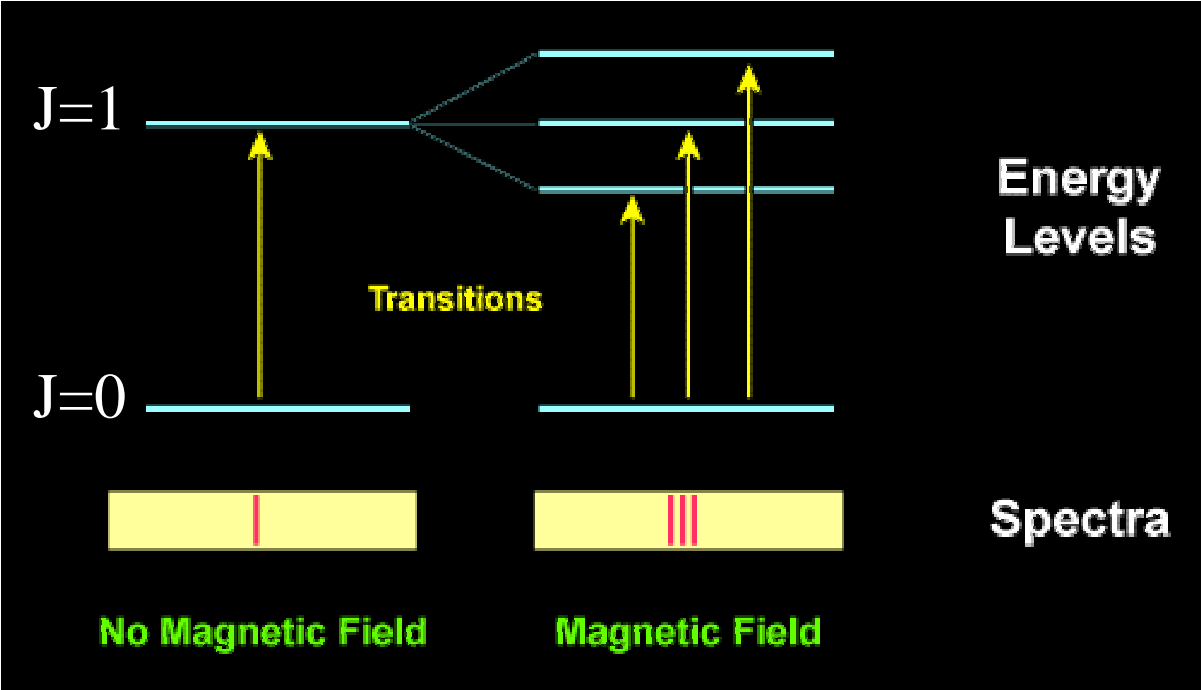


2006/03/24 14:24



2004/03/17 19:00:14 UT

Effet Zeeman

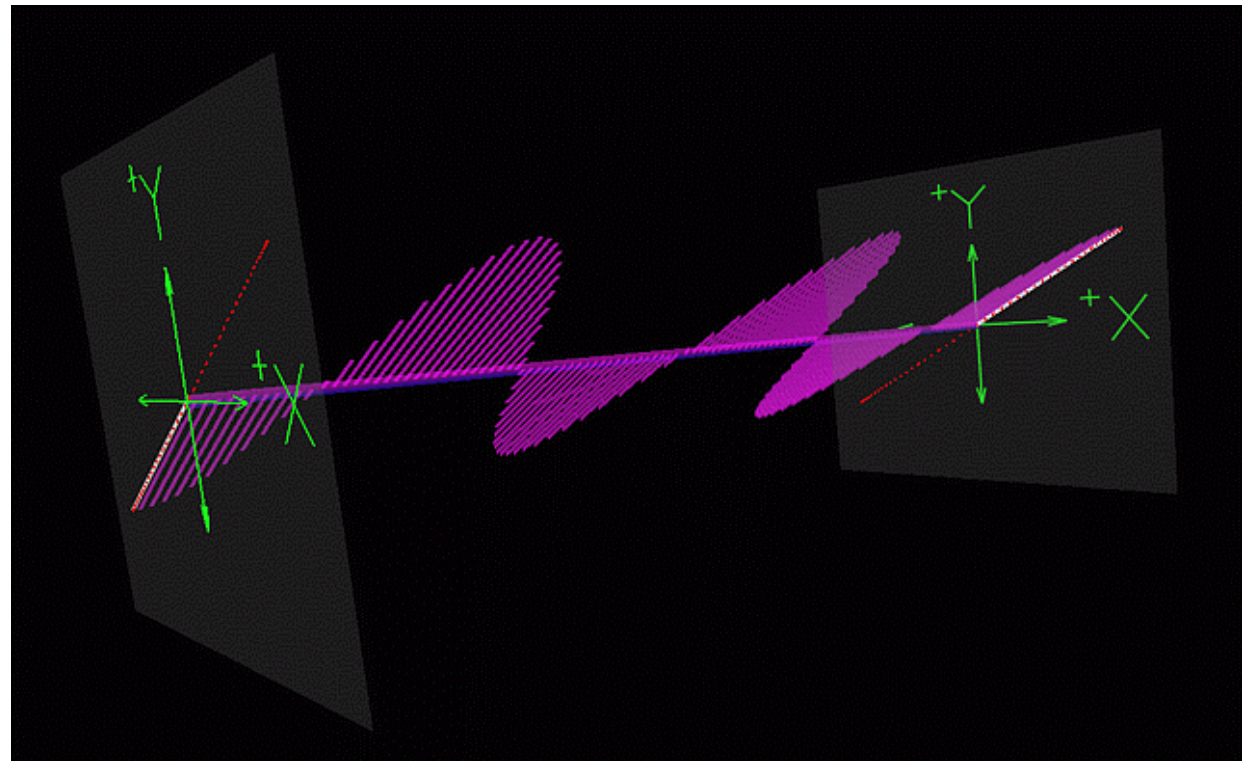


(Zeeman 1896)

Sous-transitions polarisées

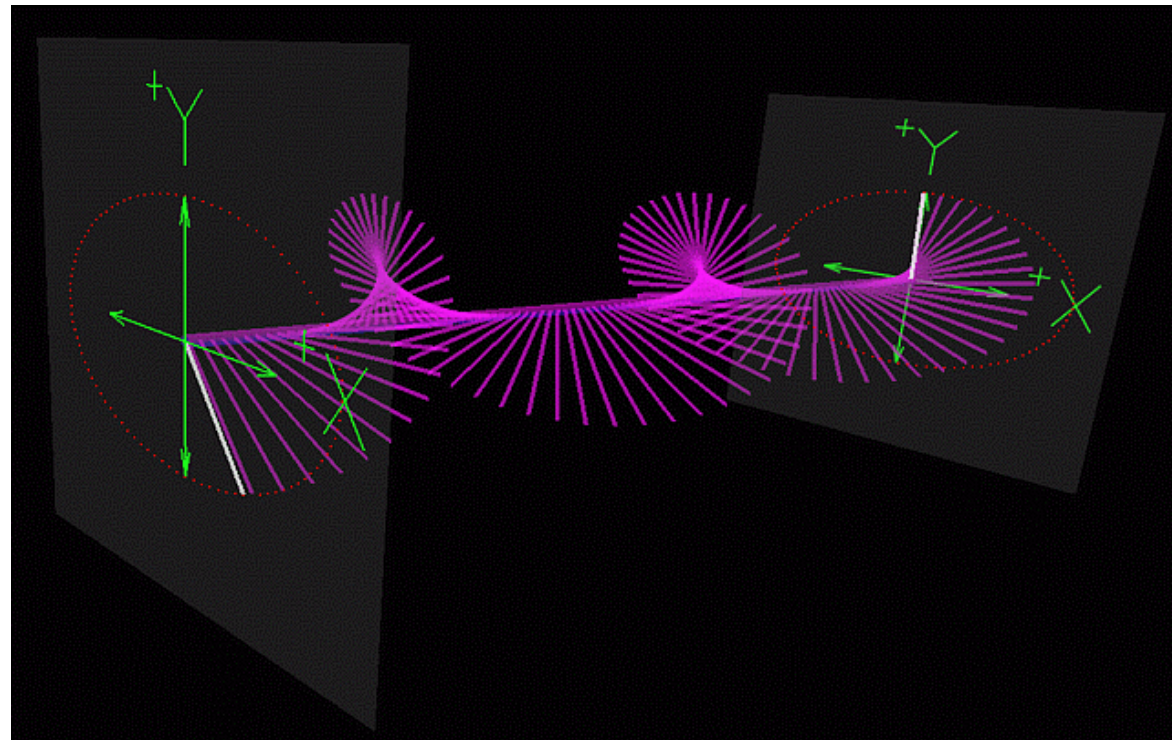
Polarisation de la lumière

Lumière polarisée linéairement:






Polarisation de la lumière



Lumière polarisée circulairement:



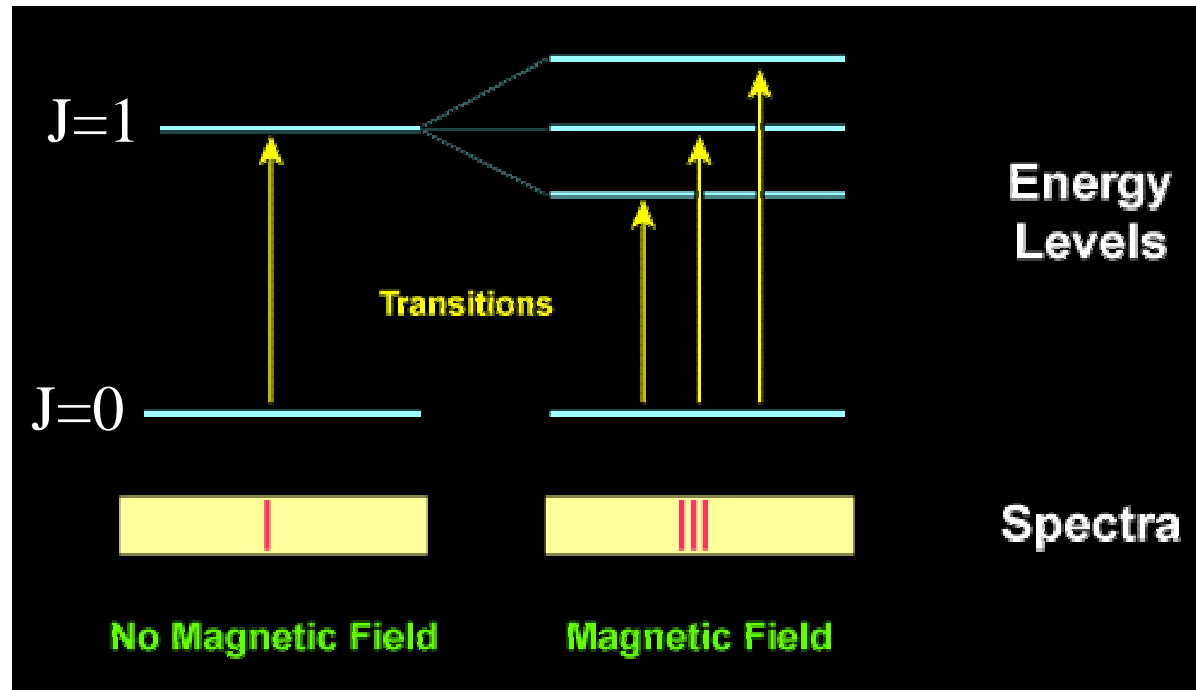
Intensité lumineuse = **Stokes I**

 -  = **Stokes Q**
 0° 90°

 -  = **Stokes U**
 45° 135°

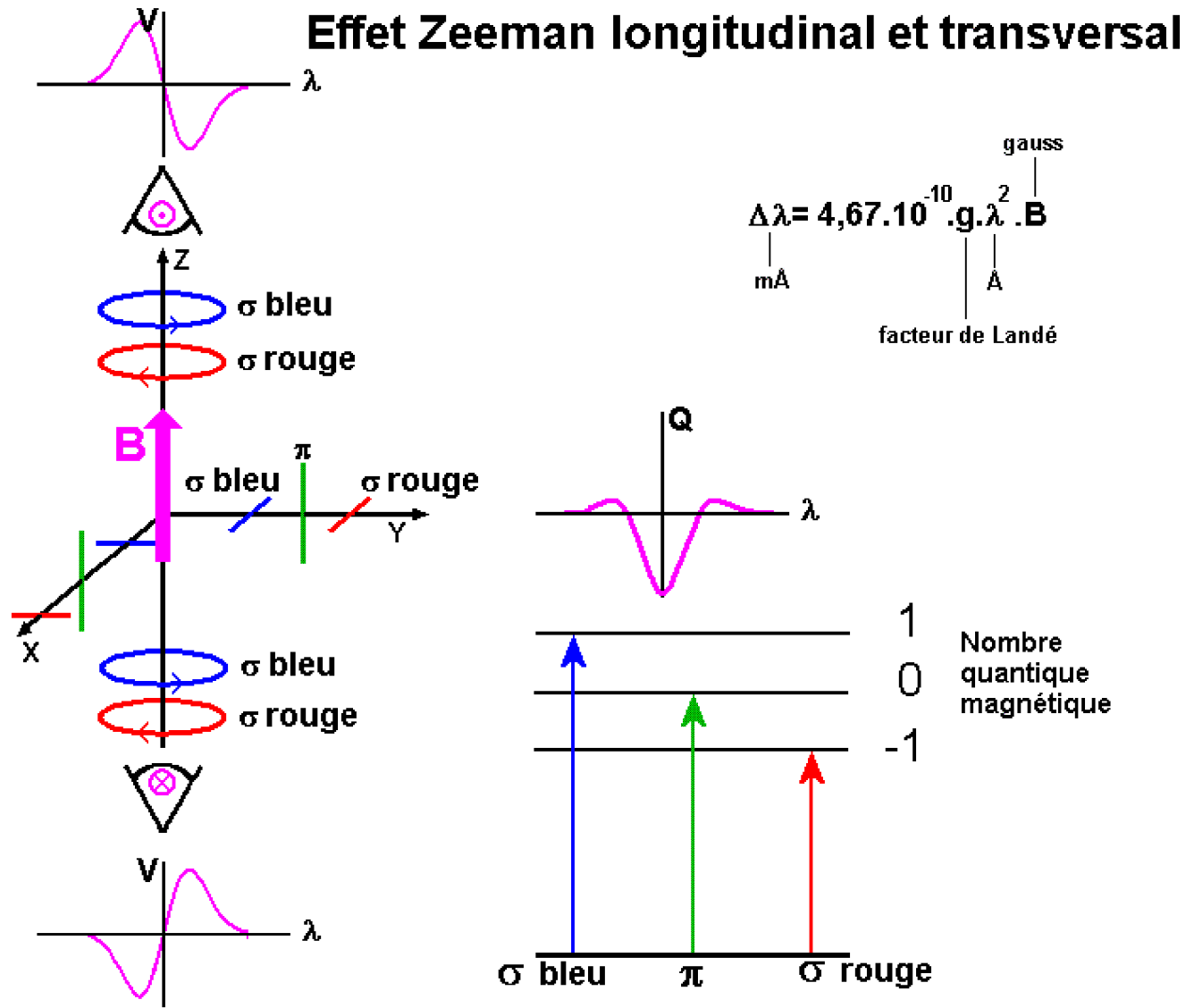
 -  = **Stokes V**
droit gauche

Effet Zeeman



Polarisation dépendante de l'orientation du champ

Effet Zeeman longitudinal et transversal



- **MuSiCoS**

$\lambda = 450 \text{ nm} - 660 \text{ nm}$

R = 30,000

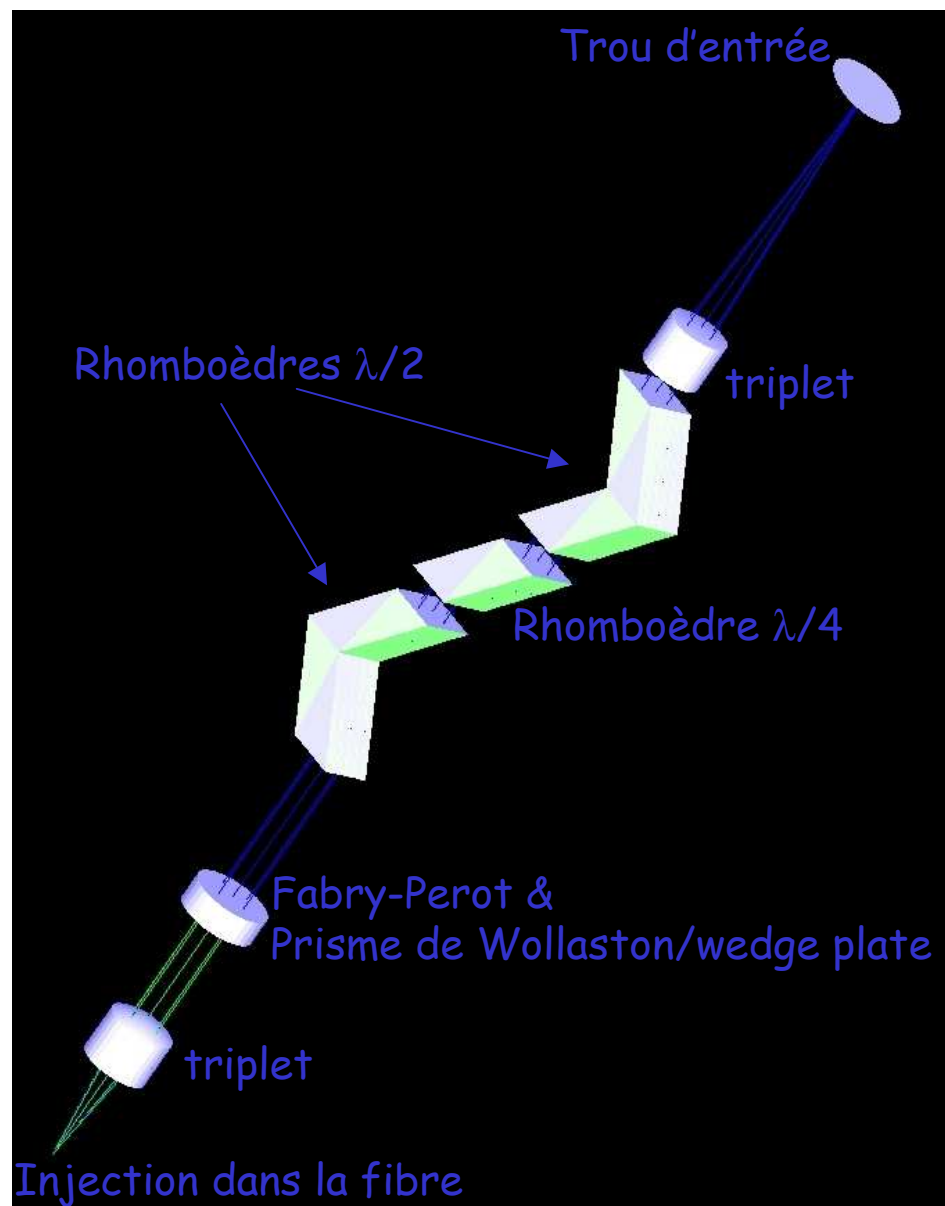
Efficacité ~1%

- **ESPaDOnS@CFHT & NARVAL@TBL**

$\lambda = 370 \text{ nm} - 1,000 \text{ nm}$

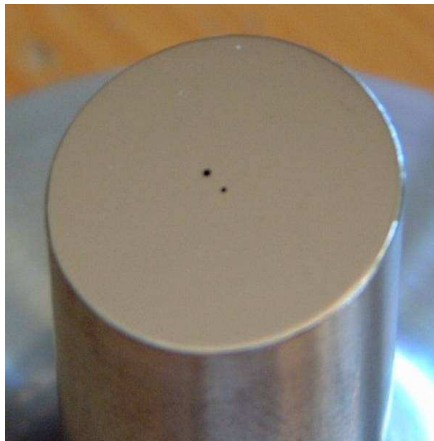
R = 65,000 (polarimétrie), R = 80,000 (spectroscopie)

Efficacité 12%



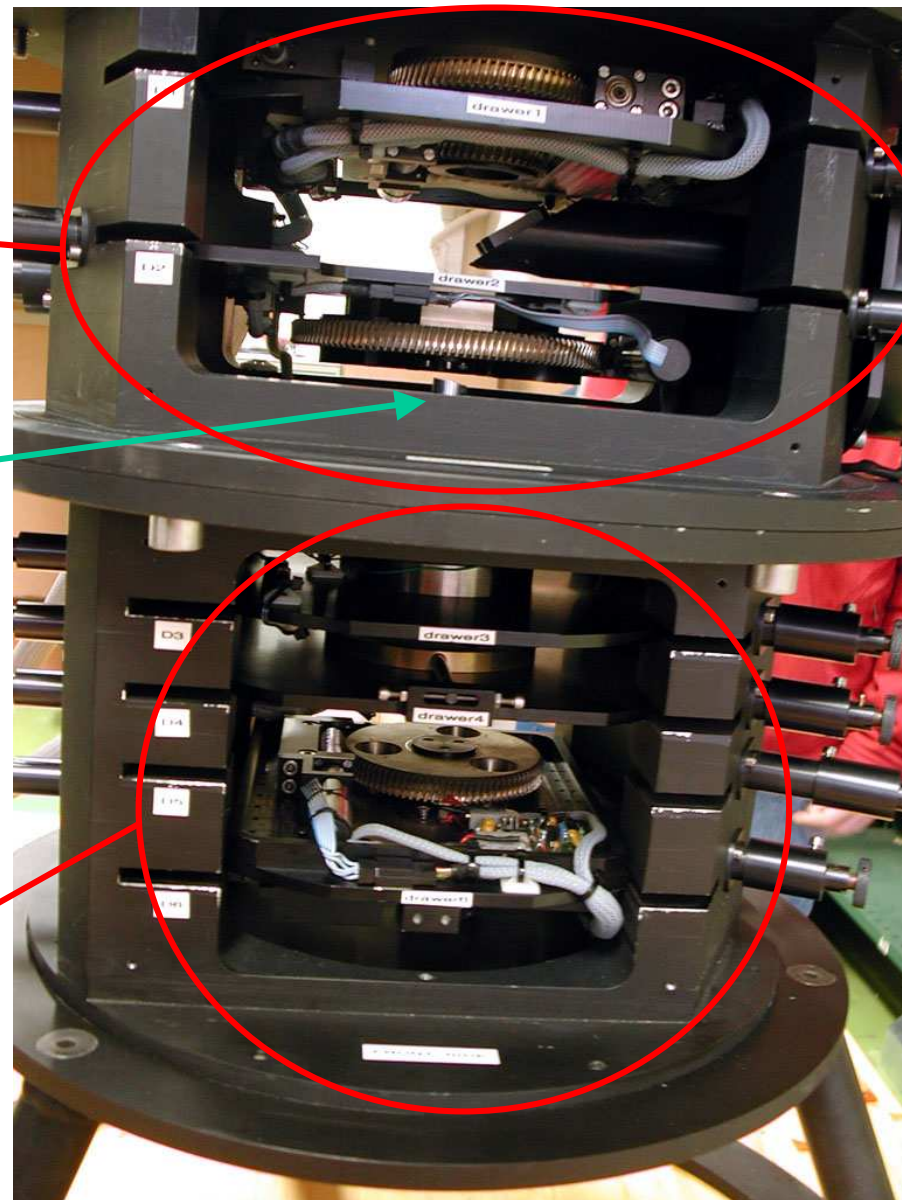


CDA, voie guidage
Roue de calibration



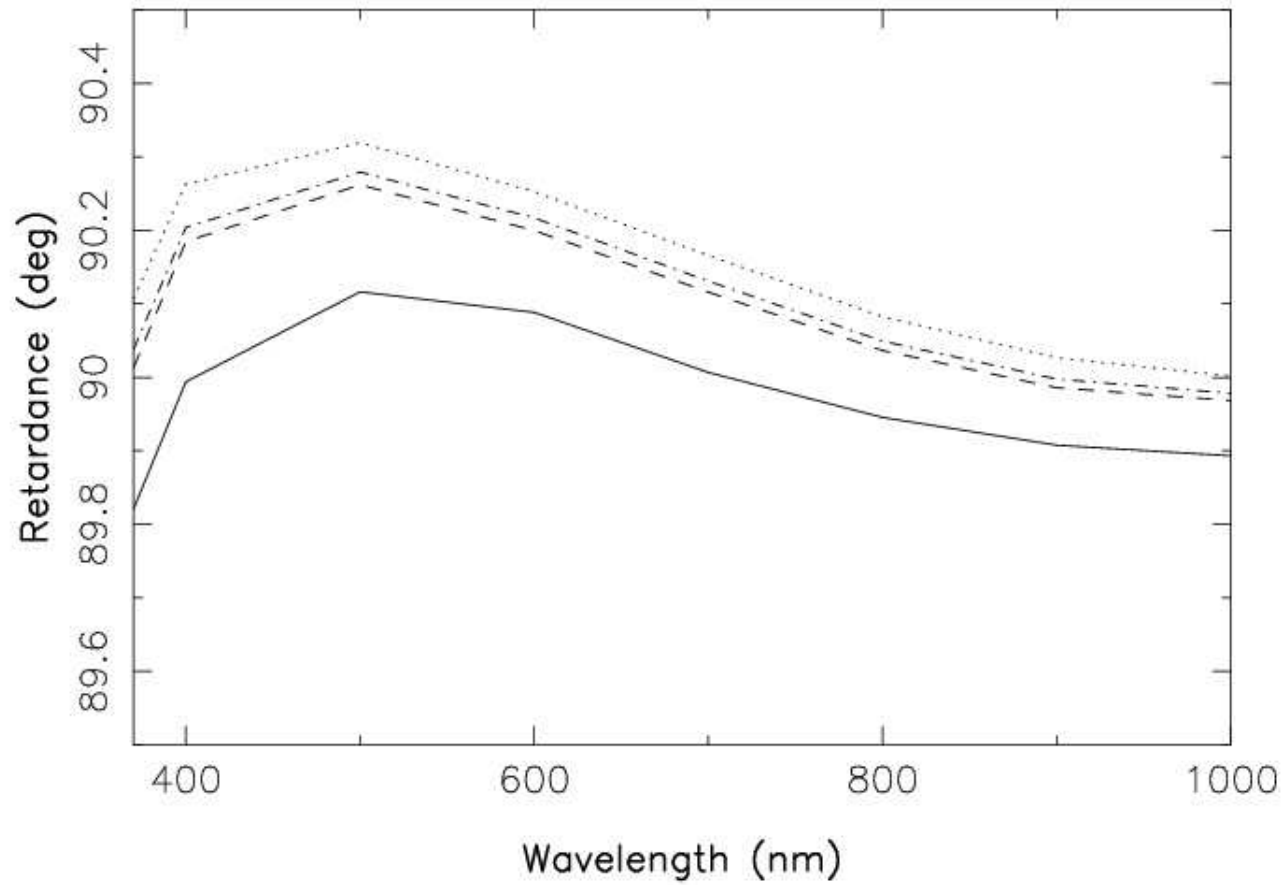
Trous d'entrée
(étoile & ciel)

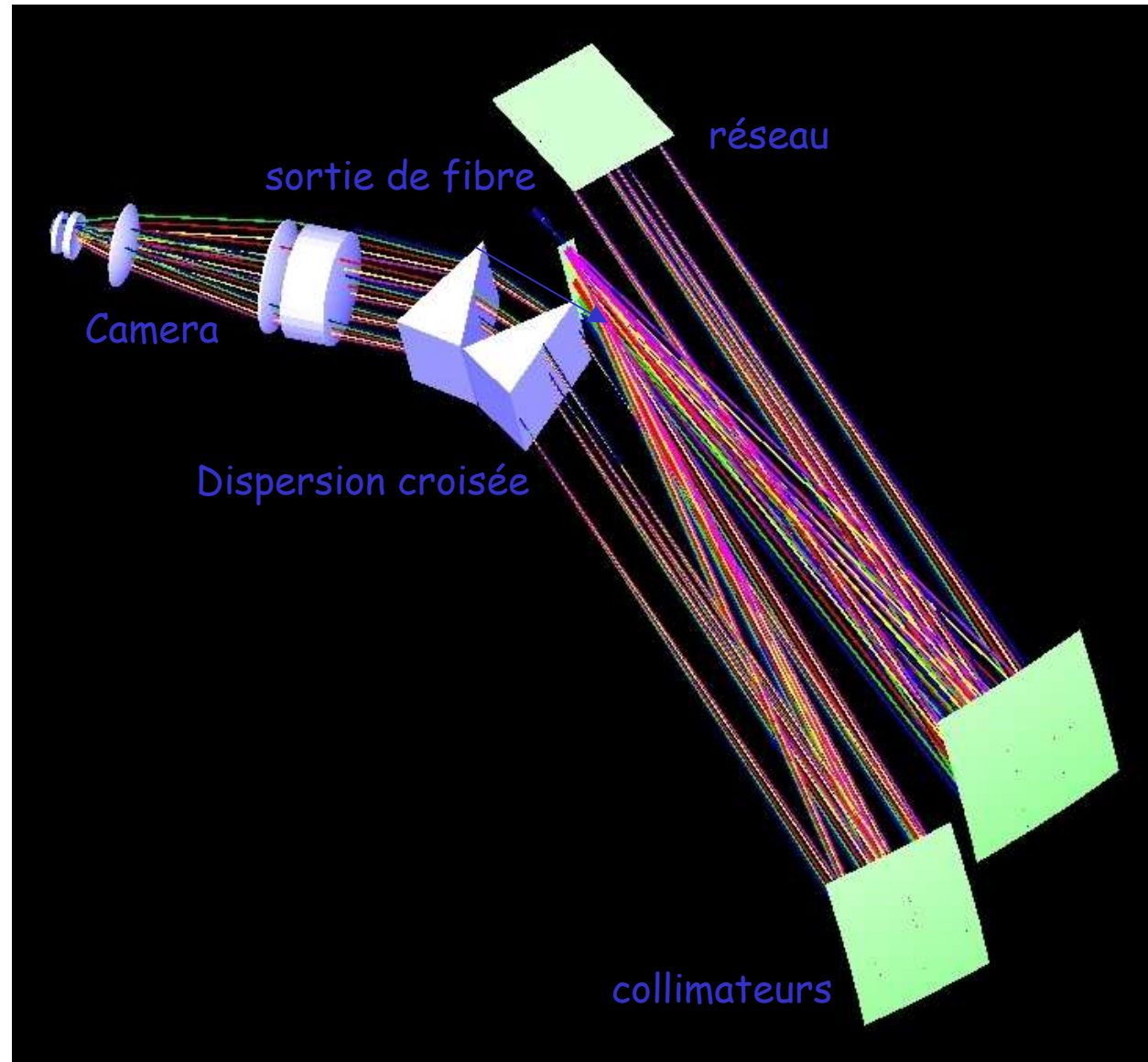
Analyse polarimétrique



Rhomboèdres de Fresnel

Retardance of MgF2 coated $\lambda/4$ Fresnel rhombs

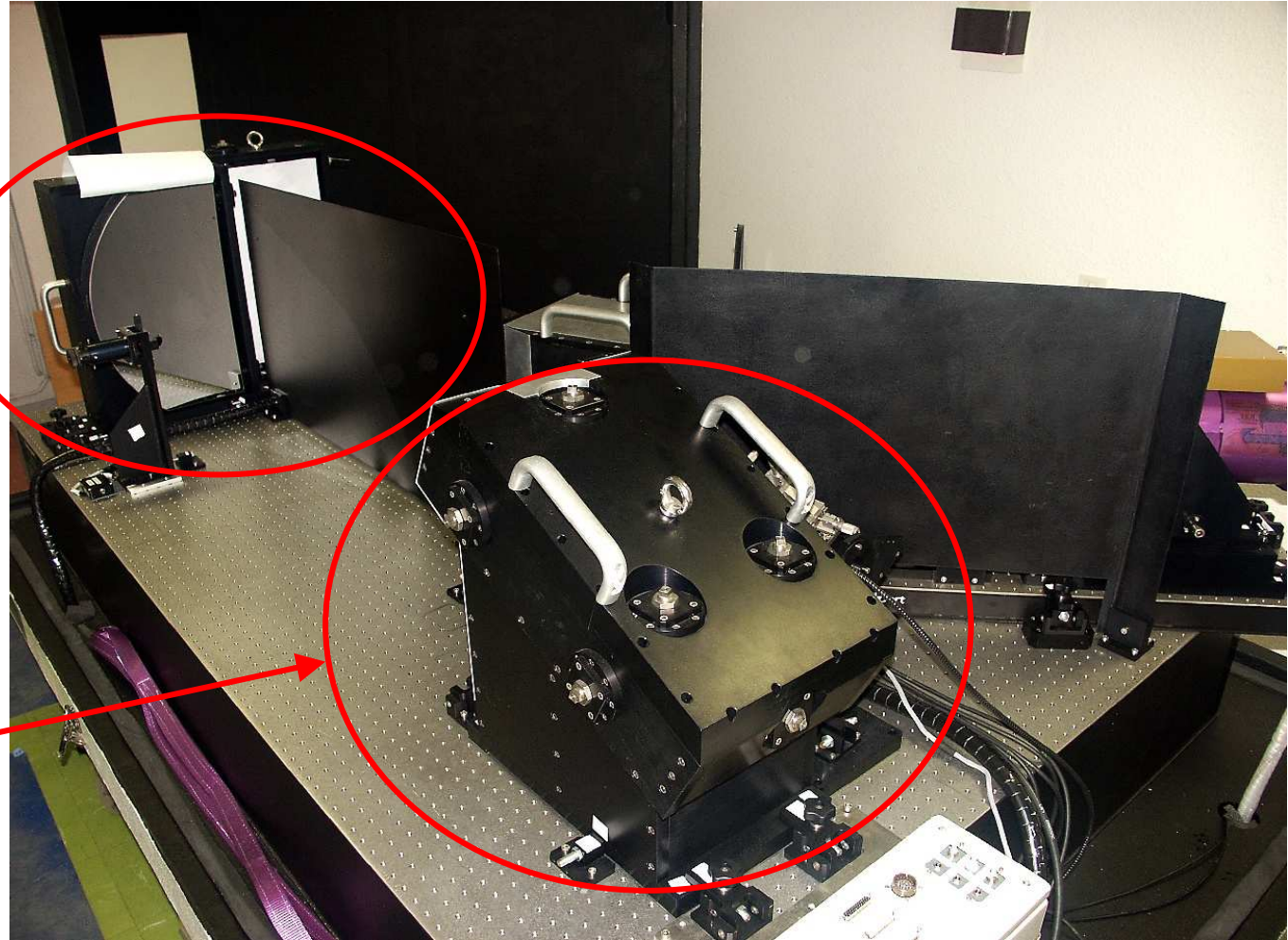


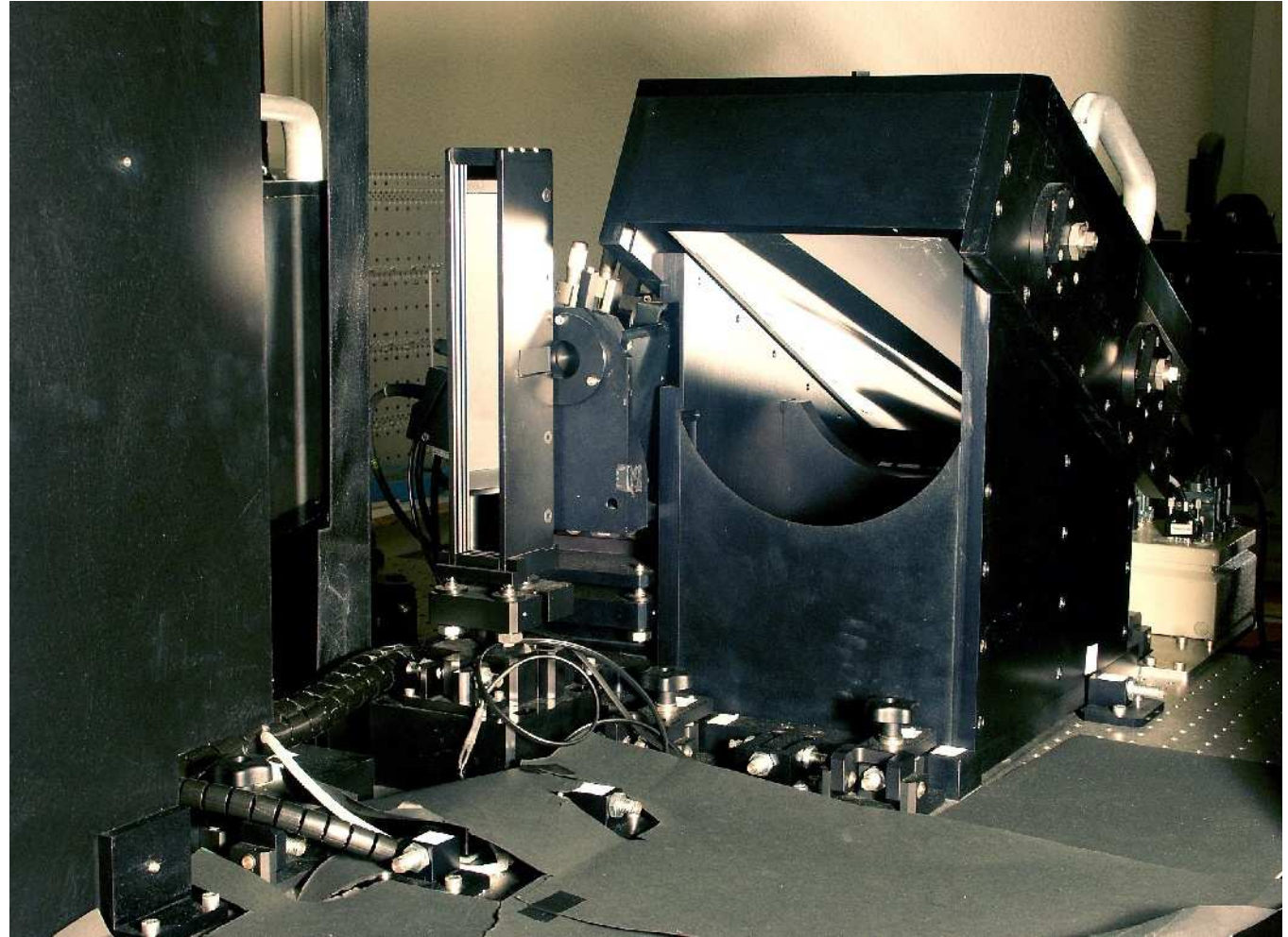




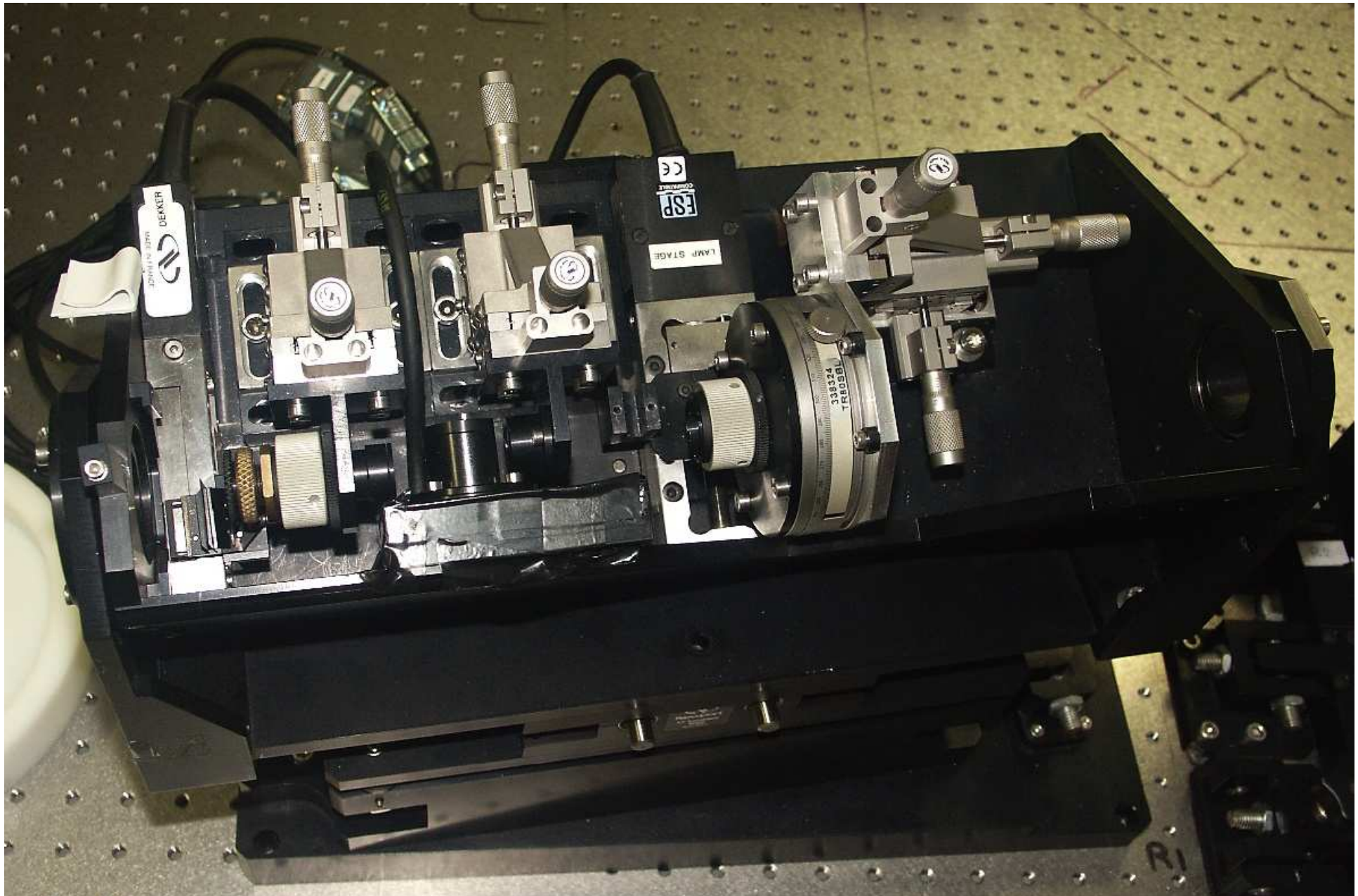
collimateurs →

réseau →

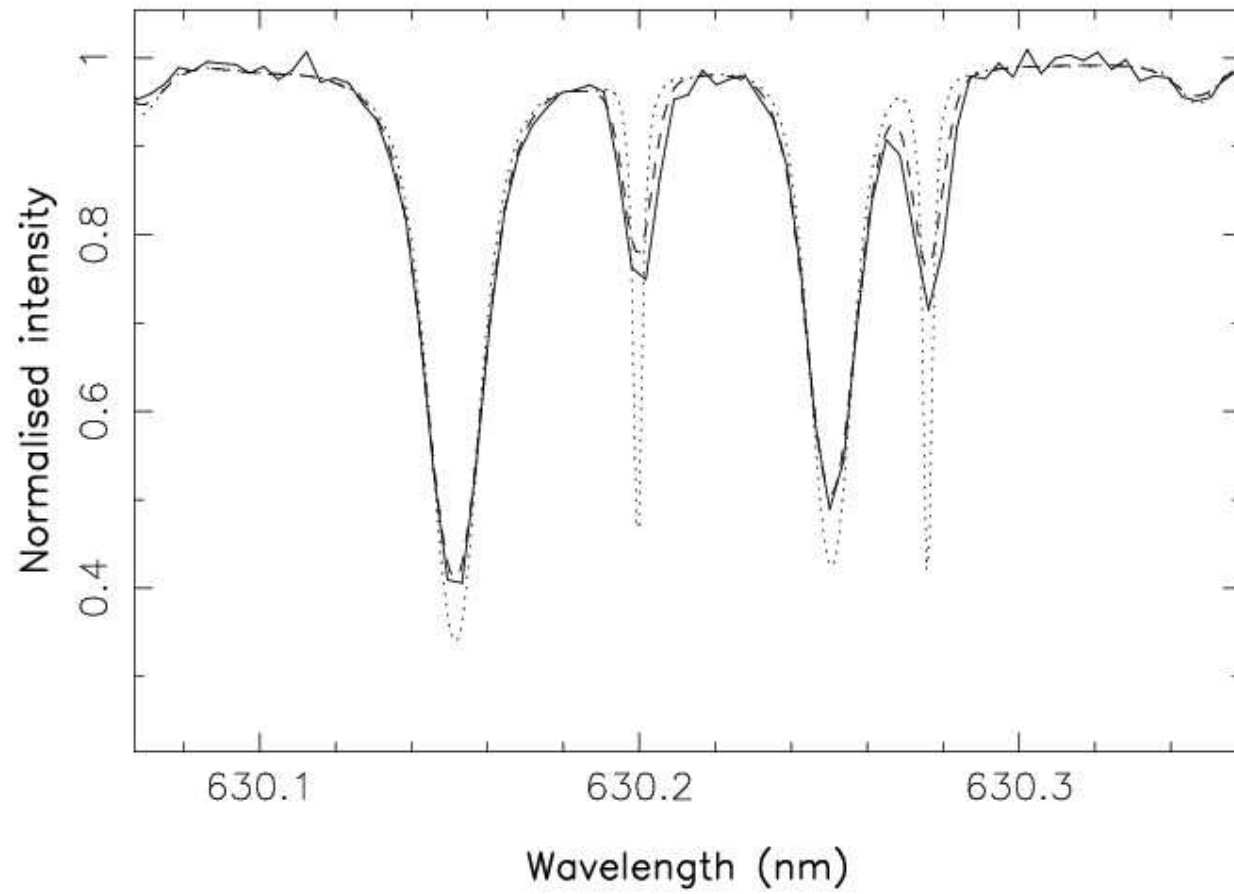




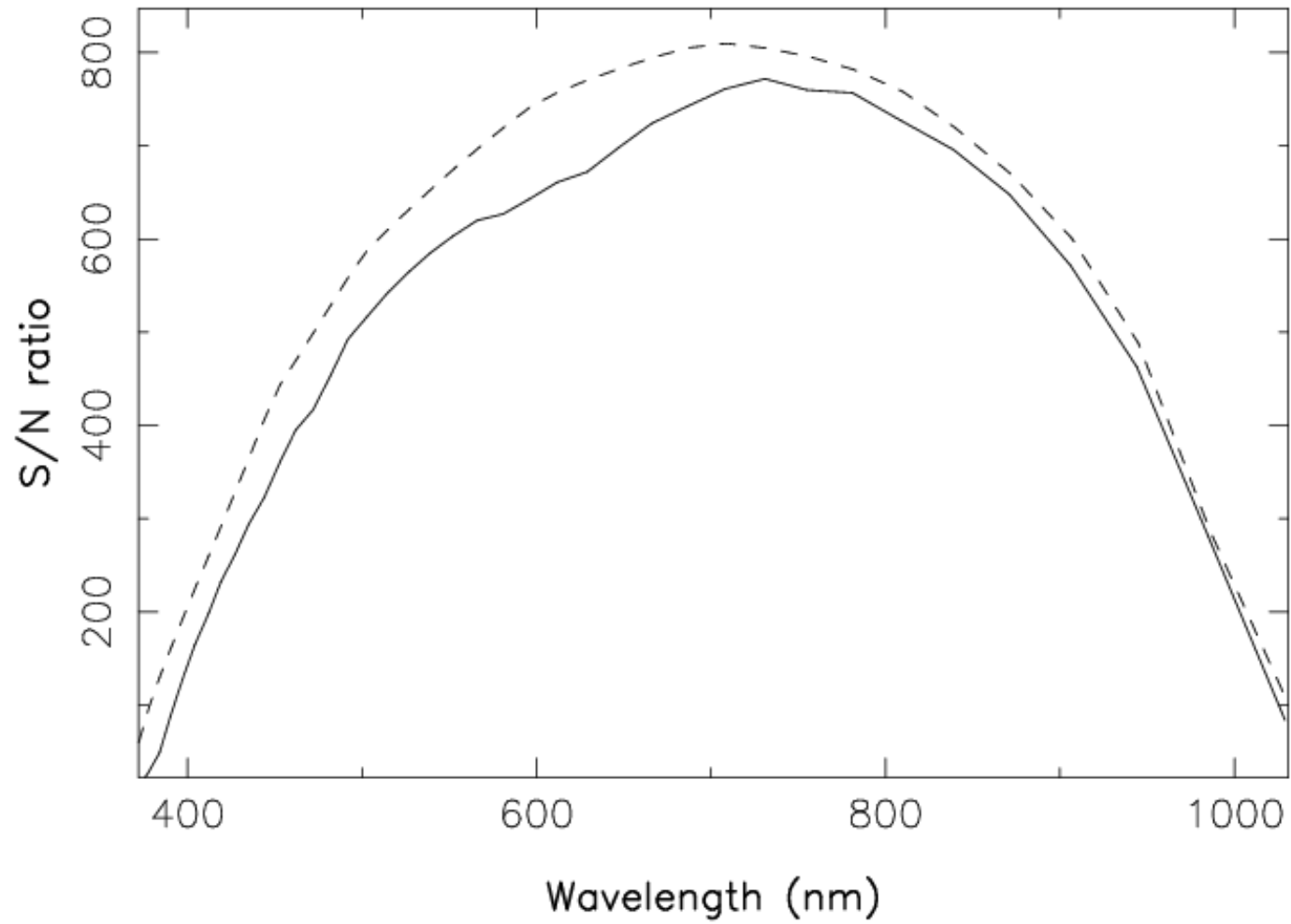
Découpeur d'image

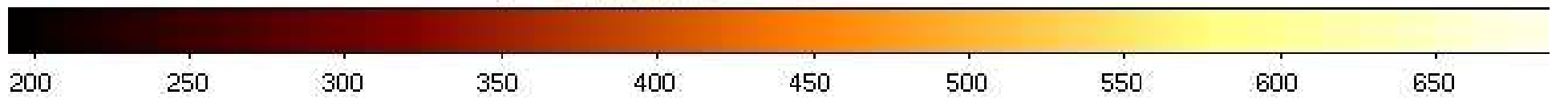
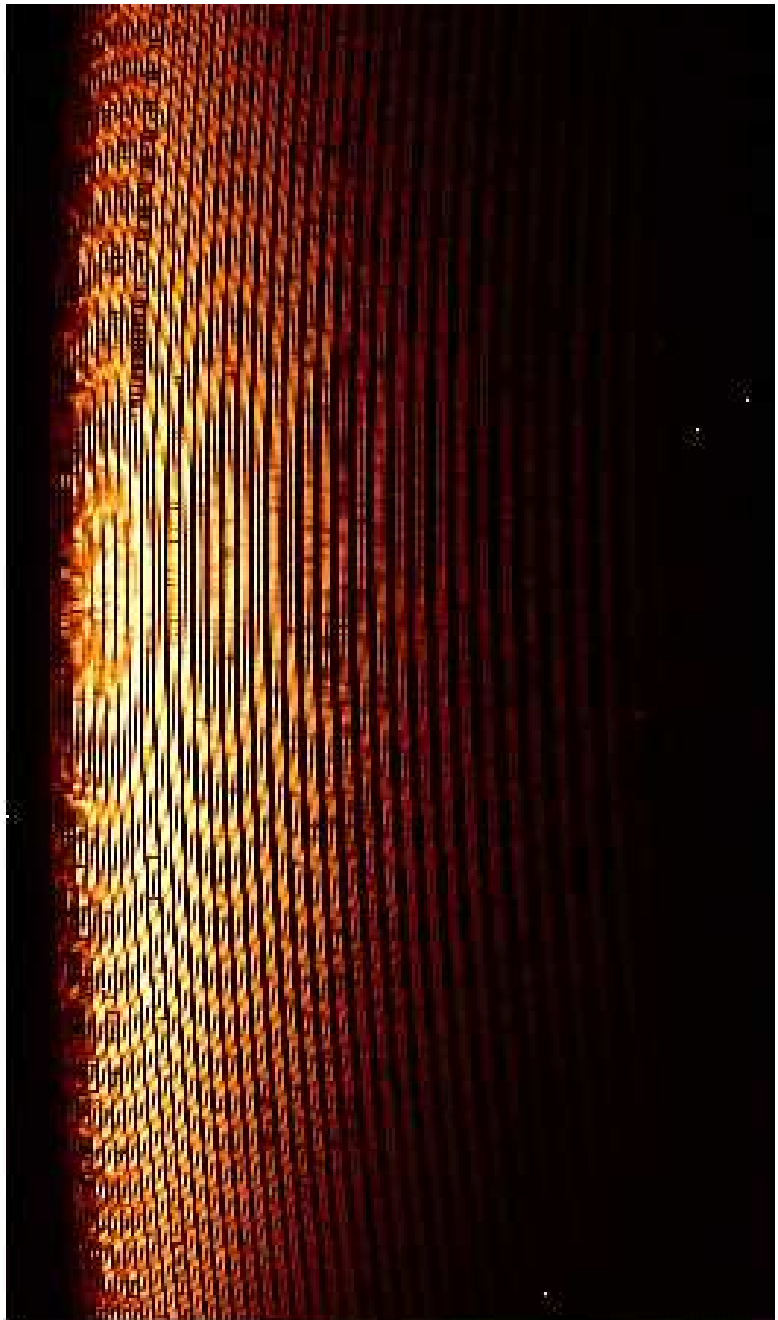


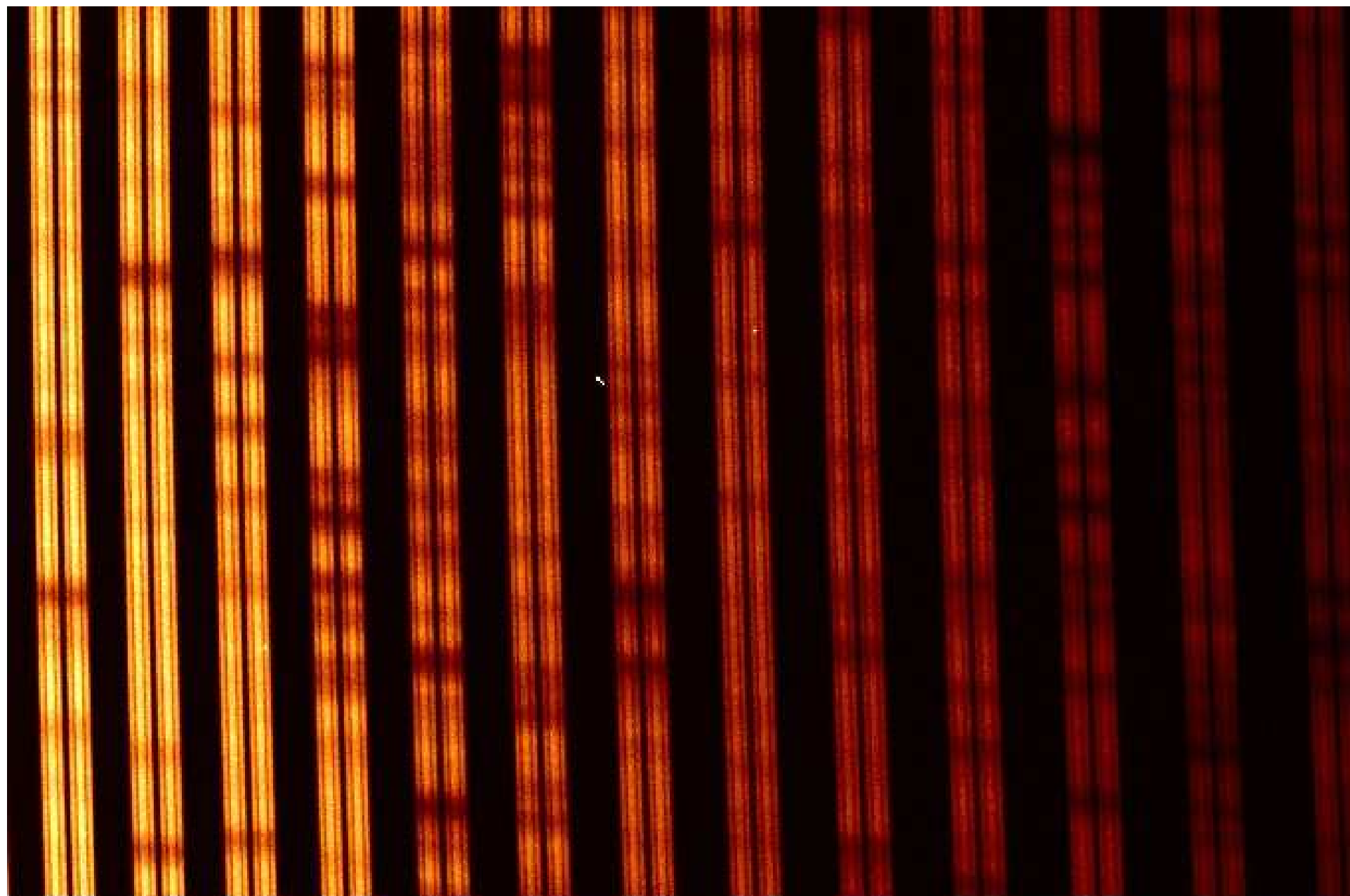
Solar spectrum with ESPaDOnS, Fe I lines @ 630.2nm

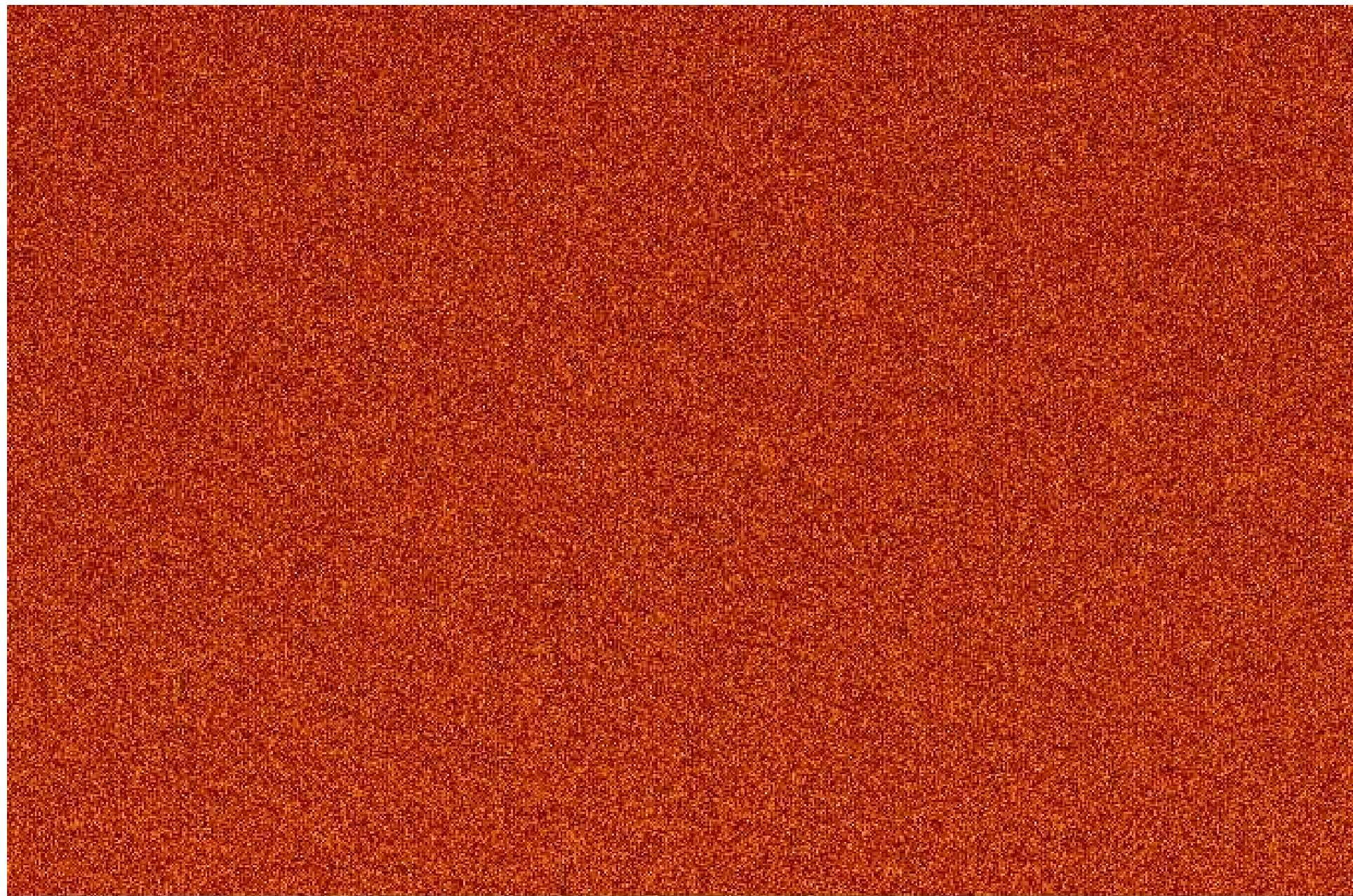


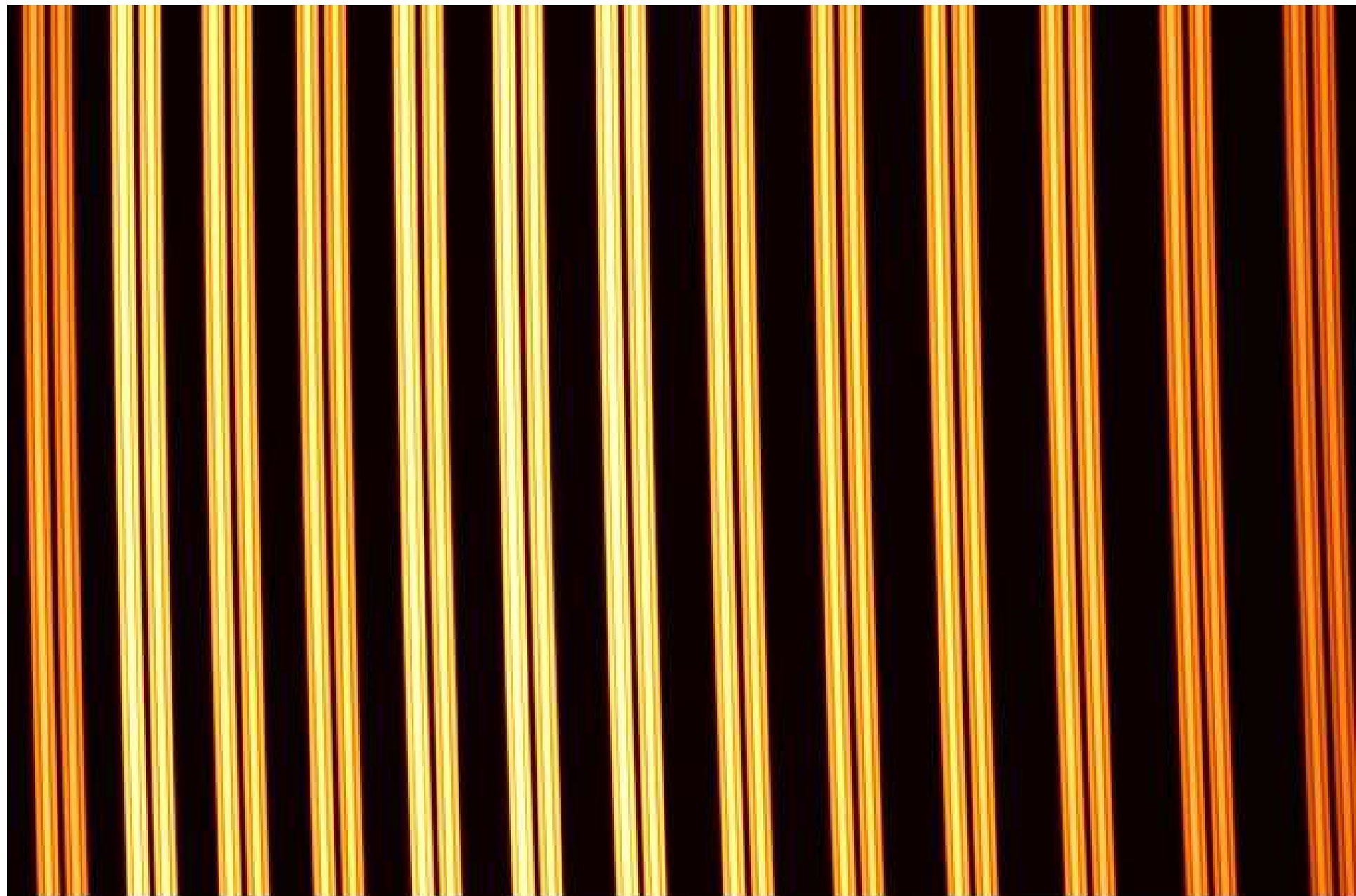
II Peg, 20 min exposure, ESPaDOnS@CFHT











5000

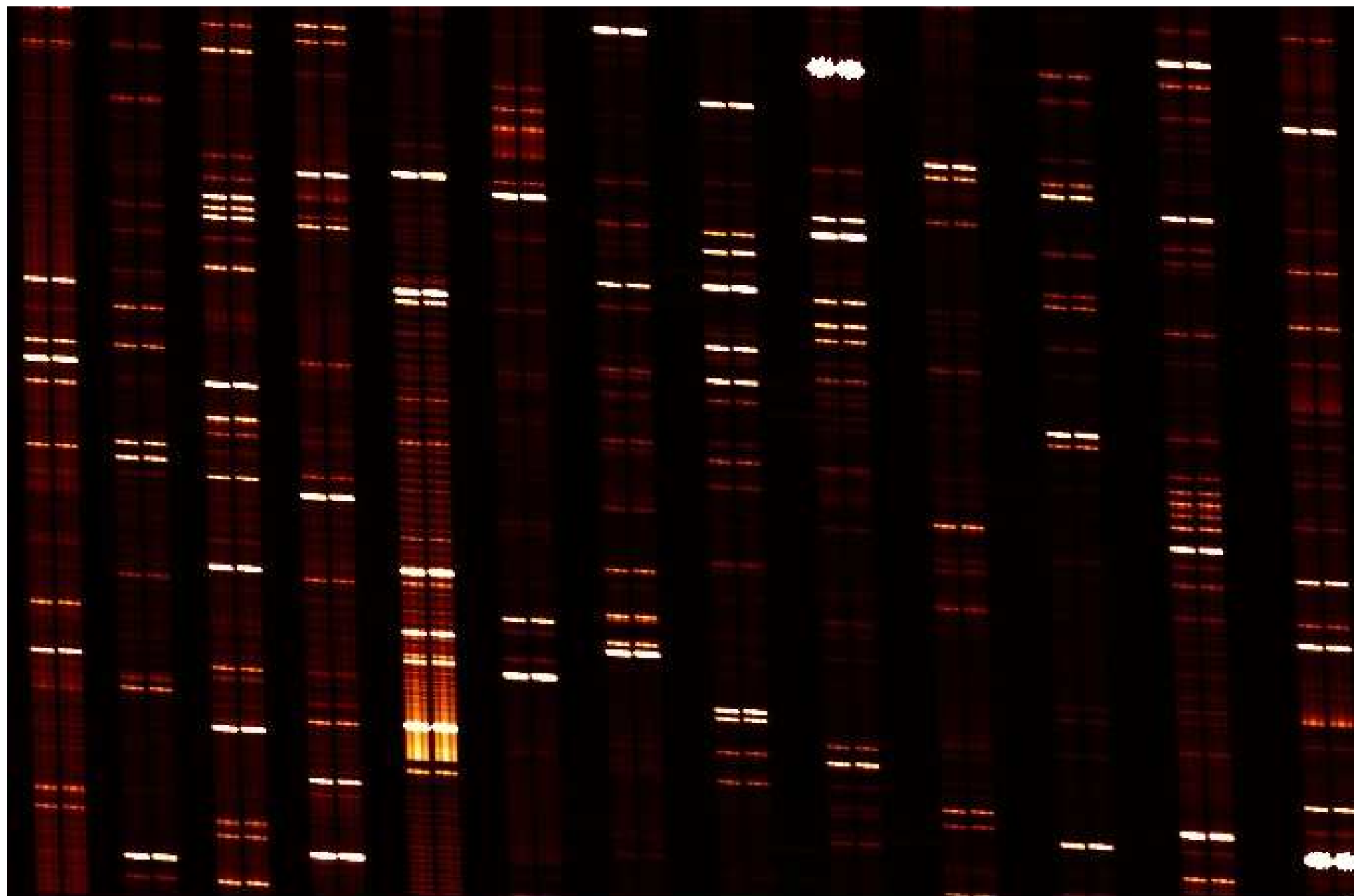
10000

15000

20000

25000





Imagerie indirecte des surfaces stellaires

Imagerie indirecte des surfaces stellaires

Pas de résolution spatiale directe sur les étoiles

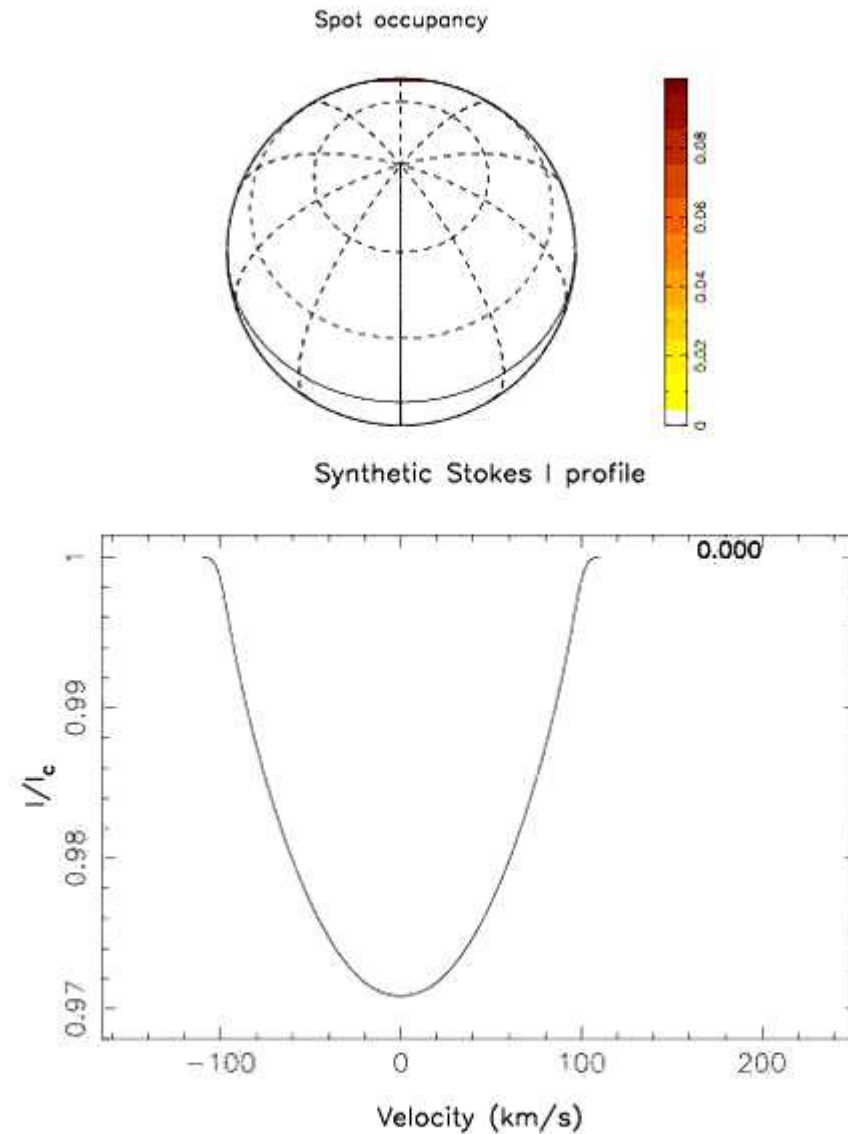


Techniques d'imagerie tomographique,
inspirées de l'imagerie médicale

Imagerie indirecte Des taches froides: Imagerie Doppler

Signature spectrale Des taches stellaires

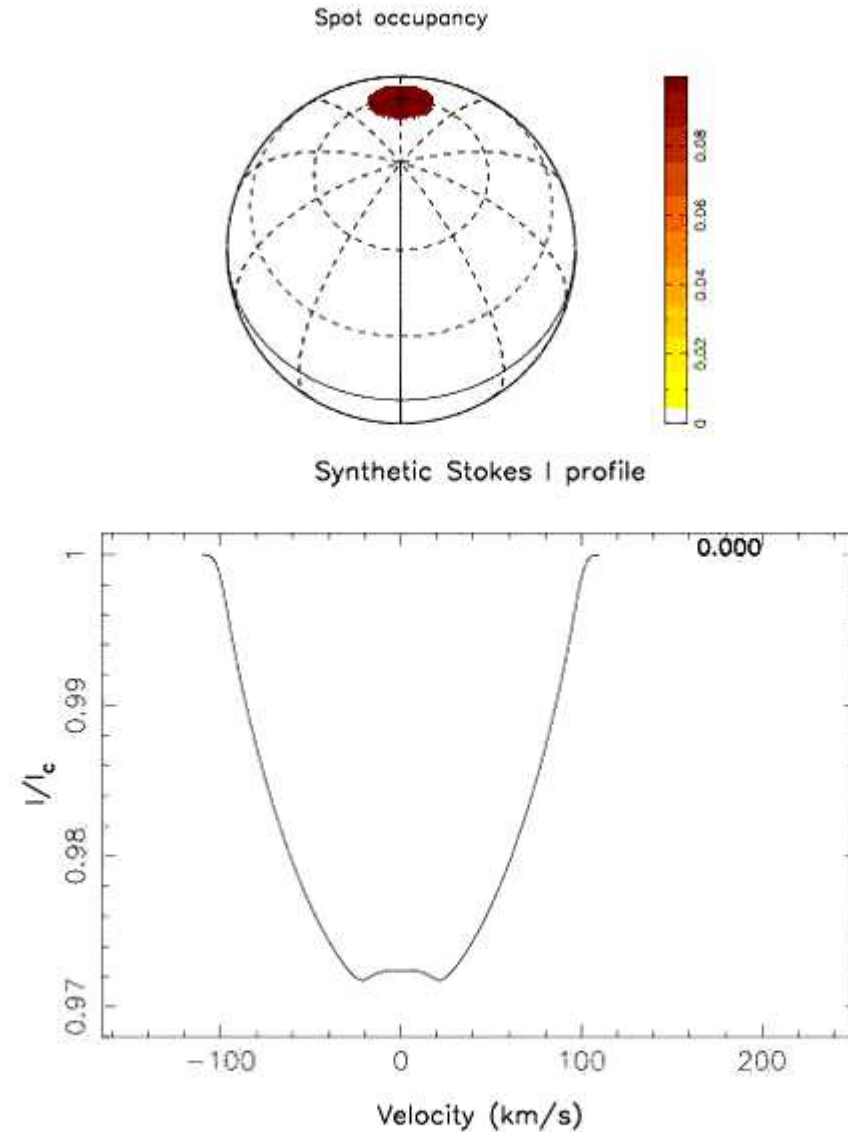
1. Tache à basse latitu



Imagerie indirecte Des taches froides: Imagerie Doppler

Signature spectrale Des taches stellaires

1. Tache à haute latitude

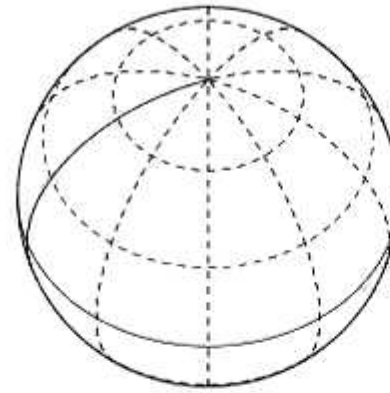


Série temporelle
De spectres

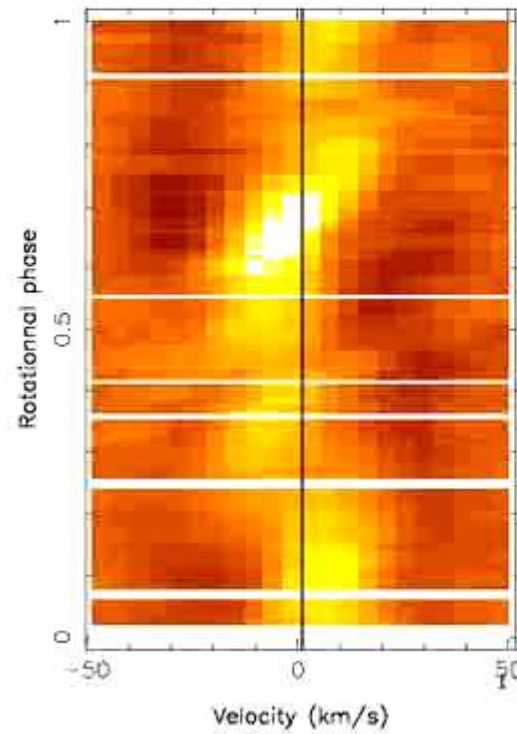


Carte reconstruite

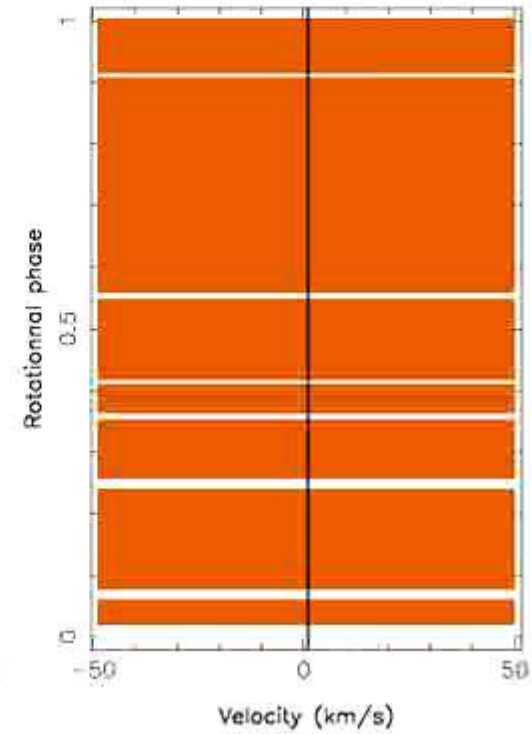
Spot occupancy



HR 1099, Stokes I profiles



Reconstructed Spectra

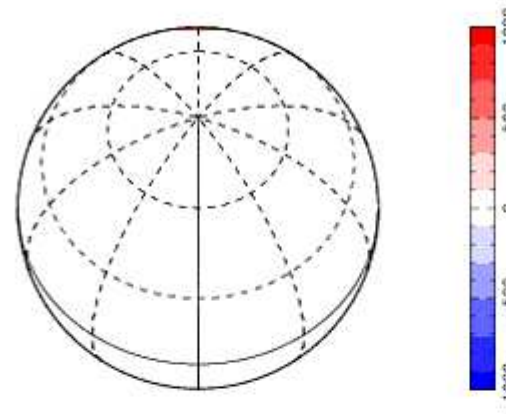


Imagerie Zeeman-Doppler

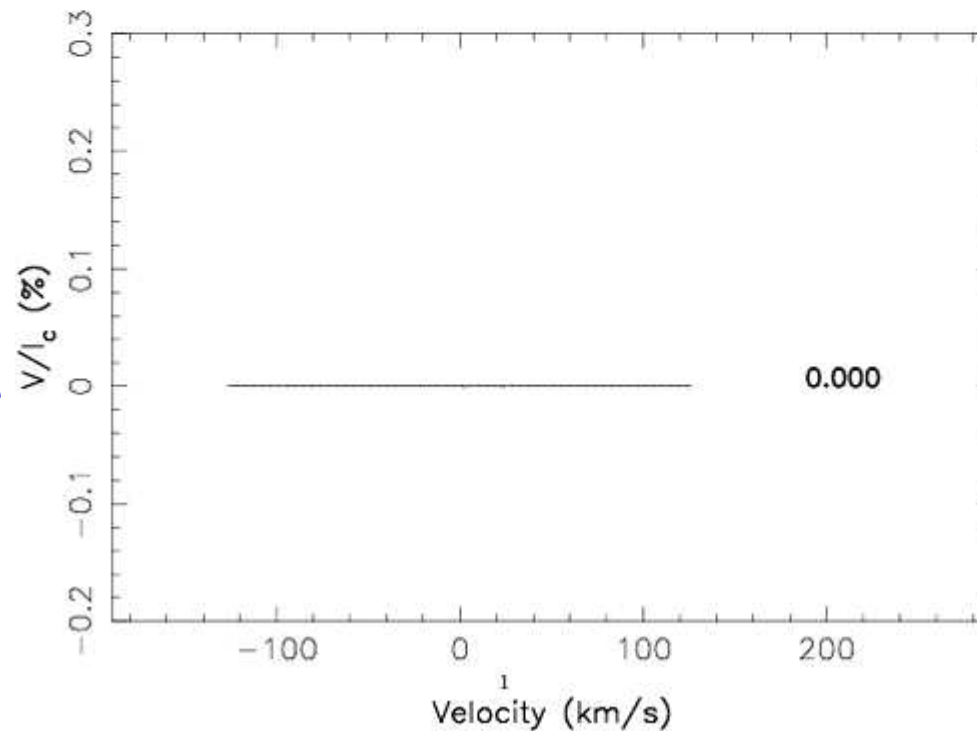
Magnétogrammes stellaires

1. longitude des
régions magnétiques

Radial magnetic field



Stokes V profile

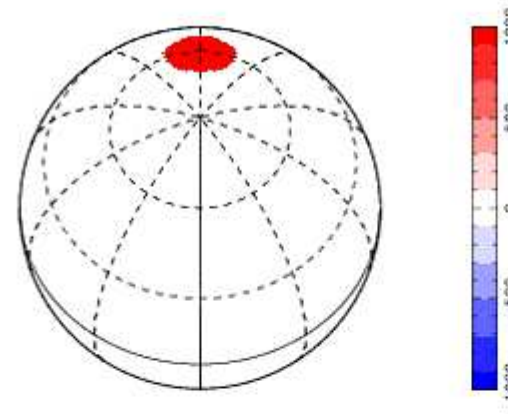


Imagerie Zeeman-Doppler

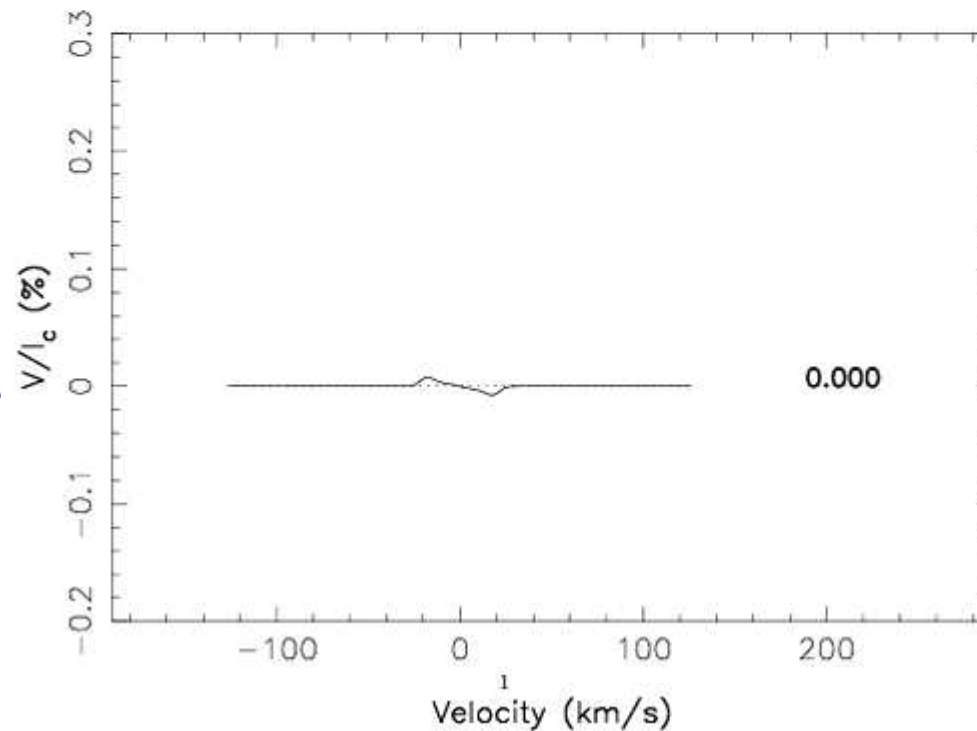
Magnétogrammes stellaires

1. latitude des
régions magnétiques

Radial magnetic field



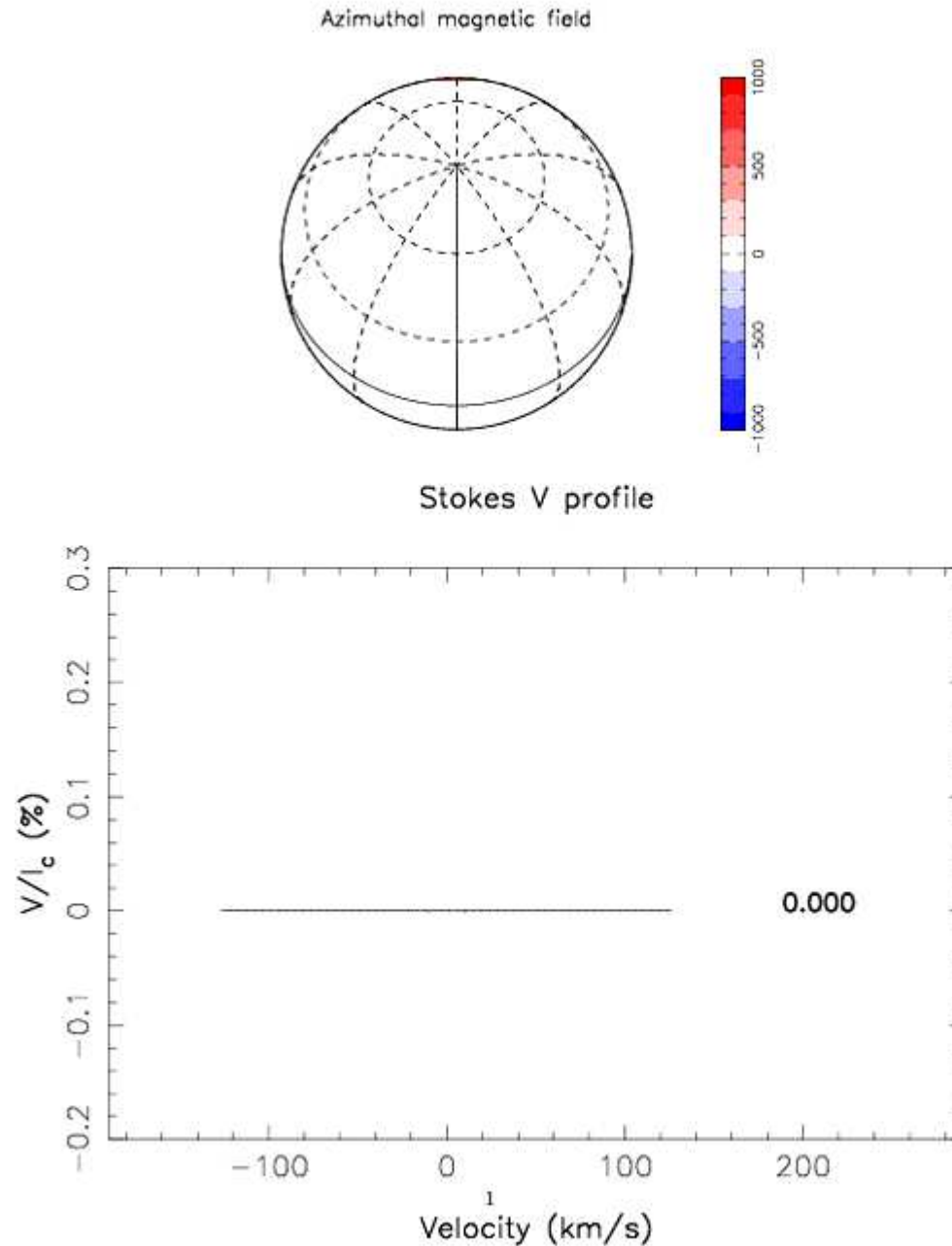
Stokes V profile



Imagerie Zeeman-Doppler

Magnétogrammes stellaires

1. orientation des
lignes de champ

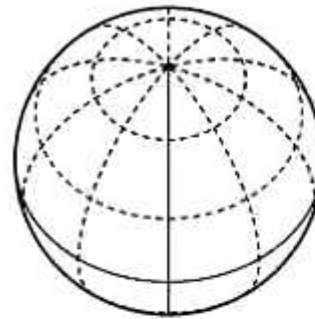


Série temporelle
De spectres polarisés

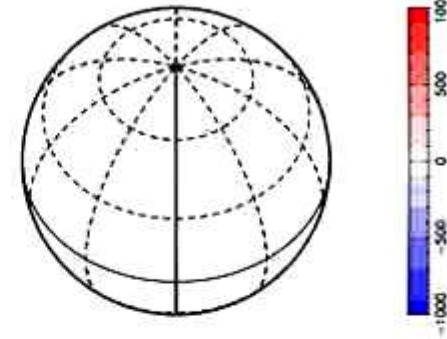


Carte reconstruite

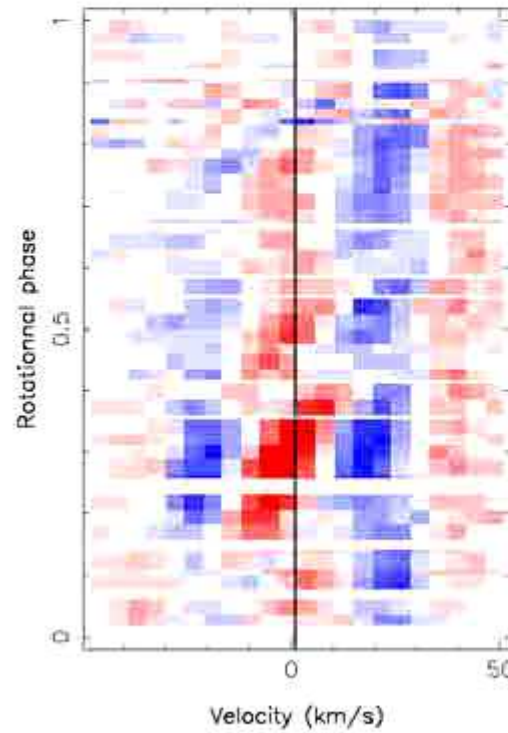
Radial magnetic field



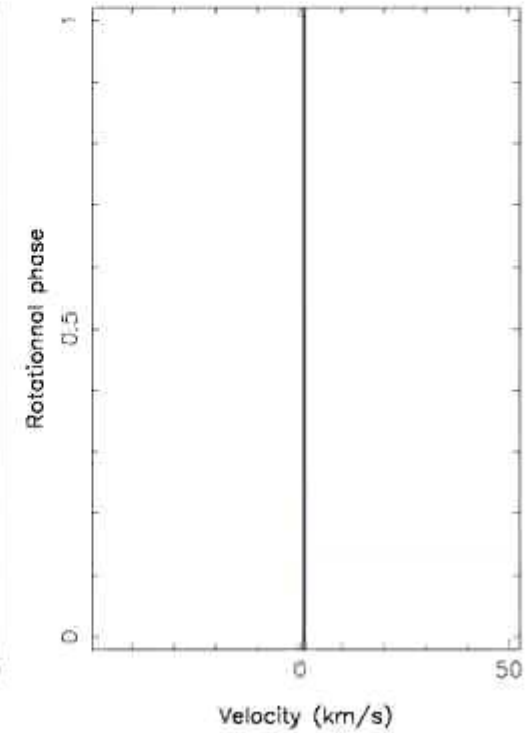
Azimuthal magnetic field



HR 1099, Stokes V profiles



Reconstructed Spectra



Magnétogrammes stellaires

HR 1099

Binaire serrée

Sous-géante K1 (+ G5 sec.)

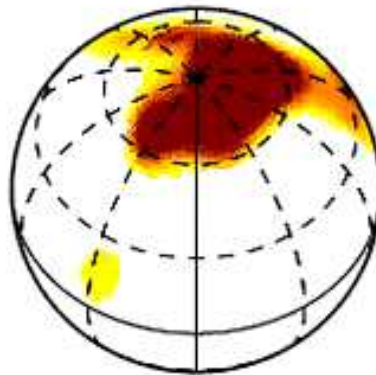
$P_{\text{rot}} = 2.83$ days

$M \sim 1.0 M_{\text{sun}}$

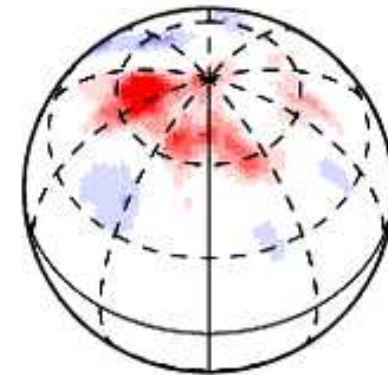
$R \sim 3.7 R_{\text{sun}}$

$T \sim 4700$ K

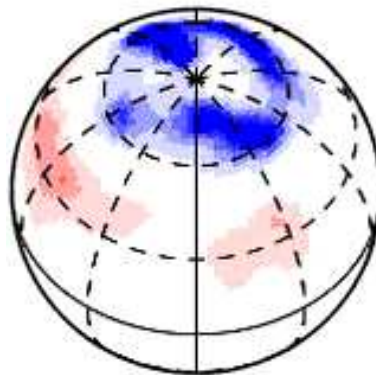
Spot occupancy



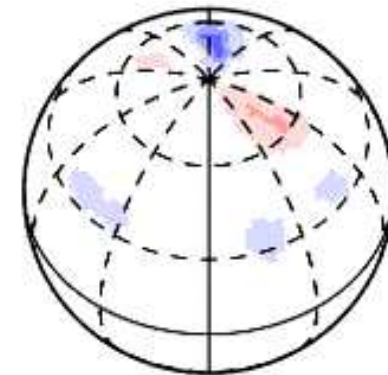
Radial magnetic field



Azimuthal magnetic field



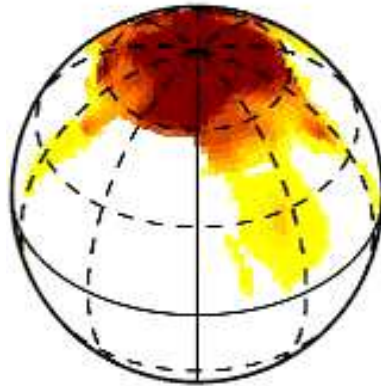
Meridional magnetic field



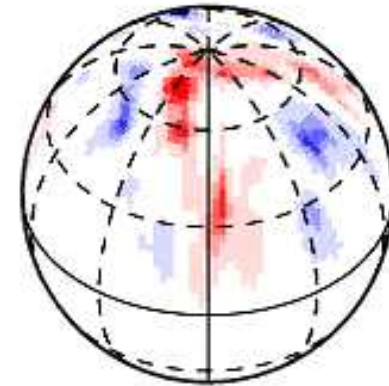
Magnétogrammes stellaires

HD 199178
FK Com type star
G5 giant
 $P_{\text{rot}} \sim 3.3$ days
 $M \sim 1.65 M_{\text{sun}}$
 $R \sim 6 R_{\text{sun}}$
 $T \sim 5400$ K

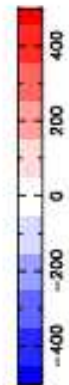
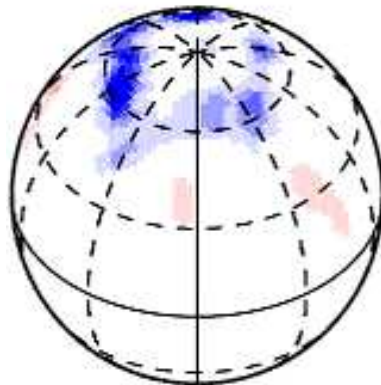
Spot occupancy



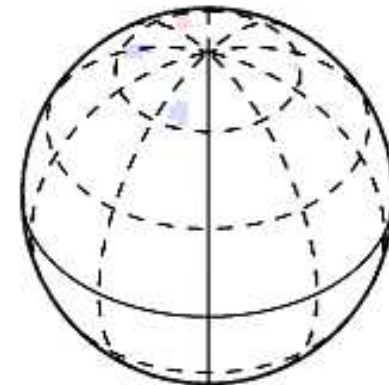
Radial magnetic field



Azimuthal magnetic field

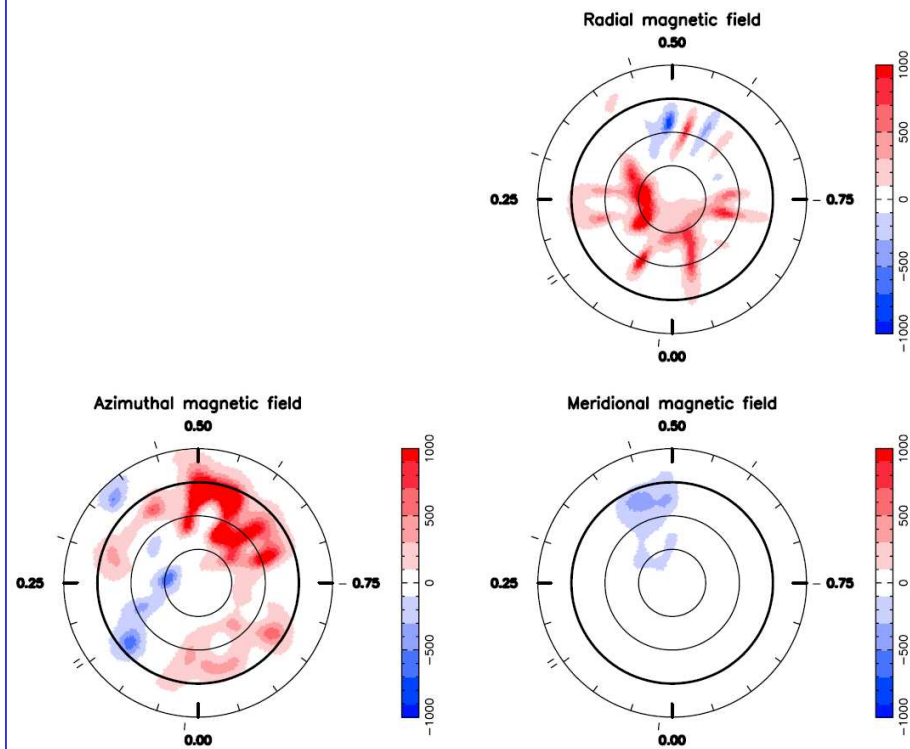


Meridional magnetic field

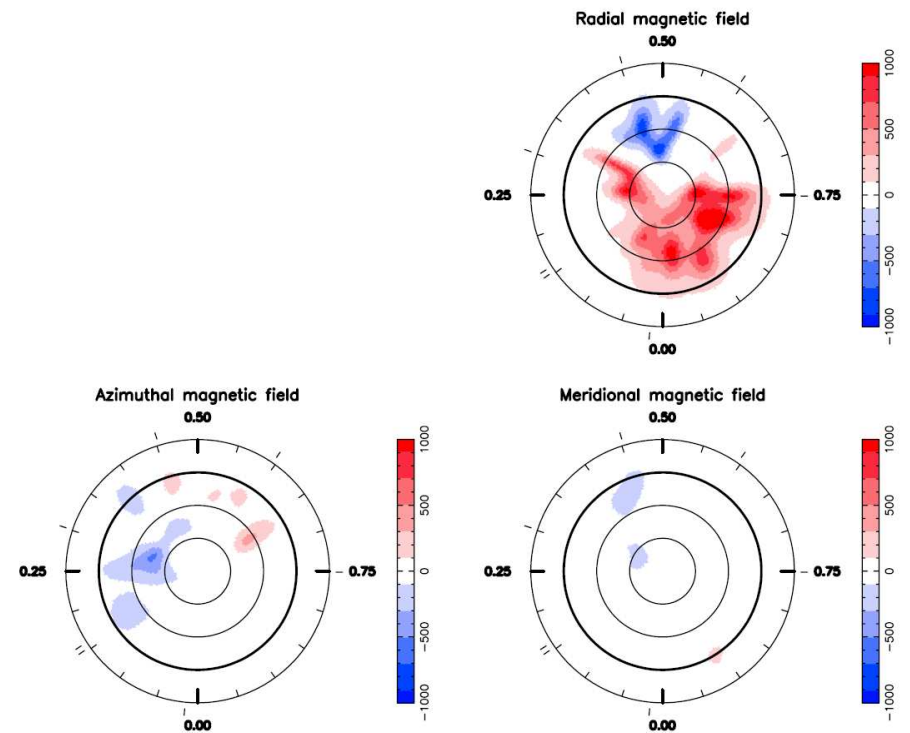


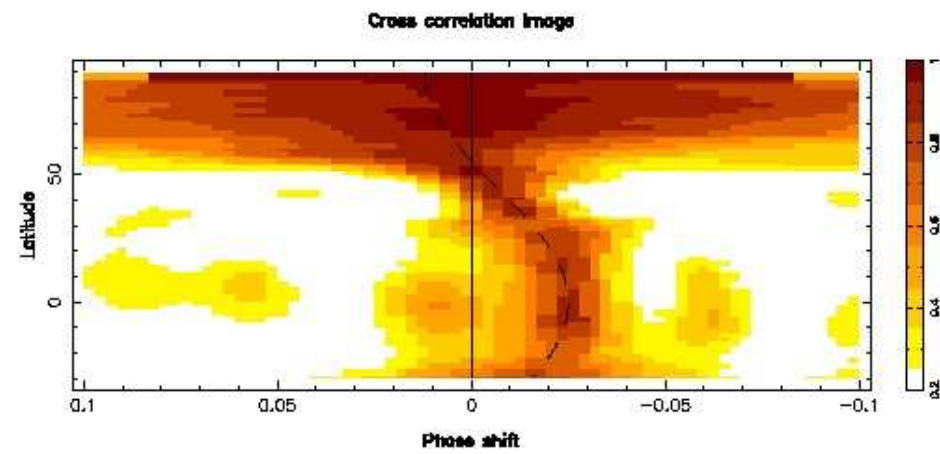
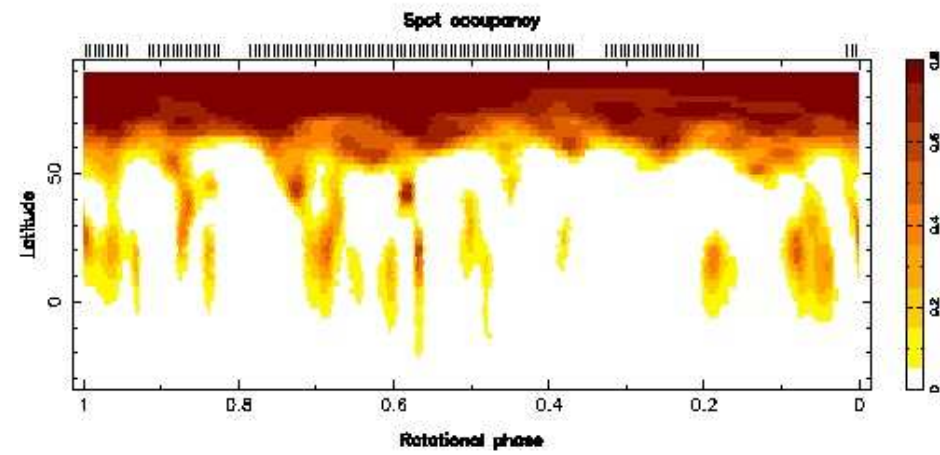
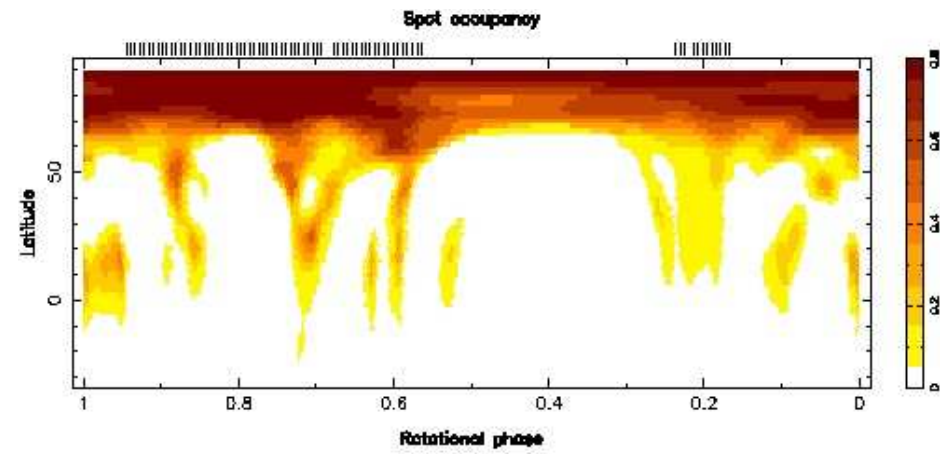
Champ magnétique chromosphérique

photosphère

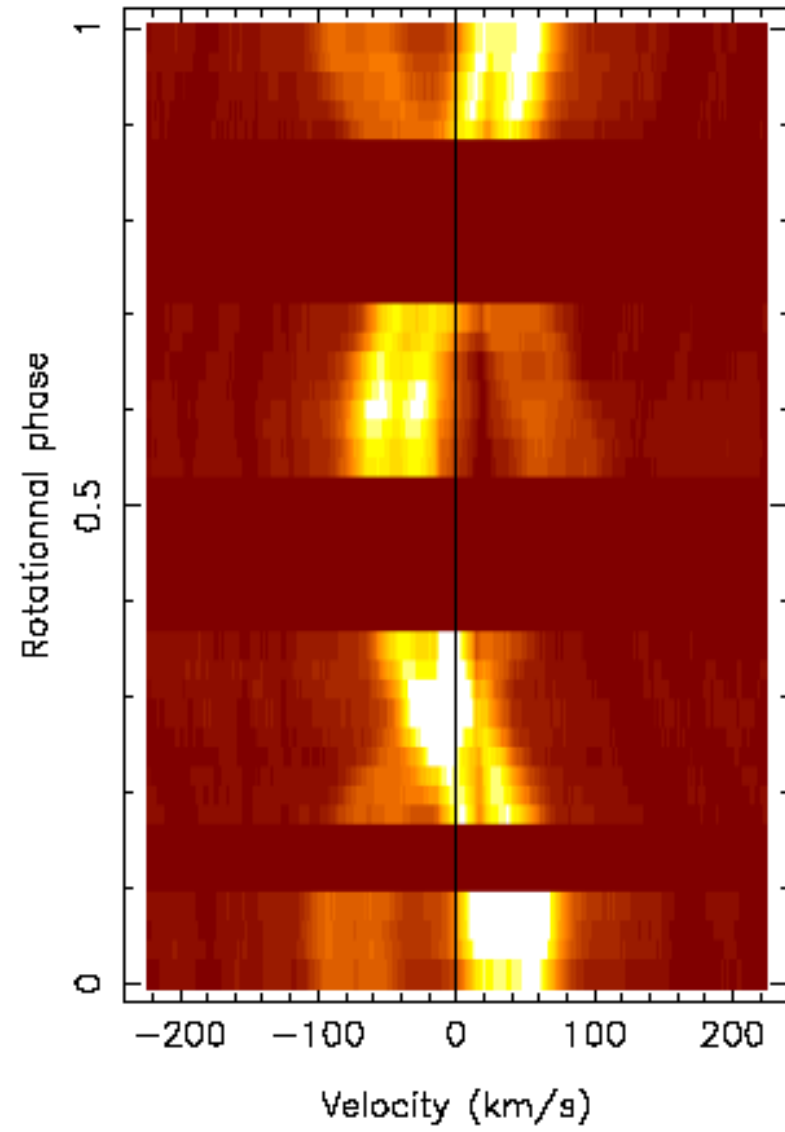


CaII IR triplet

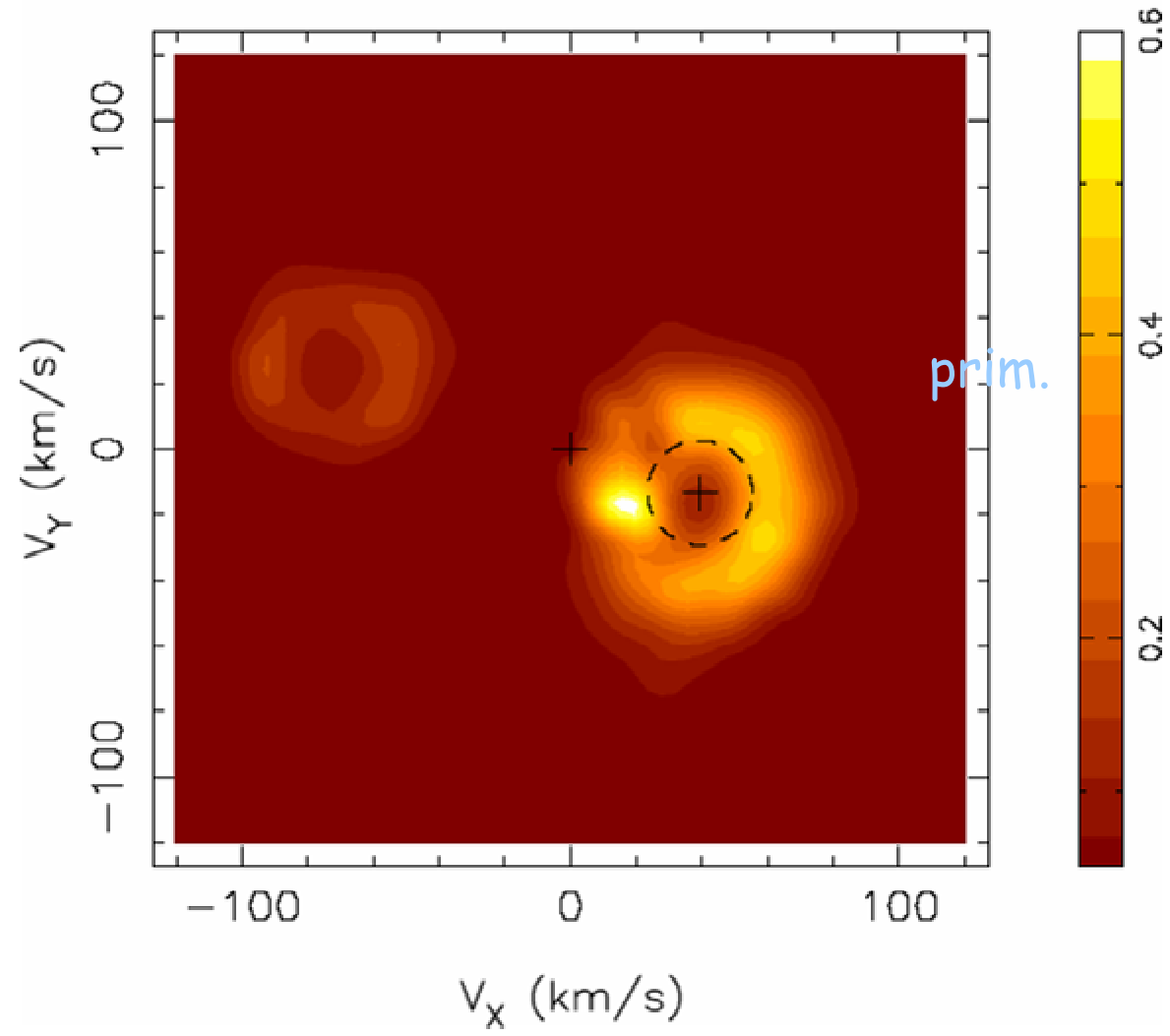




CC Eri, H α profiles



Doppler map



Doppler map

