Atelier PERSEE
CNES Paris
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Emilie LHOME (LESIA – CNRS/Observatoire de Paris)

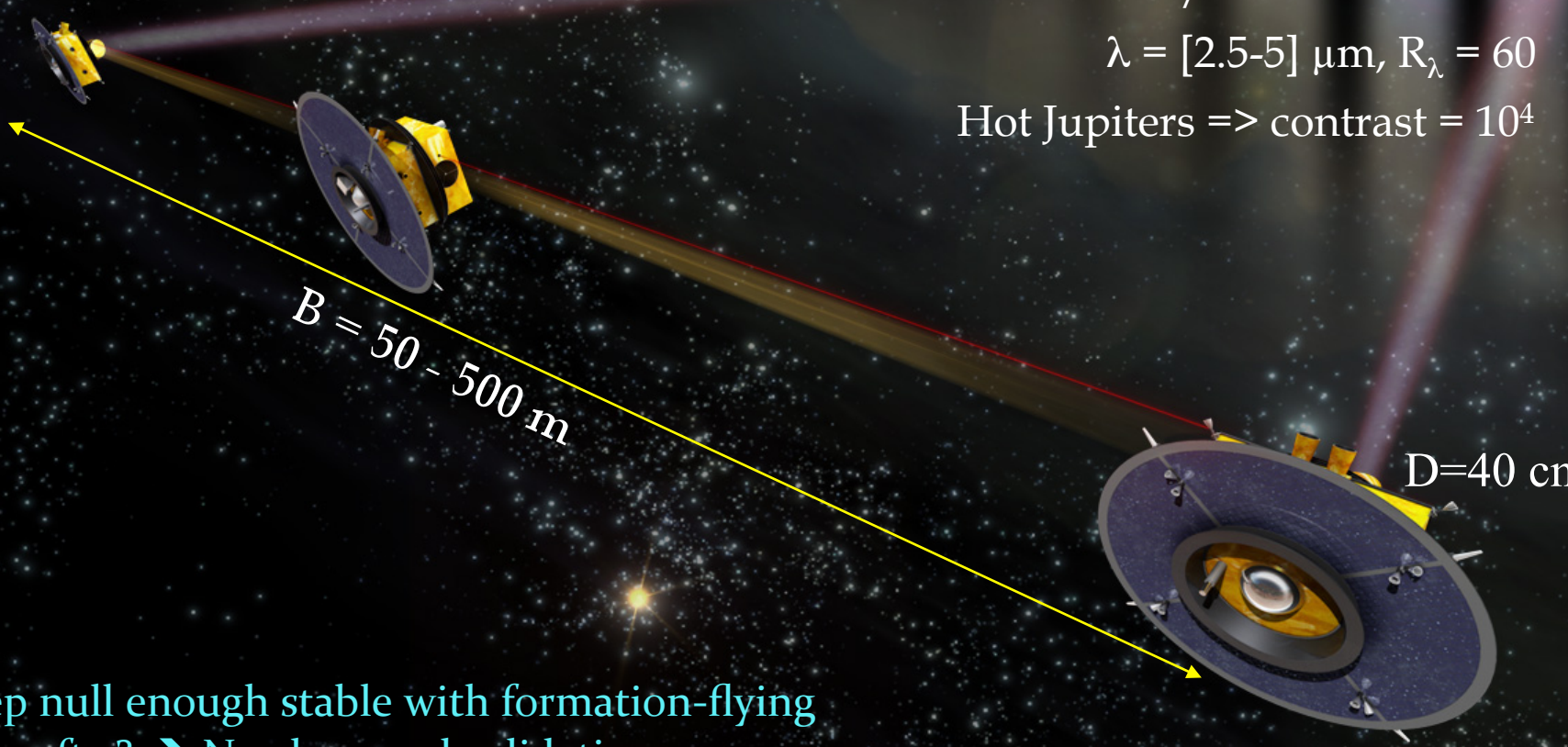
Présentation générale
Performances et résultats
Exploitation en cours

Présentation générale de PERSEE

General context

Science cases: exoplanet spectroscopy + exozodiacal dust imagery

2006: Pegase proposal to ESA Cosmic Vision (postponed)

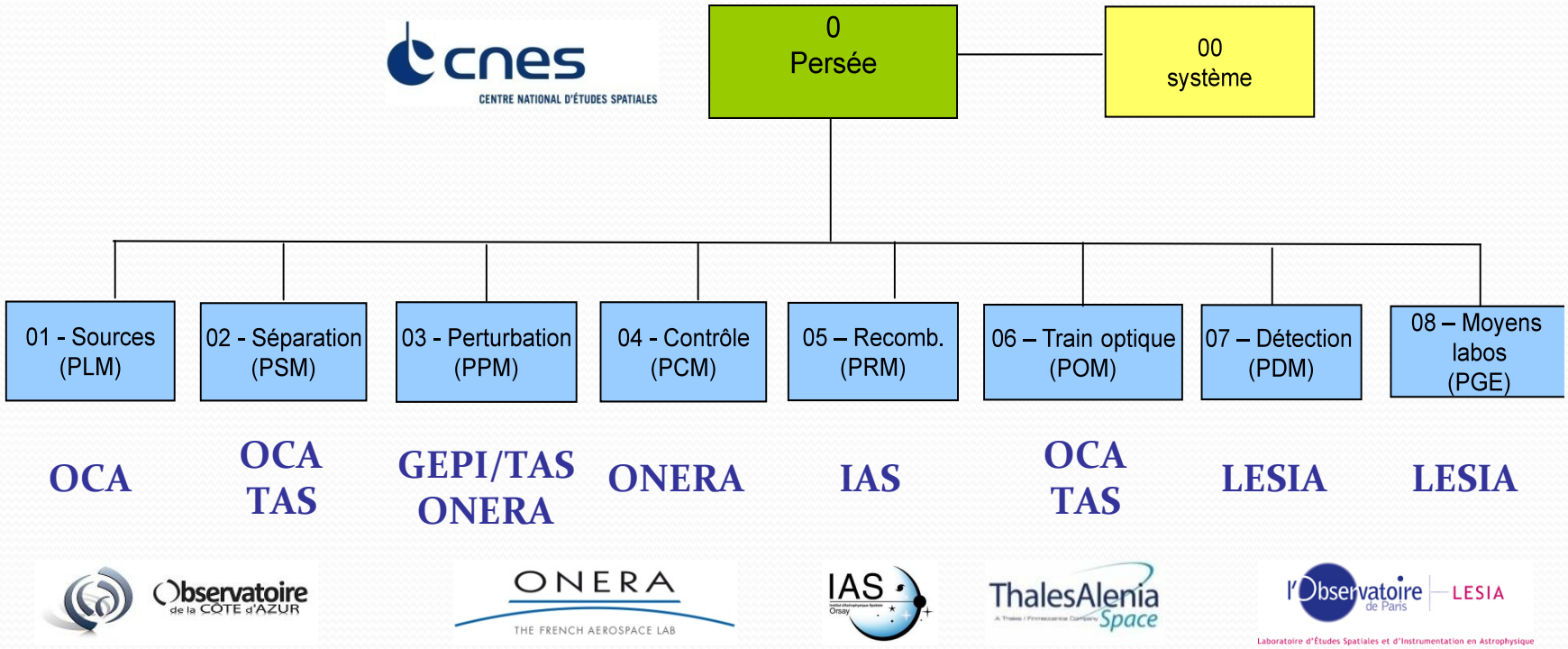


Is deep null enough stable with formation-flying spacecrafts ? ➔ Need ground validation

Composition de PERSEE

PERSEE = Pegase Experiment for Research and Stabilization of Extreme Extinction

⇒Validation au sol des points durs de Pégase
⇒Simulation en laboratoire d'un interféromètre annulant soumis à des perturbations



Un travail d'équipe !

20-25 ETP depuis 2006
3 thèses soutenues + 1 en cours
+ 20 publications
Collaborations industrielles

Detailed main goals

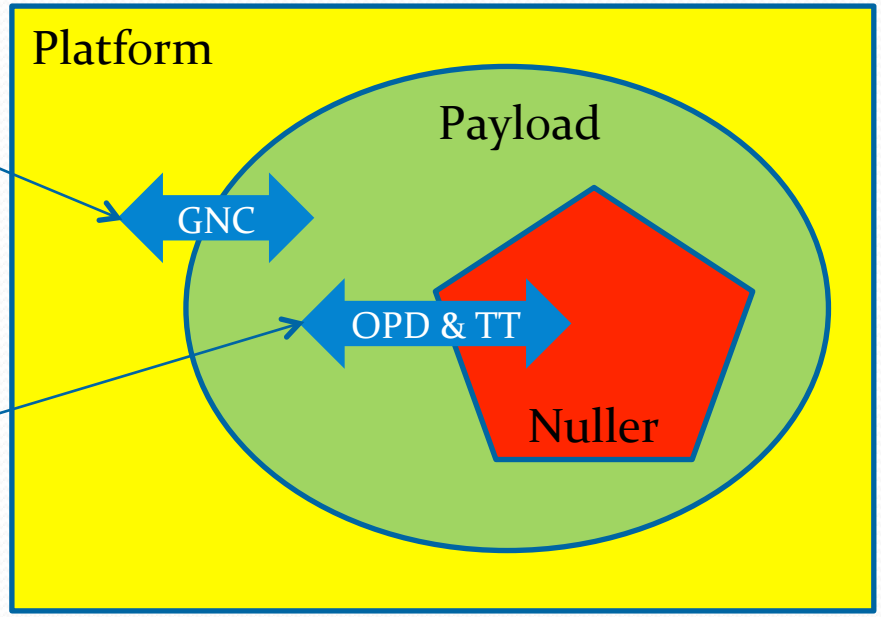
- IR interferometer (optical train + nuller)
- Metrology: fine control loops (OPD and Tip/Tilt)
- GNC: calibrated disturbances injection (slow drifts and low frequencies vibrations)

GNC *vs* boucles de contrôle

=> **Caractériser bruits et dérives extérieurs admissibles (boucles piston et tip/tilt)**

Perfo. boucles de contrôle *vs* stabilité voie de nulling

=> **Garantir la stabilité différentielle entre le nulleur et les senseurs**



Detailed main goals

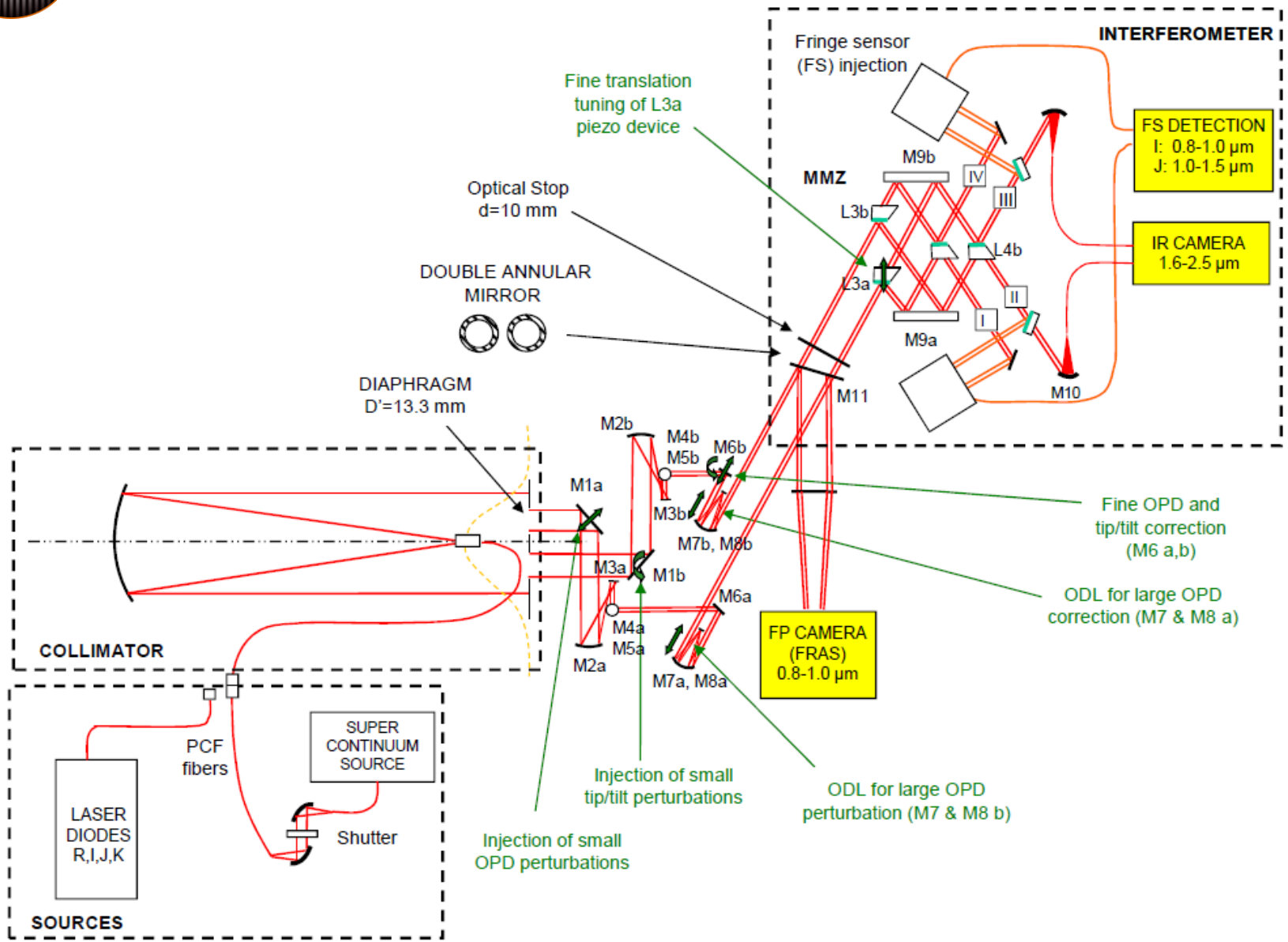
- Validate fringes acquisition with a drift speed up to **150µm/s**
  - ➔ Simplify platform metrology

- Average nulling ratio (I_{min}/I_{max}) of **10^{-4}** with a **10^{-5}** stability over 10h on the [1.65 – 2.45] µm spectral band (40%, 9 channels)
  - ➔ Need OPD control at a nm level

Specifications w/ disturbances:
-OPD: 2 nm rms
-TT: 600 mas rms

Specifications w/o disturbances:
-OPD: 1 nm rms
-TT: 100 mas rms

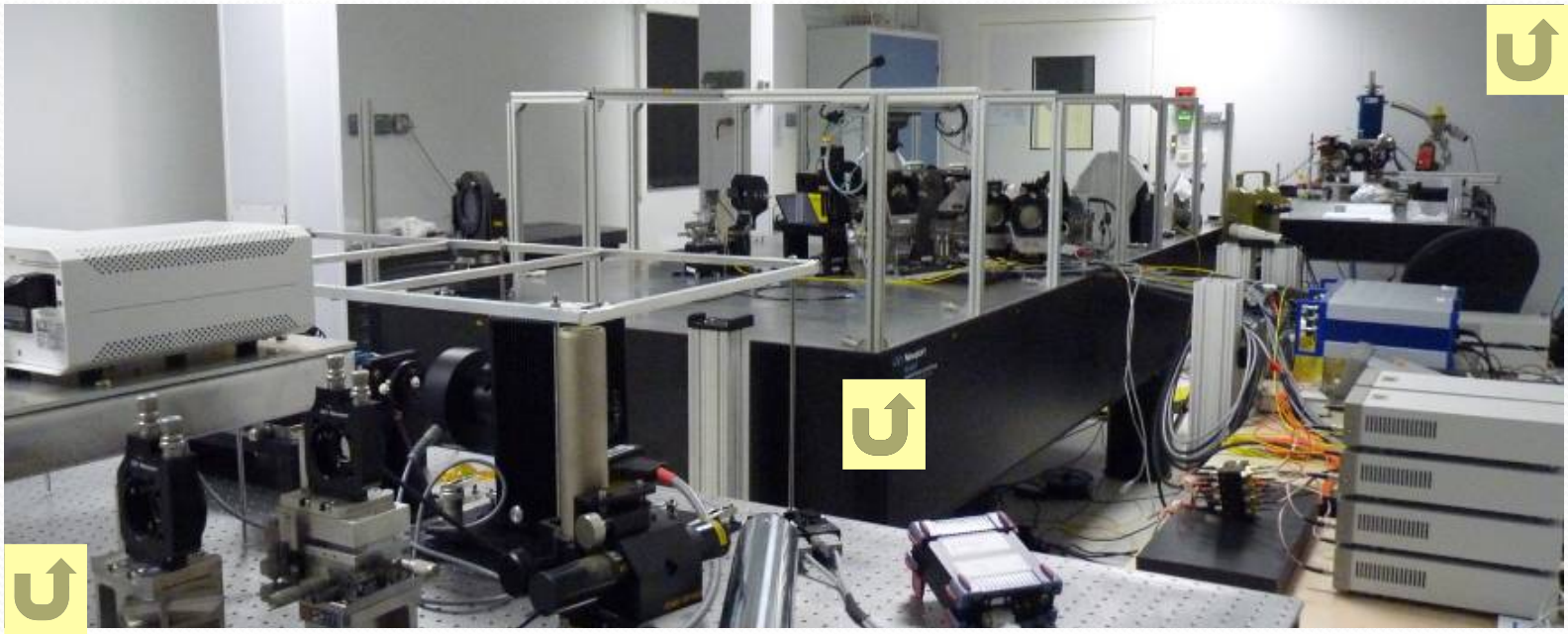
Optical layout



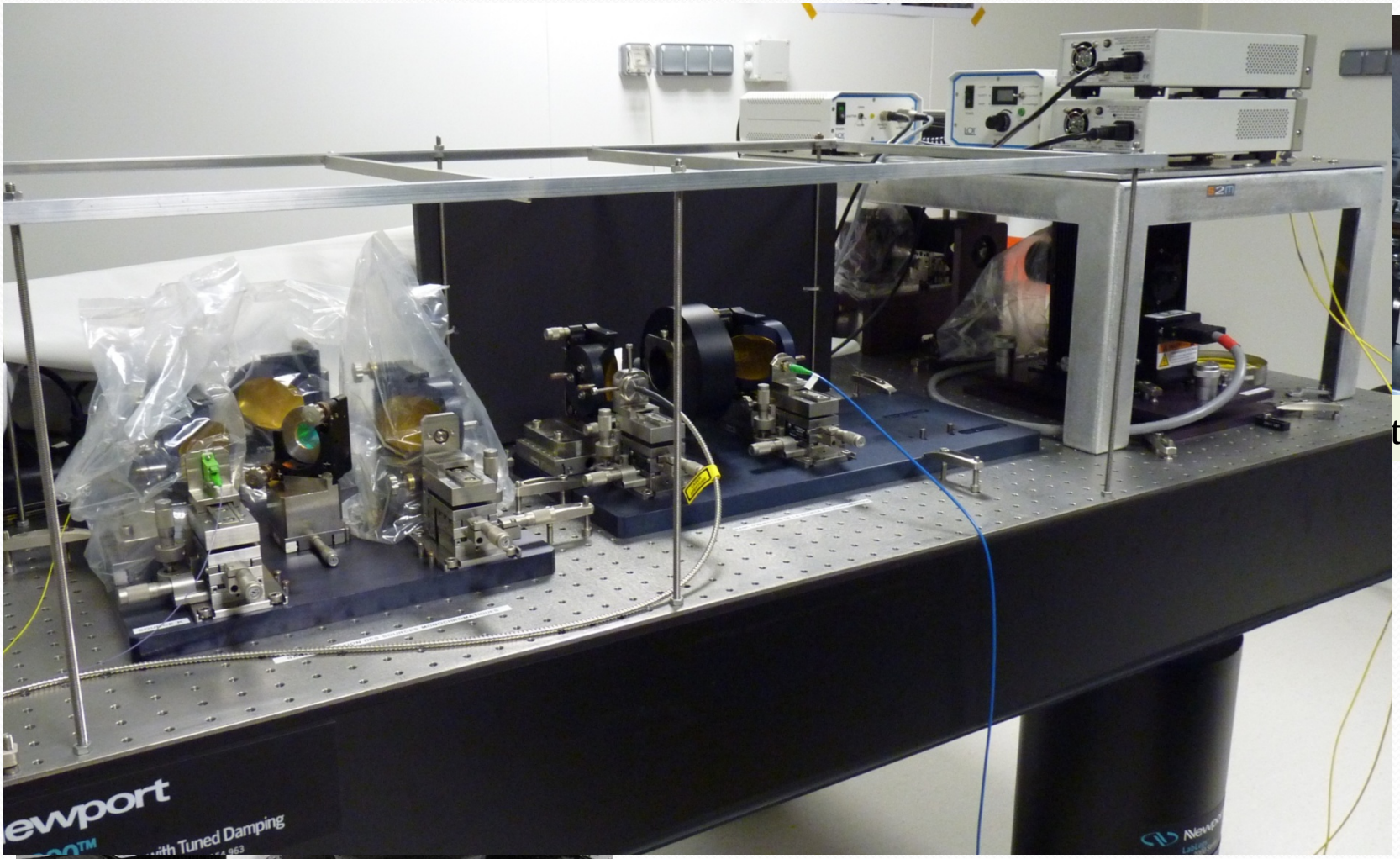
Experiment overview

3 bancs optiques reliés par fibres optiques

Salle blanche
- Classe 10000 (ISO 7)
- 40m²
- Régulation T & H



Injection bench



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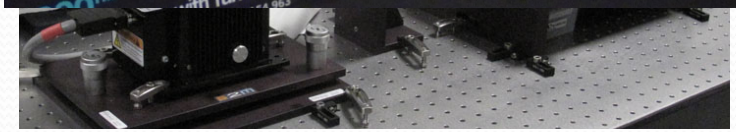
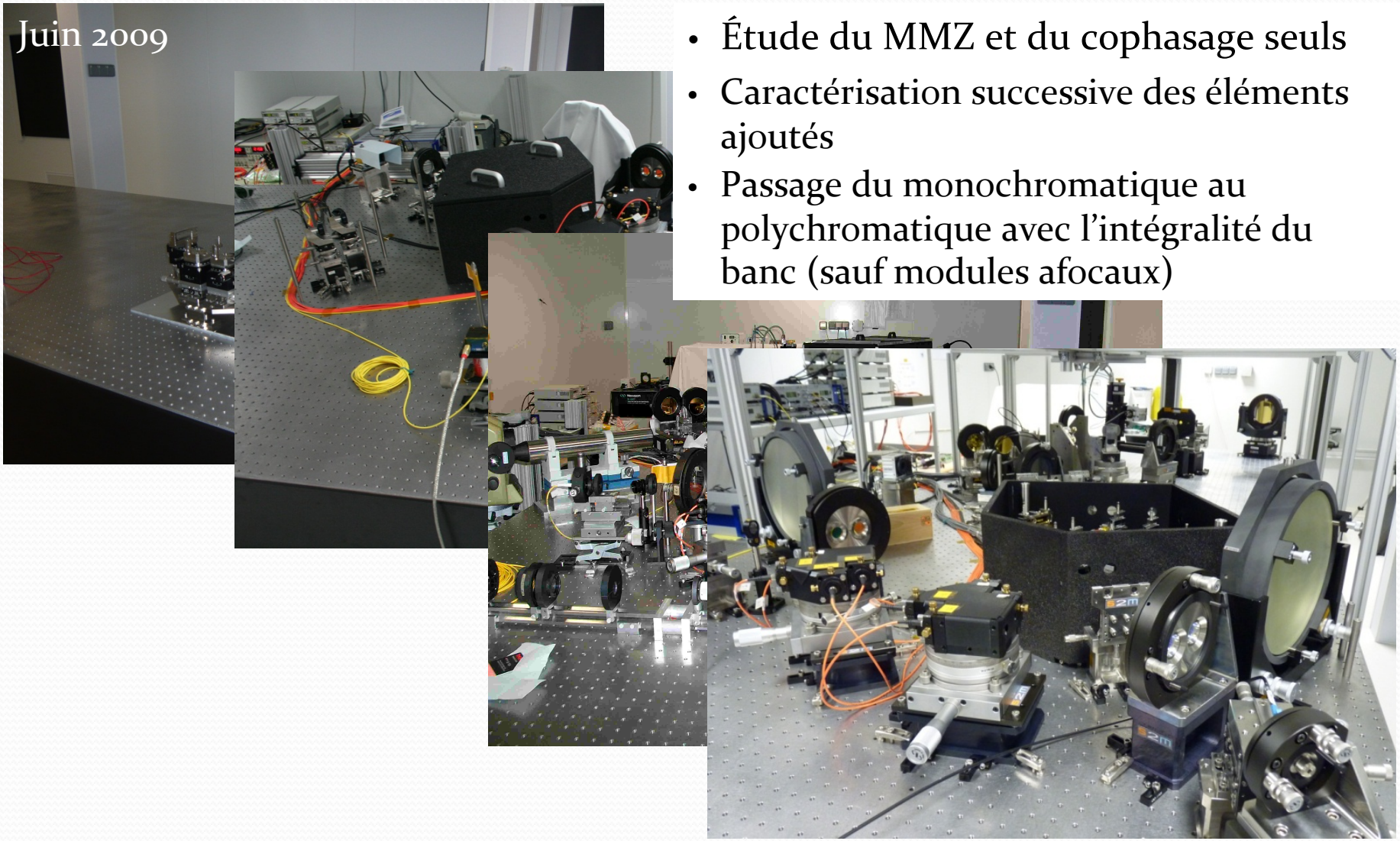
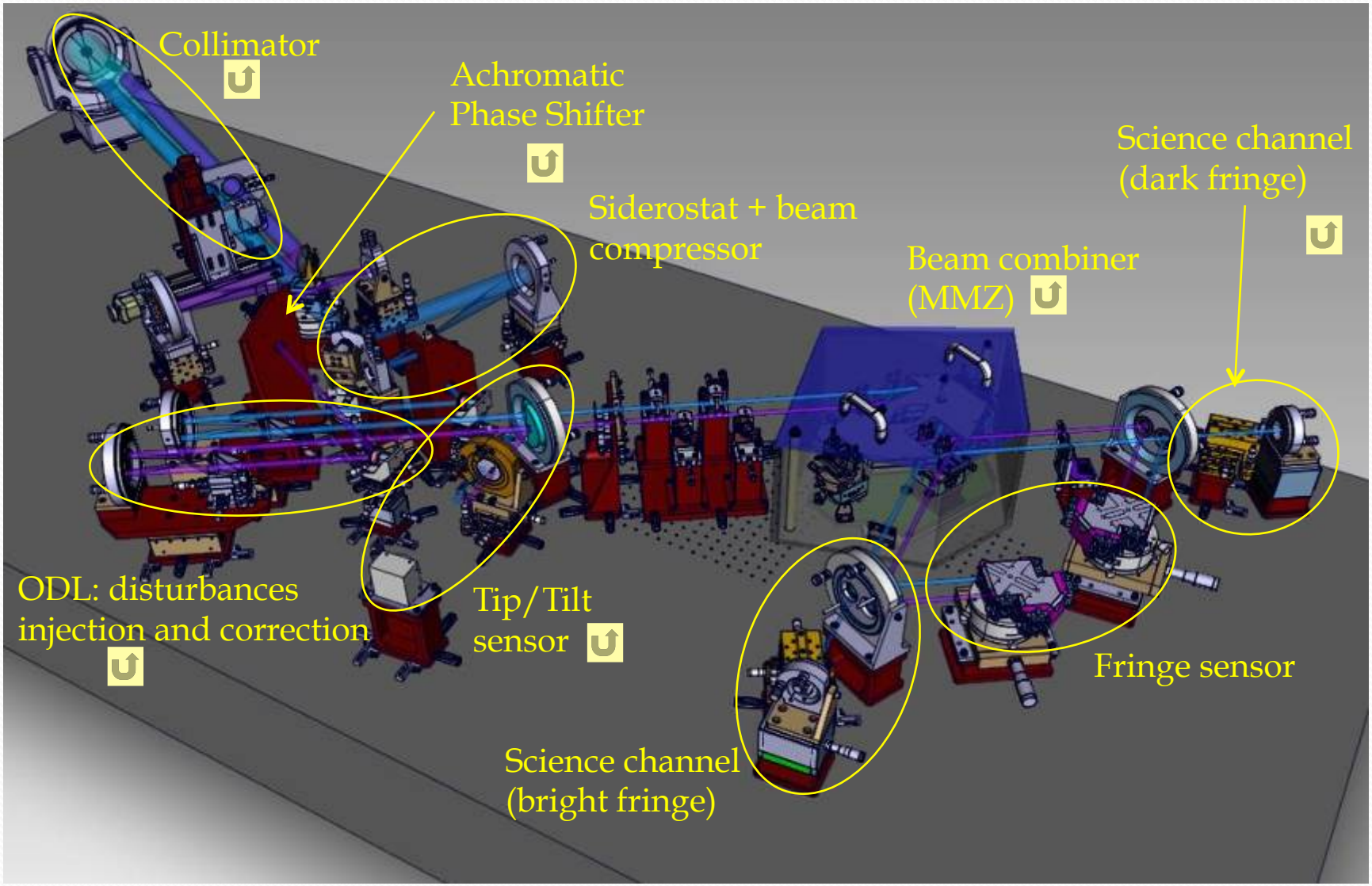


Main bench - AIT

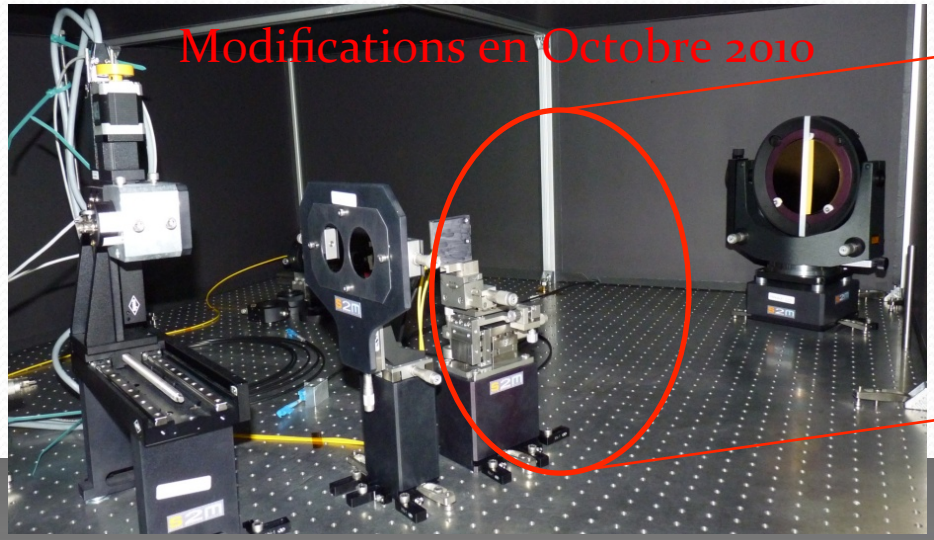


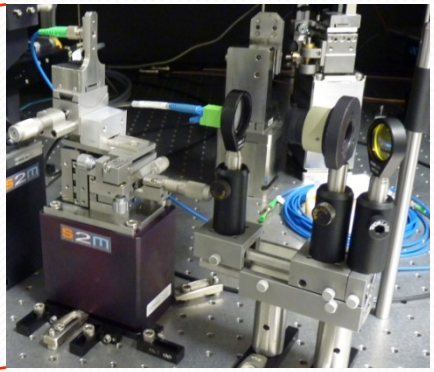
- Étude du MMZ et du cophasage seuls
- Caractérisation successive des éléments ajoutés
- Passage du monochromatique au polychromatique avec l'intégralité du banc (sauf modules afocaux)

Main bench - overview

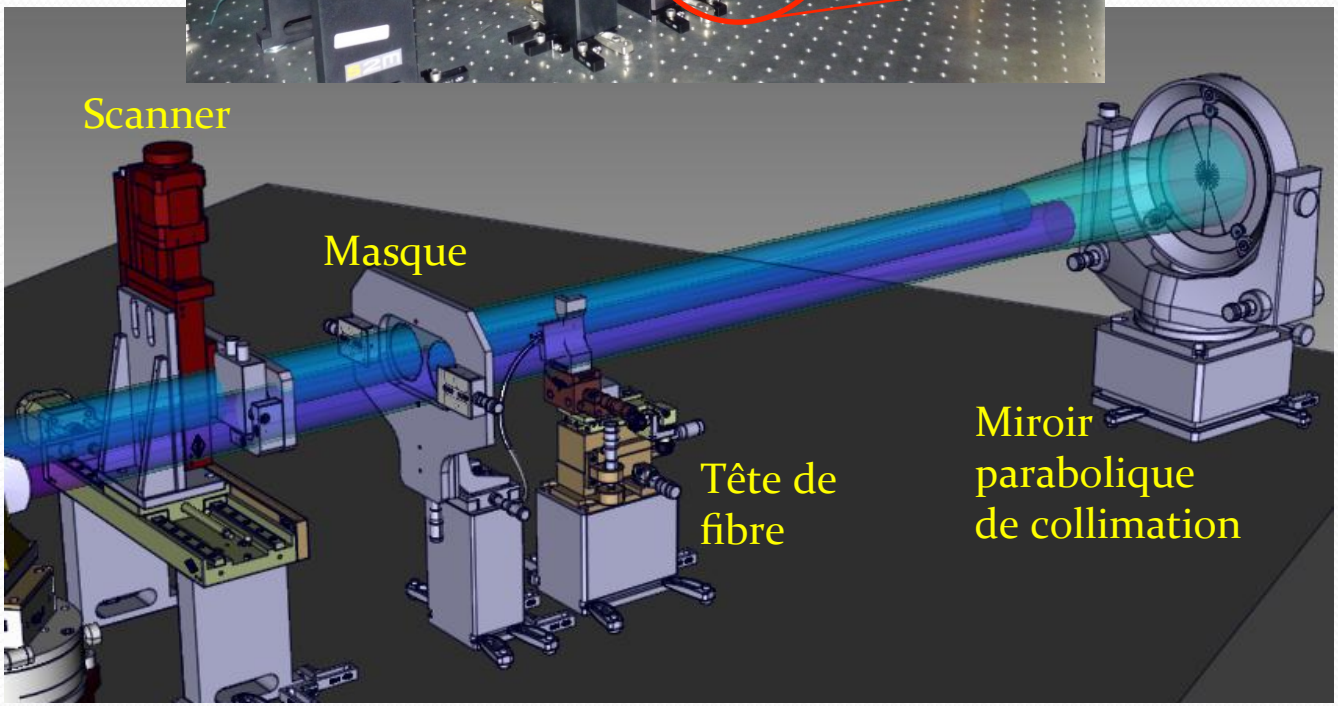


Main bench - Collimator





Imax

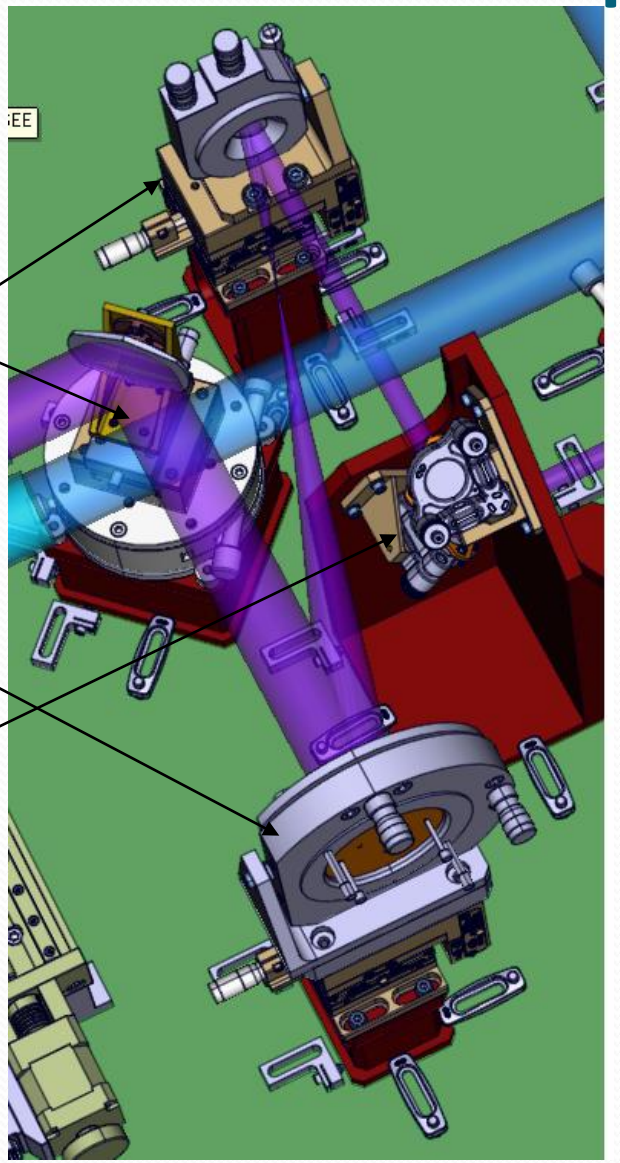


Main bench - Beam shaping

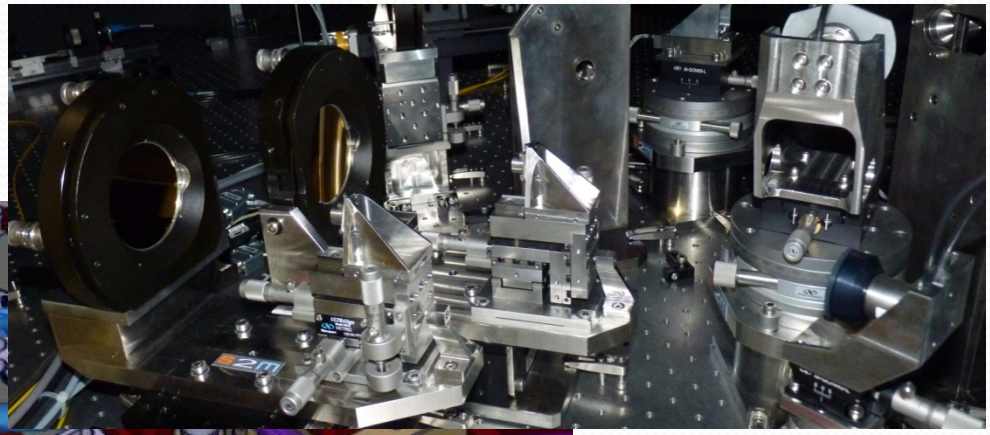
Sidérostat: injection tip/tilt
ou piston

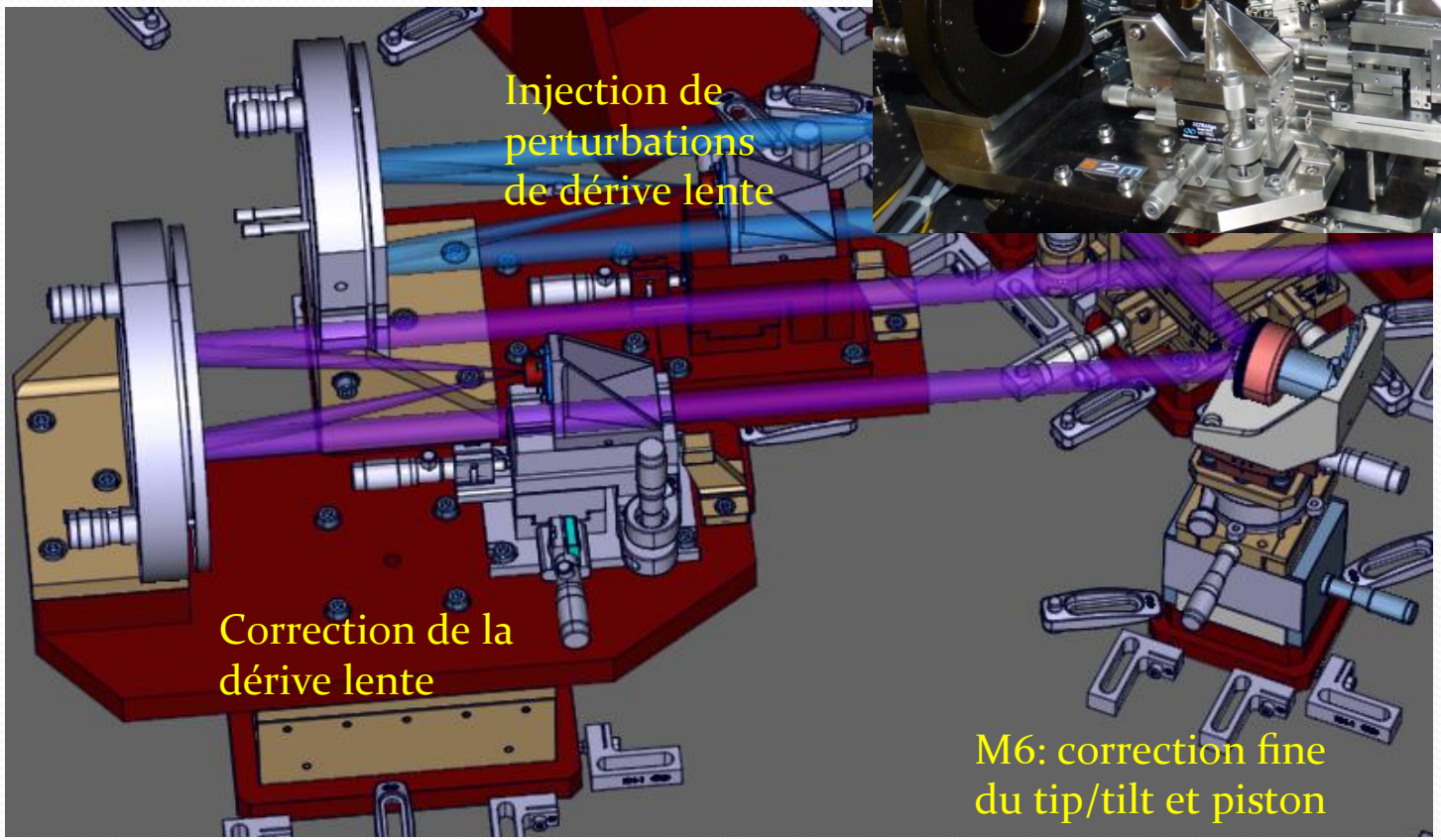
Réduction de pupille
M=3 (montage afocal)
Faisceaux Ø 13mm

Déphasage achromatique
par retournement de champ



Main bench - ODL



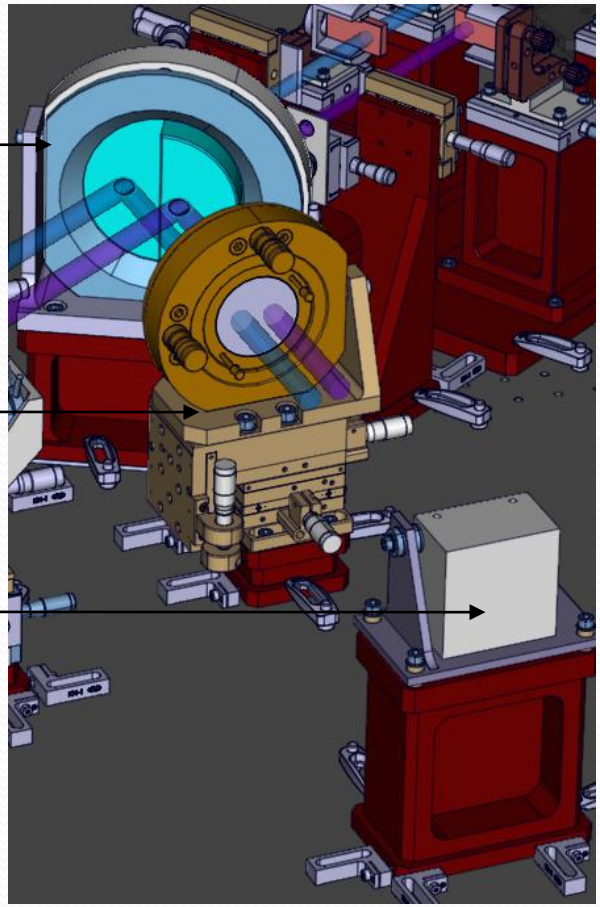


Main bench - FRAS

Miroir annulaire => Stop optique

Lentille

Caméra



FRAS: Field Relative Angular Sensor
Système de mesure de tip/tilt

Position angulaire et intensité des 2 bras