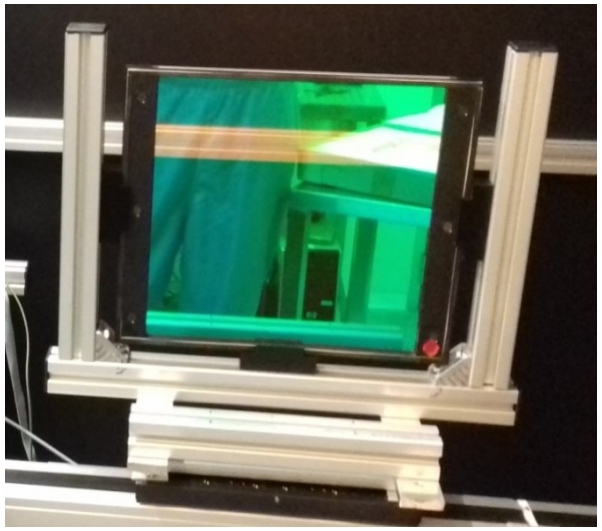


Réponse optique des filtres de MegaCam: premières mesures sur le filtre R

B. SASSOLAS, B. LAGRANGE, D. HOFMAN, C. MICHEL, L. PINARD, G. CAGNOLI,

Laboratoire des Matériaux Avancés - Villeurbanne

MegaCam Filters

- Delivery of the MegaCam filtrer on December 23rd 2016
- Customs authorization to open the boxes on early January
- There are waiting in the lab's basement

- Manipulation of the R-filter in the ISO3 cleanroom
- Visual Inspection for scratches or other defect

Optical bench

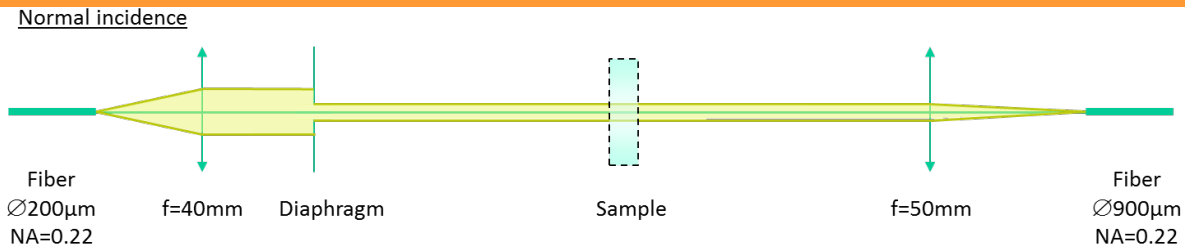
The bench as in last june…

Optical bench

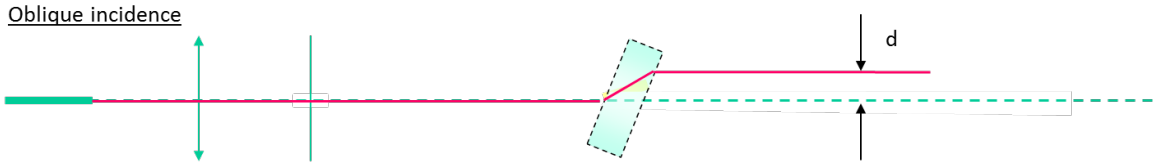
Today, the bench is enclosed for many reasons:

- Physical hazards of people due to moving parts
- UV-light hazard
- Stray light from the clean room

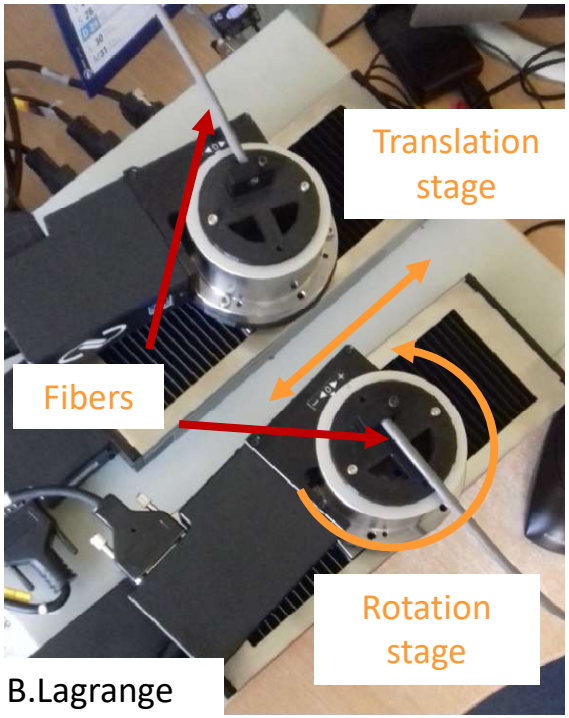
Optical layout



The optical path is the same with or without the sample



Beam displacement due to the refraction in the substrate



B.Lagrange

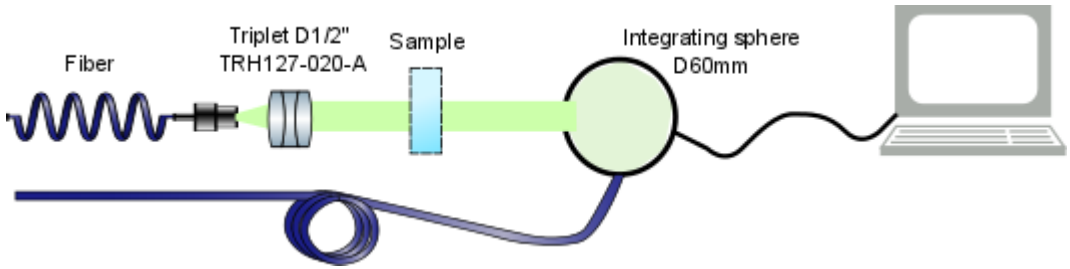
Funding have been allowed for the motorized stages

The system does not work at oblique angles yet

- Multiple reflected beams inside the sample issue
- Strain sensitivity of the fiber
- Still chromatic effects

Work in progress

Temporary solution



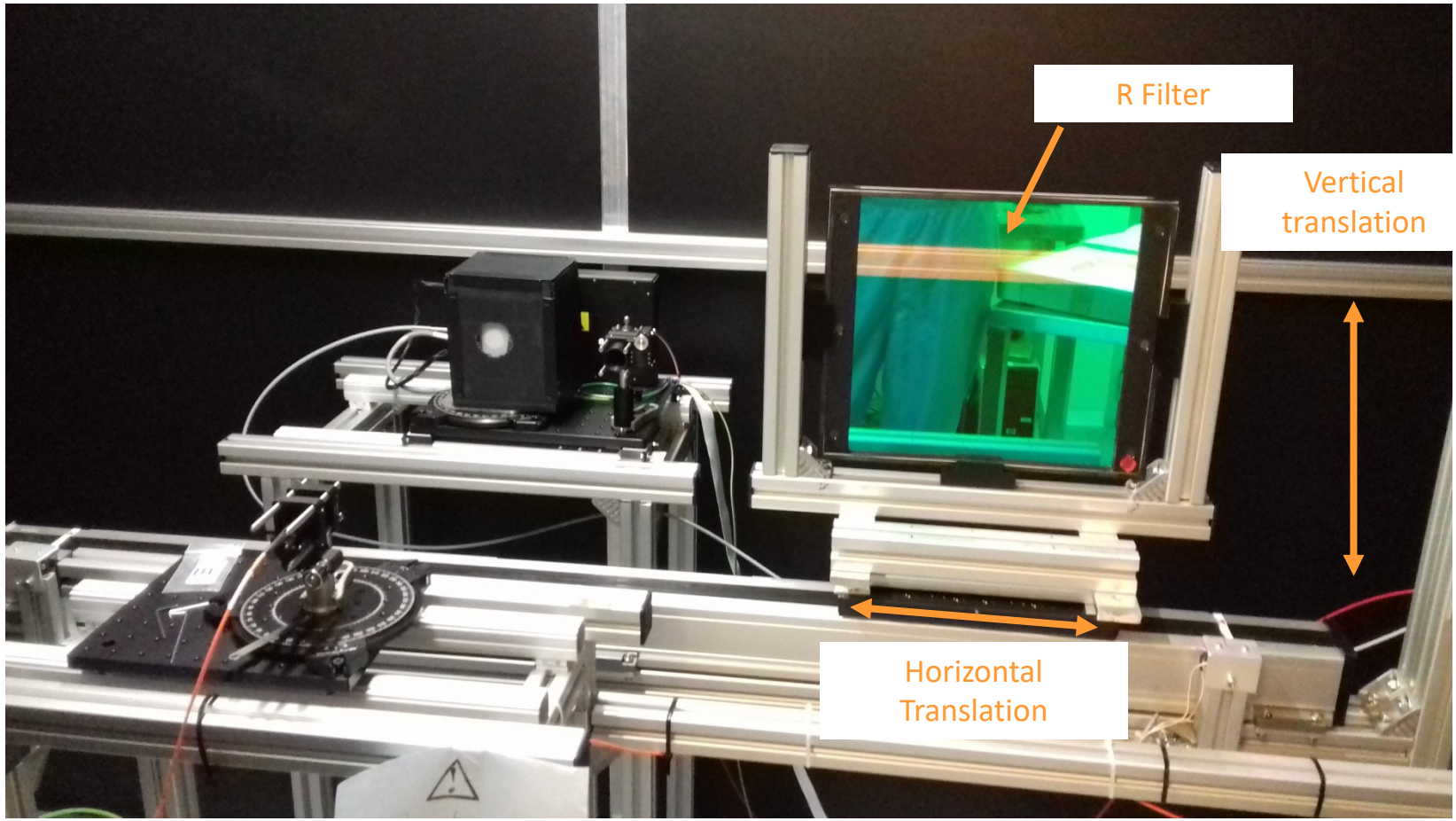
An integrating sphere is temporarily available (aimed at an optical monitoring system for the large coating chamber)

Not fitted our purpose :

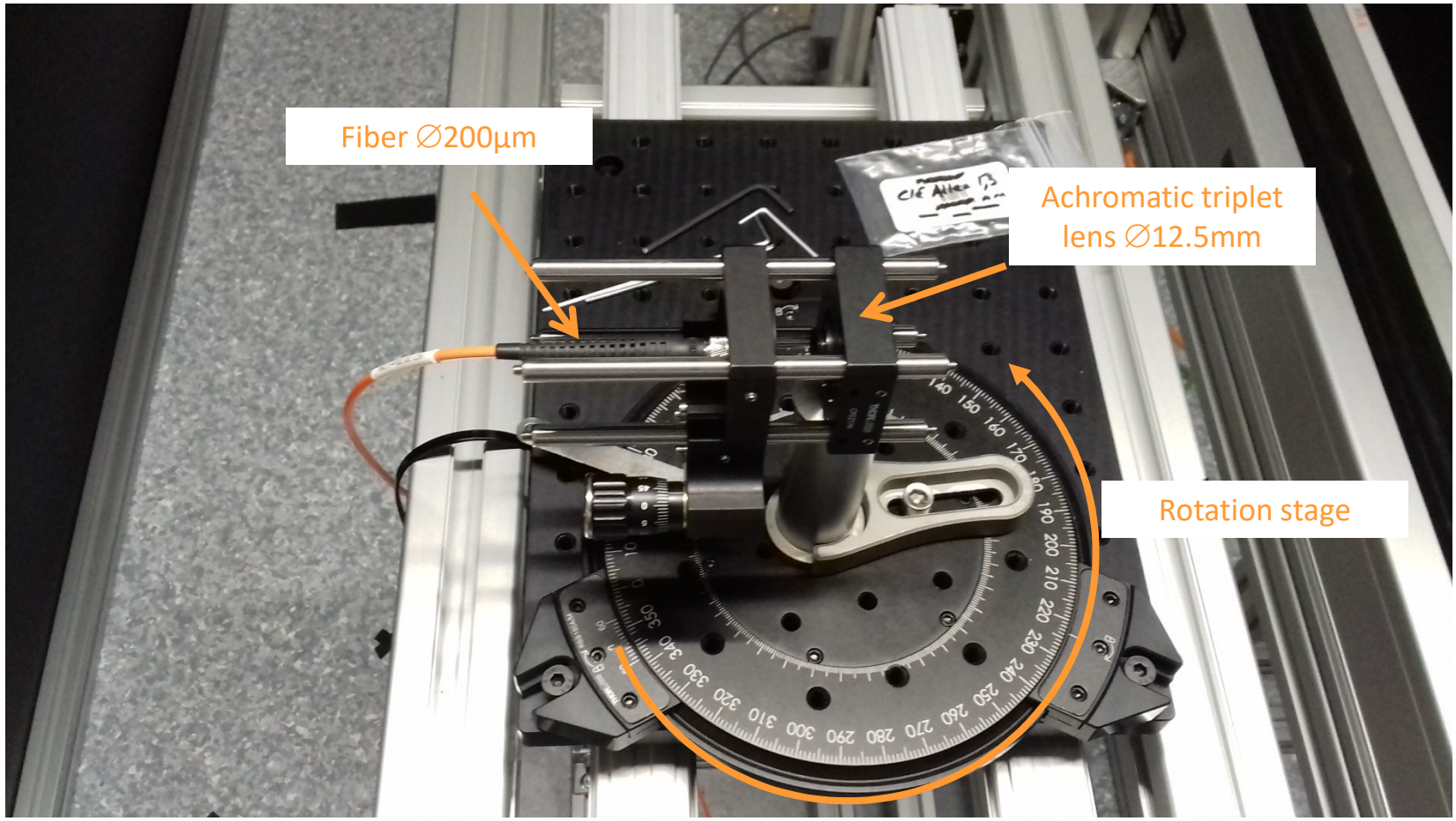
- small sphere
- large port
- no baffle

But with some tricks it could provide reliable measurements in short terms.
Even at OBLIQUE INCIDENCE !

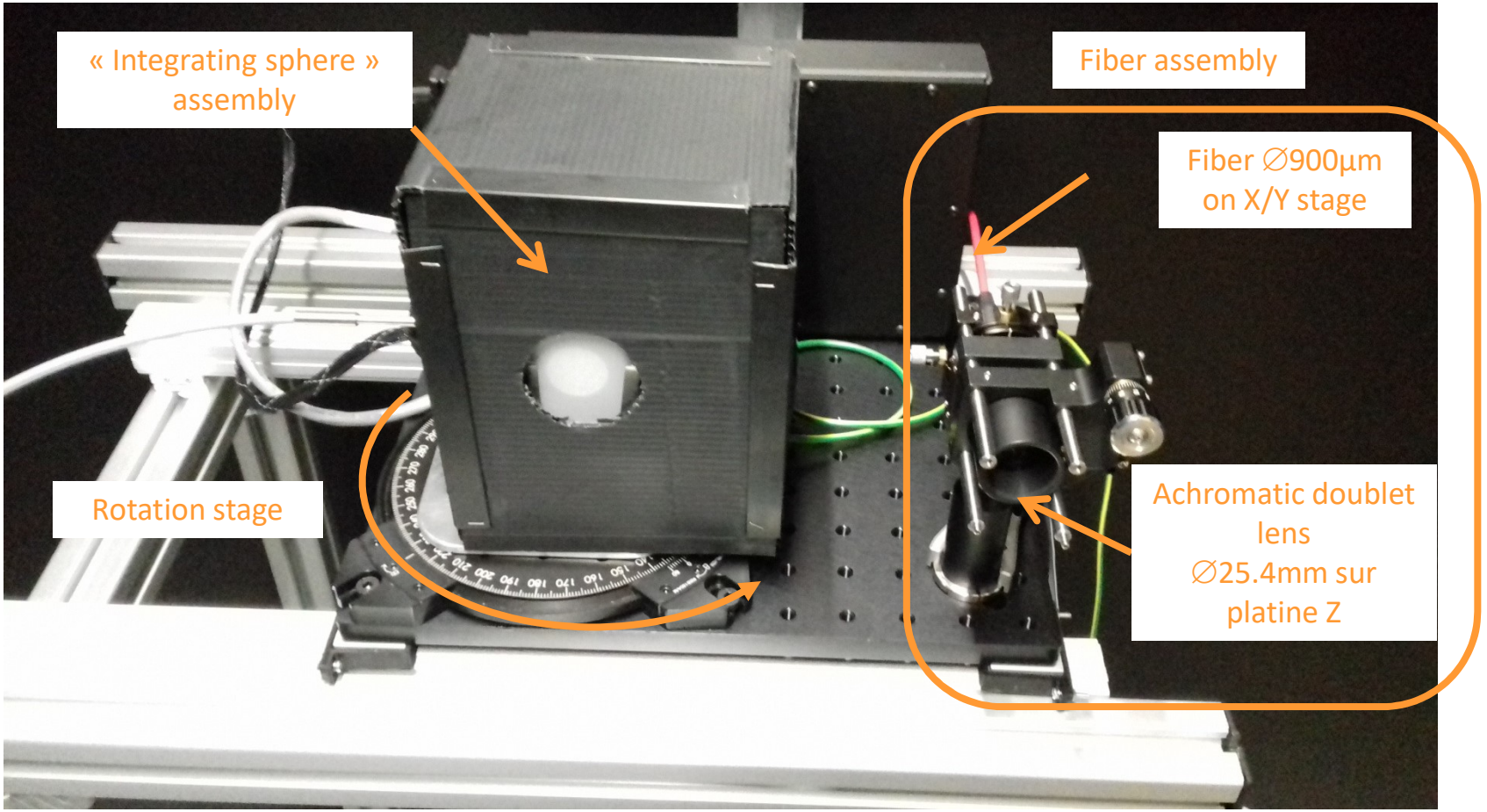
Some pictures of the system



Some pictures of the system



Some pictures of the system

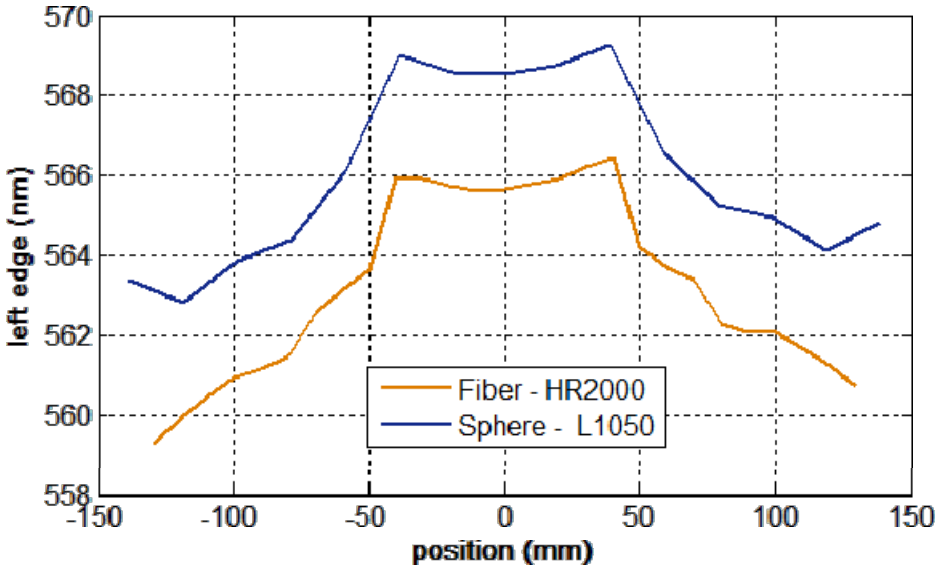


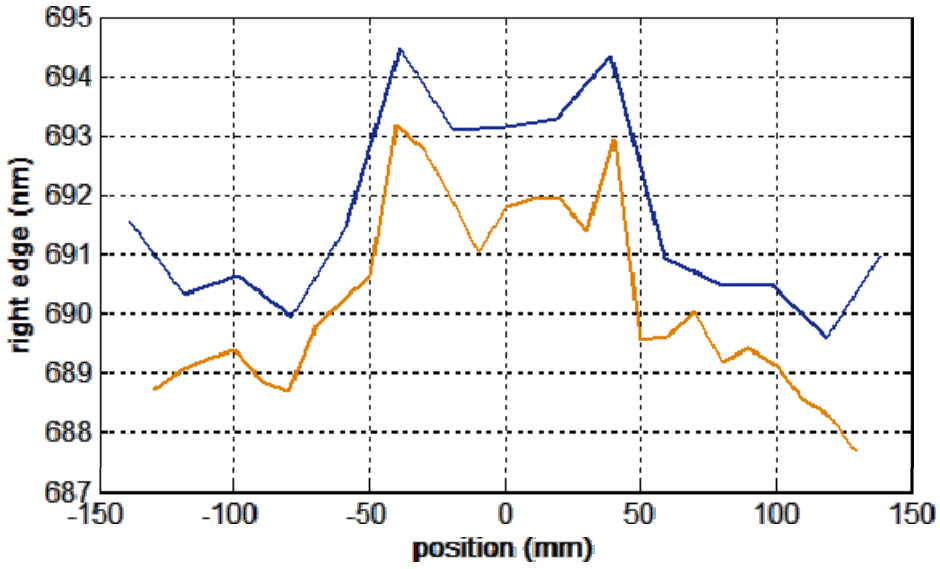
« Integrating sphere » assembly : works with high performance Perkin Elmer L1050 spectrophotometer

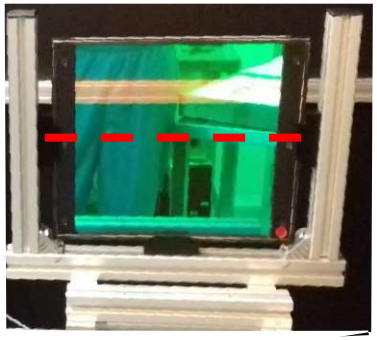
Fiber assembly : works with compact OCEAN OPTICS HR2000 spectrometer

R-filter measurements : uniformity of the band pass

AOI 0°







- The shapes are quite similar between L1050 and HR2000 but there is an offset of ~2.5nm

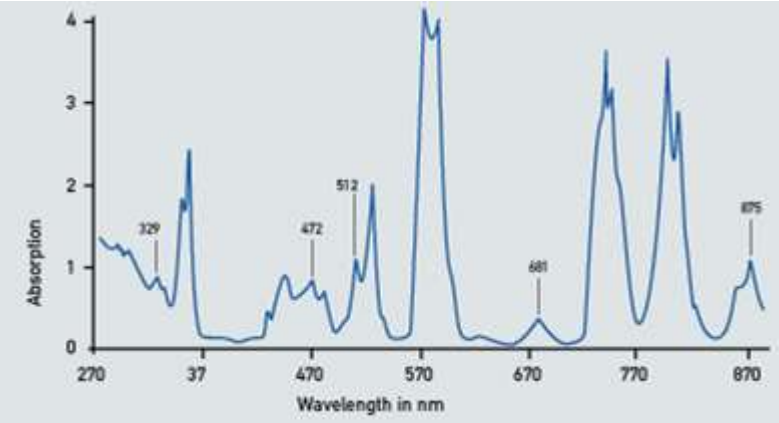
  → Wavelength calibration to be checked

- The behaviours are different for the right and left edges

  → Probably due to a HighPass and LowPass structure

- Quite large variations : ~1.4% and 0.6% over ∅ 260 mm for the left and right edge respectively

R-filter measurements : wavelength calibration

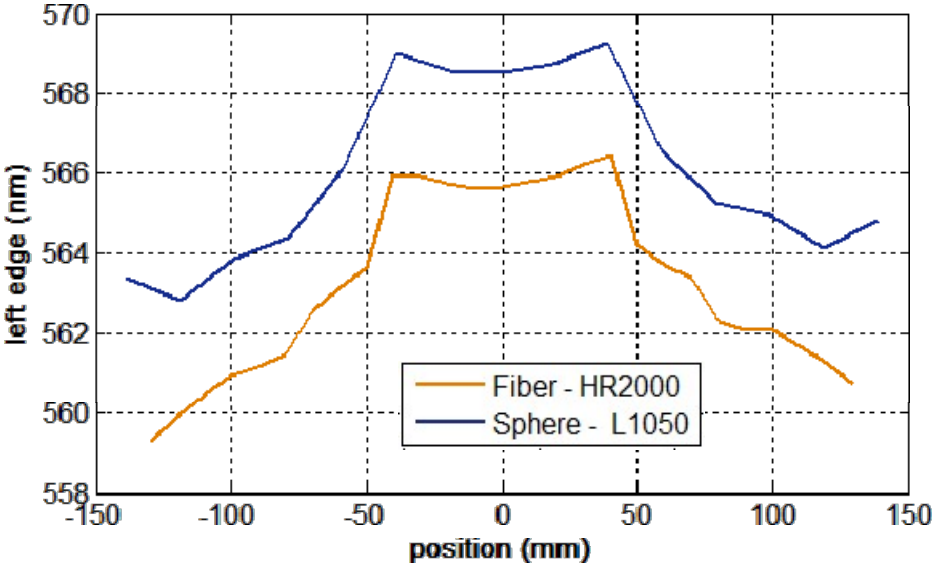


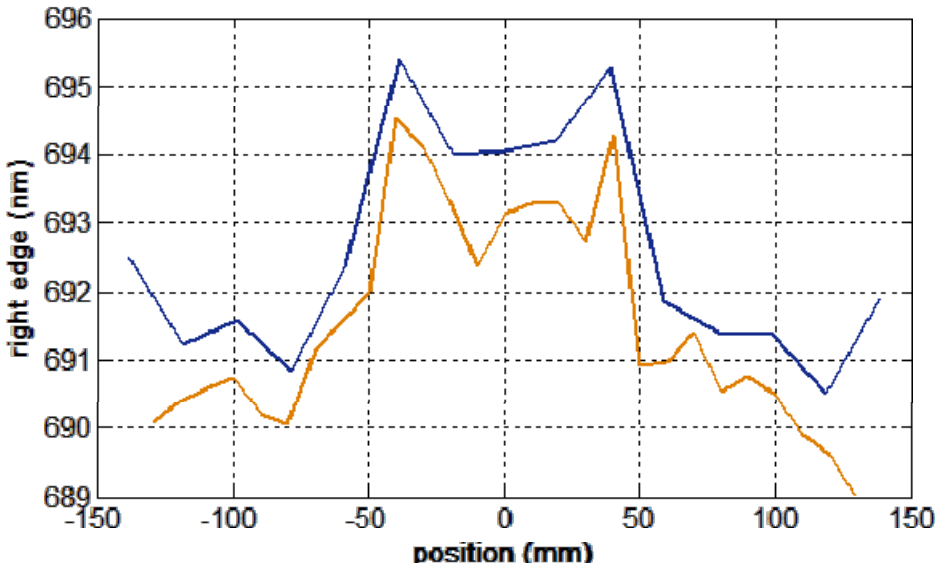
Capabilities:

- Wavelength accuracy in the UV and VIS range (329-875nm)
- Photometric accuracy in the UV range (270-340nm)

Product specs:

- Wavelength tolerance: +/- 0.2nm
- Wavelength peaks: 329, 472, 512, 681, 875nm
- Photometric tolerance: +/- 0.0024au
- Photometric accuracy verification points: 270, 280, 300, 320, 340nm

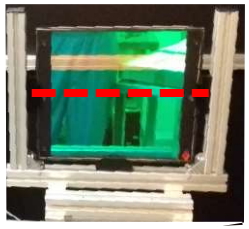




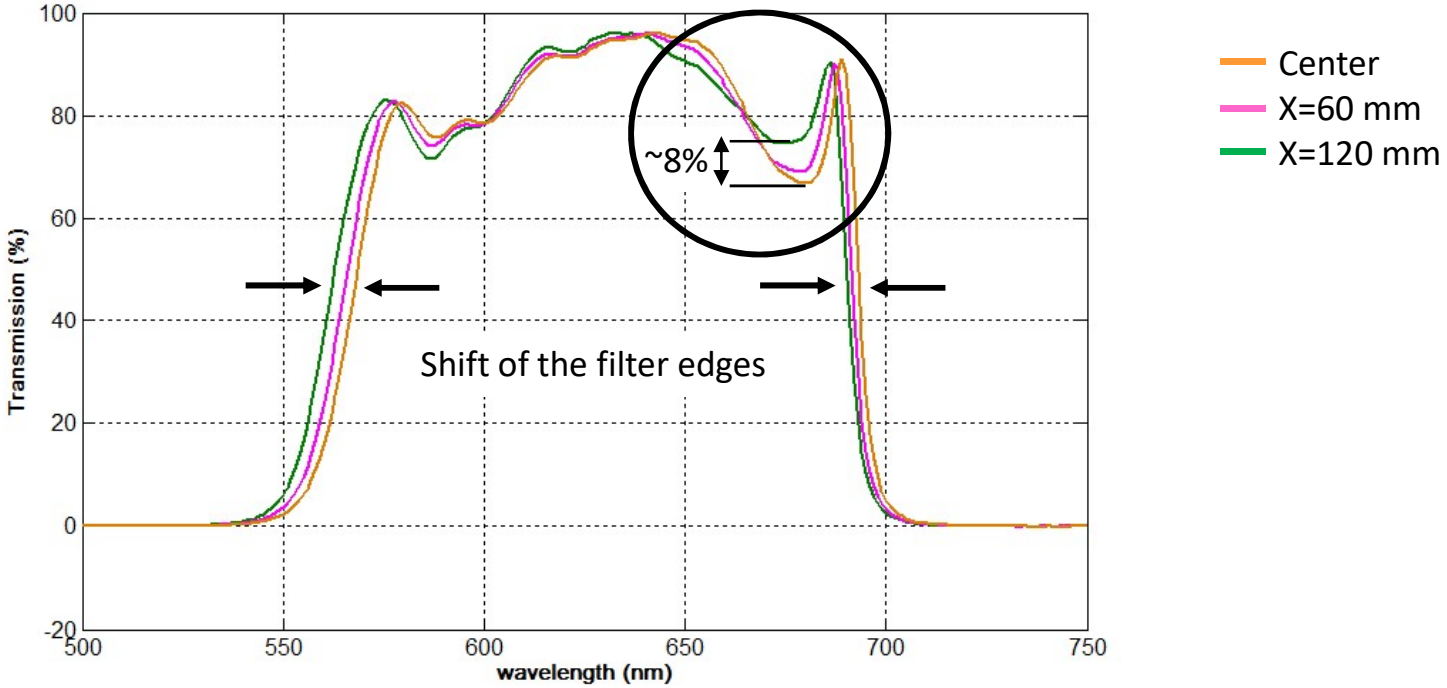
- Edge position after wavelength calibration
- Still some offset between L1050 and HR2000 : further investigations required

R-filter measurements : spectral shape

AOI 0°

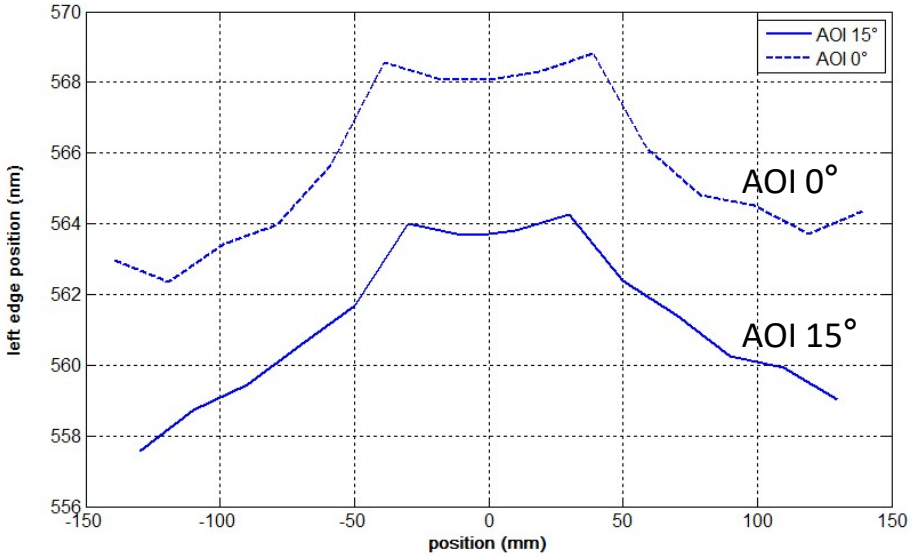


Deformation of the bandpass

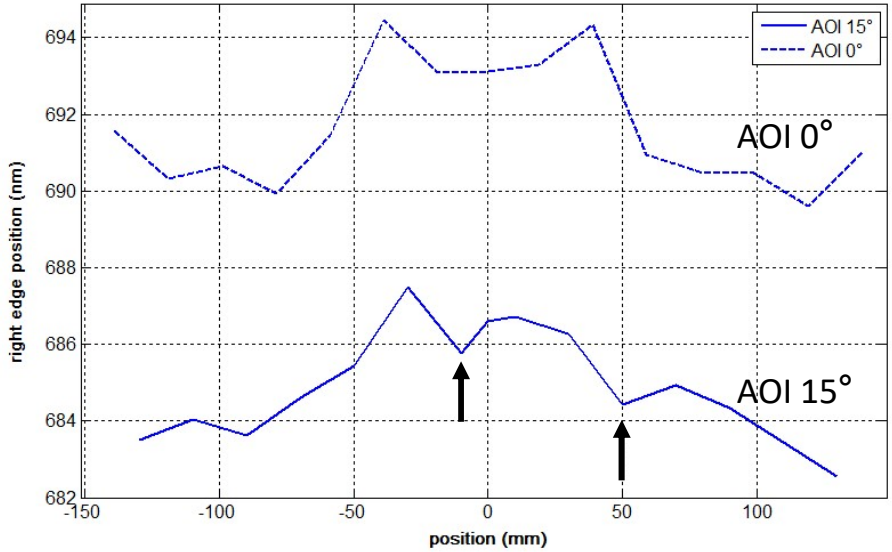


In addition to the shift of the filter edge, there is a deformation of the bandpass

R-filter measurements : oblique incident measurements



- Shift towards shorter wavelength at AOI 15° (as expected !)
- Pretty the same variation over ∅ 260mm as at AOI 0°



- Shift towards shorter wavelength at AOI 15° (as expected too !)
- Some strange « points» : real or artifacts ? Further measurements to be done

Conclusion and further work

Optical bench :

- Fiber alignement system still in development
- Pretty ready for filter measurements
- Some tests should be performed to characterize the performances

Filter scan :

- R-filter is the first to measure
- Spatial variation of the bandpass position over the filter surface : up to 1.6%
- Variation of the transmission amplitude in the bandpass

ToDo List :

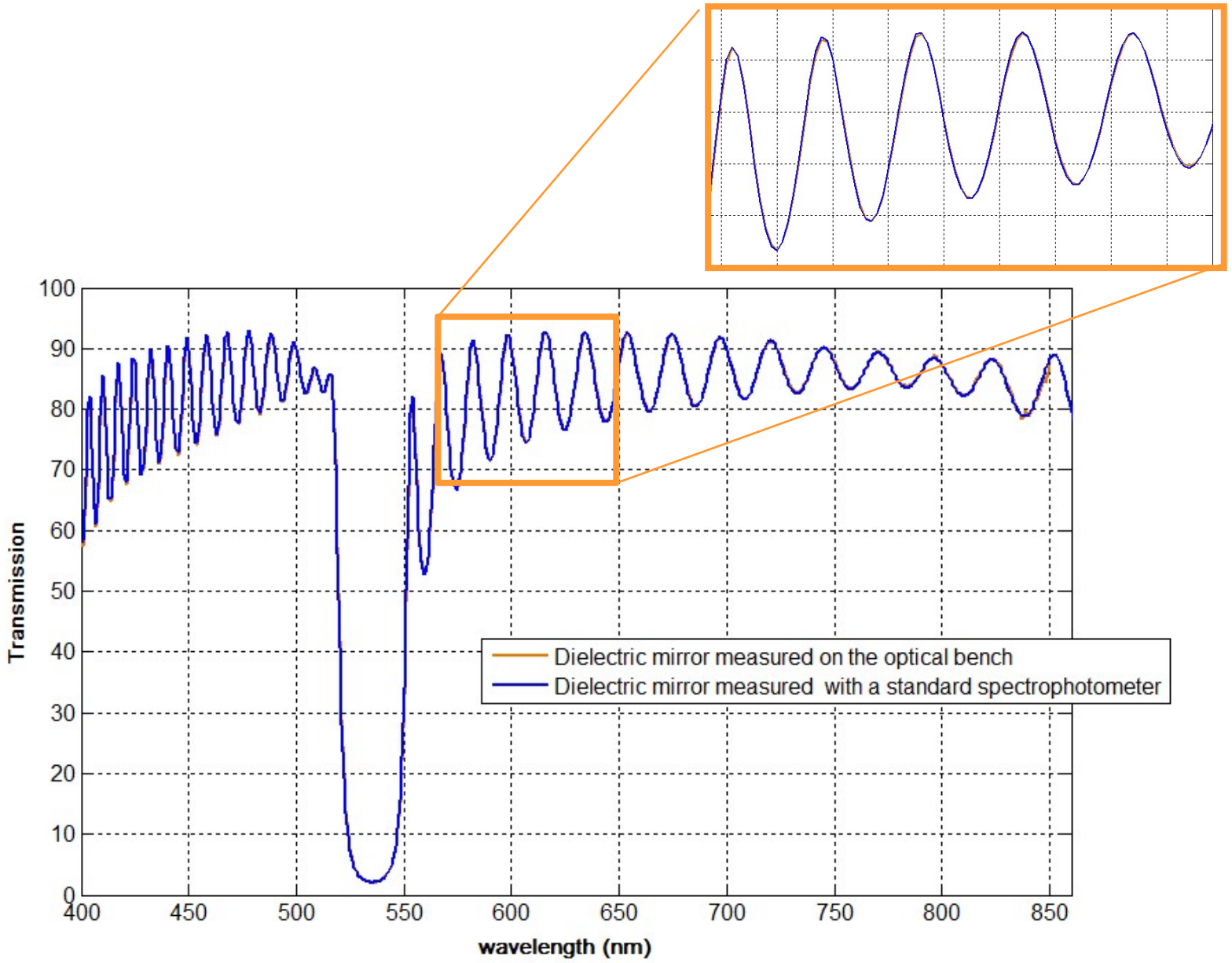
- Scan over the full filter surface at AOI 0°-5°-10° and 15°
- Search for leaks in the rejection band
- Study of the filter structure (What colored glass ?, What coating on each side ? , …)
- …

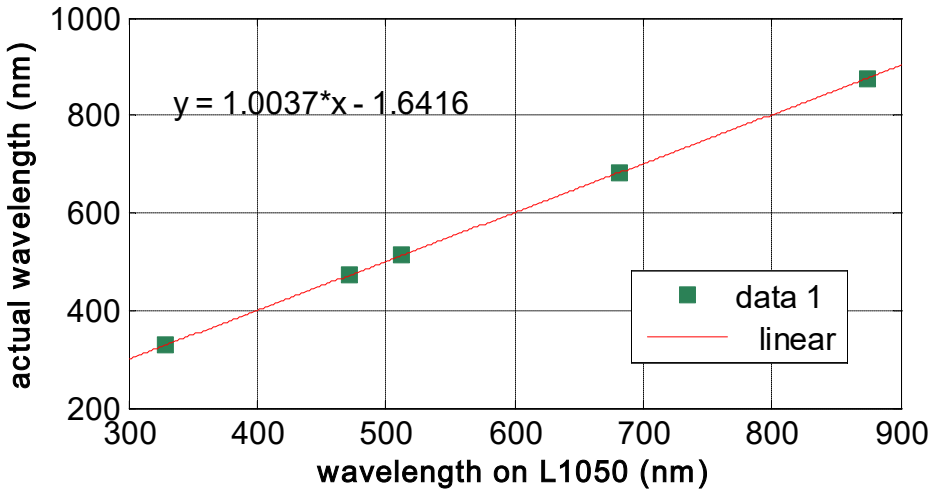
Spare slides

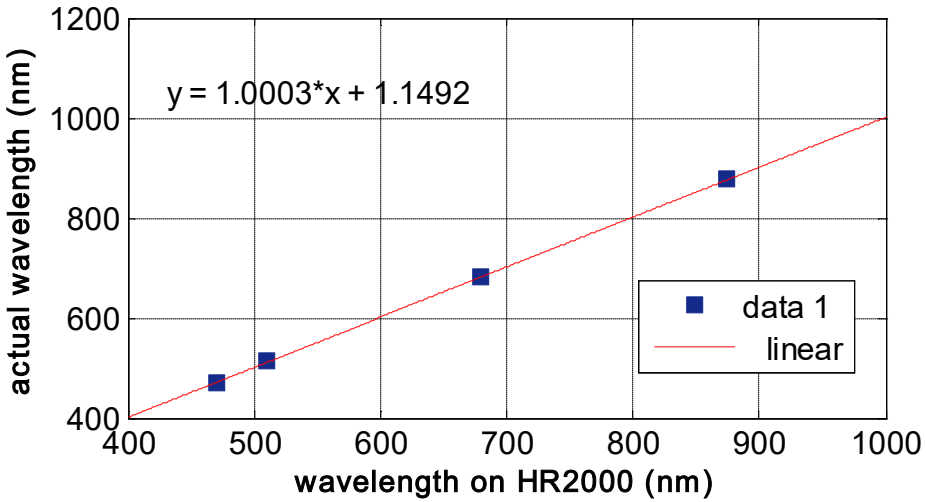
PE L1050 vs HR2000

Wavelength range	175-3300nm	190-1100nm
Wavelength resolution	~0.05 to 0.2 nm (FWHM)	~0.035 to 6.8 nm (FWHM)
Accuracy	0.2% within 2σ confidence range	SNR 250:1
Acquisition time	~2.5 min / 100nm range	~1ms (full range)
Comment	Versatile	Compact
Use	High precision measurement	Quick & qualitative measurement

The optical bench vs standard spectrophotometer




y = 1.0037*x - 1.6416
actual wavelength (nm)
wavelength on L1050 (nm)
data 1
linear
1000
800
600
400
200
300
400
500
600
700
800
900


y = 1.0003*x + 1.1492
actual wavelength (nm)
wavelength on HR2000 (nm)
data 1
linear
1200
1000
800
600
400
400
500
600
700
800
900
1000