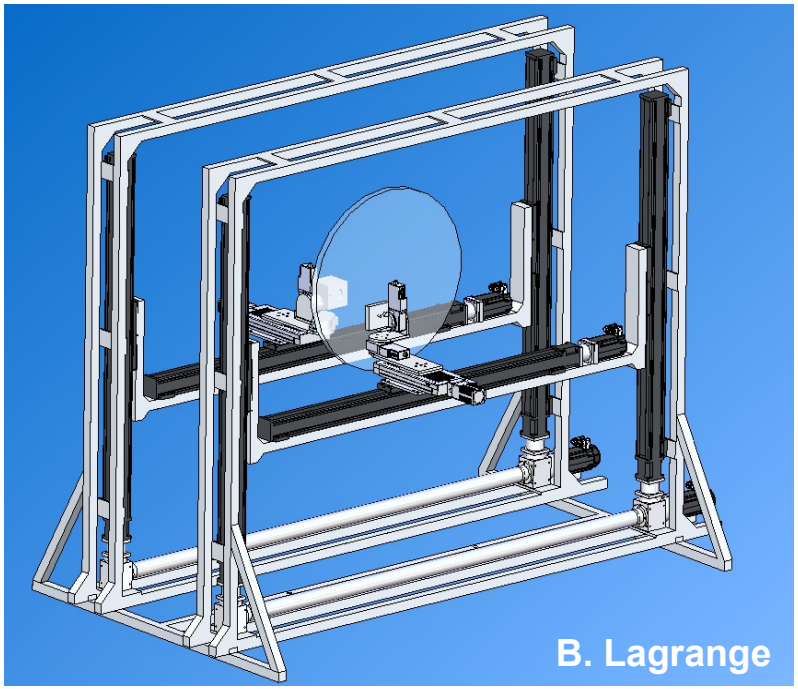

Filter Metrology @ LMA

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Laboratoire des Matériaux Avancés - Villeurbanne

Discussion about the needs

Calibration Workshop – Harvard March 2016

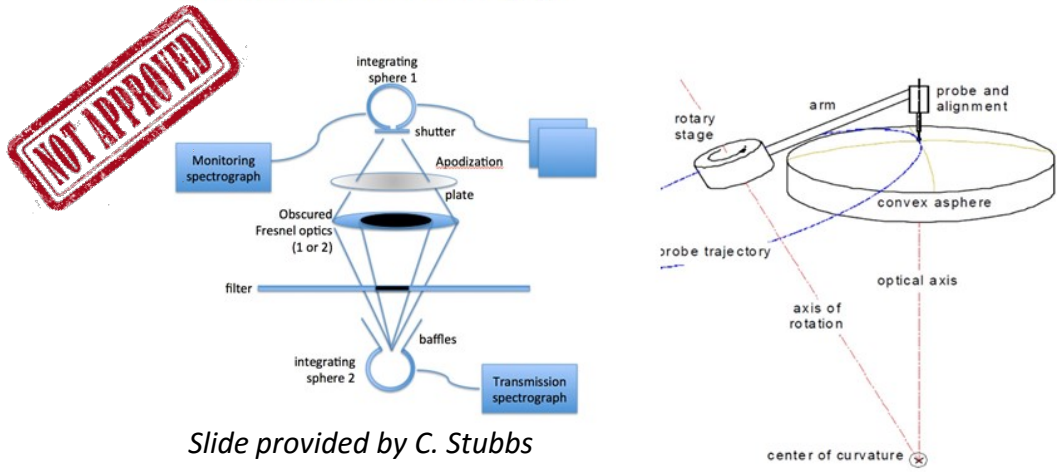
- First time we met non-french final users of LSST
- French members are interested in filter metrology but what about the others ?
- Presentation of the LMA capabilities and plans

Most of them were interested in such metrology

and … actually they have already made a proposal to get funding for a filter-scanner

Proposition: Construct a Filter-Scanner that can measure the 'PSF transmission' vs. position

Measures all wavelengths simultaneously by using differential spectroscopy
Angle distribution of rays mimics LSST's beam
Need only to scan spatially, with beam on filter having same footprint as a PSF
Requires excellent control of stray light



Slide provided by C. Stubbs

Discussion about the needs

Camera Technical Meeting – Telecon 16-04-27

- Discussion about LMA metrology capabalities
- Evaluation of the witness samples (BBAR coating and bandpass coating) provided by potential vendors
- Real filters metrology issues
    - technical issues
    - impact on the Science
    - possibility to adjust the design to fit the requirements

We wanted to trigger a discussion on the large filter metrology developments …but we did not discuss a lot

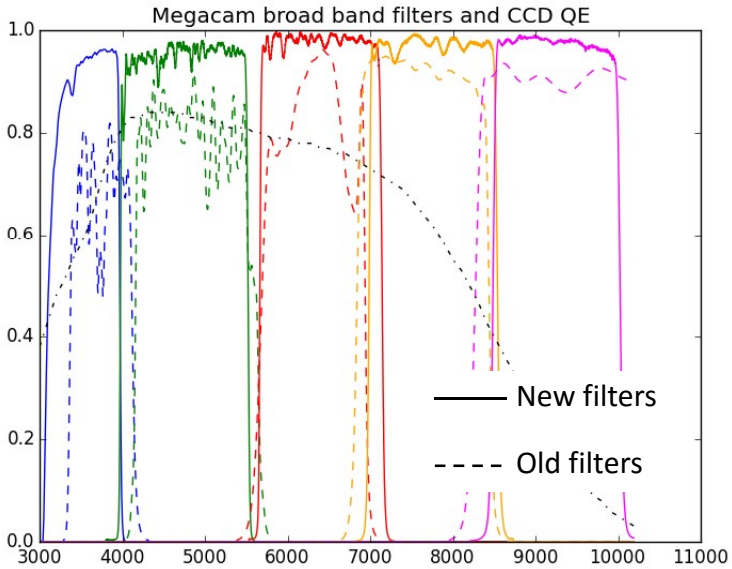
Filter metrology is not part of the construction baseline.

It requires new funding, so the improvements on the Science must be demonstrated.

MegaCam filters

Measurement of the MegaCam broad band filters :

- A necessary (and hopefully sufficient) condition for LSST
- Direct scientific return
- Investigation on the origin of problems



www.cfht.hawaii.edu/Instruments/Imaging/Megacam/specsinformation.html

So far :

- Poorly known spectral response
- Average value – no spatial variation

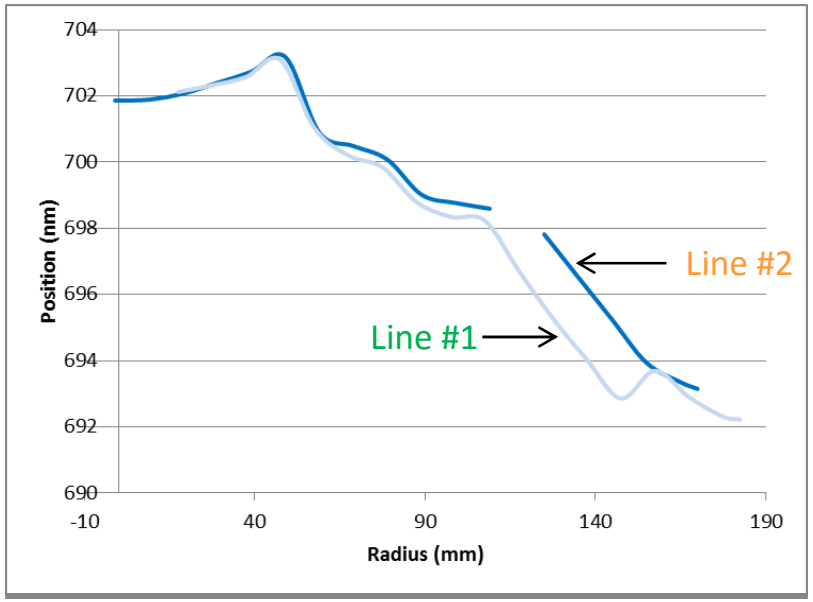
Further :

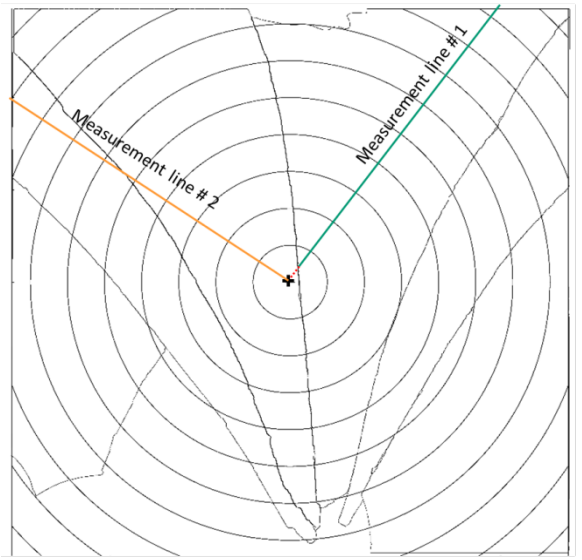
- Spectral response uniformity
- Angle dependence measurement (5°-15°)
- Light leaks

The filters (u g r i z) will be available in late August

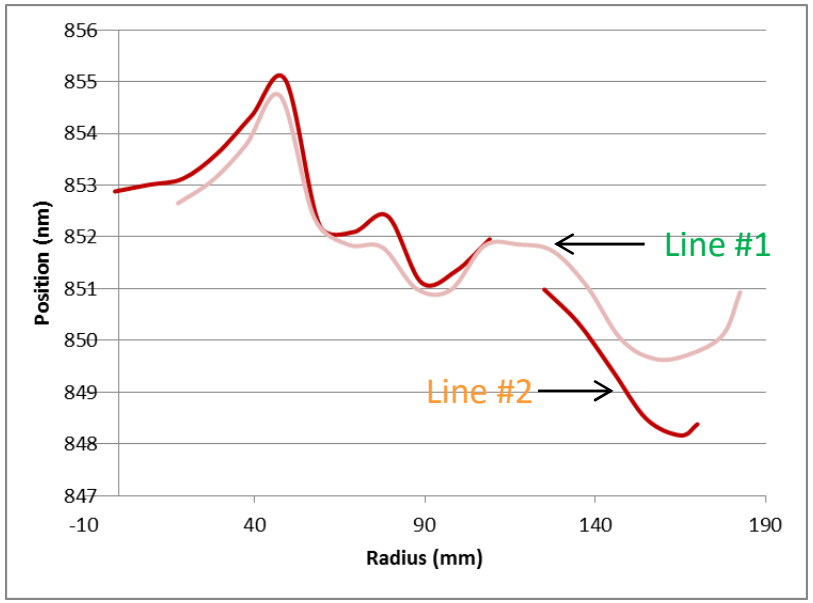
Work ongoing to be able to scan the filters

I filter update (measurement @ 0°)





M. Betoule



Good agreement for radii < 115mm

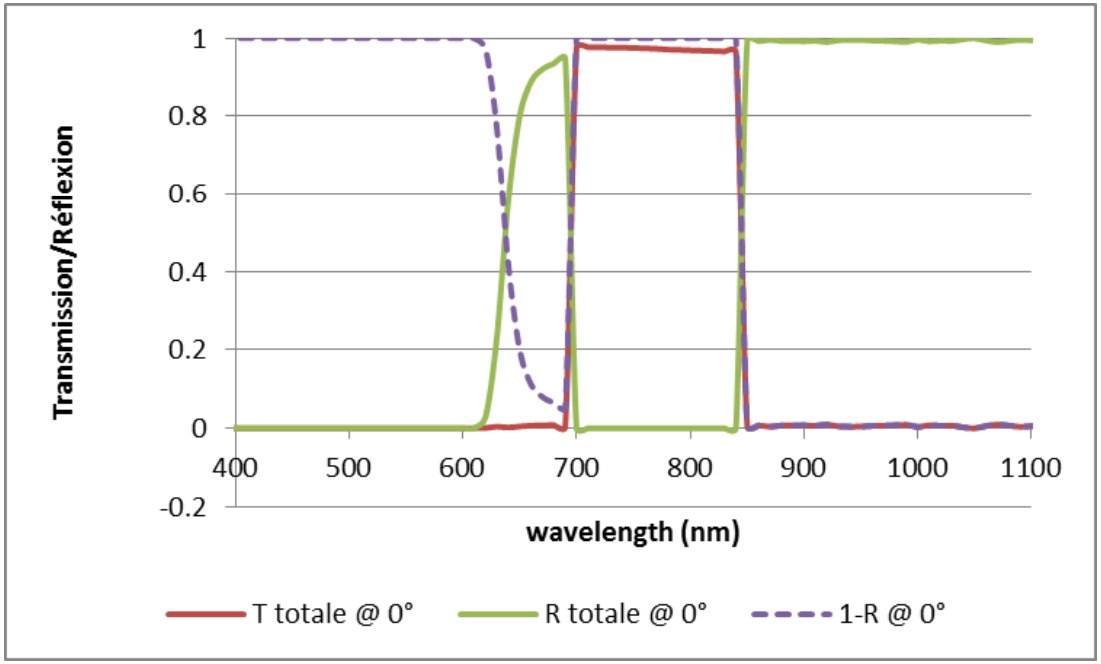
Some discrepancies above 115 mm : ~1 nm

Towards a filter scanning

What have we learnt from the i (broken) filter ?

- Substrate = colored glass (**CG**) with cutt-off wavelength at 635 nm
- Lowpass (**LP**) filter to define the right edge
- Highpass (**HP**) filter to define the left edge

Probably g, r, i (new) and z filters have the same structure **LP-CG-HP**. What is the best way to measure them ?



Example :
HP & LP: 0<T<1% in the stopband
HP & LP: T=100% in the passband
Substrate = Schott RG 630

T measurement :
- spectral shape
- inband transmission
- Rejection

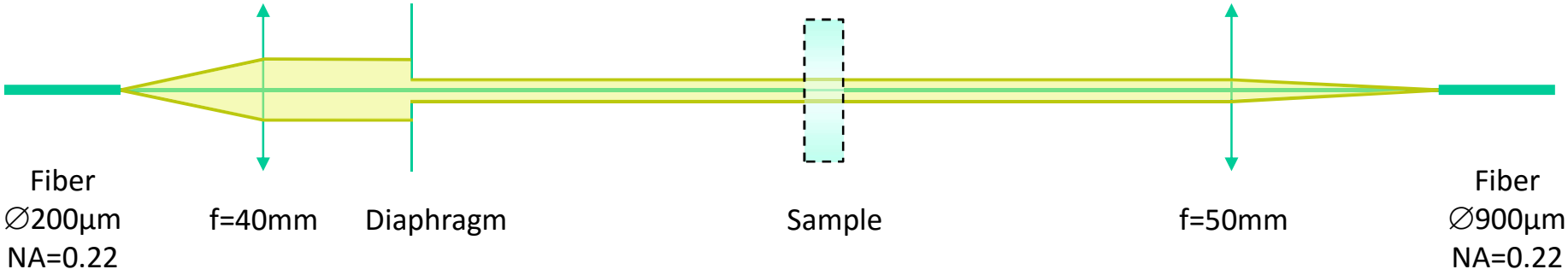
R measurement: spectral shape (only)

Due to the substrate absorption, T can not be computed from 1-R

Transmission measurement provides the most relevant informations

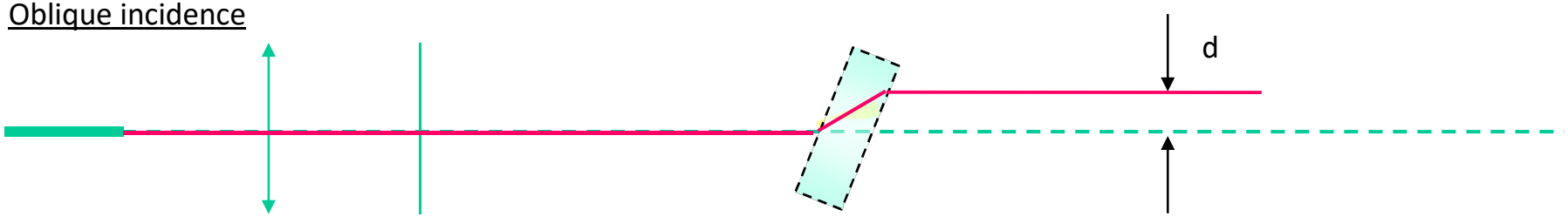
Oblique incidence : a technical issue

Normal incidence



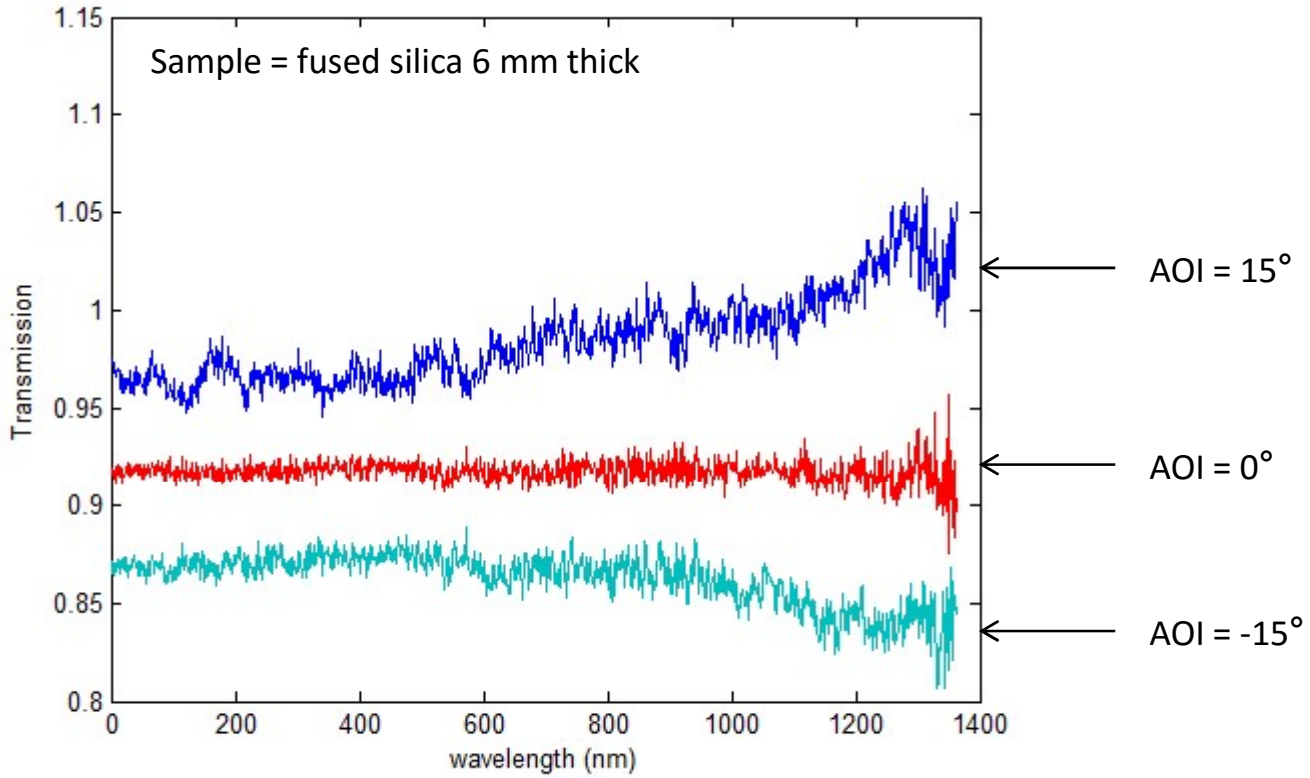
The optical path is the same with or without the sample

Oblique incidence



Beam displacement due to the refraction in the substrate

Oblique incidence : a technical issue



Difficulties to achieve reliable transmission measurements :

- Distorsion of the patch and chromatic effects
- Modification of the optical system (not so easy)
- Automated alignment (cost issue)
- Manual alignment with motorized stages (the solution)

Installation is in progress

Installation of the optical bench (developped for the actual LSST filter) in the ISO3 cleanroom

The mechanical frame will be used to move the filter according to a regular grid

Fundings have been required for the motorized stages