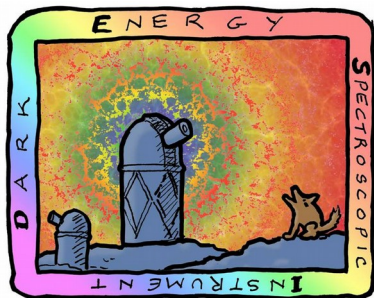


# DESI

Measuring the spectrograph throughput :

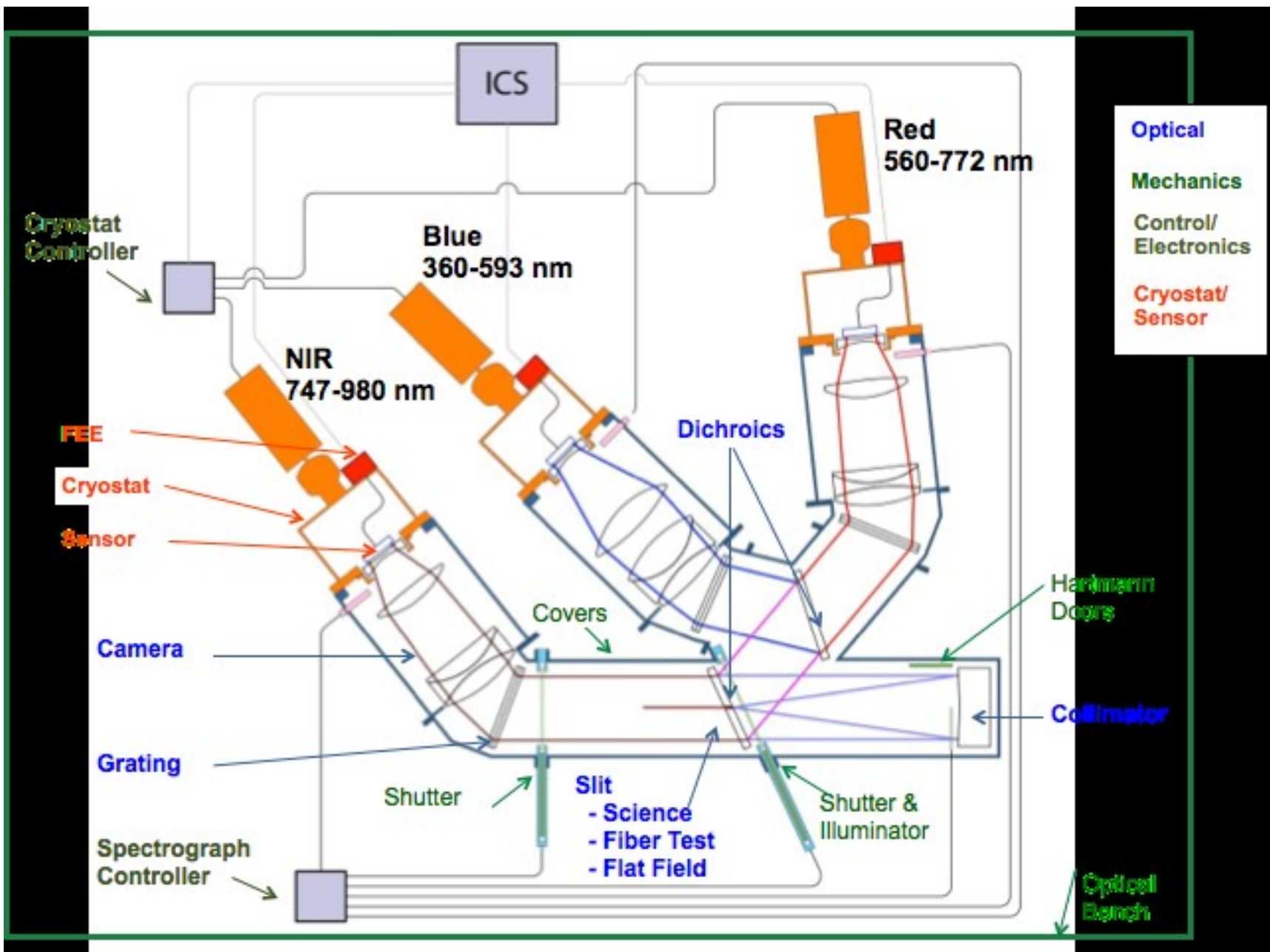
*Status report - 2016-02-02*

P. Ghislain, J. Guy, S. Karkar, L. Le Guillou, Ph. Repain



# Measuring the throughput

- Critical : misestimating the spectro. throughput may endanger the DESI science
- Throughput measurement could be done during the acceptance tests in Marseille (AMU/Winlight)
  - E.g : during fiber sparse field test slit removal/reinstall repeatability tests (Test 7.15 Acceptance tests)
  - Limited time overhead



**Optical**

**Mechanics**

Control/  
Electronics

Cryostat/  
Sensor

Cryostat  
Controller

ICS

Red  
560-772 nm

Blue  
360-593 nm

NIR  
747-980 nm

FEE

Cryostat

Sensor

Dichroics

Covers

Camera

Hardman  
Doors

Grating

Collimator

Shutter

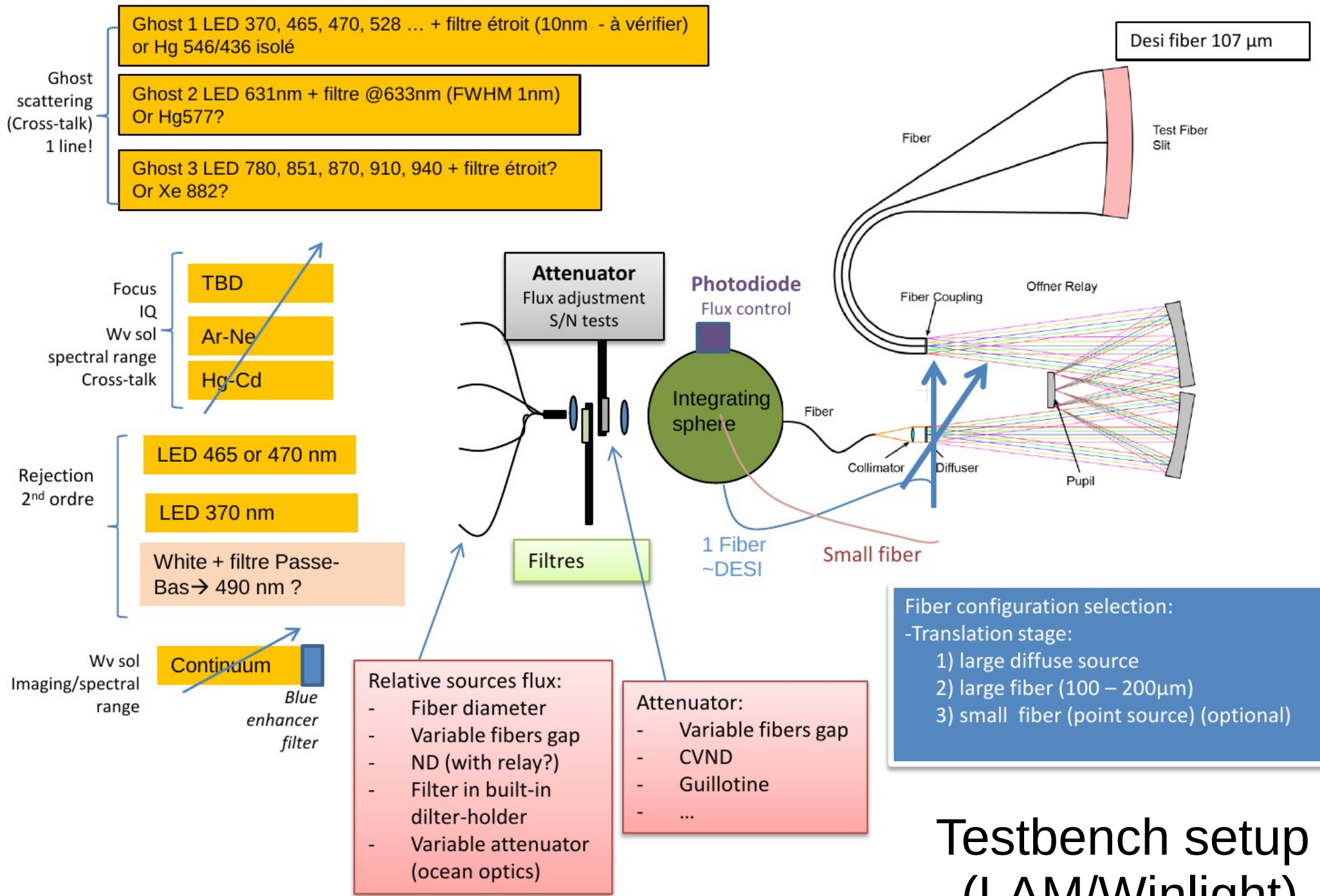
Slit  
- Science  
- Fiber Test  
- Flat Field

Shutter &  
Illuminator

Spectrograph  
Controller

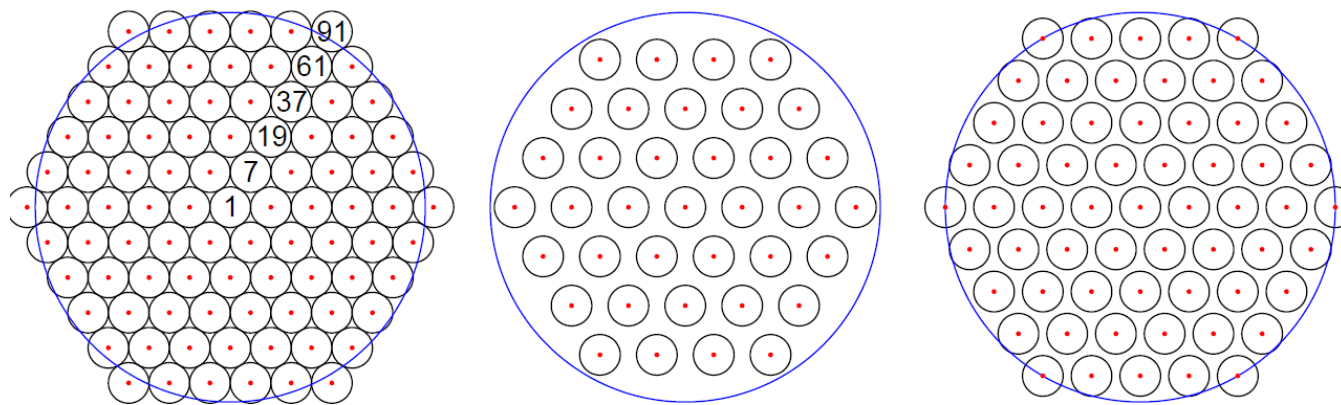
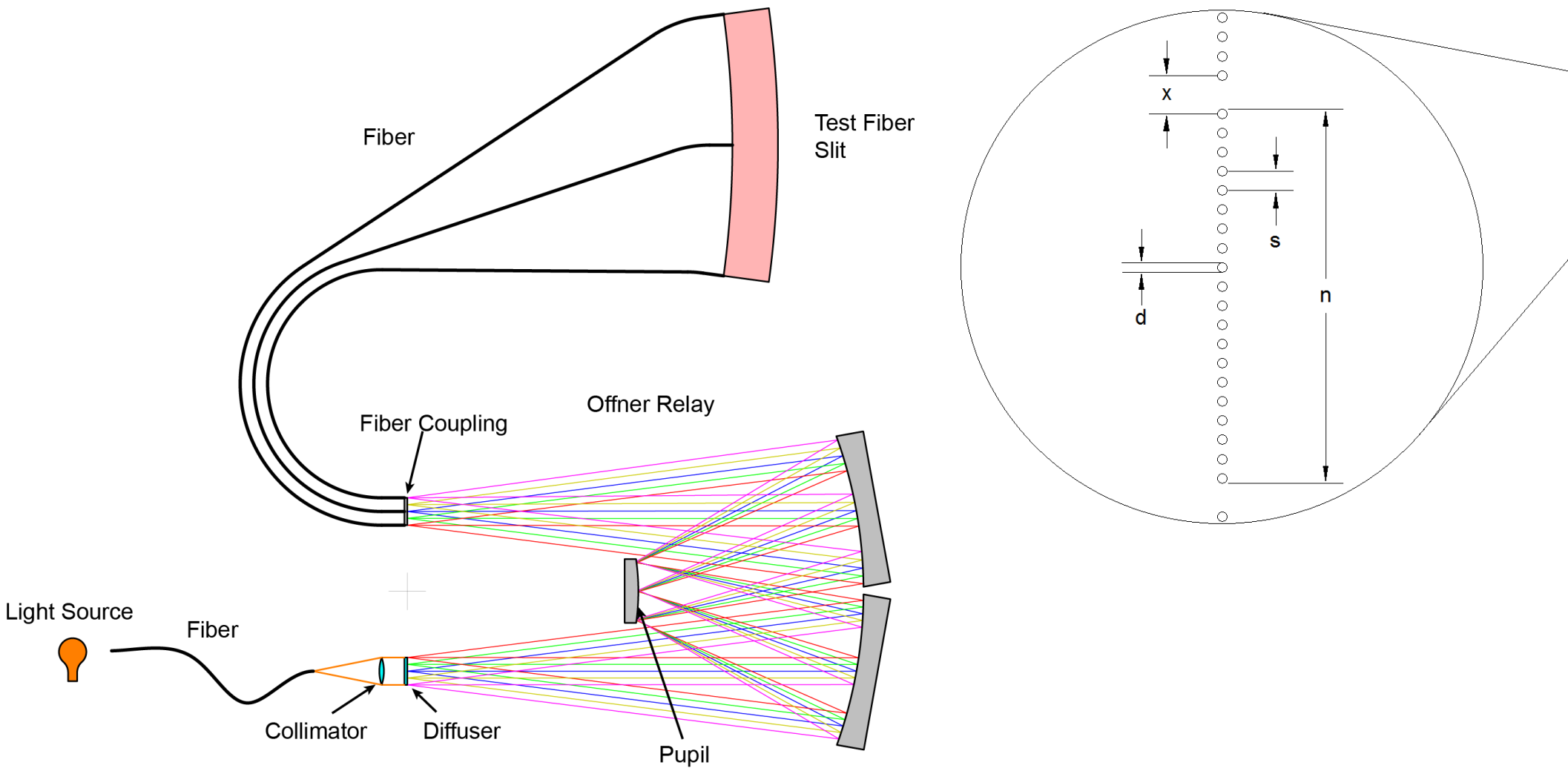
Optical  
Bench

Schéma (25/08/2015)



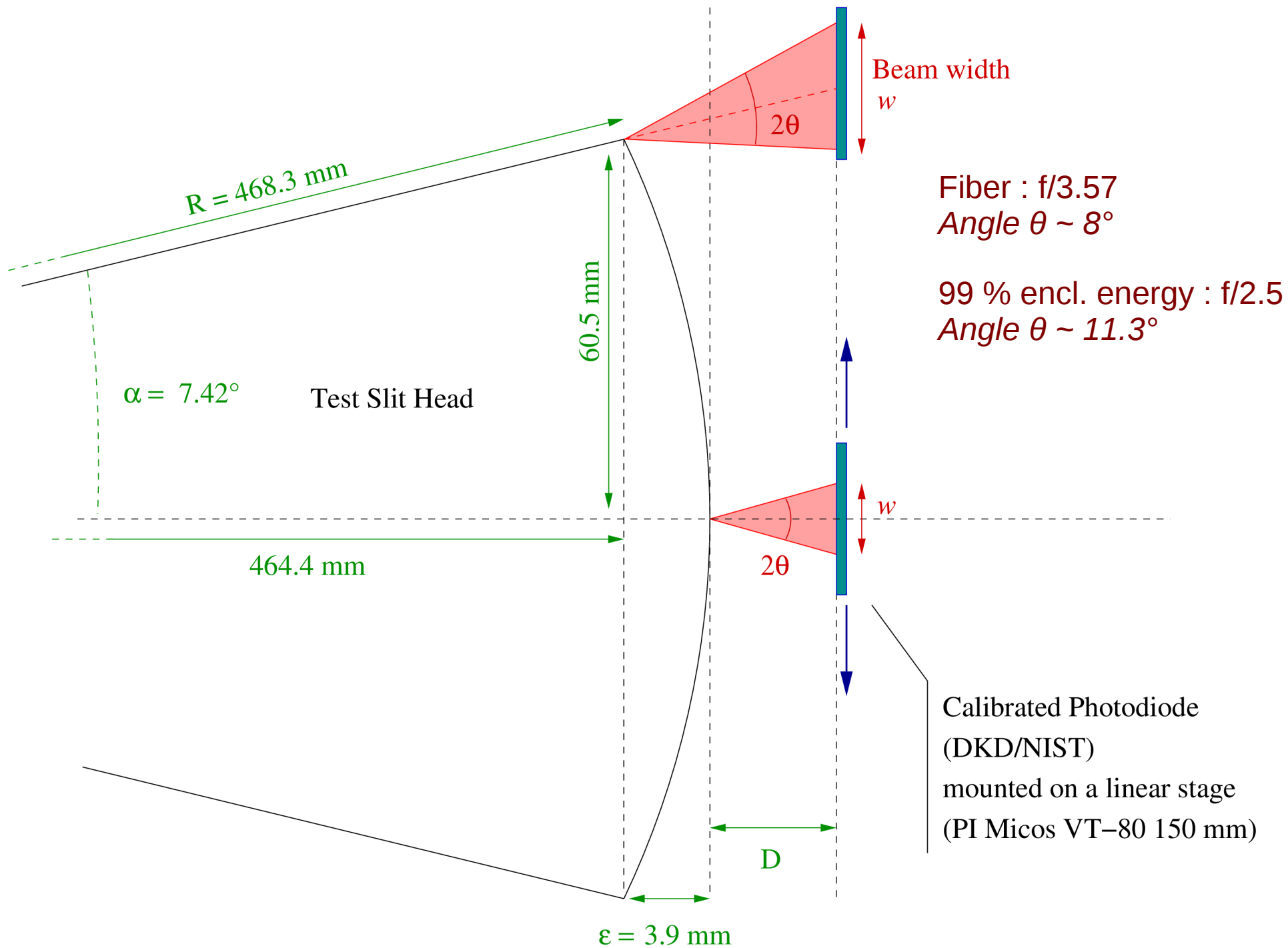
DESI

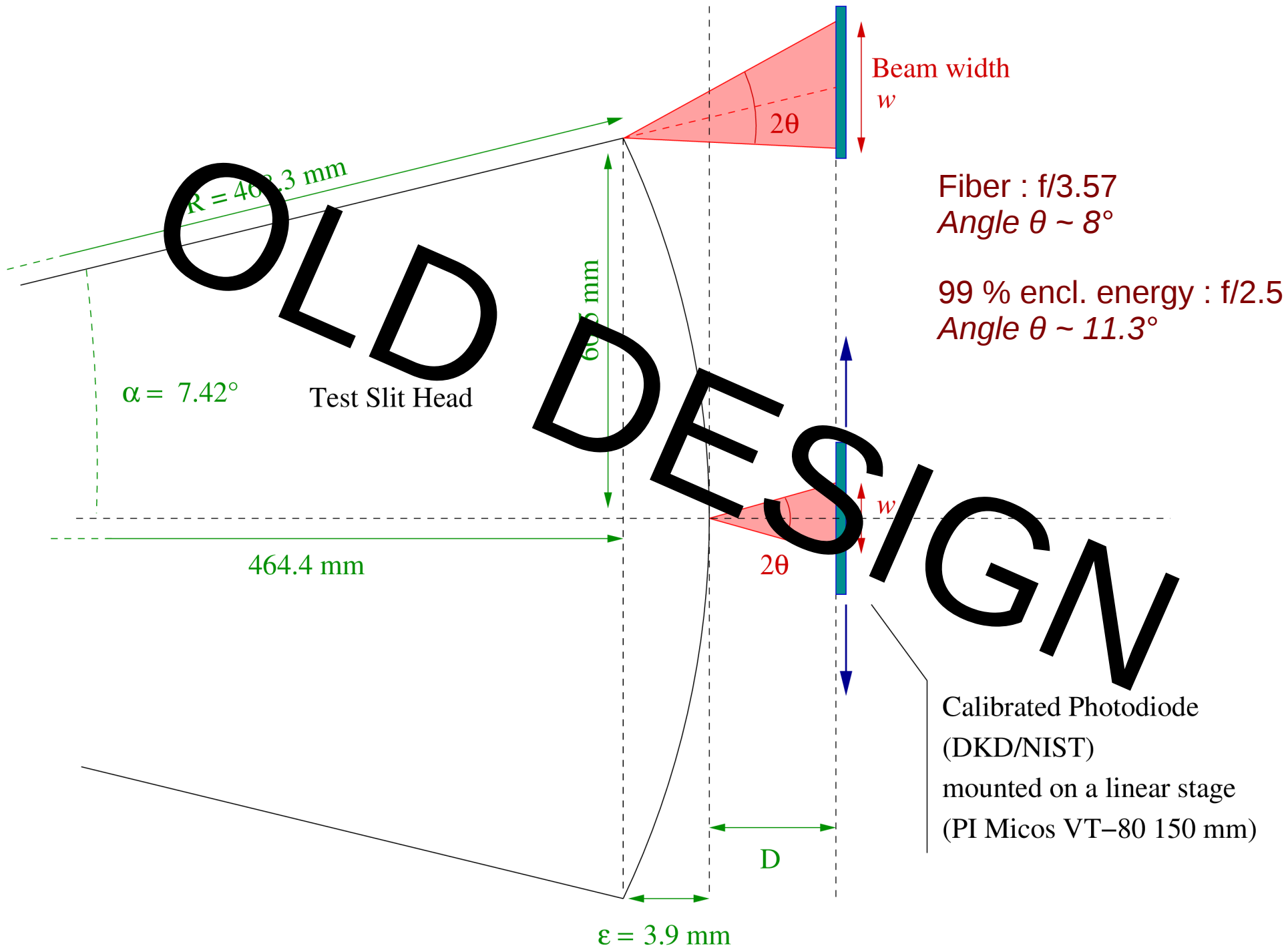
# Testbench setup (LAM/Winlight)



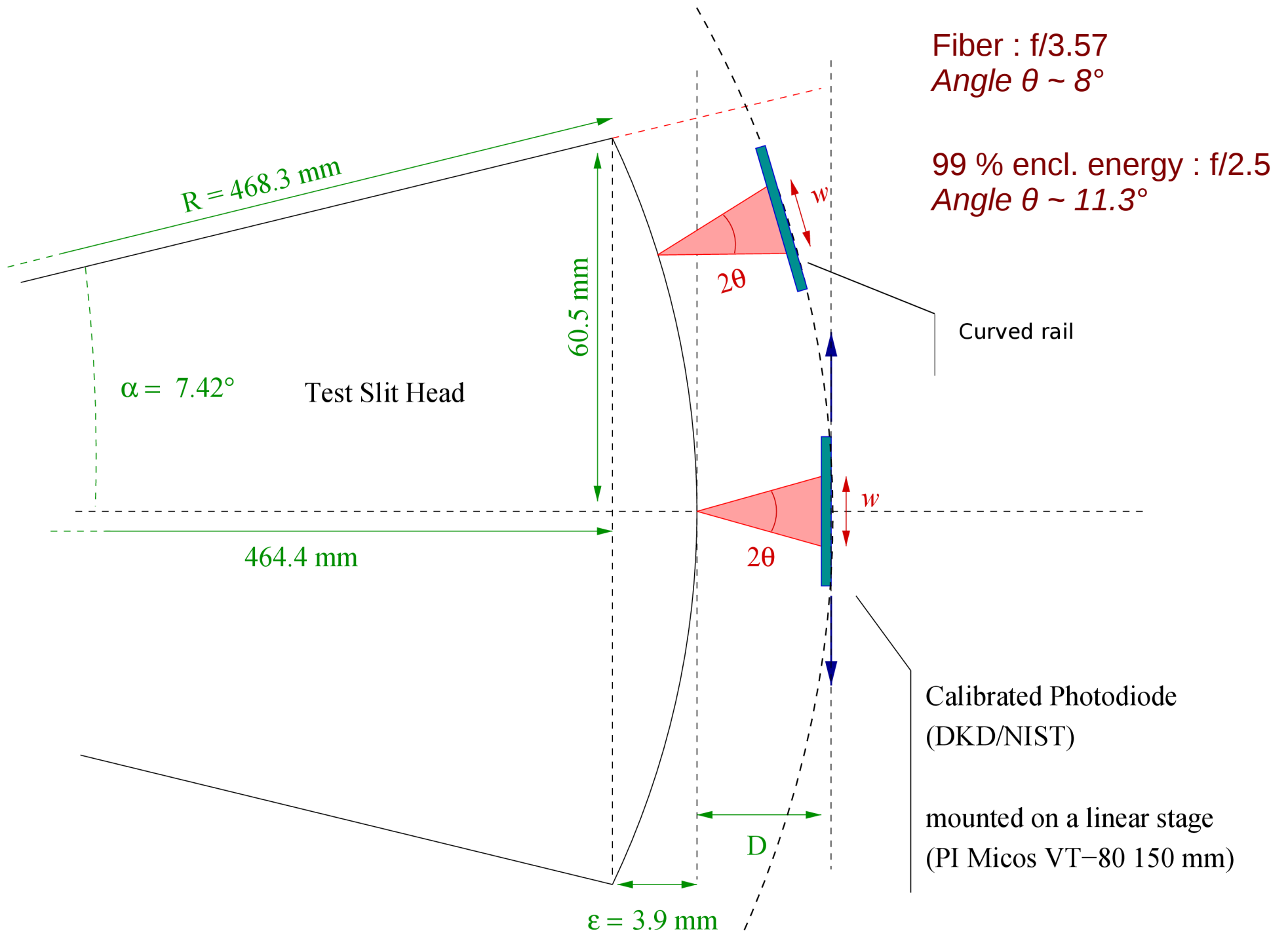
# Measurement procedure

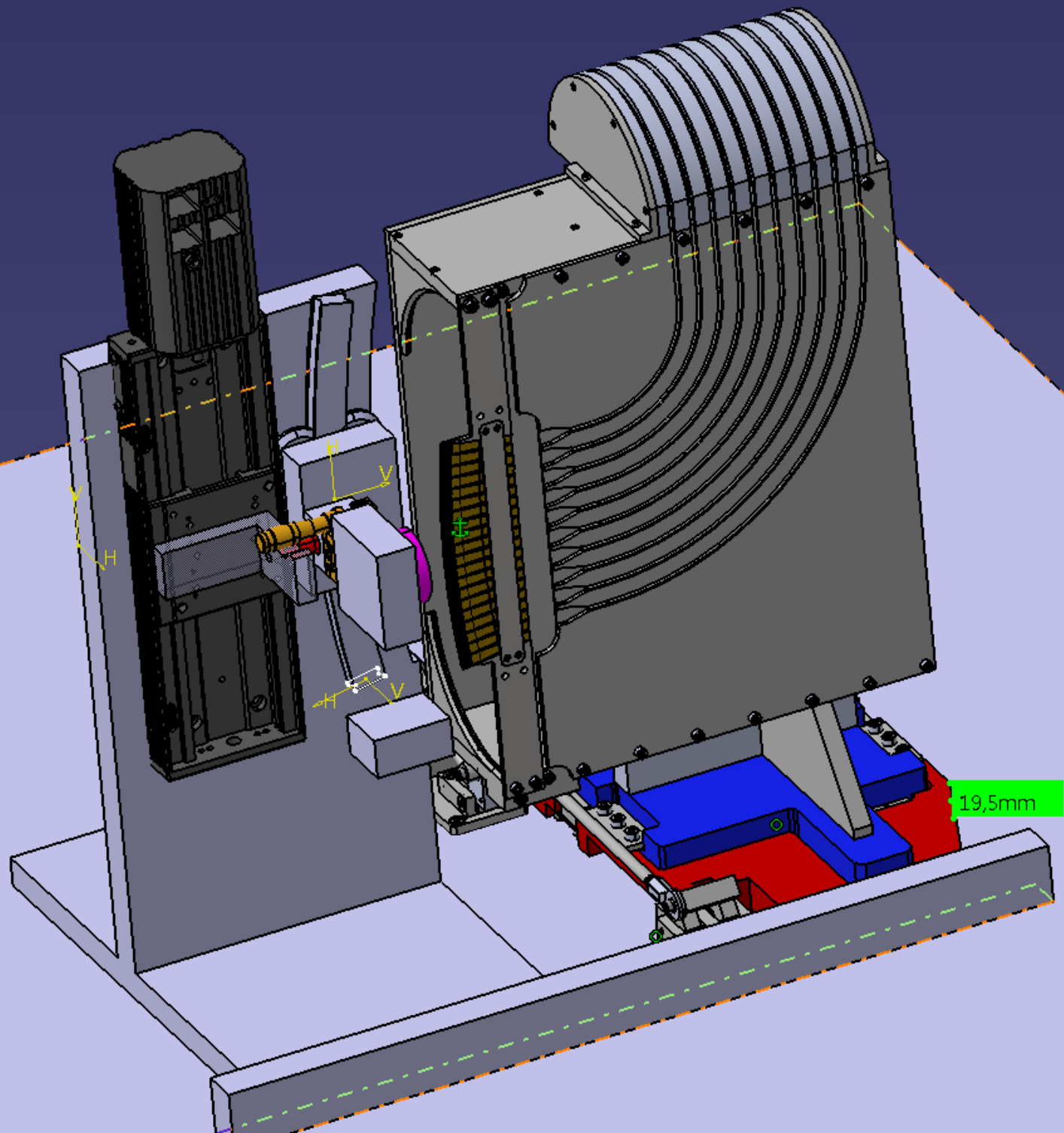
- Test fiber slit inside the spectro.
  - various illuminations (flux ramp, wavelength scans)
  - Light only through isolated fibers / fiber blocks
  - CCD spectra on the 3 branches
- Test fiber slit outside :
  - Fixed on a dedicated optical table (is that possible?)
  - same illuminations setups as before
  - measuring the total flux received by the photodiode in front of each fiber/fiber block.
- Test slit back inside : same illuminations (with a good control of the flux)...
- Repeat...
- Ratio : flux on CCDs / flux measured by the photodiode



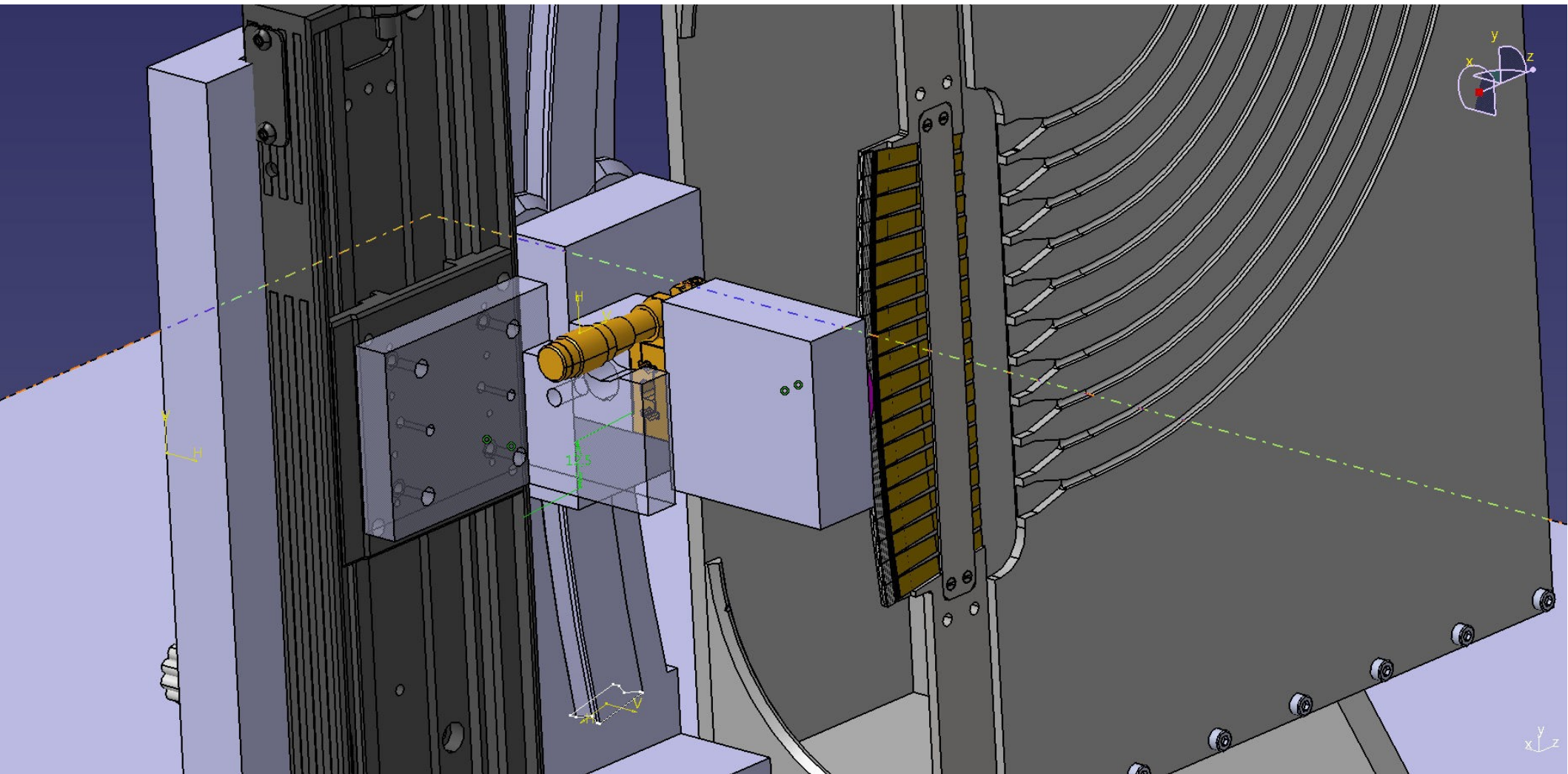








19,5mm



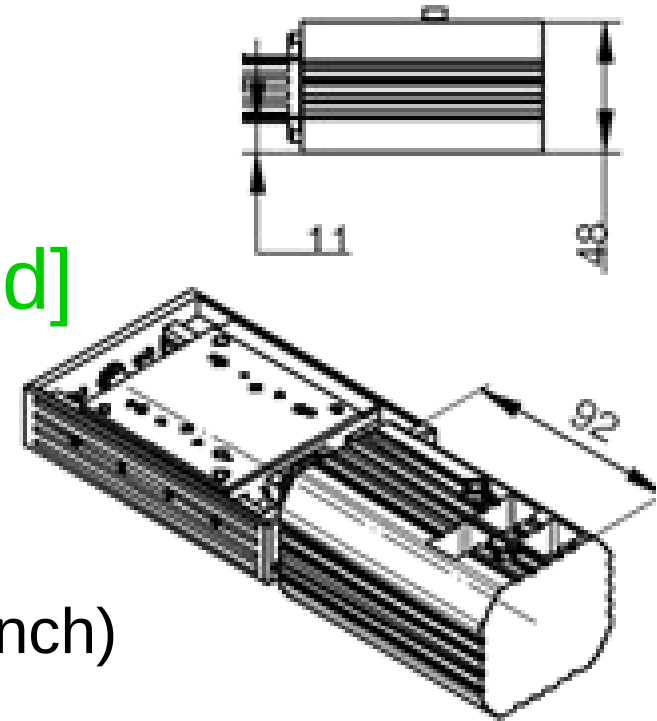
# Calibrated photodiodes [2 delivered]

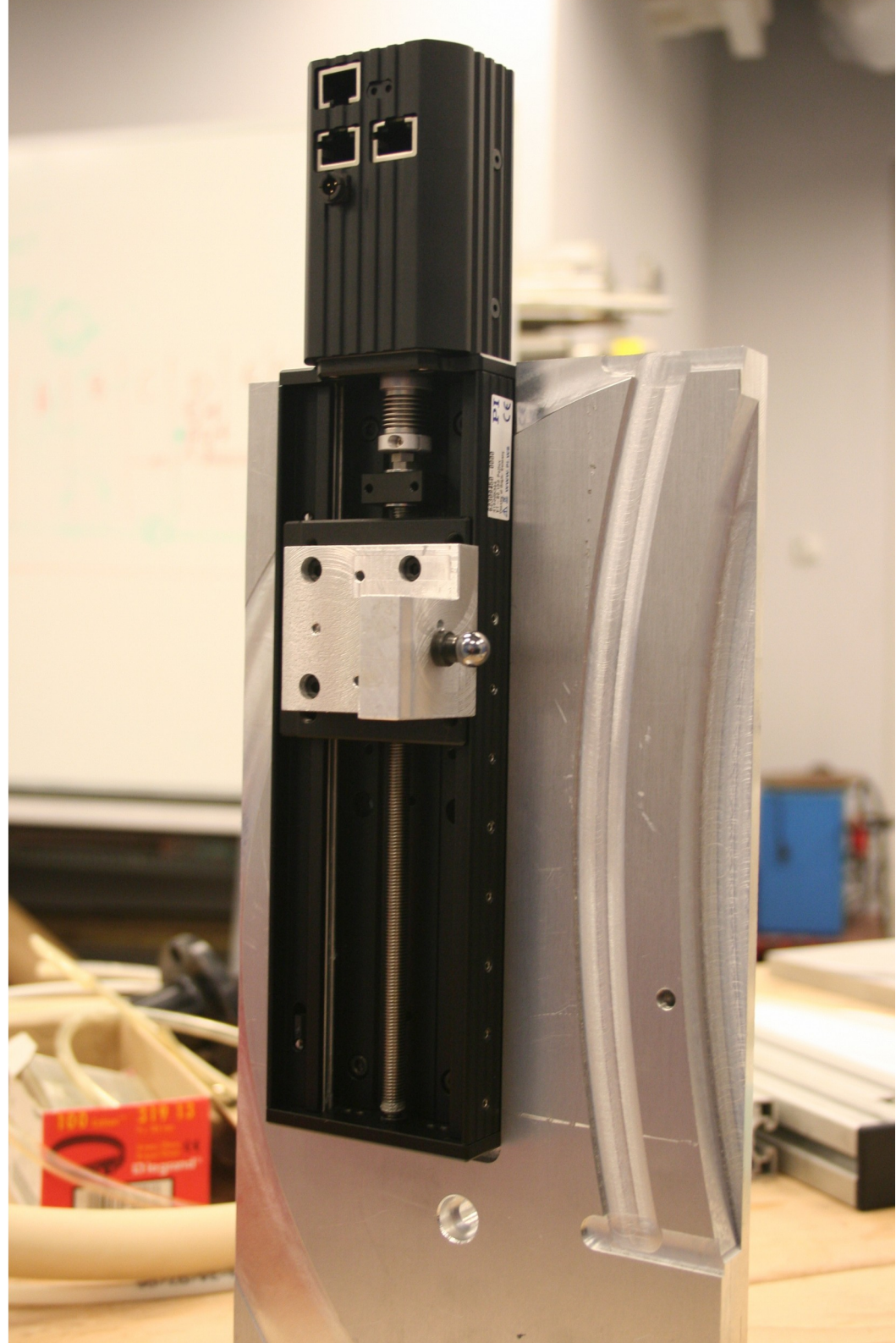
- MD-37-SU100 calibrated (spectral sensitivity)
  - **DKD certified absolute calibration**
  - A few % on 250 – 1100 nm.
  - Size : 100 mm<sup>2</sup>
- Photodiode current readout : electrometer  
(e.g. Keithley 6514, or better 6482 (2 channels))
- Other option :
  - Hamamatsu 100 mm<sup>2</sup>  
calibrated by NIST
  - Delays...

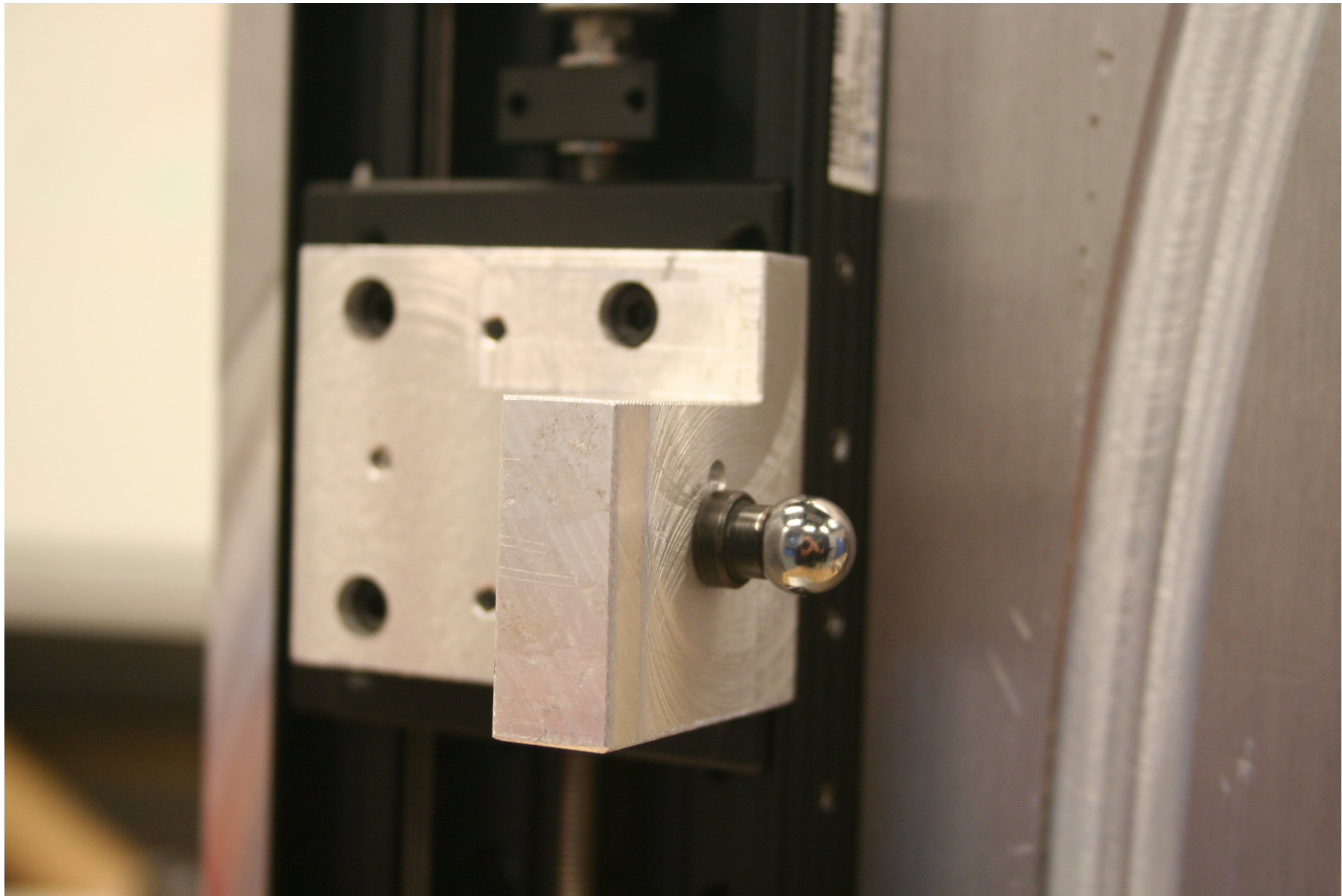


# Moving the photodiode

- Linear stage Pollux VT-80 **[delivered]**
  - from PI Micos : range 150 mm
  - Uni-directional repeatability  $\sim 0.4 \mu\text{m}$
  - Existing LPNHE software (LSST testbench)
- Photodiode support moving on a curved rail
  - (500 mm curvature radius) **[delivery 2016-02-09]**
- Mechanical coupling linear stage - rail (« rotule »)
- Micrometric linear stage(s) to adjust the photodiode position (curvature radius)







# Mockup of the slit head (for tests)

- 3D printed (ABS) with removable fiber bundles
- For mechanical and optical tests (at LPNHE)





# Integration on the AMU bench (for the tests at Winlight)

(collab. with P.-E. Blanc, S. Perruchot, X. Regal, S. Ronayette)

- Teleconfs, visit (SK & LLG) at OHP and Winlight on January 7-8<sup>th</sup>, 2016.
- Allocated space for the throughput setup on the AMU bench  
(Slit head + our flux measurement device + dark box)
- Integration of the electrometer and the linear motor in the bench control system (Beckhoff systems, resp. Xavier Regal)  
[first tests done with the motor, on going tests for the electrometer]
- When the sparse test slit will arrive at OHP (early March)
  - mechanical measurements & adjustments
  - Tests & first flux measurements
- Goal : a working device, tested and qualified for the end of March.