



# DEVELOPMENT OF MIRRORS IN SACLAY

CTA

P. Brun

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Irfu, CEA Saclay

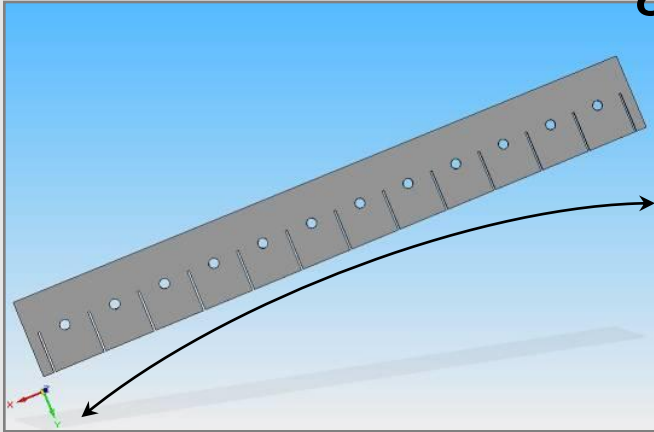
*SST Meeting, Liverpool Sept 7-8 2010*

# HOMEMADE STRUCTURE

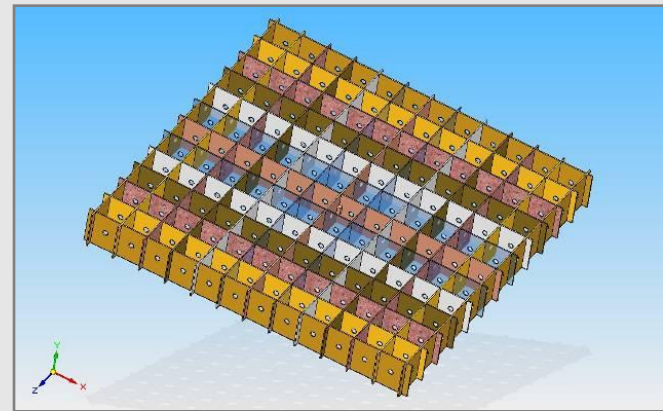
Idea: use pre-shaped strips for the support structure and  
a masterpiece

Carbon or G10 or Aluminum strips,  
thickness 1.5 mm

1 side is shaped with a 30m radius

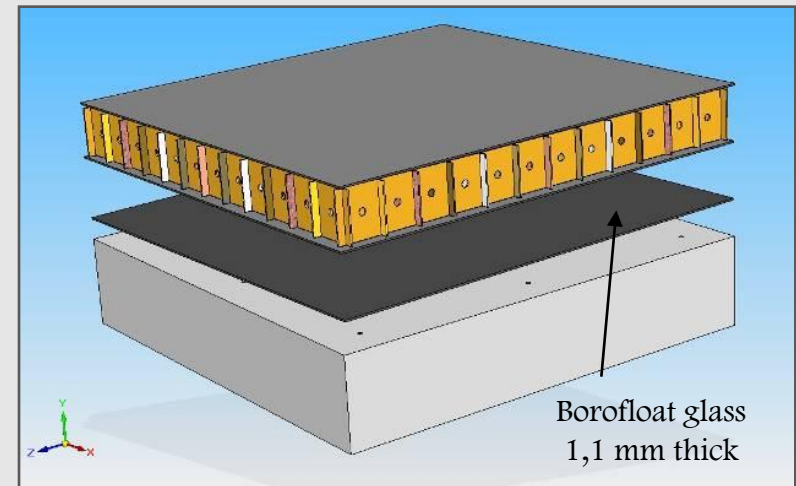
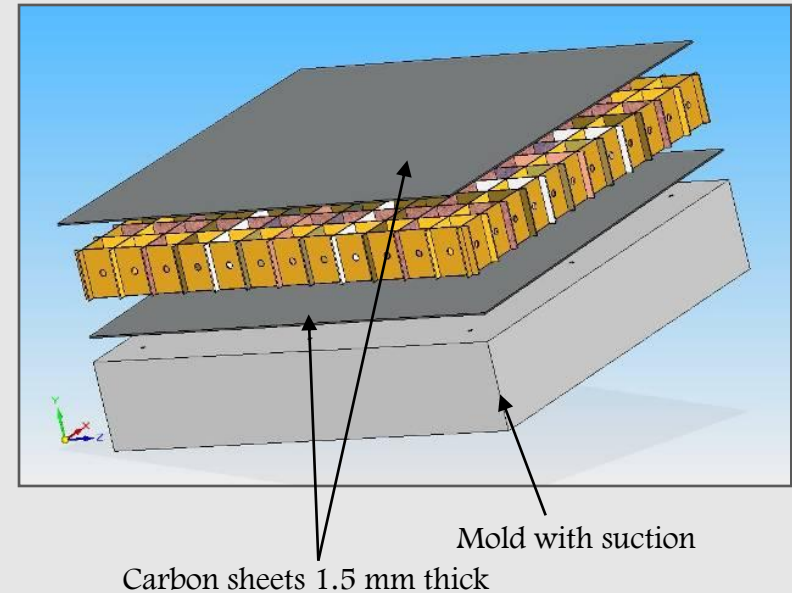


for 50cm x 50cm mirrors :  
13 X-strips  
13 Y-strips



# PROCEDURE

1. Gluing of the panel structure
2. Gluing of the carbon sheets on the mold
3. 12h of polymerization  
*in vaccum, room temperature*
4. Gluing of the mirror  
*liquid epoxy, 15 minutes in vacuum*
5. 12h of polymerization  
*atmospheric pressure, room temperature*

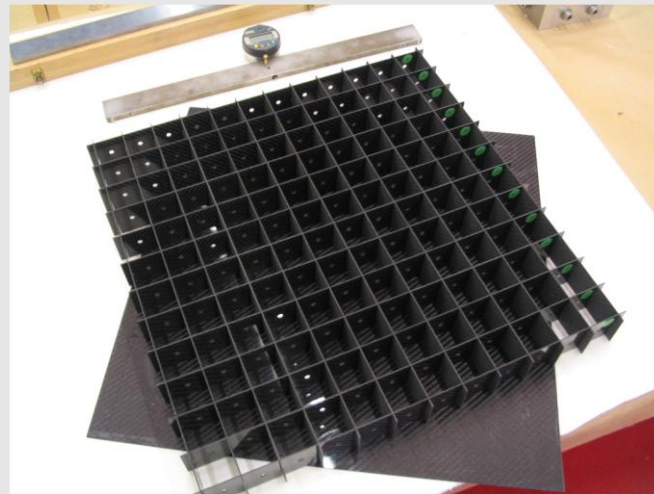
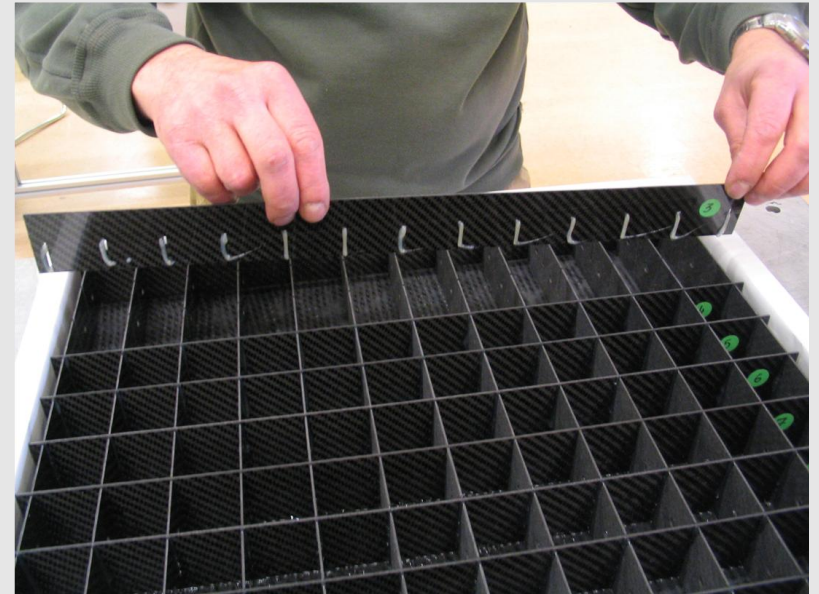
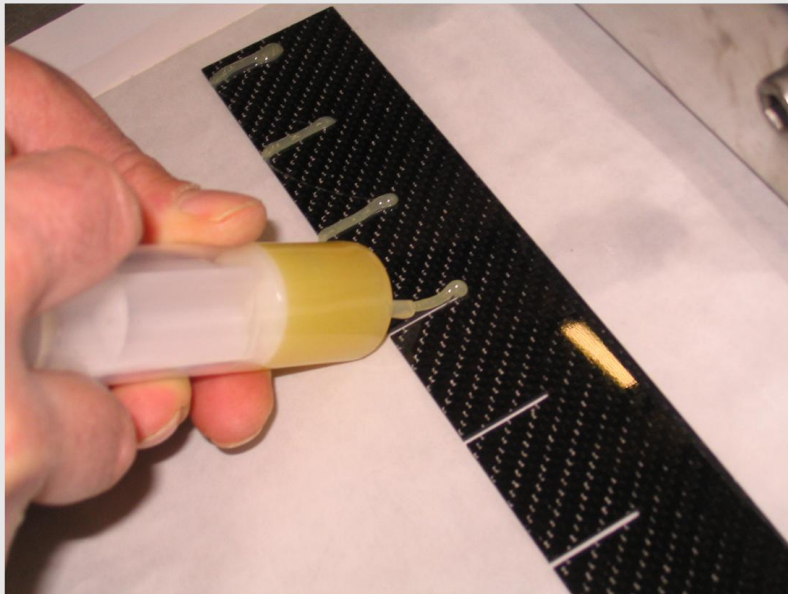


# PROCEDURE

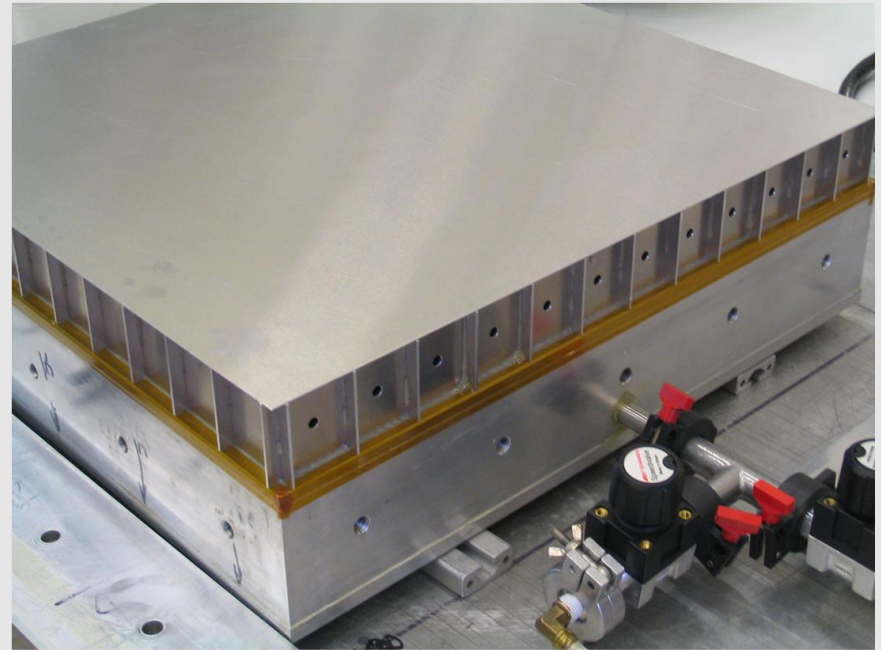
The 500 X 500 mm  
mold  
With its suction setup



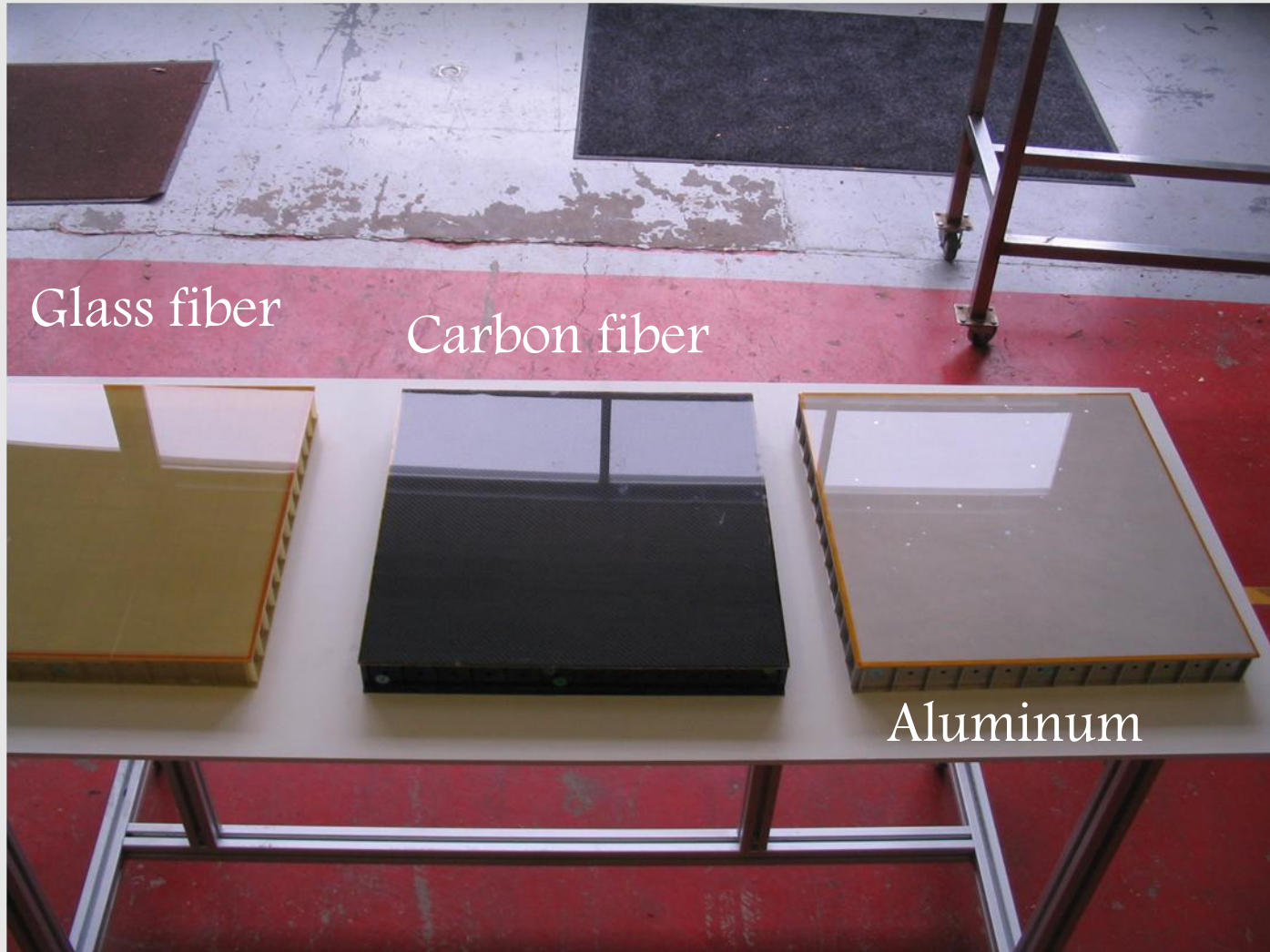
# BACKPANEL CONSTRUCTION



# BACKPANEL CONSTRUCTION



# FINAL RESULT WITH THE GLASS



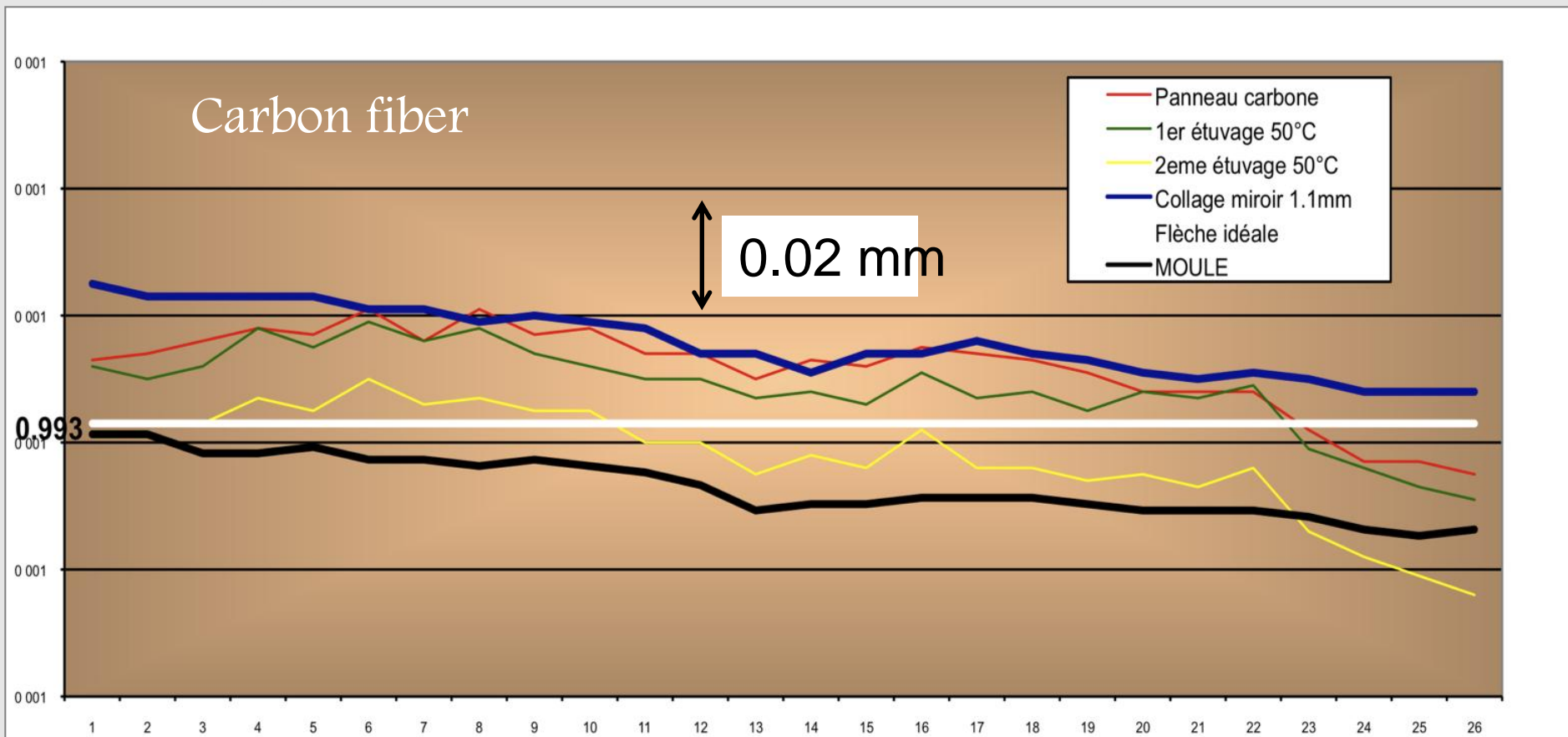




# MIRROR TESTING

- In Saclay:
  - Small climate chamber
  - 2-F setup is being commissioned
- In Erlangen:
  - Shape measurement with deflectometry
- In Zeuthen:
  - Large climate chamber in development

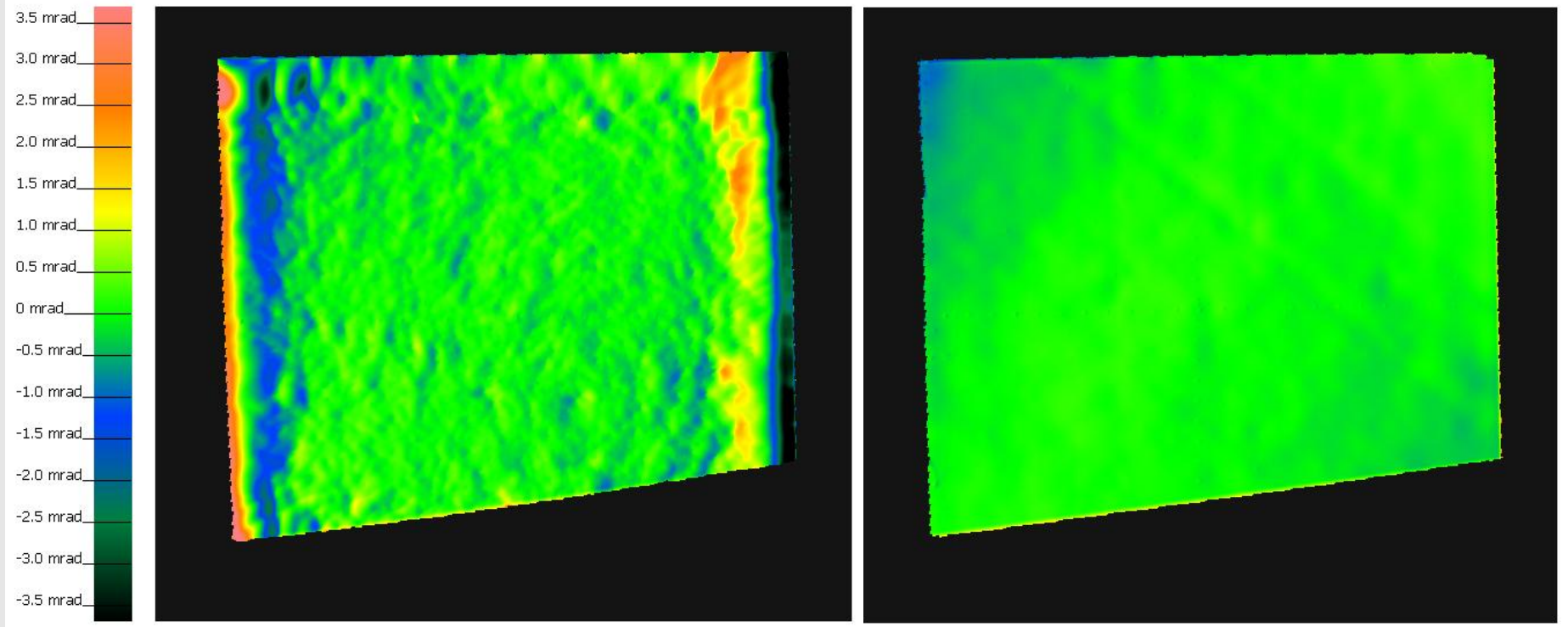
# SHAPE MEASUREMENTS



Gluing the mirror erases the defects of the backpanel

The shape of the mold is very accurately reproduced

## Deviation Slope X

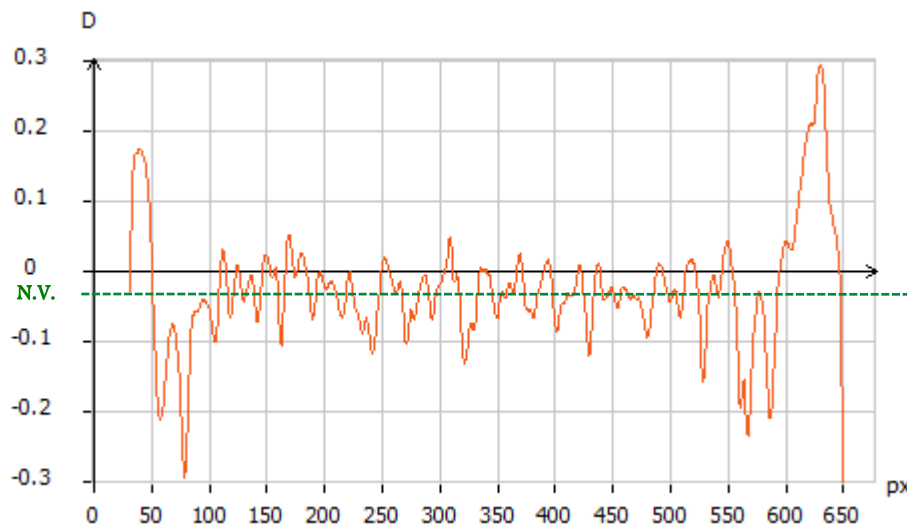


Alumimum

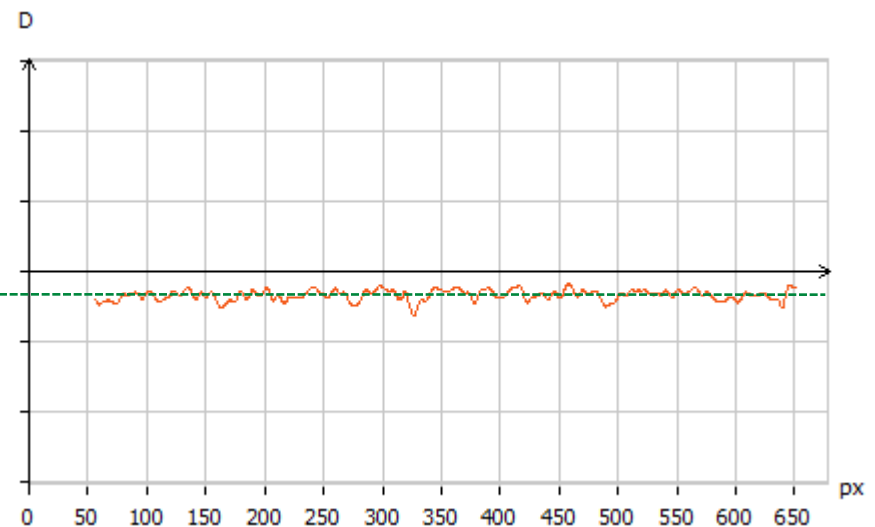
Carbon

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F. Stinzing, G. Häusler

Mean curvature along diagonal section K-L  
(Nomnal Value N.V. =  $\sim 0.0333D$ )



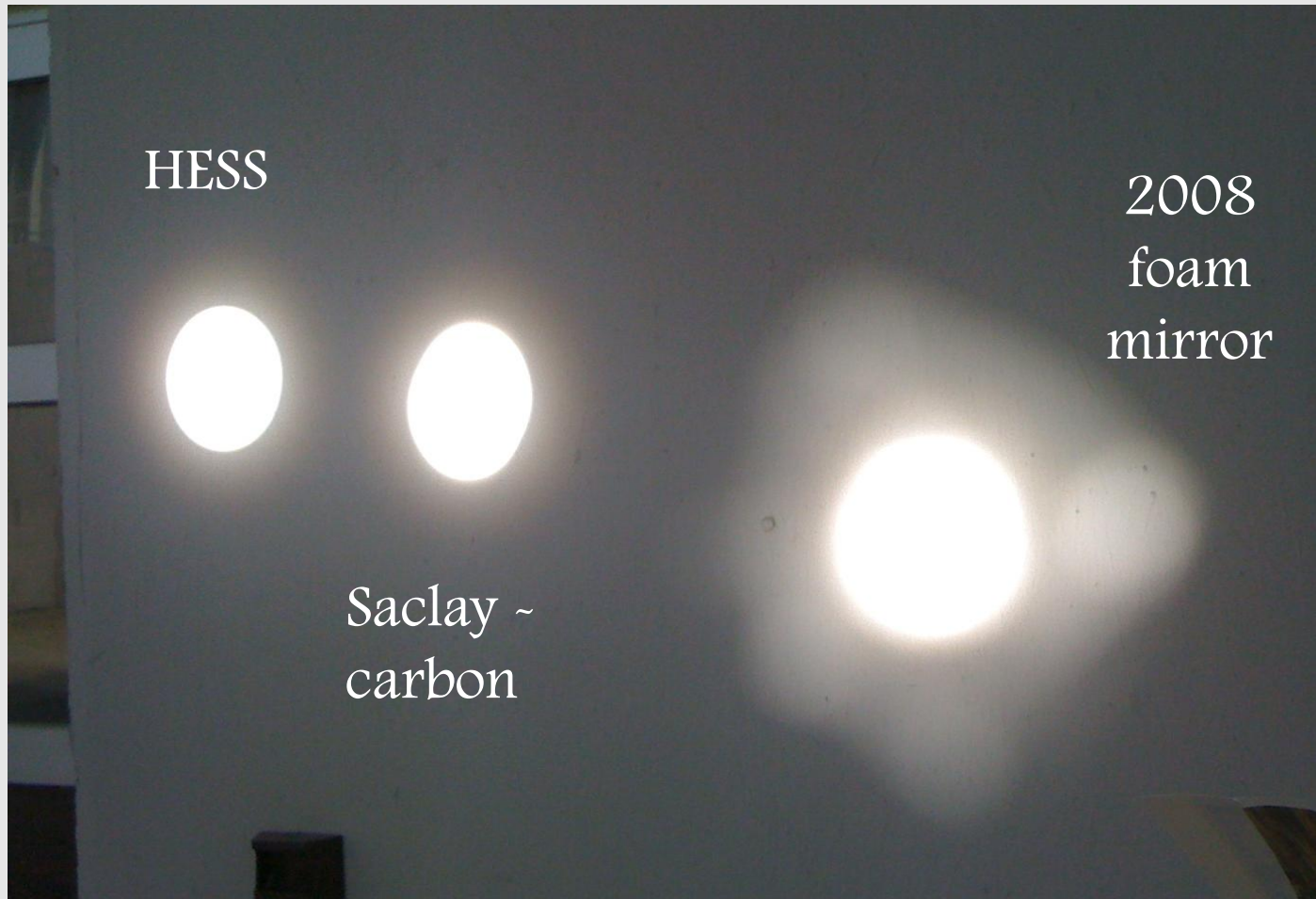
Aluminum



Carbon

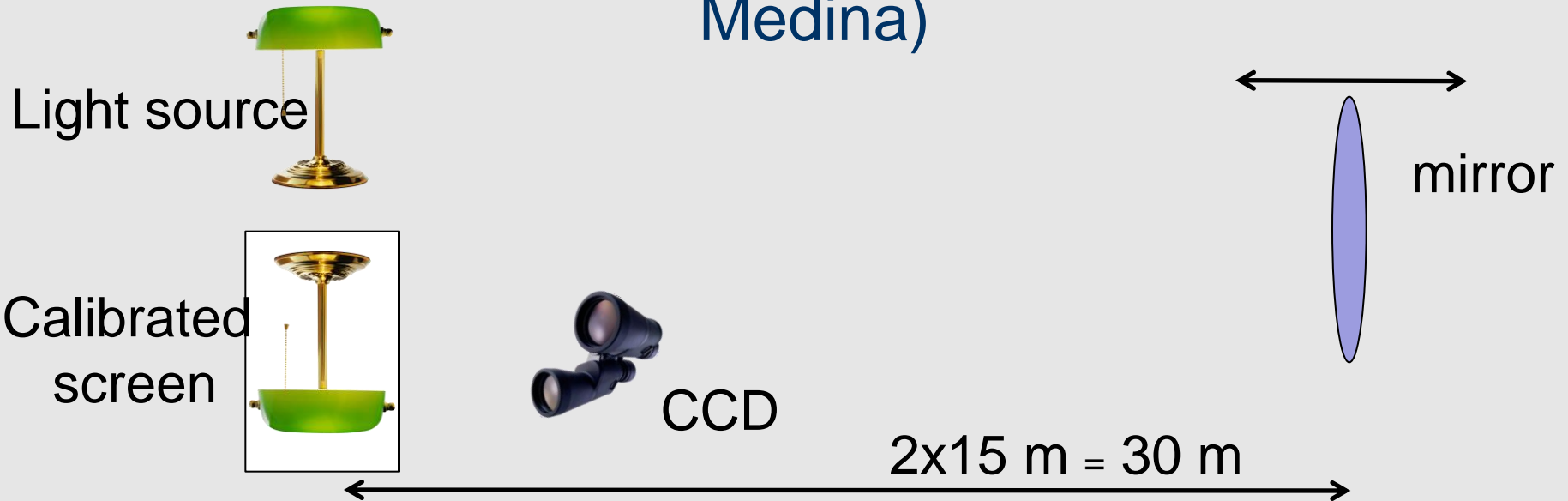
C. Faber, T. Gal, R. Krobot, A. Schulz,  
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# 1-F MEASUREMENTS



# 2-F TEST BENCH

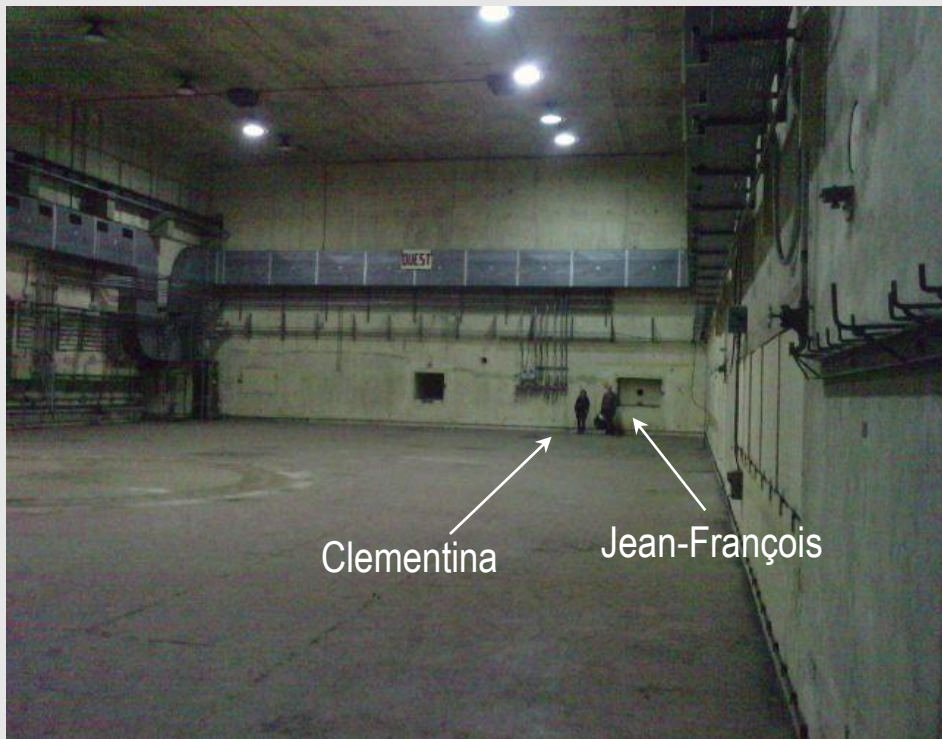
We are building a 2-f setup in Saclay (Clementina Medina)



Simultaneous measurement of PSF & total reflectivity

CCD & calibrated screen ordered

Results to be shown in Oxford



Clementina

Jean-François

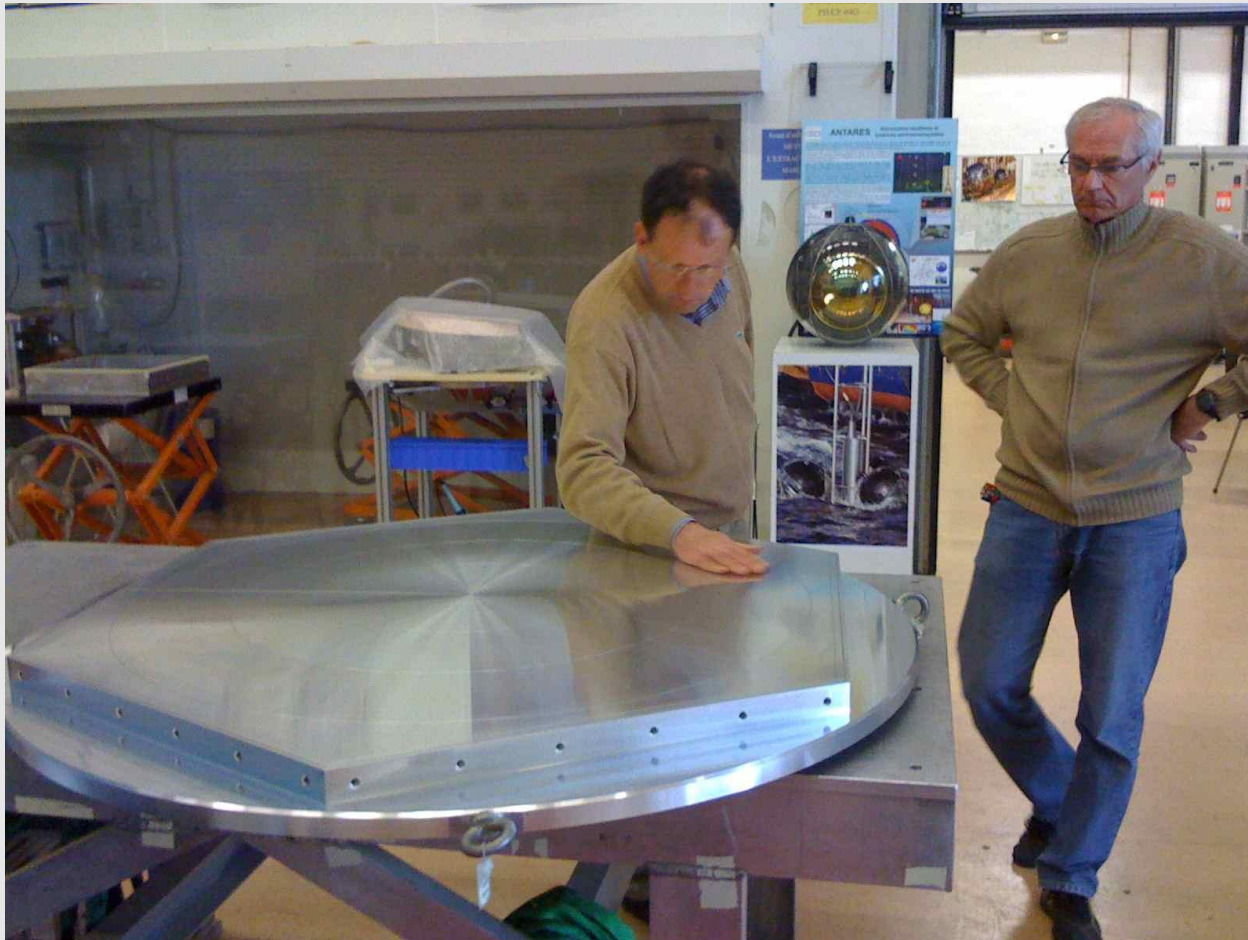


40 x 40 m hall in the Saclay  
basement  
(former linac experimental  
hall)



# OUTLOOK: LARGE MIRRORS

Our new mold: Portion of a 32m sphere





# OUTLOOK: LARGE MIRRORS



3 1.2m mirrors  
produced  
Will be tested before  
Oxford meeting

# MIRROR PROD : SUMMARY

- Nice way to produce cheaper mirrors
- Extrapolation and transfer to industry considered from the beginning
- Everything seems OK, but still not fully demonstrated!
  - Need deeper looks into temperature/humidity cycles
  - Quantitative results on large mirror PSF/reflectivity will be crucial
- Large mirrors, if carbon or glass fiber:
  - 15 to 20 kg together with a 3 point fixation on the back
  - ~1500-1700€/m<sup>2</sup>
- Easy extrapolation to larger curvatures (shorter focal length)
- Possible adaptation to non-spherical shapes/ non-circular facets