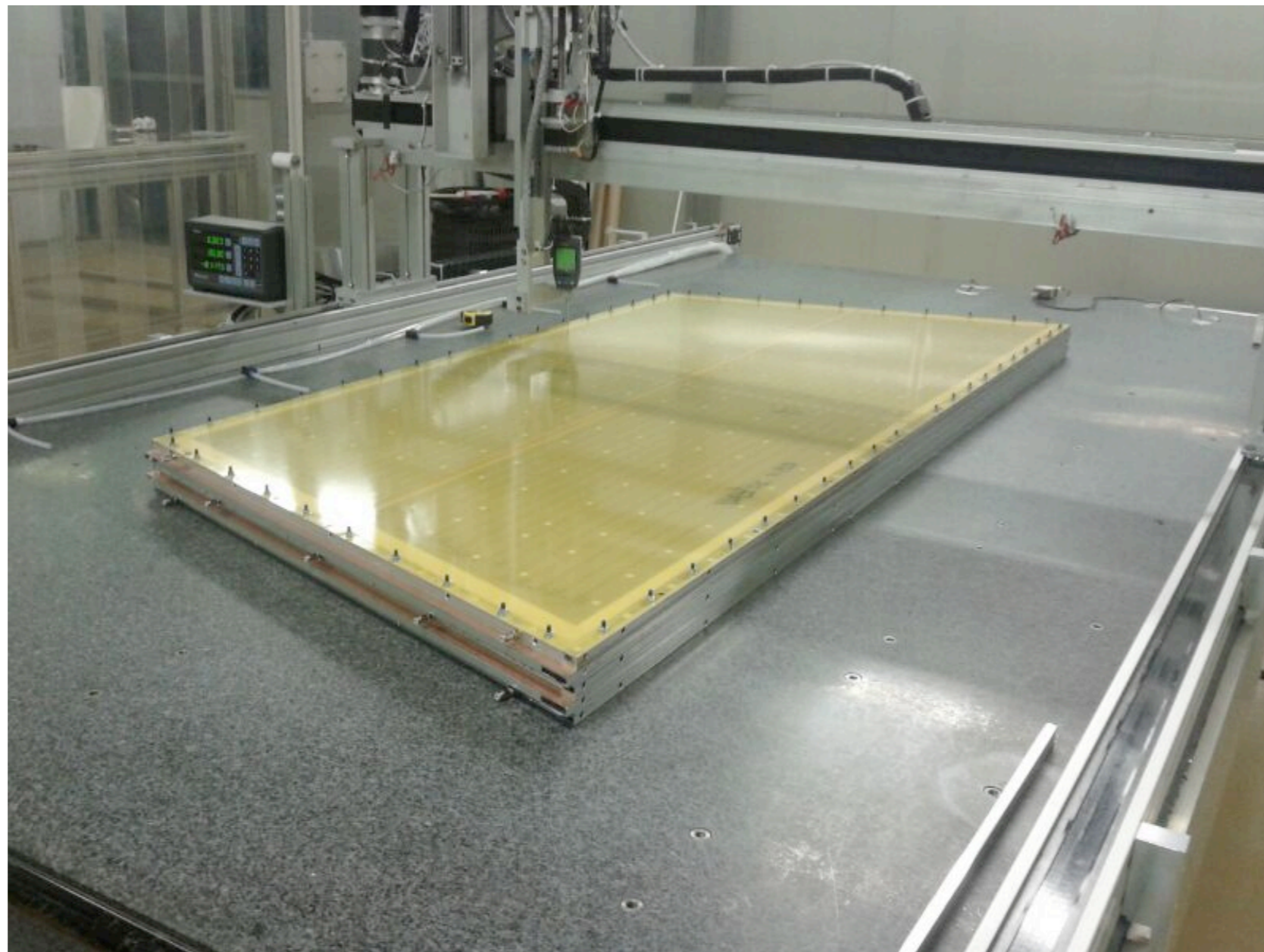


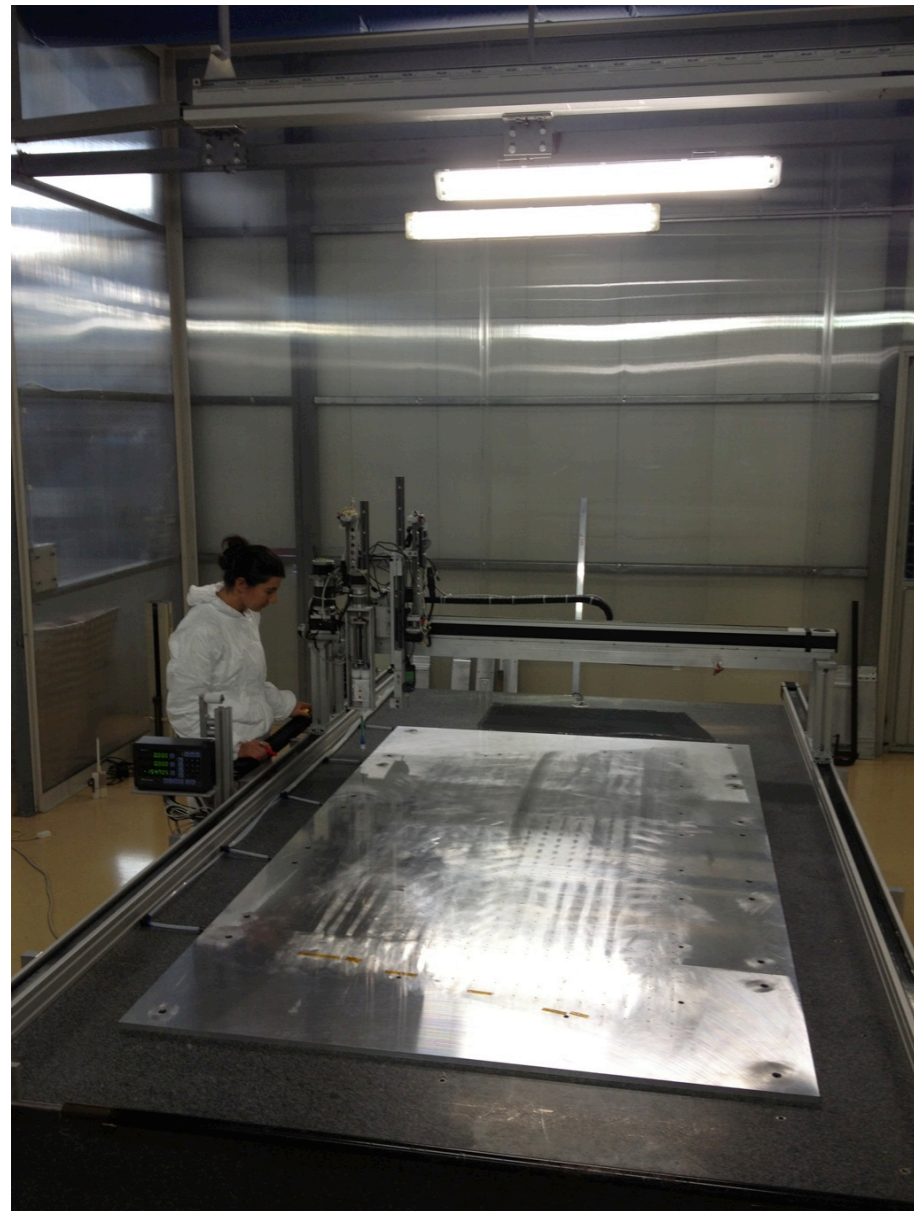
# Update on Pavia MM mechanical prototype

G. Gaudio  
for the ATLAS Pavia Group

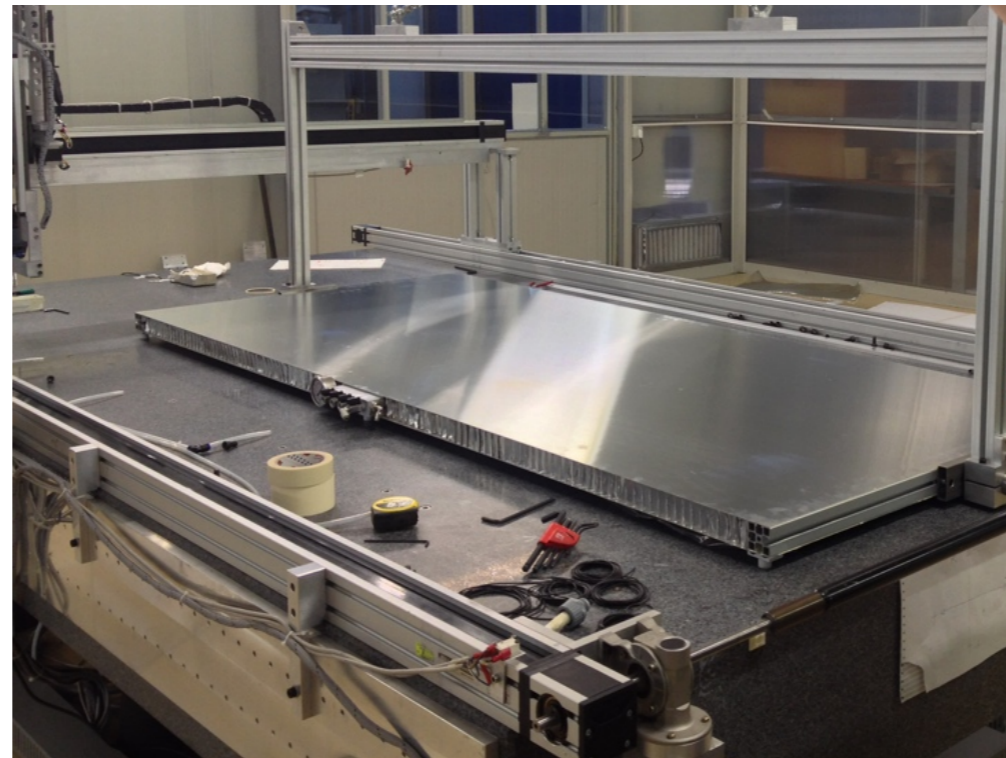


# MM Mechanical prototype construction tools

Construction system is based on reference platforms with sucking capability positioned on a granite table

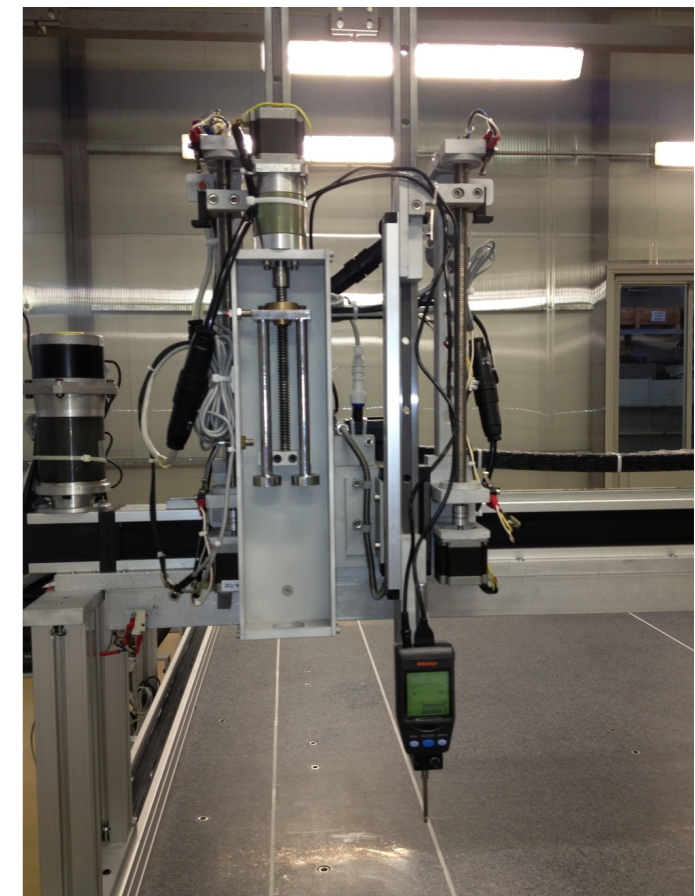


Stiffback equipped with reference platforms with sucking capability. stiffback can rotate both in the plane and around the longer axis

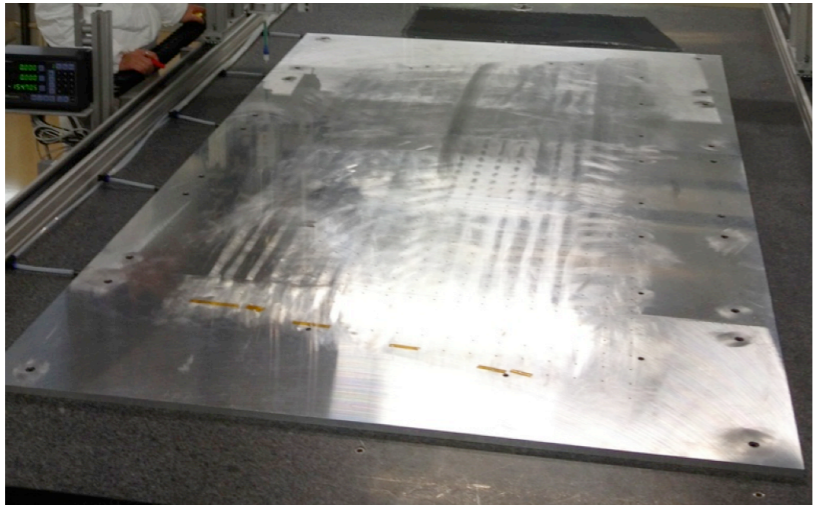


Digital gauge for planarity measurement of pcb, panels

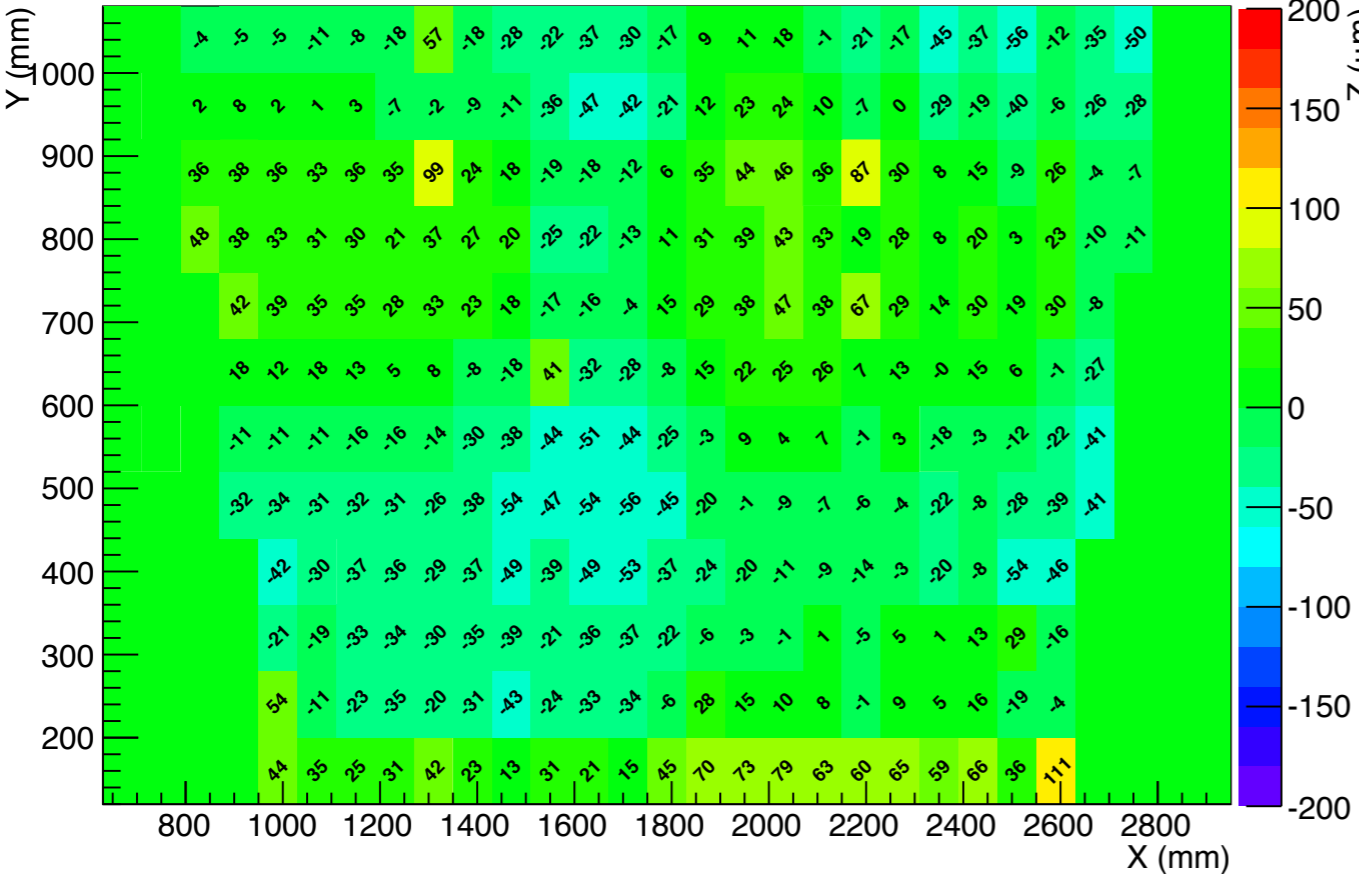
Glue dispensenser for automatic glue distribution in strip. Step motors allow for x,y,z movement plus glue deposition



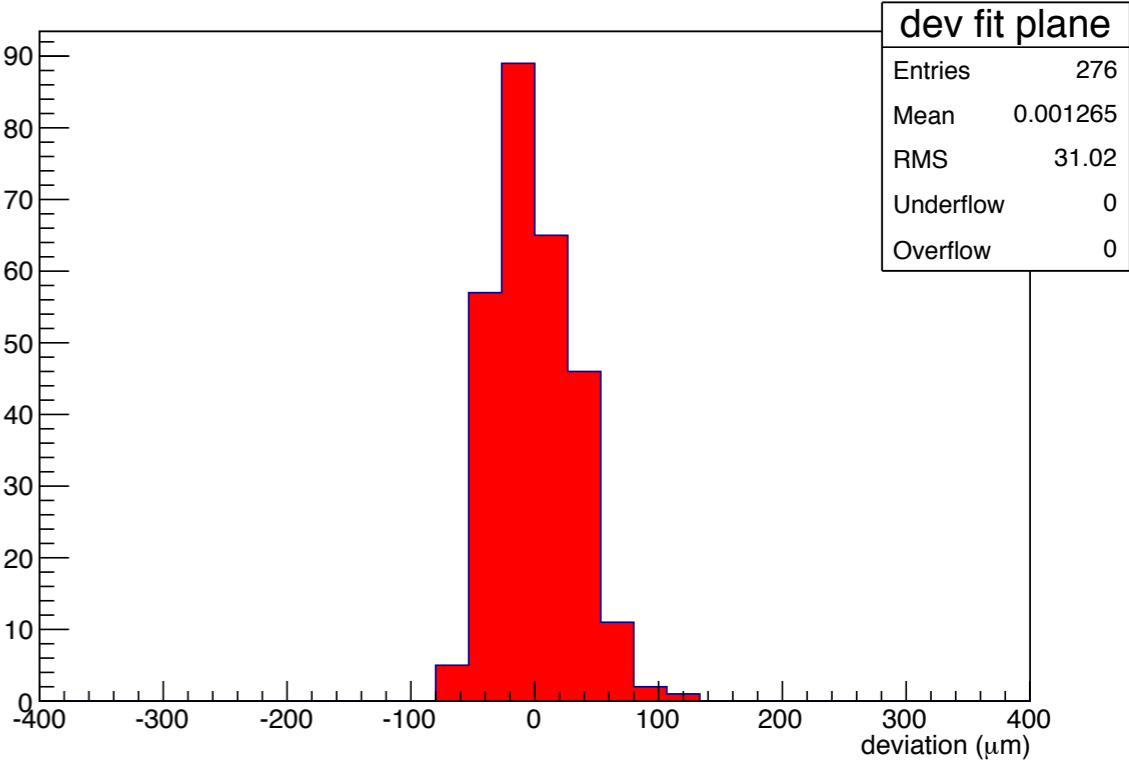
# Plates measurements



diff fit plane

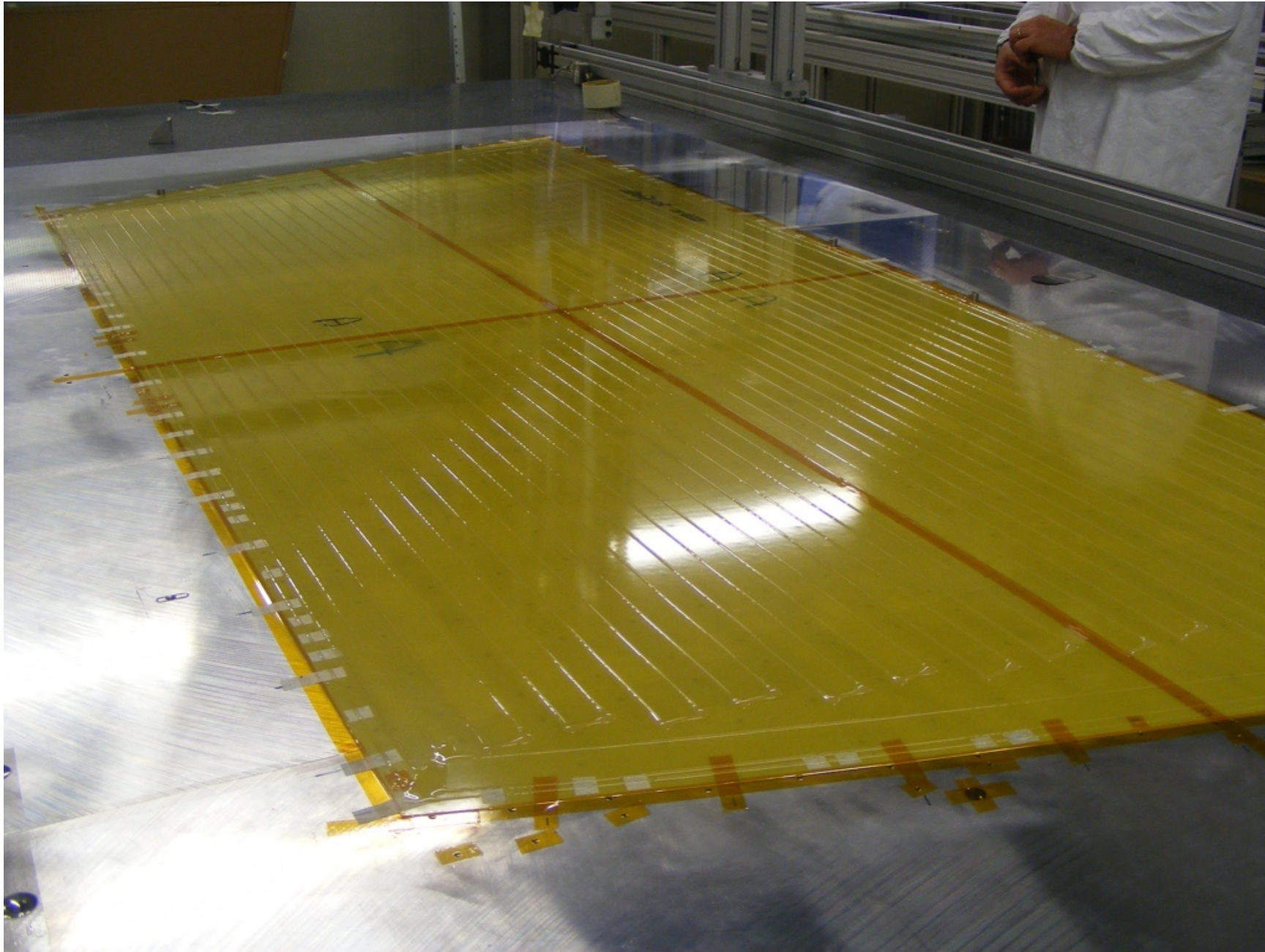


dev fit plane



$\text{coeff\_a (zx)} = -11 \mu\text{rad}$   
 $\text{coeff\_b (zy)} = -4 \mu\text{rad}$   
 $\text{d zx} = -0.025\text{mm}$   
 $\text{d zy} = -0.004 \text{ mm}$   
 $\text{RMS} = 31 \mu\text{m}$

# Panel construction (I)



- 4 PCBs positioned and sucked on the reference platforms
- kapton tape on the pcb junction
- Holes (for reference pin and module assembly) protected with tape then removed after glue deposition
- glue distributed on the PCB surface

small sample glued with this technique measured in Saclay for Young's module (see Patrick's talk)

- samples break under small deformation
- glueing technique to be changed

# Panel construction (II)

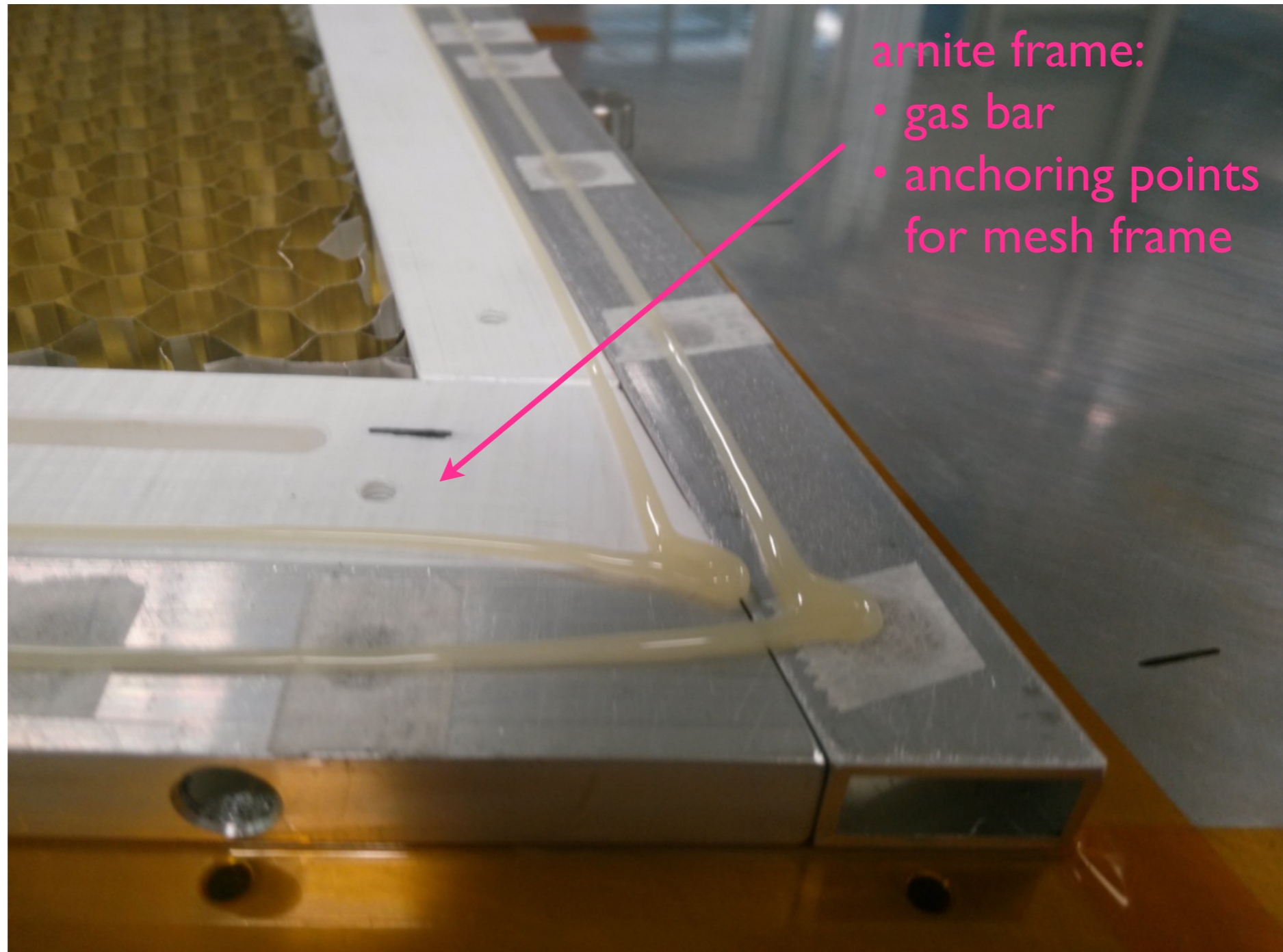


- we position on the pcb
- the aluminium frames
  - the inner aluminium bars
  - the gas distribution system frame (arnite)
  - the aluminium honeycomb foils
    - 10 mm thick
    - 9 mm cell diameter

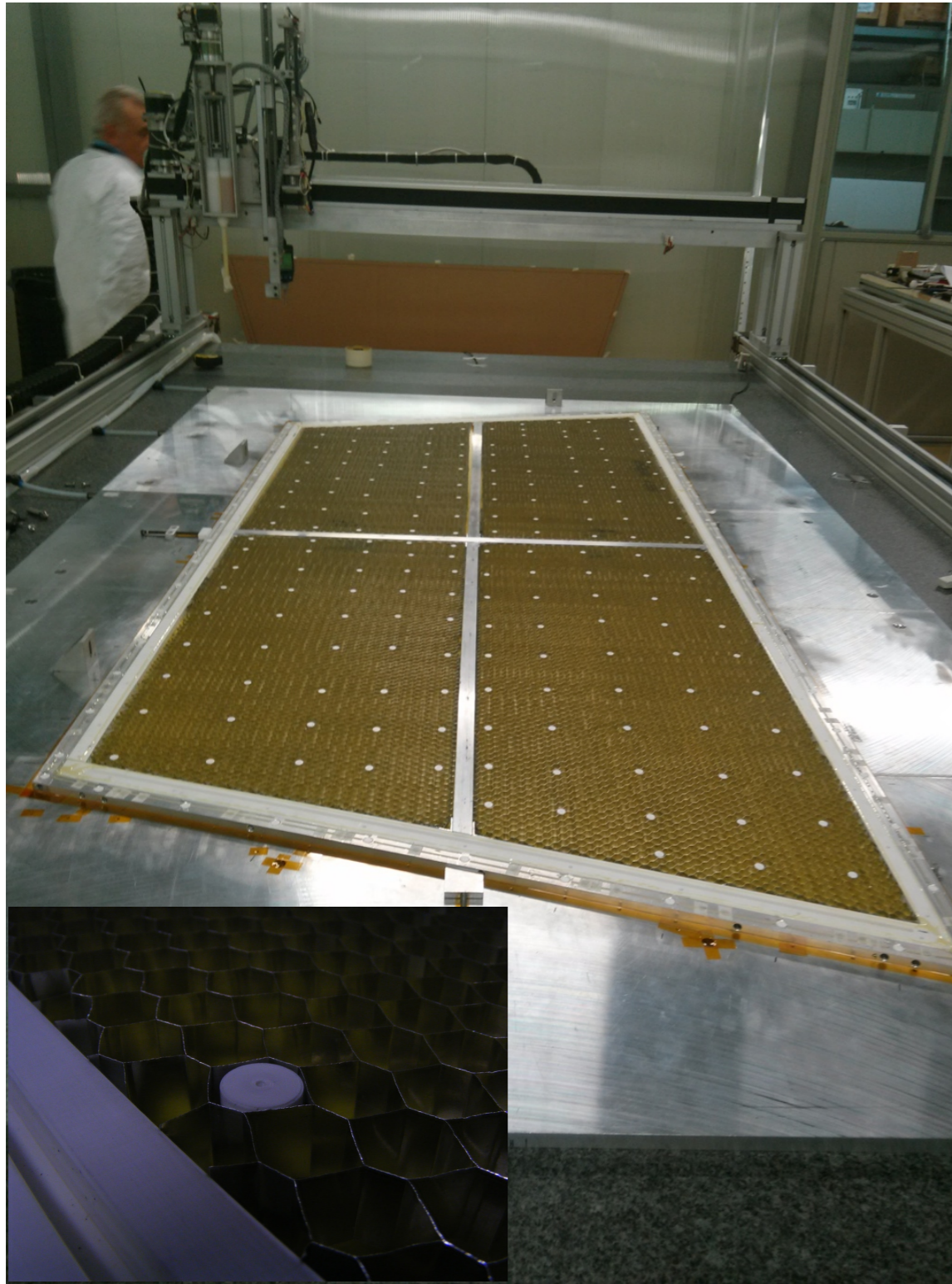
# Panel construction (III)

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Glue is then distributed on the frames



# Panel construction (IV)

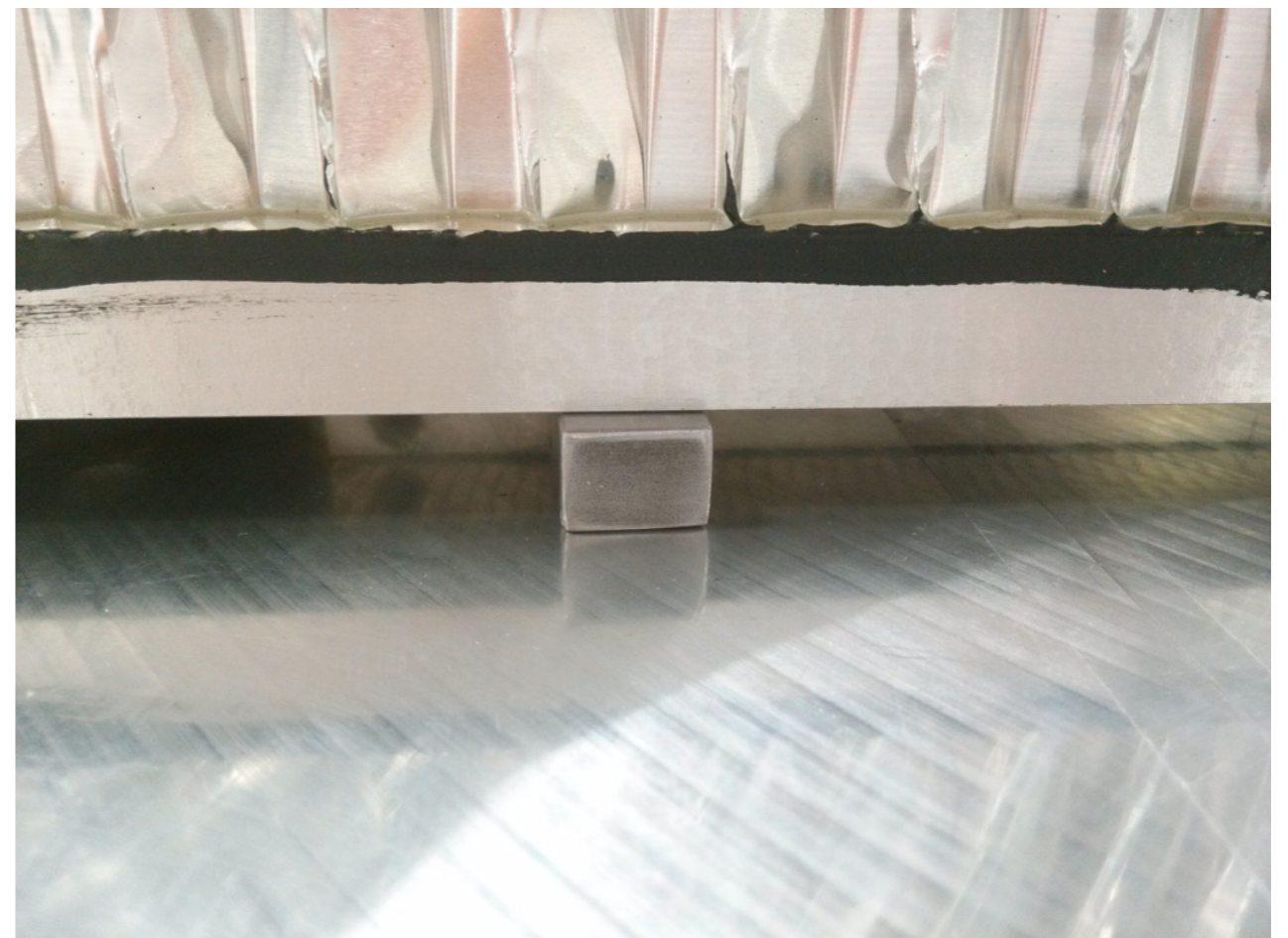


We tested two different spacing techniques

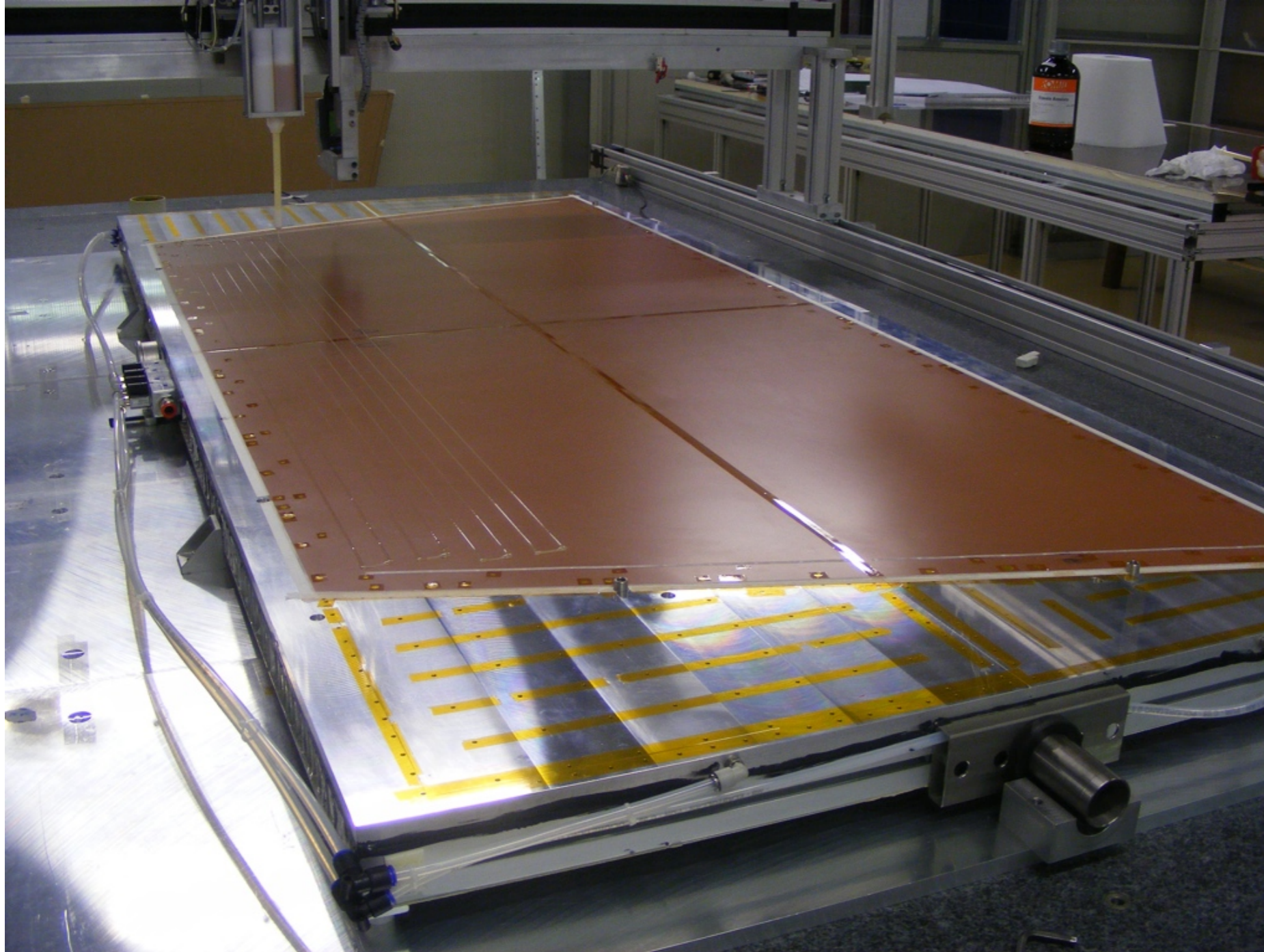
- Pillar in arnite positioned in the honeycomb holes and in the frame holes at about 10 cm from each other (not glued)
- External reference for the stiffback

no significant difference

we choosed the simplest one (external reference)



# Panel construction (V)



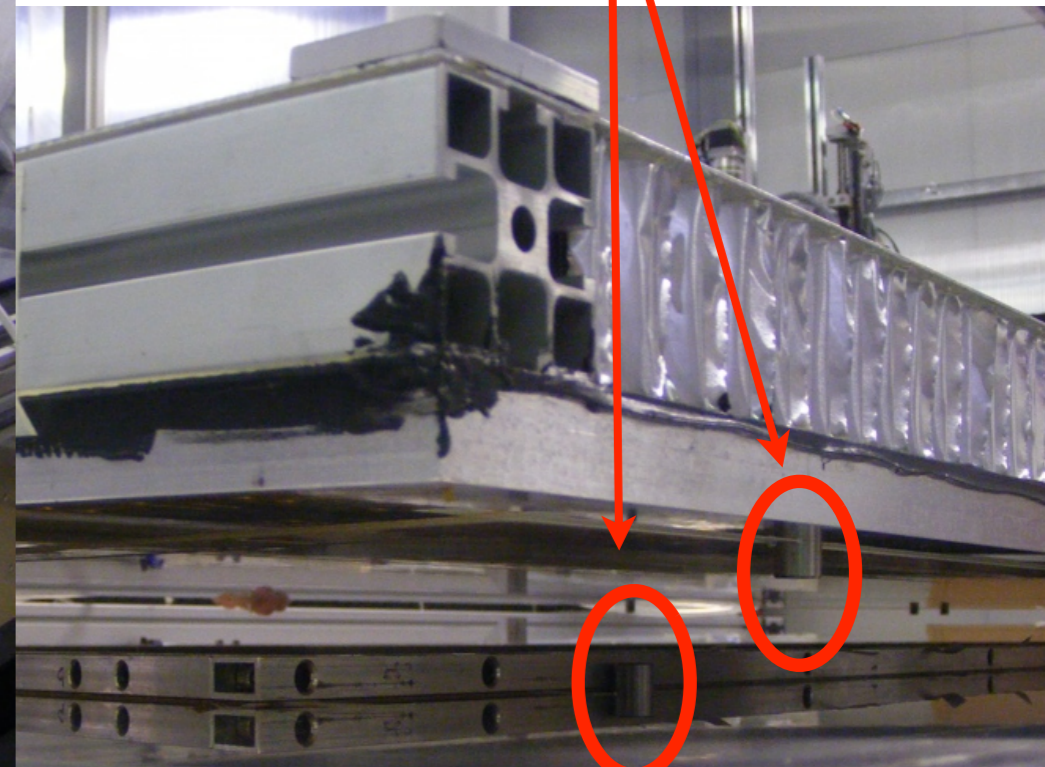
Glue deposition on the upper pcb positioned on the stiffback

Lower part of the panel still sucked on the table

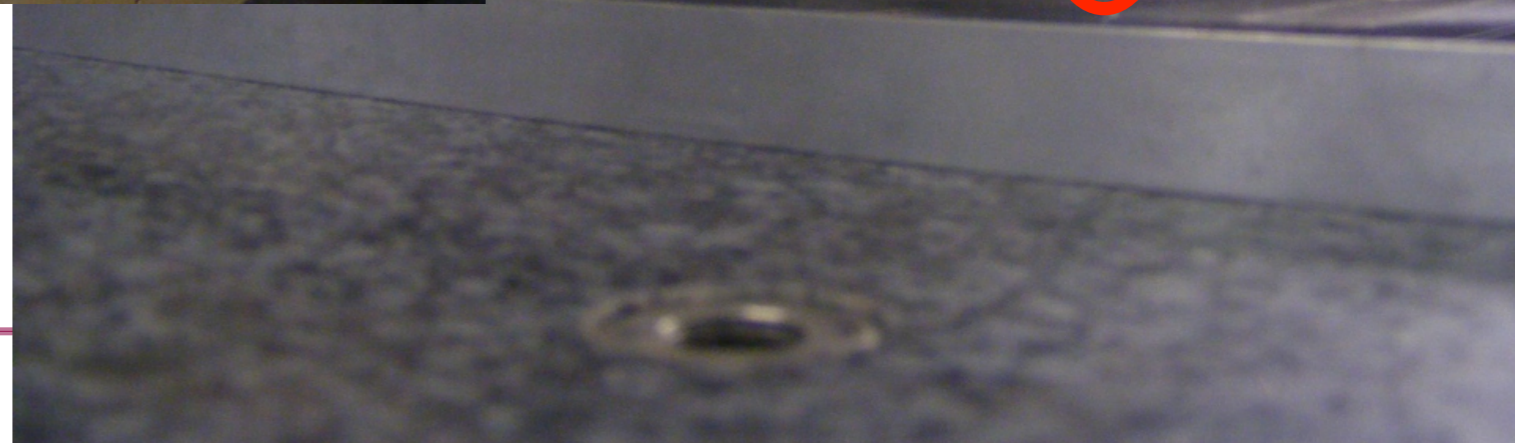


# Panel construction (VI)

reference pin for alignment in the horizontal plane



Once the stiffback is positioned, leave it in position for glue curing



# Panel construction (VII)

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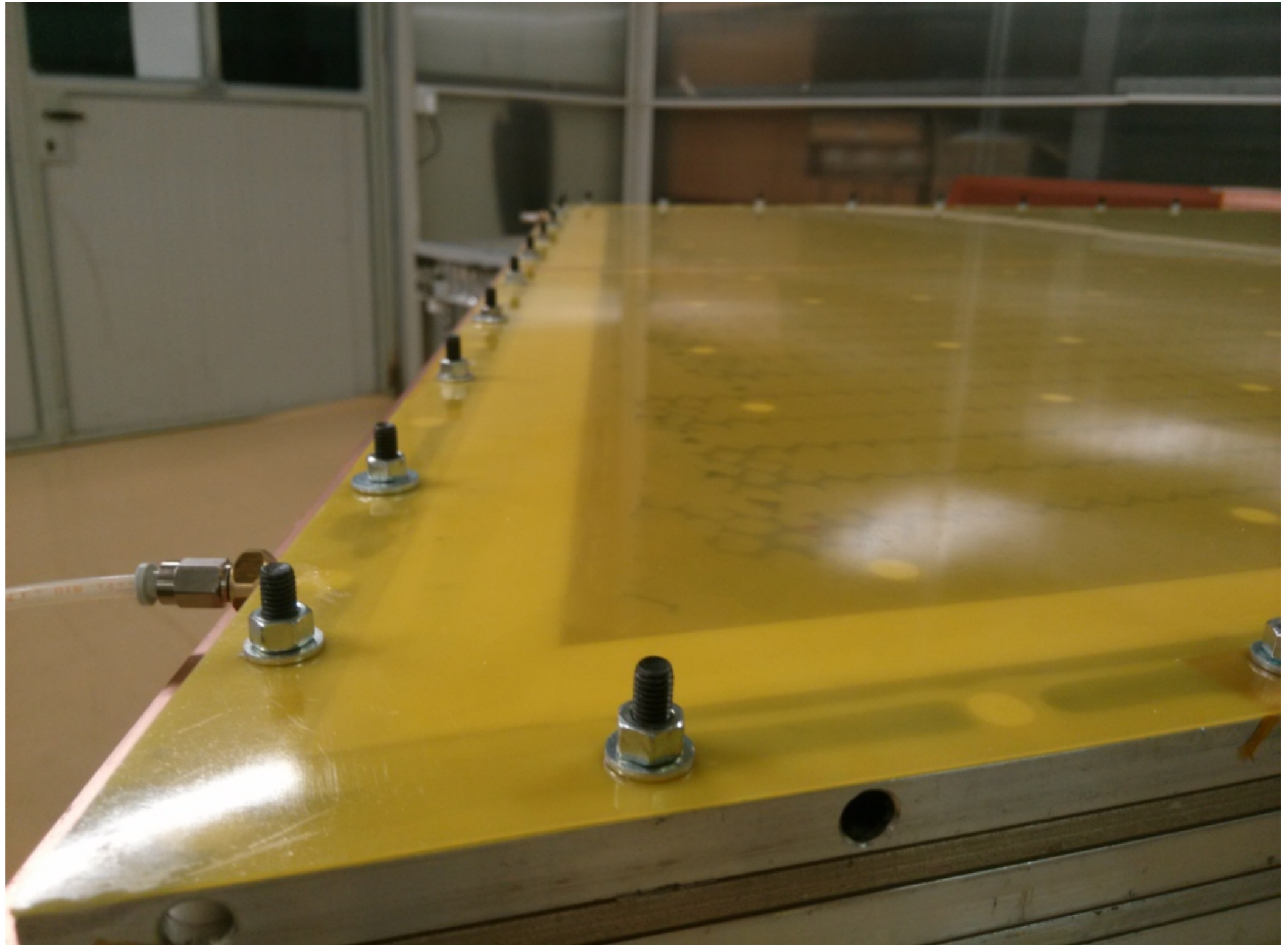
# Module assembly



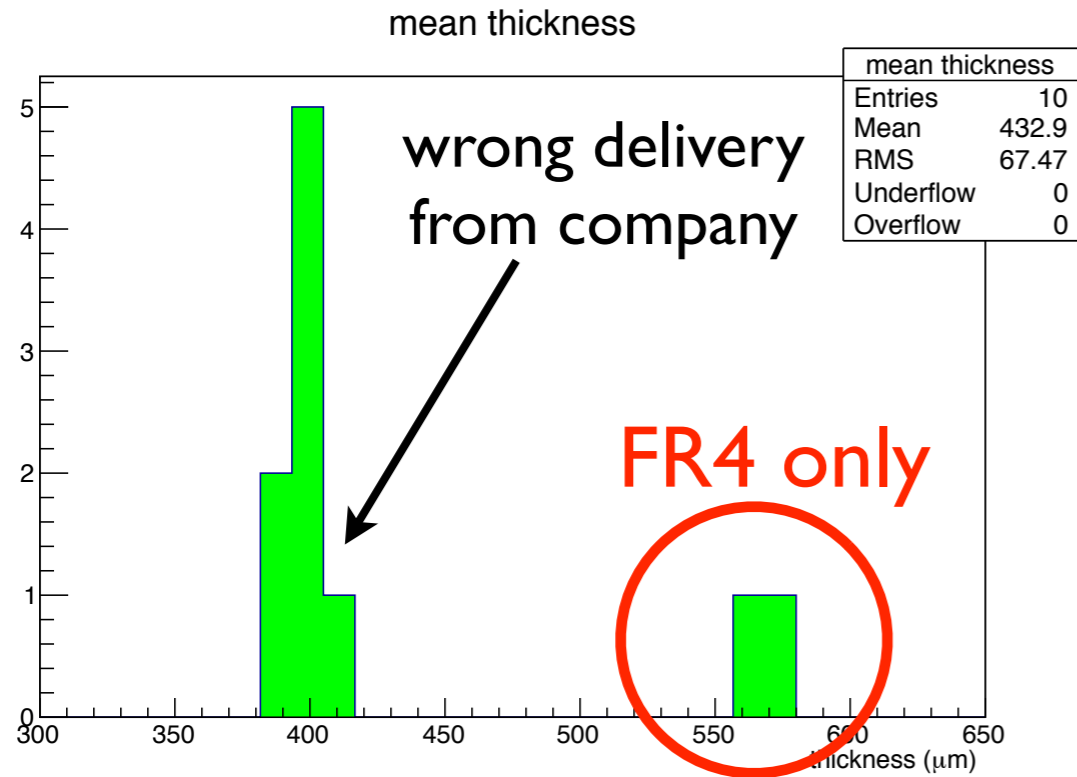
# Module assembly

panels are  
screwed to allow  
for re-opening  
and further test

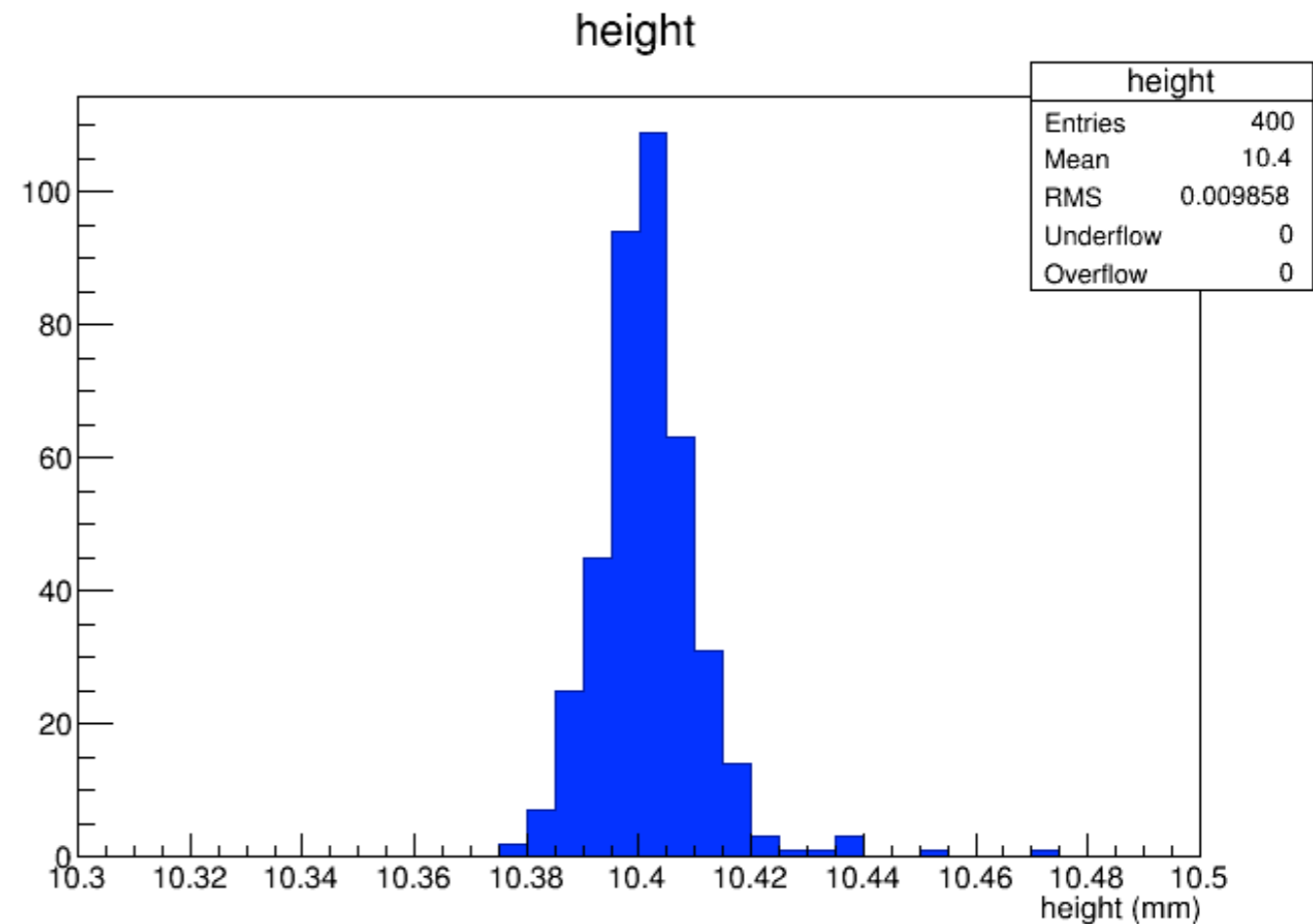
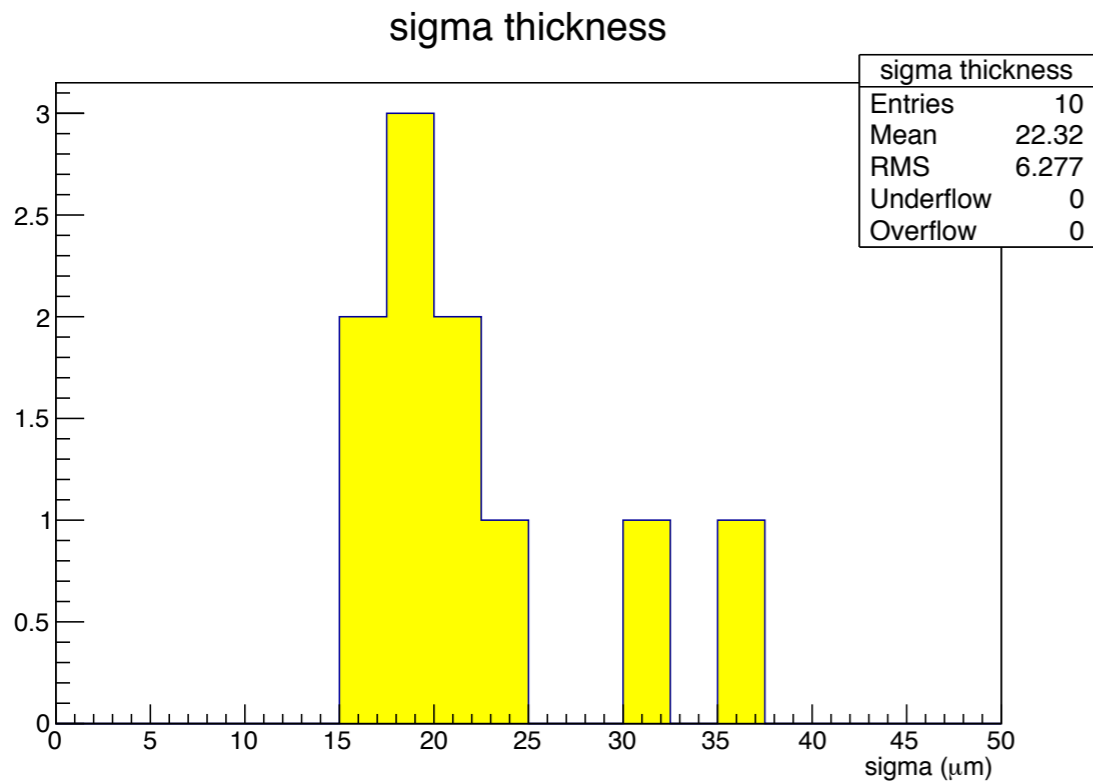
on the opposite  
side screws are  
within the  
aluminium frame  
to allow to  
position on the  
spacer



# PCB and arnite pillars



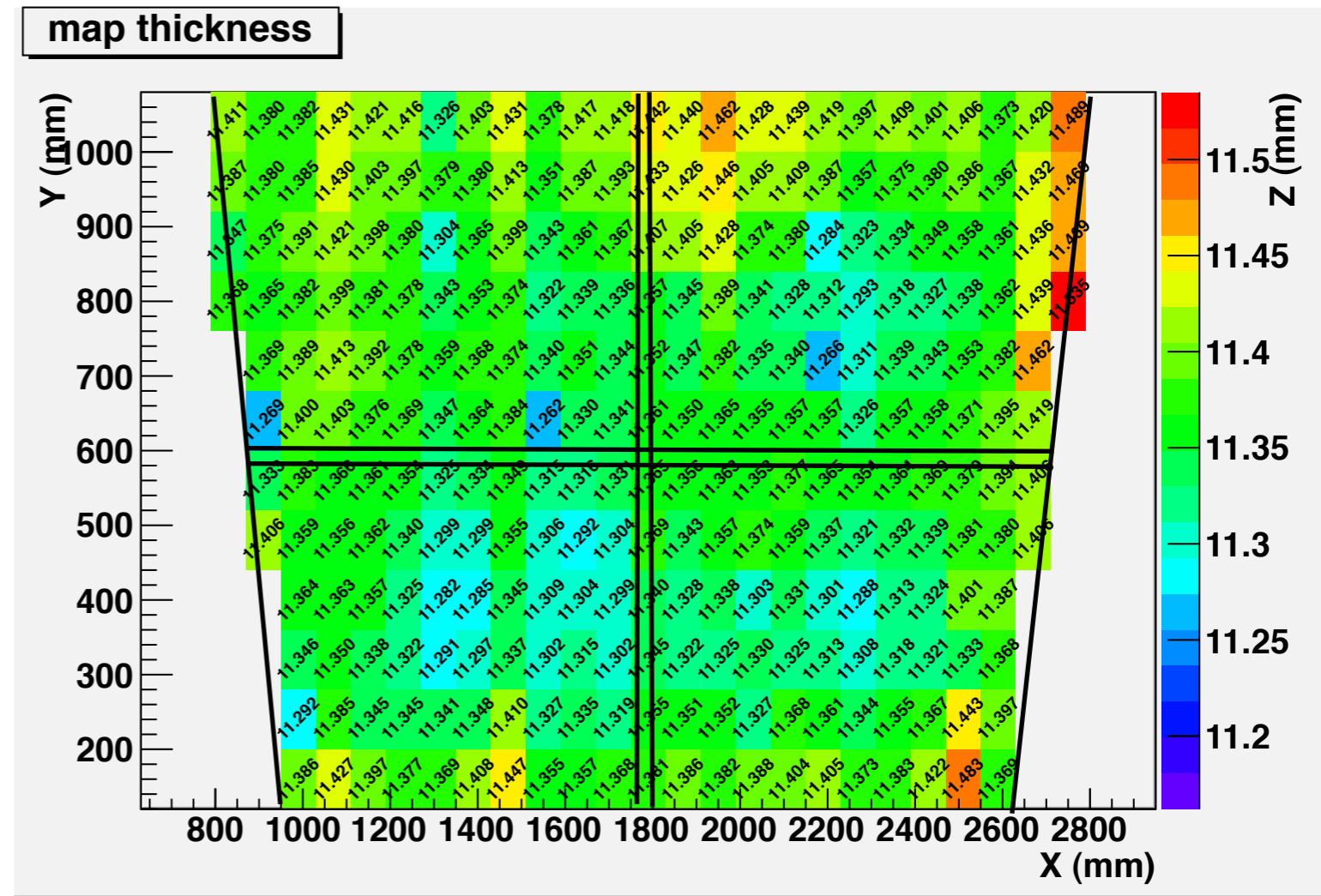
- ◆ Requirement to the company:  $10.40 \pm 0.01$  mm
- ◆ As RMS ok
- ◆ As tolerance, good range 10.390-10.410 mm
- ◆ Good 342/400 = 85.5%
- ◆ we have selected pillars from the bulk of the distribution



# Panel measurements

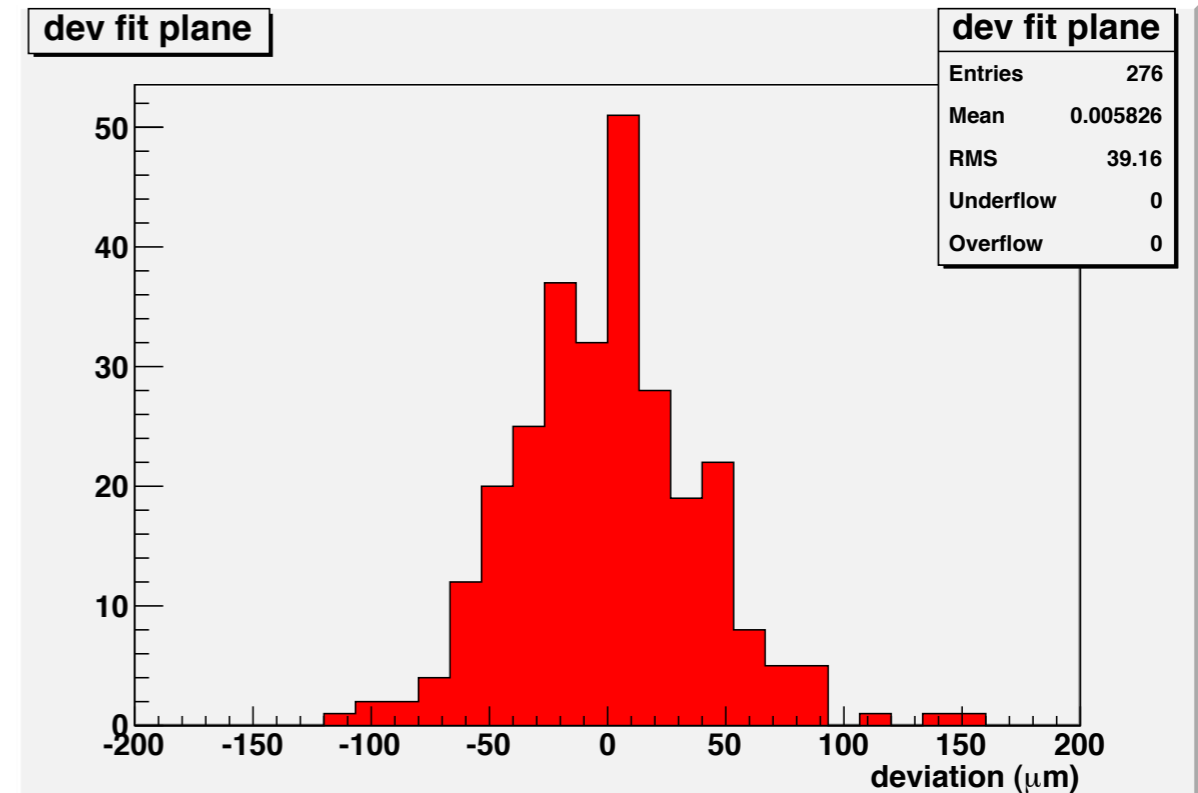
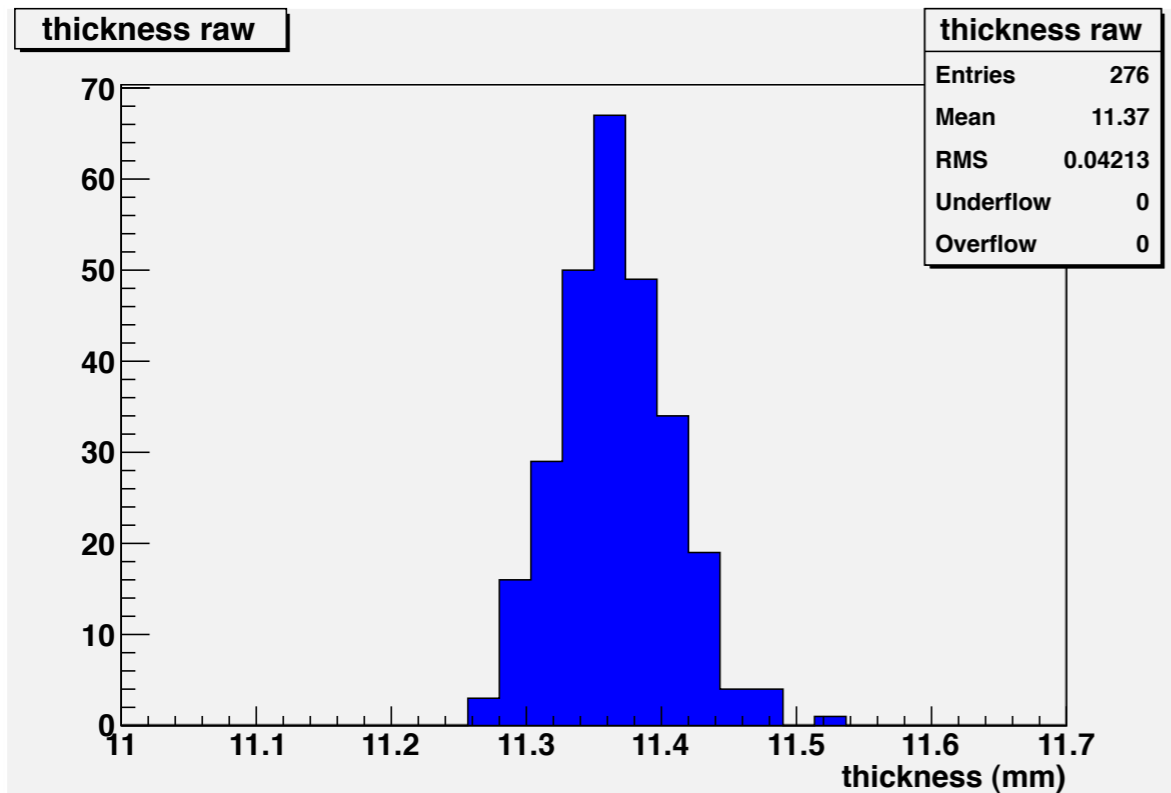
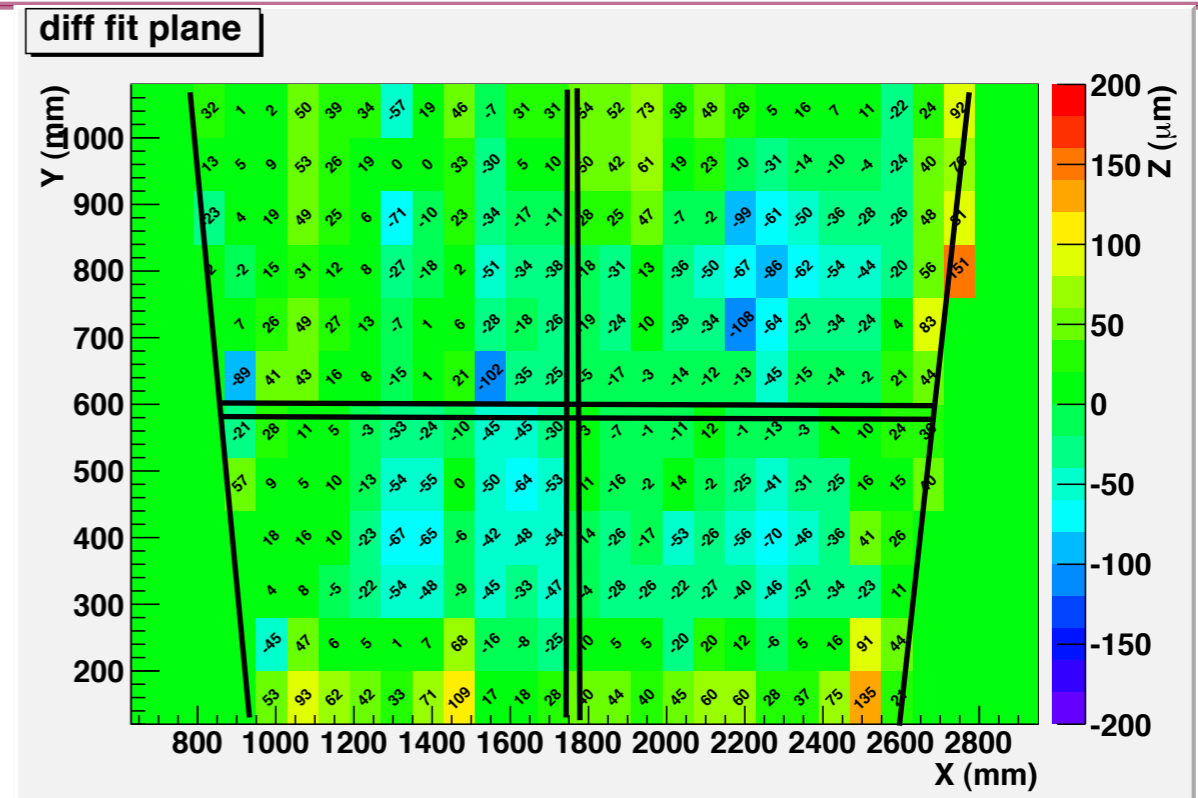
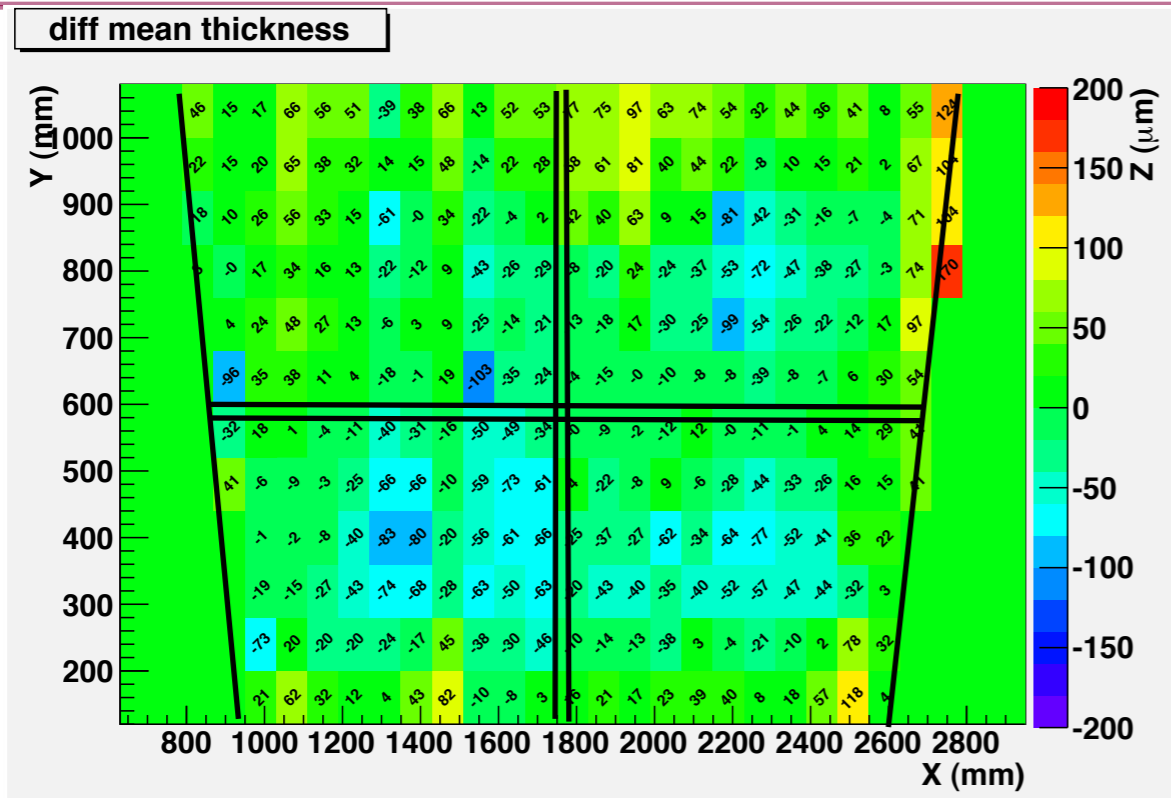
- ◆ Scan of the panels in steps of 80 mm in X and 80 mm in Y (roughly following the trapezoidal shape)
- ◆ 276 points (about 1h)

Measurement of the panels both with vacuum sucked on and off and on both side of the panel ( 4 measurement each panel)



panel thickness: difference between measurement on the panel and measurement on the reference plates

# Panel measurements



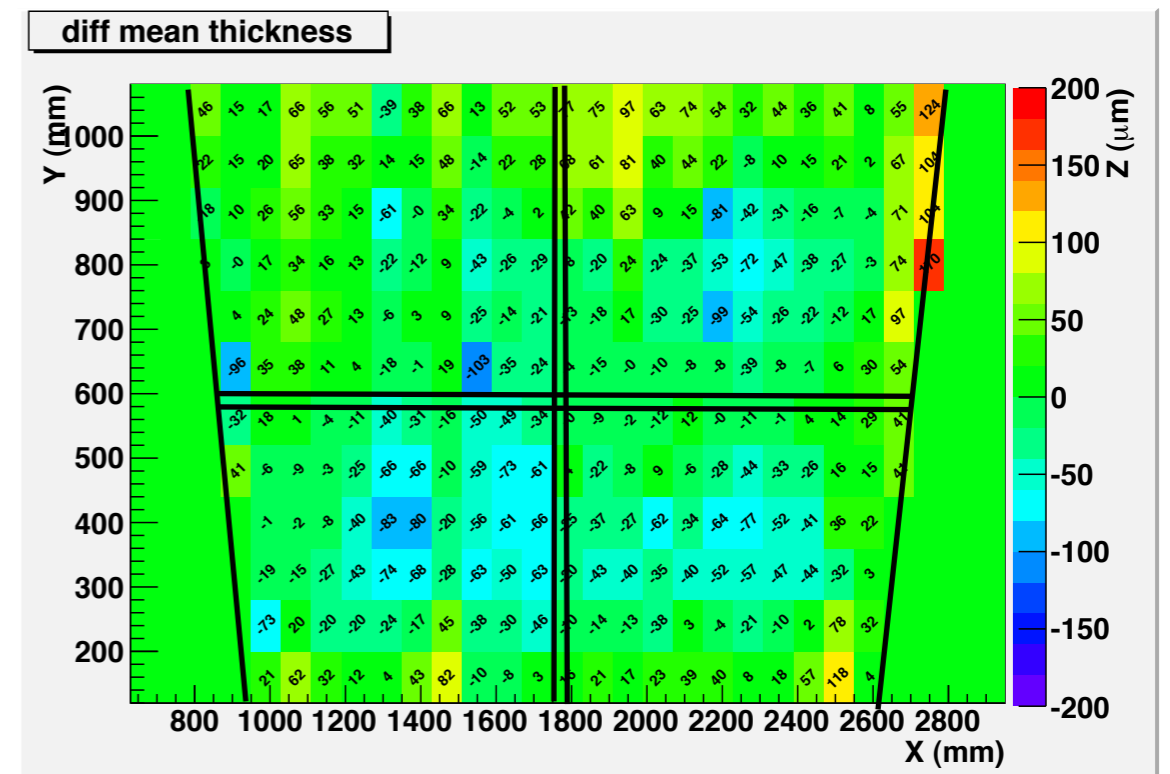
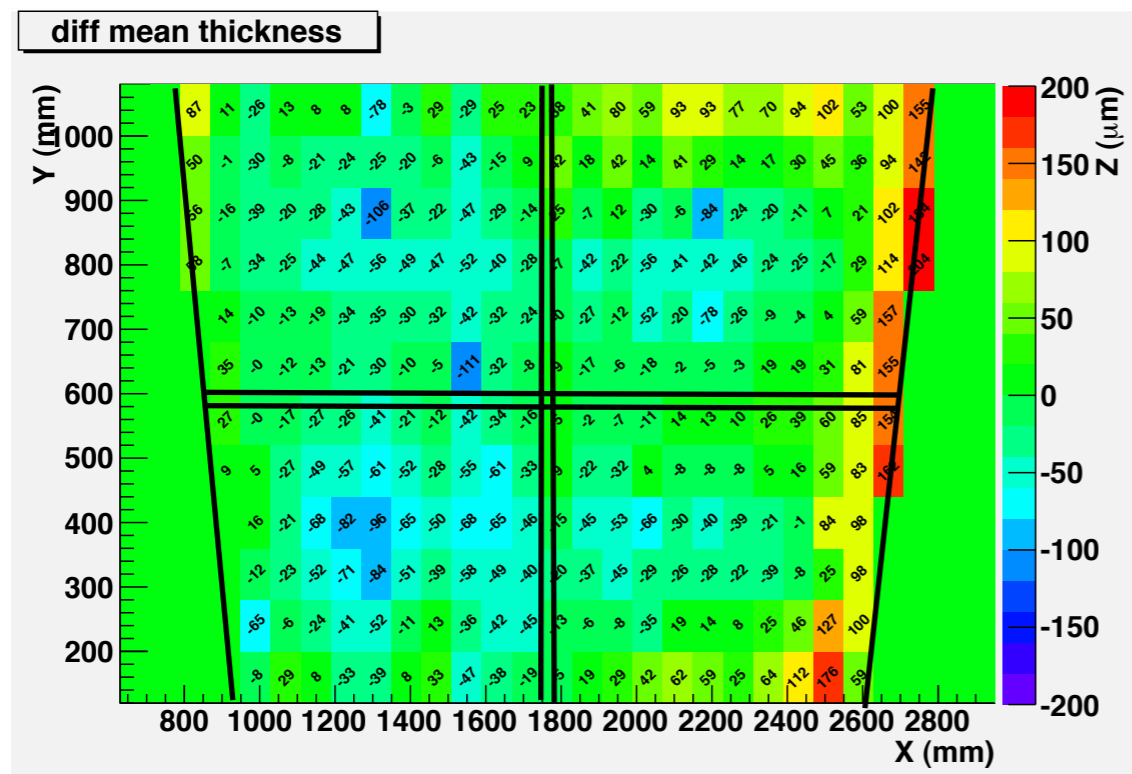
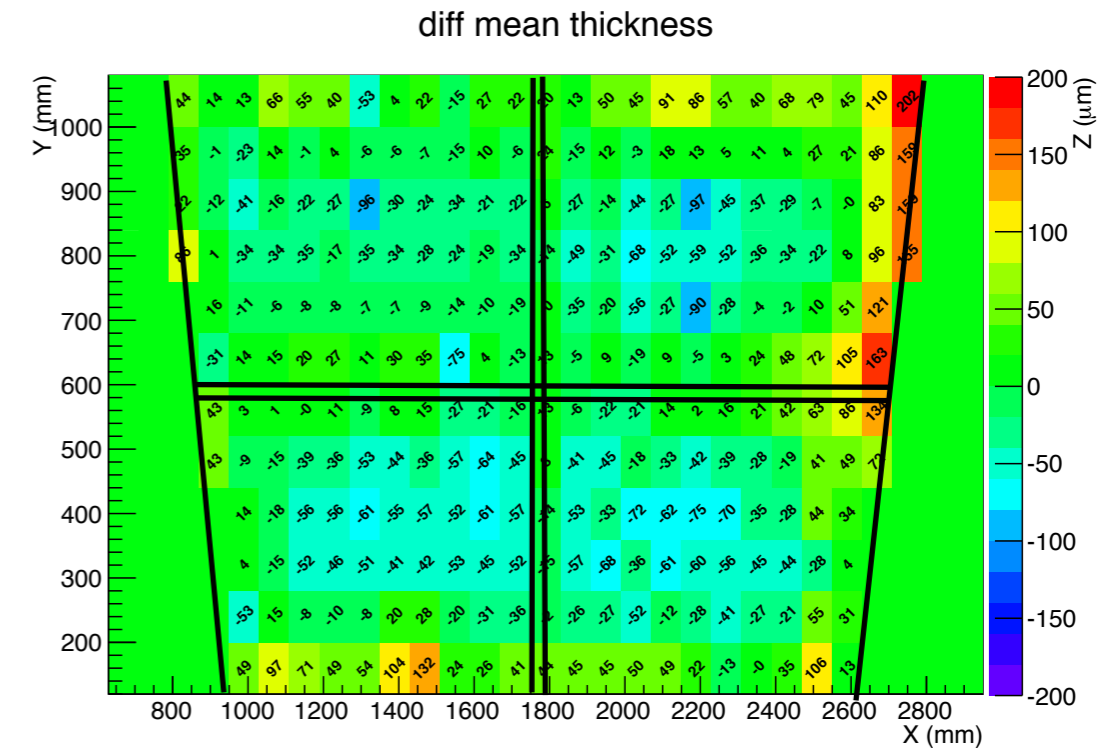
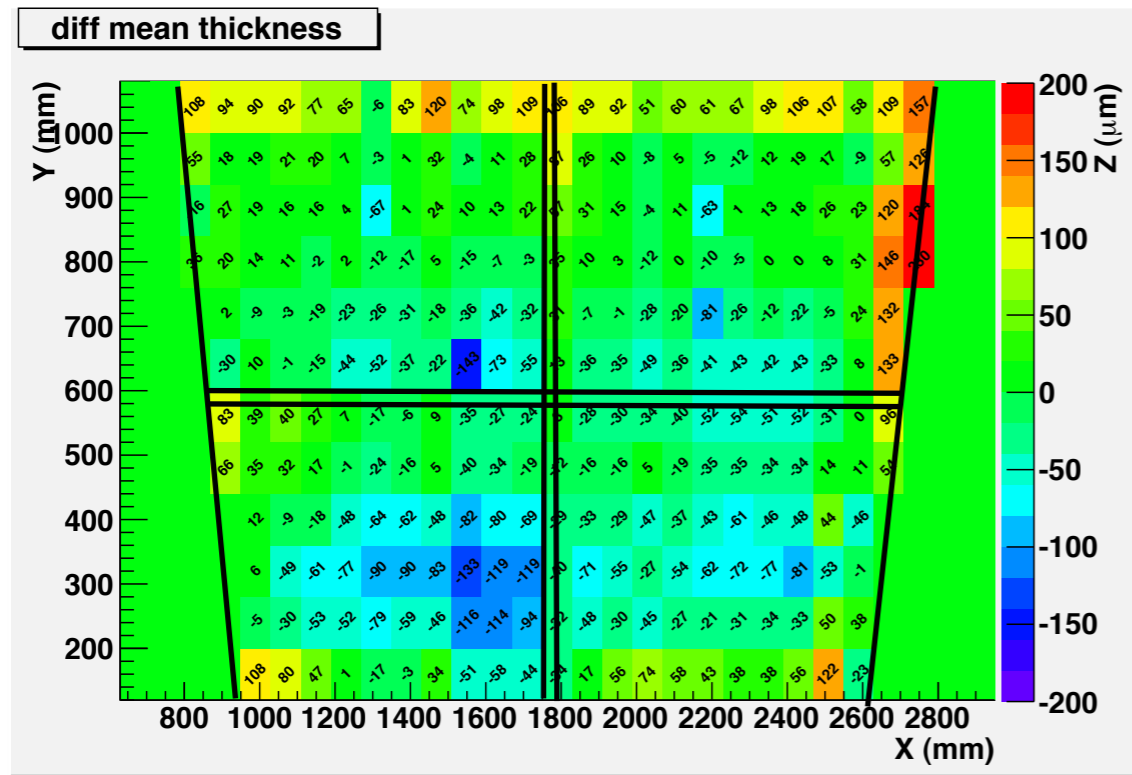
# Panel measurements

panel	thickness (mm)	rms raw ( $\mu\text{m}$ )	rms fit ( $\mu\text{m}$ )	$\alpha_{zx}$ ( $\mu\text{rad}$ )	$\beta_{zy}$ ( $\mu\text{rad}$ )	PILLAR
* pcb1up-free	11.427	48	46	22	25	yes
pcb2up-free	11.431	45	44	-6.8	38	
pcb3up-free	11.365	42	39	9.5	53	no
pcb4up-free	11.323	48	46	2.2	44	
pcb5up-free	11.355	57	53	5.5	67	no
pcb6up-free	11.335	56	49	13	94	
pcb7up-free	11.232	39	38	4.6	-13	yes
pcb8up-free	11.211	36	35	8.2	-22	
* pcb9up-free	11.395	69	55	-72	62	no
pcb10up-free	11.383	53	44	52	28	

\* one side is FR4 only (thicker)



# Frame effect (?)

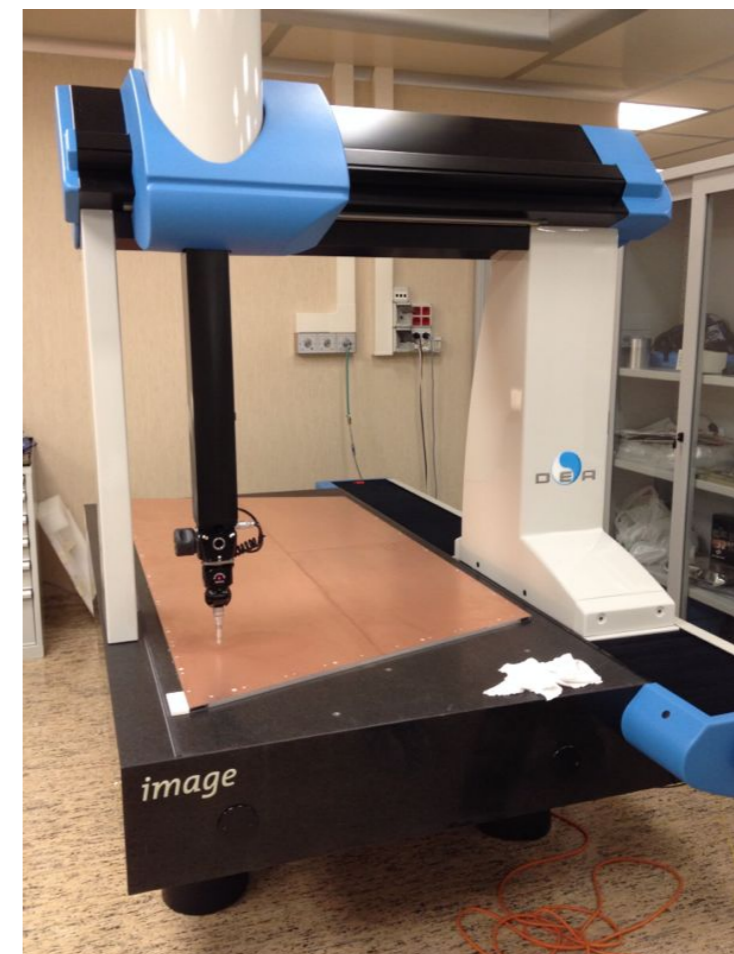
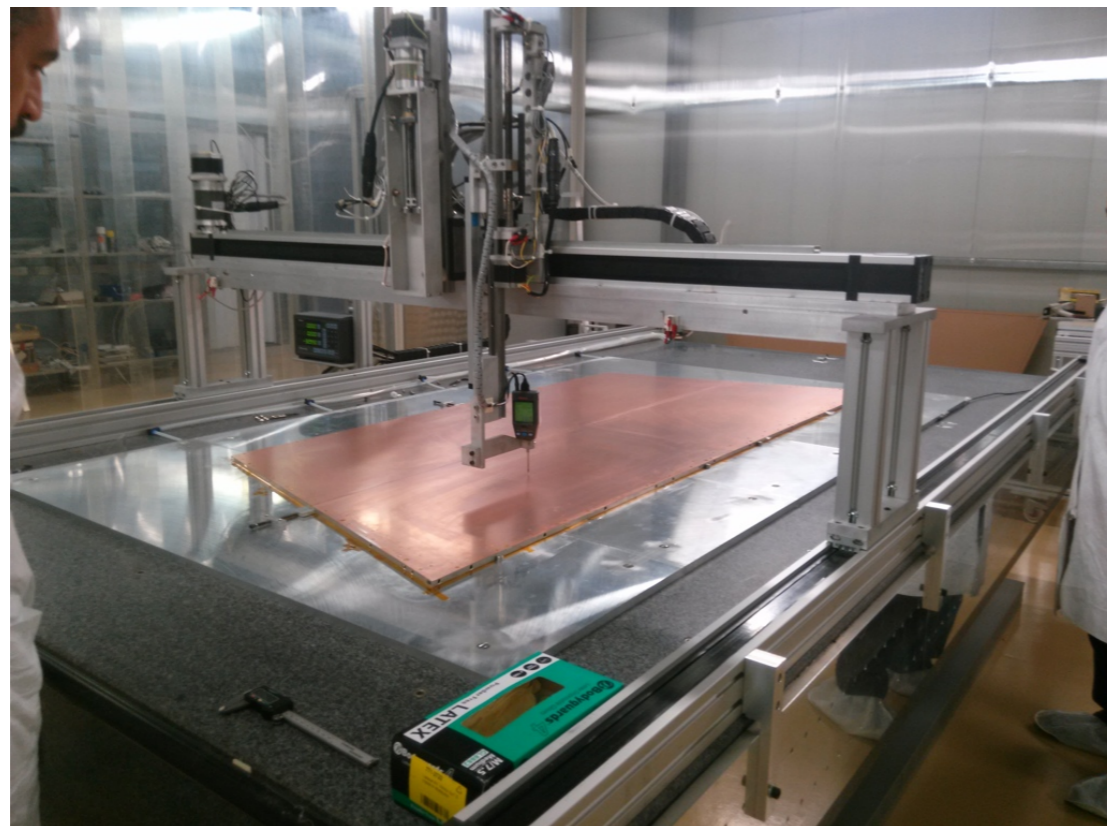


# Measurements comparison

two panels have been measured in different conditions to validate the measurement system

- measurements on reference platform
- measurements with panels on granite
- poli machine in INFN Pisa
- repeatability test

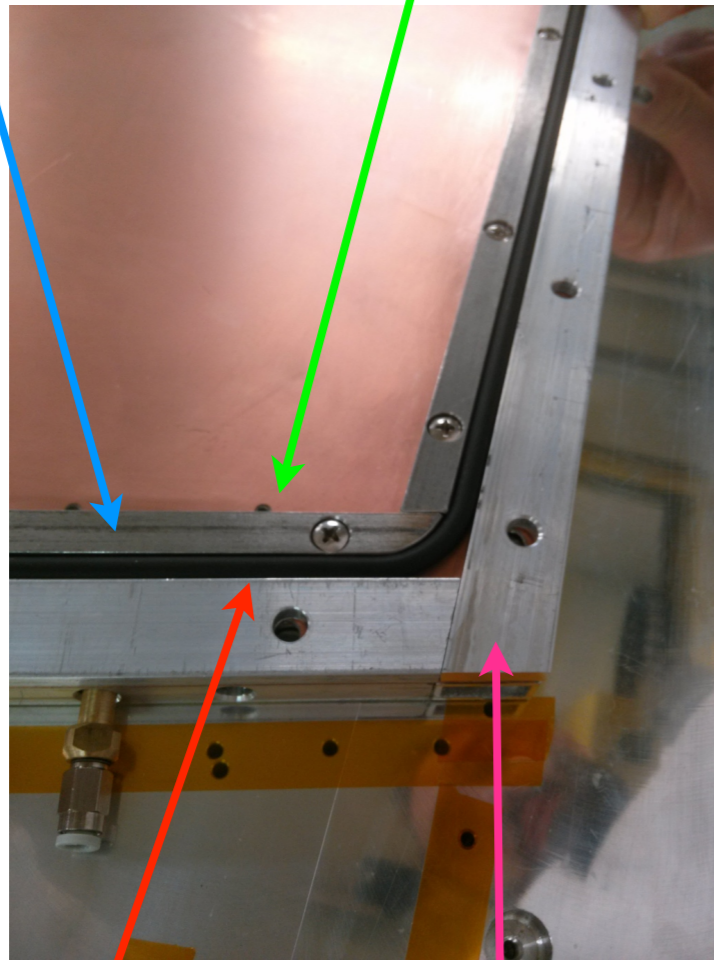
panel	plates meas.	granite meas.	pisa meas.
pcb1up-free	48	48	52
pcb2up-free	45	51	51
pcb3up-free	42	36	22
pcb4up-free	48	54	28



# Mechanical prototype

mesh frame

gas bar holes



o-ring

gas gap bar

holes for chamber support

gas system



## Short term plans

- ◆ gas deformation test
- ◆ vertical measurements
- ◆ mesh mounting (?)

# Conclusions

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- ◆ A complete mechanical prototype has been built
  - ◆ panel construction with reference plates + stiffback techniques
  - ◆ internal structure with mesh frame and gas system
- ◆ From this experience:
  - ◆ glue technique to be reviewed (possibly still automatic)
  - ◆ use of external reference for the stiffback is preferred
    - ◆ improve simple system used here with more defined reference
  - ◆ measurement system to be further cross-checked and possibly improved (new rails)
    - ◆ many problem with no-stable temperature caused calibration loss