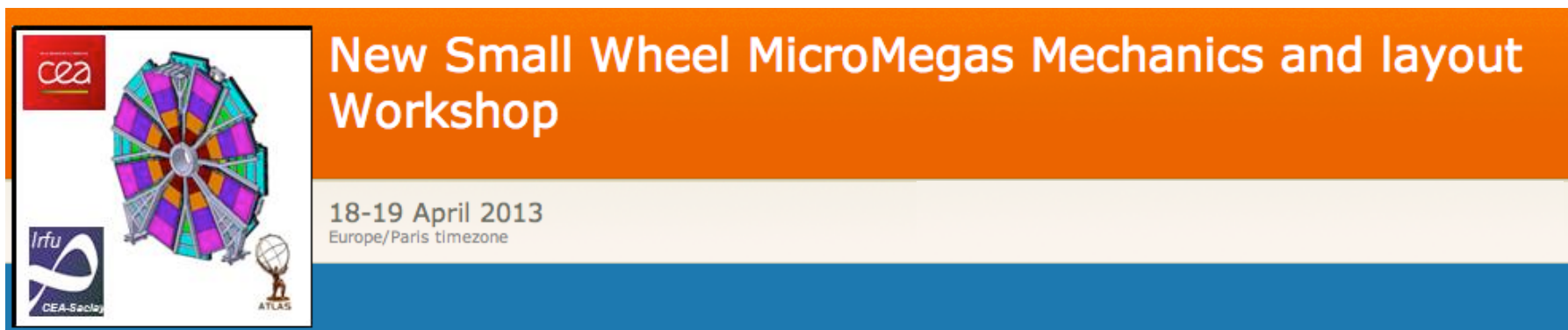


# Status and plans on micromegas activity in Pavia

G. Gaudio,  
for the ATLAS Pavia Group



The banner features a central illustration of a small wheel detector with a central hub and multiple colored segments (purple, blue, green, yellow, orange, red). To the left of the wheel are the logos for CEA (Commissariat à l'Énergie Atomique), Irfu (Institut de Recherche Fondamentale sur les Hautes Energies), and CEA-Saclay. To the right of the wheel is the ATLAS logo. The text on the banner is as follows:

**New Small Wheel MicroMegas Mechanics and layout Workshop**

18-19 April 2013  
Europe/Paris timezone

# Activity in Pavia

- ◆ Due to availability of the clean room (ex ATLAS-MDT) with granite table (3500 x 2500 x 350 mm<sup>3</sup>, planarity ~ 8 μm) we plan to
  - ◆ Setup a measurement system for both components and assembled (part of) chambers
  - ◆ Perform assembling test
  - ◆ Participate in INFN effort for M3 mechanical prototype assembly
- ◆ Clean room is operational since a couple of weeks (cleaned and conditioned)
  - ◆ first measurement of particles: ~ 5000/ft<sup>3</sup> → better than class 10000
  - ◆ temperature constant at 21°

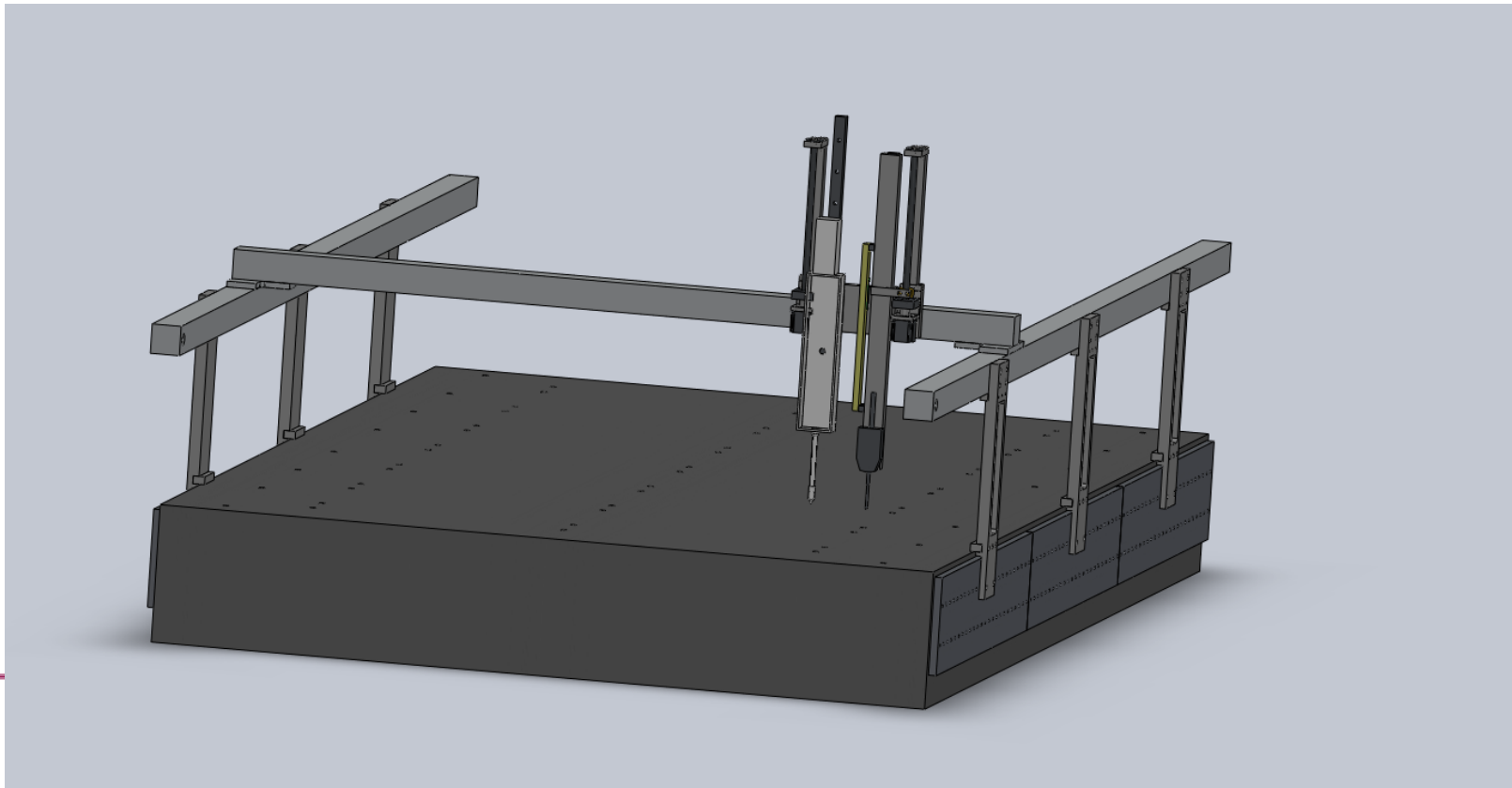
Effort in the past months mainly concentrated in designing and building the required tools  
Small size test on pcb carried on in the mechanical shop



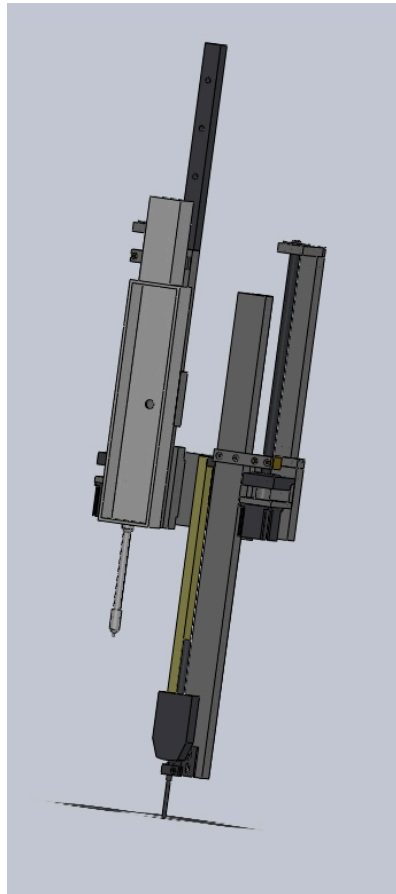
# Planarity measurement system

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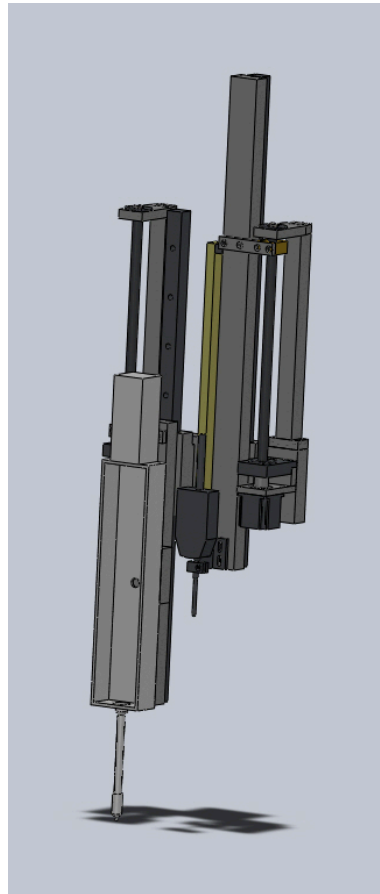
- ◆ Reuse as much as possible of the infrastructure from MDT assembly
- ◆ 3-axis movement system (used for MDT tube glueing) equipped with
  - ◆ high precision measurement gauge
  - ◆ optical line for precise re-positioning of the measurement gauge (vertical axes)
  - ◆ a glueing tool (to be used alternatively to the measurement gauge)
  - ◆ remote control with labview program



# Measurement and glueing tools

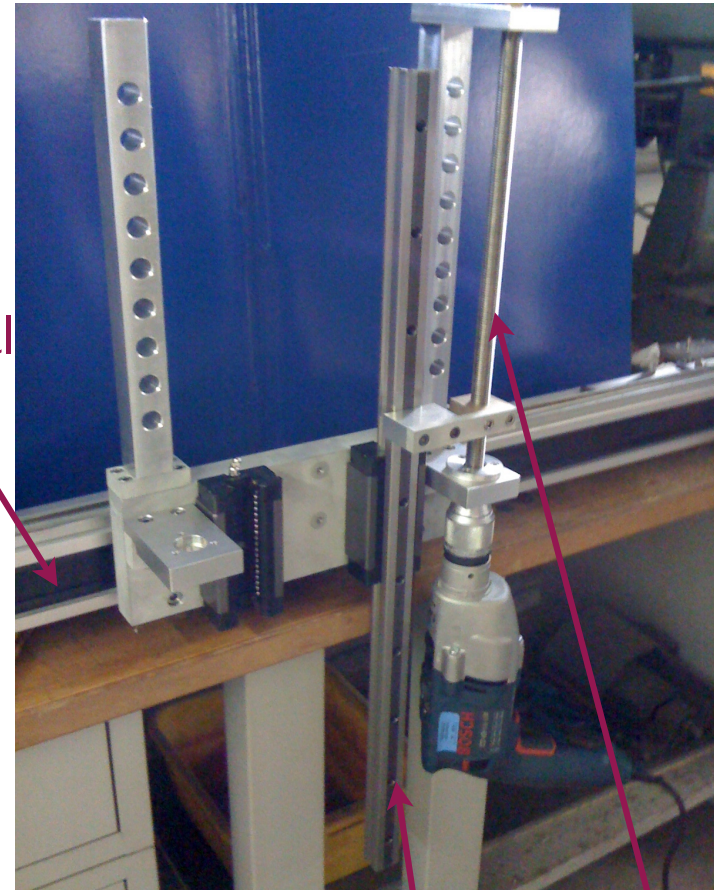


Measurement gauge



Glueing tool

Horizontal rail



Vertical rail

Movement screw for vertical rail

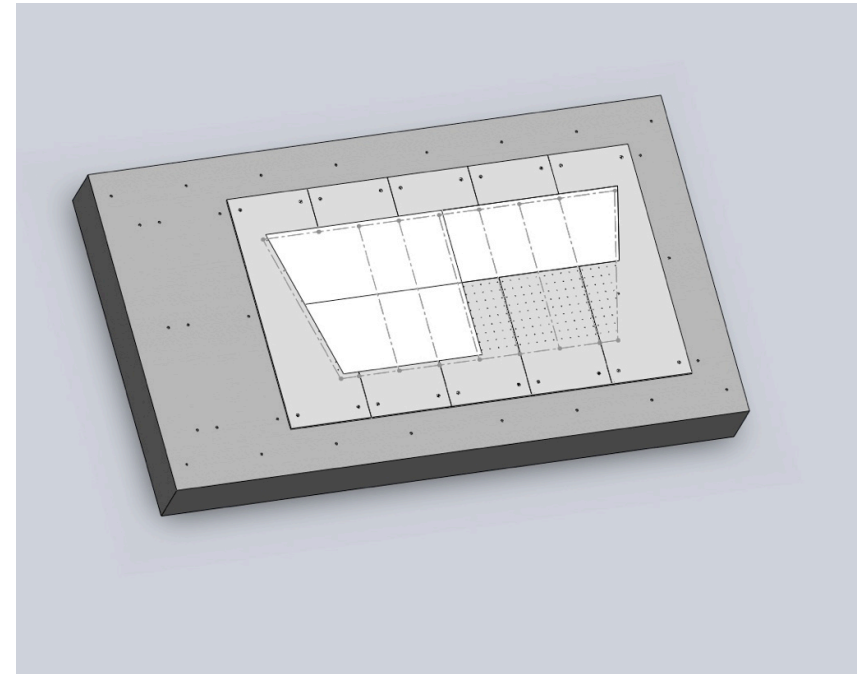
# Reference plates

## Measurement Schema

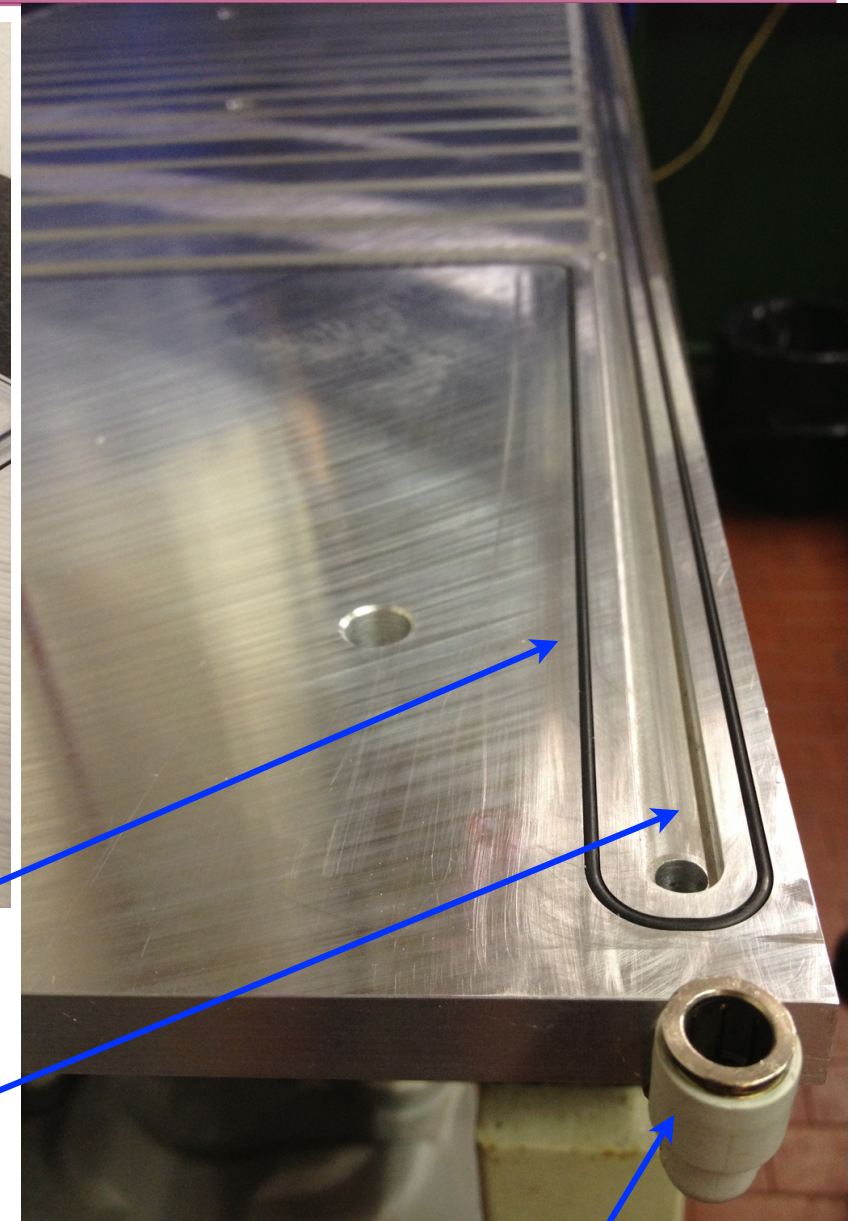
- ◆ Critical point is the reference surface planarity
- ◆ Need for a blocking system tool
  - ⇒ **usage of reference plates**
- ◆ Mapping of the granite table (reference)
- ◆ Use of rectified aluminium tool, blocked on the granite table and equipped with a vacuum system
- ◆ Mapping of the aluminium tool surface
  - ◆ measurements of the component/chambers are taken as difference wrt the aluminium surface

## reference plates

- ◆ Due to technical issues for machining large surfaces at high precision , we have 5 separate plates
  - ◆ they are bolt to the granite table
  - ◆ each has separate vacuum connections



# Reference plates



Vacuum lines

Holes for  
FR4 blocking

O-ring

Vacuum lines

Vacuum  
connector

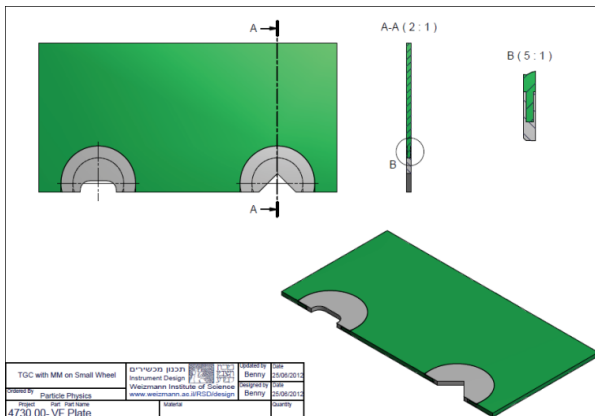
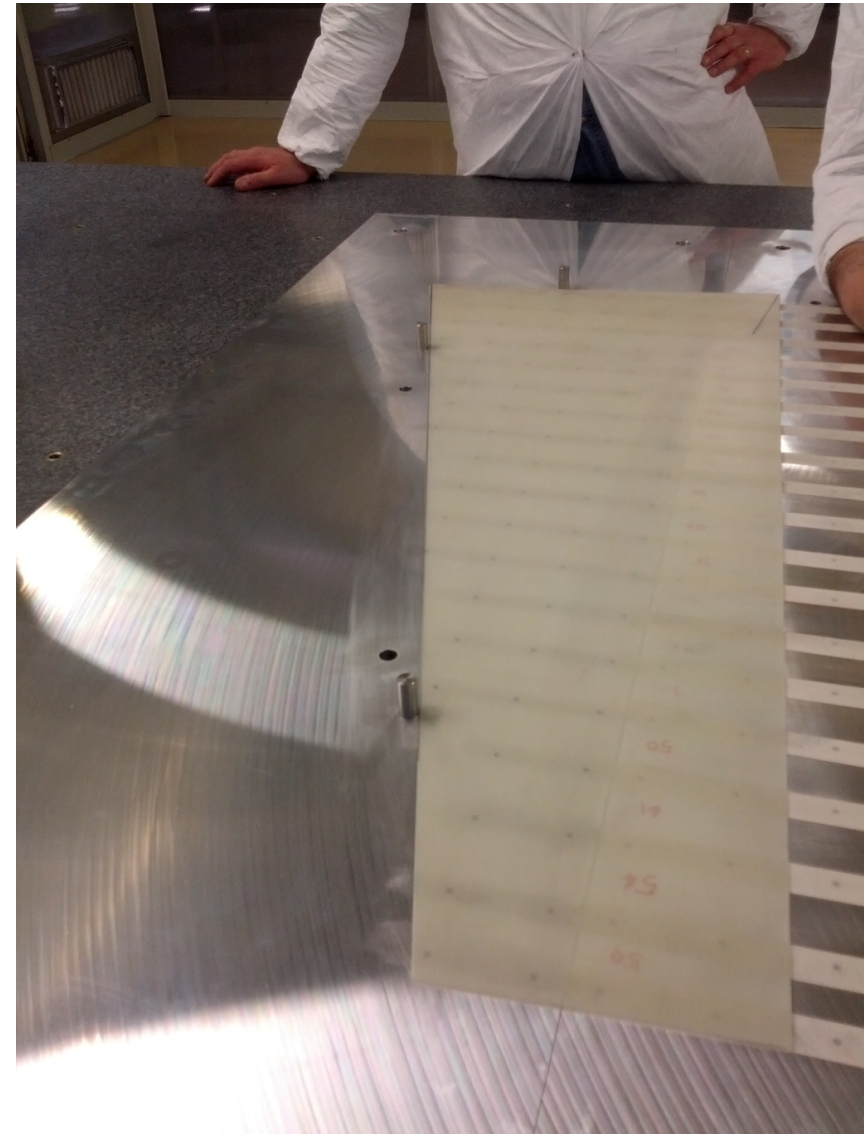
# Reference plates

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# Reference pin

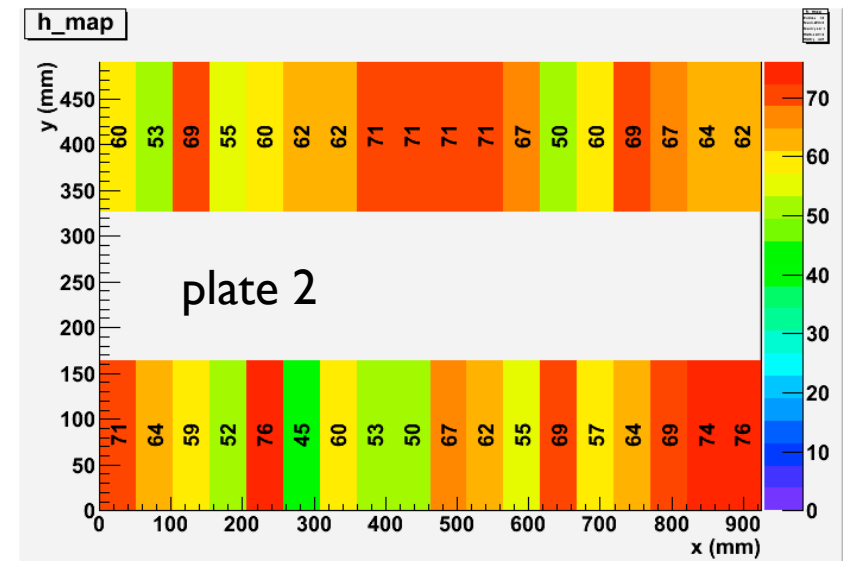
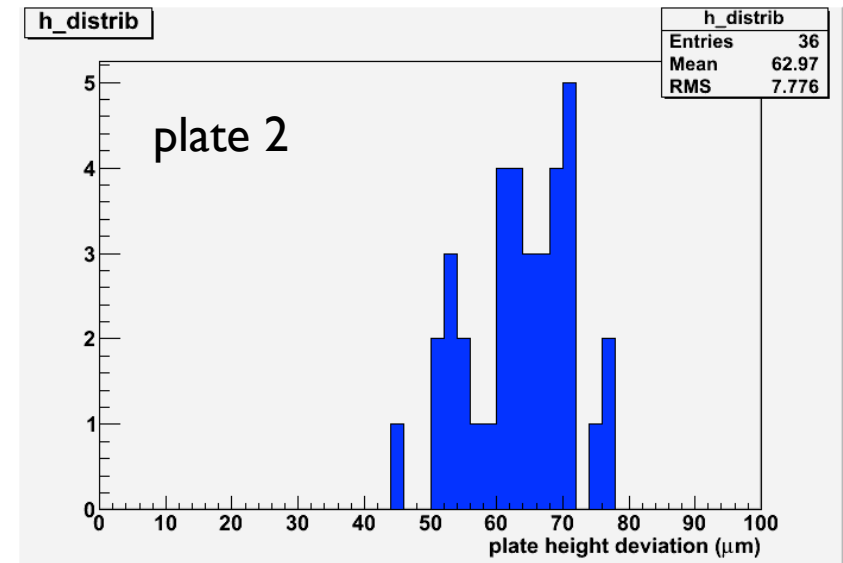
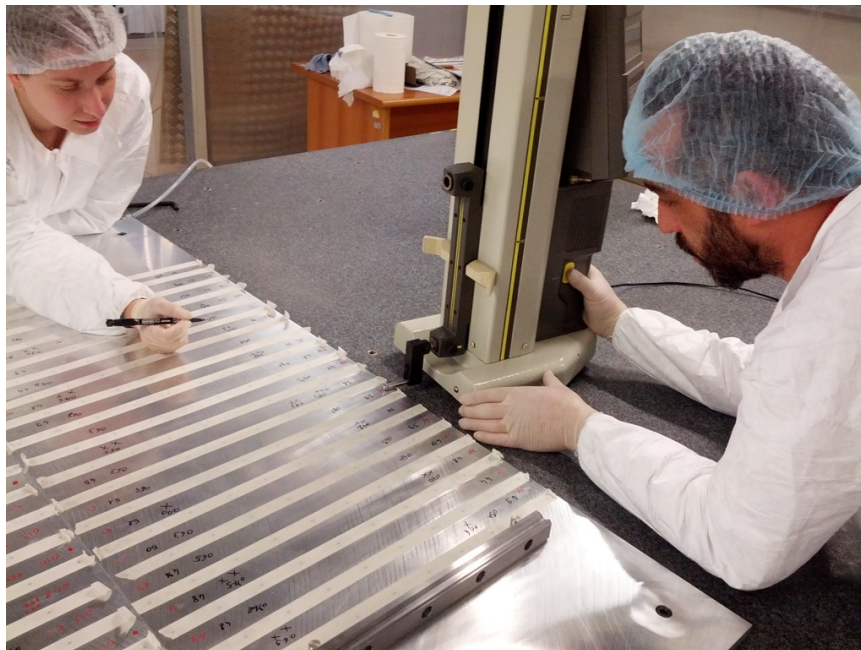
- ◆ For mechanical prototype the bare FR4 boards have been bought from company BASELECTRON (Pavia)
  - ◆ machining in shape in the Pavia mechanical shop.
  - ◆ no reference point foreseen on the FR4
- ◆ Positioning of the FR4 done with the reference pins inserted on the reference plates
  - ◆ evaluating system of pin + v-shape reference on the FR4 for final system (TCG-like)
  - ◆ a lot depends on what will be provided by company as final PCB





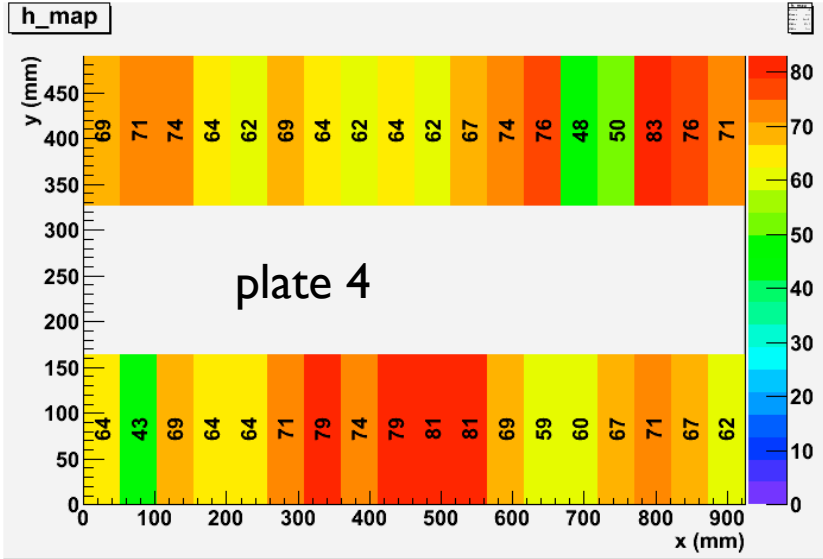
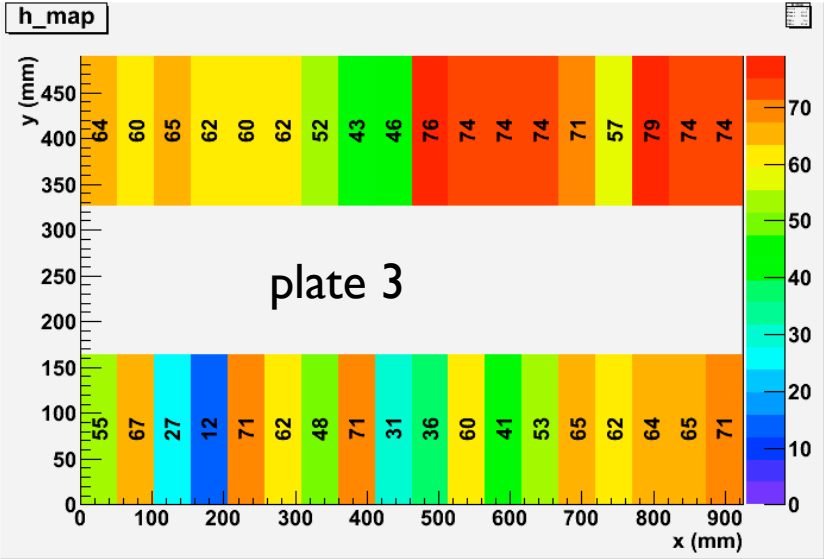
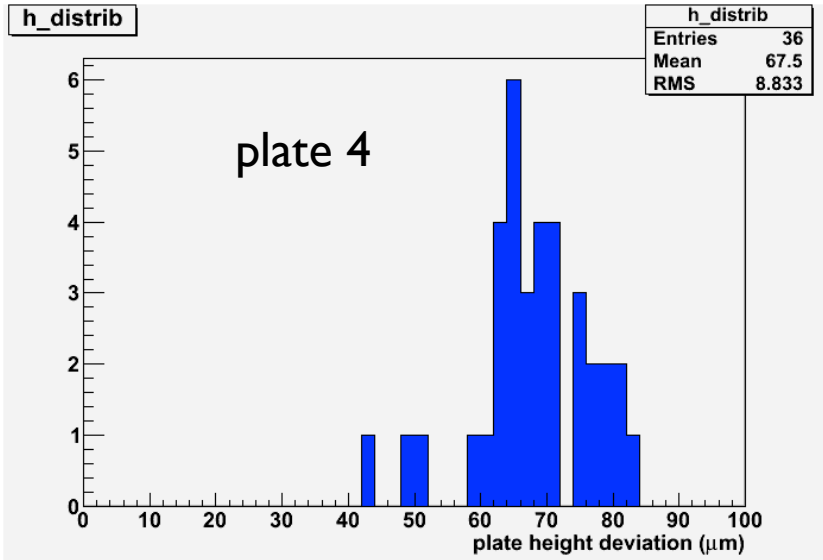
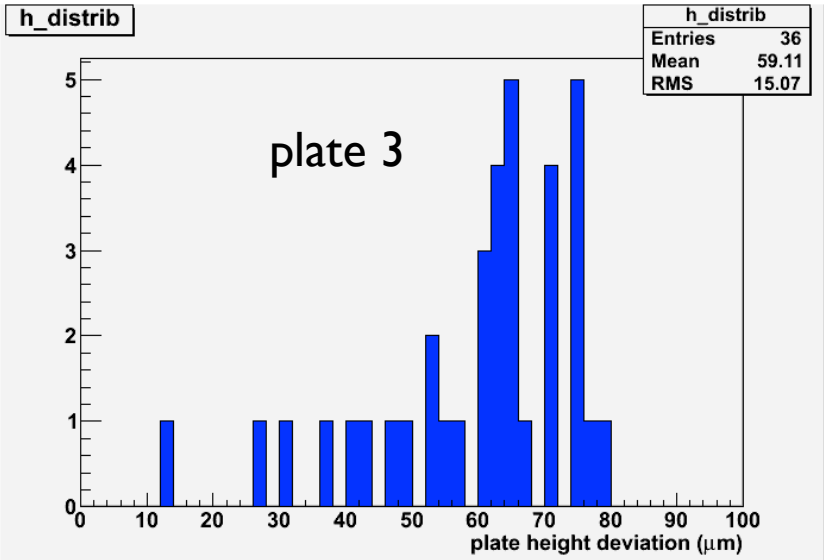
# Plate measurements

- ◆ Planarity of the plates measured with a linear height
  - ◆ only borders accessible with measurement tool
  - ◆ it will be completely re-measured when the measuring head will be in place
- ◆ Both sides of the plates have been scanned
- ◆ Zero referred to the granite table
  - ◆ shown in plots, difference with respect to 15 mm (nominal plate thickness)

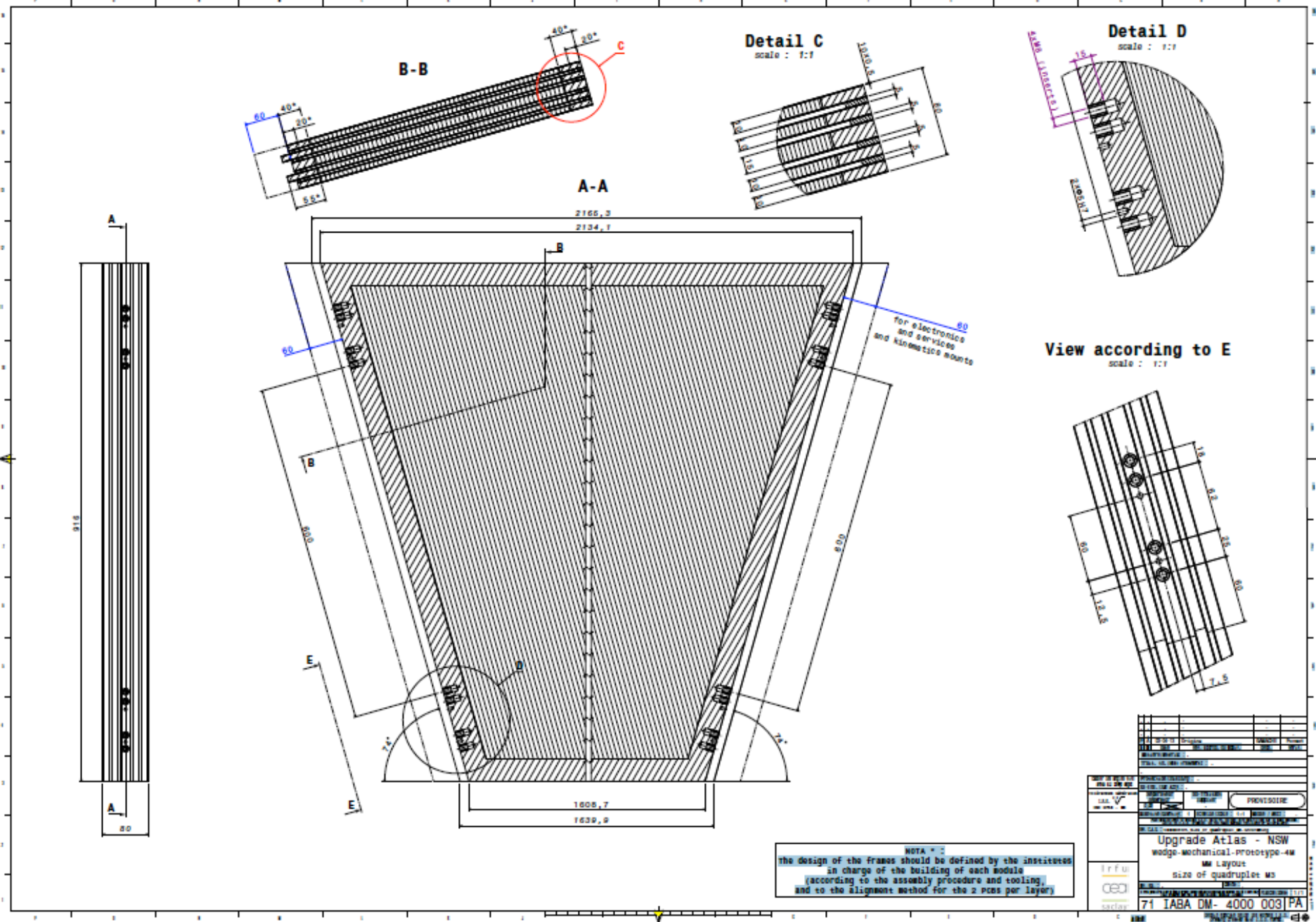


# Measurement results

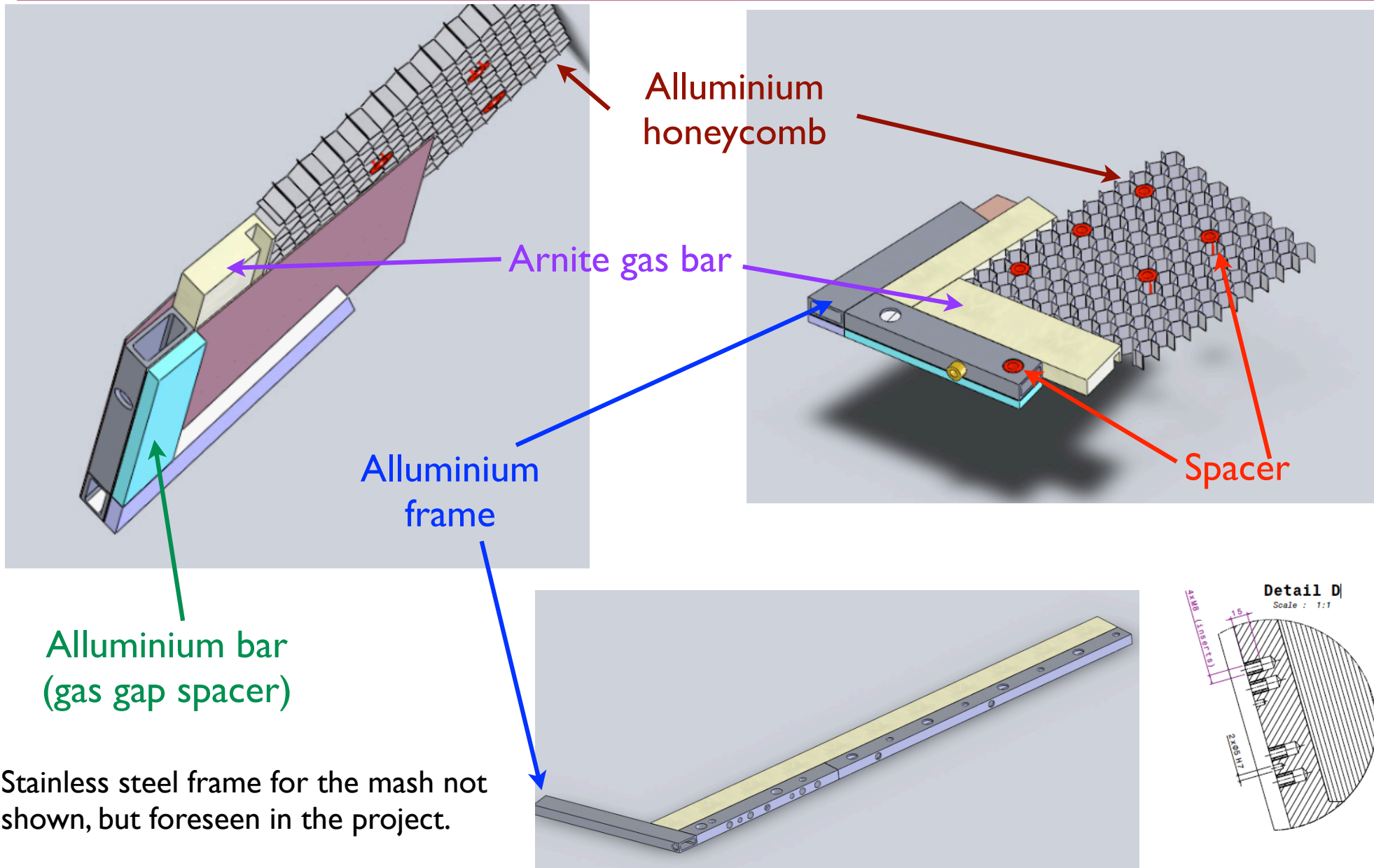
A further adjustment will be done next week



# M3 mechanical prototype

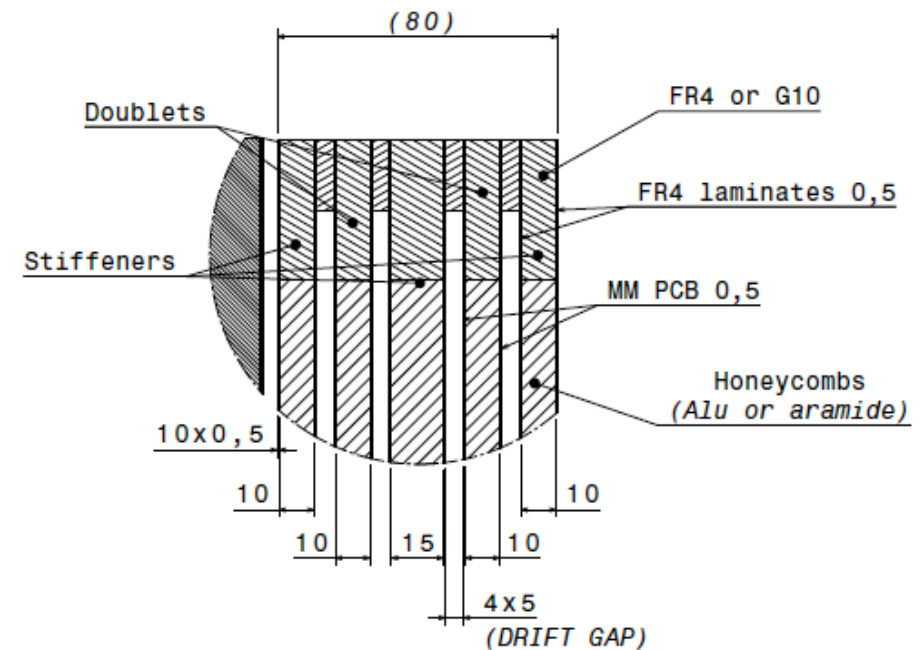


# Internal structure

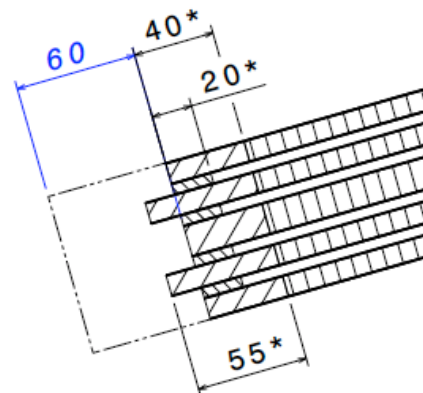


# Prototype dimensions

- ◆ Thickness of the stiffeners is given by spacers, included both in the honeycomb and in the frames.
- ◆ closest commercial thickness for aluminium and arnite bars is 10 mm
- ◆ In order to avoid machining of the frames we propose to
  - ◆ keep the frame bars as they are (10 mm)
  - ◆ increase the height of the spacers to 10.40 mm, with tolerance of  $\pm 0.01$  mm (external company)
  - ◆ do not put glue below the spacers
  - ◆ final thickness of the stiffeners is 10.5 mm
  - ◆  $5 \times 10.5 + 10 \times 0.5 + 4 \times 5 = 77.5$  mm



IS THIS ACCEPTABLE FOR THE MECHANICAL PROTOTYPE ?



In our drawing, the aluminium frame is always 20 mm, the arnite frame will be 20 for the shorter planes, 35 for the larger ones

# Assembly procedures

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- ◆ positioning of the bottom side PCB on the reference plates and planarity measurement
- ◆ glue disposal on PCB surface
- ◆ positioning of the chamber frames
- ◆ positioning of the honeycomb on the PCB
- ◆ positioning of the spacers in the holes in the frame and honeycomb

- ◆ positioning of the top PCB on the stiffback reference plates
- ◆ glue disposal on the top PCB
- ◆ positioning of the stiffback on the table
  - ◆ reference height is due to the stiffback feet and the reference spacers
  - ◆ in x,y plane positioning is guaranteed by reference pin

The design of the stiffback and the overall procedure is still preliminary.

# Short term program

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- ◆ mounting of the measurement head on the table ( during week of the 22.4 )
- ◆ commissioning of the measurement system ( foreseen for the 6.5 )
- ◆ milling of the frames ( starting on week 29.4 )
  - ◆ aluminium material available
  - ◆ arnite for inner frame not yet delivered
- ◆ machining of the pillars
  - ◆ will be done by an external company, schedule depends on arnite delivery date to INFN
- ◆ measurements of the table and reference plates ( during week of the 6.5 )
- ◆ cut & milling of the PCB boards ( during week of the 27.5 )
  - ◆ material not yet delivered, delivering date to be confirmed
- ◆ First glueing test on large prototype ( during week of the 10.6 )