



# Report Frascati Activities

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# Outline

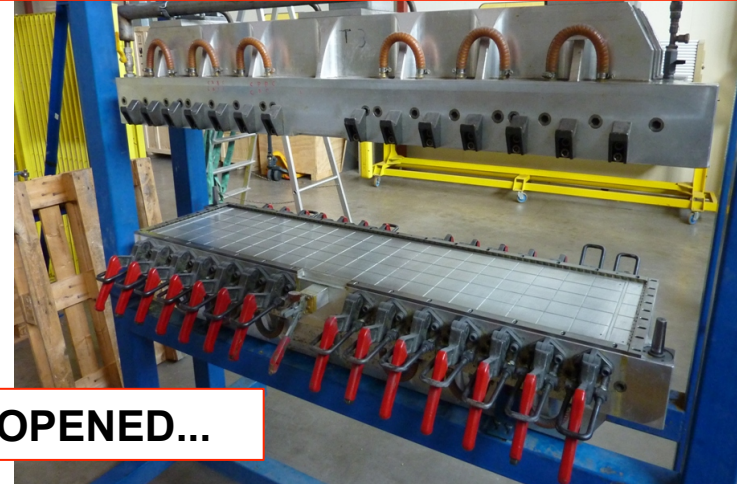
- Panel Construction
  - Single Panel done using a Mold with a single PCB
  - Large Panel done with a precise Joint
  - Measure and Results
- Working Prototype
  - Remind of the June presentation
  - PCB Production Status
  - Schedule

# Single Panel Construction-Tool

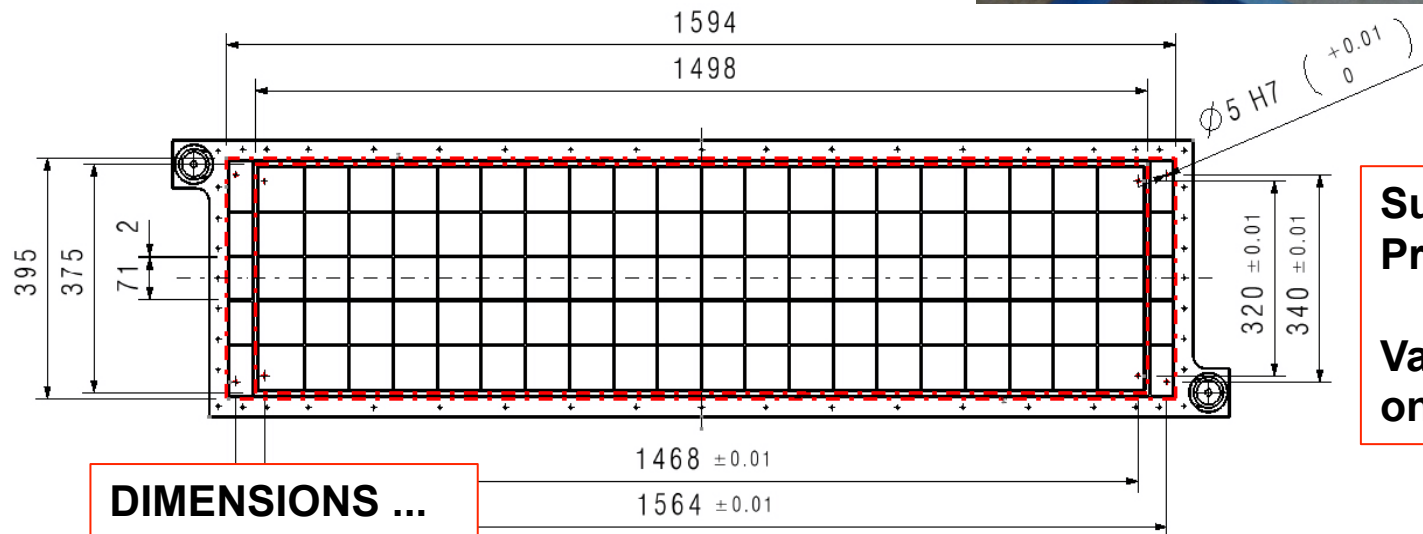
The Sandwich Thickness is set by calibrated Spacers between Plates



CLOSED...in Clean Room



OPENED...



DIMENSIONS ...

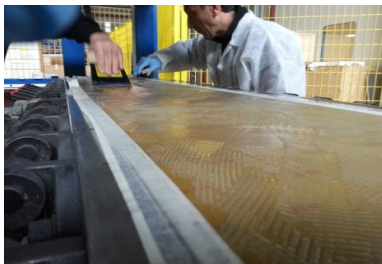
Surface  
Precision: 15  $\mu\text{m}$

Vacuum suckers  
on both sides

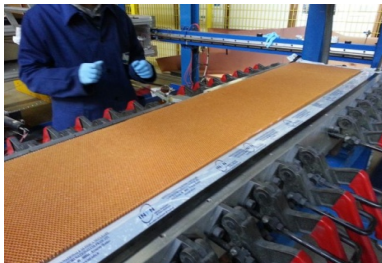
# Single Panel Construction-Procedure



1. Both PCBs are kept in plane on both sides of the mold with vacuum



2. **Glue is applied on bottom PCB**



3. Honeycomb is layed on the PCB



4. 1st gluing: molds are separated by precision spacers



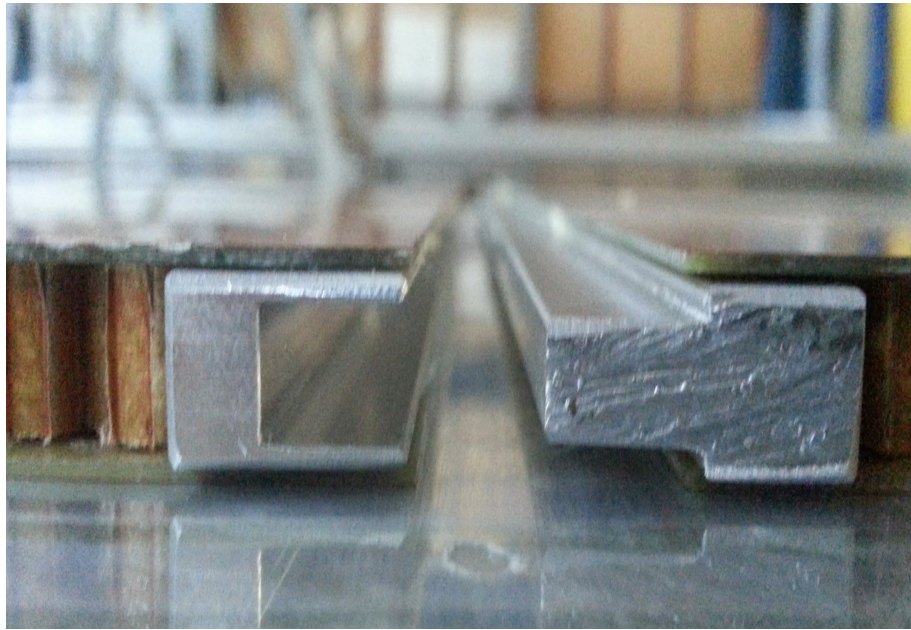
5. PCB are exchanged. **Gluing is always on the bottom side**



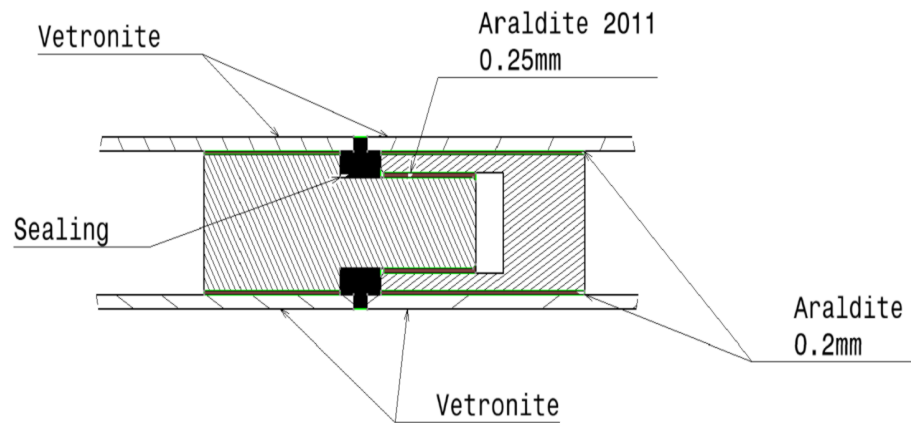
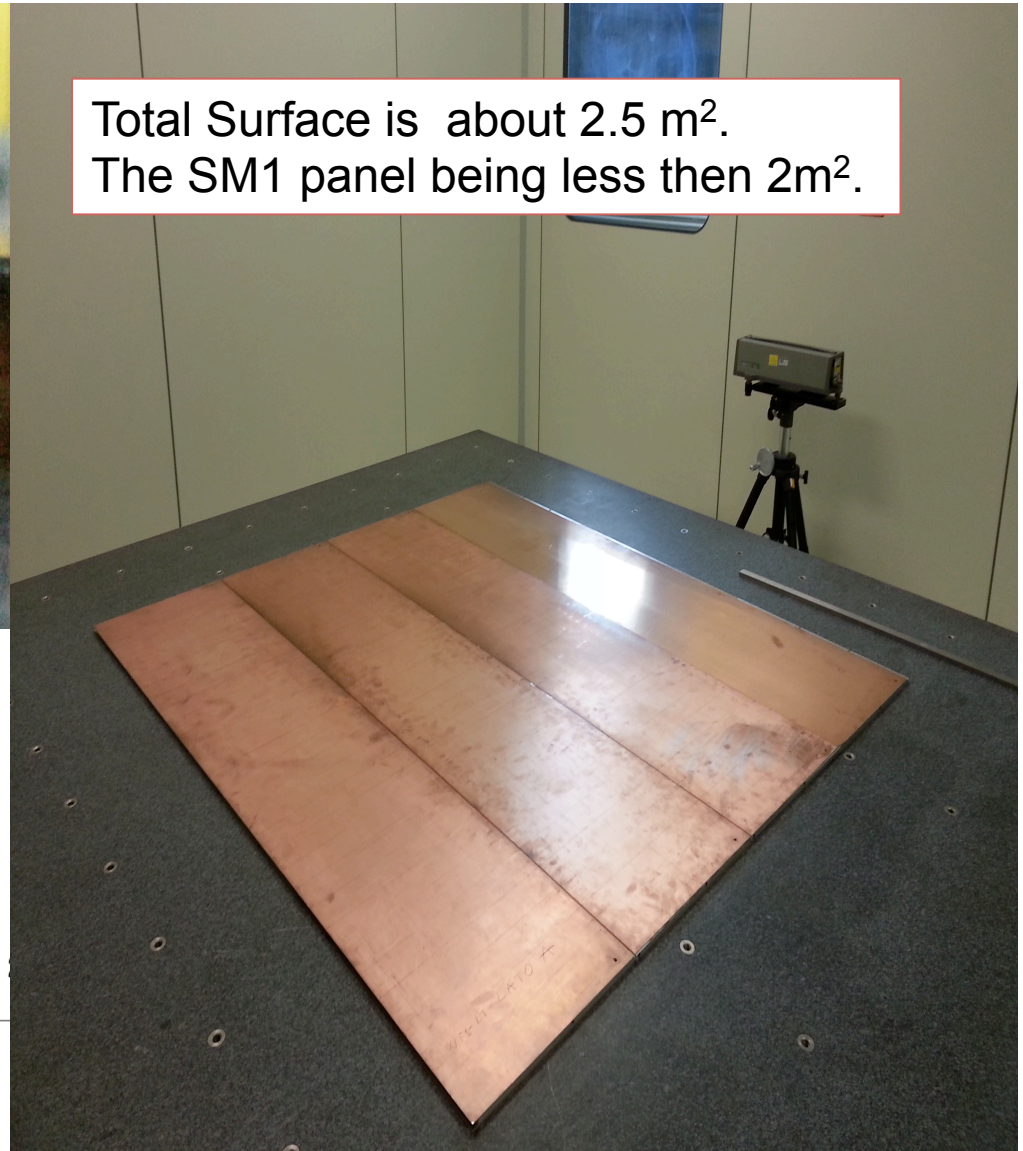
6. Final gluing. Two days for one sandwich

A possible improvement to this procedure is to continuously rotate the mold while glue curing. Double gain: fully symmetry up-down, one day / panel.

# Jointing Panels



Total Surface is about 2.5 m<sup>2</sup>.  
The SM1 panel being less than 2m<sup>2</sup>.



# Measure - Tools

Laser tracker ( LT )  
INFN Frascati

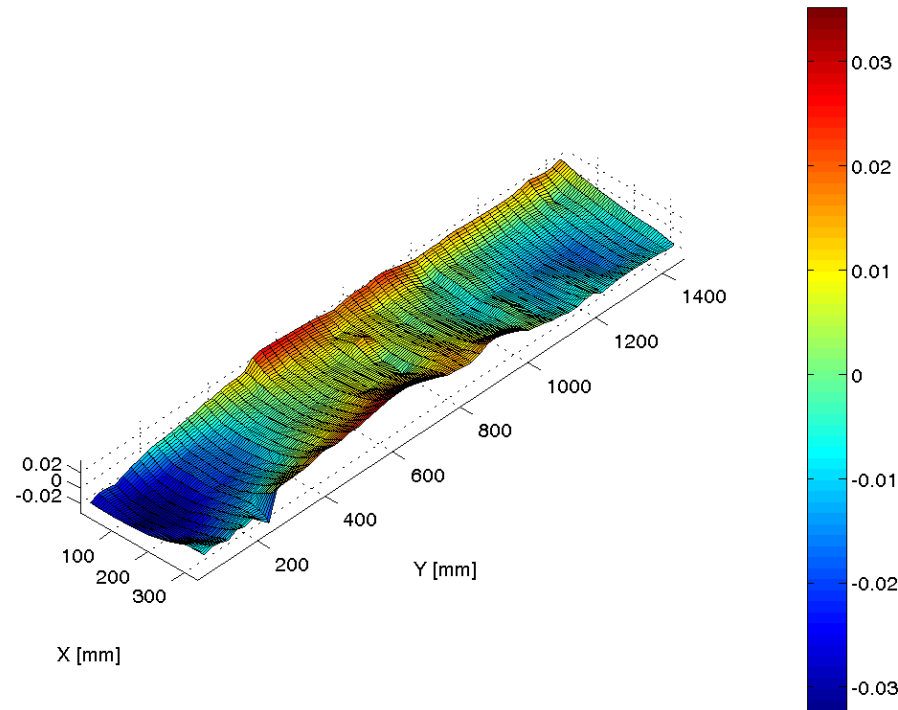


CMM  
INFN Pisa



Many panels have been measured and results presented in the past. The large panels have been measured with both technique and results are in good agreement. This confirm that Laser Tracker is a good tools to be used in the future. Our idea is to have one dedicated during the prototype construction and during the whole production.

# Measure – Results I



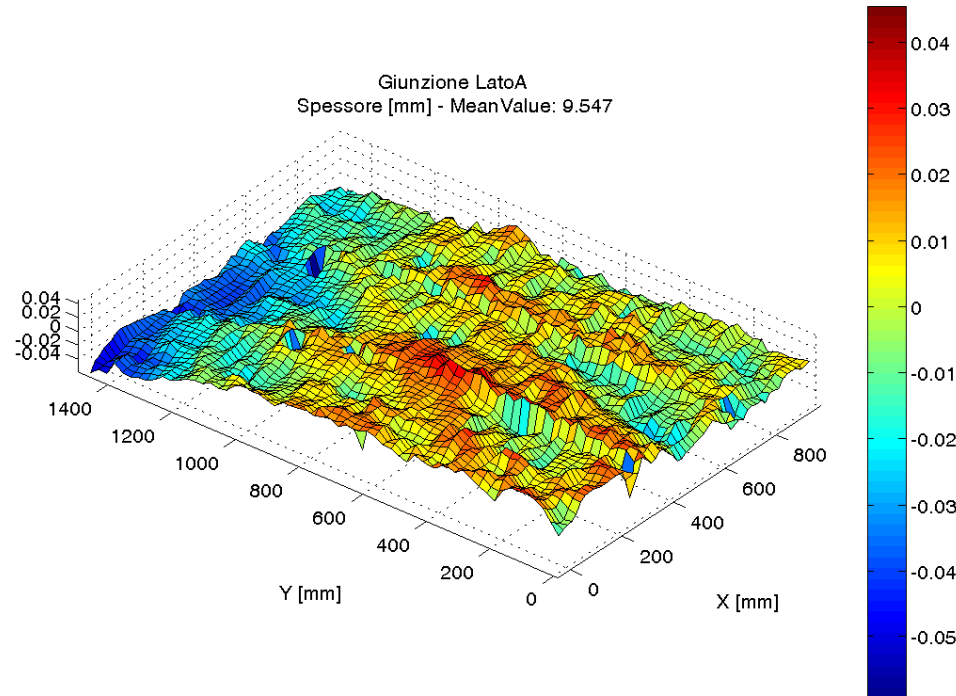
We have glued three panels in September and measured in Pisa and LNF, the fourth panel has been glued last week, after we have moved the mold inside the clean room. Not yet measured.

“Typical” Panel measure results.

Actually the best in the sense that the other two panels show some singularity (less than  $100\ \mu\text{m}$ ) due probably to dust in the gluing phase or measurement. Despite this the RMS even for these panels is well inside the request.

- Average Thickness: 9.532 (9.500 Nominal)
- RMS: 0.014mm
- Tolerances: +0.03 -0.03

# Measure – Results II



Result of the large panel jointing the three pieces.

Only LT measure is available, too big for the Pisa CMM.

Joints are visible, steps of the order of couple of tens microns. This large panel is well inside the request in term of RMS precision...

Is it good enough to work as RO Panel ???

To get an answer to this question we need the operating prototype.

- Average Thickness: 9.547 (9.500 Nominal)
- RMS: 0.018mm
- Tolerances: +0.04 -0.05



# Guide lines (June Presentation)

- Develop contacts with companies for:
  - Raw Materials (FR4 0.5 mm thick 35  $\mu\text{m}$  Cu)
  - PCB production (Copper strips)
  - Screen Printing deposition of resistive strips on Kapton
  - Pillars
  - Mesh
- Eltos is our major referent company for this enterprise, in green the aspects for what we asked them an offer (see after)
- Maximum chamber size, minimizing impact on Eltos production, to try to stay in a reasonable cost.

# Guide lines (changes from June)

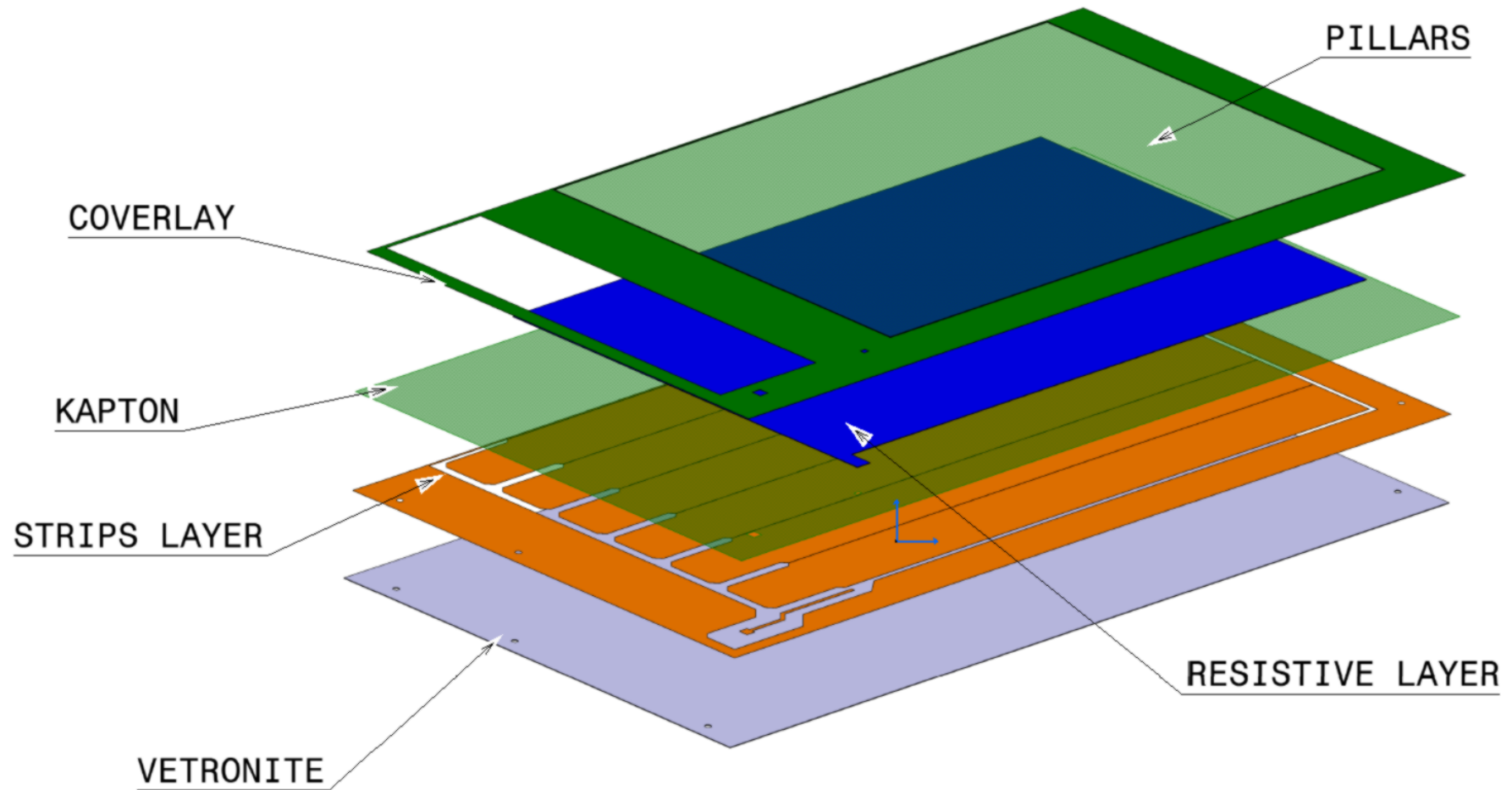
Screen Printing (or sputtering) deposition of resistive strips on Kapton needs expertise that is not clearly in our hands.

We decide to make PCB using serigraphy directly on the RO strips with an insulator layer in between. This is not in ELTOS know how, but they can refer to an expert in this field they know very well.

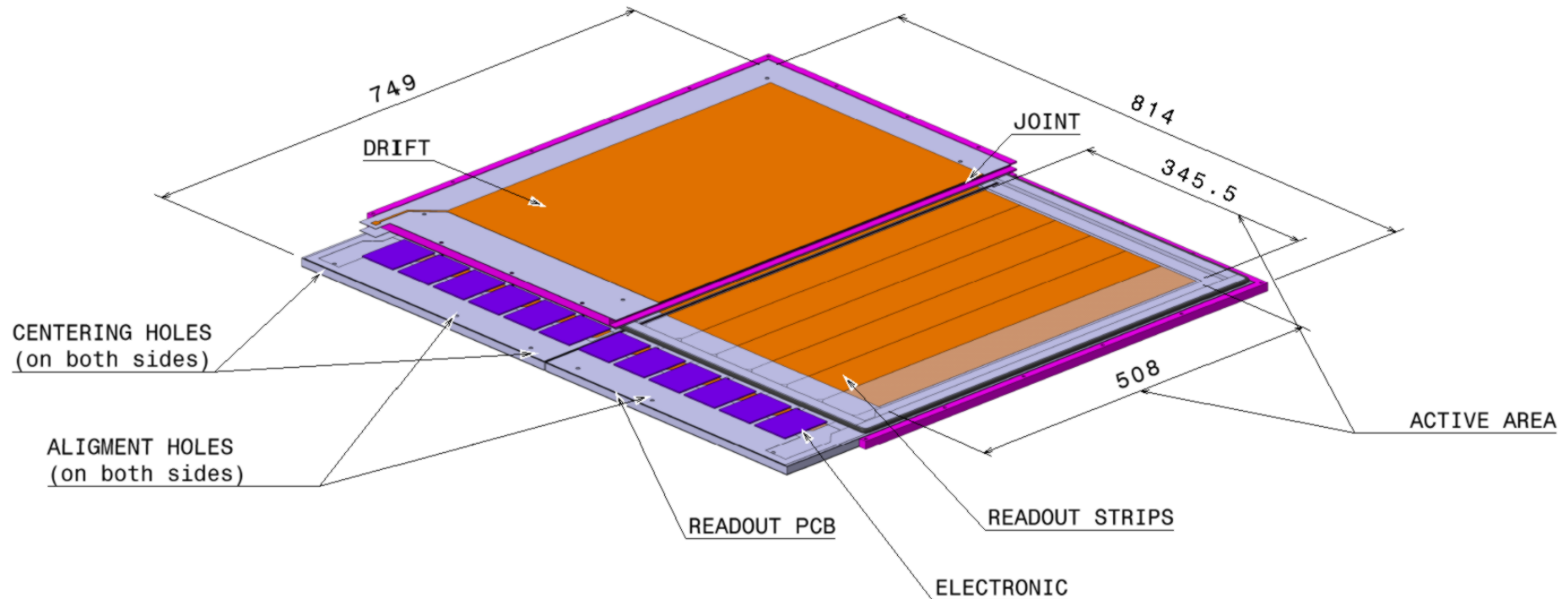
This was a technique studied time ago but not in the main stream for the moment.

PCB production is one of the most important issue to study with the working prototype but is not the only one, joint PCB and assembly procedure can be anyway studied.

# PCB layout (Exploded View)

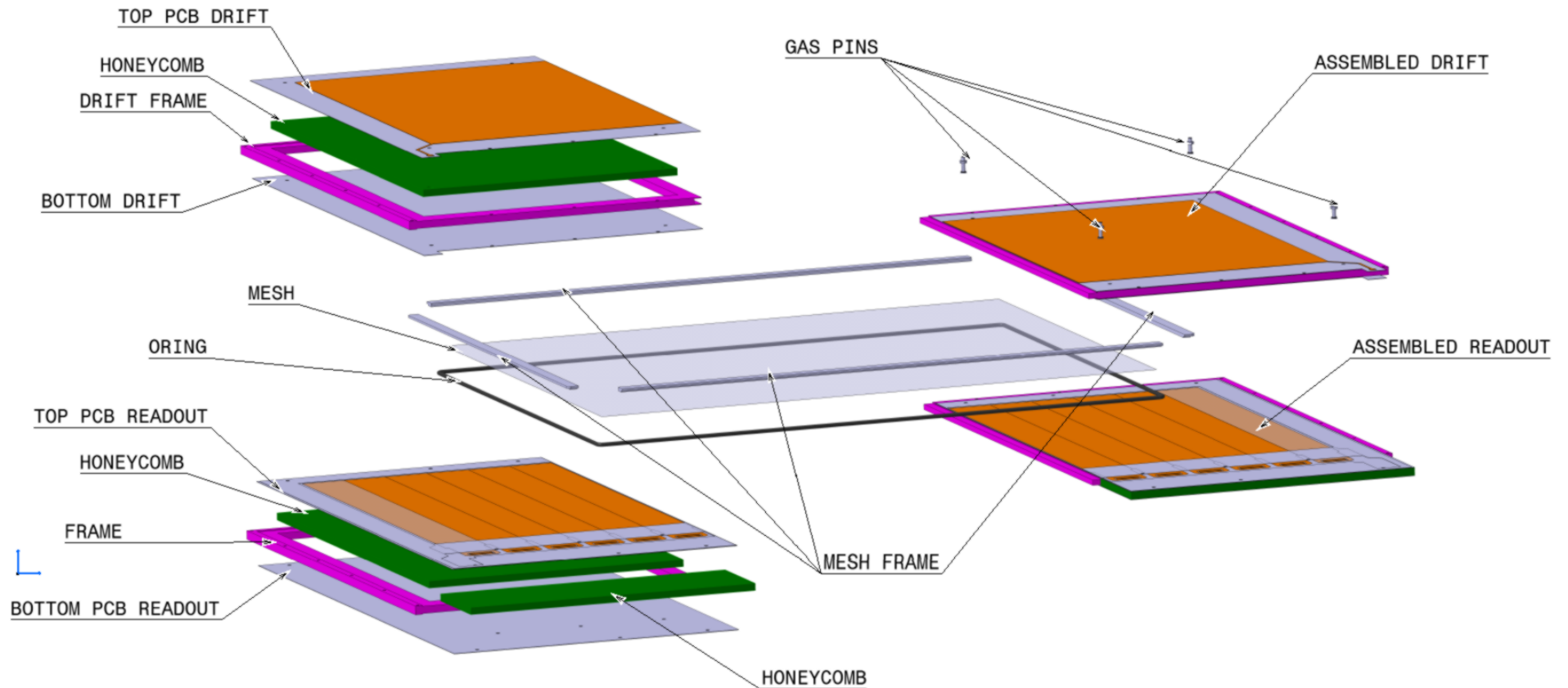


# Mechanical Drawings (Global View)

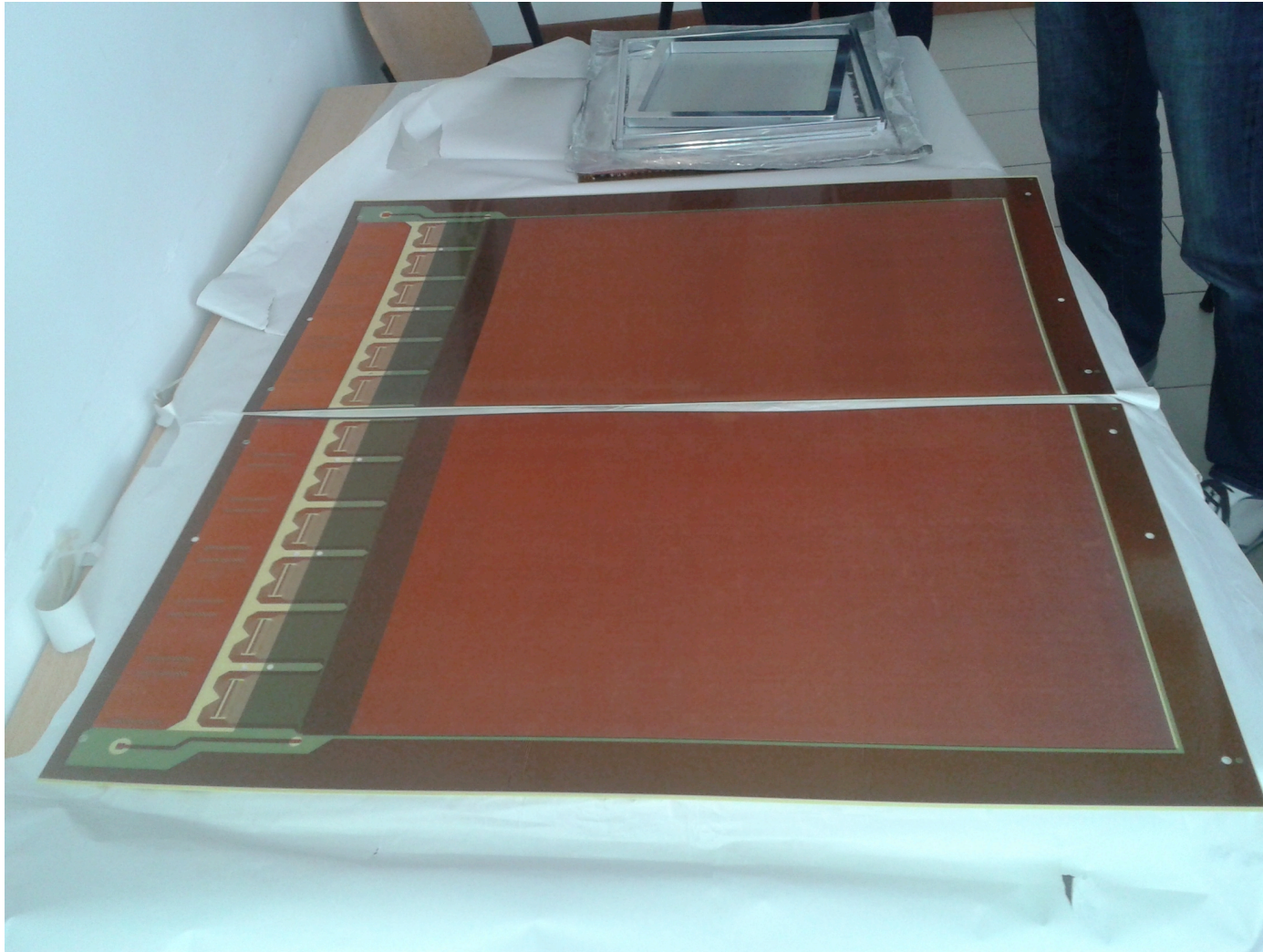


Drawing for one layer MM prototype  
Nomex (7.5 mm)  
Total Sandwich height 9 mm

# Mechanical Drawings (Exploded View)



# First PCB from Eltos



## Not Final PCB

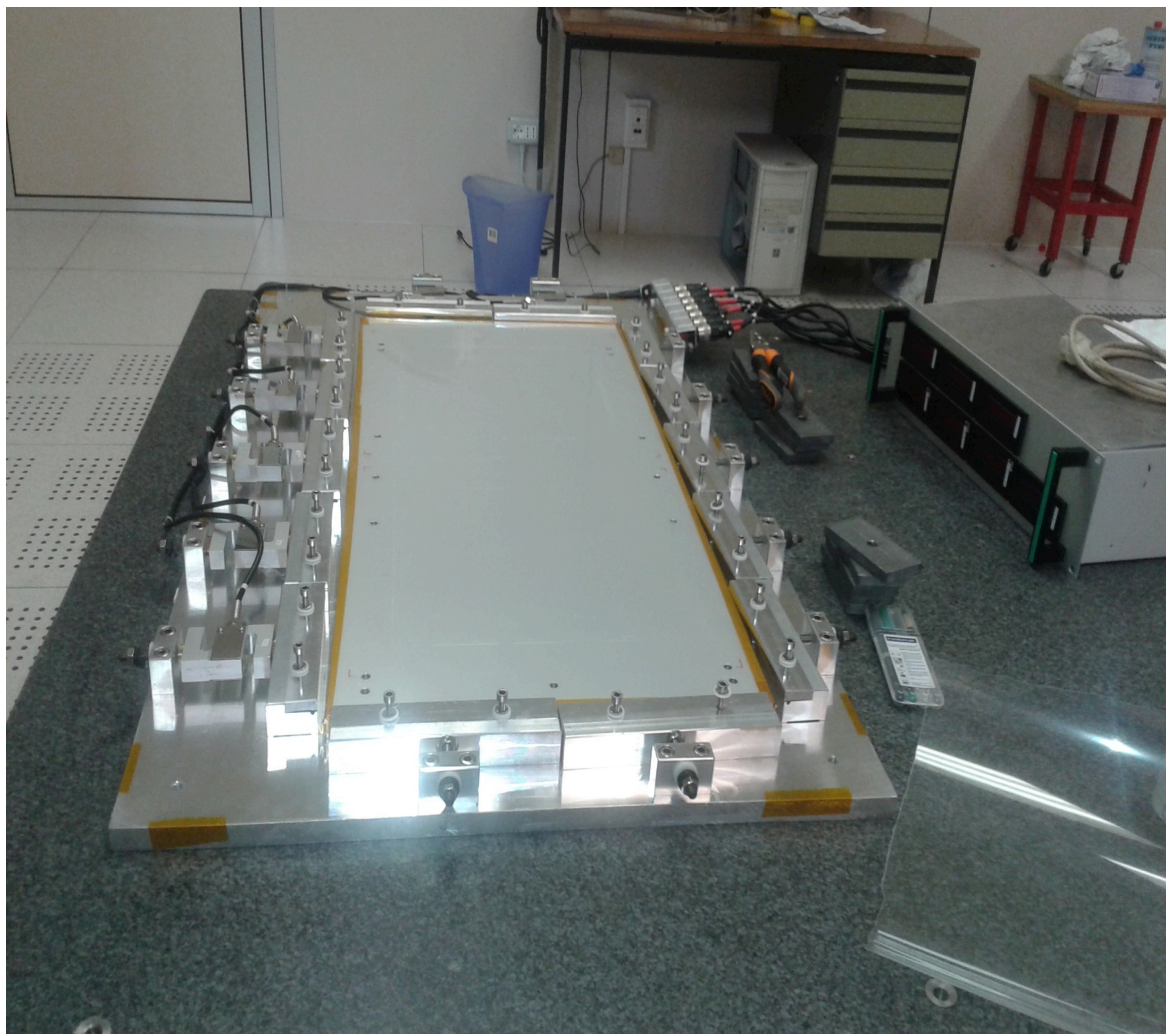
PCB w/o Resistive Layer, with RO strips and pillars.

Useful exercise for Eltos to check the other steps of the process, useful for us to have pieces to start to work from the mechanical point of view...and do not forget that this will be a working chamber!

# Construction: Mesh



# Construction: Mesh



Gem stretching tool from Kloe.

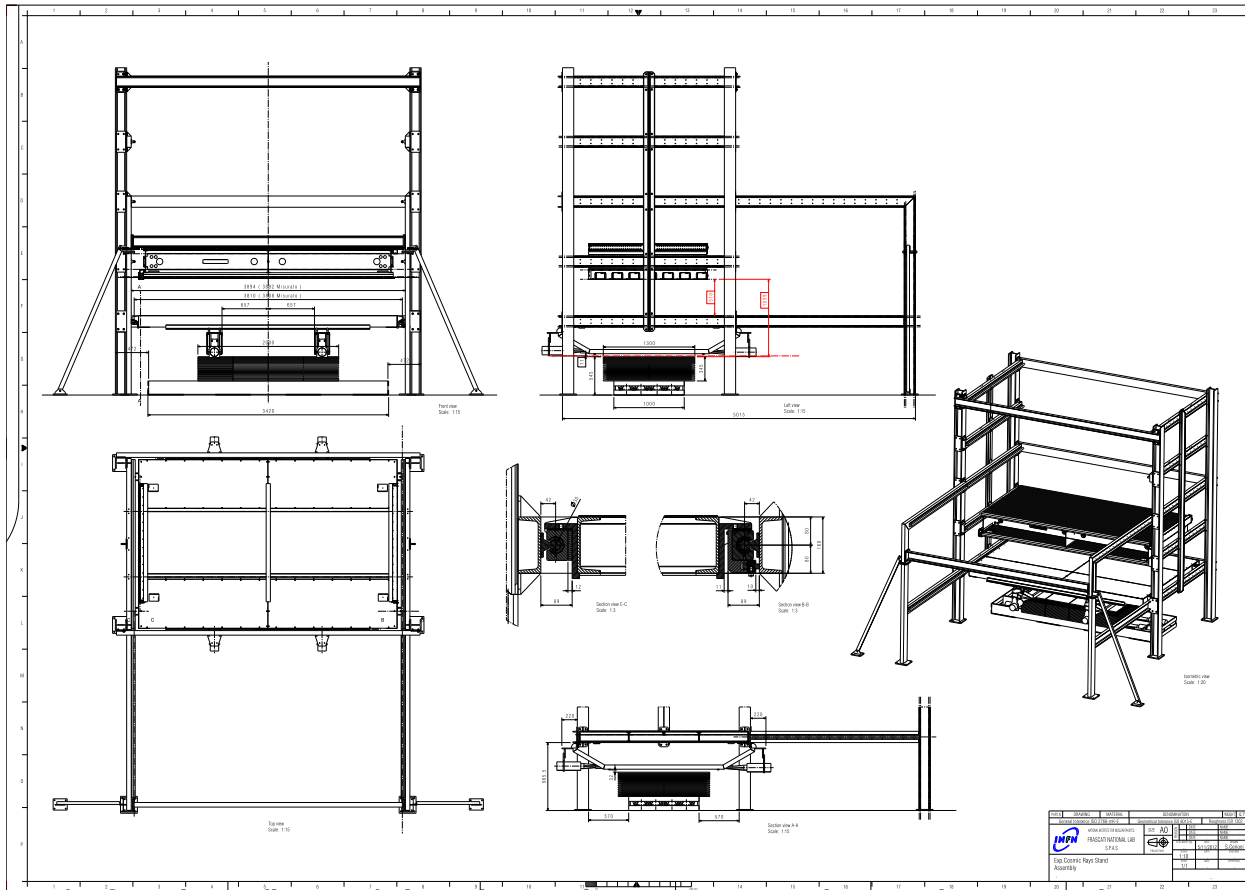
People from RomaTre is working on this item to make experience.

They are preparing a larger setup to provide mesh for this prototype, the idea is to glue the mesh, directly from this tool, to the drift panel.

Commercial solution must be immediately available... if needed !



# Cosmic Test Stand



CTS modification (starting from the one used for MDT) is in progress, the final version will have a double layer of plastic scintillators for triggering of about 1x1.8 m<sup>2</sup>, placed on the floor. Iron slices (25 cm in total) on top will cut the soft component of the cosmic rays. A drawer will be used to put the object to be tested inside the stand easily.

(56 tubes/layer) is placed on top and can be used as external device for tracking. More movable scintillators will be available between the drawer and the MDT for a better trigger definition. **Ready for end of the year.**

# Construction Procedure

- Prototype construction runs on two parallel lines:
  - Drift panels
  - Read-Out Panels
- Sandwiches with PCB Drift are produced and then joined, after this the mesh will be mounted on top.
- PCB read-out are produced including resistive strips and pillars, then sandwiches are made and at the end joined.

# Construction Timescale/ Conclusions

- Final PCB ready for end of November...if serigraphy works fine. Test next week.
- PCB for drift planes ready, we will start soon to produce panel and start to play with the mesh.
- One layer prototype should be ready for the end of the year, in cascade we will start with the quadruplet.
- If get resistive strips on kapton from Atsuhiko (before the end of the year) we can produce half of our PCB with this technique (Eltos has a press of this dimension) and produce two layers of the quadruplet with these resistive strips.