

Recent LumiCal Hardware Development at TAU

I. Levy, Y. Benhammou,
M. Ben Moshe, O. Borysov

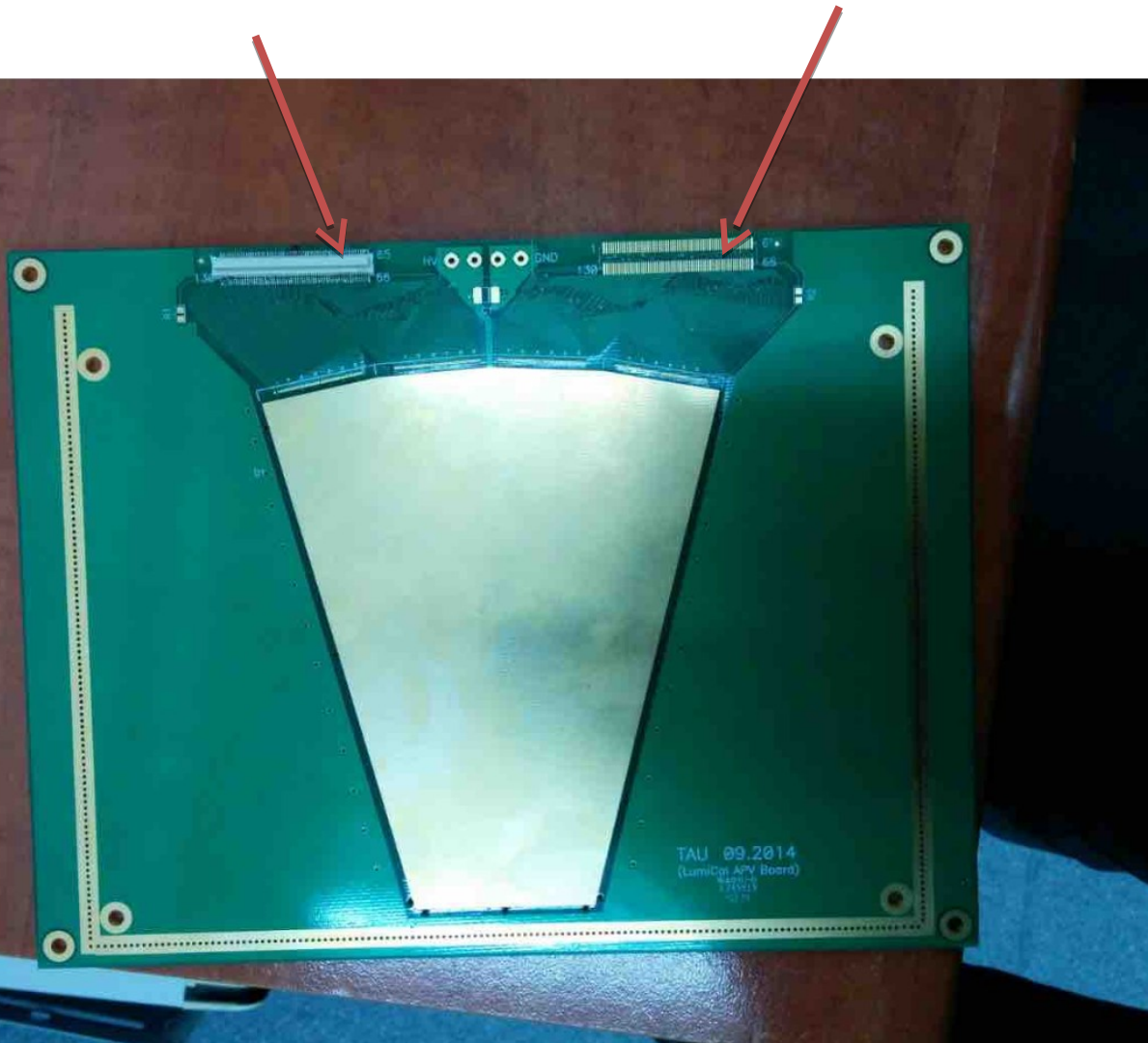
December 22, 2014

Outlook

- Electronic candidate for lab tests
- Sub millimeter wedge
- sensors

Design and production of test board

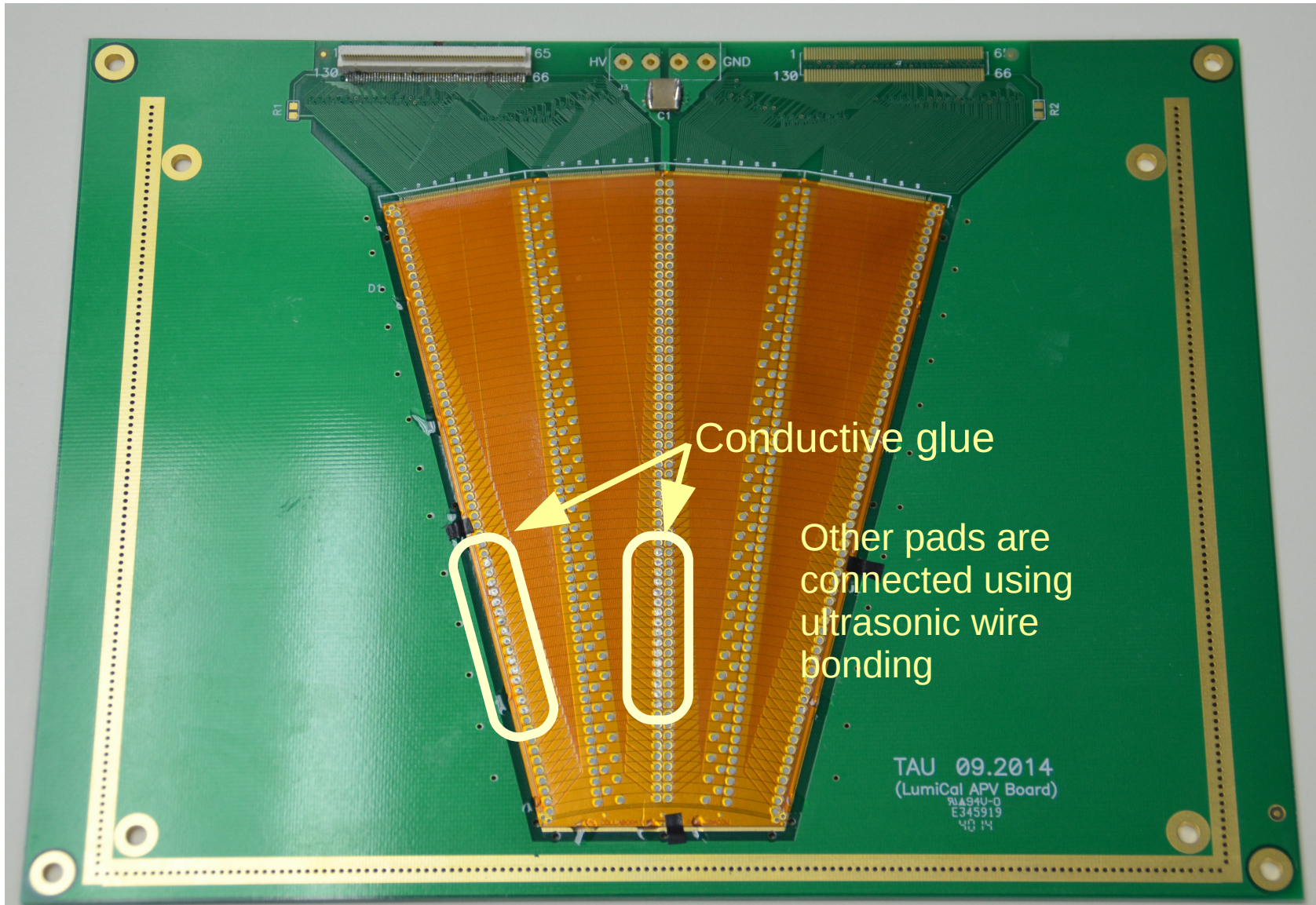
130 pins panasonic connector compliant with APV, VMM, Beetle,...



Sensor and fan out glued and tested

Test next week with APV (delay because of RD51 test beam)

LumiCal Module for Electronics Tests



Sub millimeter wedge

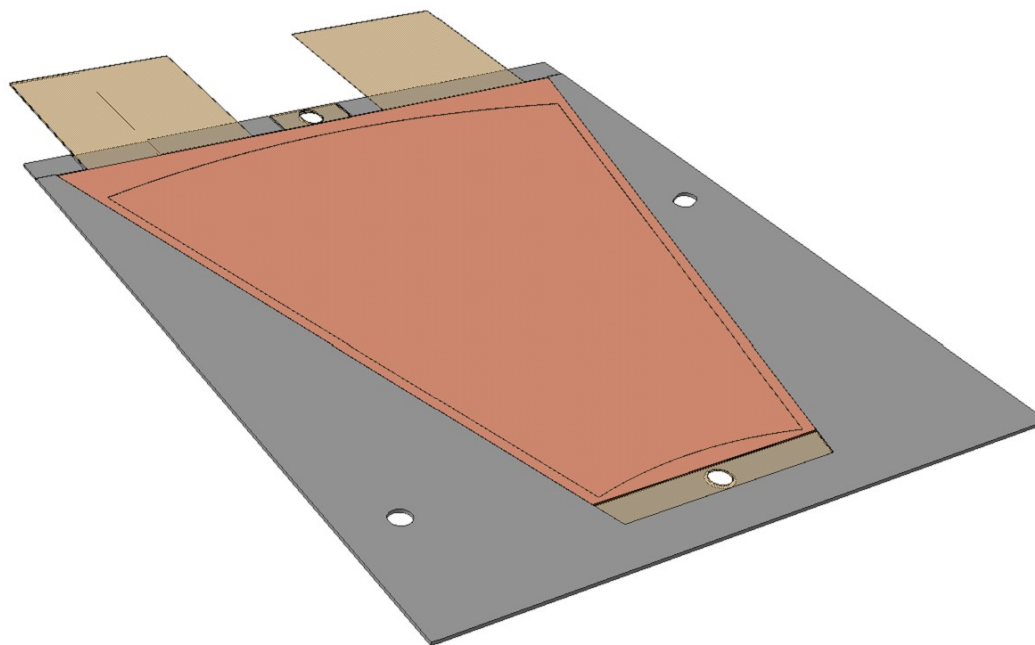
- Need to have a system sensor+fan out+ HV within less than 1 mm
- Need to be “easy” to remove from tungsten
- Need to be easy to connect electronic



- First idea in TAU
- Meetings with CERN engineers (FX Nuiiry, Christophe Bault)

Aida Calorimeter

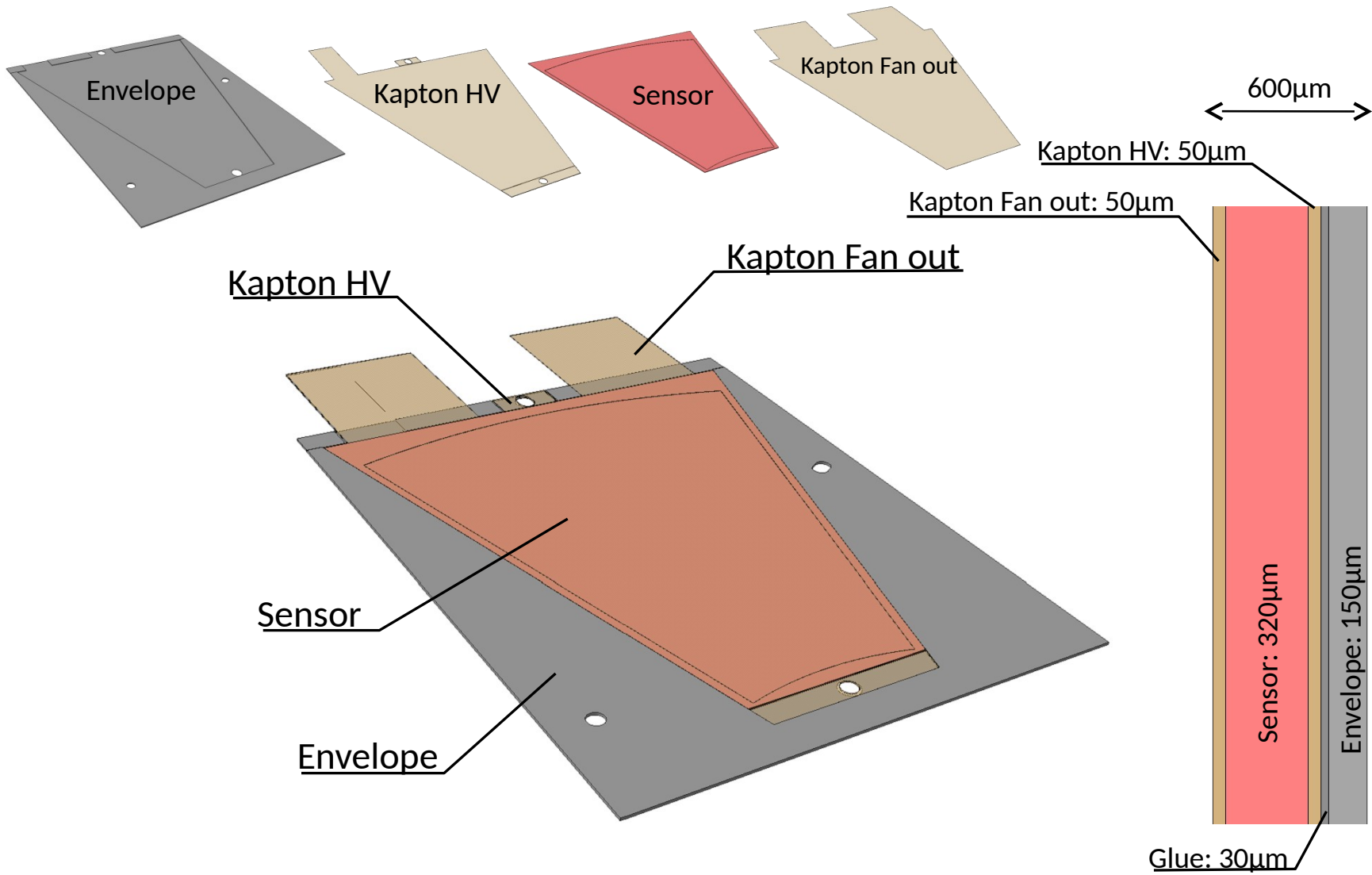
Sensor structure



Christophe Bault, François-Xavier Nuiry

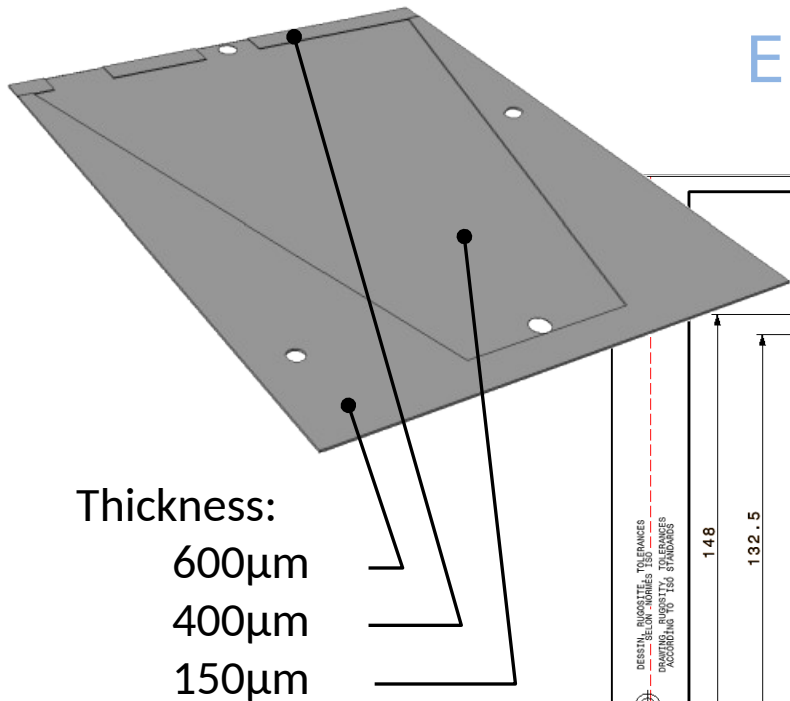
Aida Calorimeter

Sensor structure

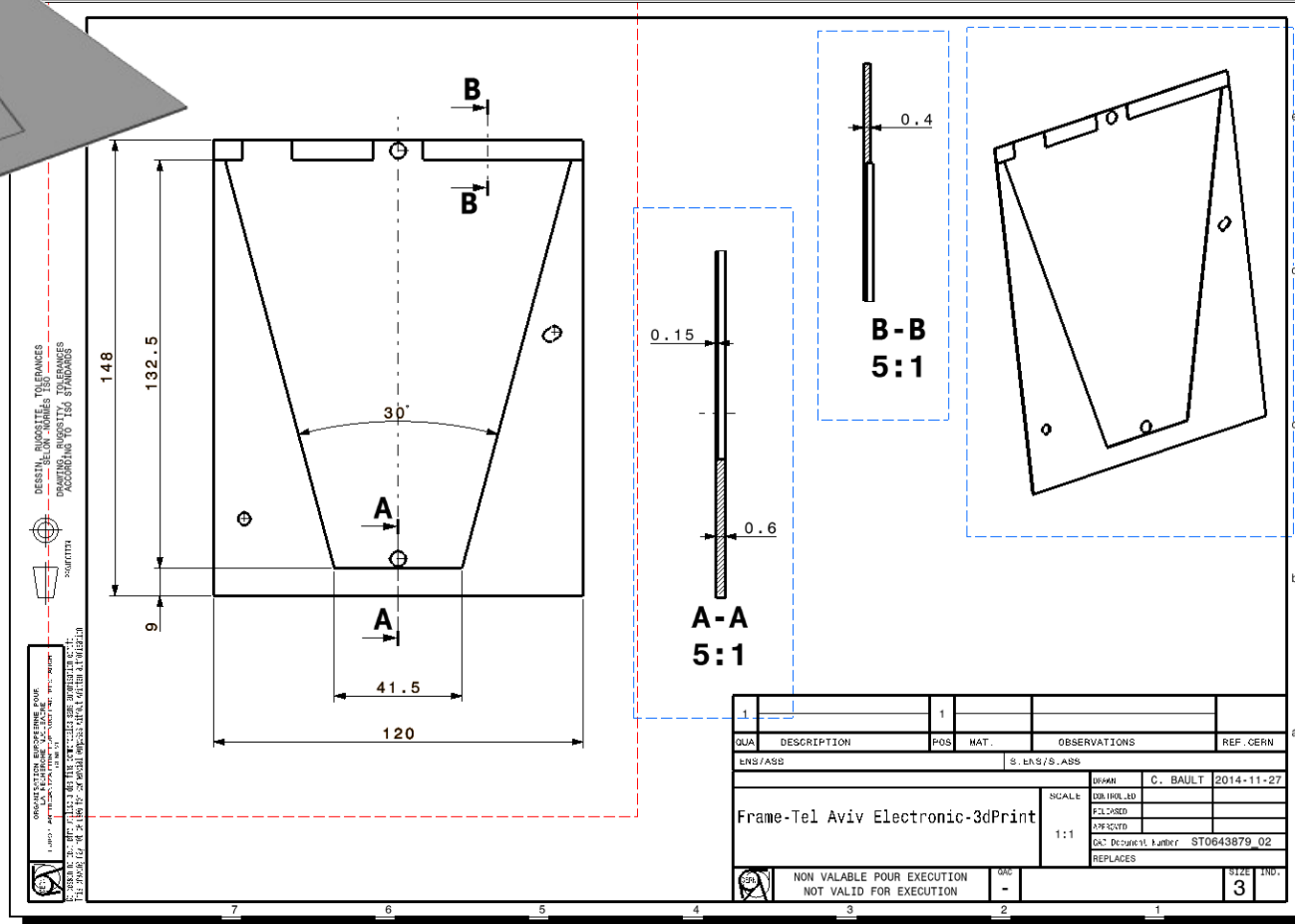


Aida Calorimeter

Envelope design



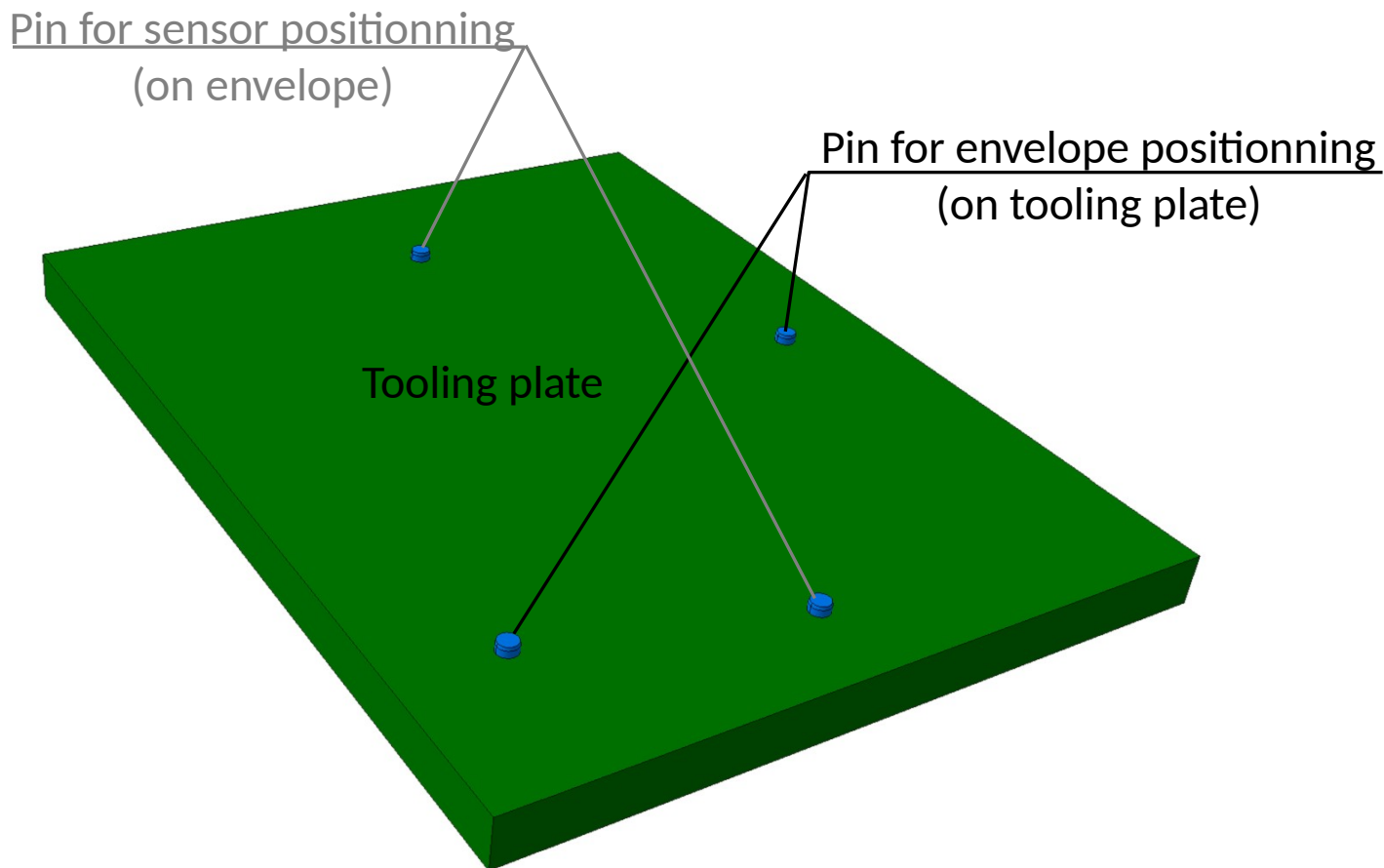
Thickness:
600µm
400µm
150µm



Can be manufactured by stereolithography at Cern: Epoxy resin Accura 25
Or could be made in carbon fibre, stacking depends of thickness needed

Aida Calorimeter

Tooling for bonding sensor on envelope

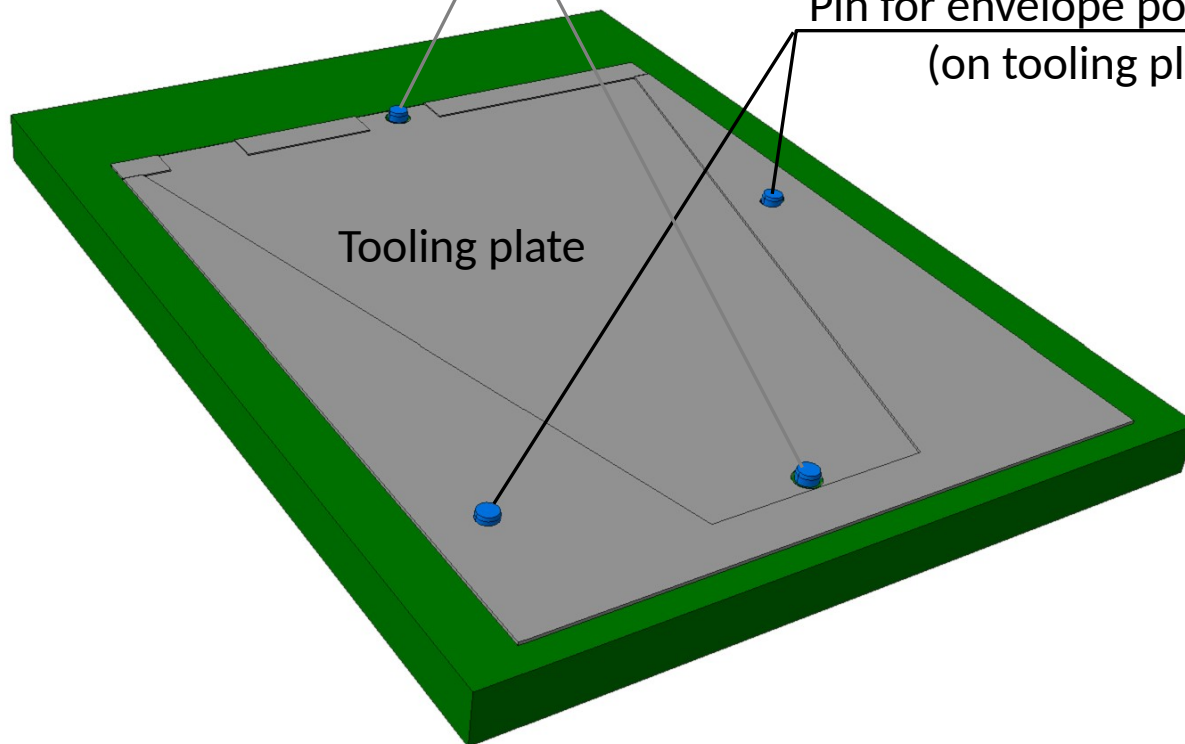


Aida Calorimeter

Tooling for bonding sensor on envelope

Clearance around pins
(Pins: $\text{Ø}4$, Holes $\text{Ø}5$)

Pin for envelope positioning
(on tooling plate)

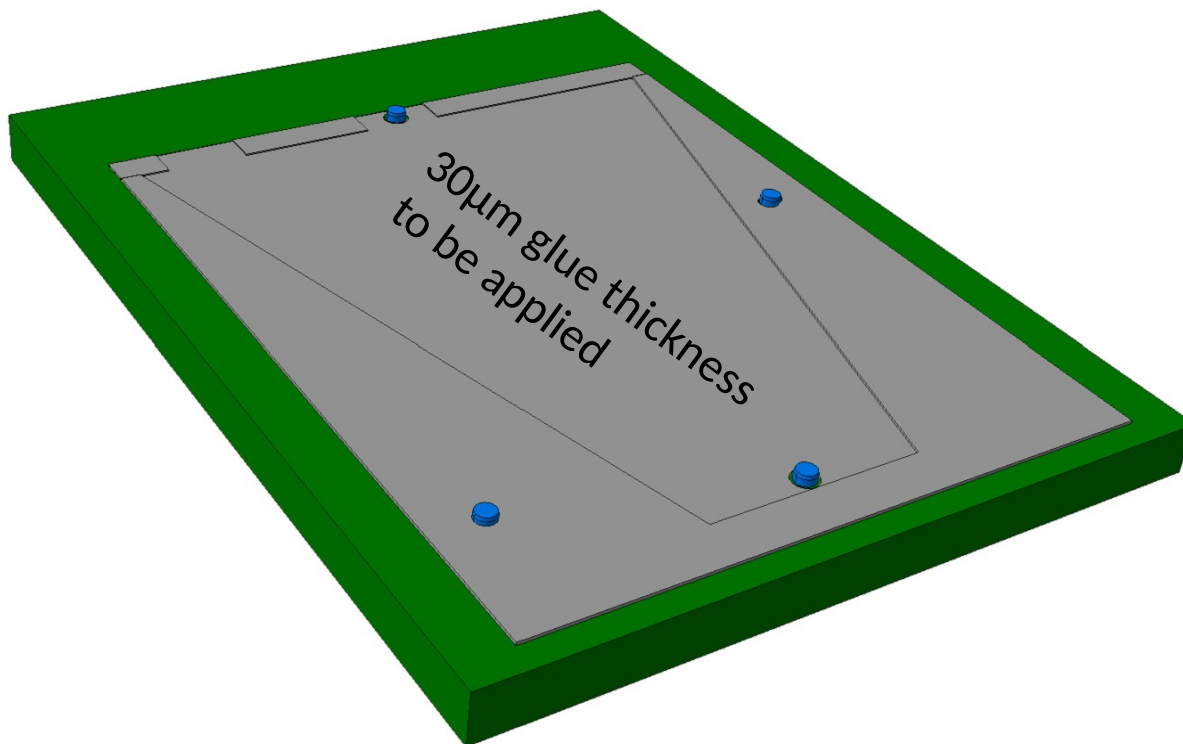


Aida Calorimeter

Tooling for bonding sensor on envelope

Glue application:

- 30 μ m adhesive pad
- Liquid, Thickness adjusted thanks to calibrated wedges. All surface, or glue dots
- Other...



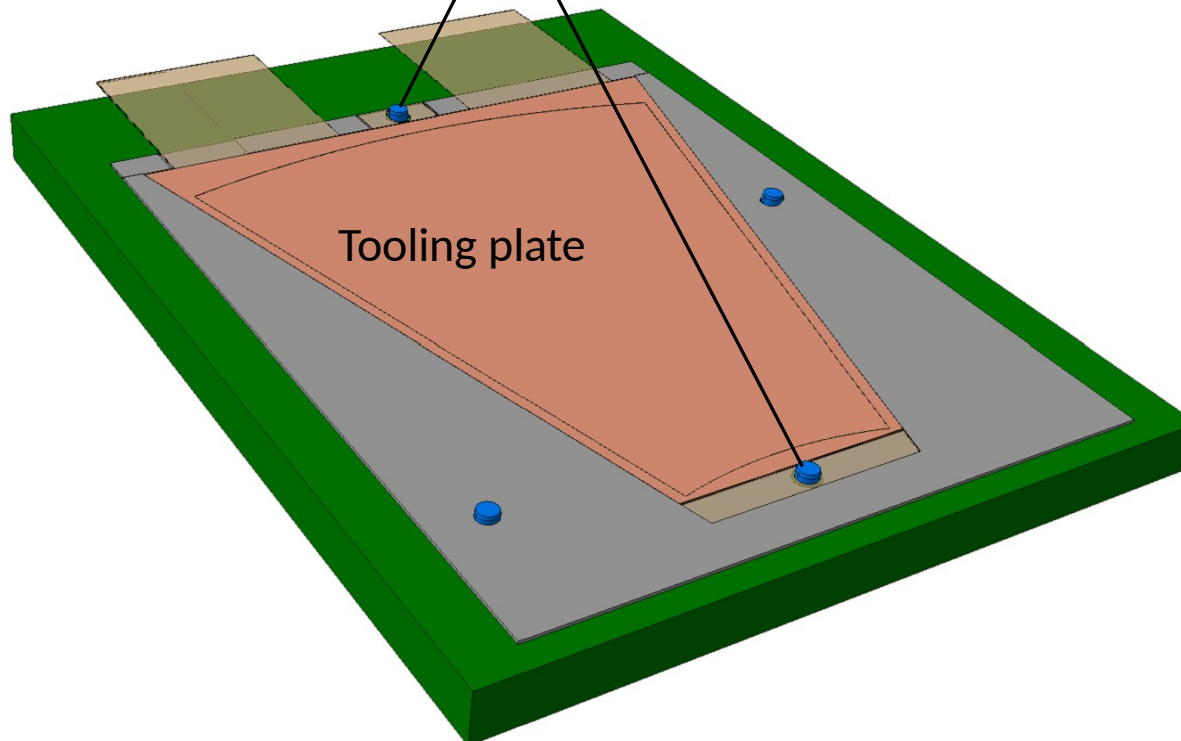
Aida Calorimeter

Tooling for bonding sensor on envelope

What is the pressure we have to applied to guarantee:

- Good sensor bonding
- No risk of sensor failure

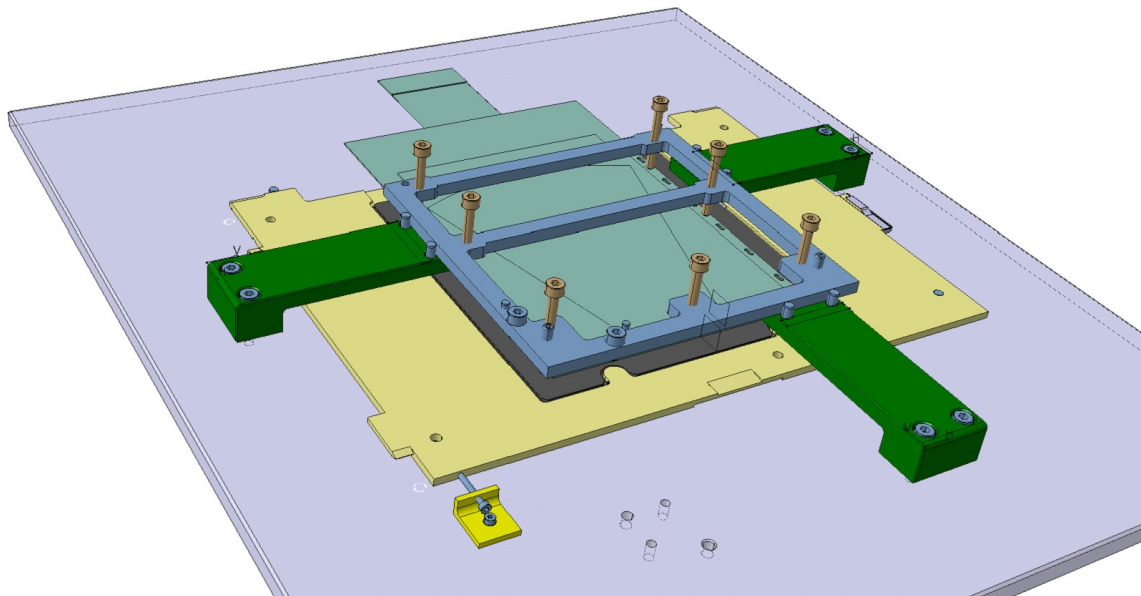
Pin for sensor positioning
(on envelope)



Aida Calorimeter

Next work

We have to think how this electronic device will be bonded on existing tungsten plates: see Thomas design



With the possibility of removing electronic device without damaging tungsten plates

Fake sensors and tungsten

- We produced at TAU “fake” sensors (300 um)
- We produced at CERN 2 “fake” tungsten 140x140 quite flat

Gluing

- Our local expert was at CERN to share knowledge with CERN experts

Kapton HV and fan out



Modified fan out with
panasonic connector

HV

envelope

- Last week, 3D printing : it failed ; the 150 um part was not printed. Polymers engineers are working on the problem. This gave us new design ideas.
- Test with carbon fiber beginning of January

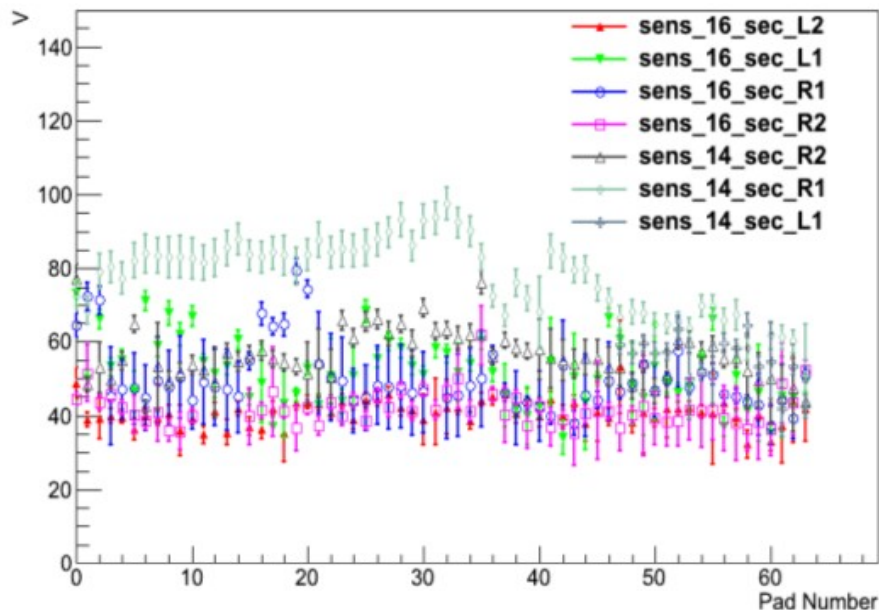
LumiCal sensor characteristics

From the measured characteristics we can extract information on the quality and uniformity of the sensor tile.

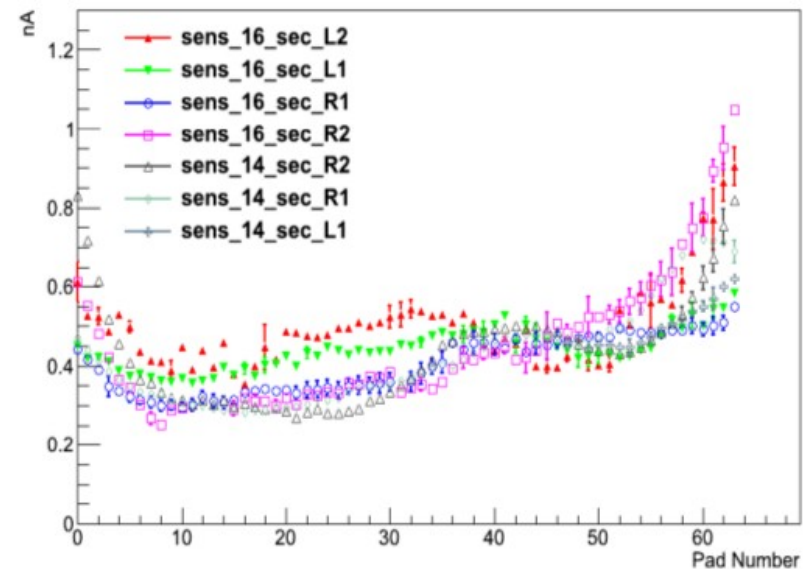
The IV measurement displays the height of the dark current.

CV measurement allows to extract the depletion voltage and the resistivity in a particular pad.

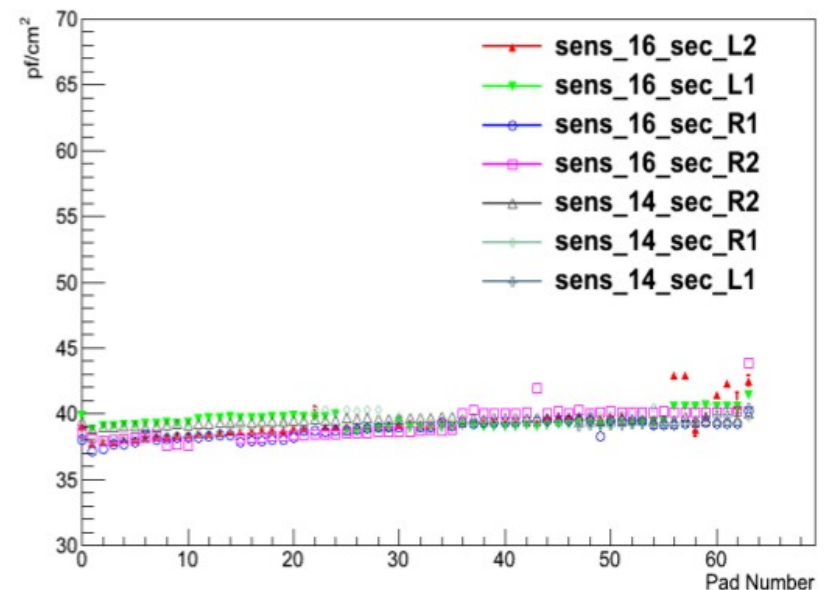
Depletion Voltage



Current



Capacitance over Pad Area



Sensors

- Started contact with Tower
- We sent them the drawing and specs of the actual sensors
- We still need some details and then we will be able to get a quote if we want to produce similar sensors
- Start discussion about edgeless sensors

conclusion

- The board for the new electronic is ready and will be tested next week
- The sub millimeter wedge prototype is well advanced and the gluing of a fake wedge (tungstene+ envelope+ fan out + sensor+HV) foreseen at CERN during the CLICpd week (CERN will provide us a clean room and advices of gluing experts)
- Discussion about actual and futur sensors started with Tower