Update on:
a) tungsten plates – IFIC
b) sensors - IFIC

A. Irles, C. Orero **on behalf the AITANA LUXE group**

AITANA group at IFIC – CSIC/UV

MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES
CSIC Consejo Superior de Investigaciones Científicas
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IFIC Institut de Física Corpuscular
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Agencia Estatal de Investigación
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a) Tungsten plates - IFIC

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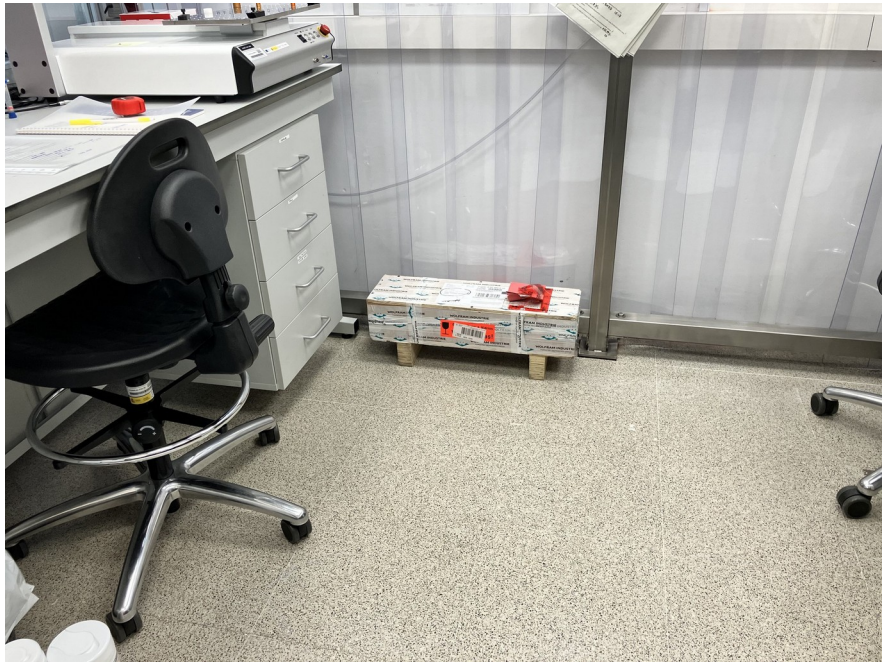
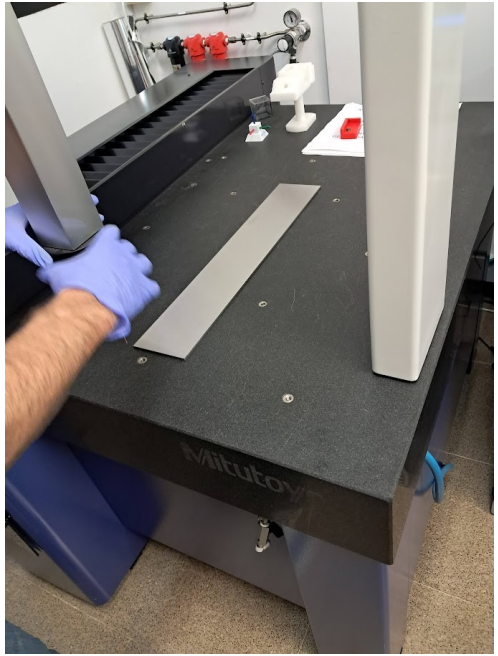
4 Tungsten plates at IFIC (from Wolfram)





metrology

- We did measurements **only to one plate**

- **Question about notation:**
  - How do we call them? N7, N8, N9, N10
  - I would add a “VLC” or “IFIC” somewhere, same for the others. In 10 years, this sufix may help a lot when doing “archeology” researches
  - We also need to find a way to label them, physically.

Thickness measurement

2 different methods:

- Digital micrometer-tool
  - 28 measurements around the edged of the plate

MIN	3506	um
MAX	3536	um
MAX-MIN	30	um
MEDIA	3519	um
DESV	8,00	um

- Manual CMM-station
  - 26 measurements around the edges too

Plane	N points	Flatness (mm)
Tungsten plate 1 TOP	26	0.0509
GRANIT TABLE	4	0.0005

Distance between planes: 3.5316 mm

3.519 mm

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Compatible results.
The planarity in a flat surface is ~51um
Only few points per method.

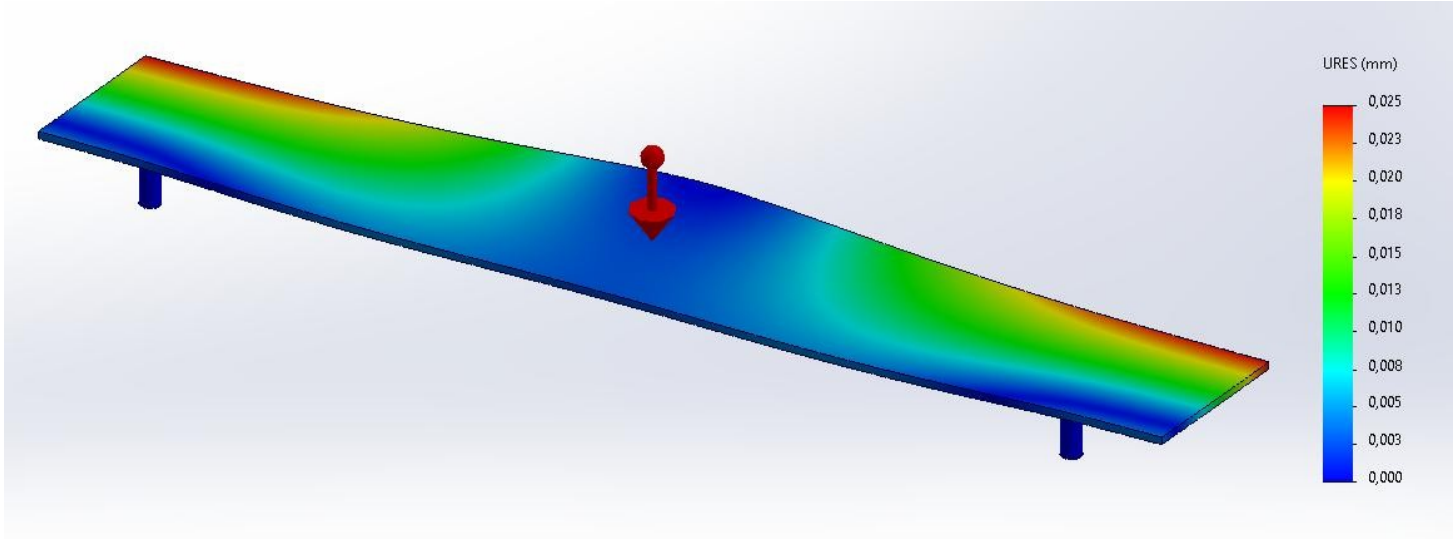
Planarity in a flat surface?

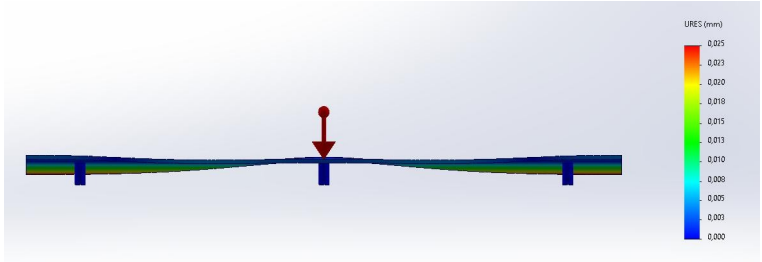
- If the plate is in a flat surface, the plate itself will flatten due to its weight. Planarity will be always over-estimated.

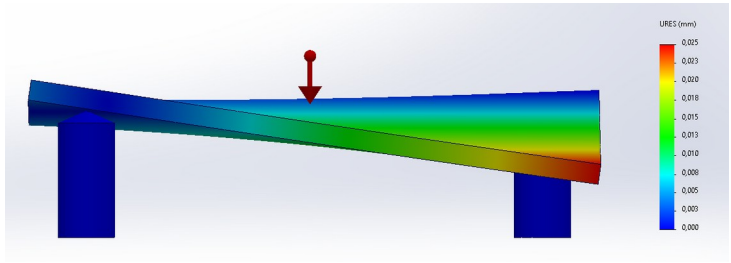
- Replicating Warsaw's methodology is not trivial for us
  - Vertical positioning requires some specific tools (we can work this solution)
  - Our mechanical CMM is manual → we cannot automatize the grid as Warsaw.

- Alternative approach?
  - Measure it in a mode that minimizes deformations by gravitation/weight.

3 point support

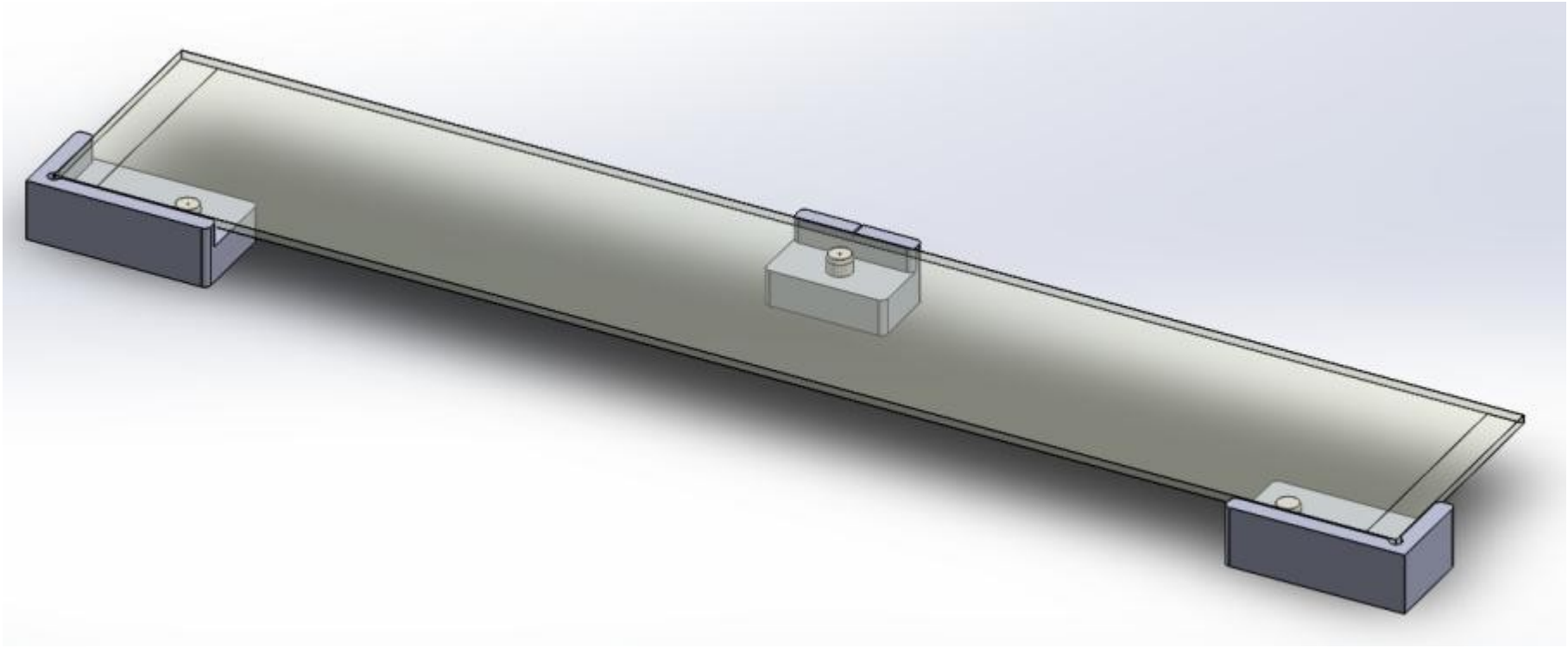






Using this kind of setup, gravity will only influence in max 25um

3 point support



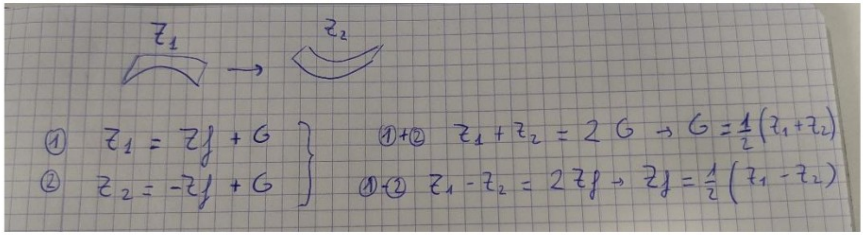
Using this kind of setup, gravity will only influence in max 25um

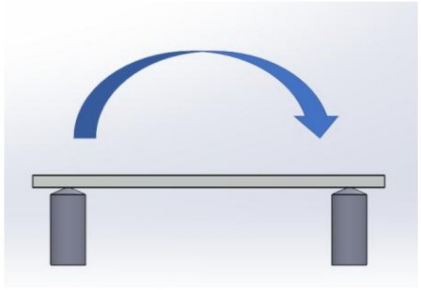
3 point support

Using this kind of setup, gravity will only influence in max 25um

Still, to disentangle the weight deformation, Carlos set-up a procedure of measuring the plate after a flip.

- Z1 and Z2 (flipped 180° over long axis) are the surfaces measured in the CMM.
- Zf is the real shape of the tungsten plate without the gravity sag.
- G is the deformation shape caused by gravity.





Long-story short

RESULTS

3 points support					
	Z1	Z2	Z2_flipped	Shape – real shape without gravity effects	G – gravity induced shape
PV	469	497	497	251	299
PV RMS	95	98	98	67	70
LS PV	248	257	257	252	15
LS PV RMS	65	68	68	67	3
MZ flatness	235	242	242	237	14
					All units: um

Lets look only to one estimator:

MZ =minimum zone flatness *representing the smallest possible distance between two parallel planes that completely enclose all measured points on a surface. It directly reflects the actual form error, but it's sensitive to outliers.*

The plates are not flat ! 237um flatness... well out of specs

however... can this be corrected with the mechanical housing of the ECALp ?

Conclusions

- At IFIC we do not have the means to measure the tungsten plates reproducing the setup used by our Polish colleagues, which objectively is the best way to measure because it is the orientation in which the plate is mounted in the detector.
- Carlos would like to improve our setup using ball bearings, but he does not expect much improvement in the quality of the measures.
- Carlos is working on measuring the tungsten plate in a "vertical" position, as the Polish setup, but it will take me some time. – *(Adrian – is it needed? See bellow)*
- **Preliminary results show that IFIC tungsten plate N1 is not in specification for flatness but its thickness is.**

My personal take (Adrián) -

- **We (IFIC) are good at measuring flatness**... but in a **configuration** that is **not** similar to the **ECALp** configuration and we **cannot compare directly with Warsaw**.
- **Thickness measurements are more** accessible... but still in manual way. I propose that we do this at IFIC, for a simple validation, and we leave the rest to Warsaw.
- **I am not sure anymore that we can do the metrology of the "old" tungsten** plates more precisely than what is already done by Warsaw.

b) Sensors

I propose to leave this discussion to the end or next time

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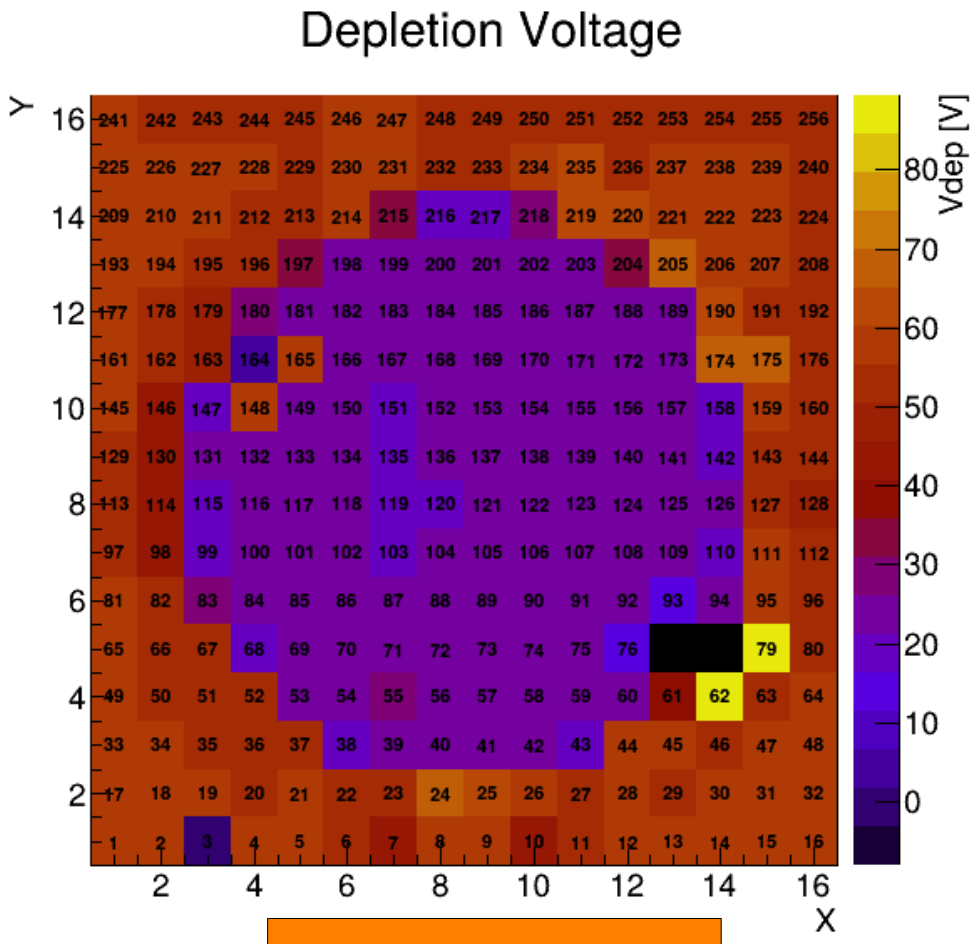
Summary

- We are currently characterizing the 500um sensors of CALICE (ECALe)
- Most sensors are okay, in specs.
  - Sensors from the same batch, aquired by IFIC, LLR, IJCLab, Toky in 2021

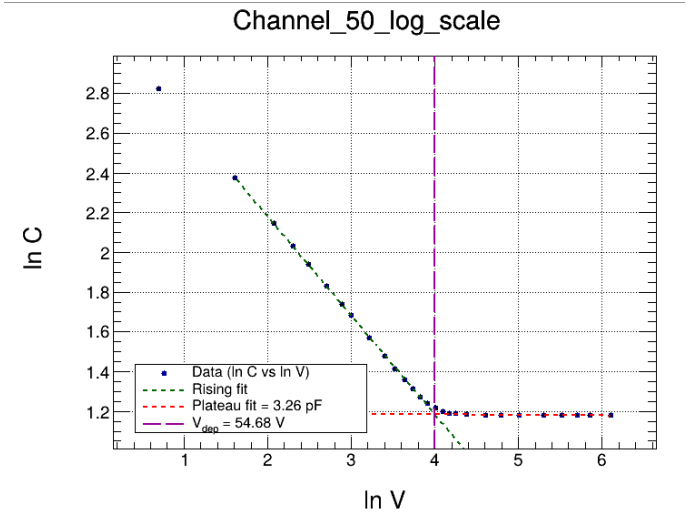
- However, we found ONE very strange sensor. Discussions with experts already started.
- The sensor shows very different pattern and curves in the pads in the center. With small capacitance and negative leakage currents at low values of V.
  - At high values, the current and capacitance seems okay.
  - Issues on the electronics have been discarded.

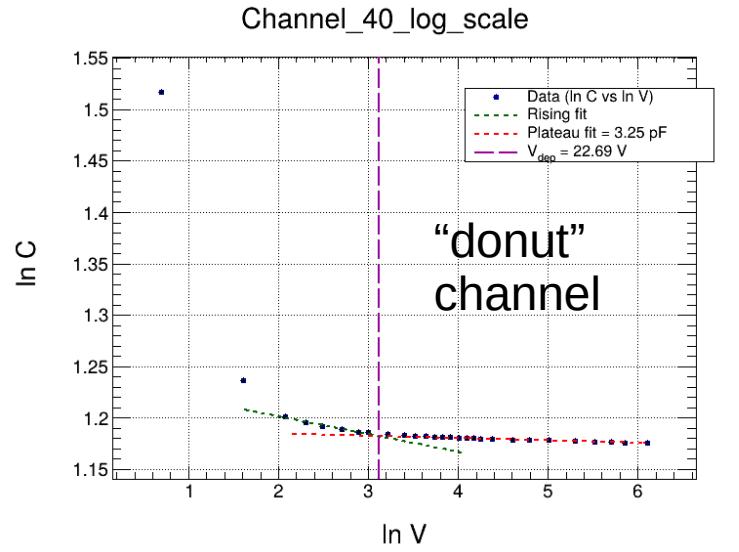
- **Testing all 90 sensors was (even more clear) a good move! :D**

Sensor 95

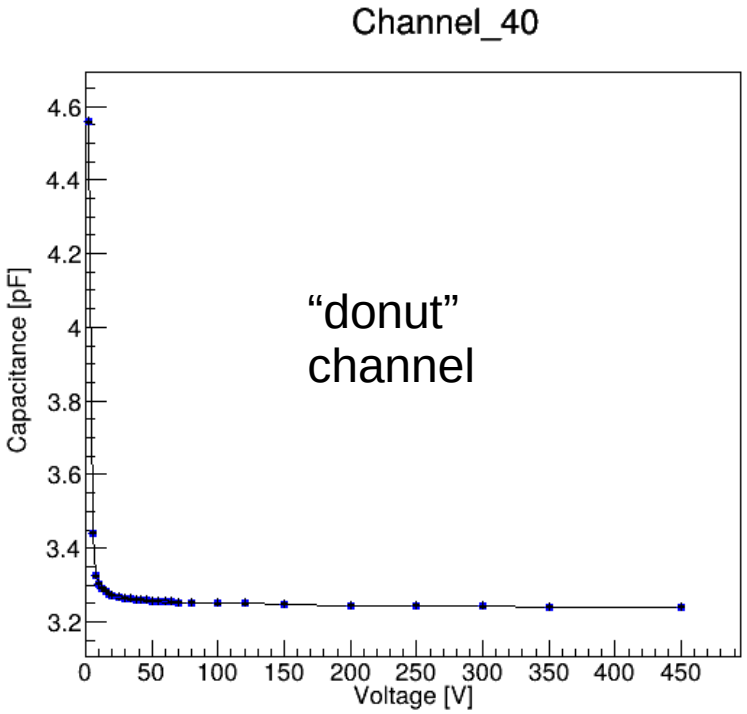


What is this donut!??

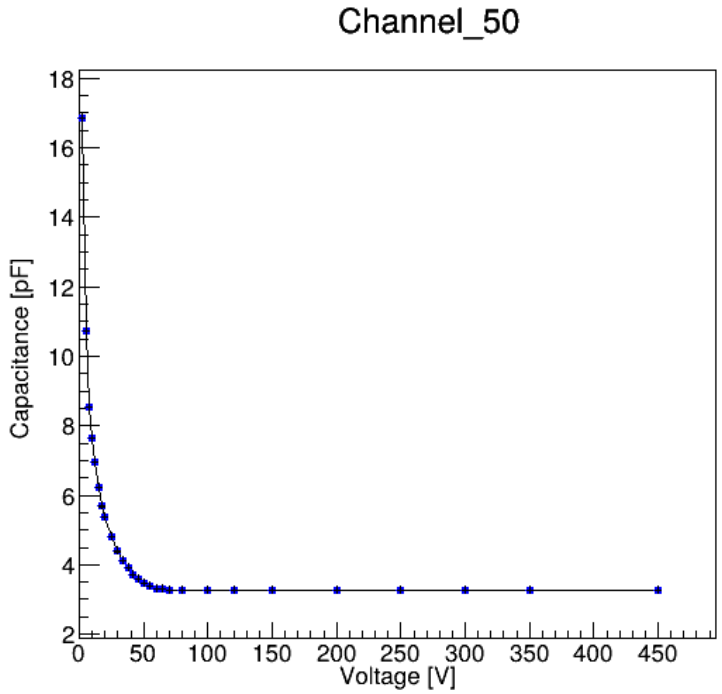




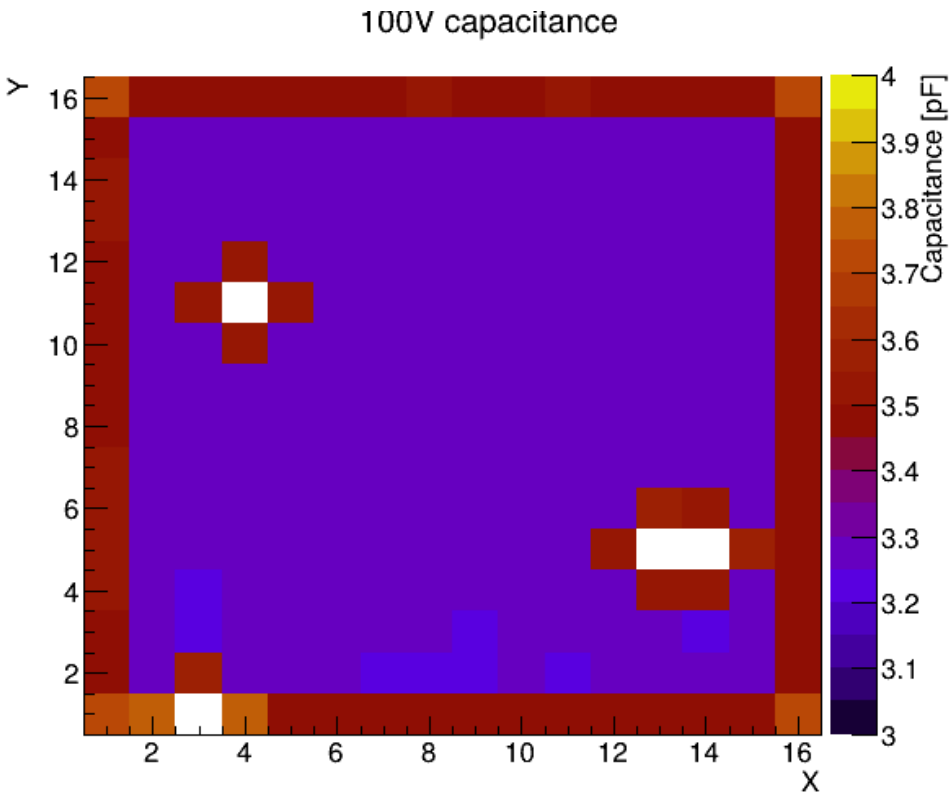
Sensor 95

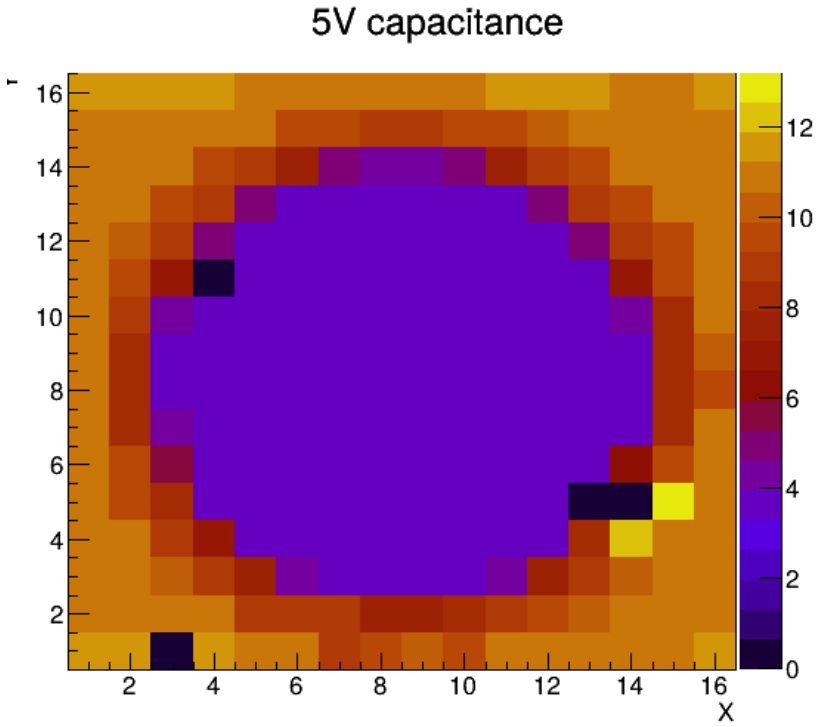


“donut” channel



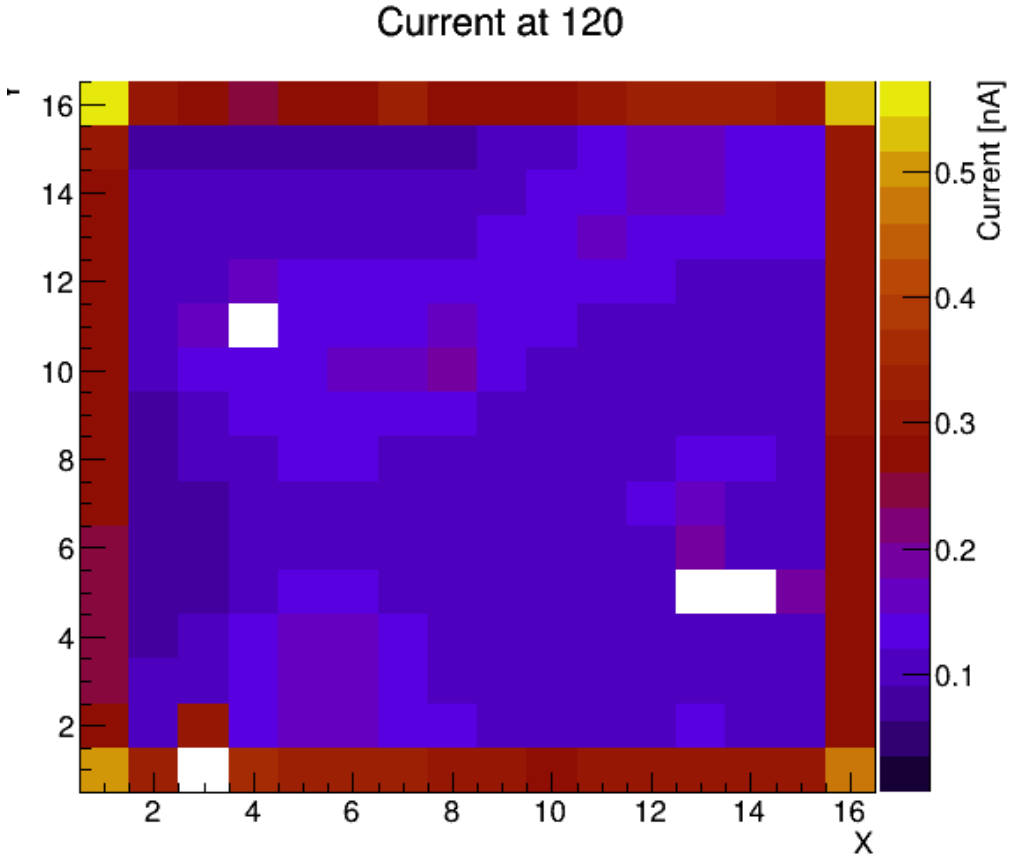
Sensor 95 – capacitance at high and Low V

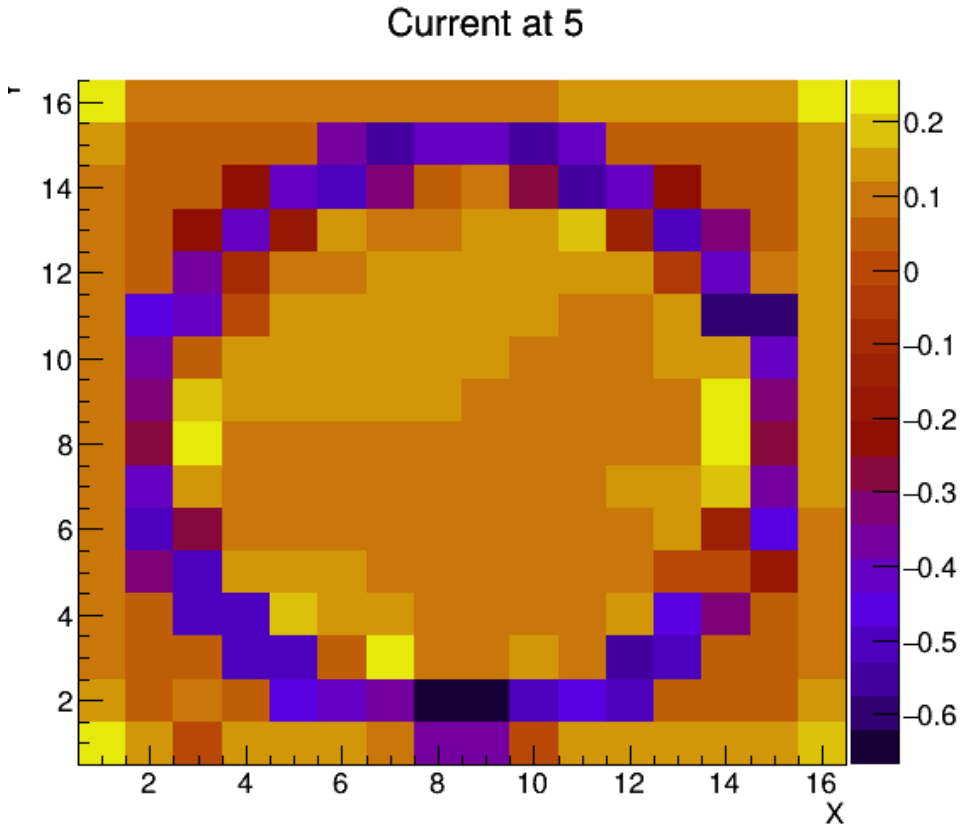




(pF bor both)

Sensor 95 – current at high and Low V





Both in nA

What is this ring!??

Sensor 95 – current at high and Low V