ECALp
CSIS-Assembly

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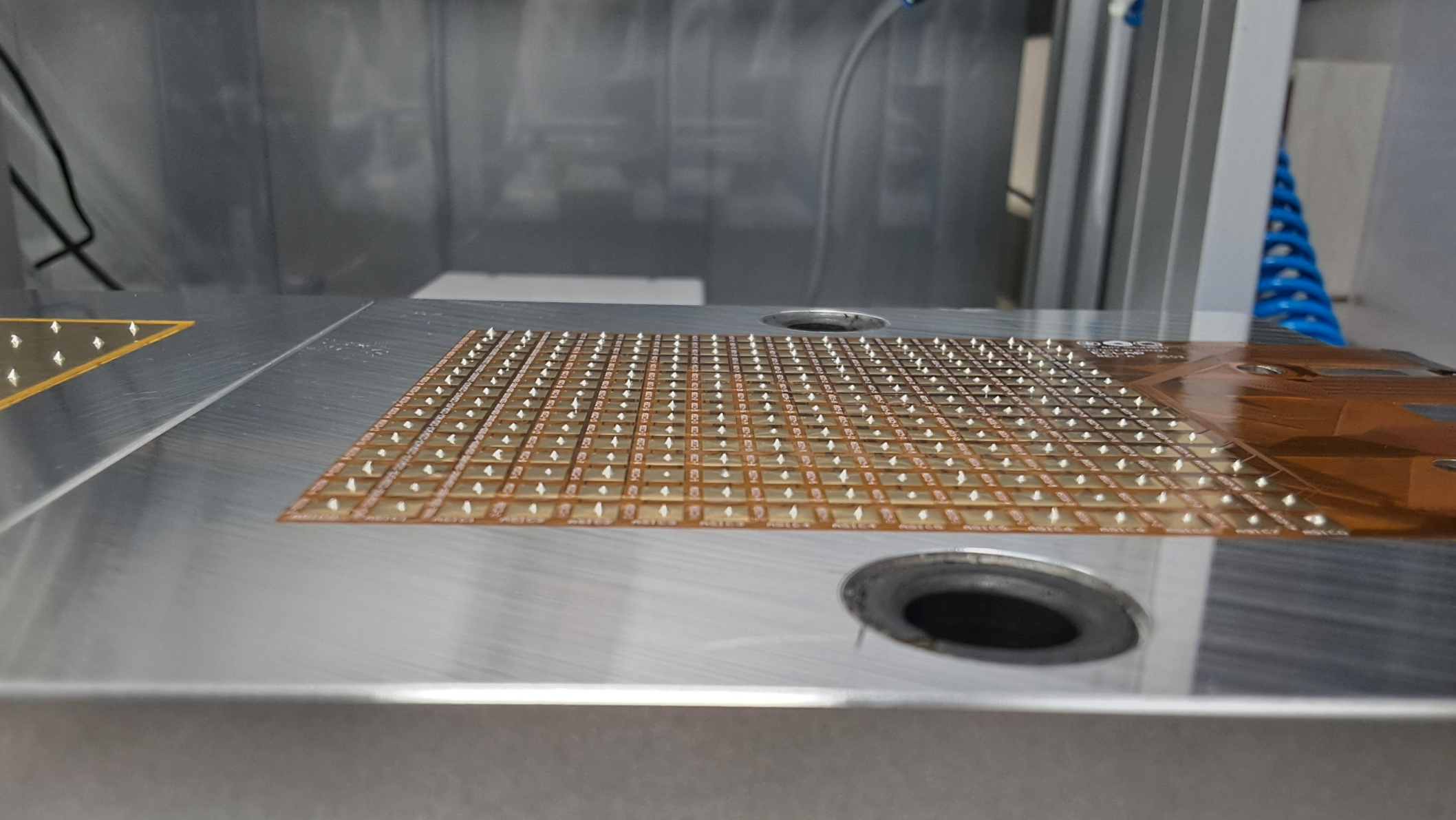
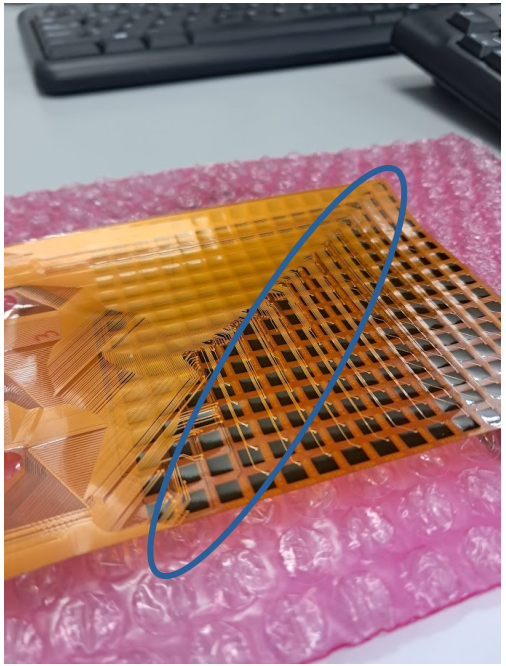
***AITANA group at IFIC – CSIC/UV**

AGENCIA ESTATAL DE INVESTIGACIÓN
GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES
Financiado por la Unión Europea NextGenerationEU
Plan de Recuperación, Transformación y Resiliencia
GENERALITAT VALENCIANA
GVANEXT Fondos Next Generation en la Comunitat Valenciana
Gen—T
AITANA



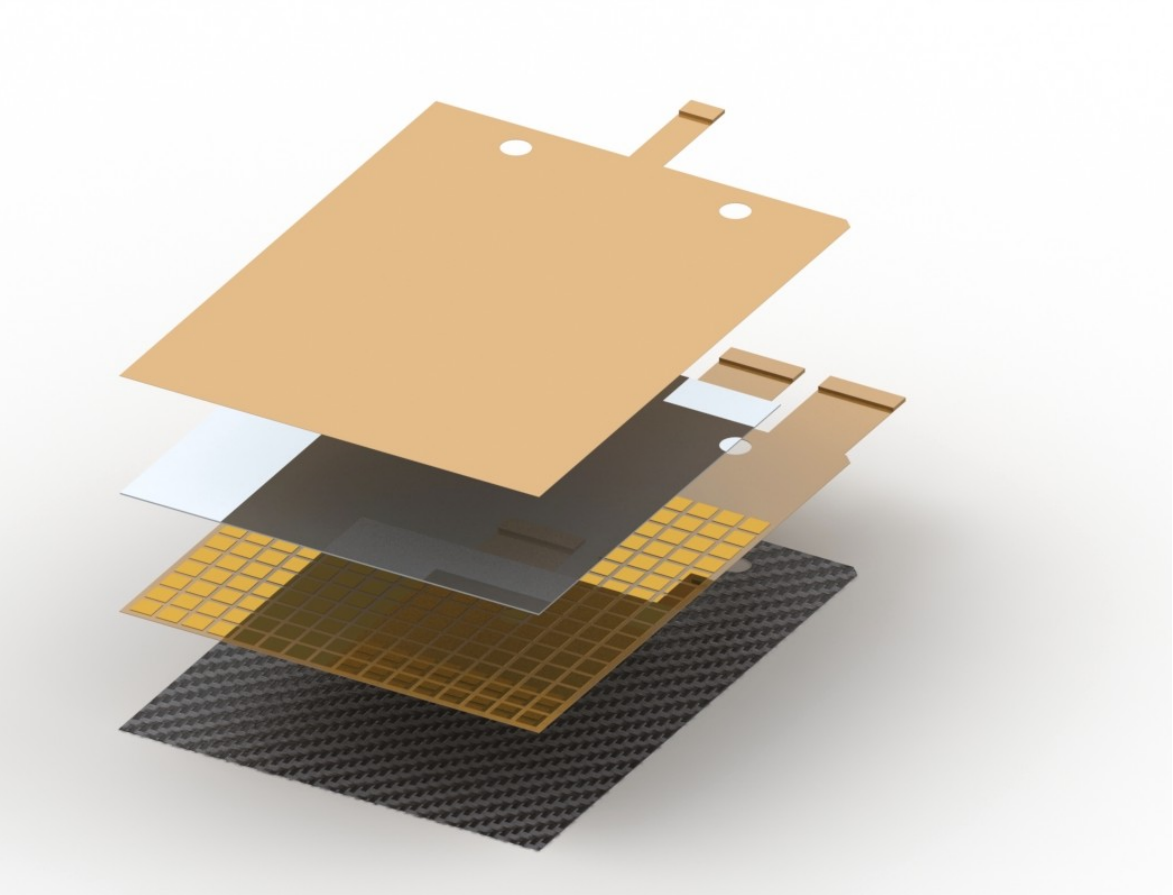
Thickness “budget”

- **CF: 225um +-10um**
- **Fanout:** 115-135um
  - depends on the “accumulation” of routing lines
- **Sensor:** 320um
- **HV kapton:** 55-60um
- **Total (with no glue layers) = 715-760um**



- Notes:
  - the siliconne layer thickness cannot be improved with “manual” pressure because we do this step at the end, with sensors attached
  - Thin double tape can be a possibility for replacement of the siliconne (under study)

CSIS: Compact Silicon Sandwich



CSIS: Compact Silicon Sandwich

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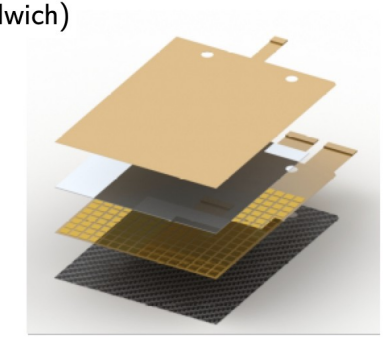
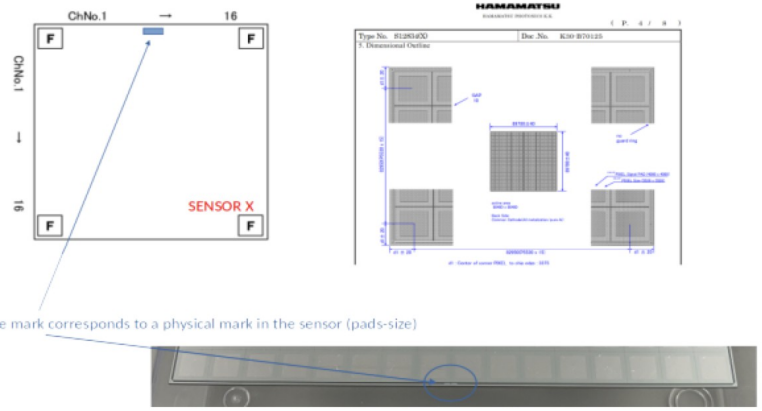
CSIS Architecture

CSIS (Compact Silicon Sandwich)





The blue mark of the drawing goes in the side nearest to the connectors

Inventory – available at IFIC

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- **Sensors – characterized-**
  - **20 from TAU are in the dry cabinet** **OK**
  - In the process of been cleaned. **– ongoing – we clean every batch that we need**
- **Adhesive – OK**
  - Different types of conductive glue + non-conductive
- **CF**
  - ~15 low quality CF (made by ClipCarbono – being used for tests)
  - **20 better quality CF** (made by ClipCarbono but machined by WorkShape (FR) **– OK**

Inventory – available at IFIC

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Signal Fanouts

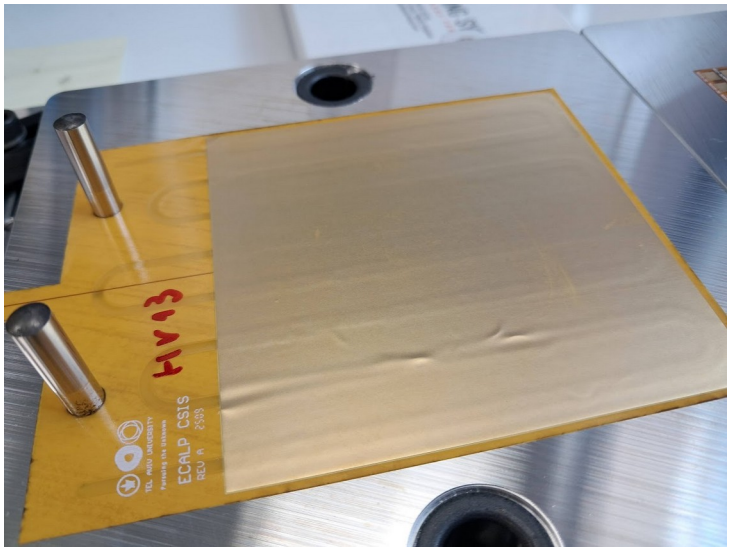
- **8 FO kaptons with connectors:** **Not OK** (but 20 more are in production by TAU)
- + 2 in Krakow
- + 2 used for CF glue tests
- +7 being used for glueing/curing/deformation studies tests today and tomorrow

HV kaptons Fanouts

- **15 HV kaptons with connectors:** **Almost OK** (but 20 more are in production by TAU)
- 5 being used in tests

NOTE, 6/8 FO have been used for current CSIS production already (see last slides)

2 more may be recoverable



Gluing

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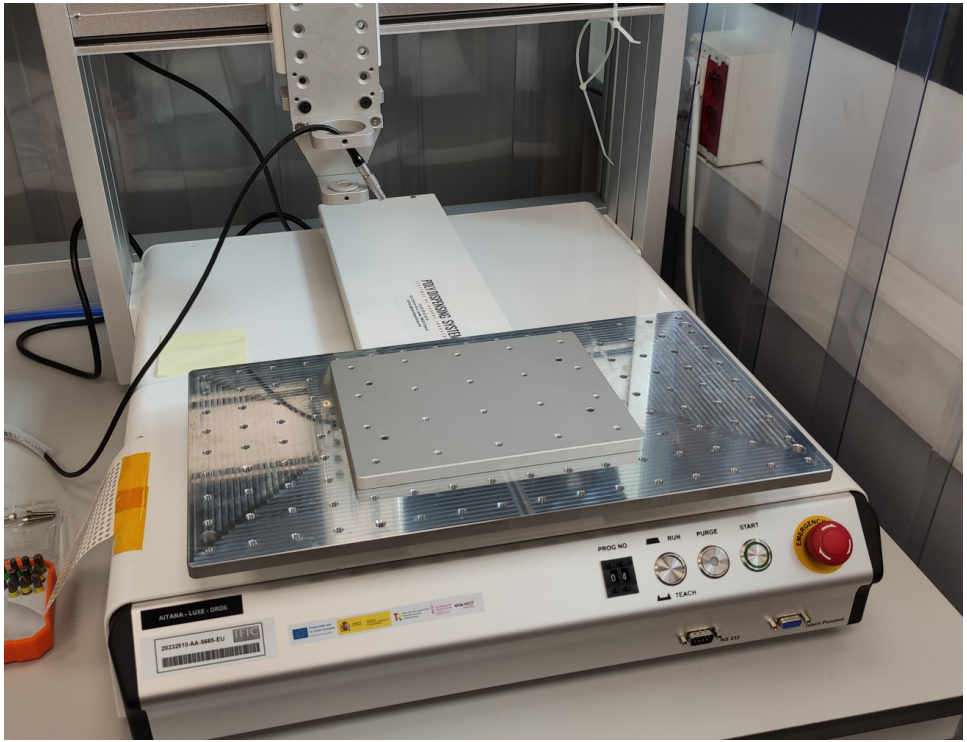
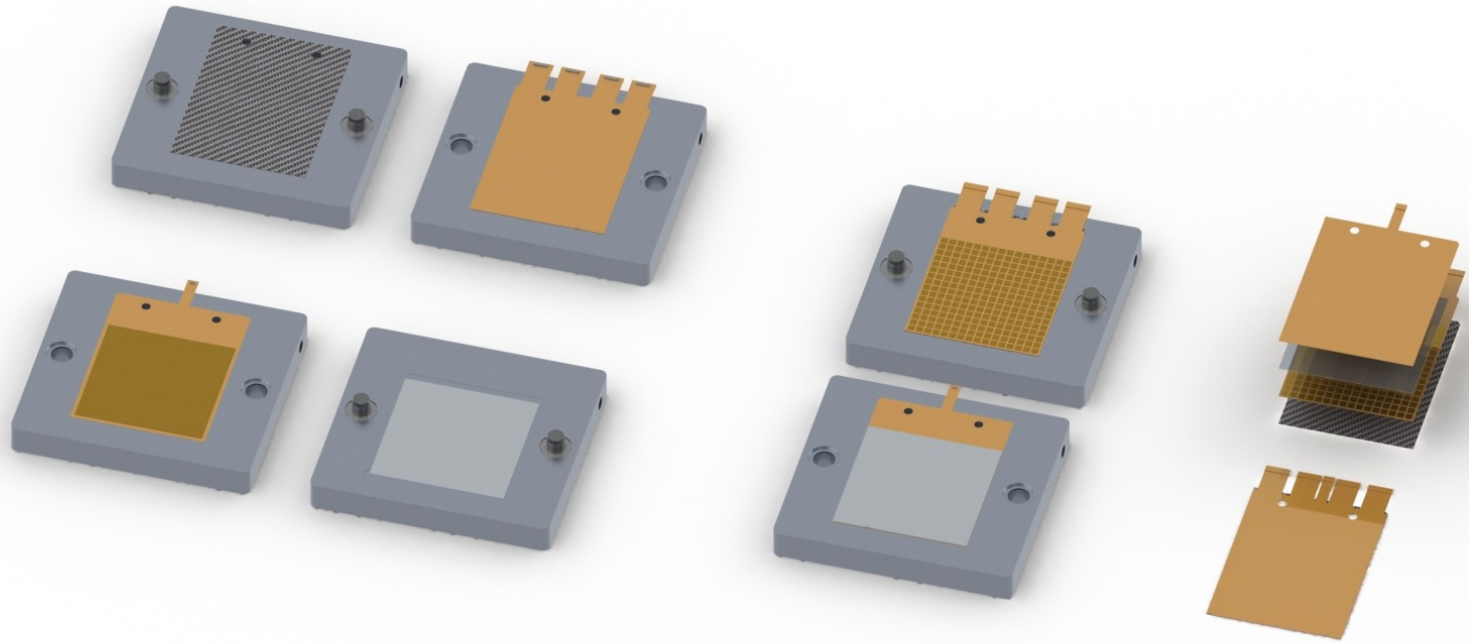
Glue mixing tooling



3d programable robot - PDS400

Sequential procedure - obsolete



CF gluing was planned as the first step – to strengthen the mechanical robusteness of the CSIS

Obsolete: why? Because the step of curing at high temperatures with the FO+CF glued, created high mechanical tensions → high deformations

Curing tests with real FOs

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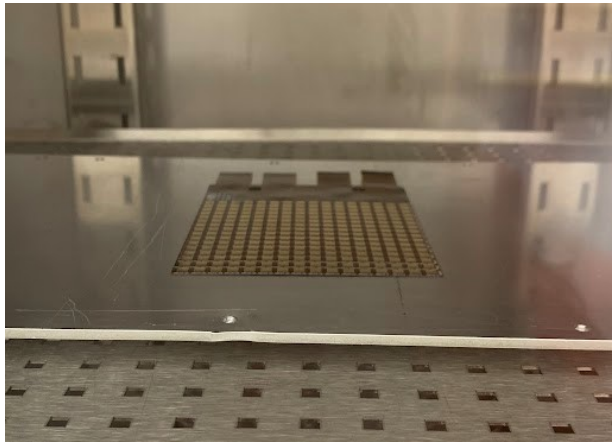
- Beginning of May tests (CF+real Fanout using siliconne glue)

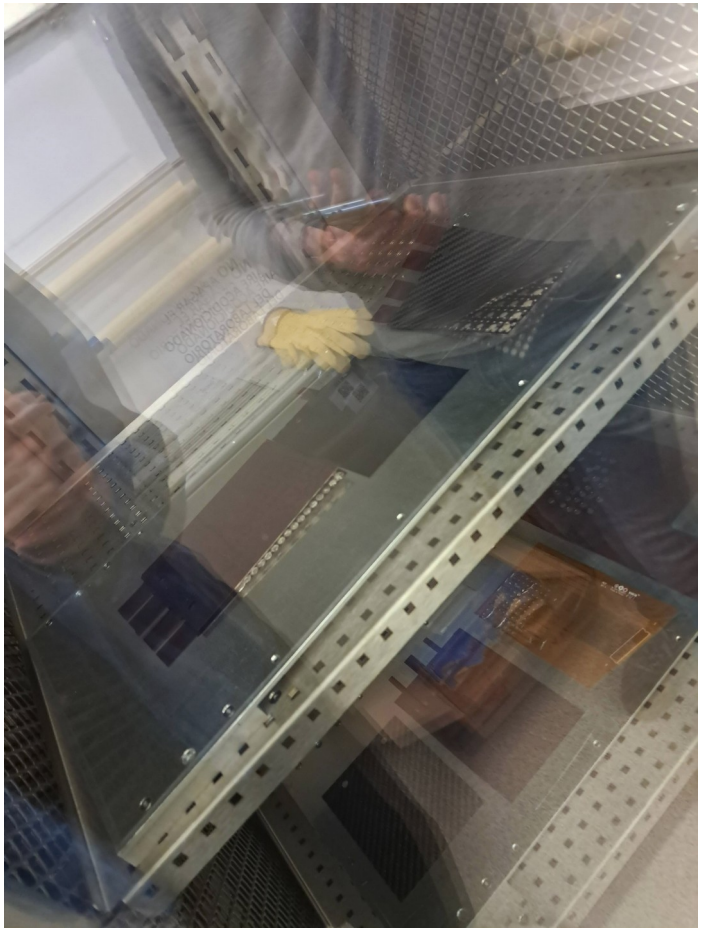


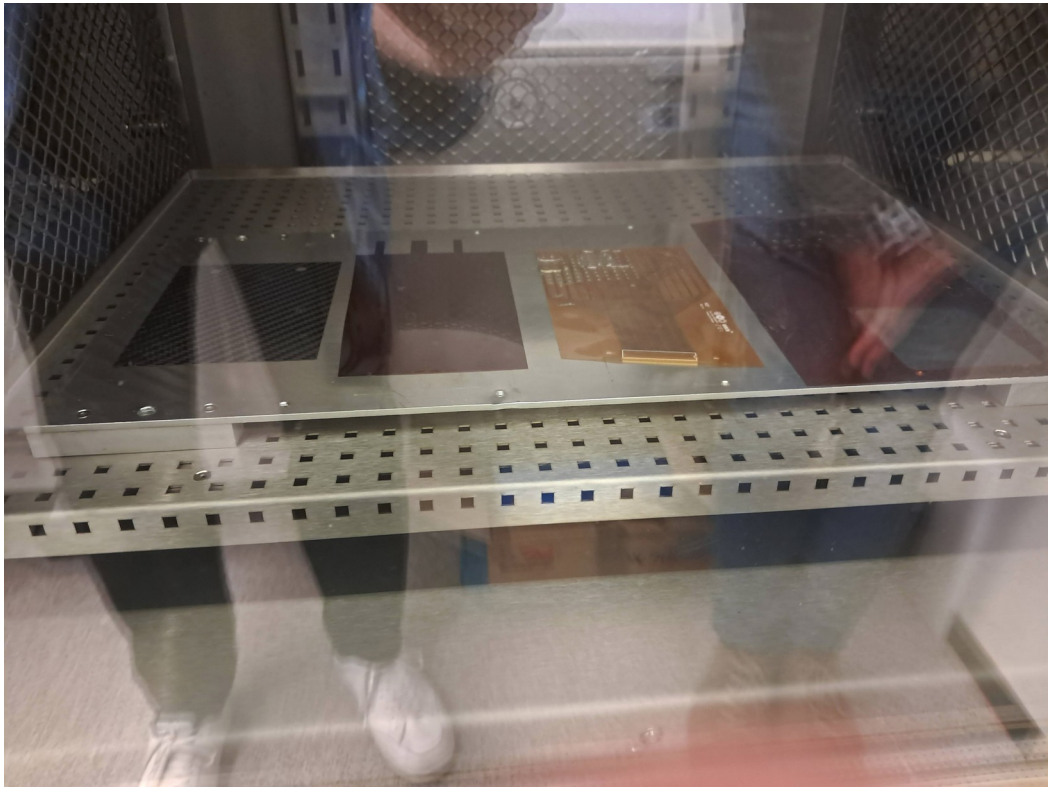
before curing

During curing

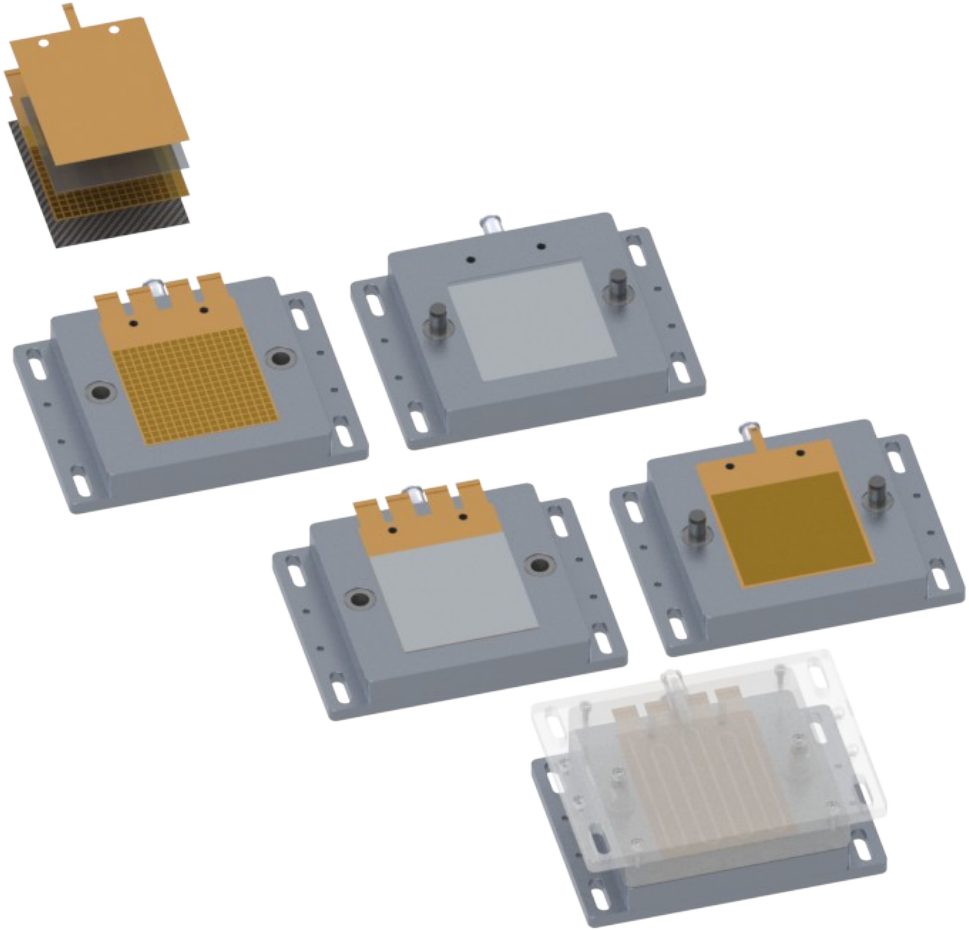
- **All previous tests were done with smaller fanouts and/or inside the jigs.**

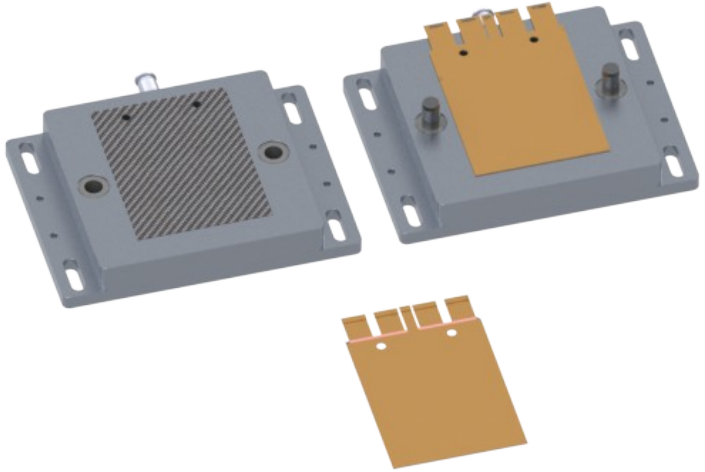
More curing tests





Sequential procedure - NEW





Now the CF is glued only at the end.

We cure the H20E glue (HV+FO) inside the jigs → slows down the process by a lot.

Tooling

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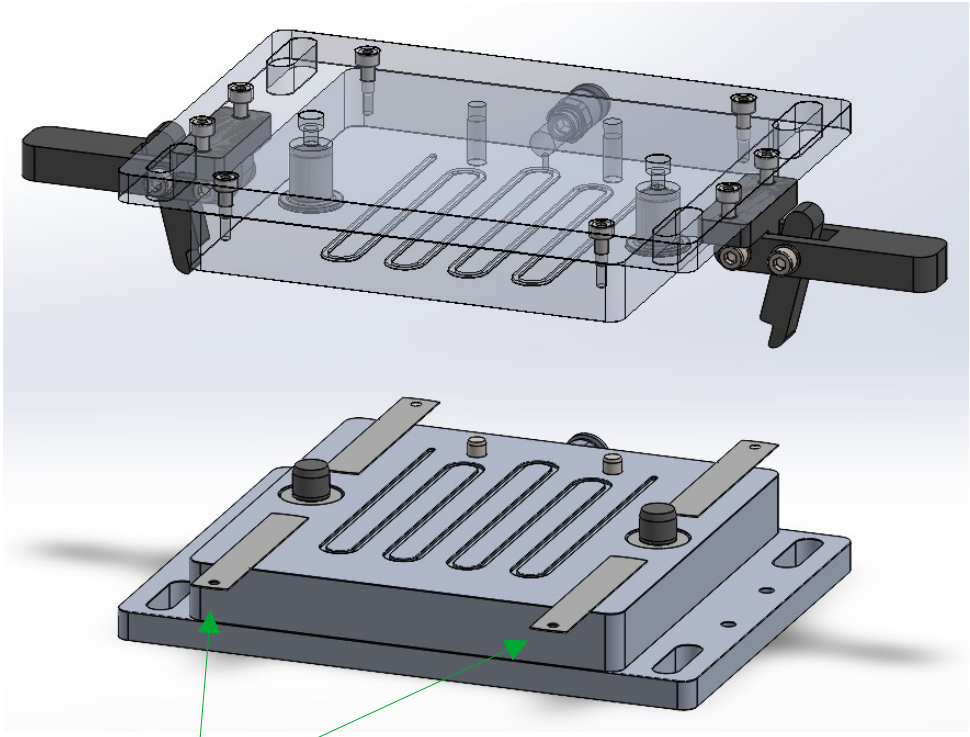
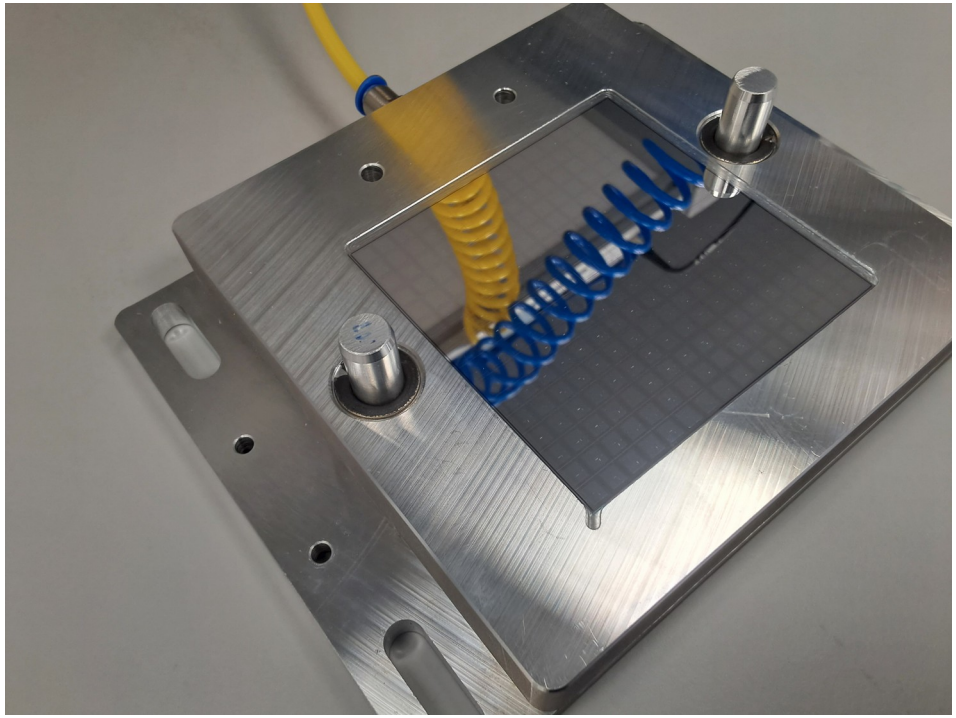
- Jigs and tooling manufactured at IFIC

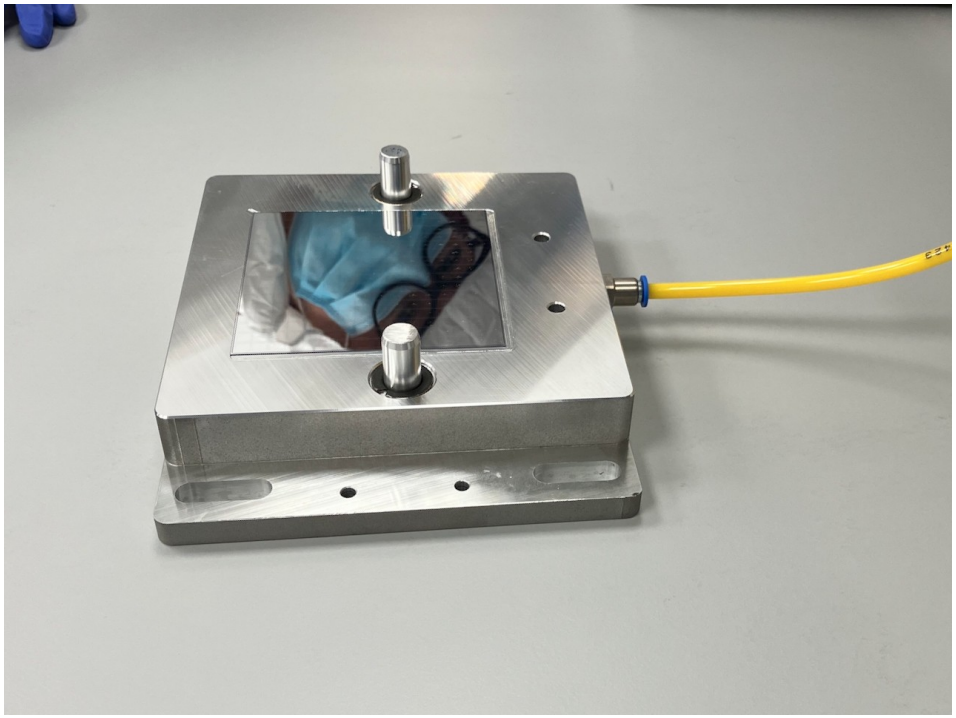


No feeler gauges used for current production → only the weight of the jigs

Tooling

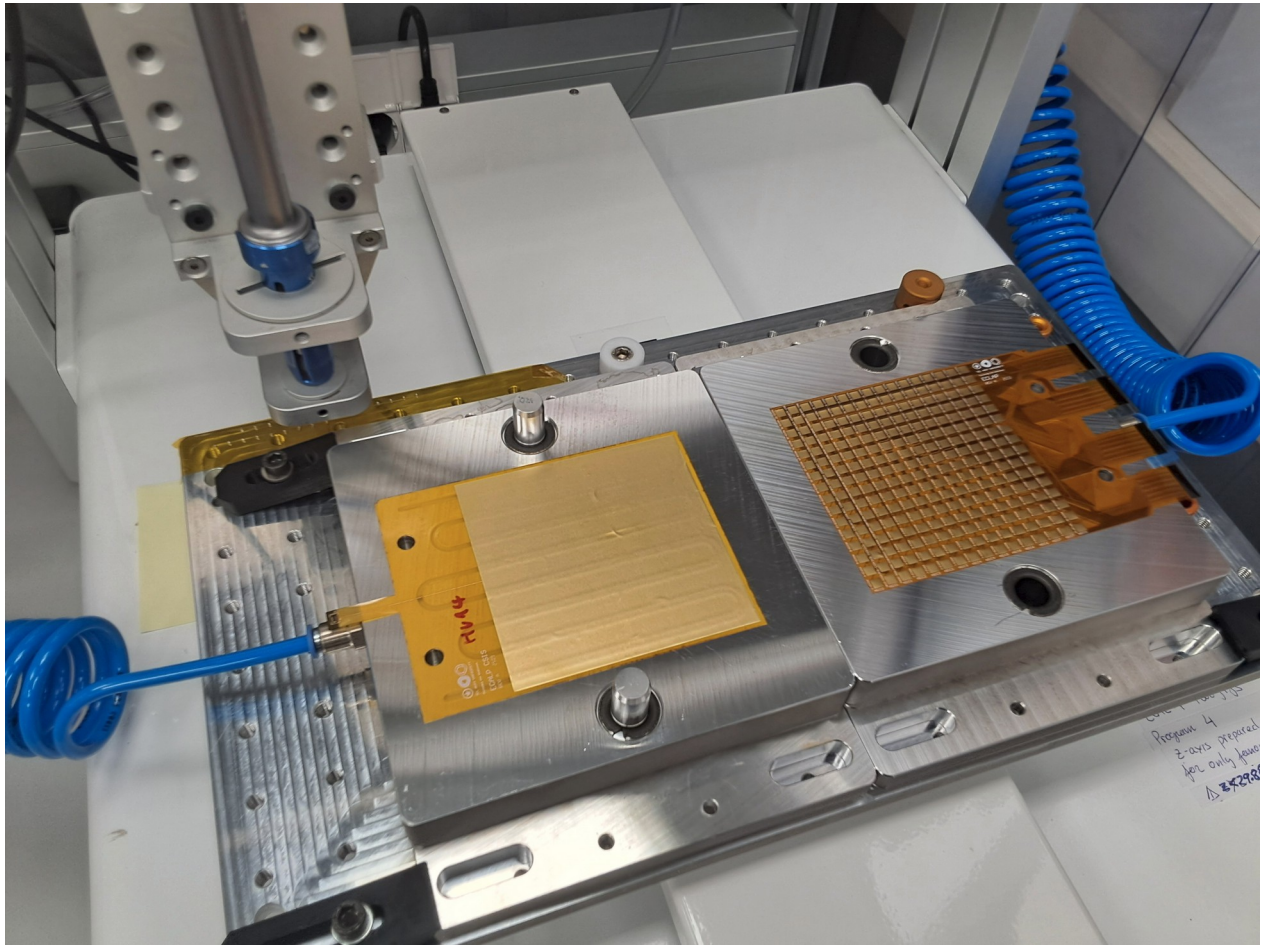
- Jigs and tooling manufactured at IFIC





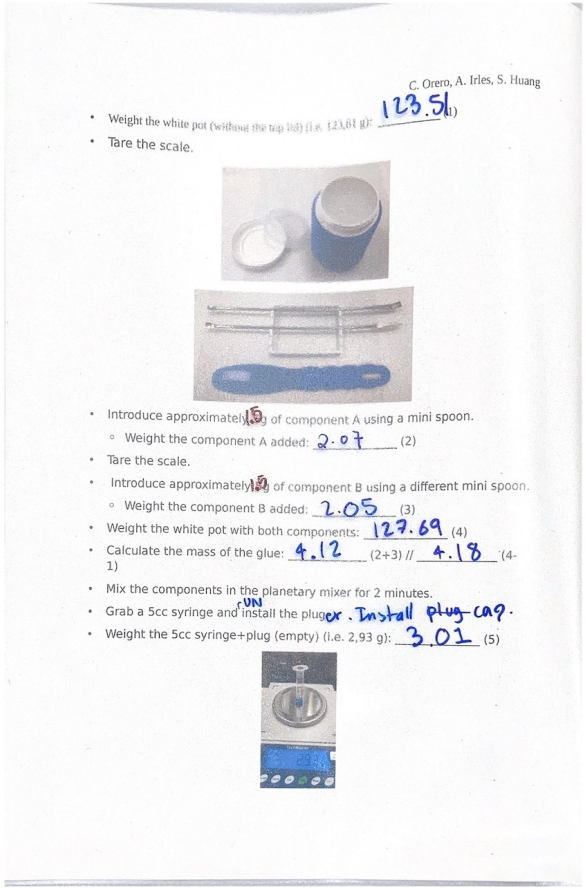
Tooling

- Jigs and tooling manufactured at IFIC



Glue mixing

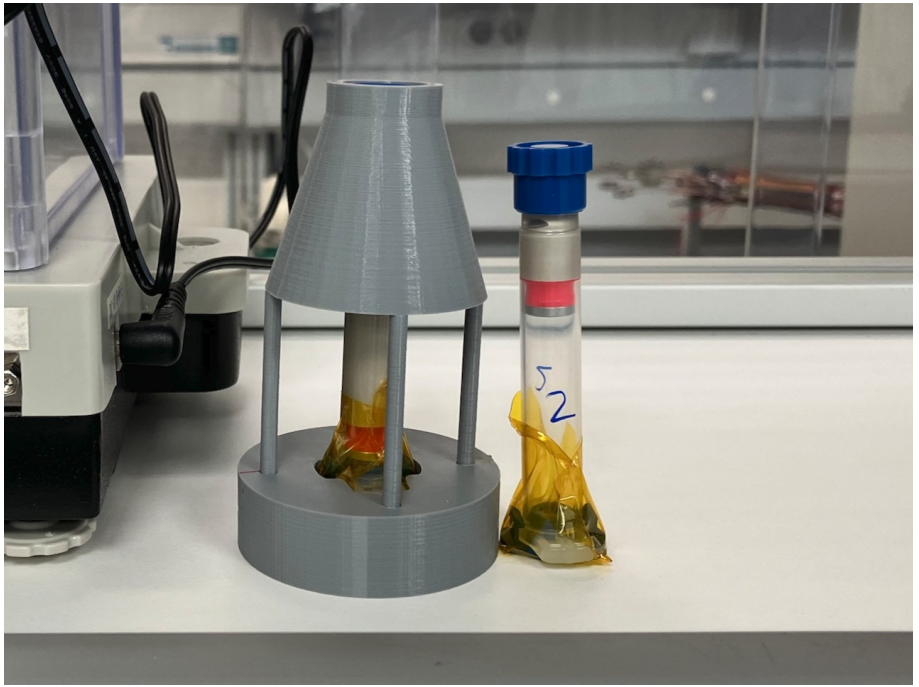
- Glue preparation (of small doses!) is an art – which has been mastered by the team



C. Orero, A. Irles, S. Huang

- Weight the white pot (without the top lid) (i.e. 123,61 g): 123.5 (1)
- Tare the scale.

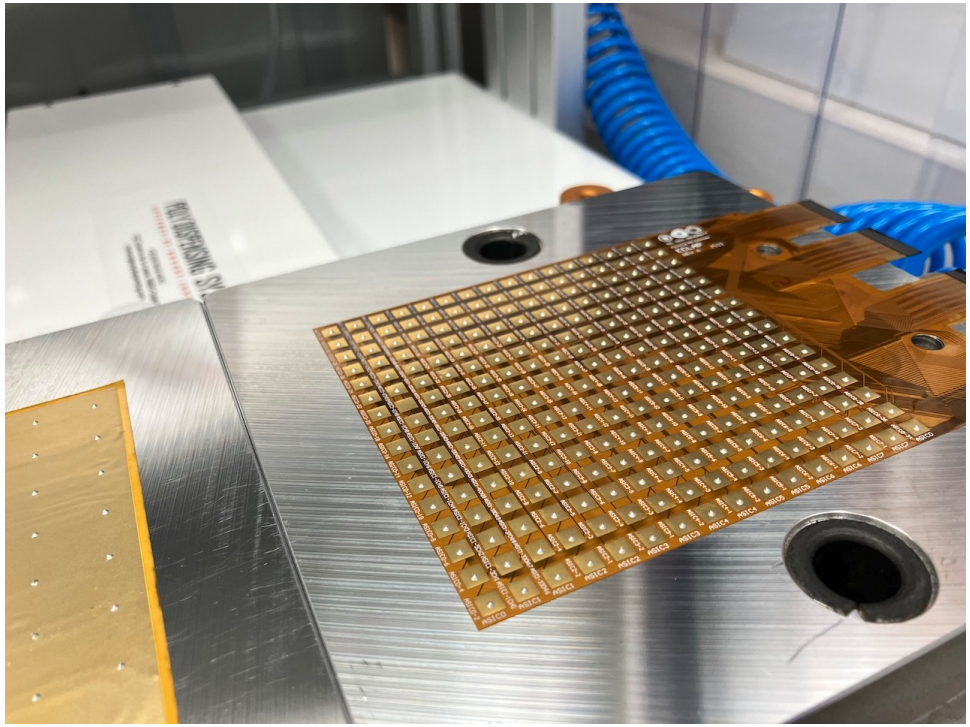
- Introduce approximately 15 g of component A using a mini spoon.
  - Weight the component A added: 2.07 (2)
- Tare the scale.
- Introduce approximately 15 g of component B using a different mini spoon.
  - Weight the component B added: 2.05 (3)
- Weight the white pot with both components: 127.69 (4)
- Calculate the mass of the glue: 4.12 (2+3) // 4.18 (4-1)
- Mix the components in the planetary mixer for 2 minutes.
- Grab a 5cc syringe and RUN install the plug or. Install plug-cap.
- Weight the 5cc syringe+plug (empty) (i.e. 2,93 g): 3.01 (5)

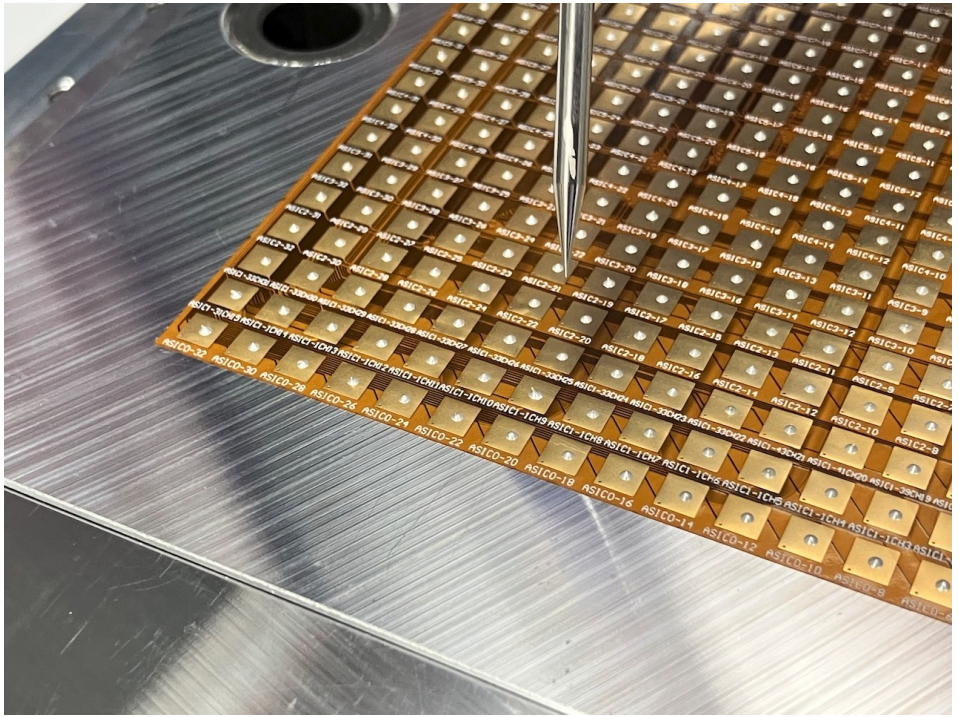


Glue mixing

Glue preparation (of small doses!) is an art – mastered by the Carlos and Melissa (others in the process)

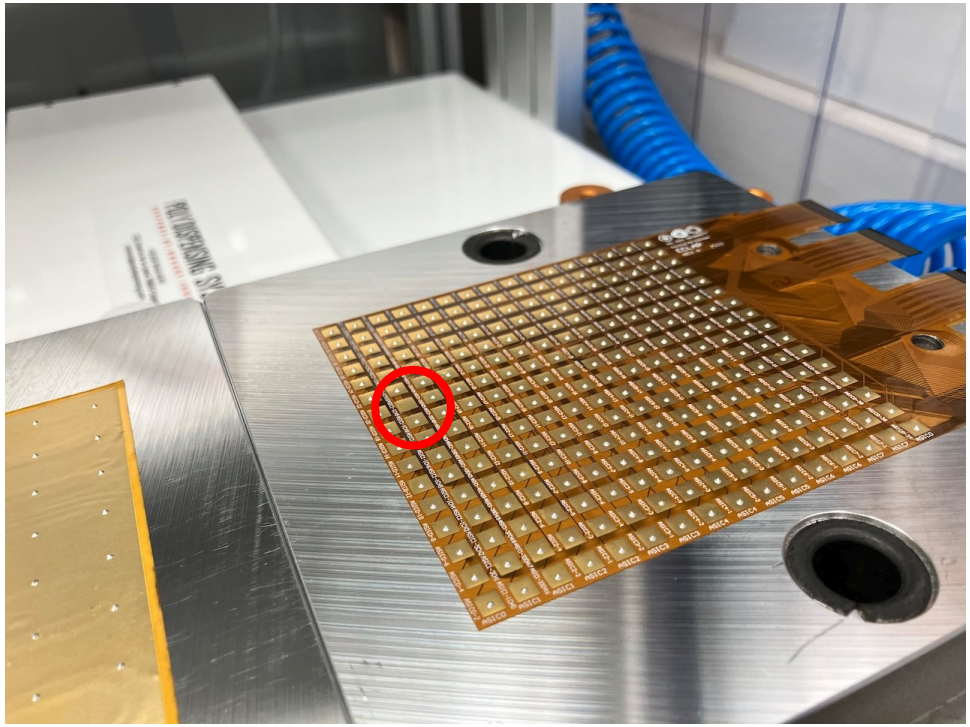
Glue deposition

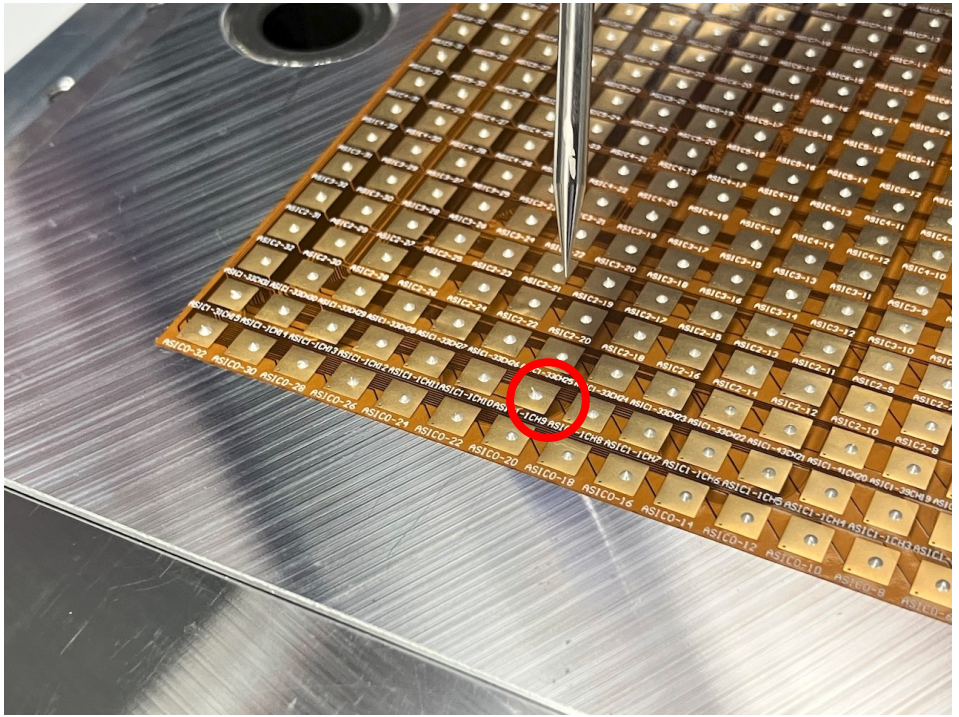




- We deposited more than 2112 glue dots → only 4 were wrong.
  - Manually corrected with a needle and profiting from capillarity effects to deposit.

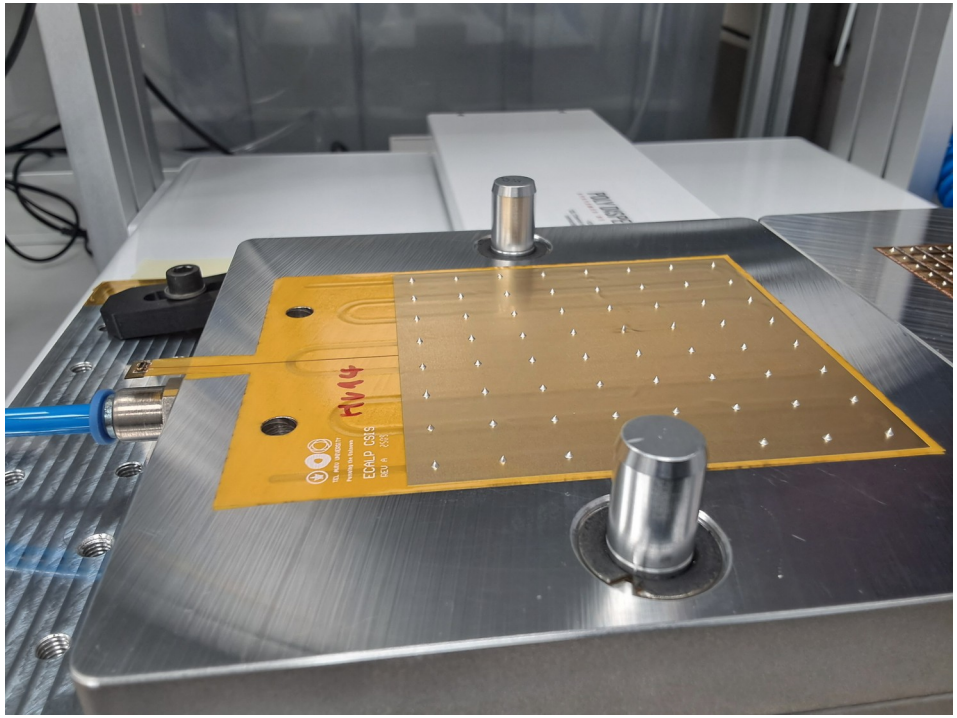
Glue deposition

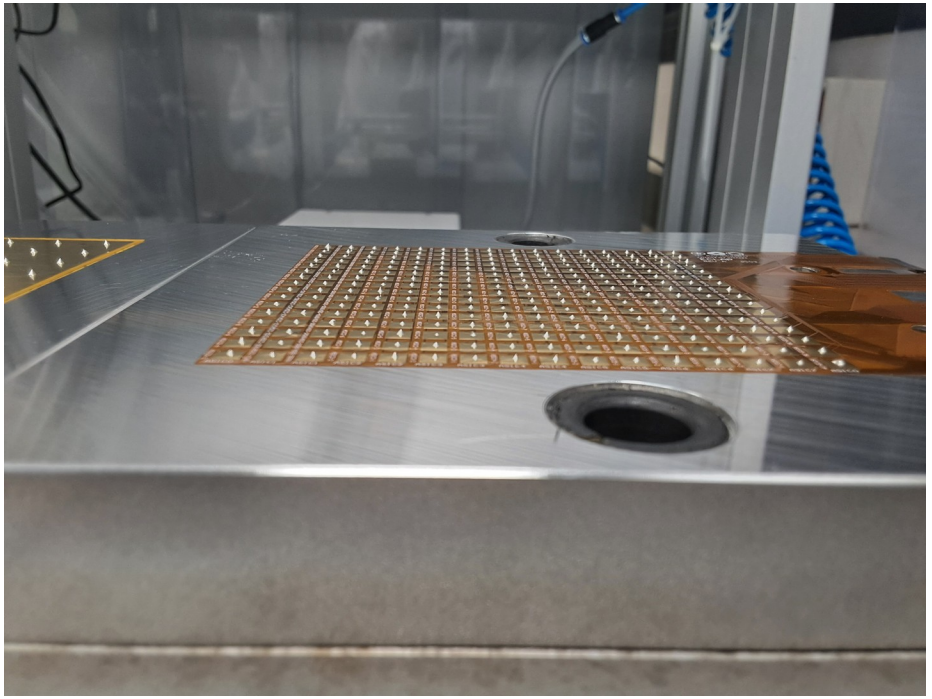




- We deposited more than 2112 glue dots → only 4 were wrong.
  - Manually corrected with a needle and profiting from capillarity effects to deposit the drop

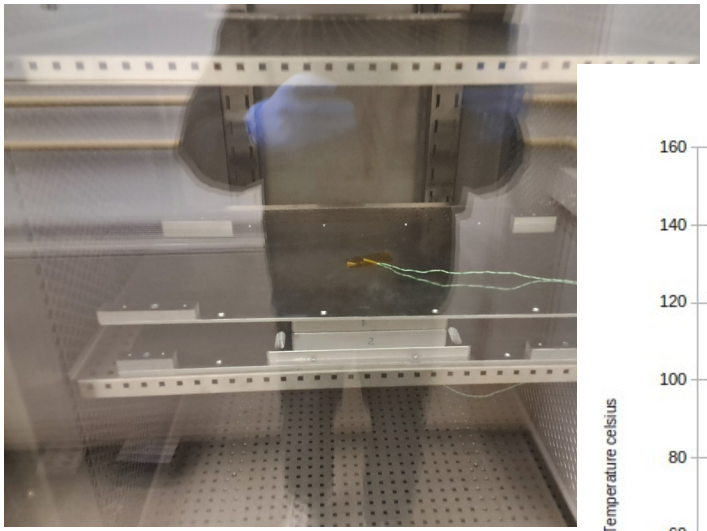
Glue deposition

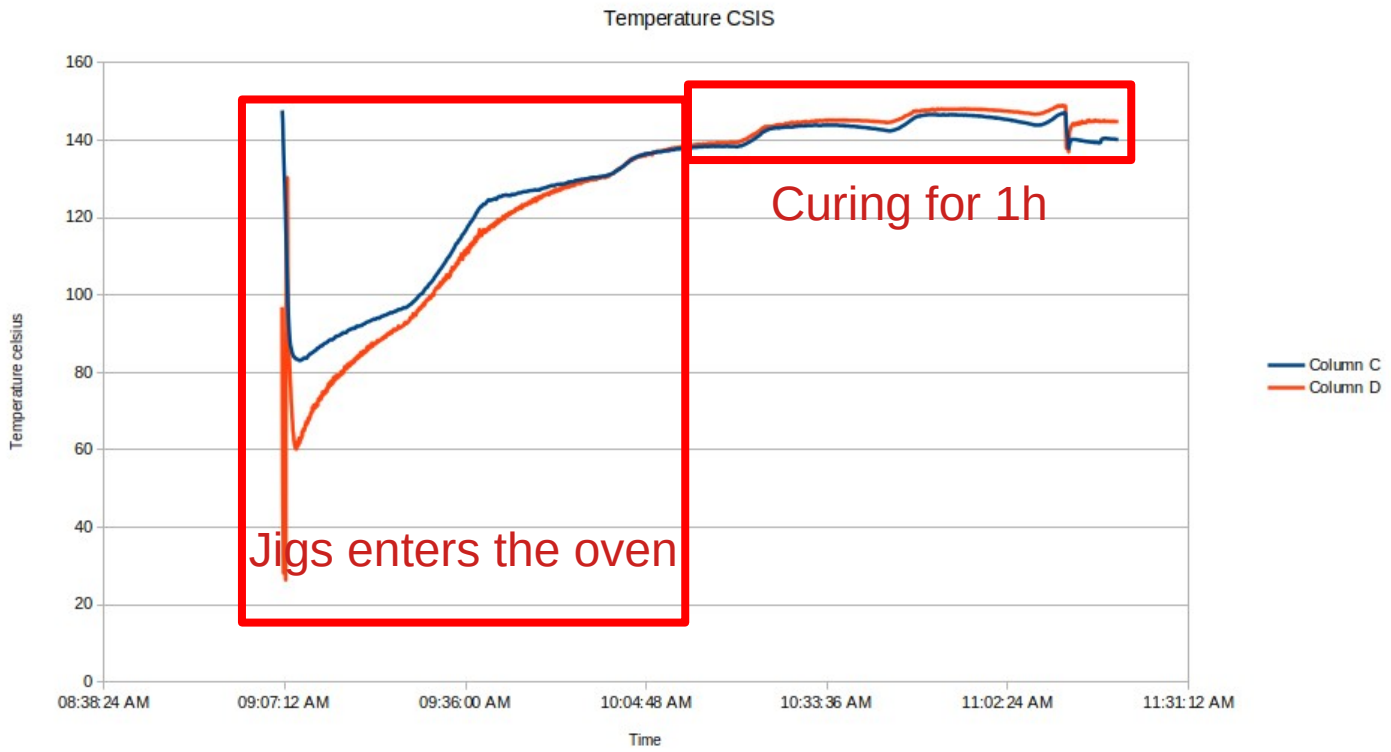




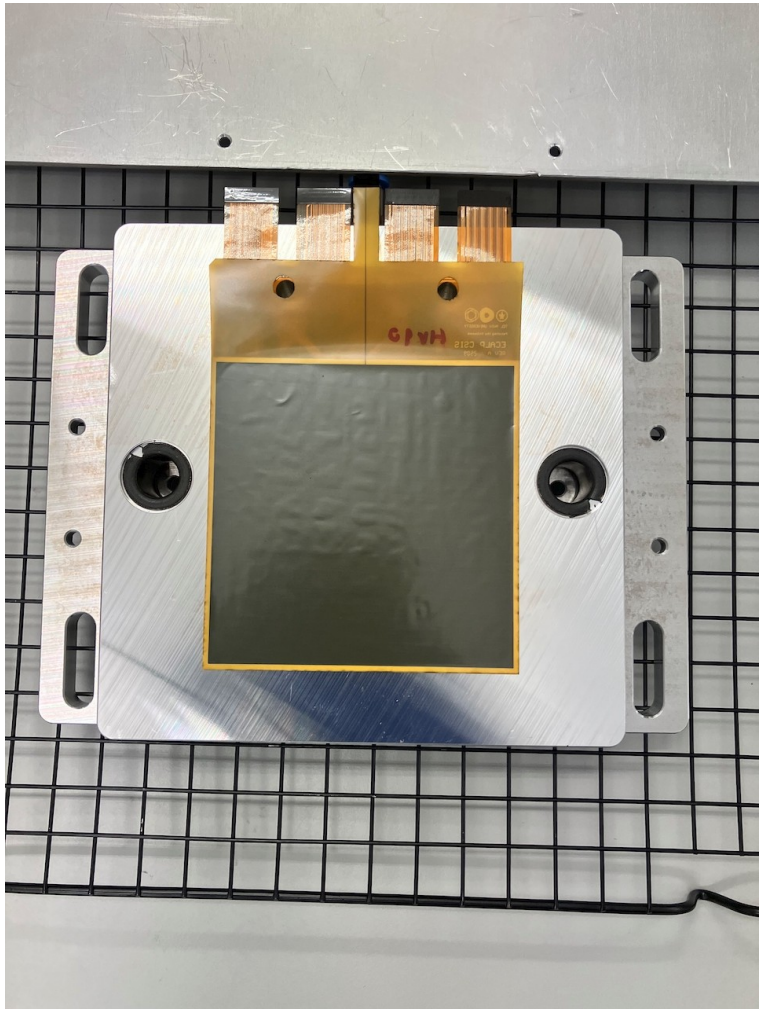
- Takes 16 minutes.

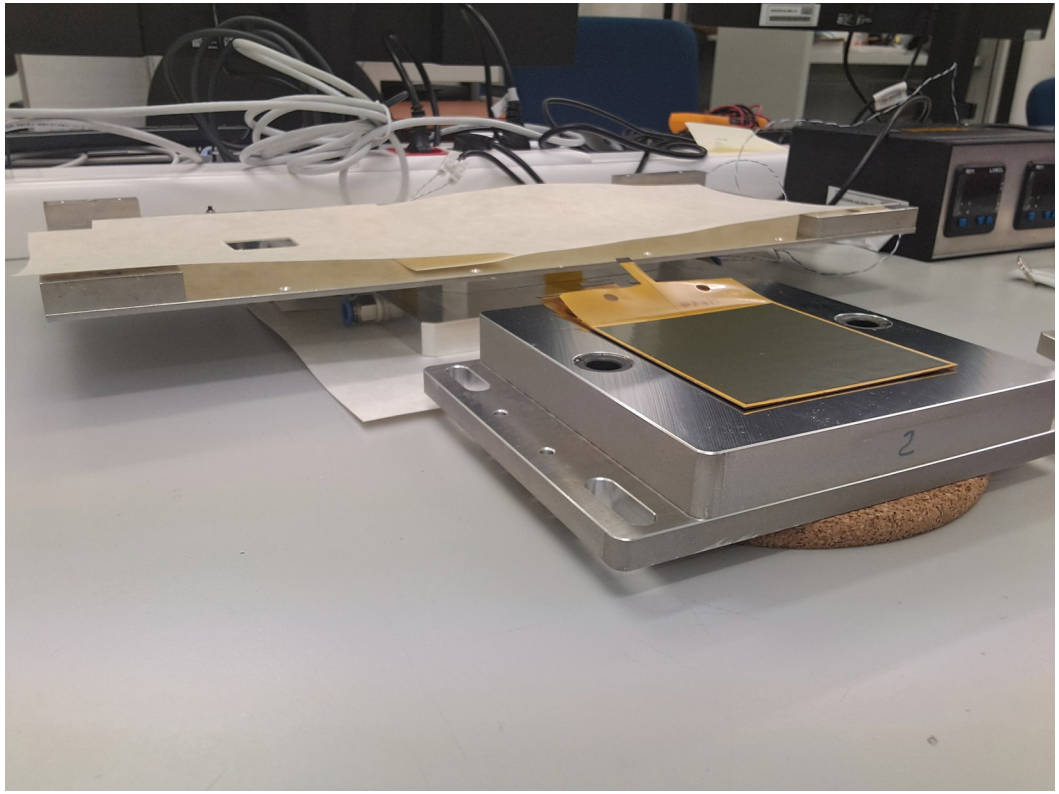
Curing and cooling



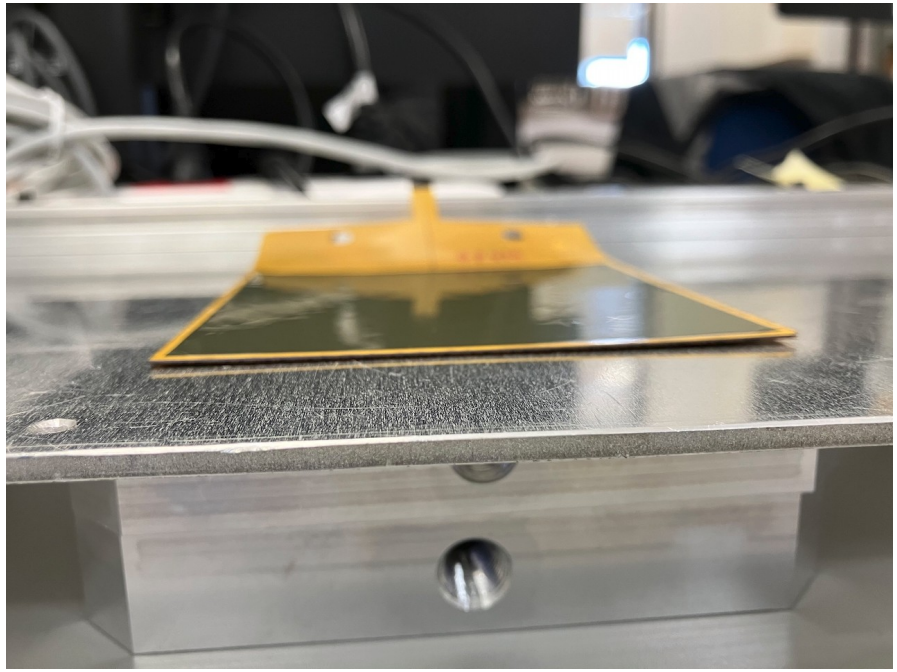


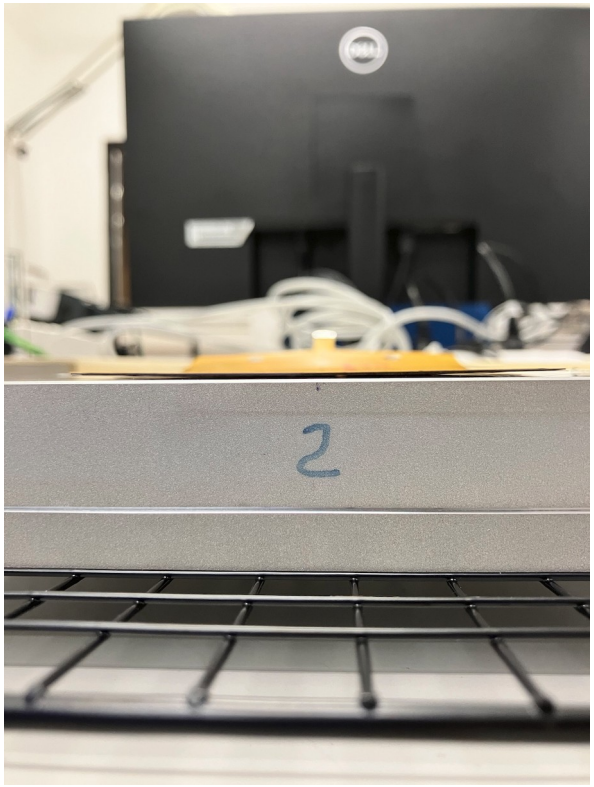
(almost final) CSIS





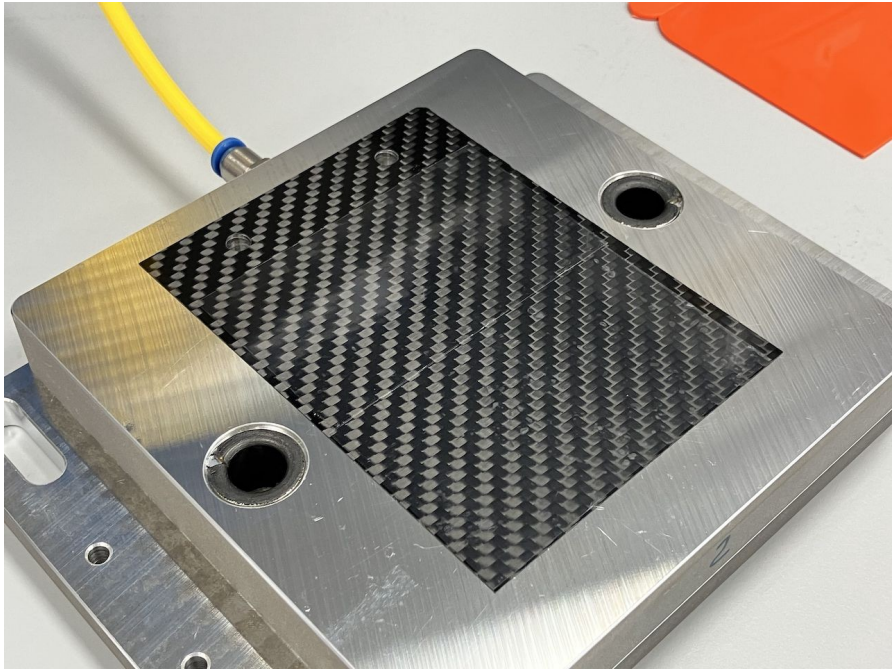
Still not flat...





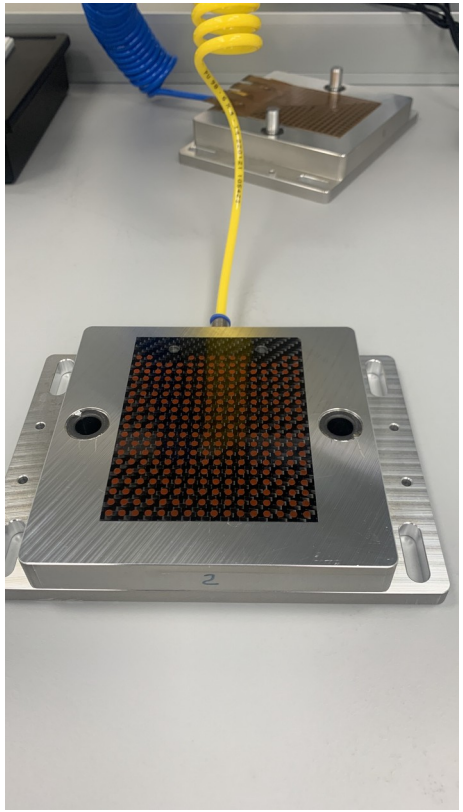
- After the curing we observed a small deformation of the sensor.
  - It is flexible enough to be flattened again just with small pressure
  - The FO doesn't look disconnected (the FO is also flexible).

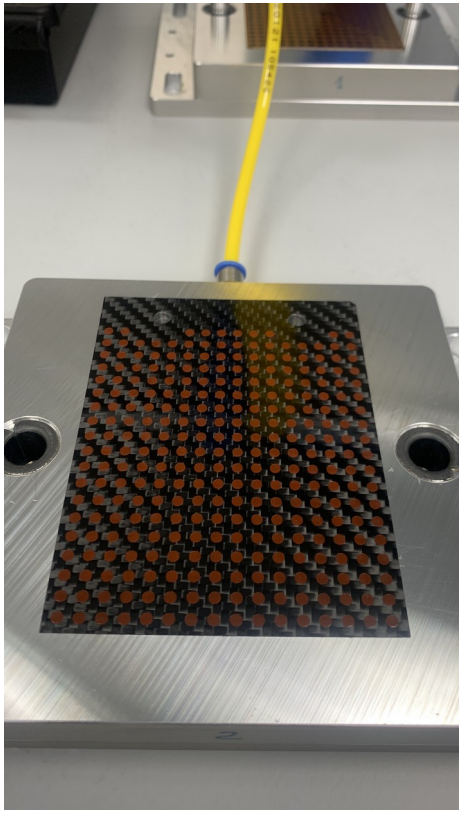
Final step: the CF

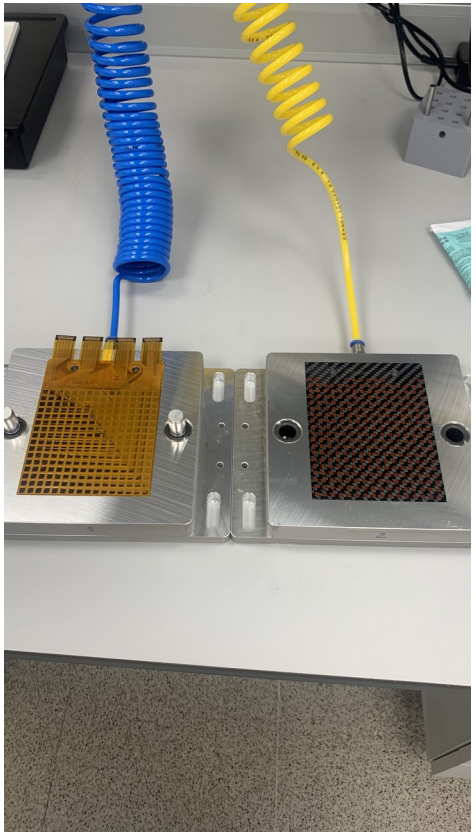


- 5um thick double tape 3M 82600

Final step: the CF

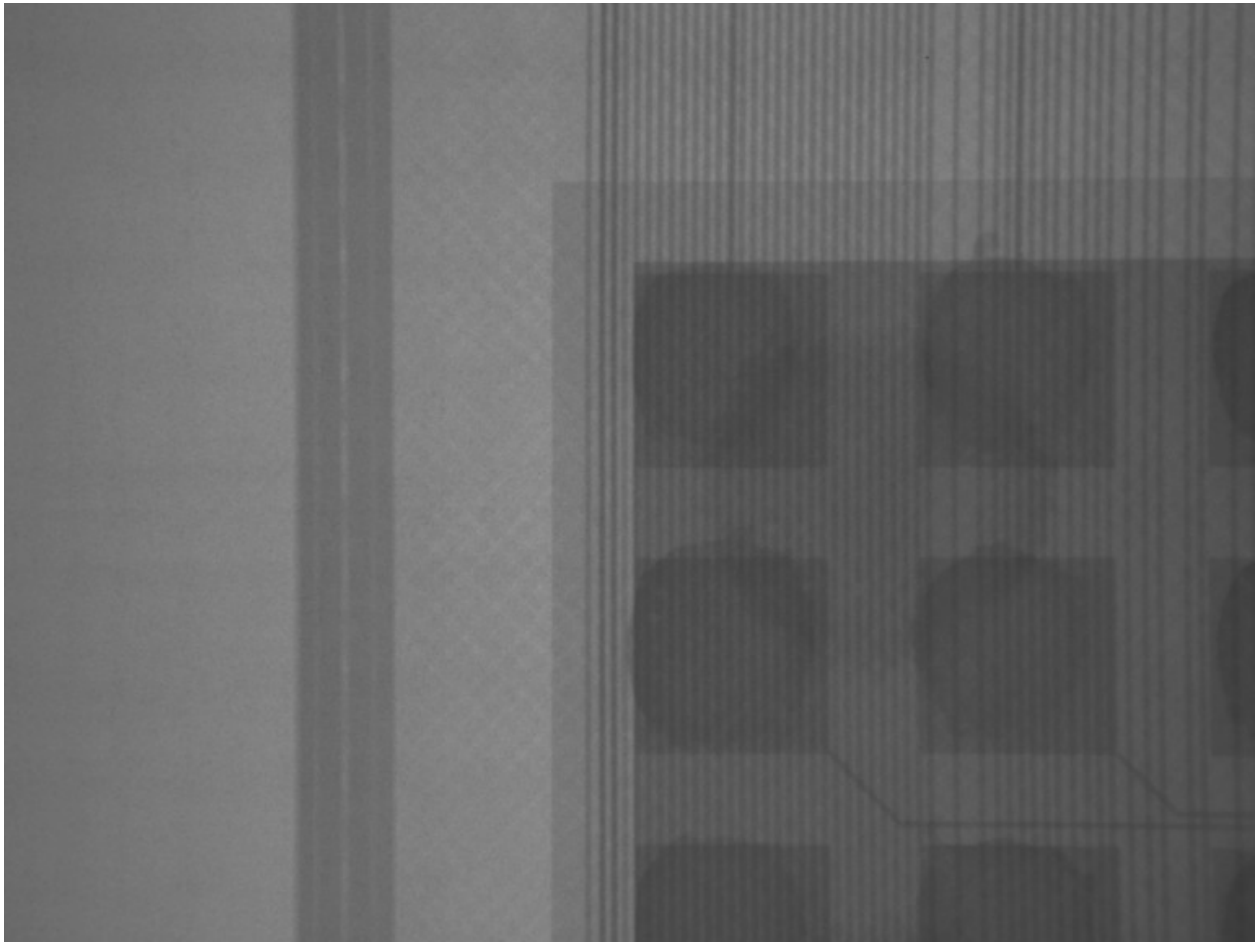




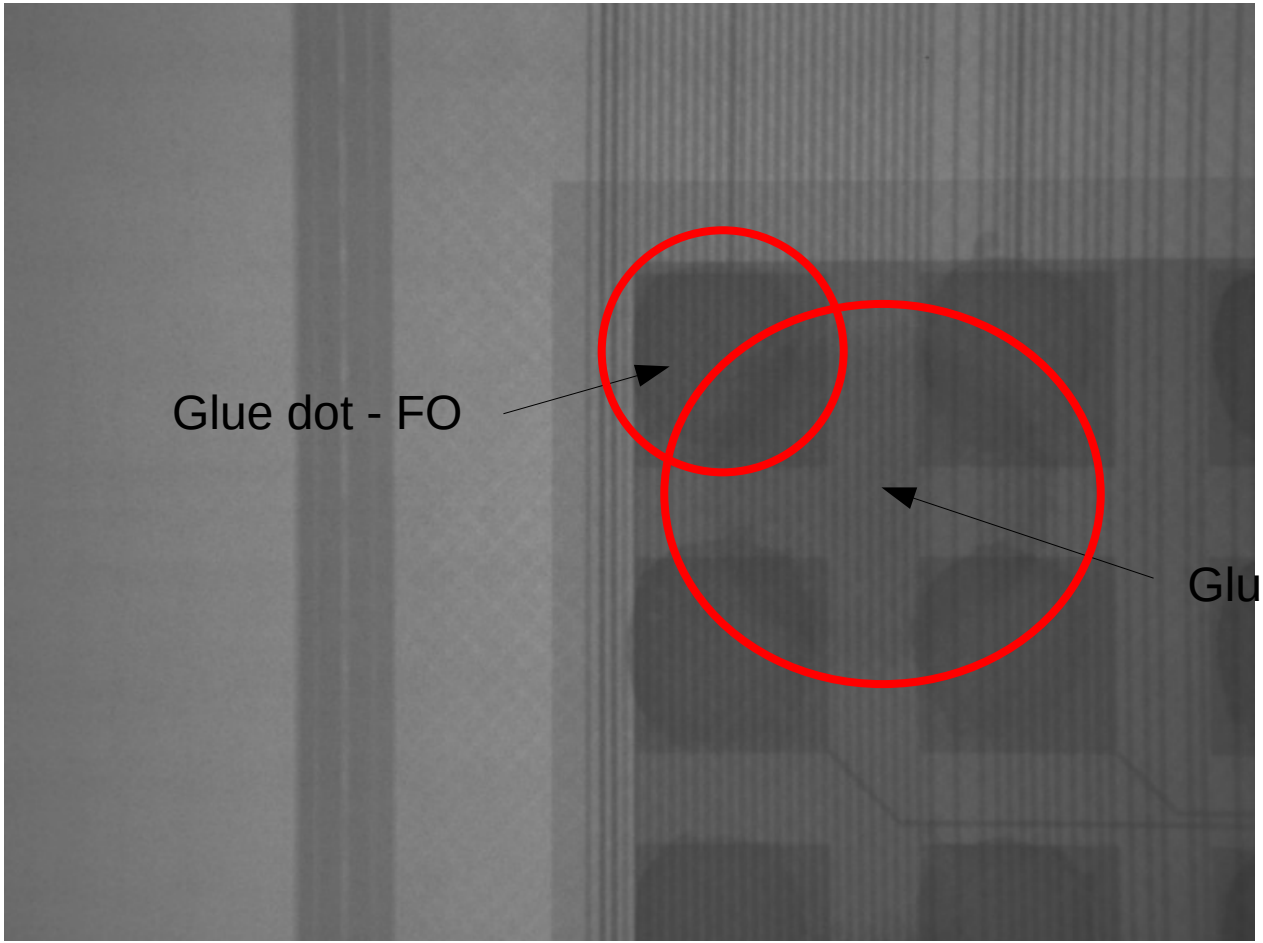


- Siliconne DOWSIL 736

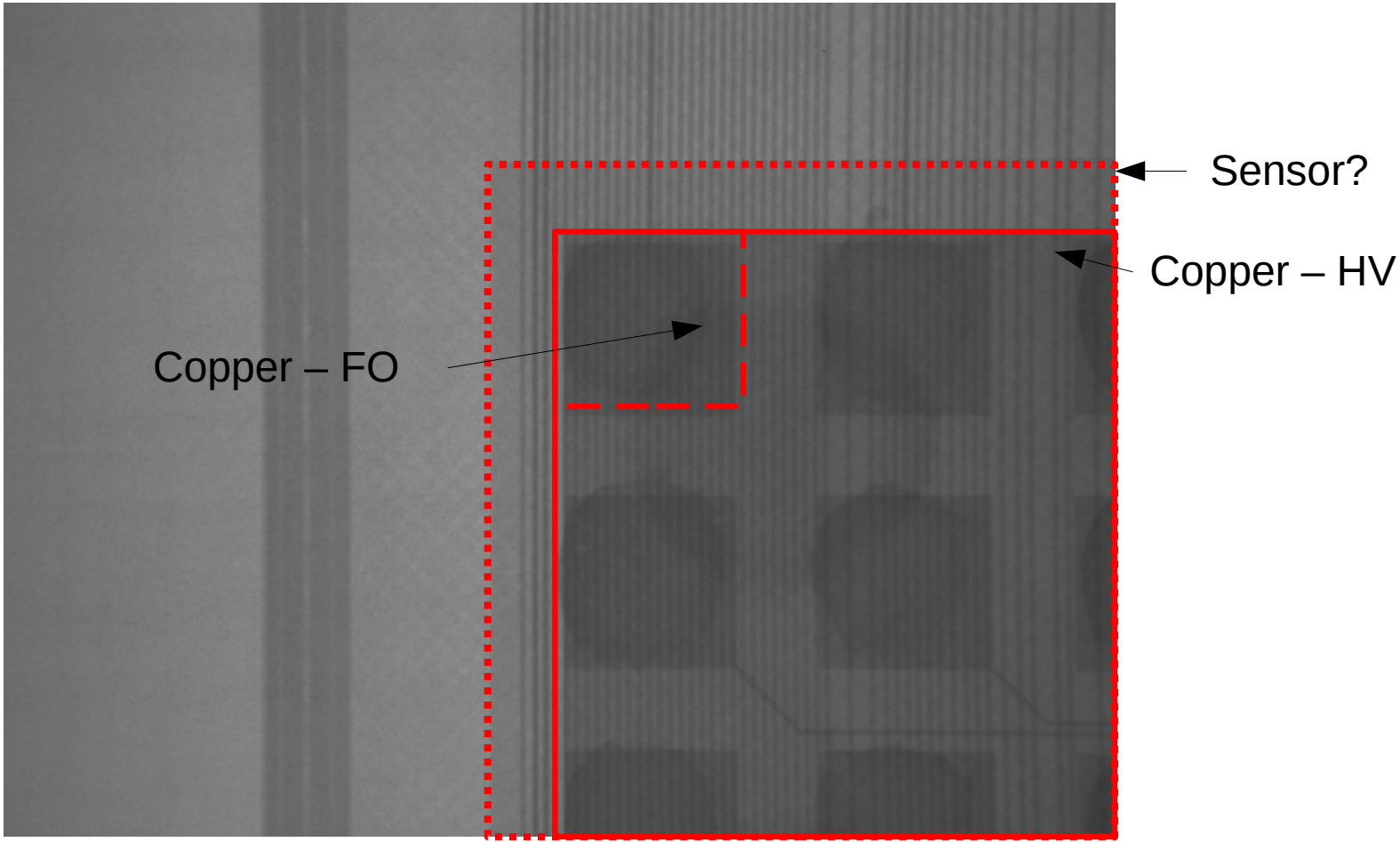
X-RAY inspection - CSIS2025_001



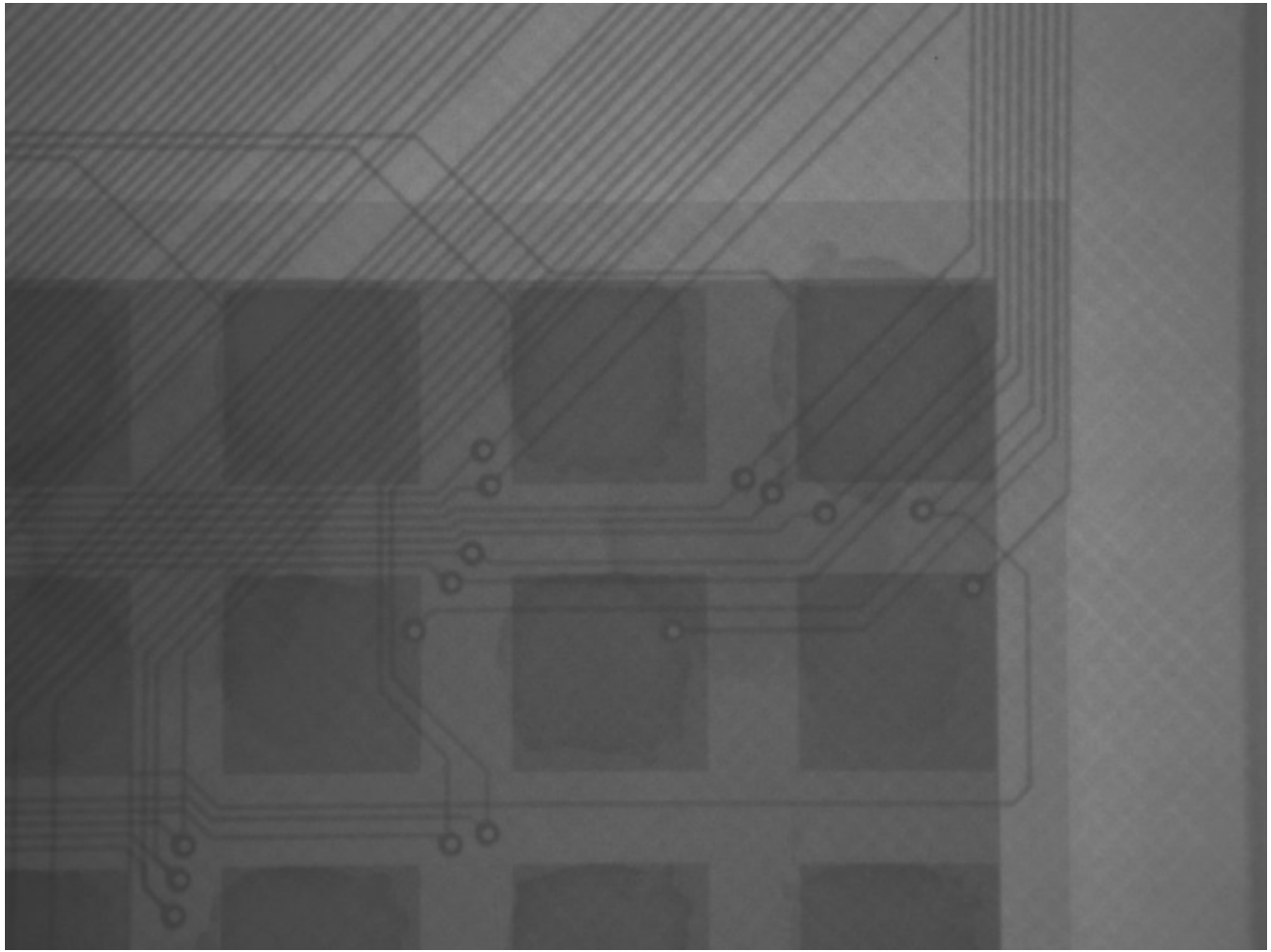
X-RAY inspection - CSIS2025_001



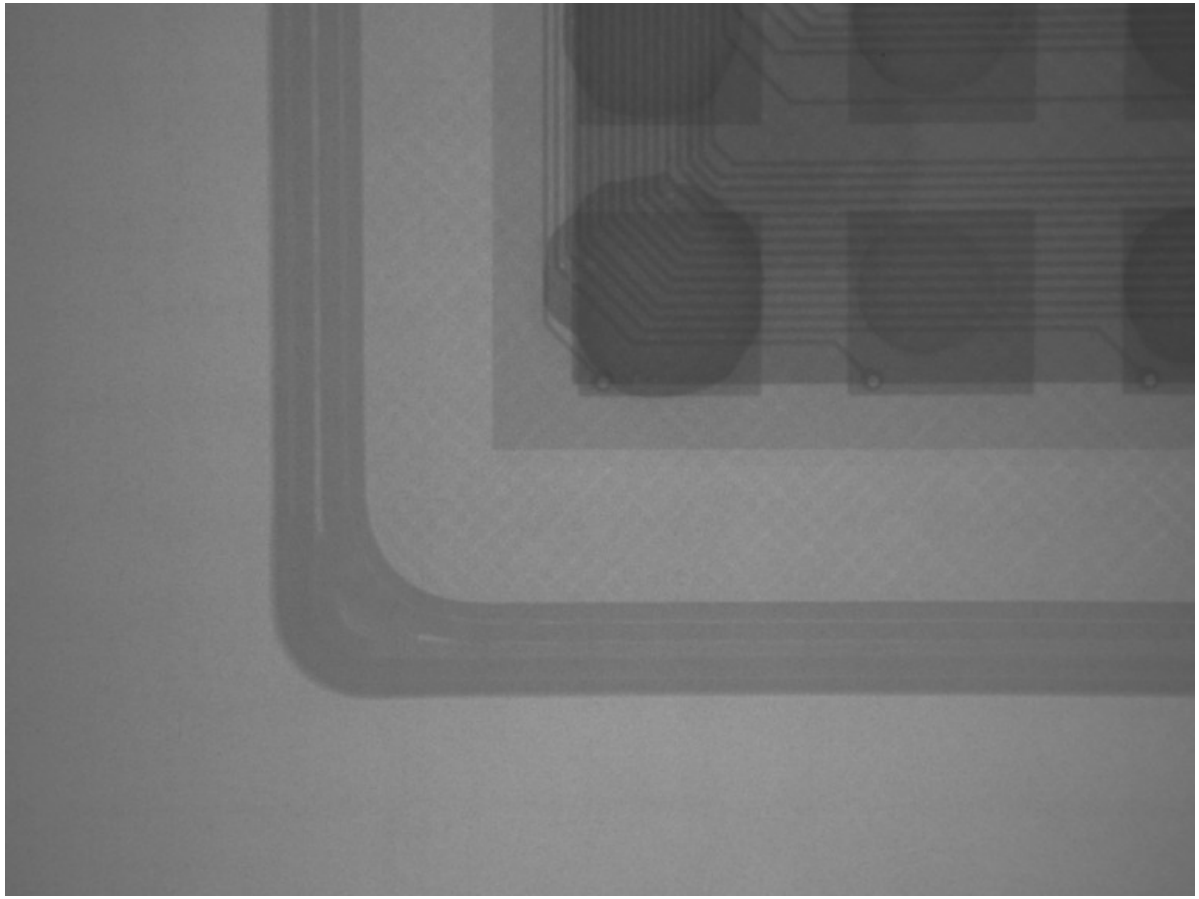
X-RAY inspection - CSIS2025_001



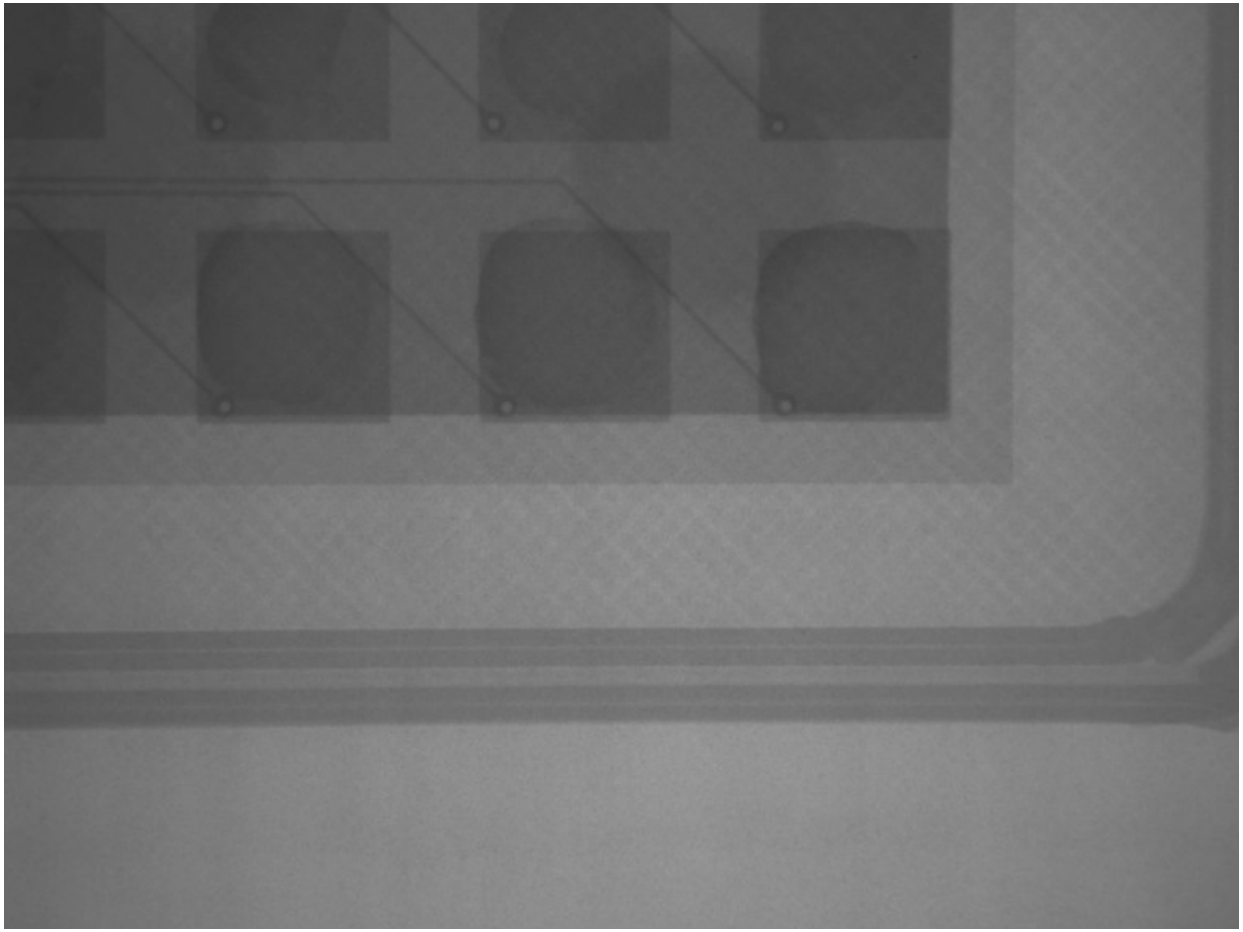
X-RAY inspection - CSIS2025_001



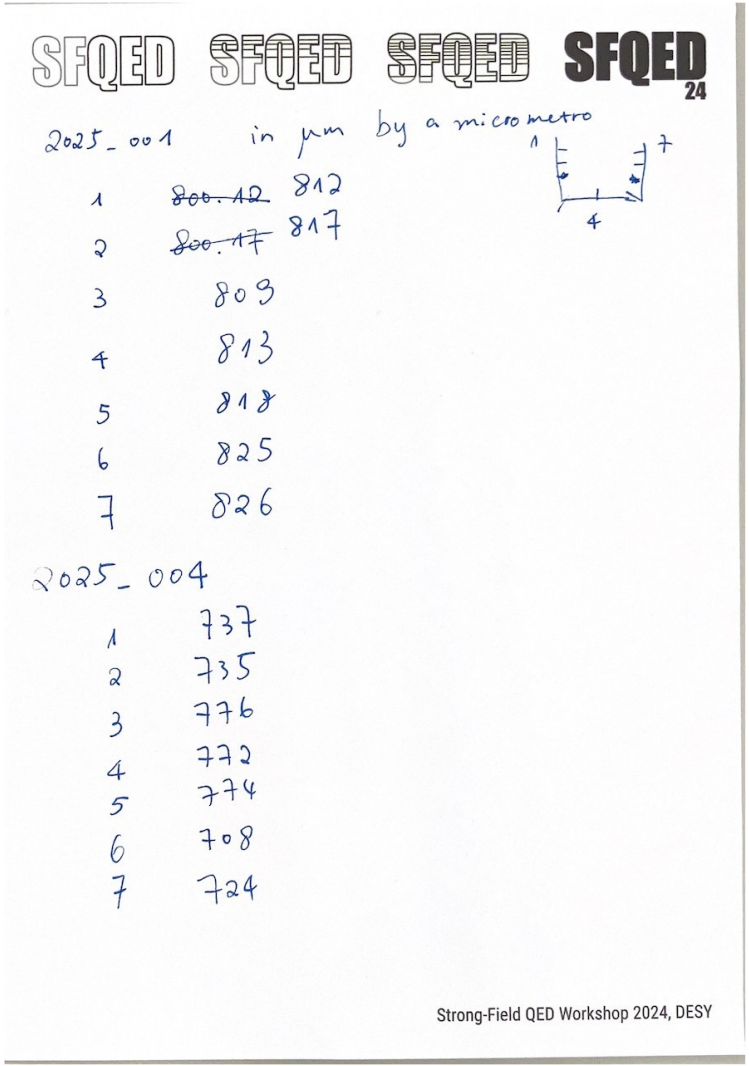
X-RAY inspection - CSIS2025_001



X-RAY inspection - CSIS2025_001

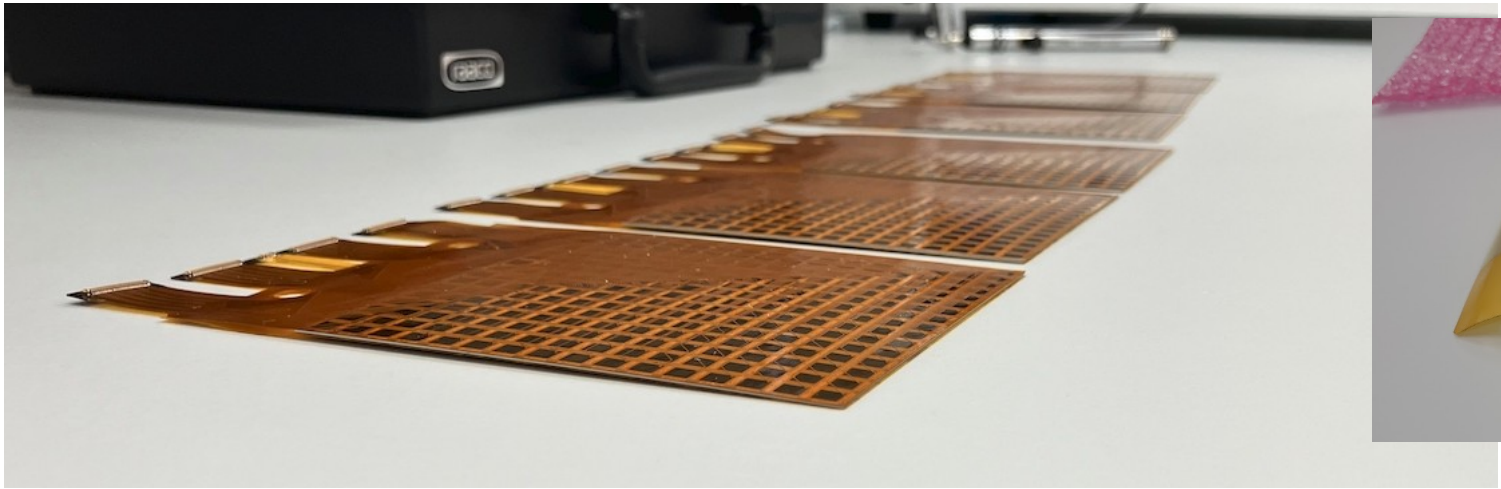


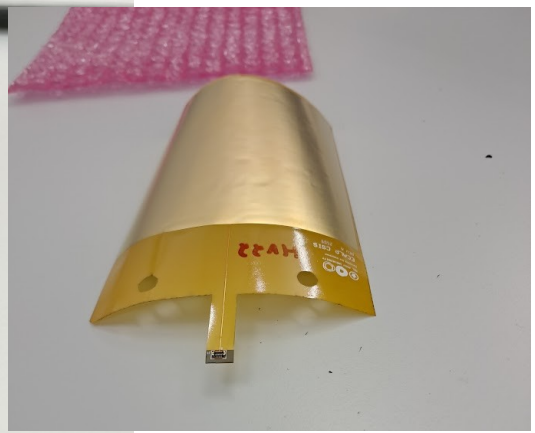
Towards the most compact HG-calorimeter



- First measurements with micrometer (manual procedure)
  → Very promising values.
  - 001 – max **826um** - has a the DOW736 glue (~100um)
  - 004- max **776um** - uses the double tape (~5um)

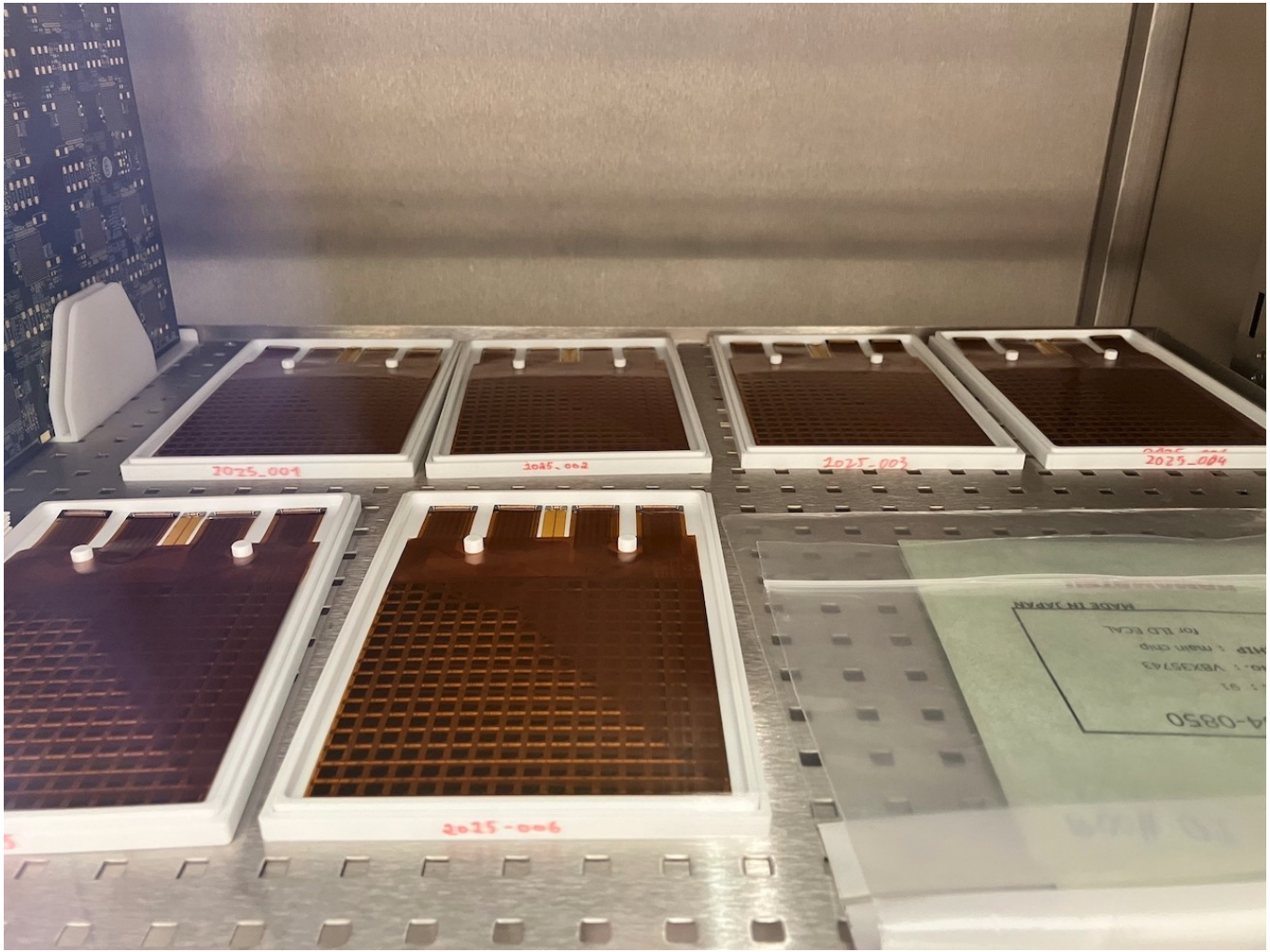
Bending ?





- Very thin CSIS but slightly bent?
- It doesn't seem to be a problem → the planarity is recovered easily with some pressure.
- Is the temperature the culprit? Is the HV kapton the culprit? .. under study
  - Metrology will be done in the coming days.
  - We cured one of the CSIS at 80 degrees (for 3h) instead of 140°

Happy first 6 CSIS



Happy first 6 CSIS

Summary -I

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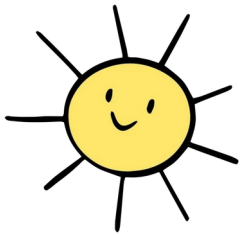
- The process for making 6 CSIS takes:
  - 12h for the glue preparation (2h of preparation, 10h of precuring overnight)
  - 3.5h per CSIS for the FO&HV glueing to the sensor (25~ minutes of actual work, the rest is the curing process… during which we cannot do anything because the jigs are in the oven)
  - Total: 2.0 days (lifetime of the glue is 2.5 days).
- Speed up possibilities:
  - Do not do the pre-curing (i.e., after preparing the glue, start with the glueing right away).
  - Use more aggressive curing times (shorter time in the oven – to be evaluated)
  - Use less aggressive curing temperatures (longer times – but we can open the jig and leave the CSIS cure while we recover the jig, after 1h of curing at 80degrees).
  - Use other glue – monocomponent and lower temp. curing (test to be done on monday, CSIS2025_007 and 008.
- We need to receive the FO+HV by the end of next week to be able to assembled the remaining 12

Summary -II



- CSIS2025_001 to 006 are ready
  - They look great
- Numbers to be completed soon
  - 001 – siliconne for CF, 140degree curing for the H20E
  - 002 – siliconne for CF, 140degree curing for the H20E
  - 003– siliconne for CF, 140degree curing for the H20E
  - 004 – double tape for CF, 140degree curing for the H20E
  - 005 – double tape for CF, 140degree curing for the H20E
  - 006 – double tape for CF, 80degree curing for the H20E

- All details and reports, including lots of pictures, can be found in the cernbox
  - Link to be shared…

Summary -III

- Yesterday we received the PCBs for connectivity tests
  - Bonding of the connectors has been done at IFIC (manually!)
  - Tests are foreseen for this monday.

- What do we do with the manufactured CSIS ? Do we send them to Poland now? My proposal:
  - Keep them at IFIC until end of next week and send them only after been tested at IFIC.