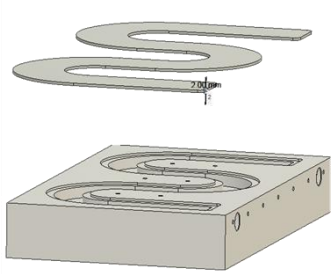
Backward Ecal / EEEMCal

Triple I Engineering Meeting Update (10/11/2025)

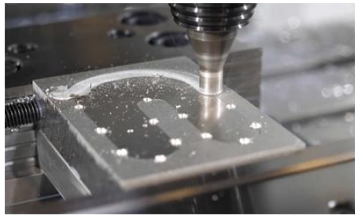
Julien Bettane

Prototype External structure – FSW

- ❑ FSW prototype
- ❑ Good watertightness (tests are OK)
- ❑ Machining of the steps with our mechanical workshop overed
- ❑ Thermal tests on going



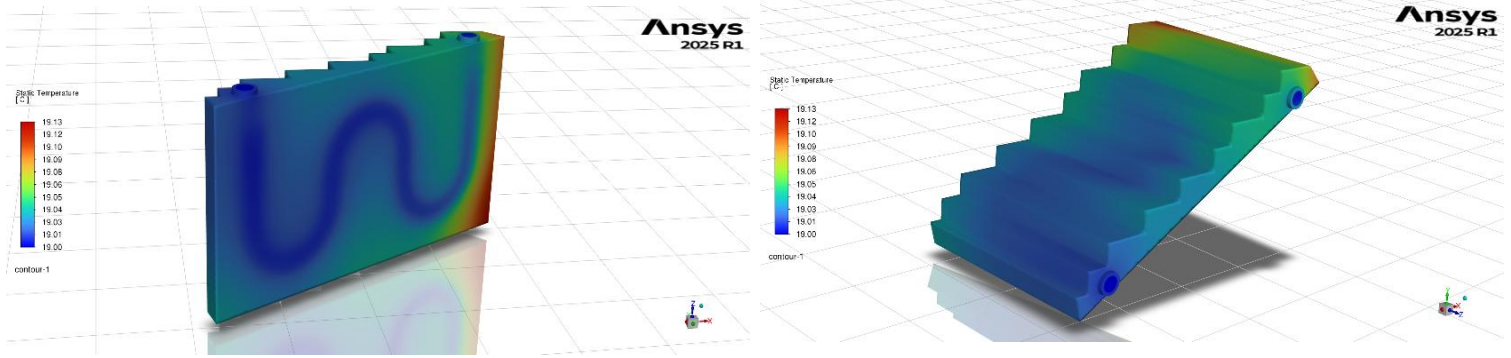
Raw bloc machined



FSW

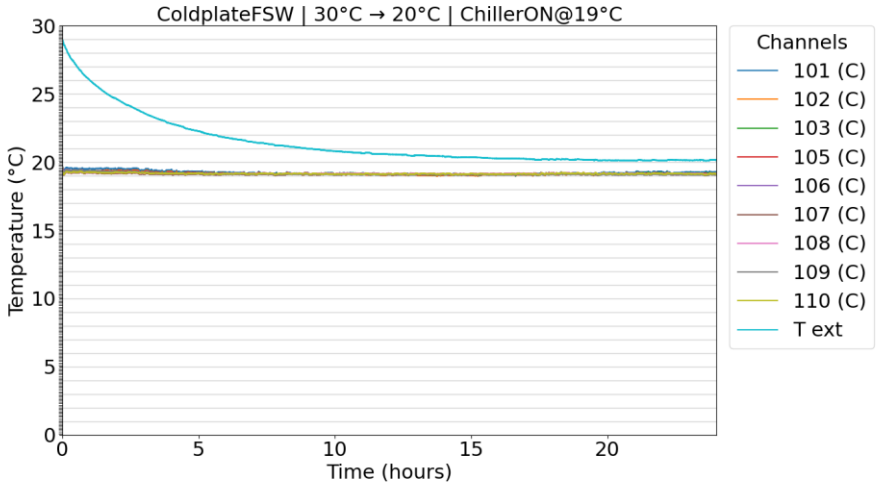
Dimensional inspection
→ OK (< 0,1 mm)

Prototype External structure – FSW

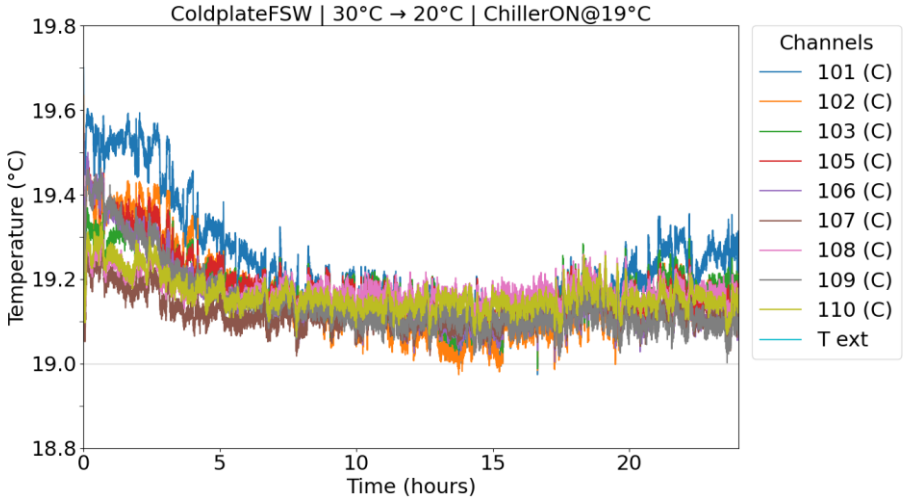


Fluent simulation (Water= 19°C / T ext = 23°C)

Fluent simulation : Gradient= 0,15°C
Measures: Gradient= 0,2°C (with alu tape)
Previous measures (0,6°C)



Temperature 30°C to 20°C in 24 hours



Thermal sensors on the cold plate

	1 Sigma	2 Sigma	3 Sigma
101 (C)	0.14	0.28	0.42
102 (C)	0.1	0.2	0.3
103 (C)	0.07	0.14	0.21
105 (C)	0.08	0.16	0.24
106 (C)	0.08	0.17	0.25
107 (C)	0.04	0.08	0.12
108 (C)	0.03	0.06	0.1
109 (C)	0.08	0.17	0.25
110 (C)	0.04	0.08	0.12

Temperature stability

Prototype External structure – FSW

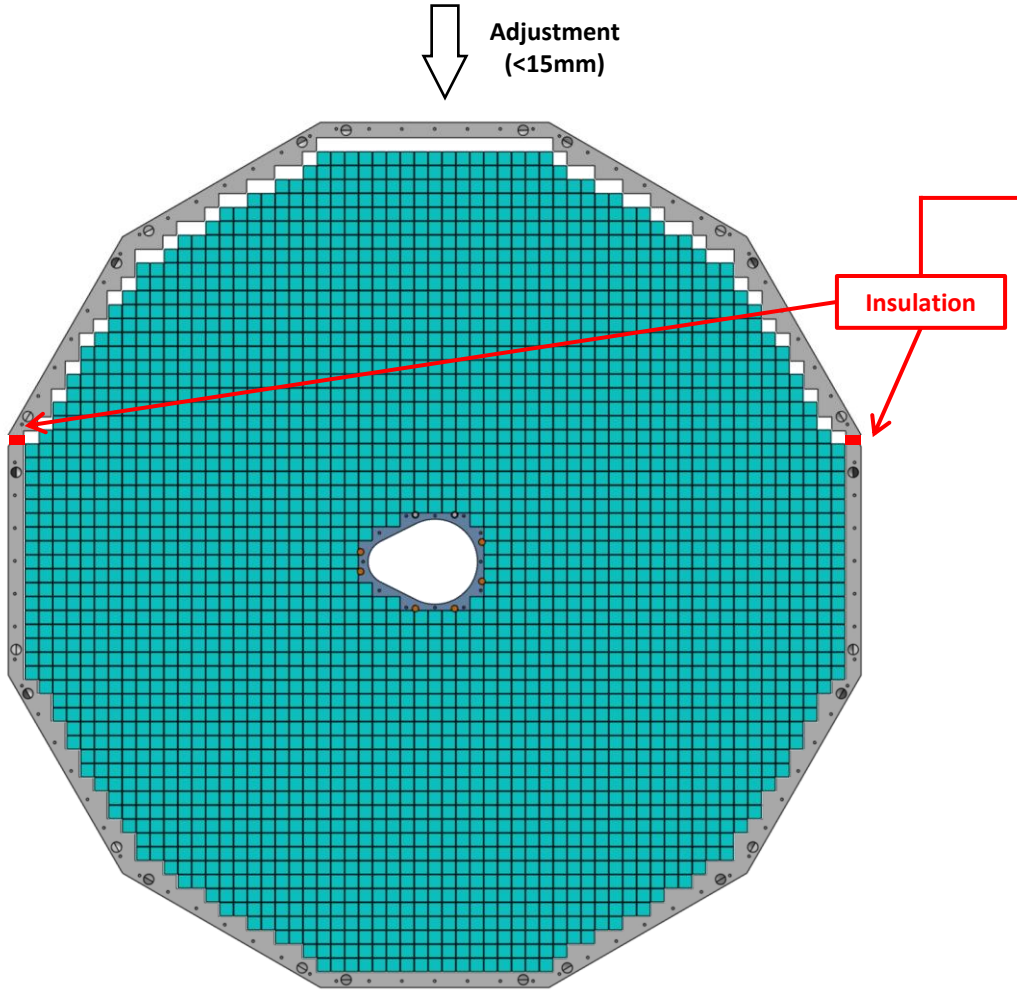

Dew point – T=30°C / h= 80%


Dew point – T=26°C / h= 80%

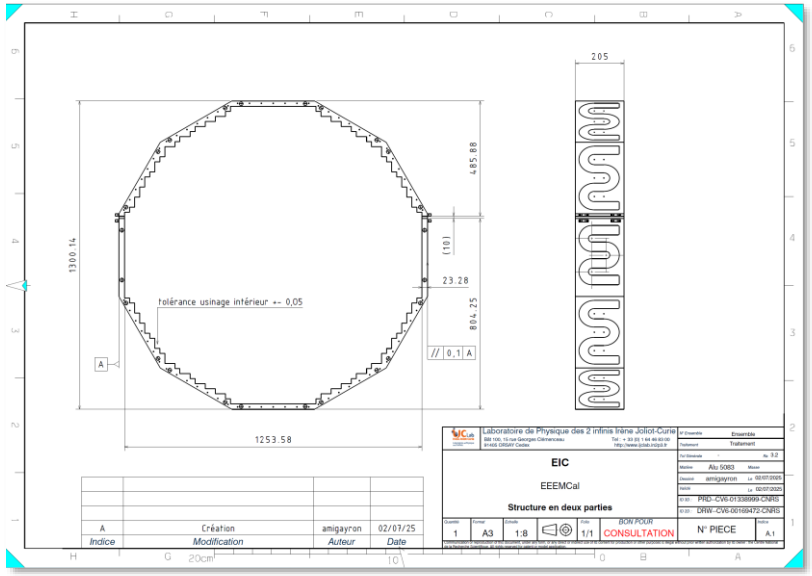
- Dew point – T=23°C / h= 80% → OK
- h<80% → OK

h= 80% in the experimental room?

Prototype External structure – FSW

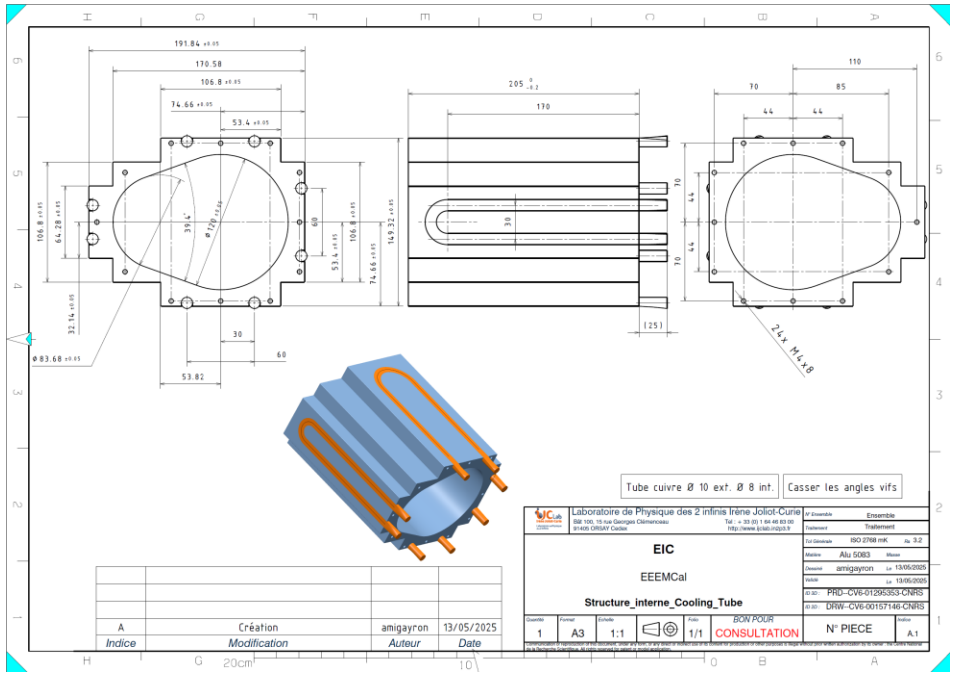


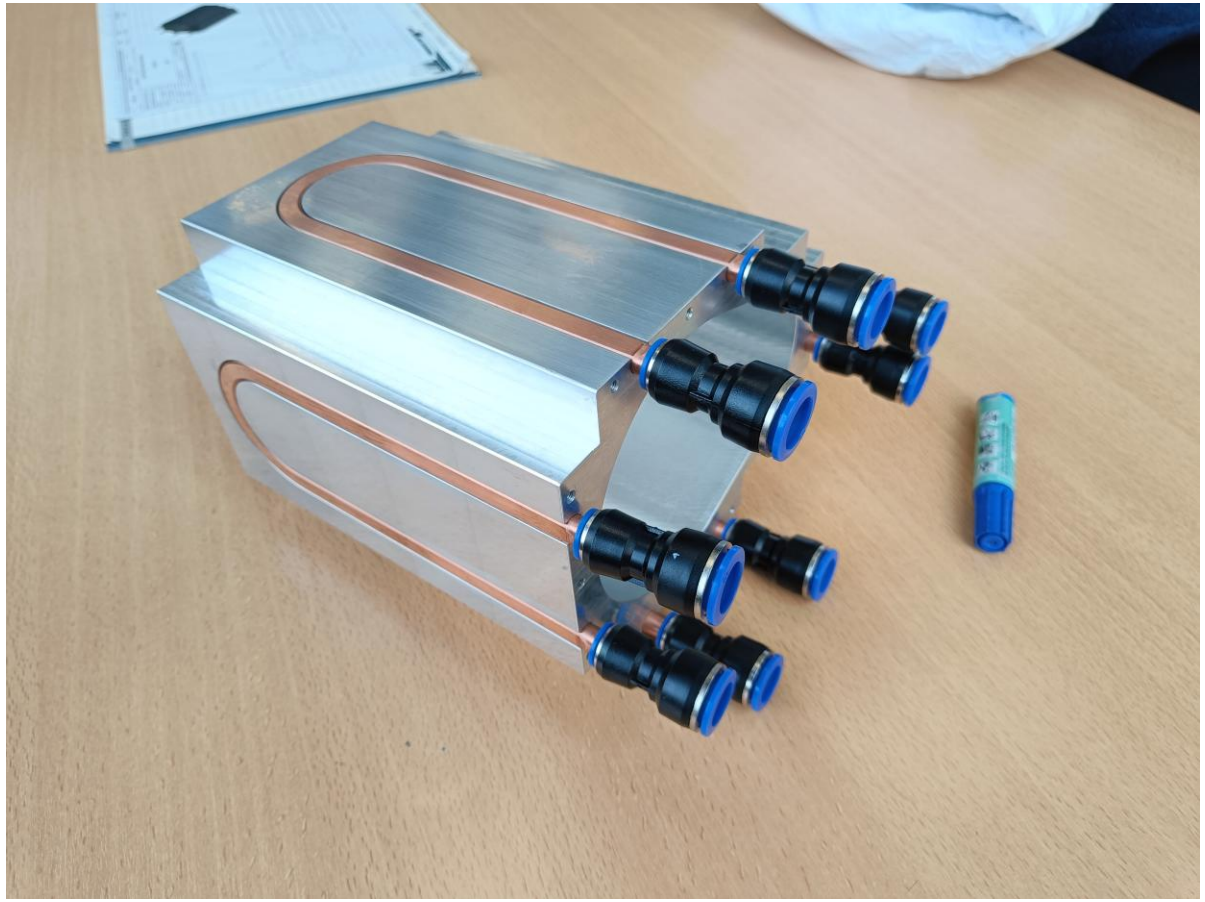
- External structure in one block at the beginning
- External structure in two parts at the end (after machining)
  - *Better for the Eddy current*
  - *Better for the contact with crystals on the top (cooling)*
- Good for the deflection & the stress
- Good for the tolerances and the positioning of the crystals
- **Current discussion with Company**



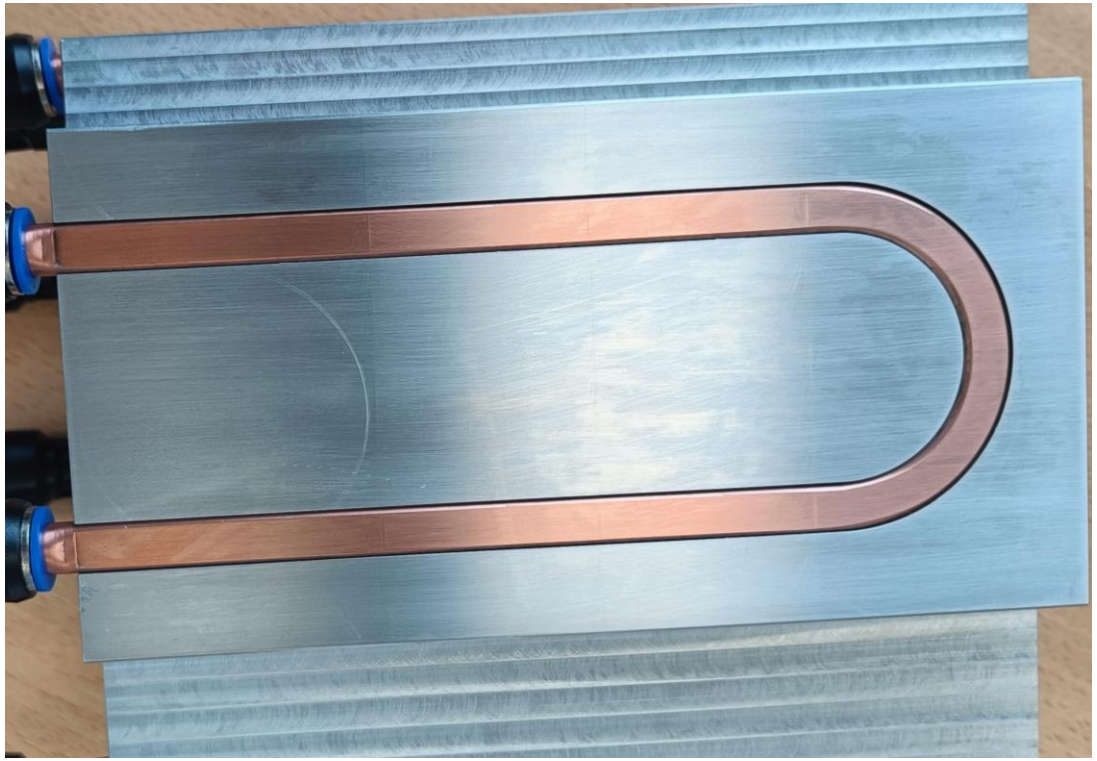
Prototype Internal structure – Copper tubes

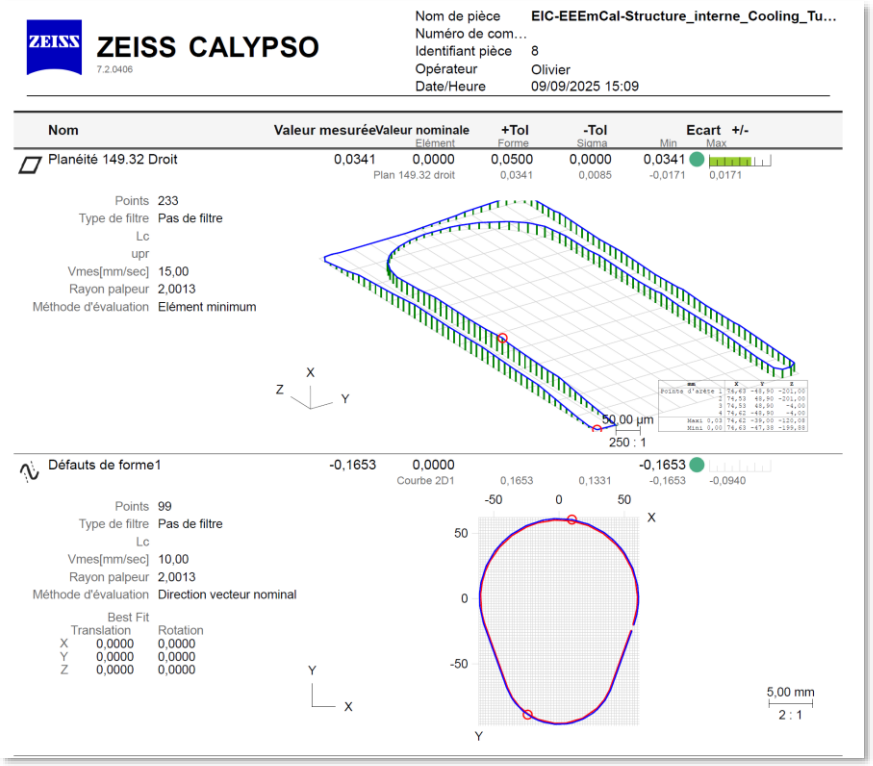
- Prototype with copper tubes
- Internal structure received
- Clearance with beam pipe = 11 mm
- Thermal tests ongoing





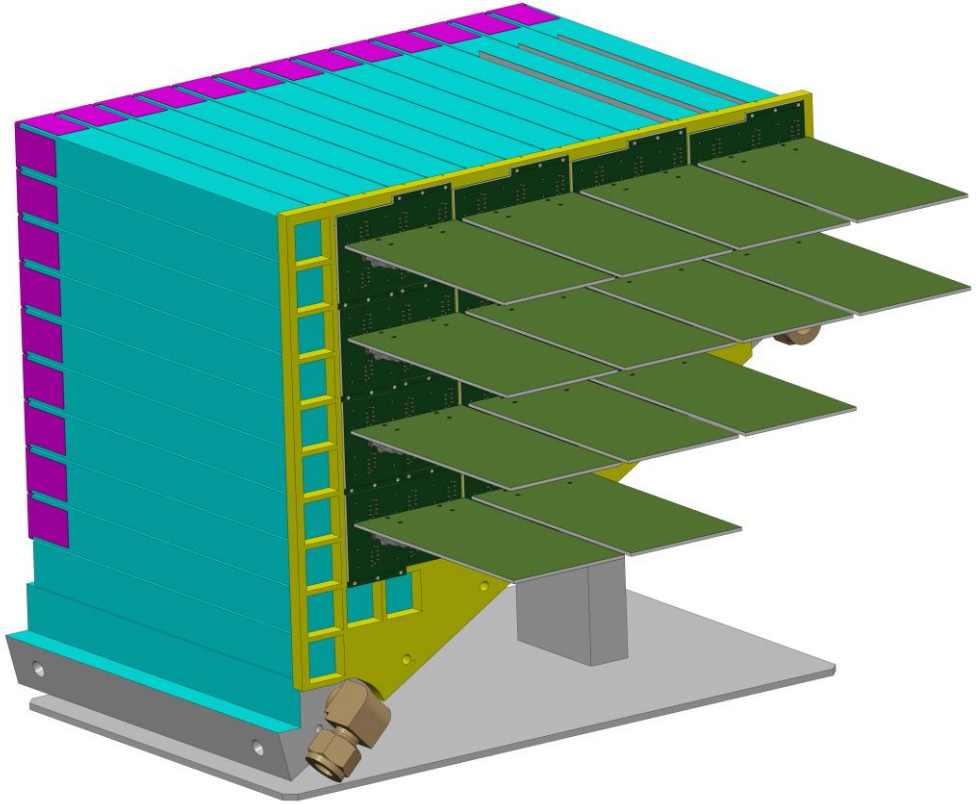
Prototype Internal structure – Copper tubes

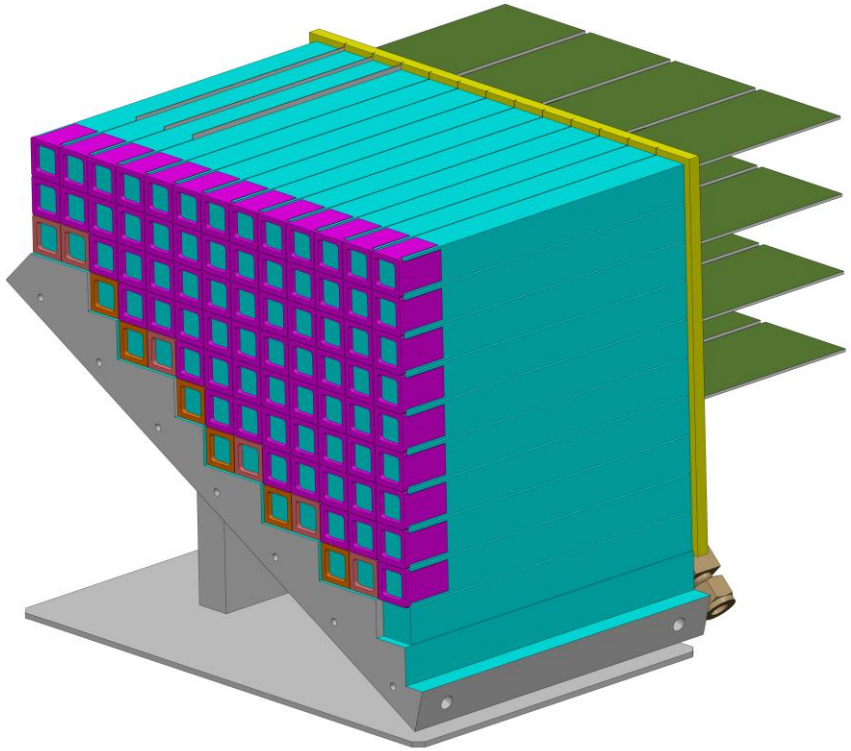




Dimensional inspection
→ OK (< 0,1 mm)

Prototype 1/12 (one twelfth)





Next steps

Upcoming thermal tests:

- ❑ Temperature variation from 26°C to 23°C in 12h (one week)
- ❑ Map of the distribution of the temperature on the cold plate
- ❑ Comparison with the calculation (fluent)
- ❑ Add the hygrometry (80%) to check the due point → To confirm

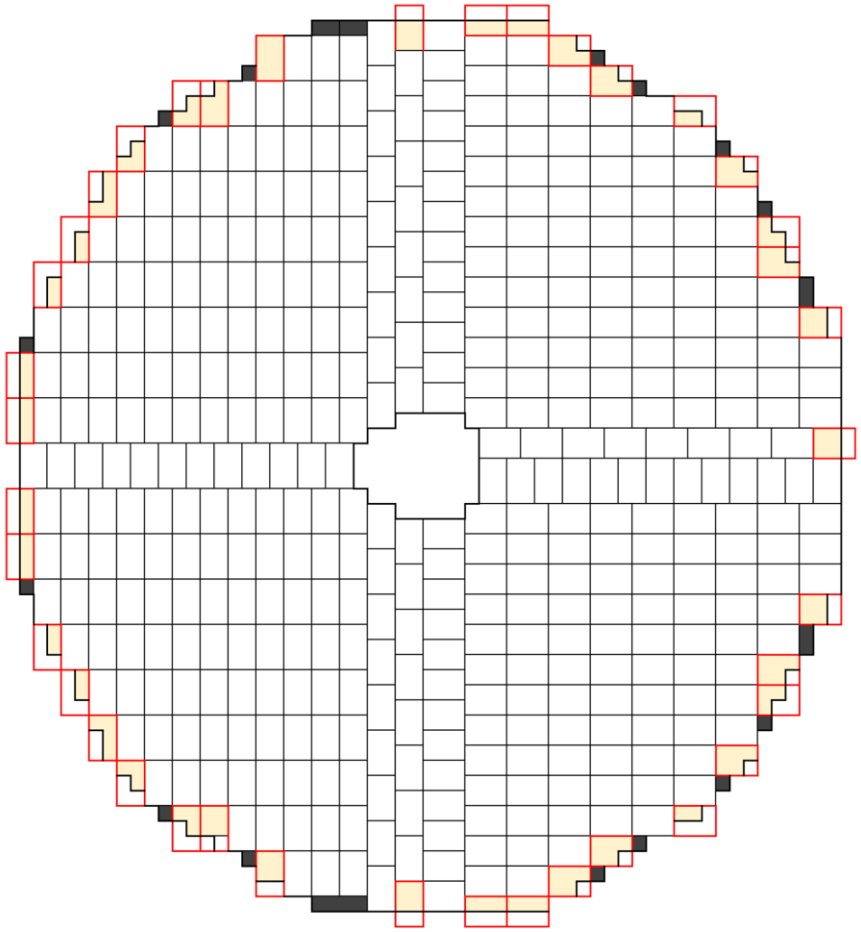
External structure:

- ❑ Validate the proof of concept with the company (machining + FSW)
- ❑ Make a prototype for mechanical and feasibility tests

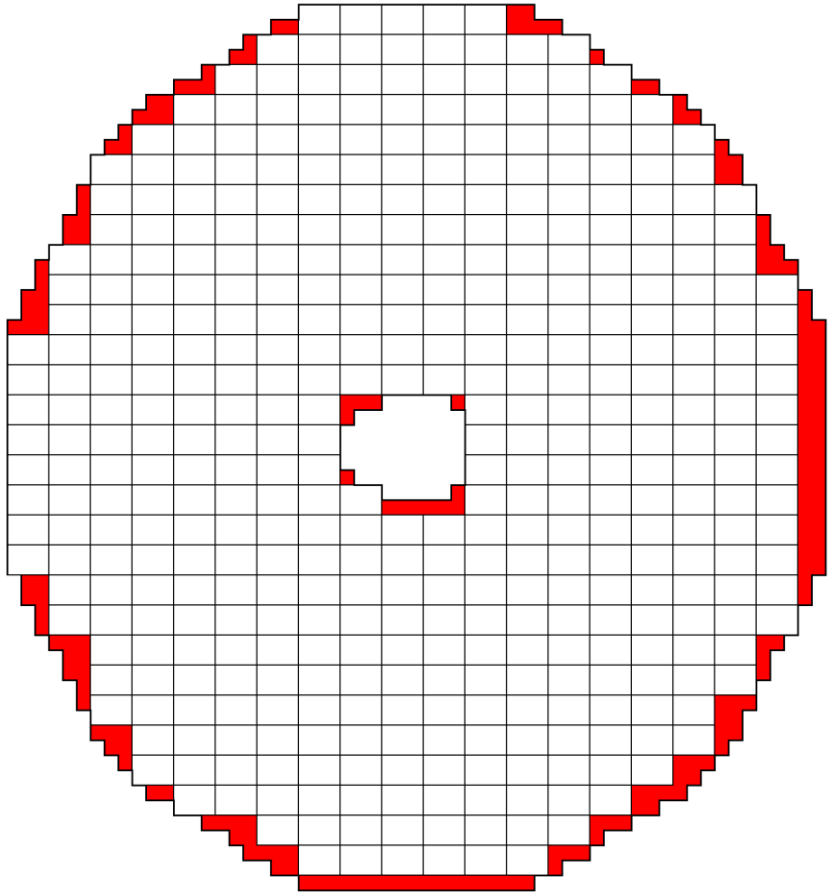
Prototype 1/12

BACKUP SLIDES

Design & Cooling for the FEB

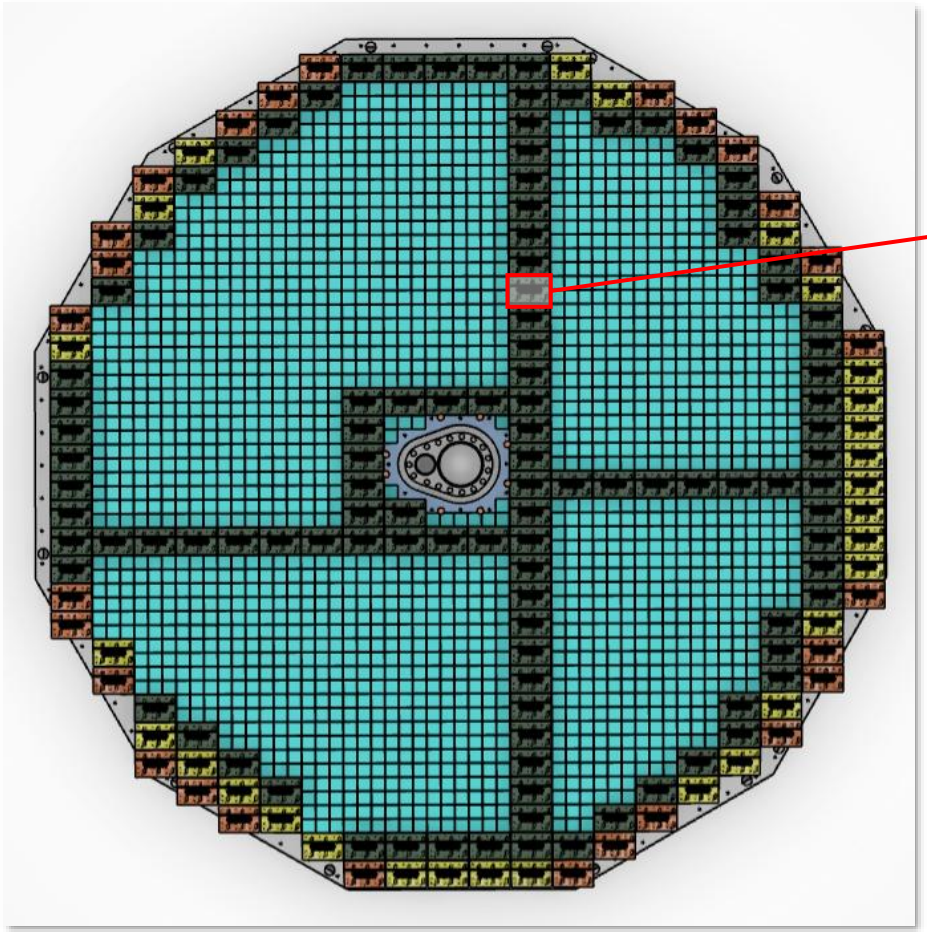


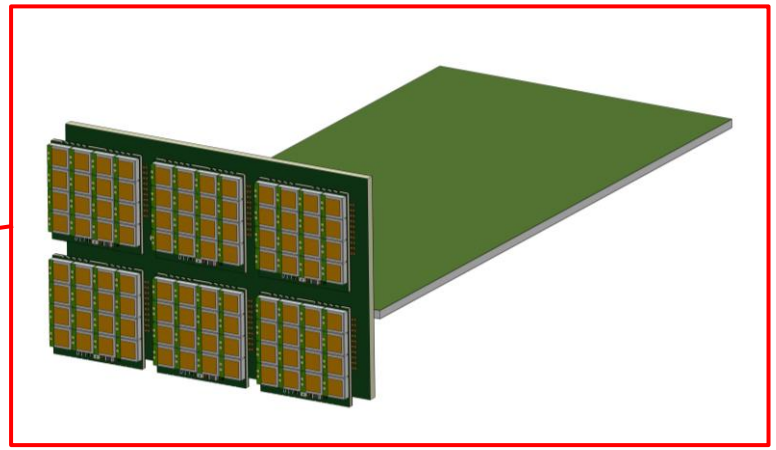
+	-
Good mapping	Hard to cool
Good fitting at the center	Bad fitting on the edge



+	-
Easier to cool	Bad fitting at the center
	Bad fitting on the edge

Design & Cooling for the FEB



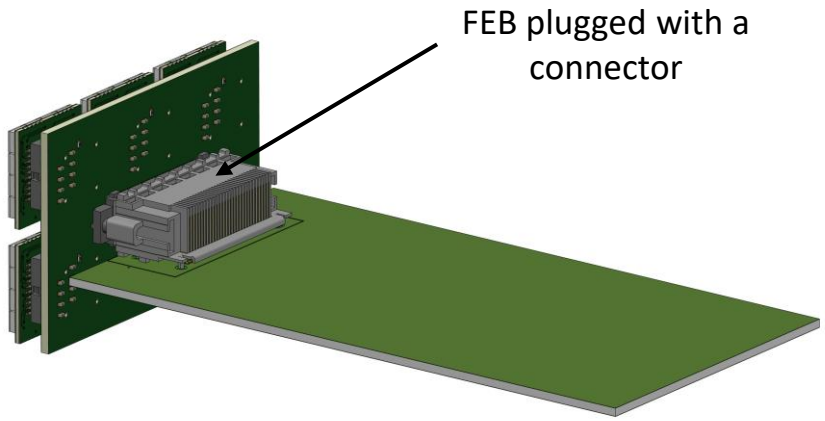


≈ 500 (Adapter + FEB)

→ Work in progress

Based on the optimum for the Asics
→ 1 lpGBT for 3 EICROC (OMEGA, IN2P3)

1 FEB for 6 crystals



Clearance OK
Clearance OK – On structure
Clearance KO – Adjustment required

Installation

- Two rails at 3 & 9 o'clock
- Validate the kinf of rails
- Mass= 2,5 tons
- Increase the surface to reduce local stress on the structure
- Two Guide bearing or Plain bearing per face
- Carbon tube removed ?
- PfRICH attached ?