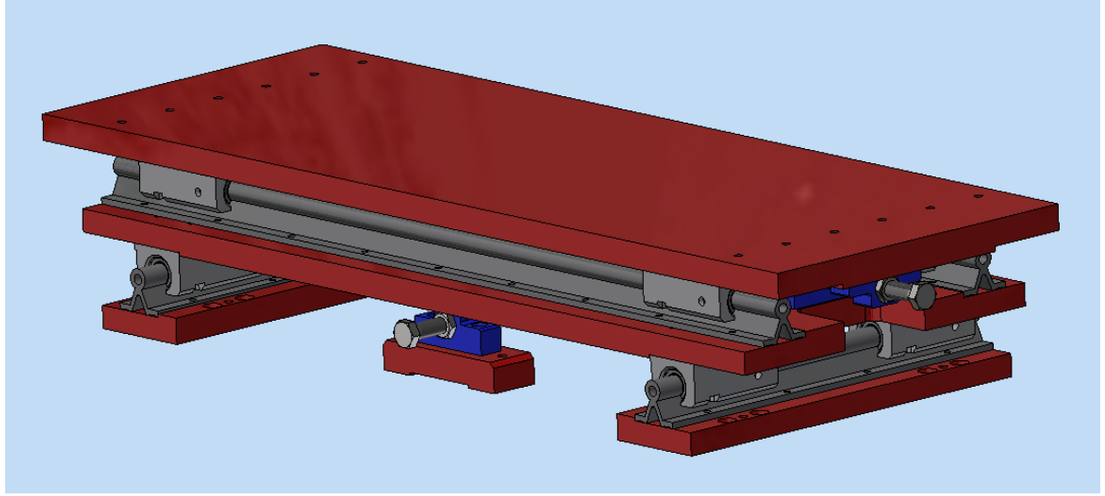
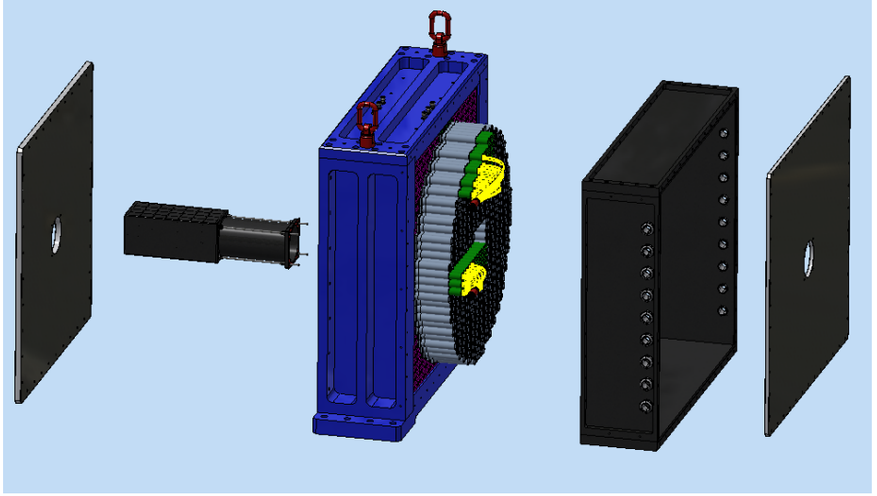
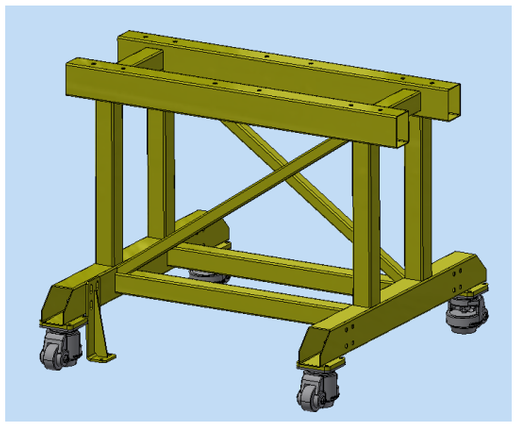
Istituto Nazionale di Fisica Nucleare

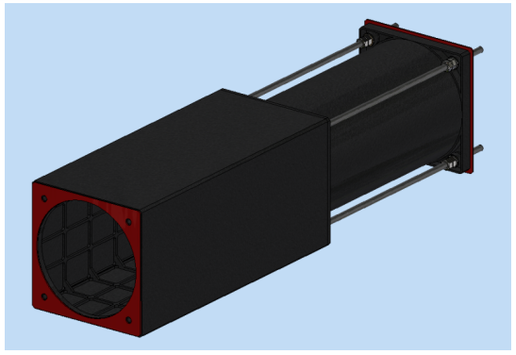
ECAL construction status

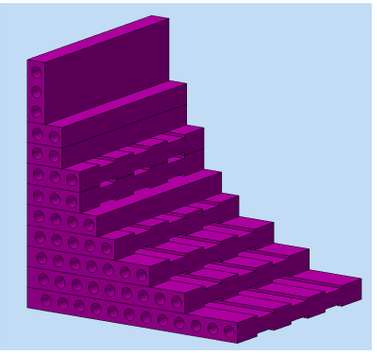
Gabriele Piperno (many thanks to Emilio Capitolo and Alessandro Saputi for infos and drawings)



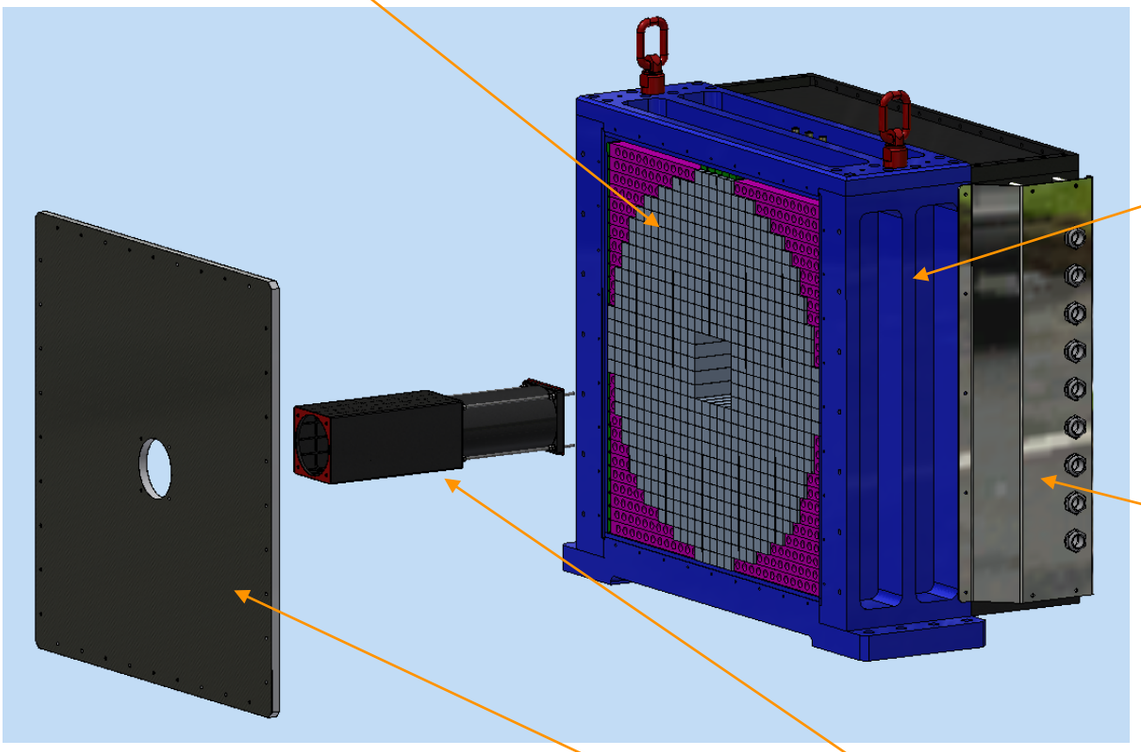


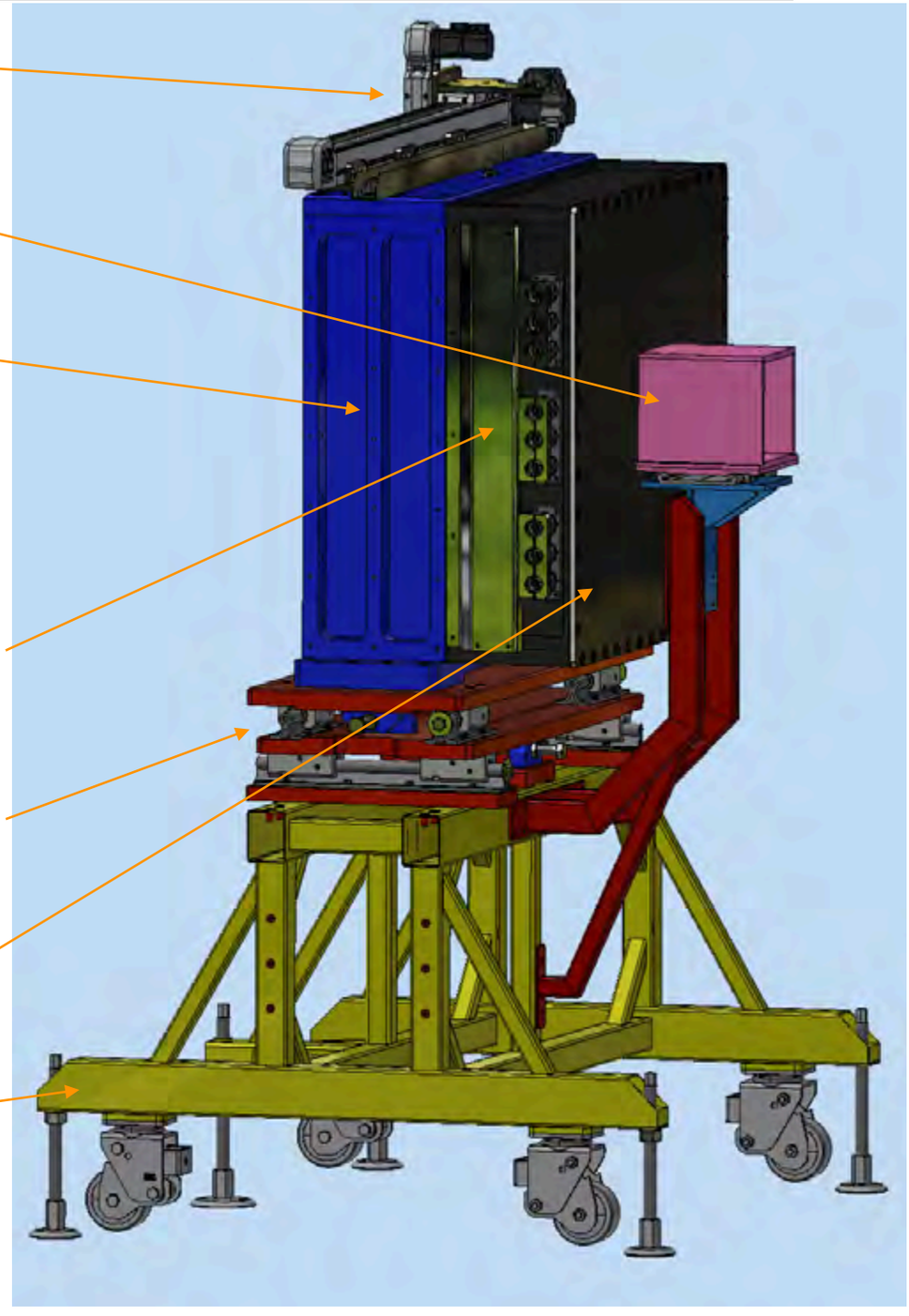






The whole object



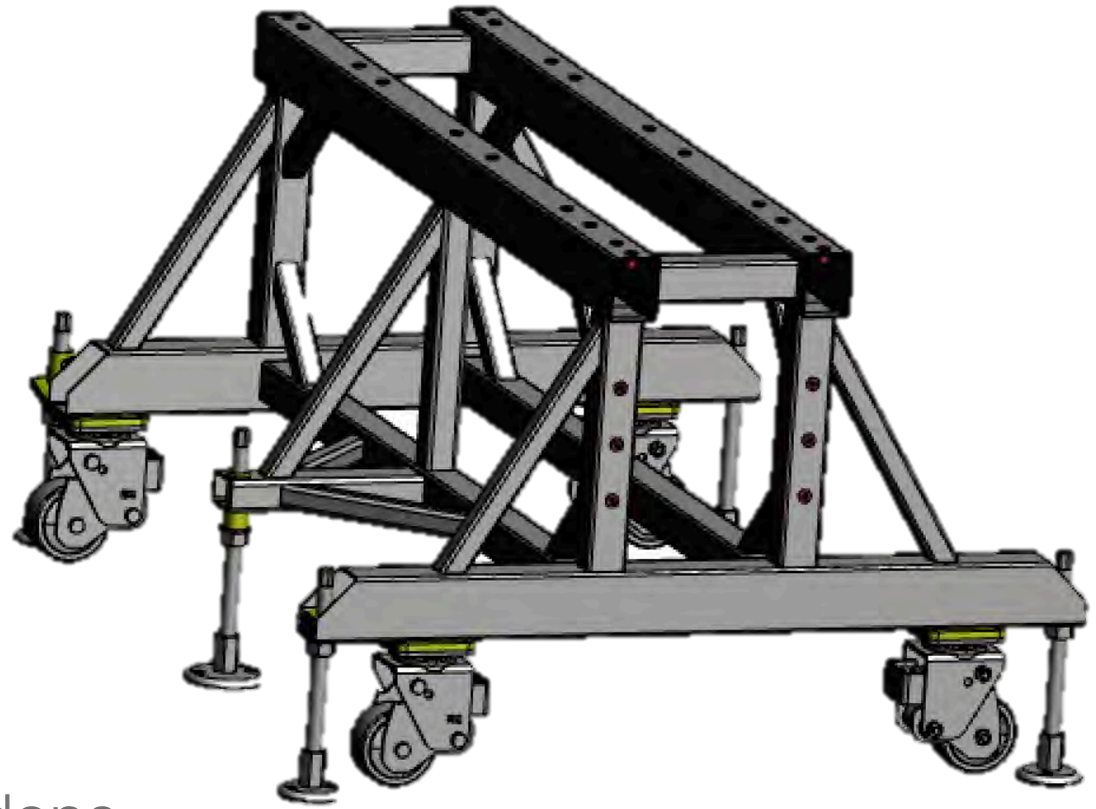


Not all the components images are updated here, see the corresponding slide.

Support structure

Design status

The design is completed and it is also ready to host the SAC supports.



Production status

We had 3 quotations:
the selected one (1600 €) has already the CIG number, but the firm (Metalmeccanica Bianchi) wants the 30% in advance otherwise it does not want to proceed: “rips the contract”.

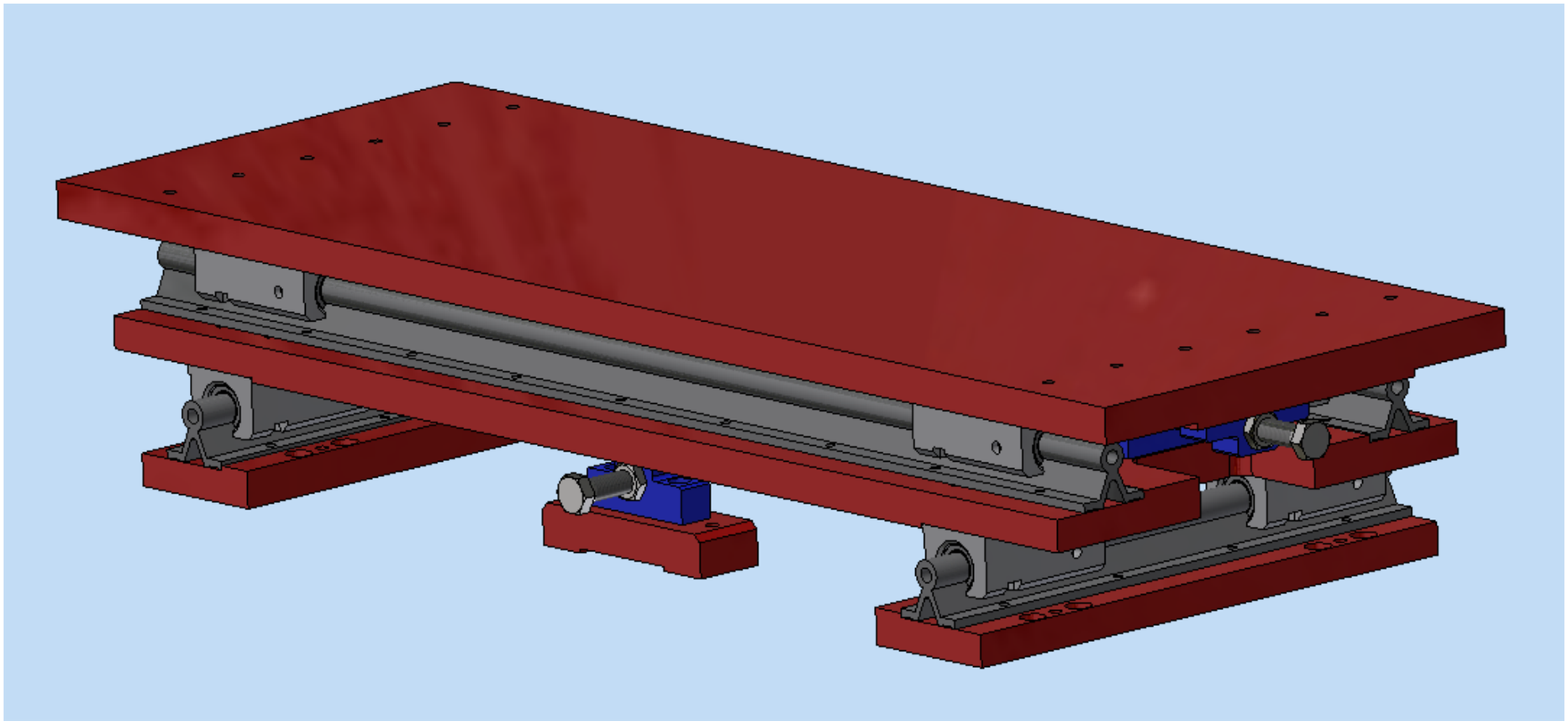
↓ This is what we’ve done…

Emilio found out that we have a contract that states the possibility to use for 50 days in 3 years manpower and carpentry from the Carlo Polacchi’s firm. Personally contacted he said that this kind of work is included in the contract.

↓

For ≃ 1300 € we are going to have the whole structure before Easter.

Support table



Design status

Completed.

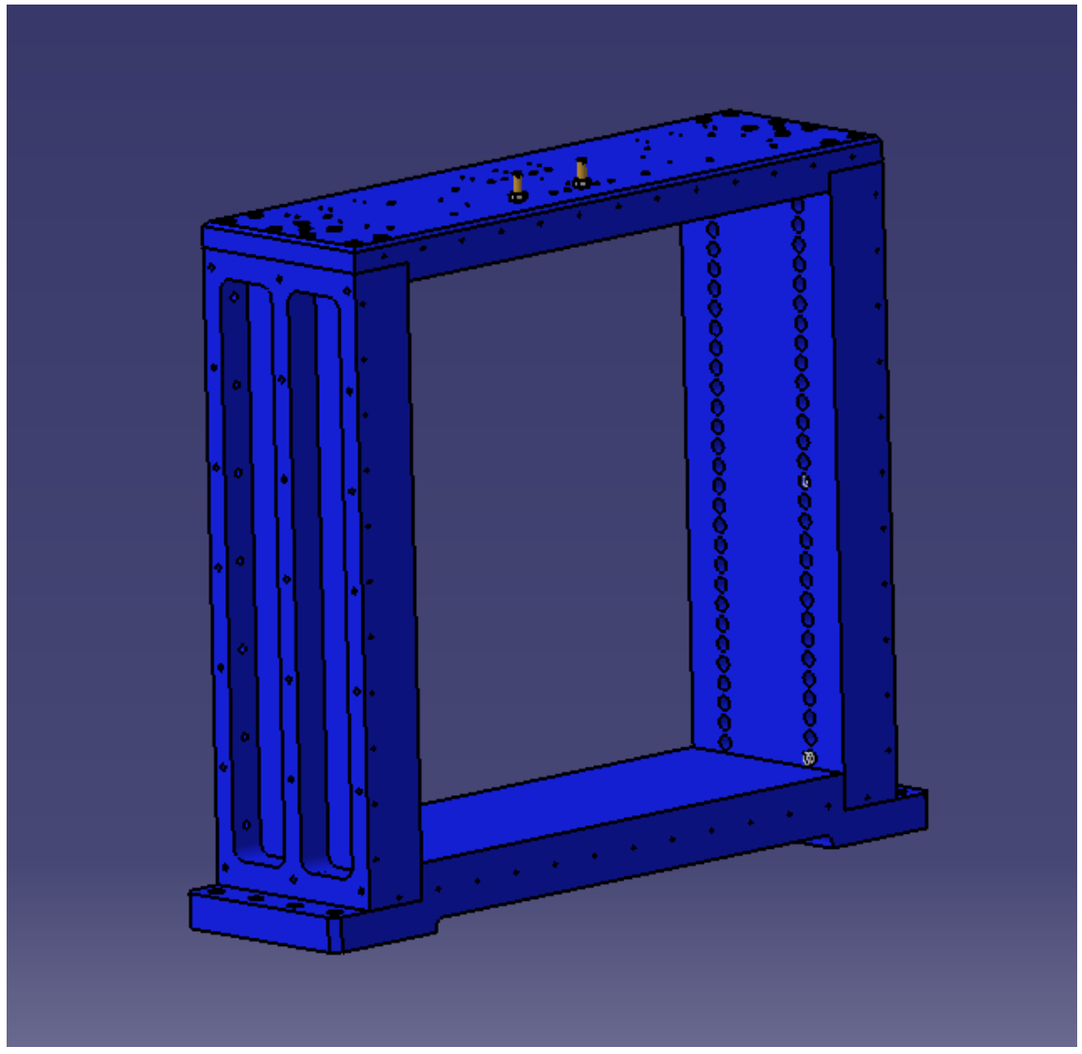
Production status

Guides and skates for x-z movements are arriving (1040 €), shipping time: 10 working days from March 7th. The rest of the material (blue and red) is at Roma 3 workshop.

ECAL support

Design status

Completed.



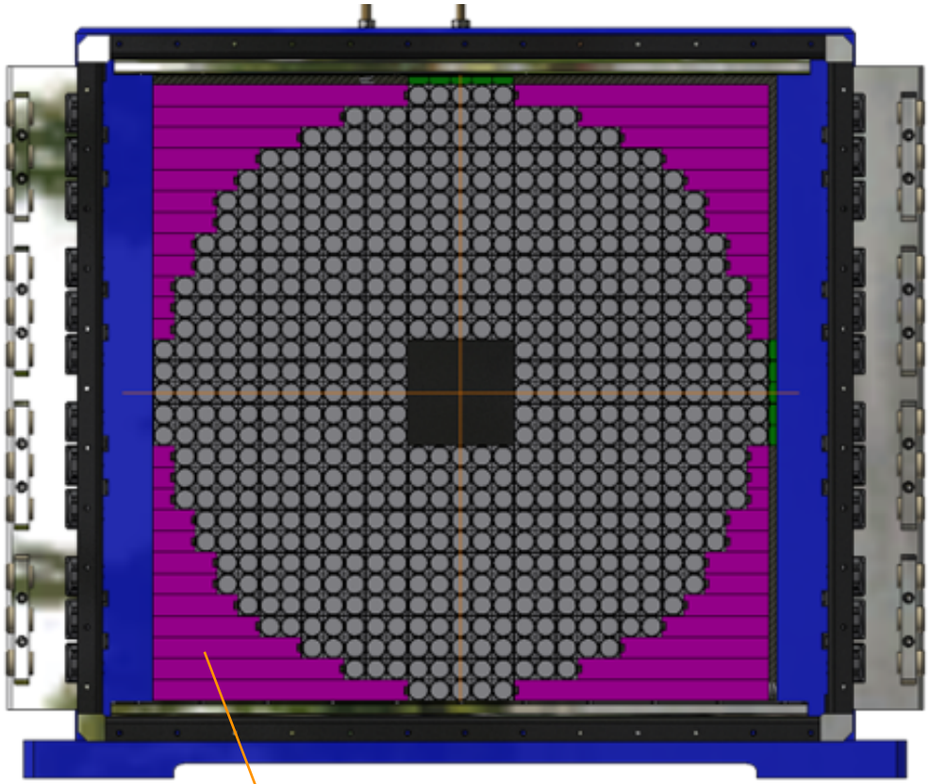
Production status

The 4 Al 7075 frames are at the LNF workshop. The parts are under process. Upper part finished, the other three are to be started (~1 week per part) → locking screws will come after this part is concluded.

Fillers

Design status

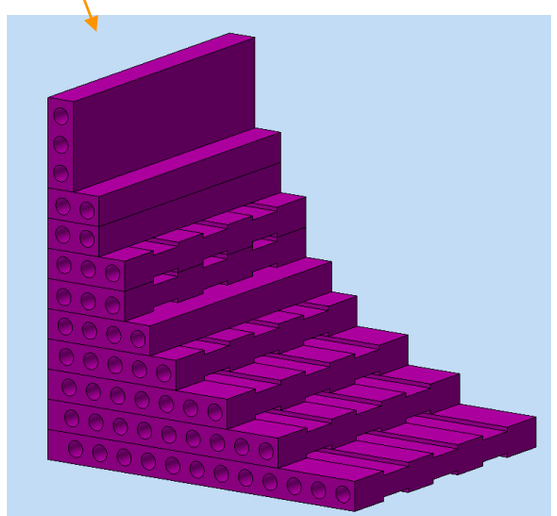
Almost completed: it remains to include the design of the slots for the thermometer cables (see next slides), probably a 8×6 mm^2 tunnel.



Production status

The material is at the LNF workshop (a total of 2 m^2 area and 2.5 cm thickness PVC foils). Must be understood if the workshop will ever produce them or not.

There will be no holes inside, but slots on the side that touches the crystals



Front and rear panels

Design status

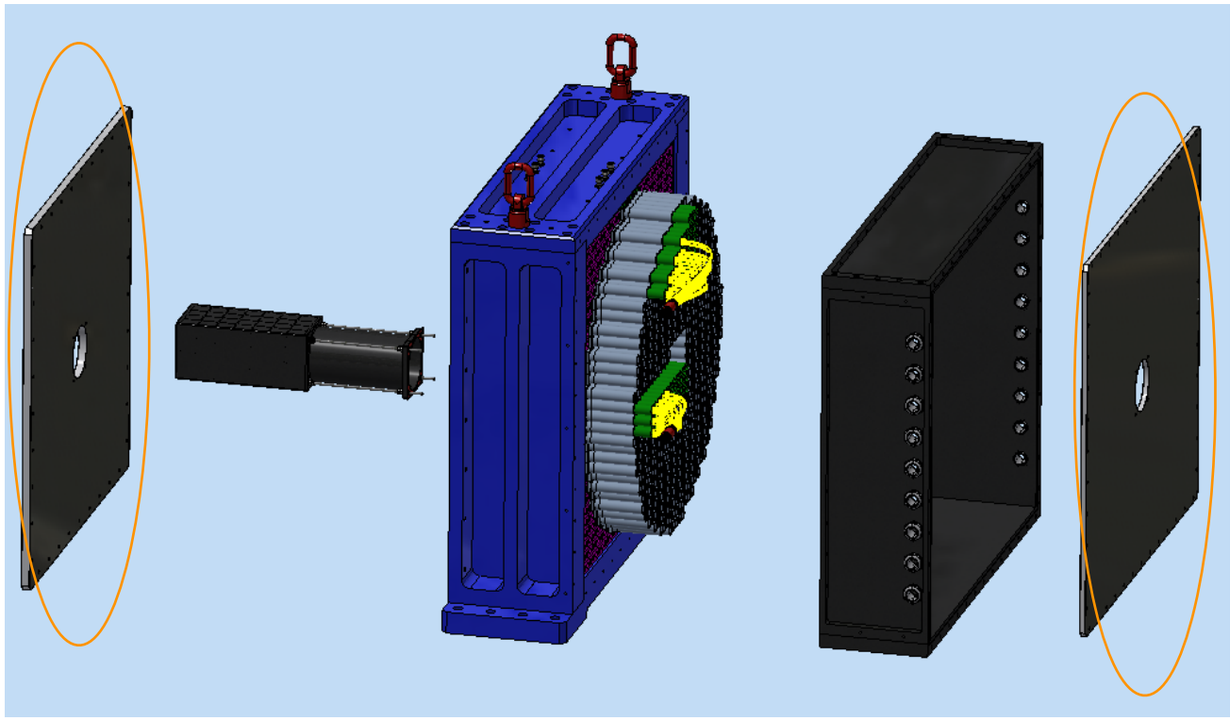
Completed.

Production status

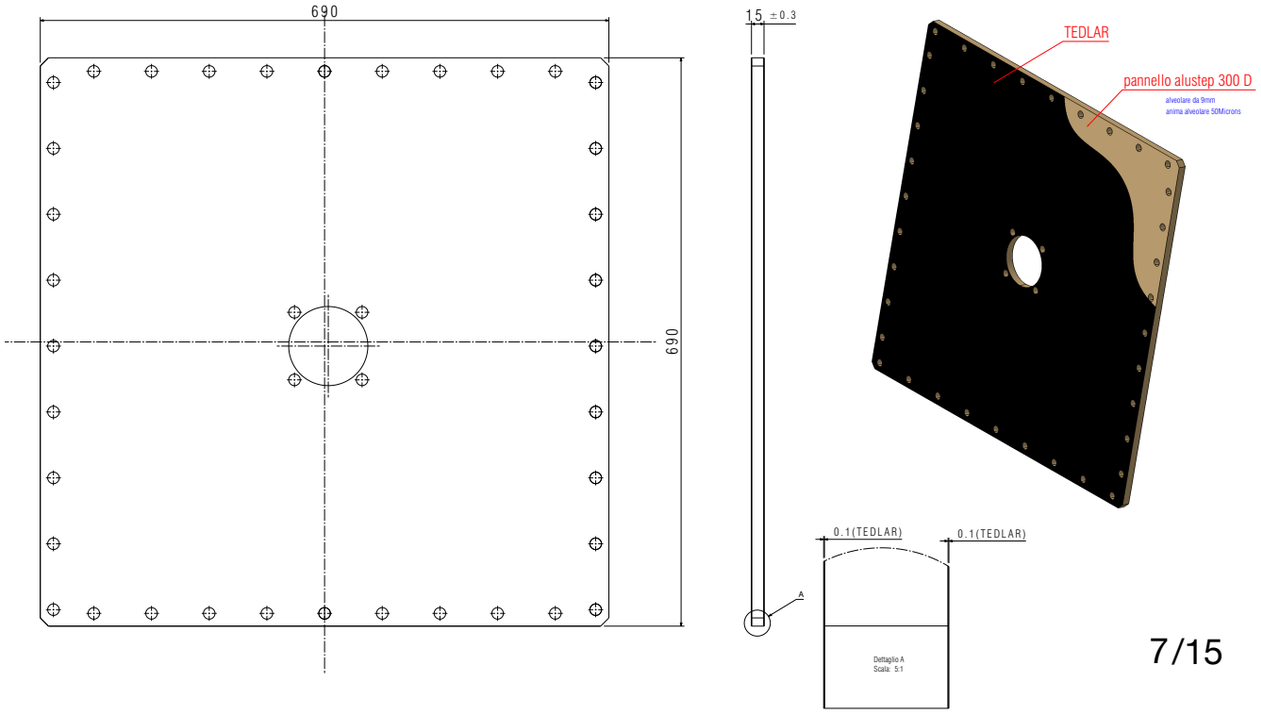
In stand-by to decide the material. At the moment we have contacts with the CEL Components for 2 possible solutions:

- Alustep 300-D, 1.5 cm of Al honeycomb, 9 mm ⌀, 50 μm walls thickness; arrives covered with tedlar; ≈1000 € for both.
- Alustep 300-FN, 1.5 cm of nomex honeycomb (mix of C, N, O and H, lower Z); 4.8 mm ⌀; 800 € for both without tedlar (it is possible to have them with it, but we cannot ask too many quotations…).

Thickness given by the requirement that the panel is able to sustain the BGOs weight in case of ECAL inclination during movement.



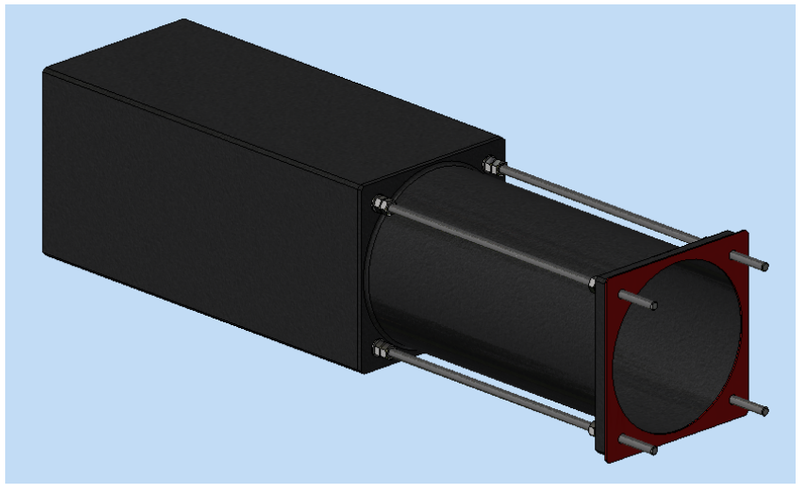
Front panel (≈ back panel)

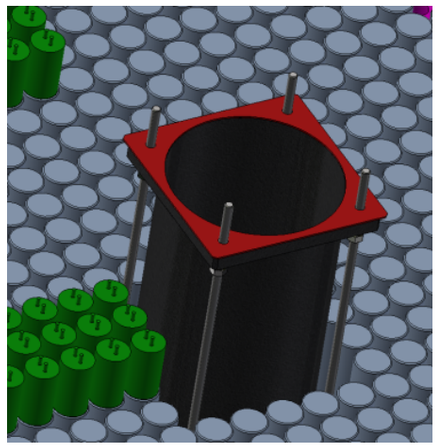


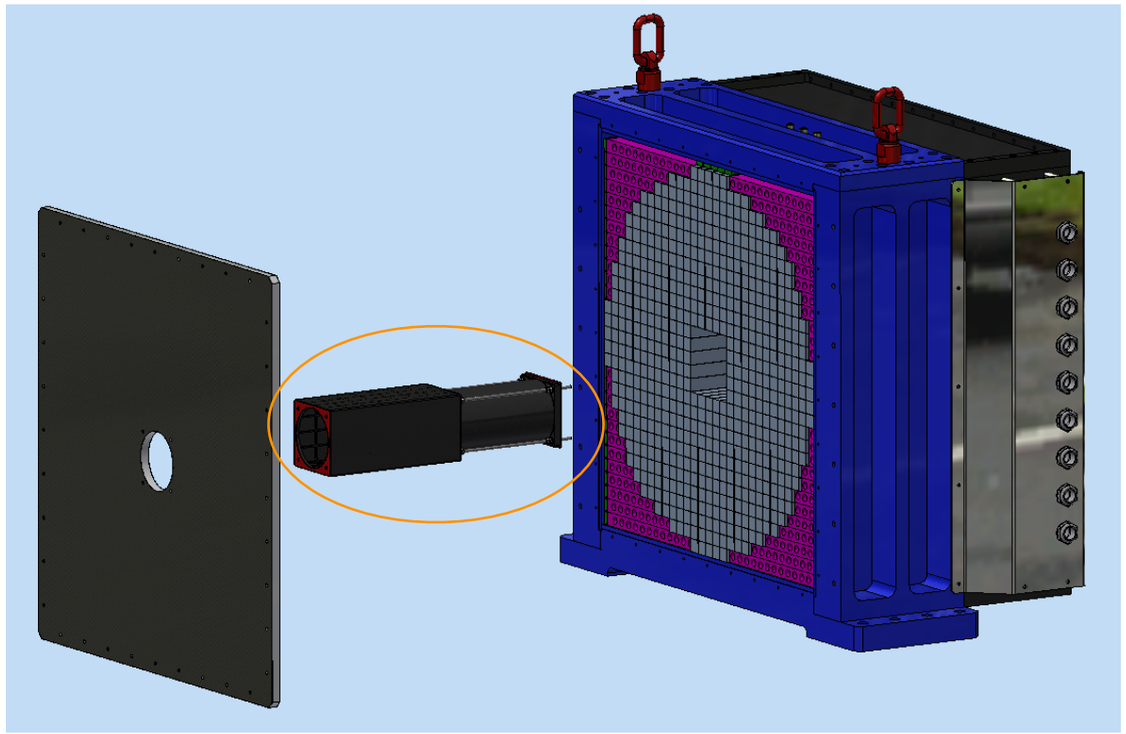
Inner support

Design status

Completed.

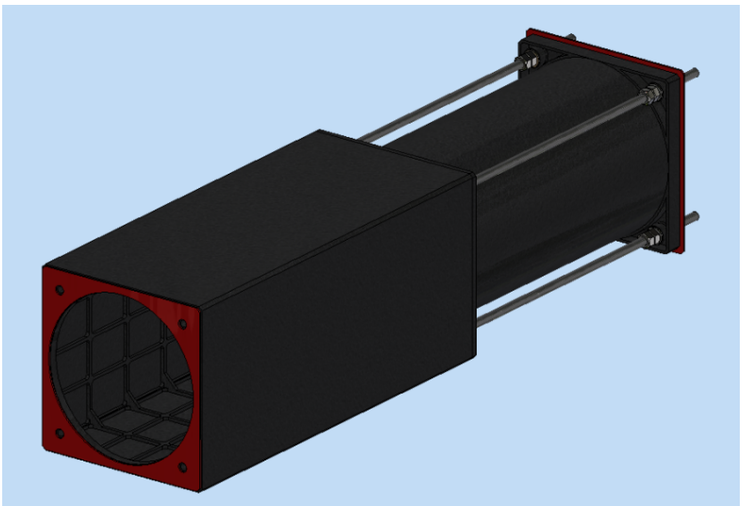






Production status

Will be 3D printed in ABS in 2 parts (too long).
In addition 2 rubber printing (≈1.5 mm, 50 - 70 shore) will be placed in between it and the closing panels to guarantee light tightness.
Verify cartridge stock.



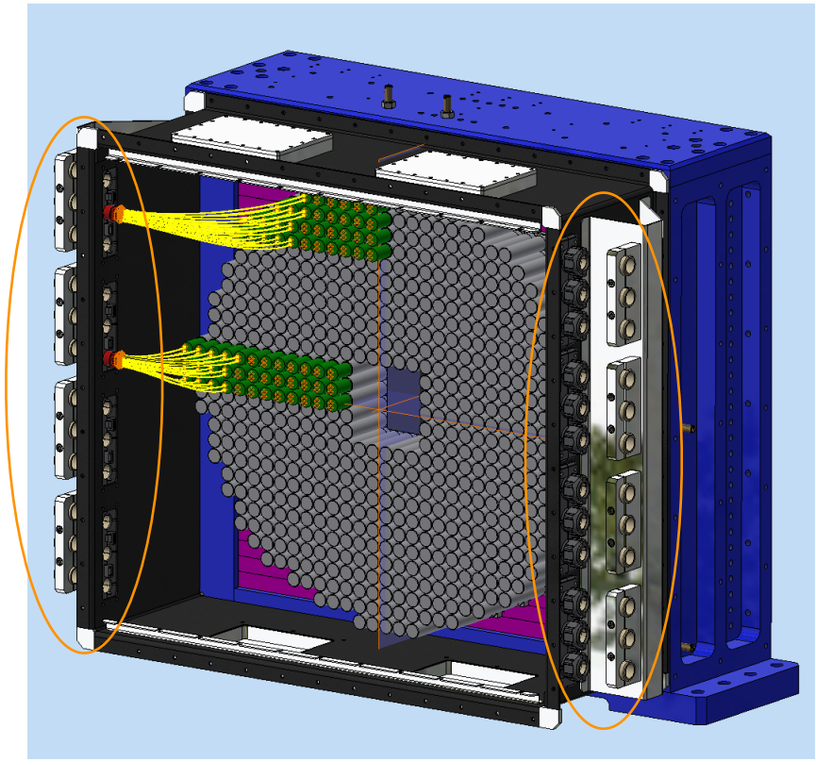
PMTs enclosure and cabling

Design status

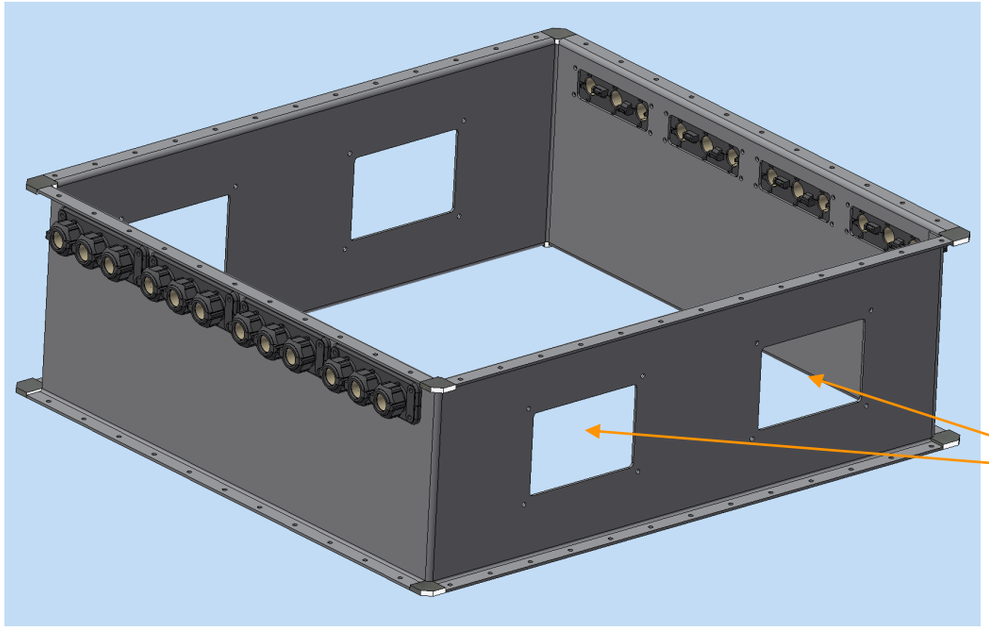
Completed.

Production status

Likely will produced by TEM (an external firm). They are preparing a quotation in these days. With some modifications it may be produced at LNF after all the rest, but it may require a lot of time.
The chosen material is peraluman (Al).



Double set of cable holder to keep them securely



It must be decided the mapping for the cables.

Openings for the thermalisation system

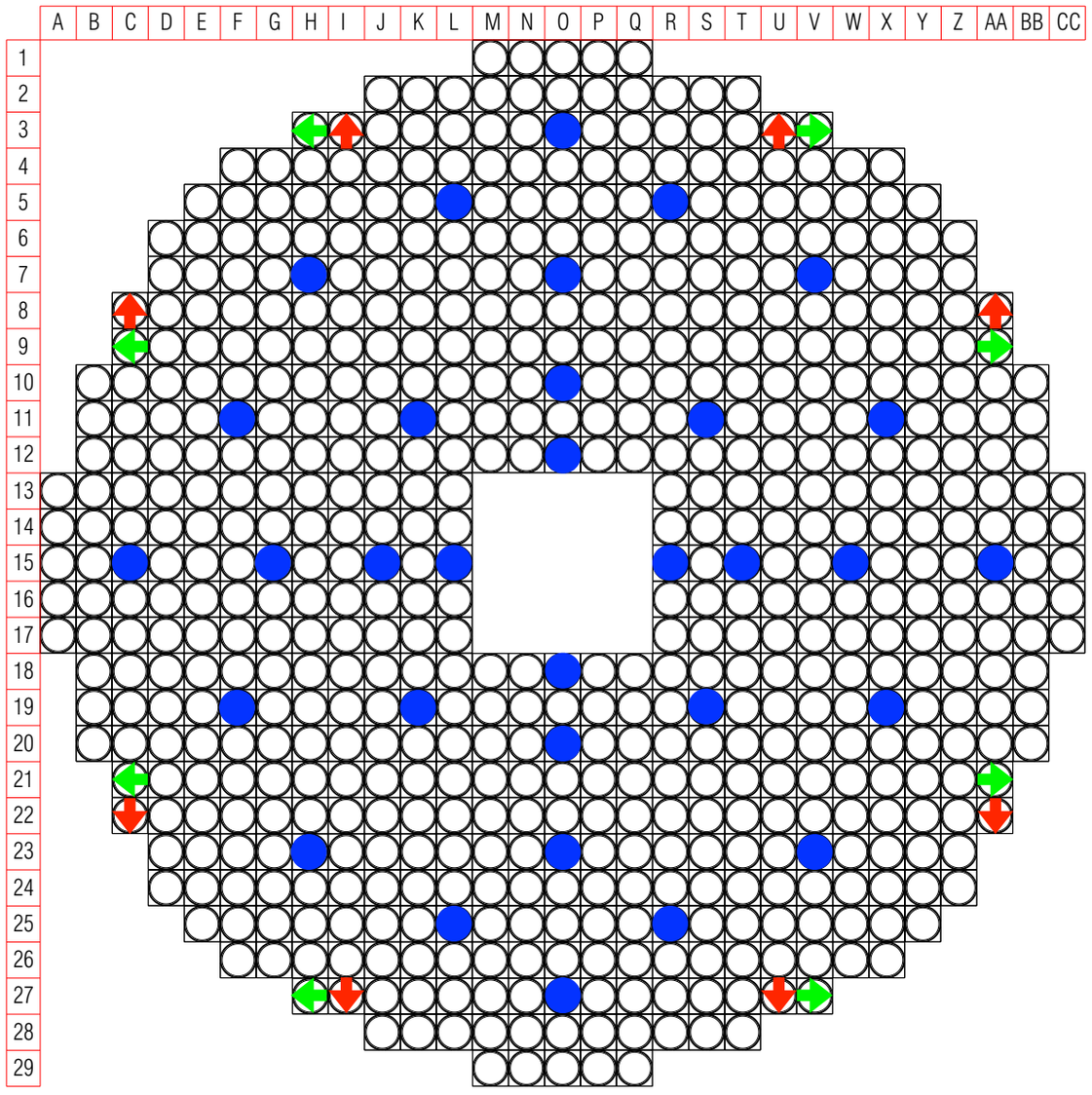
BGO thermometers

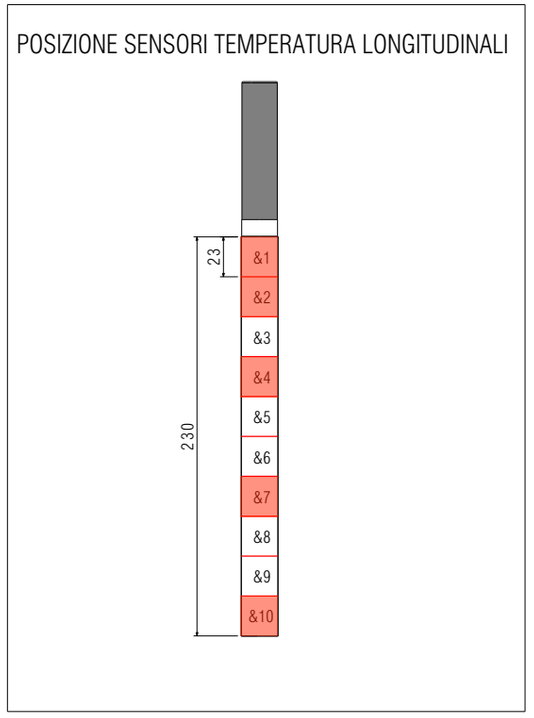
Proposed position by Giovanni:

Back

Side (not possible fo mechanical reasons)

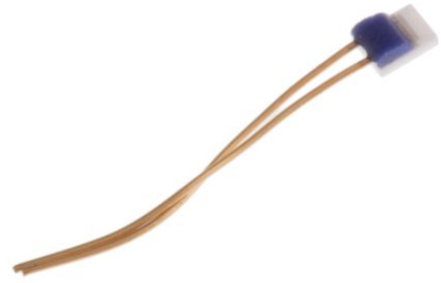
Side (90° rotation, proposed by me, easier for cabling)





Position along side

32 + 40 thermometers:

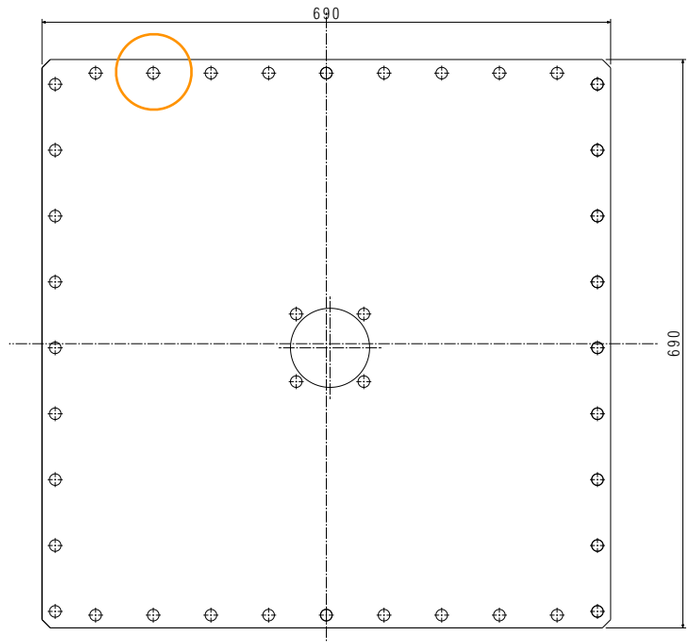


- Pt100 (100 Ohms @ 0°C)
- thin film, 10mm tails
- dimensions: 1.2×1.6 mm²
- temperature range: (-50, 500°C)
- self-heating:< 0.5 °C/mW
- thermal response: 0.1 s
- stability: ±0.05%
- cost: 70×8.09 € = 566.3 € on RS (6667362)
- we must think about the cabling

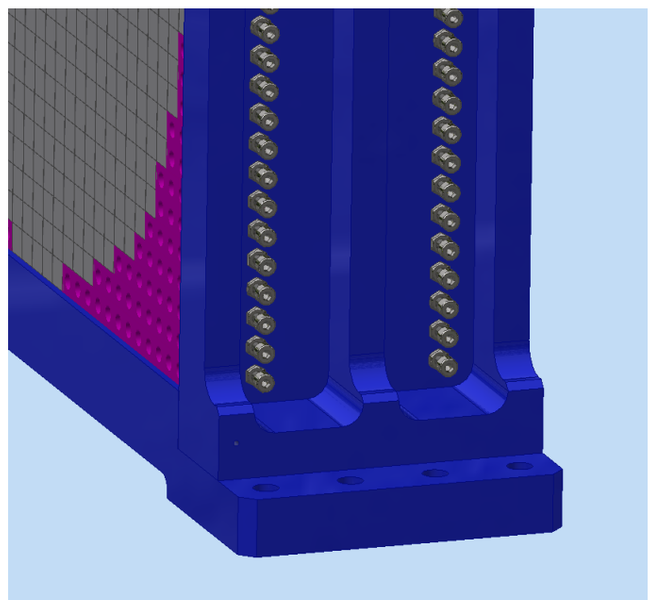
Lathe material

At 99% will be produced outside the labs.

- Bushings (≈100 pieces) to screw front and rear panels to ECAL structure. Design must be finalised depending on the panel real thickness (very fast).



- Locking screws (≈80 pieces) to tighten the crystals (side and top). Commercial springs (to buy).

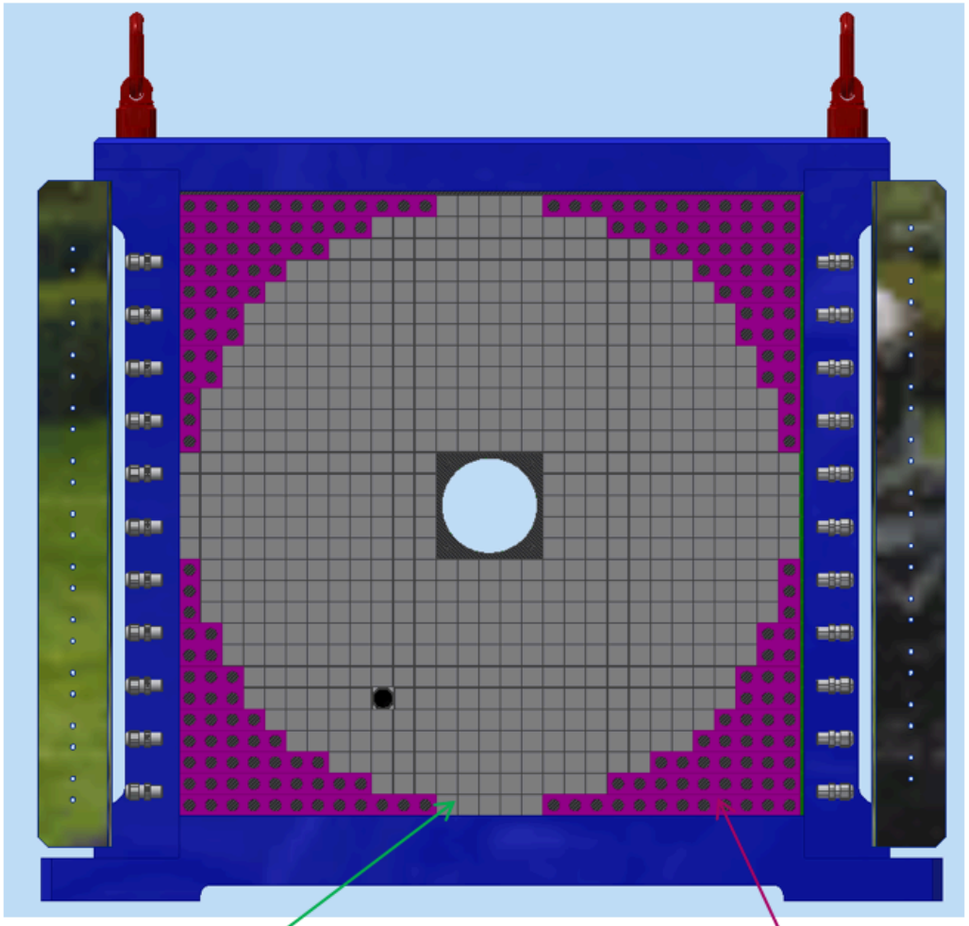


Costs are being evaluated with firms.

ECAL assembly

Crystals matrix: ass.bly

nil volentibus arduum



The assembly of the crystal matrix will start from the first row down:

1. the first crystal is placed in contact with the reference plane (first step in the left);
2. to follow, we lay the others crystals of the same row;
3. the crystals will be blocked on the right step using locking screws;
4. leveling of the top surface of the row (using spacers of different thickness or a TEDLAR sheets).

We follow this procedure up to the row # 12.

Starting from the row #13 up to the row #17, the crystals will be installed in both side of the inner support.

20

Alessandro Saputi - LNF 22th December 2017

From the Alessandro's presentation at December 22th meeting

Scintillating units

Delivered PMTs to SILO: 628. Needed scintillating units: 616.

Complete Scintillating Units (SU) at LNF:

- 32 delivered the 20/10/17
- 42 delivered the 17/11/17
- 60 delivered the 29/11/17
- 11 delivered the 20/12/17 (painted with BC 620)
- 150 delivered the 09/02/18

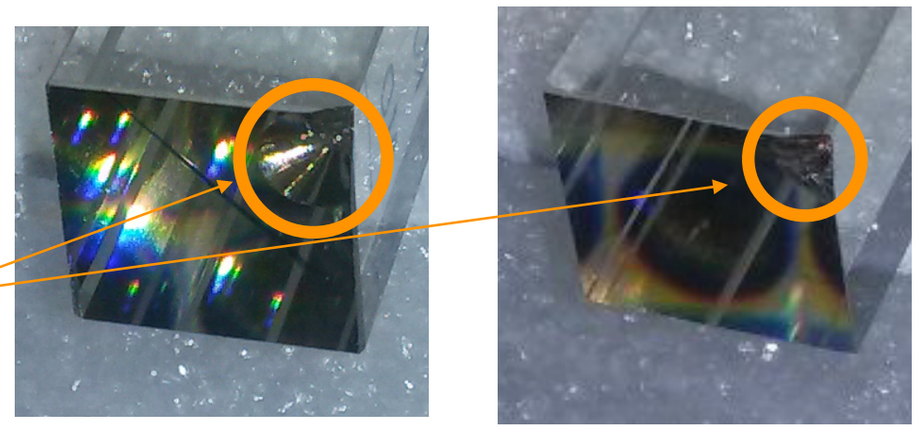
} Total: 295 SU at LNF

The other SU:

- Emilio tomorrow is going to SILO to take ≈130 SU
- the deliver of the rest strongly depends on the paint order (if everything goes well at the middle of the next month), but more in general there are things not understood about their work (paint, time scales, produced units)…

Problematic SU:

- 2 broken SU at SILO
- 1 (over 72 tested) non working SU found at LNF
- 2 glued crystals a little ruined (I think usable)
- 2 SU with PMT out of crystal shape



Summarising

item	who	when	cost [€]
ECAL support	Carlo Polacchi's firm	before Easter	≈1300
x-z table	Roma 3	Guides & skates delivered by 20/03, the rest @ Roma3	material is @ Roma 3 + 1040 (guides and skates)
ECAL frames	LNF	first week of April	material is @ LNF
Fillers	to be understood	?	material (PVC) is @ LNF
Front/rear panels	CEL components	after we make the decision, shouldn't take too much	≈1000 (both completed)
Inner support	3D printed @ LNF in ABS	1 week for production	1260 (1.4 cartridge)
PMT enclosure	TEM (or internal with design modifications)	quotation request	quotation request
BGO thermometers	RS + LNF (cabling)	2 days after the order starts	< 600
Lathe material	external firms (perhaps locking screws internally)	bushings after front/rear panels	waiting for firms answer (hopefully low price)

Open questions

- ^{22}Na source movement, do we have the space for it?
- Assembly place, BTF would be the best solution, otherwise we need dedicated objects for its movement and transport
- For the SAC we have PMTs, PbF_2 should be at LNF next week, the ECAL support foresees its structure and the material is in stock at the labs (needed slits and skates), but we have to define all the rest: Black paint? Tedlar foils? Crystals housing, …
- (Just to underline it once again) we are planning to run with no faraday cage for dividers
- Cosmics trigger (obviously we can run without it)

Backup

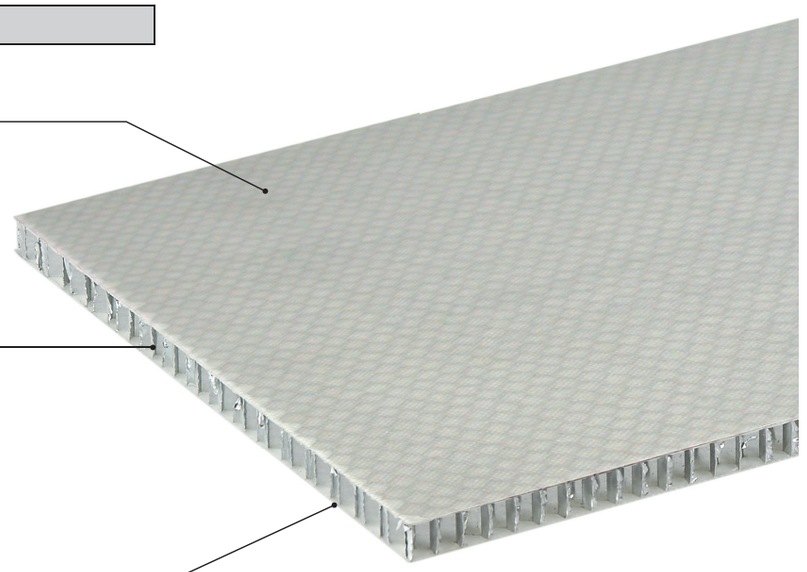
Alustep 300-D

ALUSTEP® 300 - D

Composizione del pannello

PELLI IN LAMINATO DI TESSUTO DI VETRO
2 x 290g/m² impregnato con resina epossidica

ANIMA
Alveolare in alluminio (Lega Serie 3000*)
con celle esagonali
Diametro: Ø1/4”, Ø3/8” **
Spessore Foil: da 50 a 70 microns



Spessore da 3 mm a 80 mm

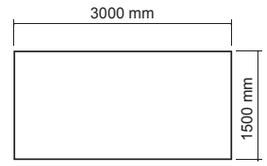
* Appartengono alla serie 3000: Alluminio Lega 3003, Alluminio Lega 3005, Alluminio Lega 3103, Alluminio Lega 3104.
** Ø3/8” su richiesta

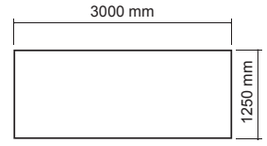
ESEMPIO	Pesi del pannello con nido d’ape Ø6 56kg/m³ (Ø 1/4”)					
	Spessore totale mm	5	10	13	15	20
	Spessore PELLI mm	0,3 + 0,3				
	Spessore ANIMA mm	4,4	9,4	12,4	14,4	19,4
	Peso kg/m²	2,46	2,74	2,92	3,02	3,3

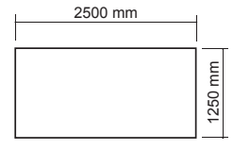
Proprietà dell’anima alveolare	50 Microns	
Tipo	ALLUMINIO LEGA 3003/3005/3103/3104	
Ø alveolari in mm ca.	6	9
Ø alveolari in pollici	1/4”	3/8”
Densità Kg/m³	56 - 59	39 - 40
Resistenza compressione stabilizzata MPa	3,0 - 3,5	1,4 - 1,95

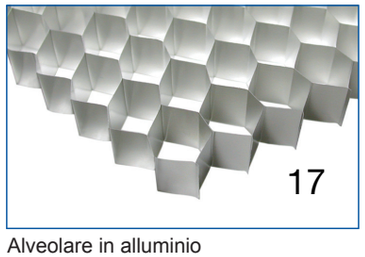
Proprietà dell’anima alveolare	70 Microns	
Tipo	ALLUMINIO LEGA 3003/3005/3103/3104	
Ø alveolari in mm ca.	6	9
Ø alveolari in pollici	1/4”	3/8”
Densità Kg/m³	80 - 83	54
Resistenza compressione stabilizzata MPa	4,3 - 4,6	2,5 - 2,6

Dimensioni standard (dimensioni speciali a richiesta)
Tolleranza dimensioni ±30mm





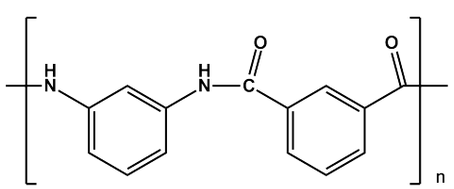


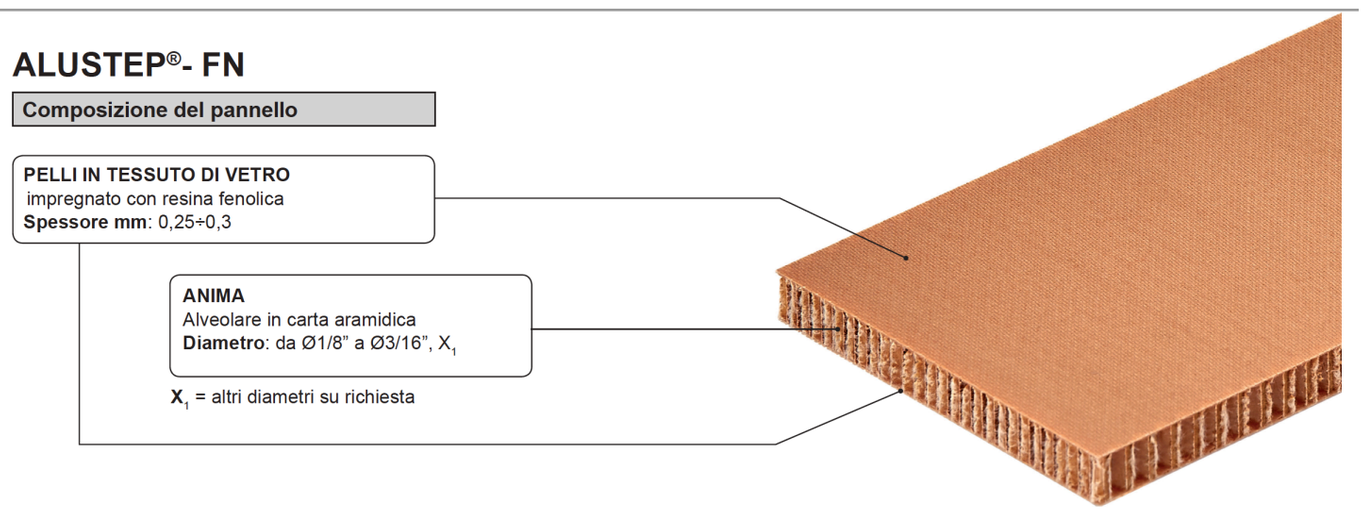


Alveolare in alluminio

Alustep 300-FN

Nomex (Z_{avg} = 4.43)





spessore del pannello	mm	da 5 a 50						
dimensioni pannello	mm	dimensioni standard 1250x2500/1500x3000 altre dimensioni su richiesta fino a max 1500 x 4000						
tolleranza spessore	mm	±0,4						
tolleranze dimensione	mm	±30						
spessore pelli	mm	0,3						
fibra di vetro pelli		tessitura satin 8/1 300 gr/m²						
Impregnazione		resina fenolica						
materiale honeycomb		tessuto fibra aramidica impregnato di resina fenolica						
dimensioni celle esagonali honeycomb	Ø = mm	3 e 4,8						
densità honeycomb	Kg/m³	48 e 32						
adesivo		termoplastico						
spessore pannello (alcuni esempi)	mm	5	10	15	20	25	30	35
peso pannello ‡	Kg/m²	1,4±0,1	1,7±0,1	1,9±0,1	2,1±0,1	2,4±0,1	2,6±0,1	2,8±0,1

From the document it is not clear if they produce such a honeycomb

Nomenclatura			Resistenza compressione	Taglio-L	Taglio-W
	Diametro degli alveoli mm	Densità kg/m³	N/mm²	N/mm²	N/mm²
Hexagonal	9,6	24	0,52	0,32	0,16

Thermometer glue comparison