Detector Update

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SUMMARY/UPDATES

– CRP design from LAPP integrated

– New Design of Cathode and Groundgrid

– Position of the Detector changed (300mm upwards)

– New Internal Cryogenic Pipes integrated (D.Montanari)

– Cryostat and Detector integrated in the EHN1 Simplified model

– Defined the size for the PMMA plates → 650x650mm^2 x 10mm thickness

– PMTs Layout

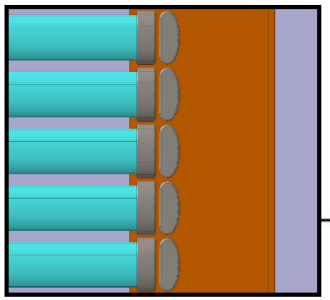
Detector Update Overview:

Field Cage Hanging Structure

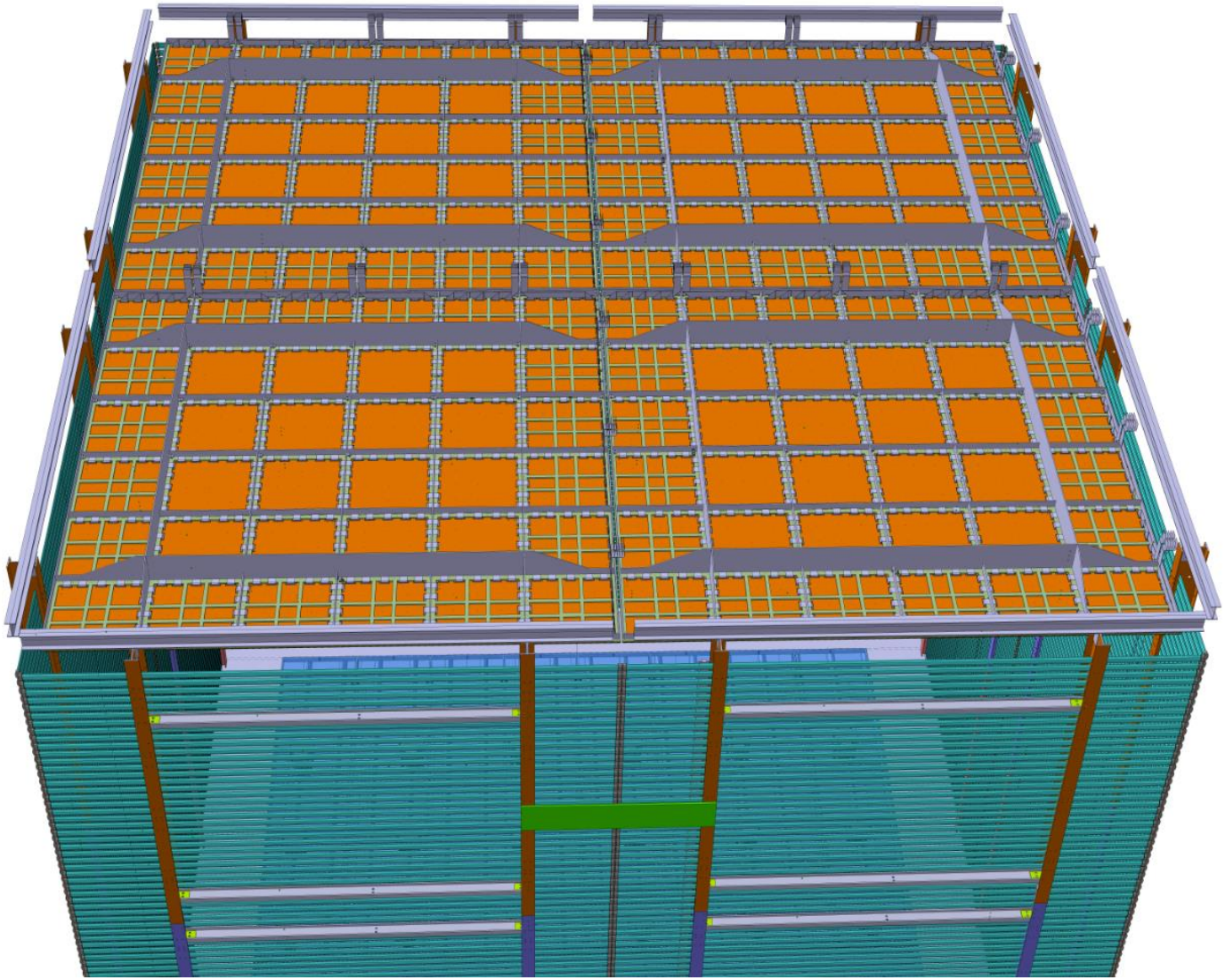
New Cathode Structure

New Groundgrid

60mm beetween Field Shapers



Detector Update Overview:

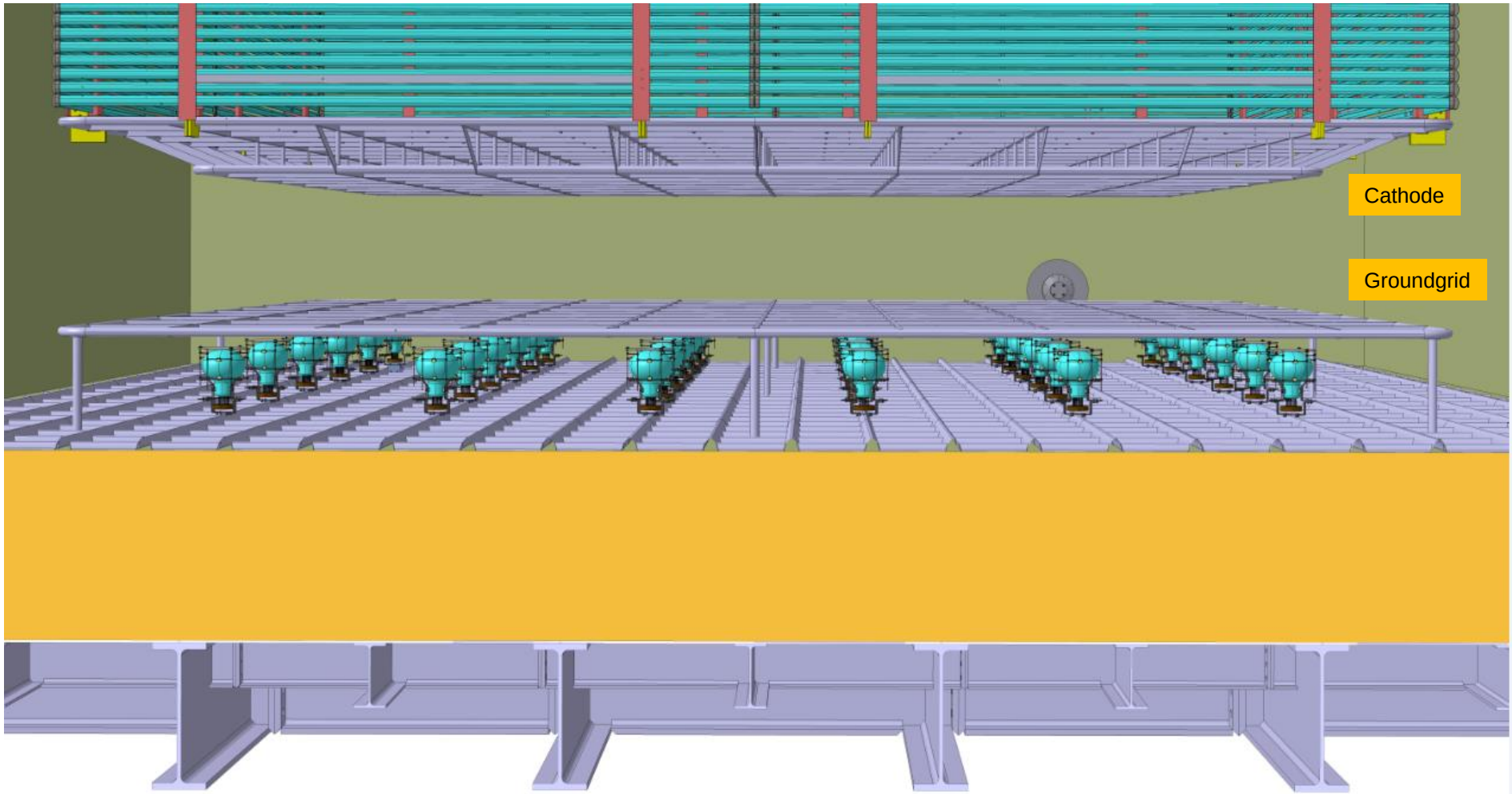


CRP Model From LAPP Integrated:

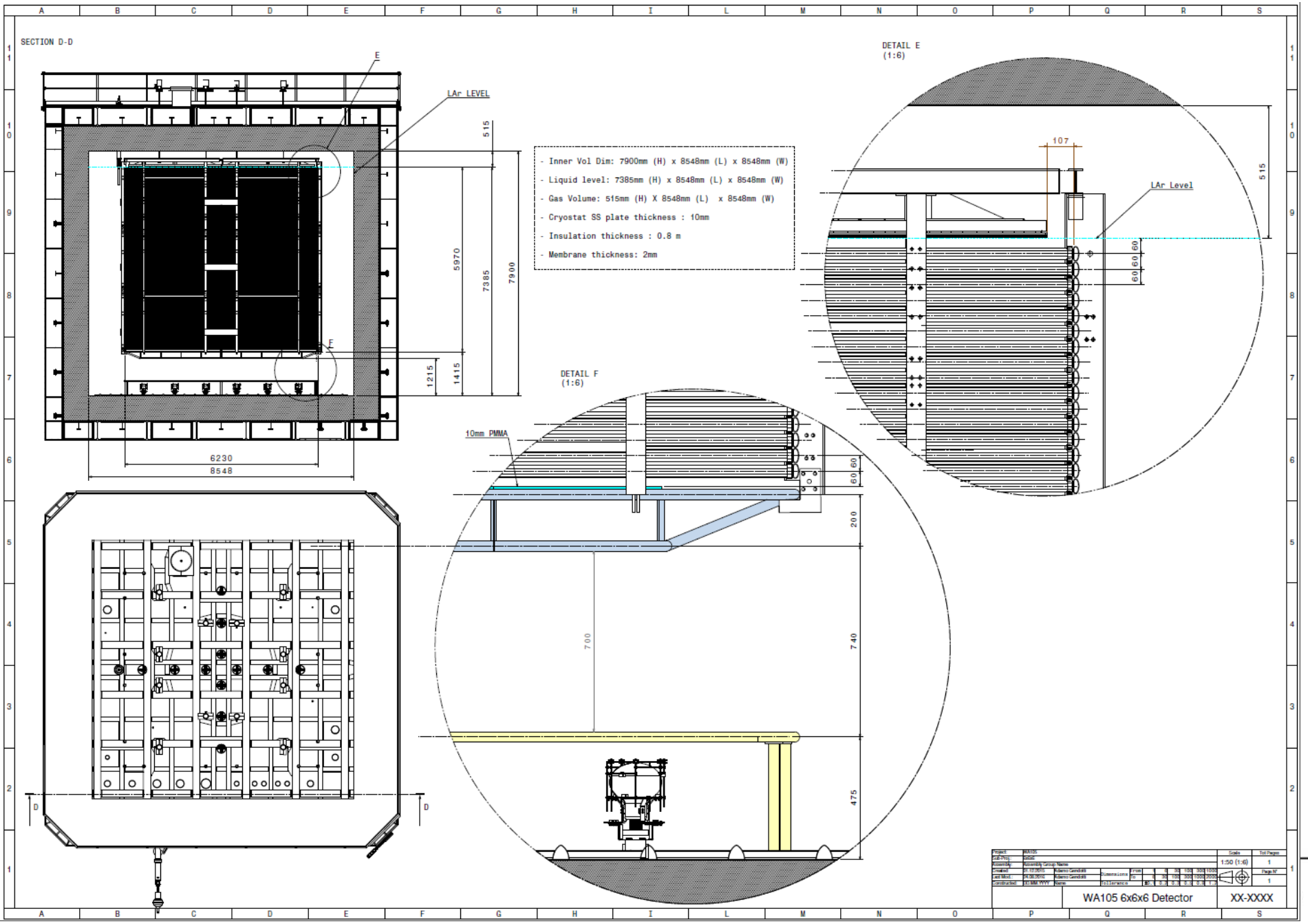
- ~100mm free space between CRP and Field Cage

Detector Update Overview:

- Cathode Structure is part of the Fieldcage
- Groundgrid decoupled and sitting at the membrane
- Fieldcage, CRPs moved 300mm upwards respect to the previous desing
  - ✓ Increase the distance from the the Groundgrid
  - ✓ Reduce the lenght for the FTs on Top



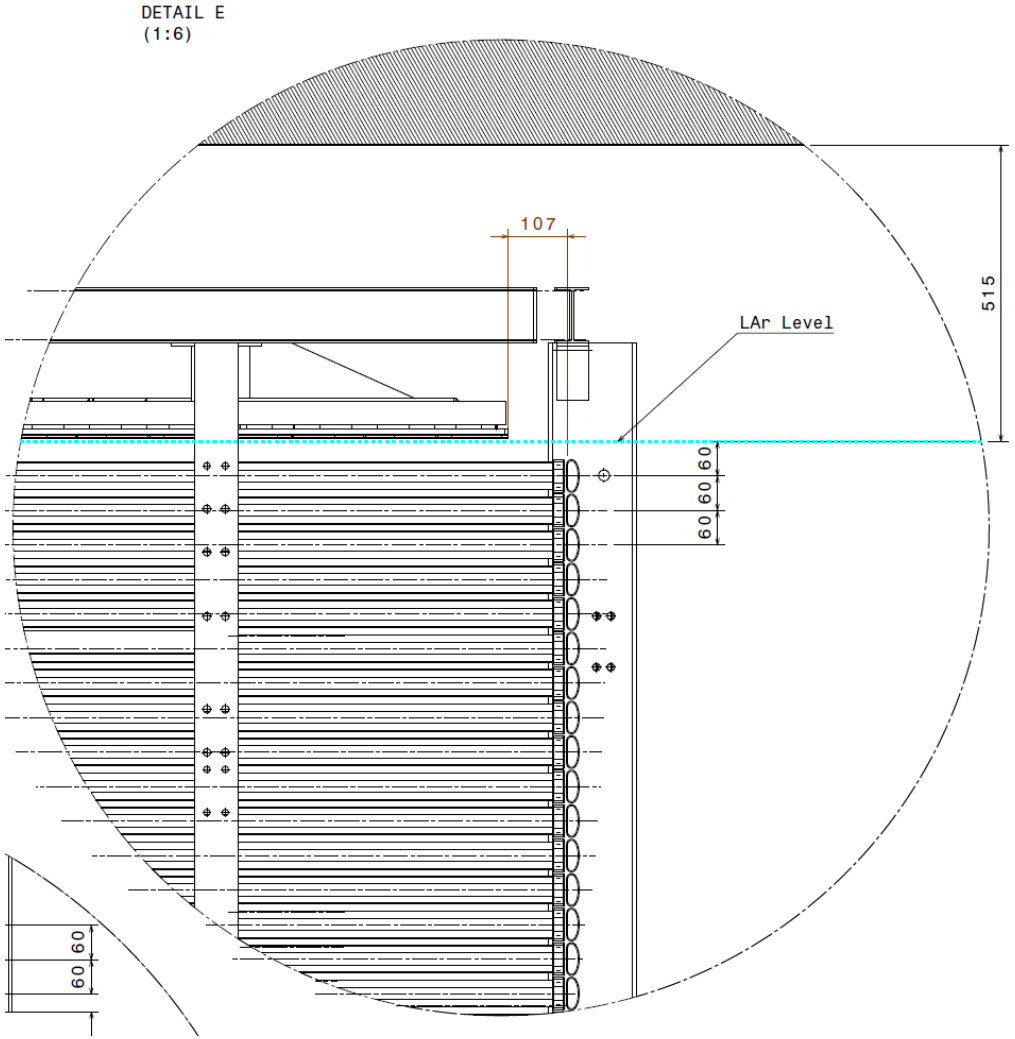
Detector Update Overview: 2D Drawings



Detector Update Overview: 2D Drawings

DETAIL E: Detector Top:

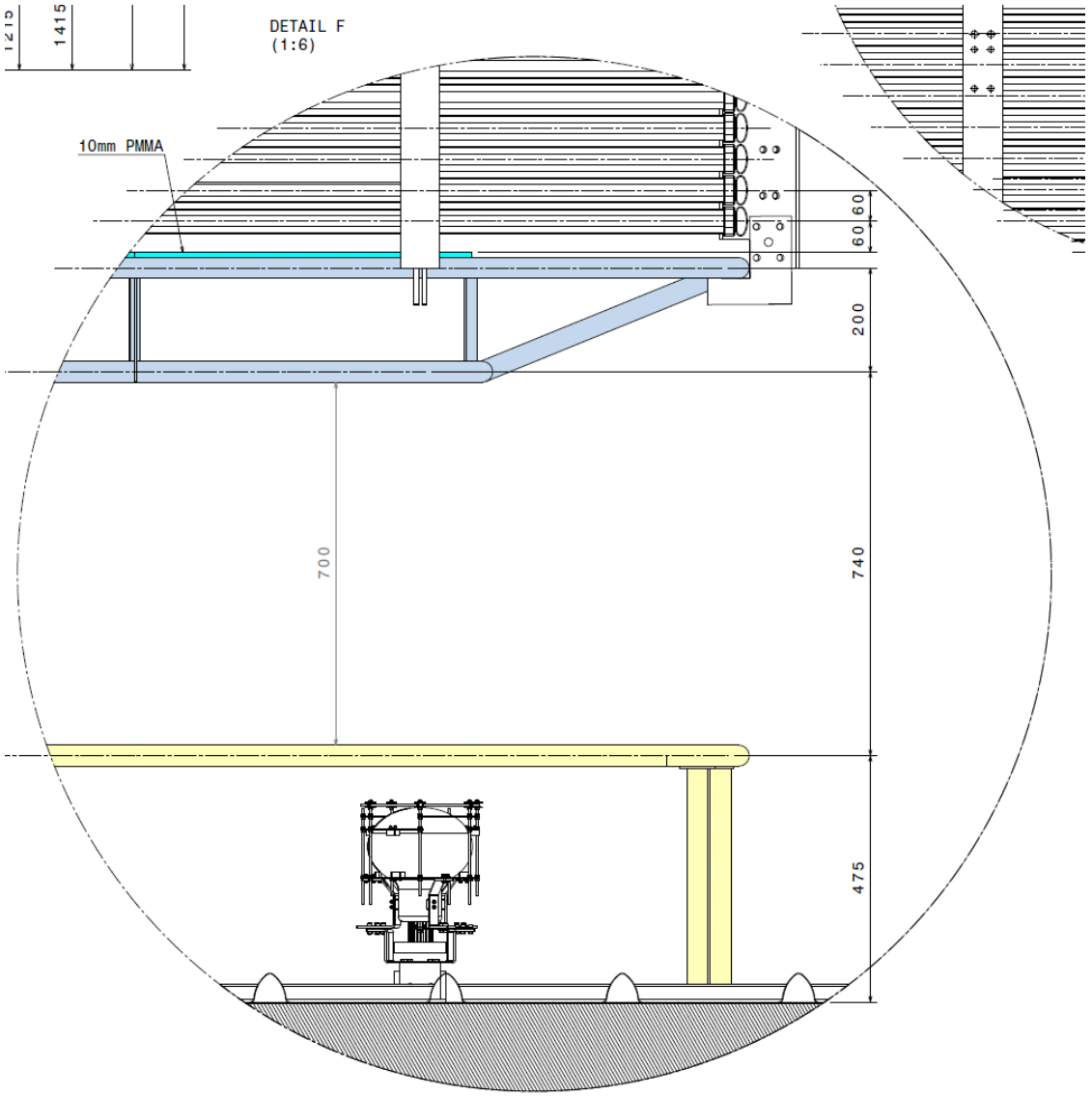
- Distance LAr-Top Membrane 515mm



Detector Update Overview: 2D Drawings

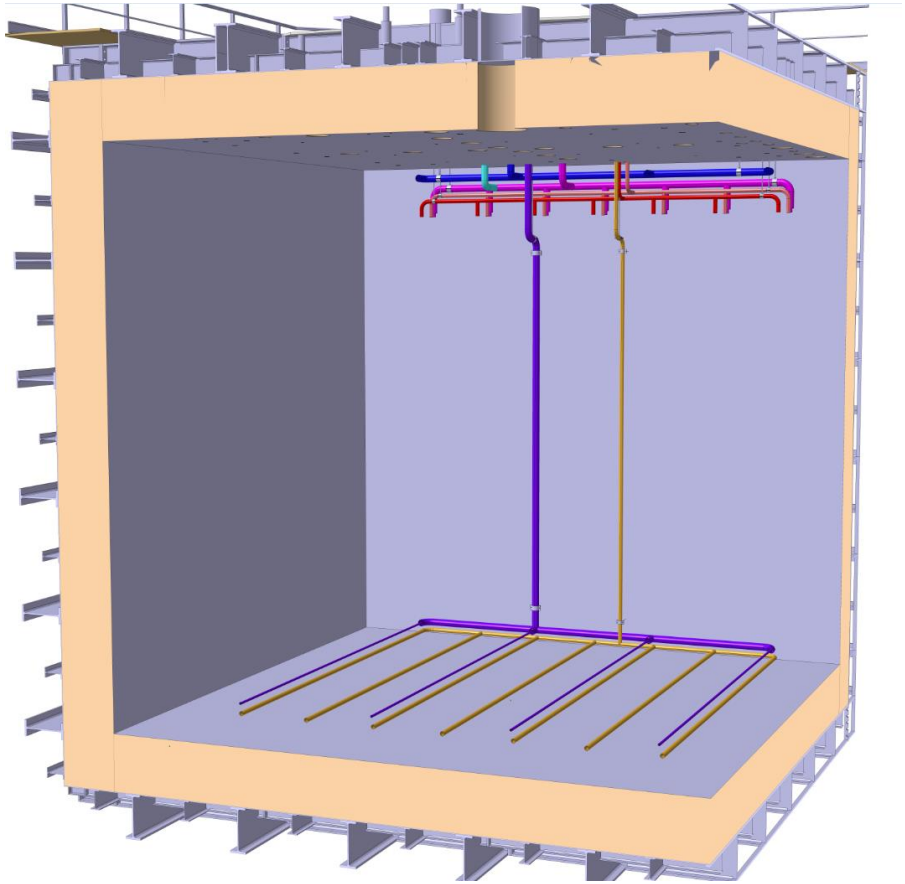
DETAIL F: Detector Bottom:

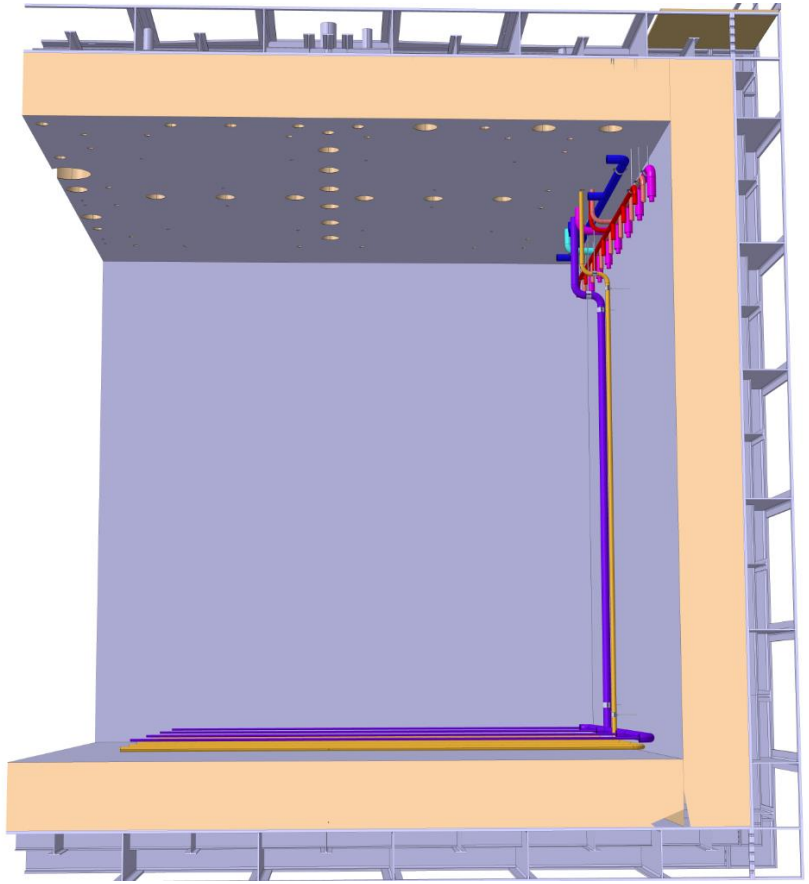
- Distance Cathode Groundgrid
  → 700mm



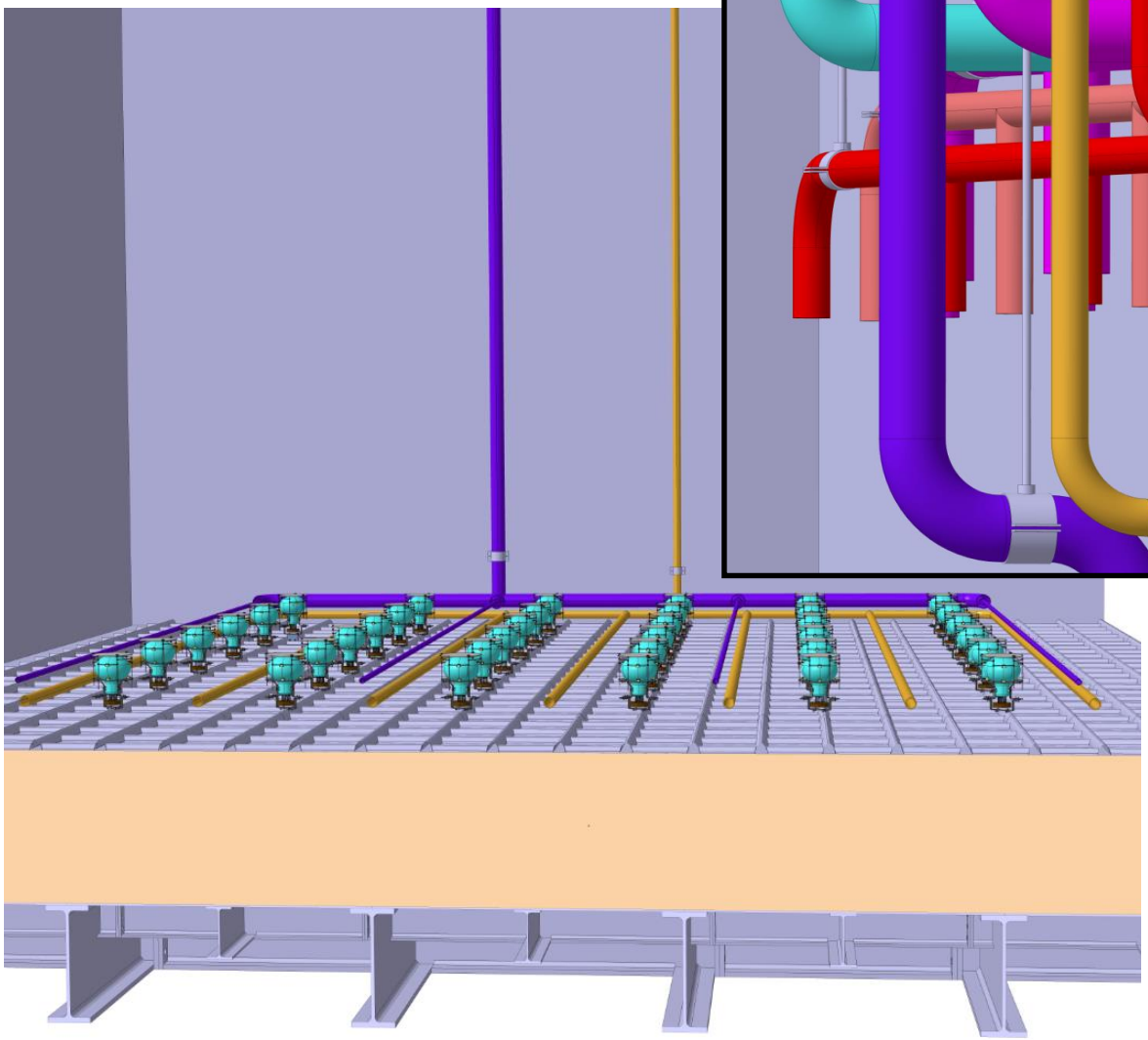
Internal Piping from :

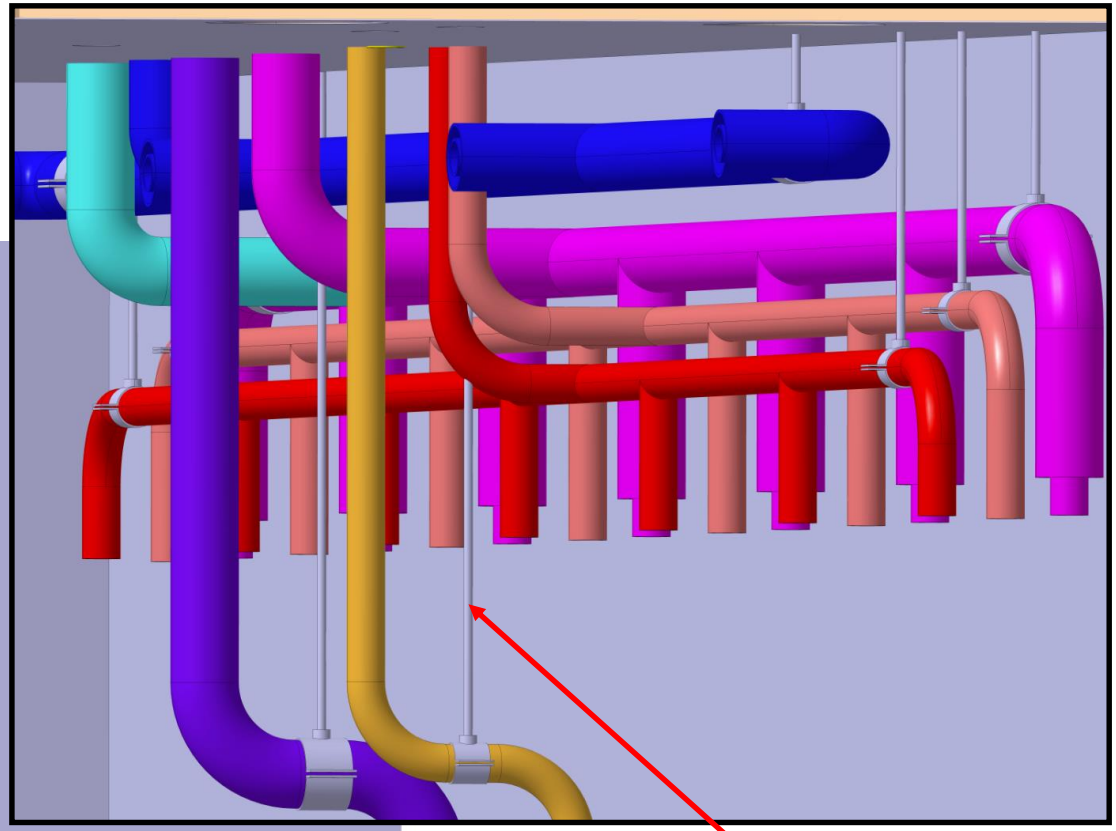
- Pipes are fixed on the Top with rods and on the Bottom with feet at the Membrane





Internal Piping:

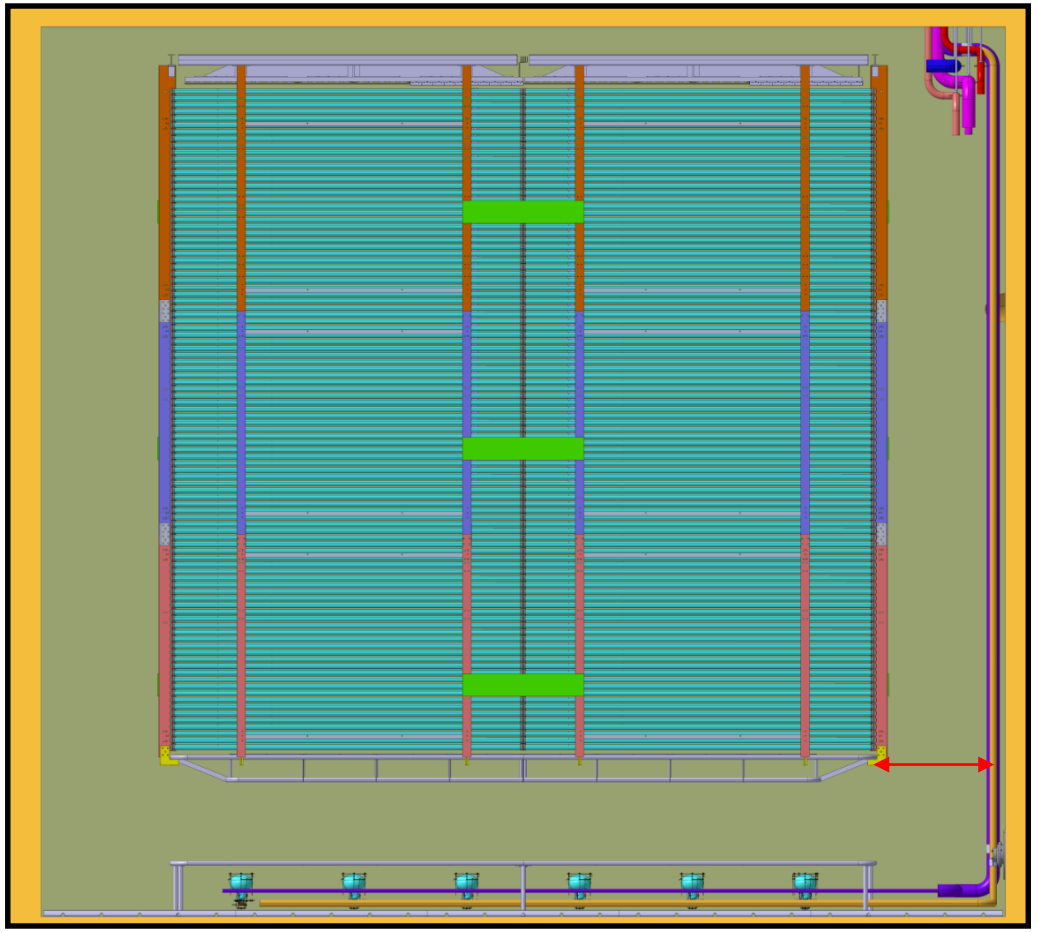


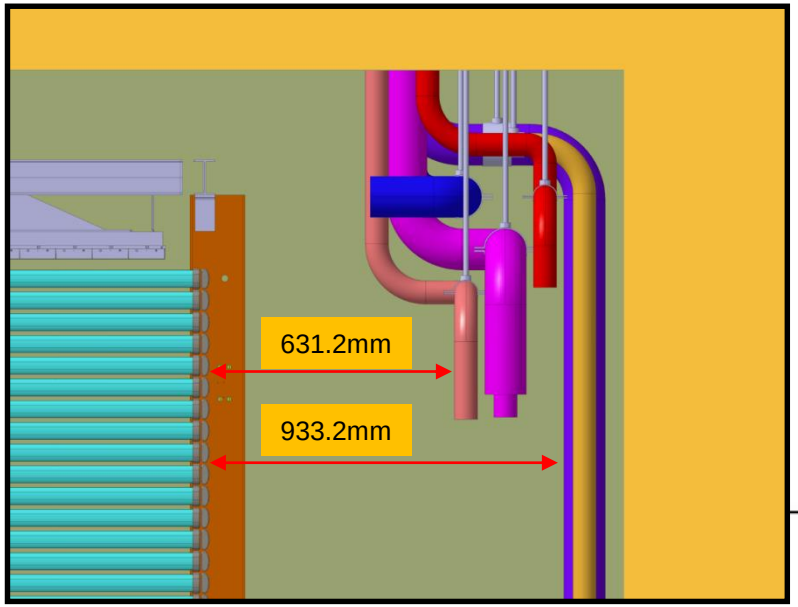


Treaded Rods

Internal Piping :

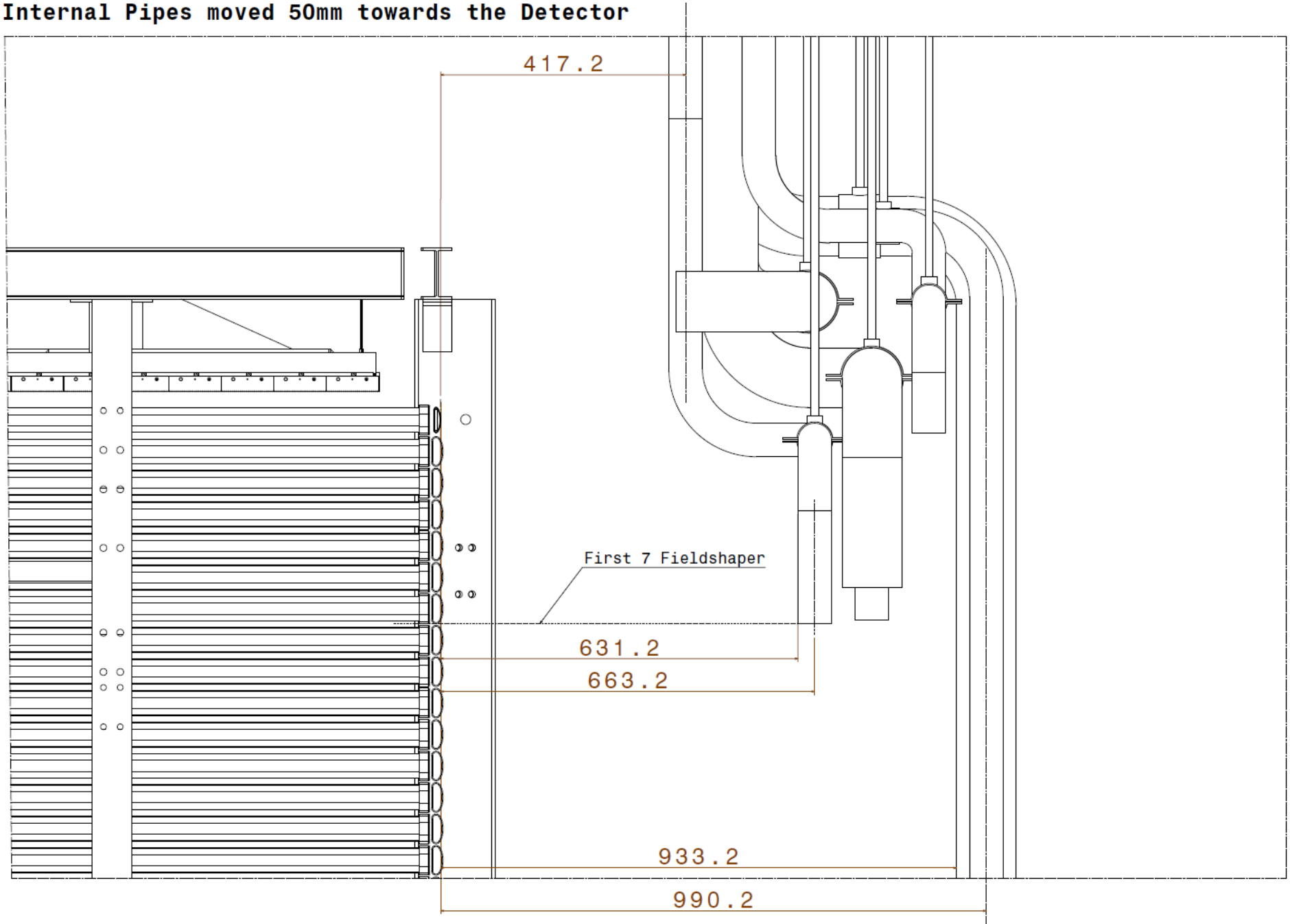
- Internal Piping moved 50mm closer to the FC
- First 7 Fieldshaper → min distance ~631.2mm
- Cathode minimal Distance from vertical pipes → 933.2 mm





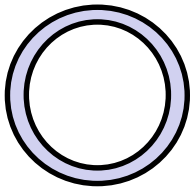
Internal Piping :

Internal Pipes moved 50mm towards the Detector

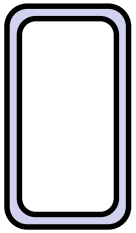


Cathode New Design:

- ¼ of the Cathode Structure: ~3.2x3.2 m²
- Material: SS Tubes
- Module 1 Piece completely welded



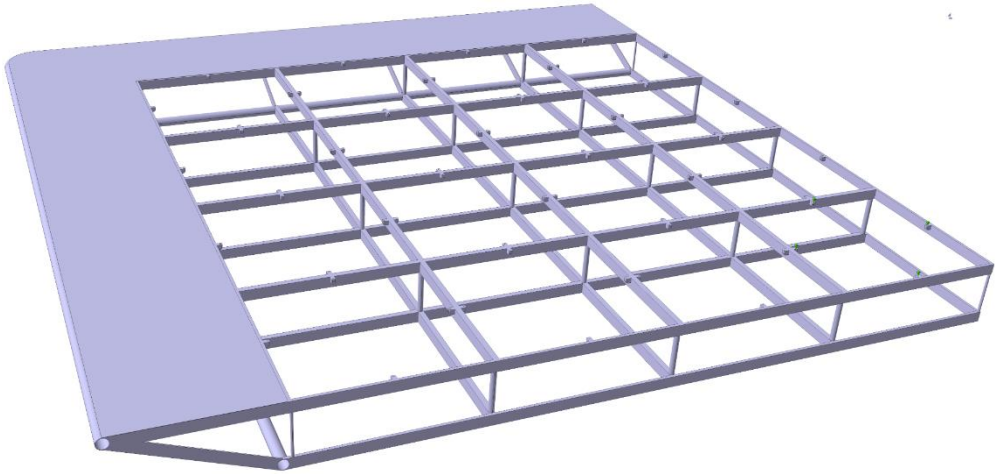
Round Tube 40x2mm

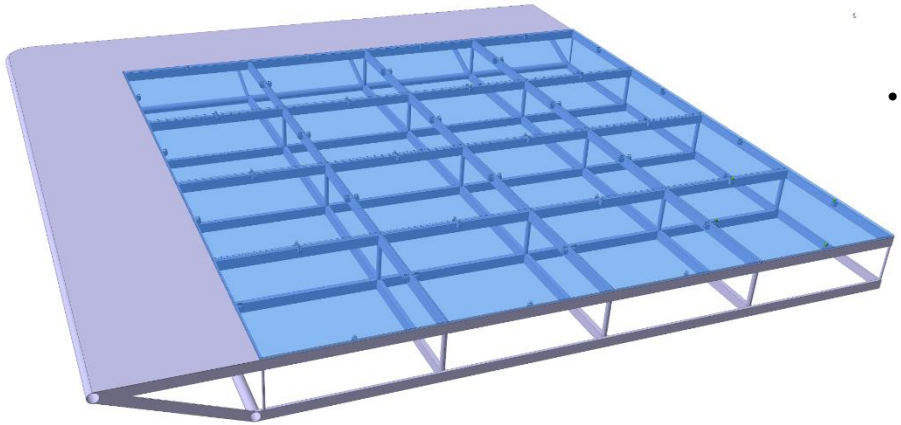


Rectangular Tube 40x10x2mm

Rectangular Tube 40x20x2mm

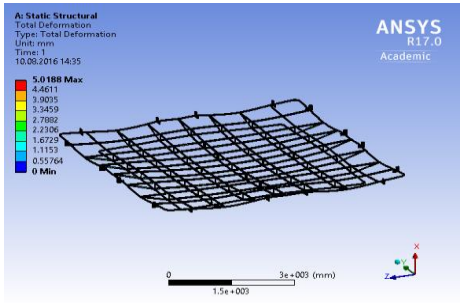
Corner Radius 3±0.6

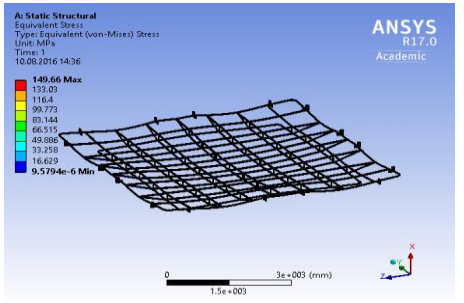




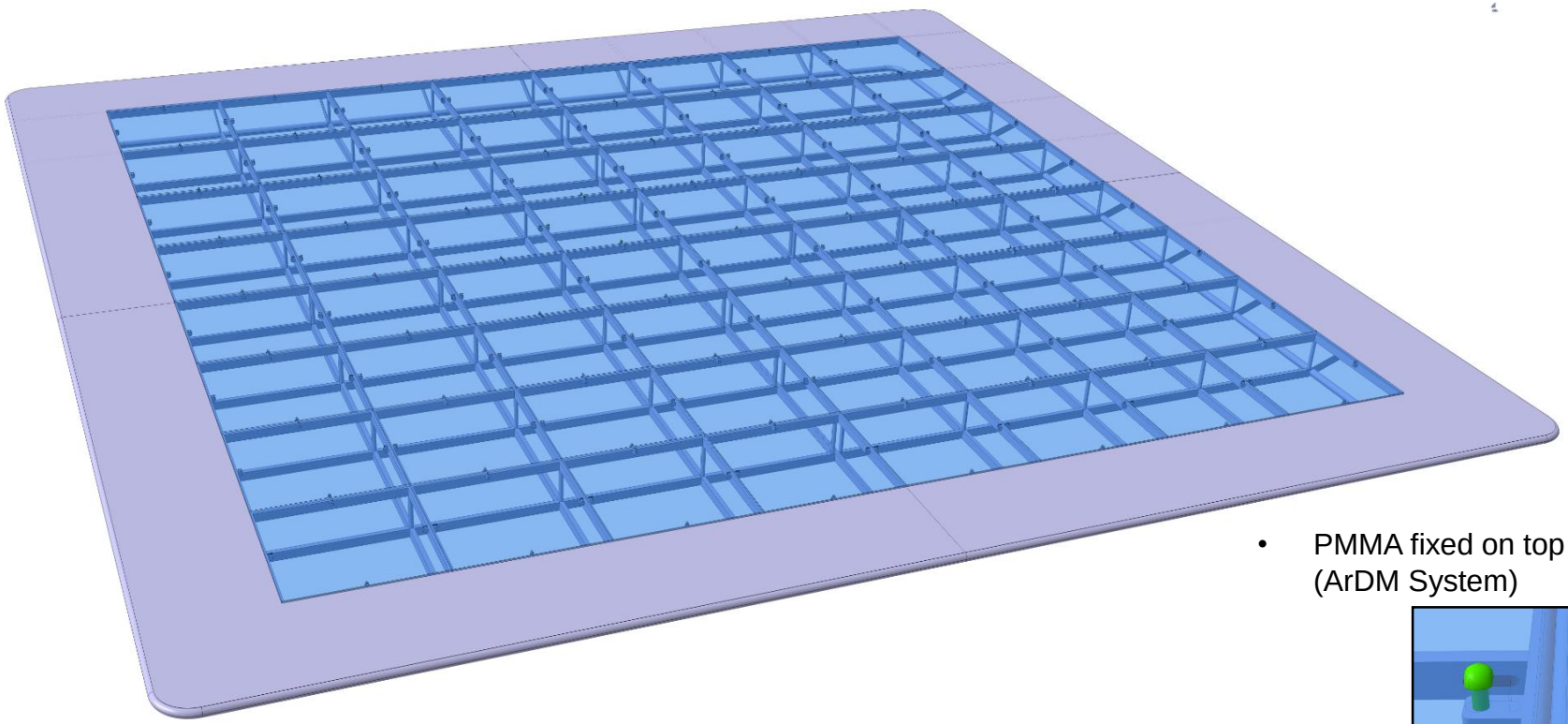
- Idea is to fully assemble a module with PMMA outside the Cryostat (test everything) and bring it in same as for the CRPs

Cathode New Design:

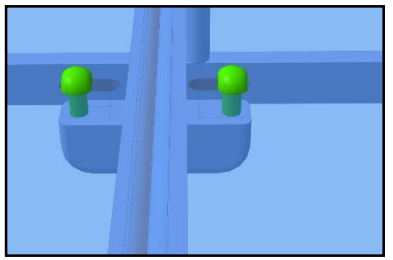


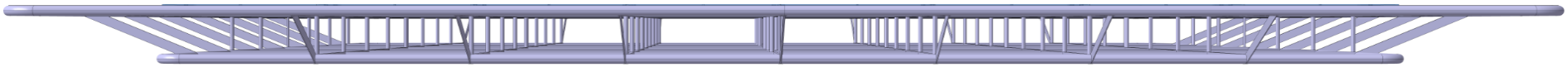


Preliminary FEM → Ok!

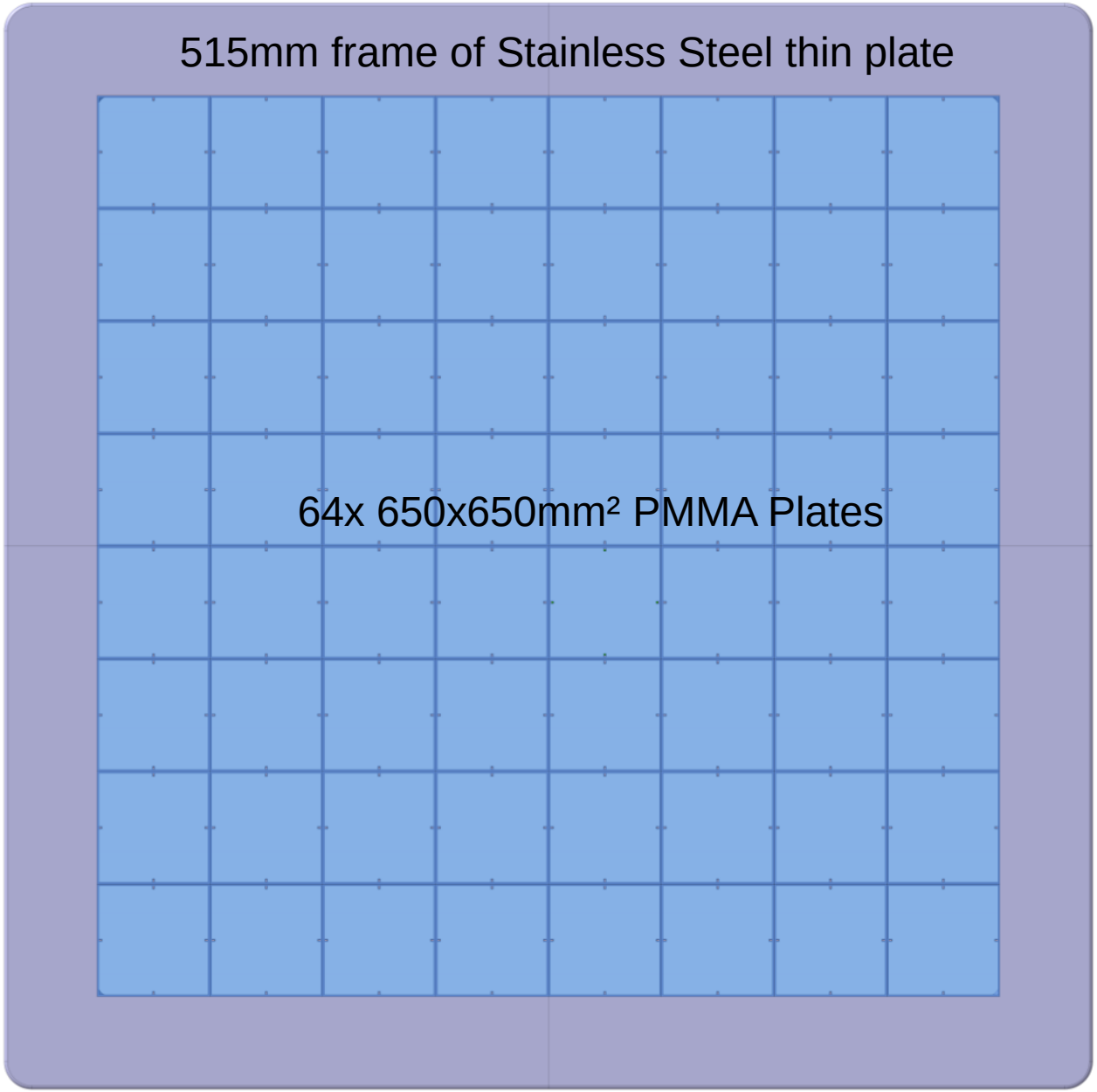


- PMMA fixed on top of the structure (ArDM System)



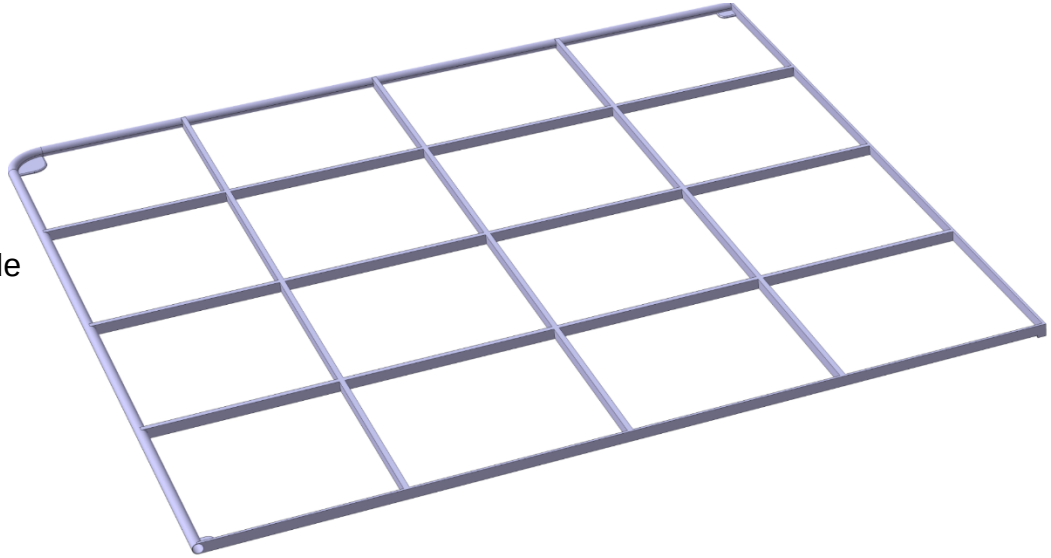


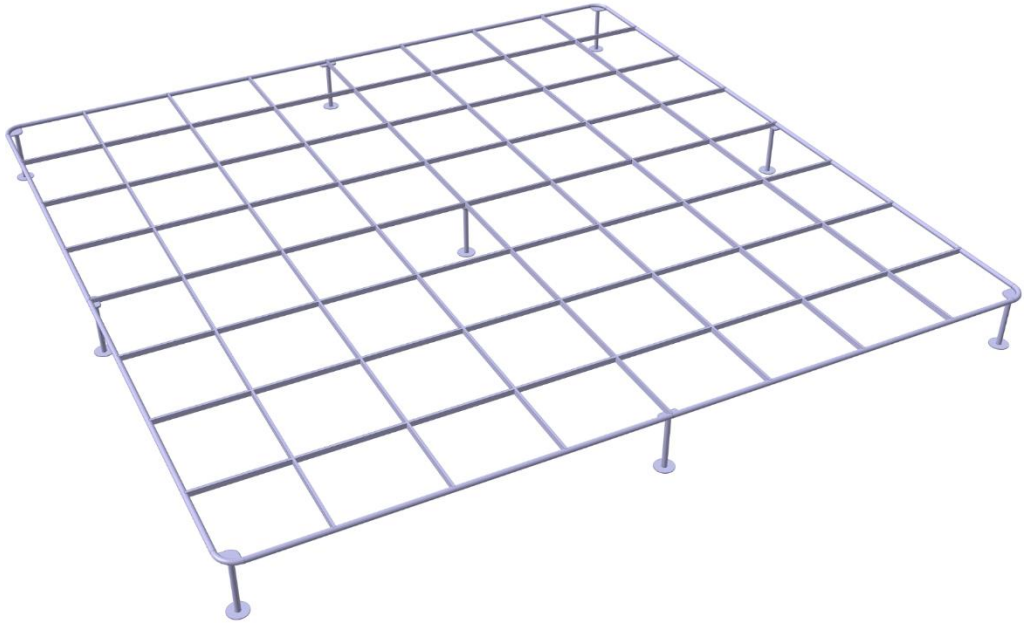
Cathode New Design:



Groundgrid New Design:

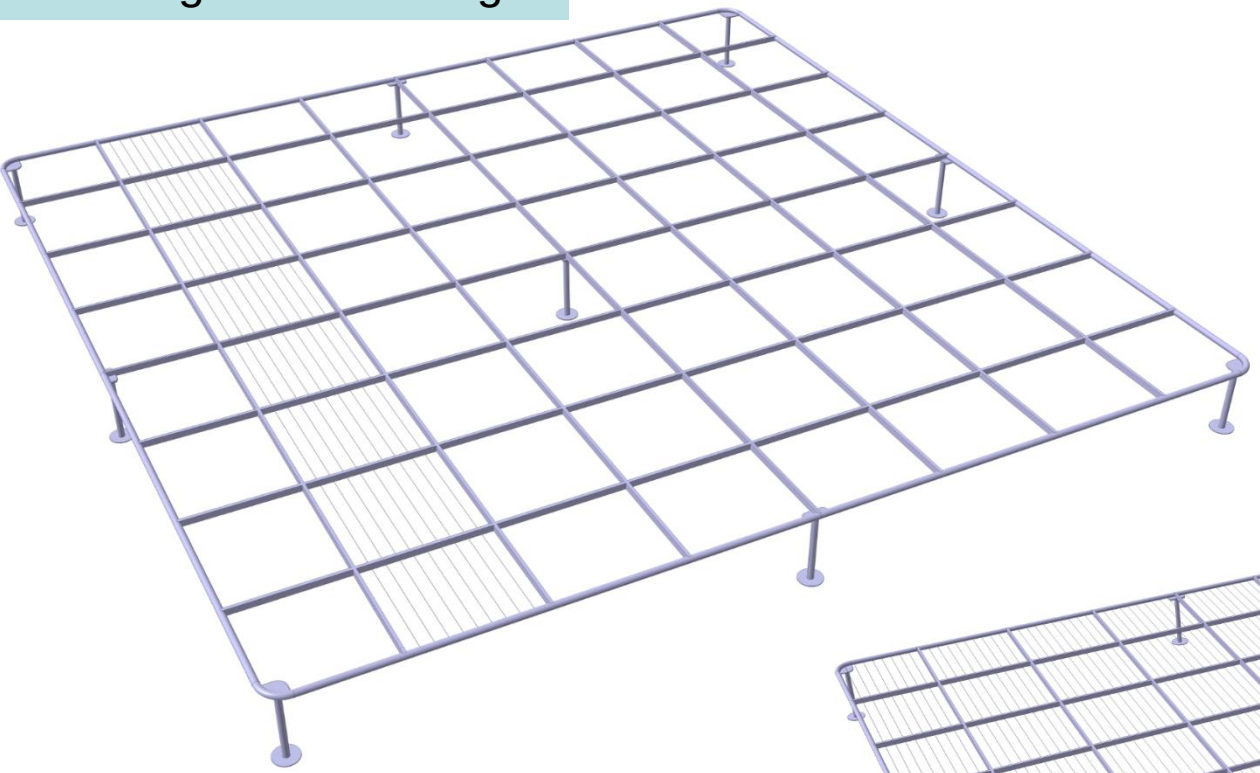
- 4 Modules with same design as for the Cathode
  → only upper frame

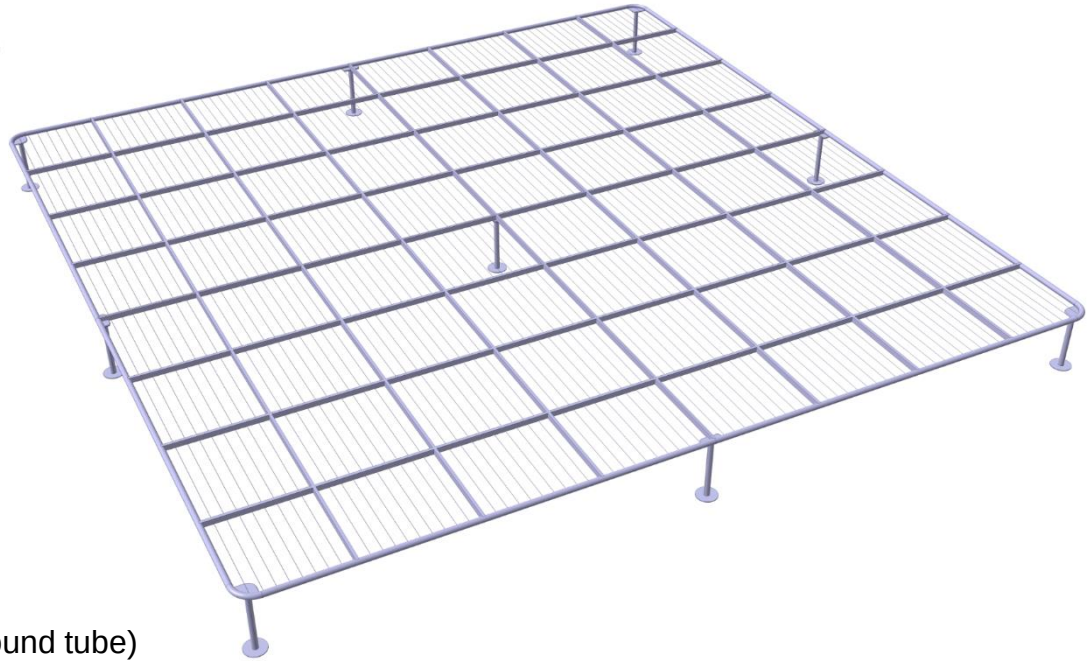


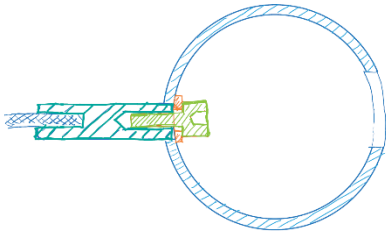


- With pillars sitting to the Membrane
- Idea is to glue the center pillar
- All other external pillars can shrink to the center (teflon sheet under)

Groundgrid New Design:

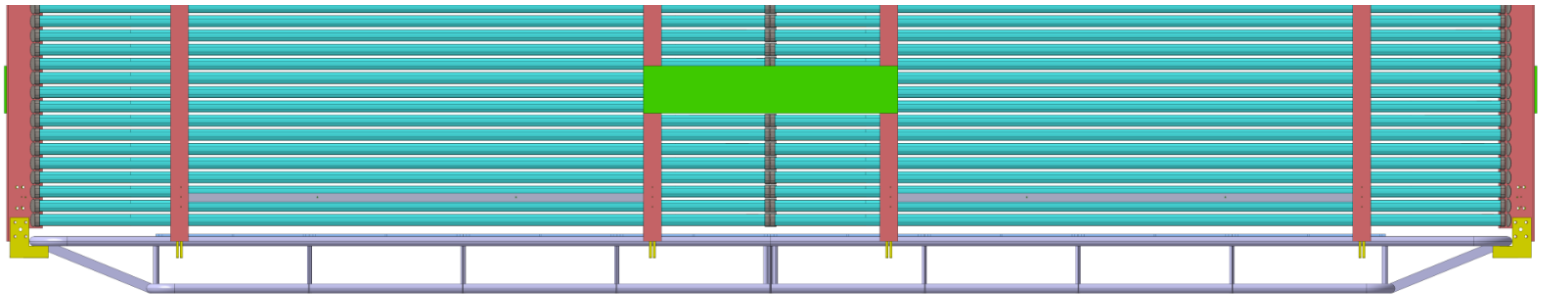


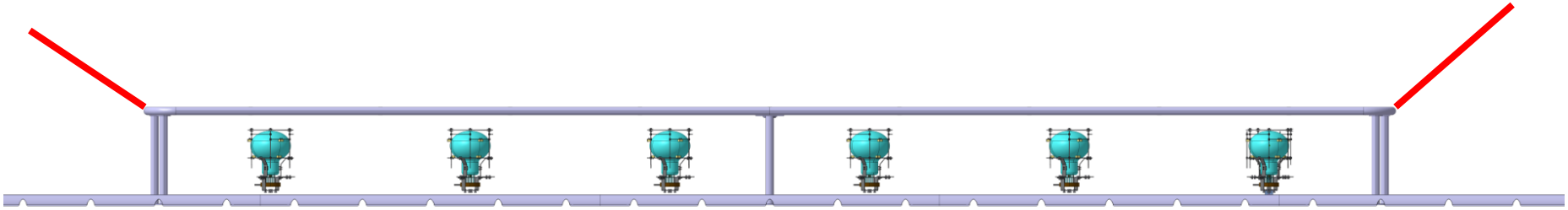




- 2 mm rope
- ~6m long
- No need to tension (support every 0.650m)
- End with internal thread (fixed inside the external round tube)

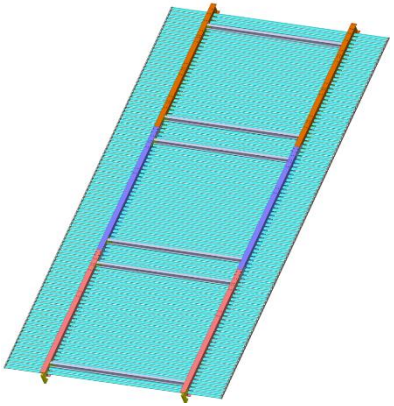
Groundgrid New Design:





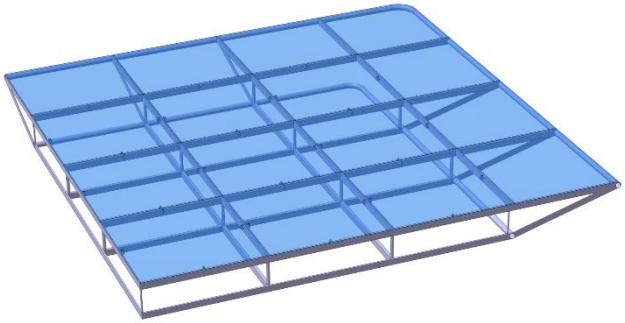
Idea is to extend the ground grid as shown with the red lines

Preliminary weight Calculation of the Detector:



- 98 SS Profiles: 1.2 Kg x 98 = 81 Kg
- FR-4 Beams and Reinforcements 65 kg

FC Module 146 Kg x 8 Modules = 1168 Kg



- Cathode Module: 136 Kg
- PMMA 79.7 Kg

Module weight 215 kg Kg x 4 Modules = 862 Kg

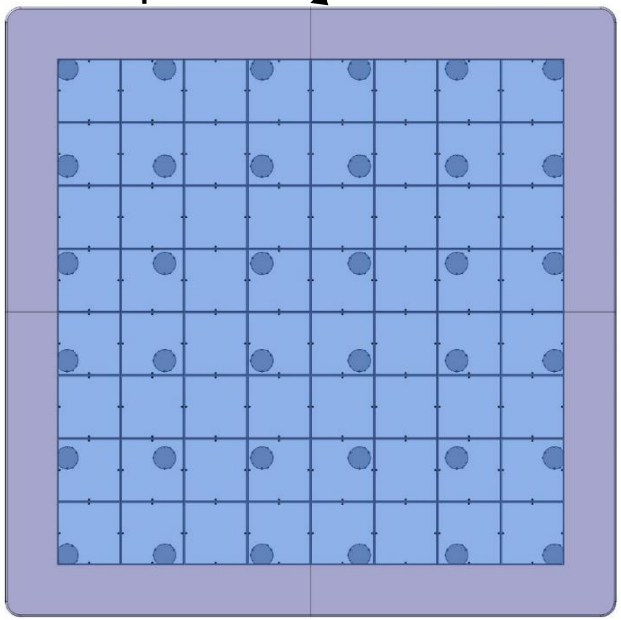
- Additional FC reinforcement ~100 Kg
- Hanging System ~ 100 kg
- Details (HV divider, small connection, bolts etc..) ~100 Kg

Total FC weight estimation ~2,4 Tons

PMTs Layout:

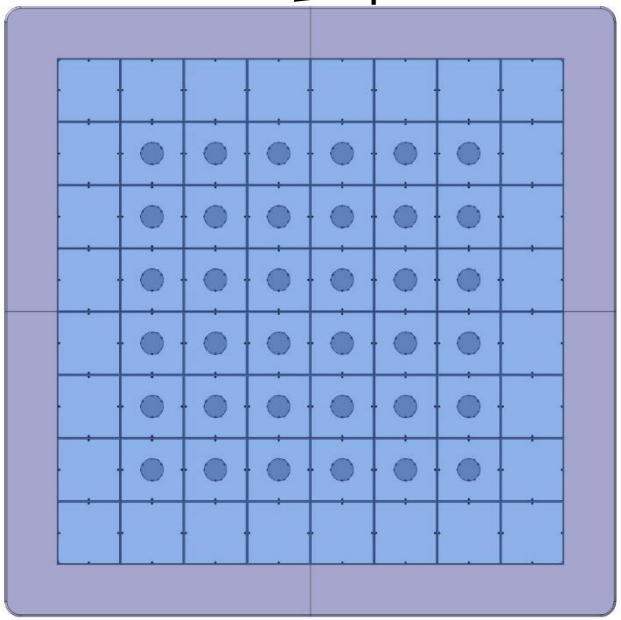
2 layouts for the 36 PMTs

Option1



Original layout: PMTs every 1m²

Option 2

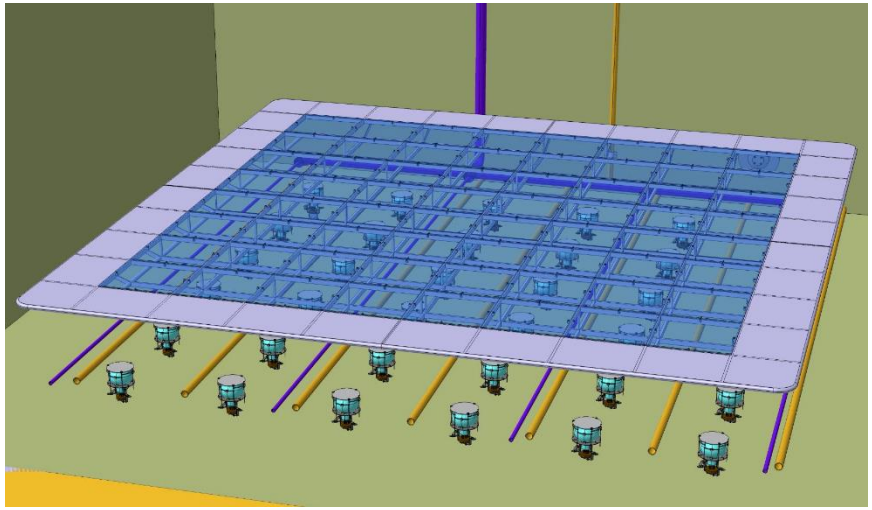


PMTs every 650x650mm²

- Centered in the PMMA plates

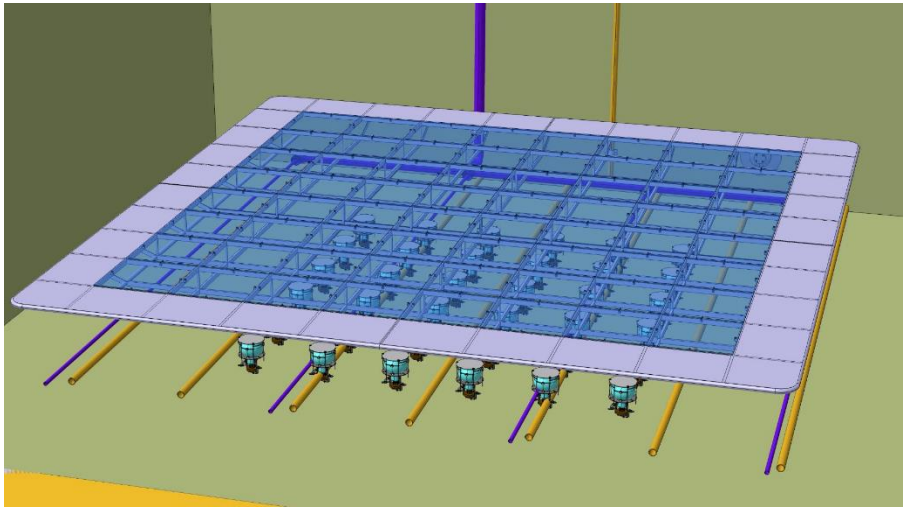
PMTs Layout:

Option1:



- No clash with the internal pipes
- Design from D.Montanari was based on this layout

Option 2:

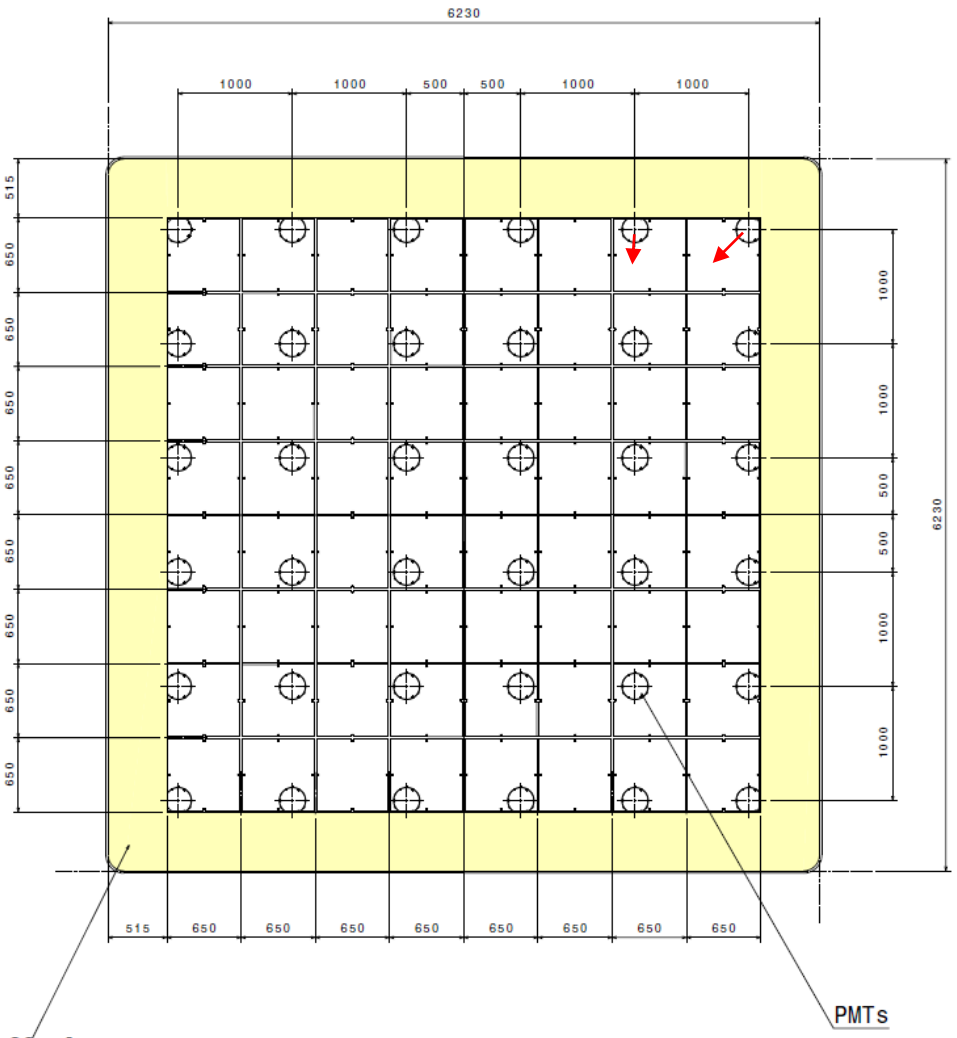


- Clashes with the internal piping
- Distance between the PMTs is smaller and at the moment D.M. Is not sure if we can pass in the middle.

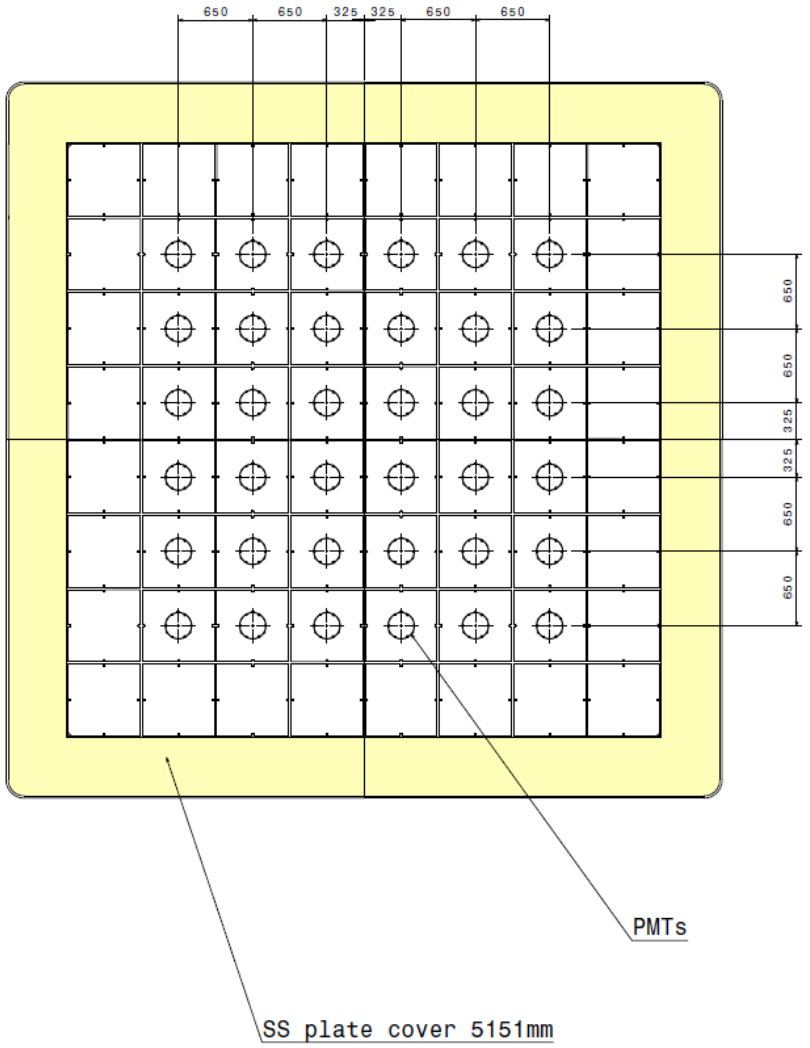
Layout needs to be defined as soon as possible → if Option 2: D.M has to redesign the entire bottom pipes.

PMTs Layout:

64 PMMA Plates 650mm x 650mm
36 PMTs every 1m^2 from the Center



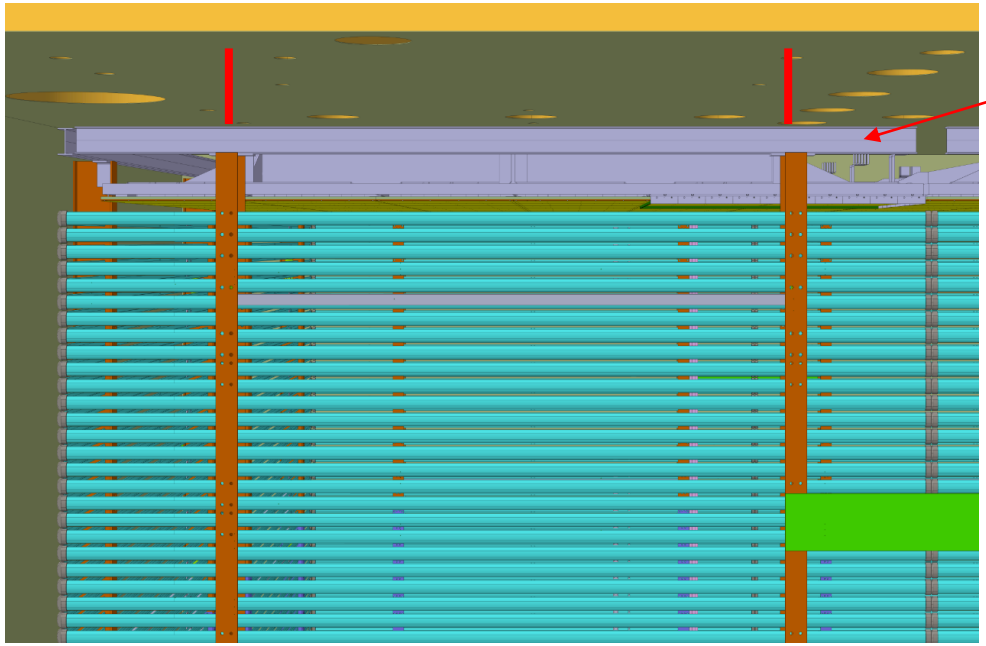
64 PMMA Plates 650mm x 650mm
36 PMTs every 650mm x 650 mm in the center of every PMMA plate



- Possibility to correct the position of the external PMTs

FC hanging system:

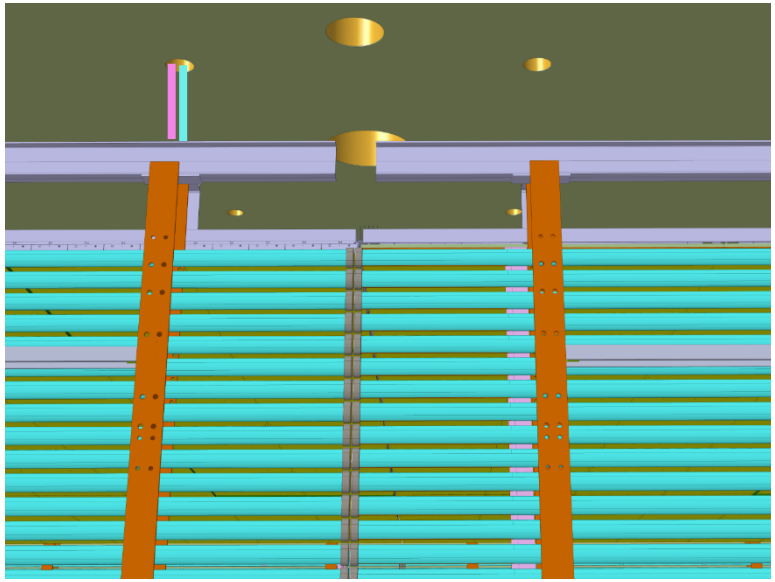
Each FC Module has 2 hanging Points (16x Field Cage FTs)



Stainless Steel I-Beam

Each FT with 2 separate system

- 1 for lifting the modules during installation
- 1 for the final hanging (with fine manual tuning)

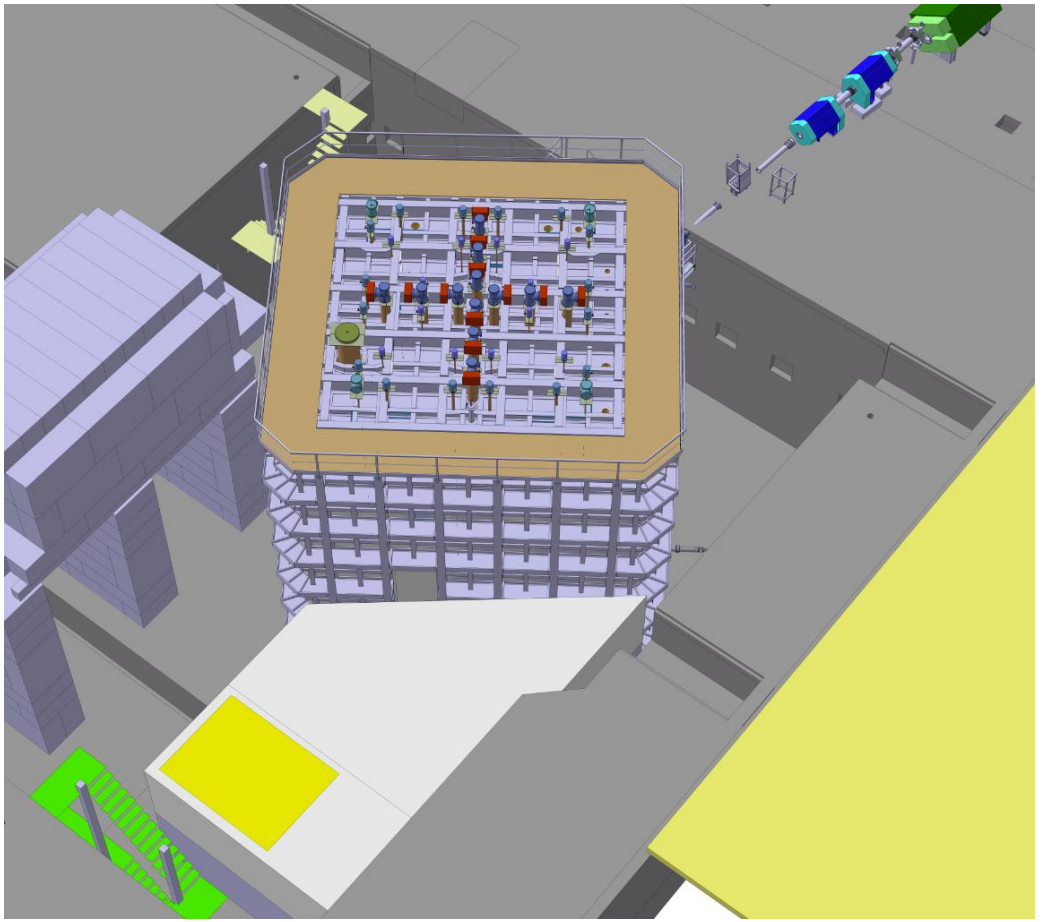


Final Manual tuning

EHN1 Area:

CLEAN BUFFER

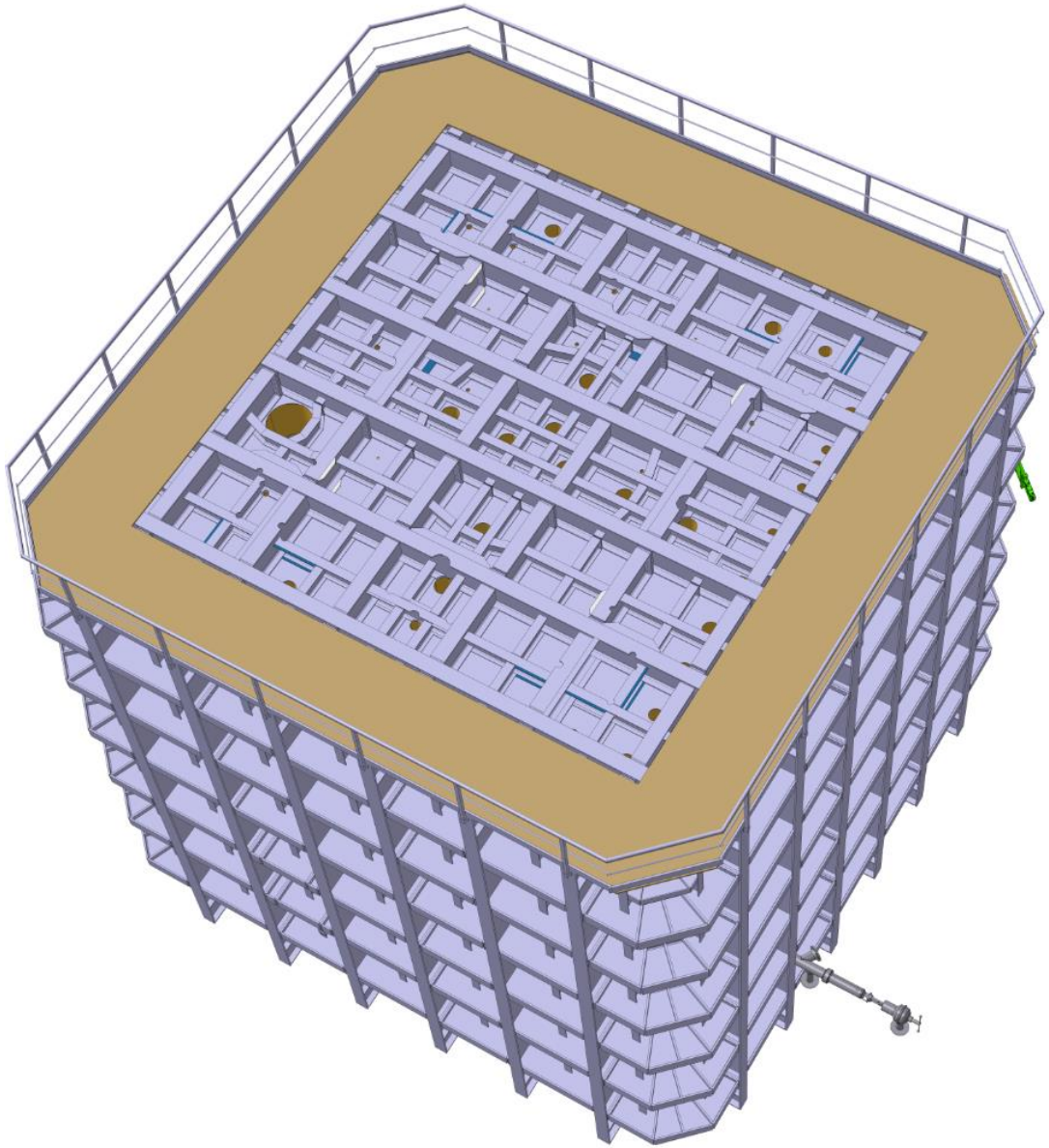
- Sketch with the size needs to be done
- Add all our requirements
- Send to M.Nessi → they will do the final design



Cryostat:

Cryostat Last Version found in the SMART TEAM:

- Still no membrane mapping
- Top Crossing pipe are missing
  → I asked Dimitar if we can define as much as possible the lenght of the crossing pipes → no answer yet
- Important for example for the HVFT and the SGFTs → reduce the lenght



Conclusion / To do list:

– New position of the Detector (300mm upward) need to be accepted

– PMTs layout needs to be decided

– Is the actual design of the Cathode and the Groundgrid ok (no major changes) ?

– Preliminary drawing of the Clean Room Buffer needs to be done

– Define lenght of the different FTs (HVFT, SGFT, etc..)

– Since many parts will be on the membrane → Membrane Layout is needed

– Boxes for CRP, FC modules, Cathode Modules, etc.. Still need to be designed
→ less urgent at the moment

Thank you