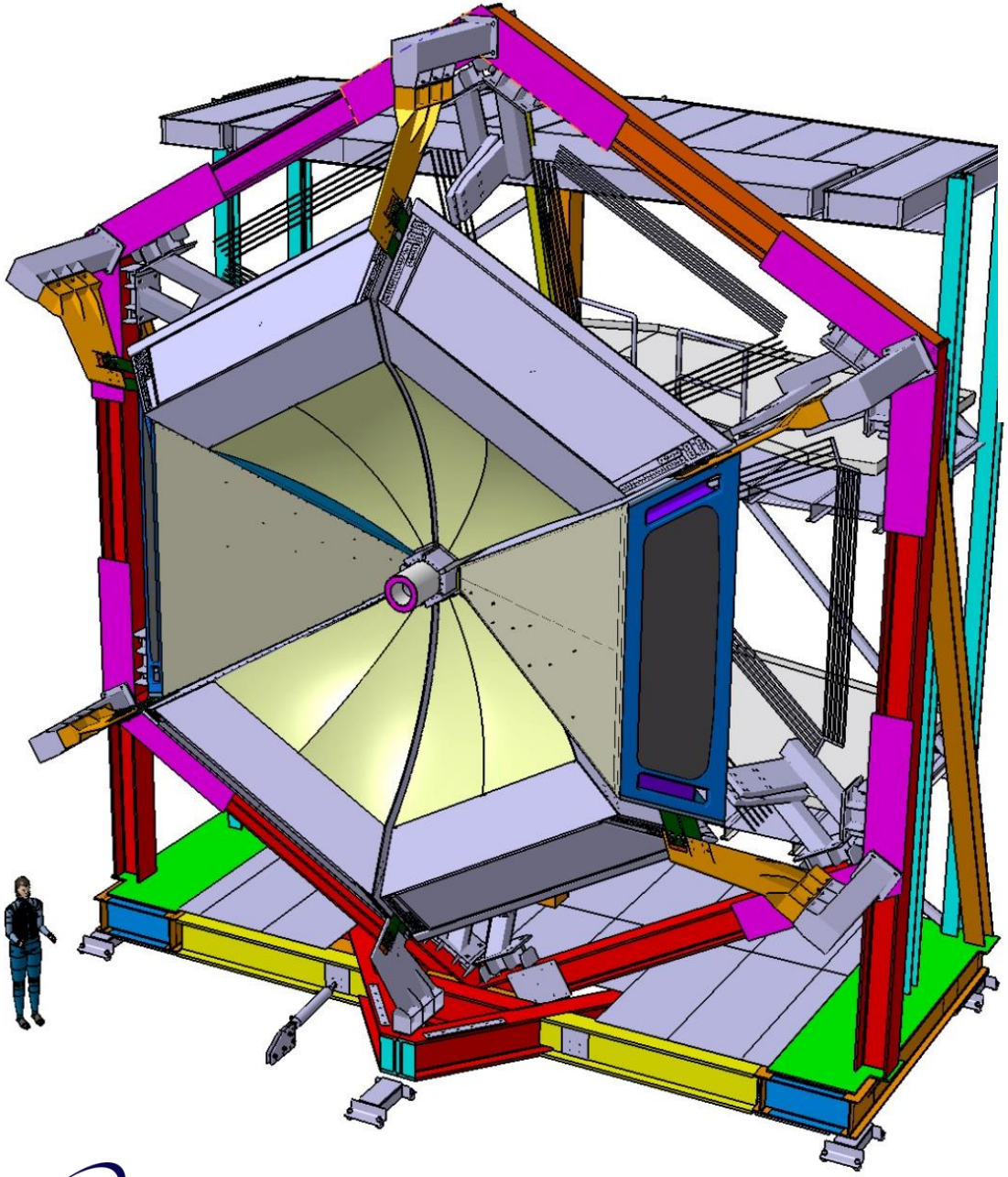


CLAS12 RICH – Detector Group meeting

RICH Installation and integration in CLAS12

April 25th 2016

D. Orecchini, S. Tomassini

INFN Istituto Nazionale di Fisica Nucleare

Outline

1. **The RICH Gas System (RGS)**
2. **The setup for the mirror tests in the small clean room in EEL-121**
3. **The work to be done for the detector assembly in the big clean room in EEL-124**

1. The RICH Gas System (RGS)

Gas System

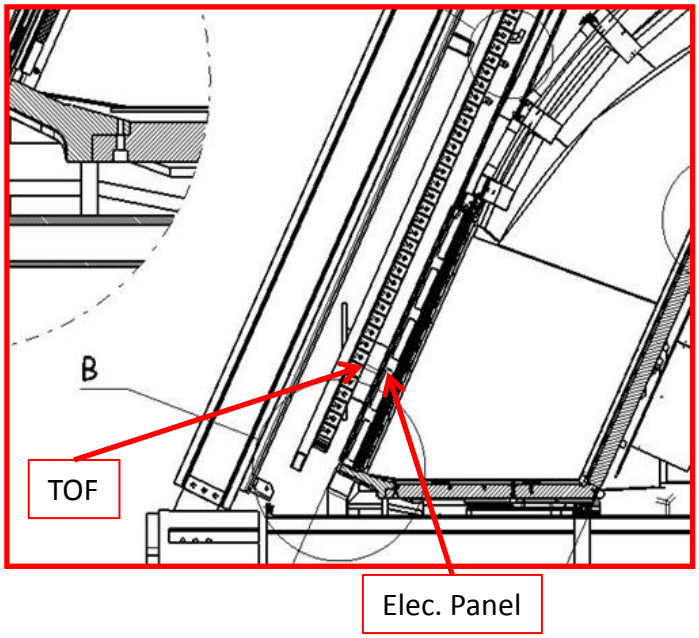
- **Compressed air** to cool down the electronic panel to keep safe the FTOF

  Limit temperature is 100 °F on the FTOF panel

- **Purging Nitrogen** to reduce the relative humidity inside the RICH as required to maintain the aerogel performances

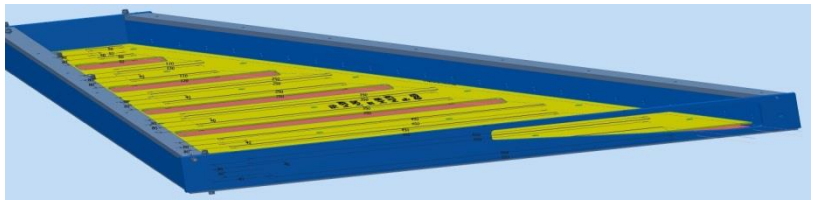
  Total volume is **5 m^3** **Flow Rate =?**

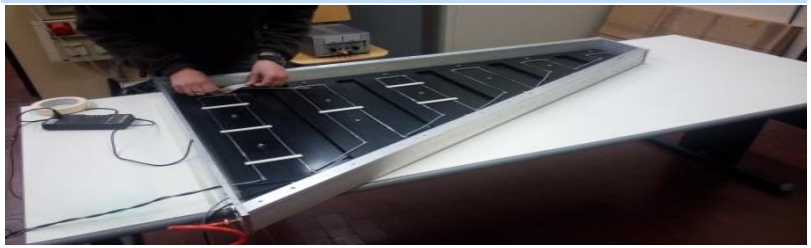
Electronic Box: Test Cooling Setup

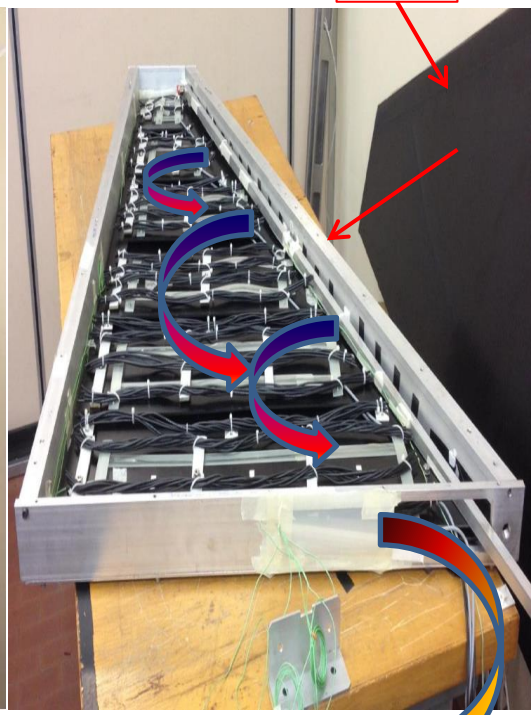


Prototype of half of the electronic panel made of Aluminum and PVC and resistive wires to simulate the heating.
The box is sealed and has an air inlet and outlet
~ 50W on the ASIC plane
~ 200W on the FPGA plane
Fresh air fluxed inside the box from a compressor
Temperatures measured in few points inside and outside the box

Temperature limit for TOF operation is 100 °F /38 °C

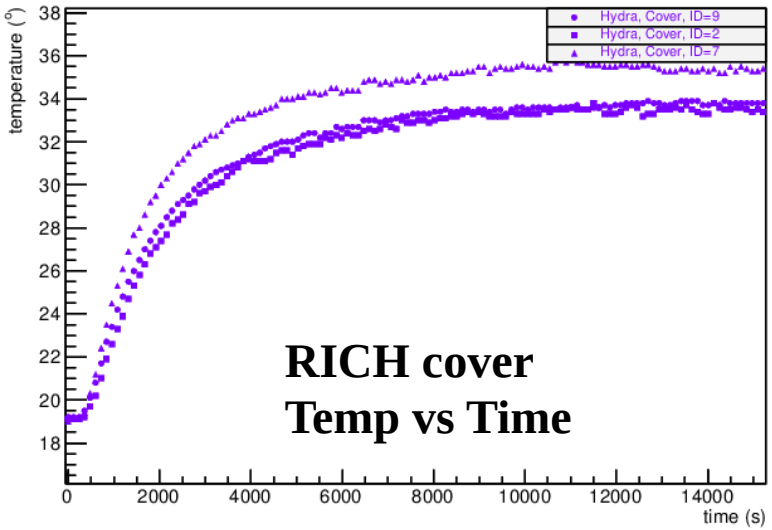




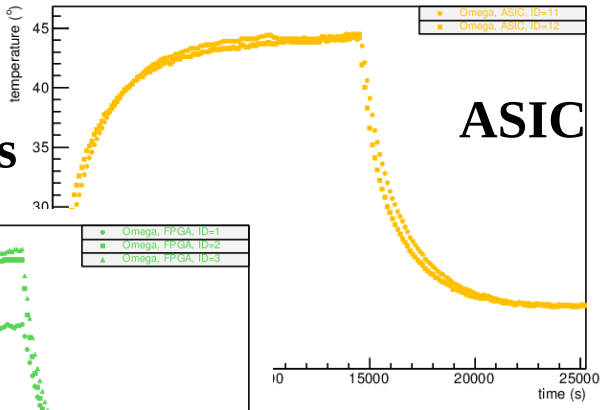


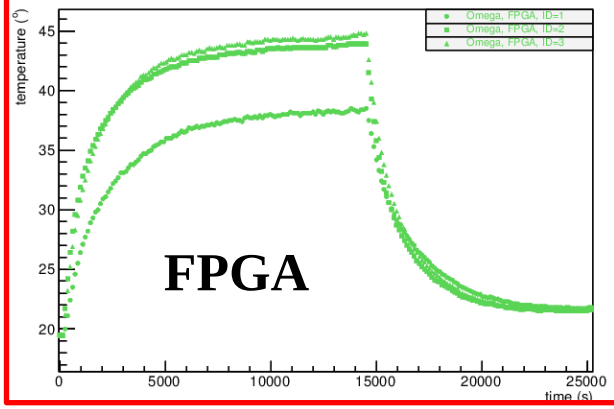
Measured Temperatures

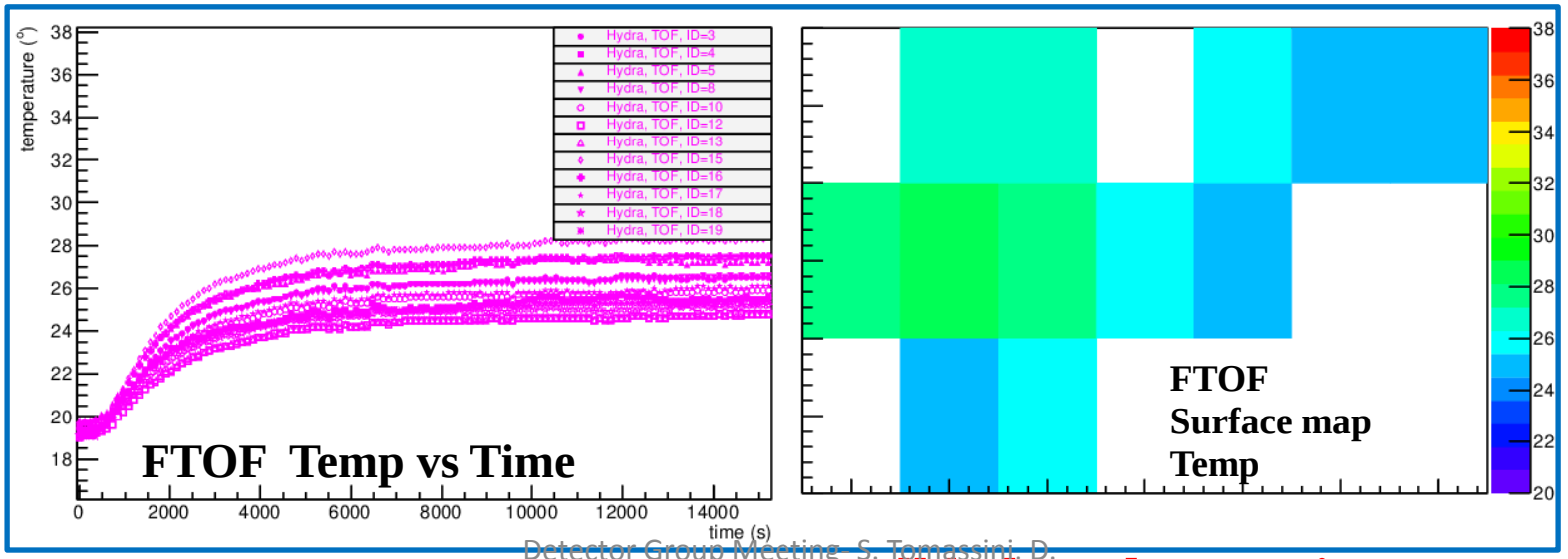
Air flow is 100 l/min, inlet temperature scaled to 20 °C



Inner temperatures







Tmax~28C well below the requirements

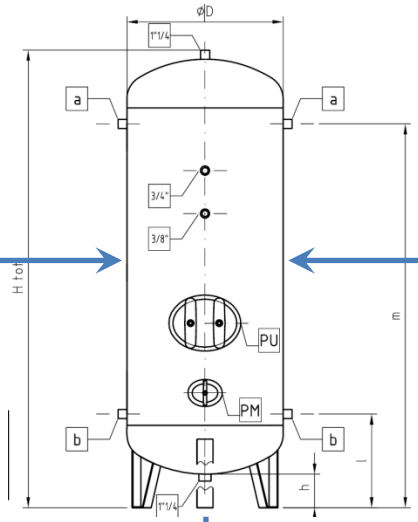
Gas System: Compressor Layout

http://www.atlascopco.com/us/

SF11-8 MC FF

http://www.atlascopco.us/Images/SF%20series%20brochure%20English_tcm795-1701214.pdf

SF11-8 MC FF

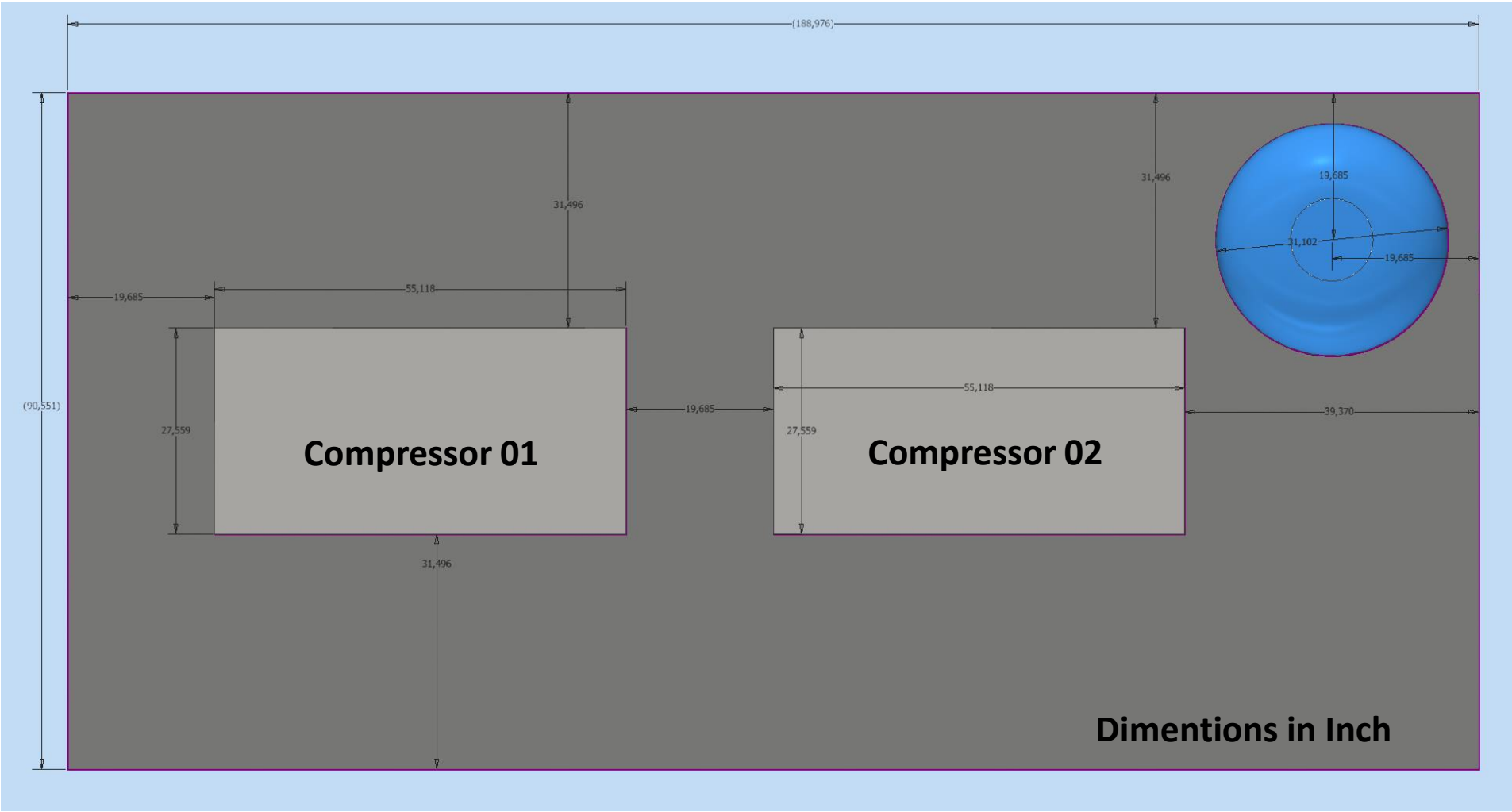


Single Unit Parameters	
Flow rate	20,2 l/s
Elec. Power	10,4 kW
Dew Point T	3 °C
Dimensions	1,4x0,7x1,8m
Weight	515 kg
Noise Press	60 dB(A)

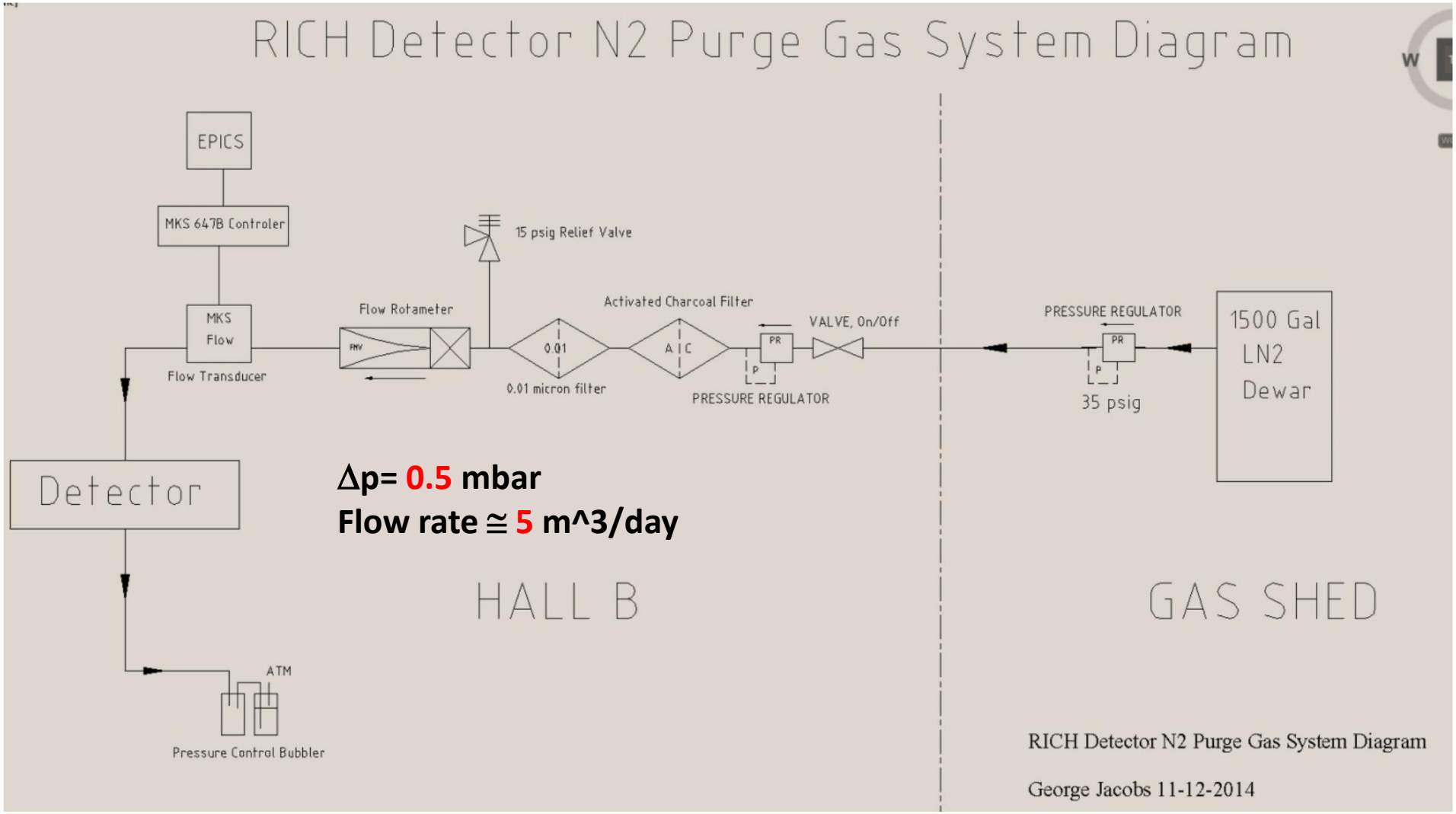
- Installation area: ~ 12 m^2

To the Electronic Box

Gas System: Compressor Layout

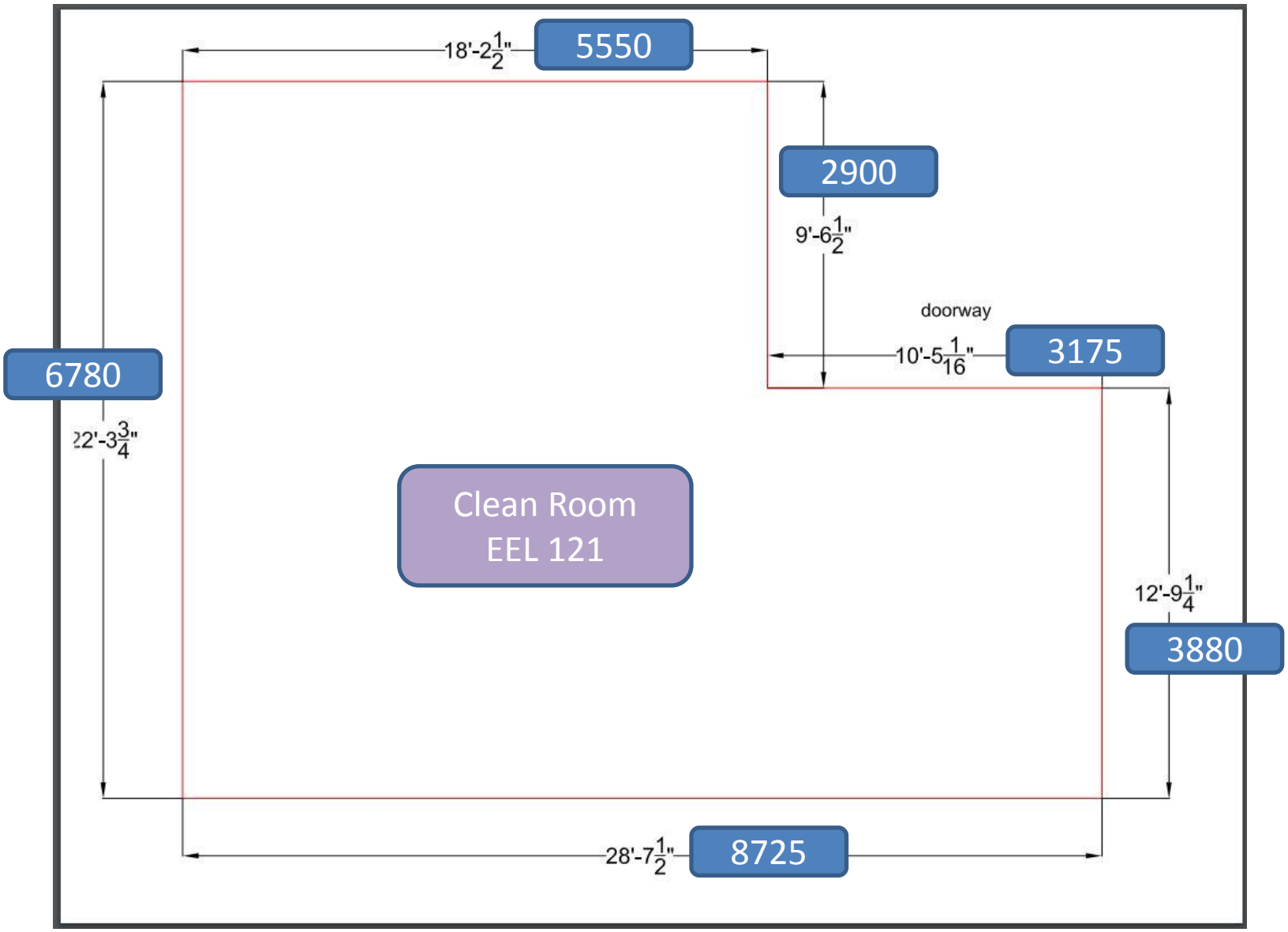


Gas System: Purging Nitrogen



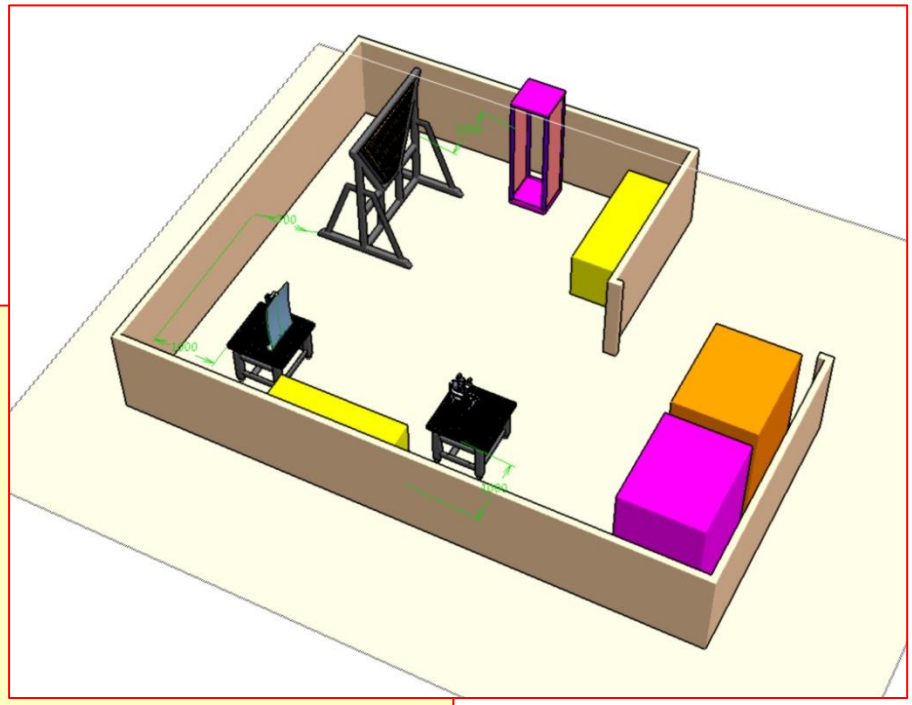
2. The setup for the mirror tests in the small clean room in EEL-121

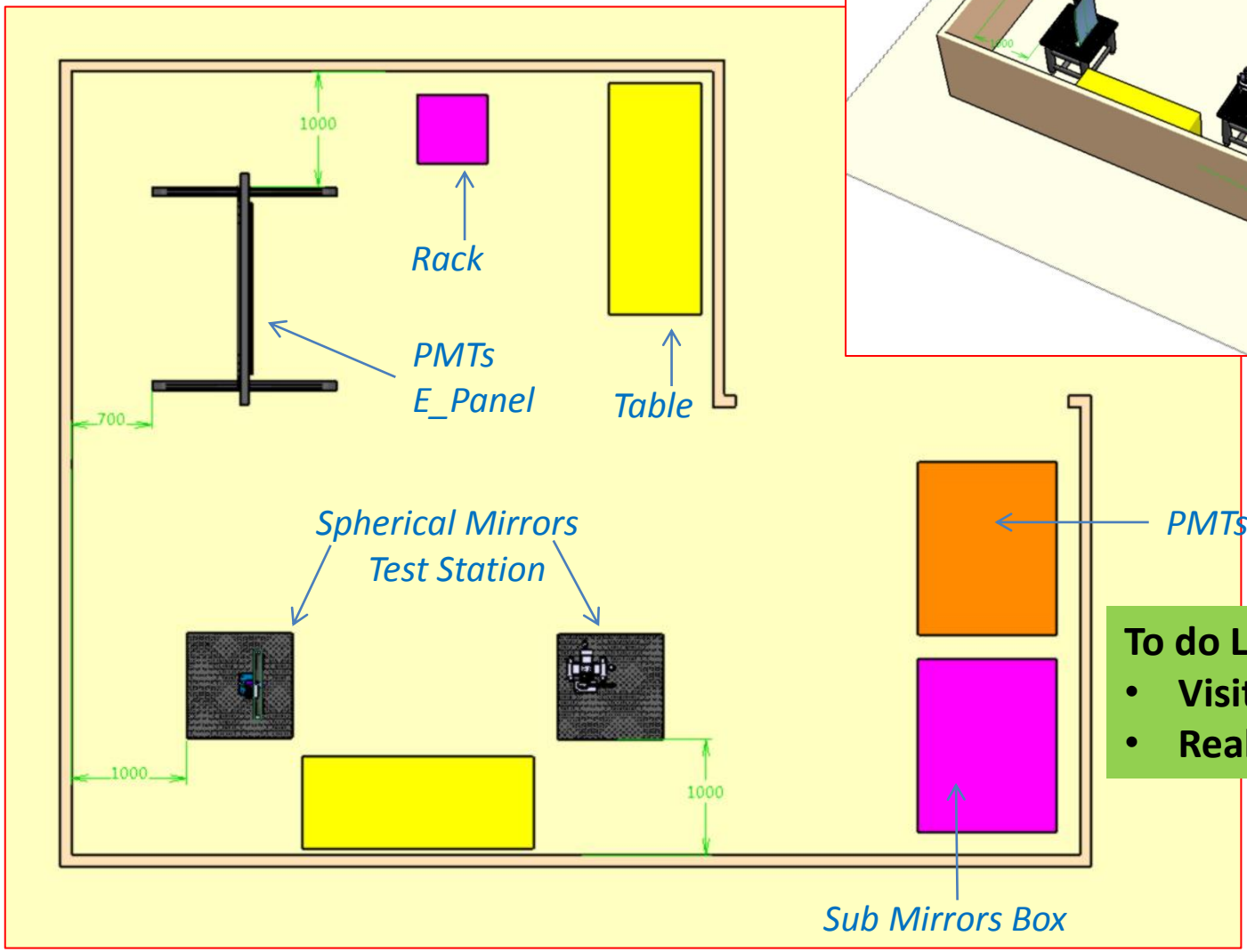
The small clean room EEL-121



The small clean room EEL-121

- Test the CFRP Mirrors (DO measurement)
- E-Panel assembly and test



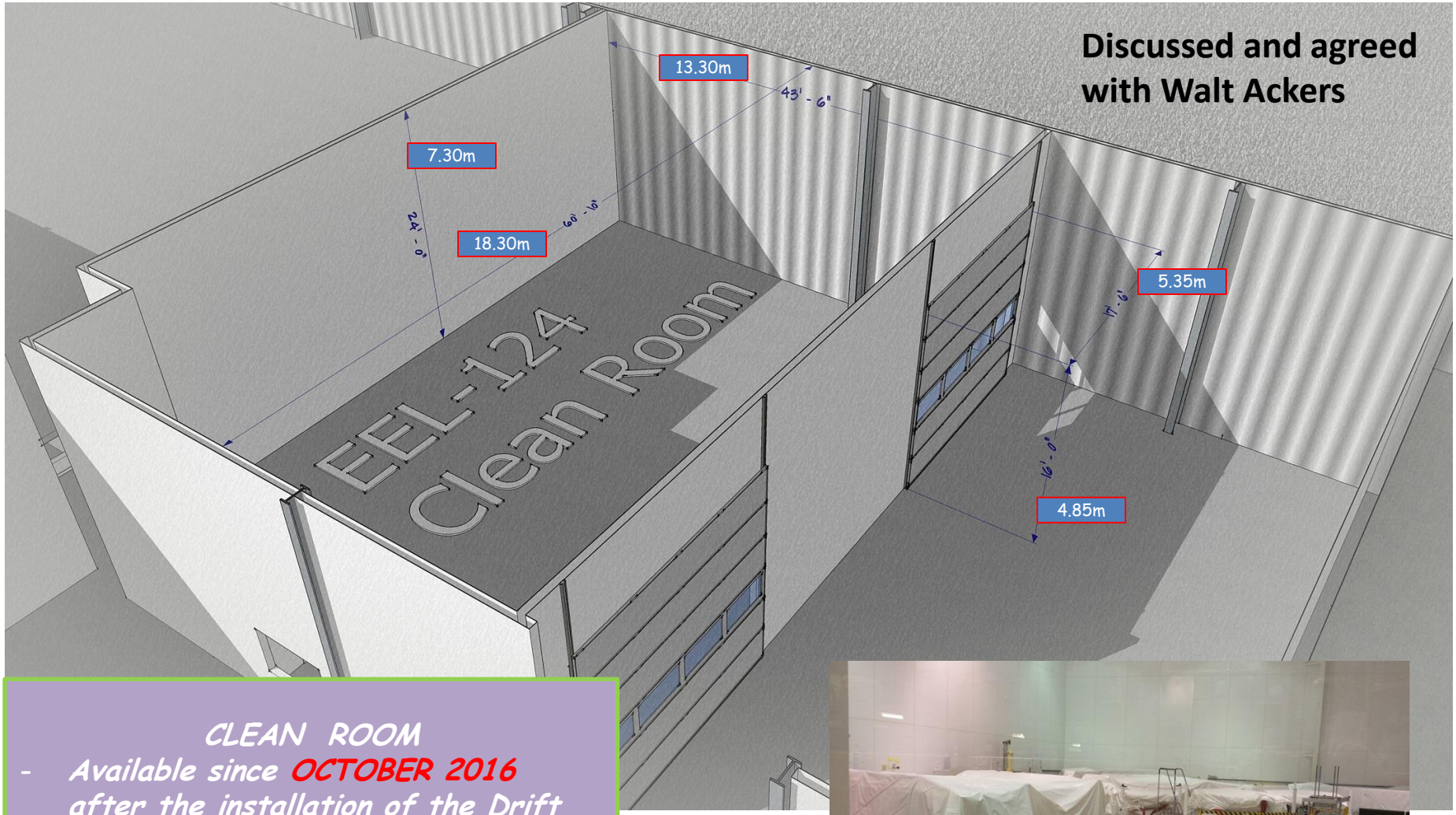


To do List:

- **Visit of the room**
- **Real occupancy**

3. The work to be done for the detector assembly in the big clean room in EEL-124

Clean Room EEL-124



Discussed and agreed with Walt Ackers

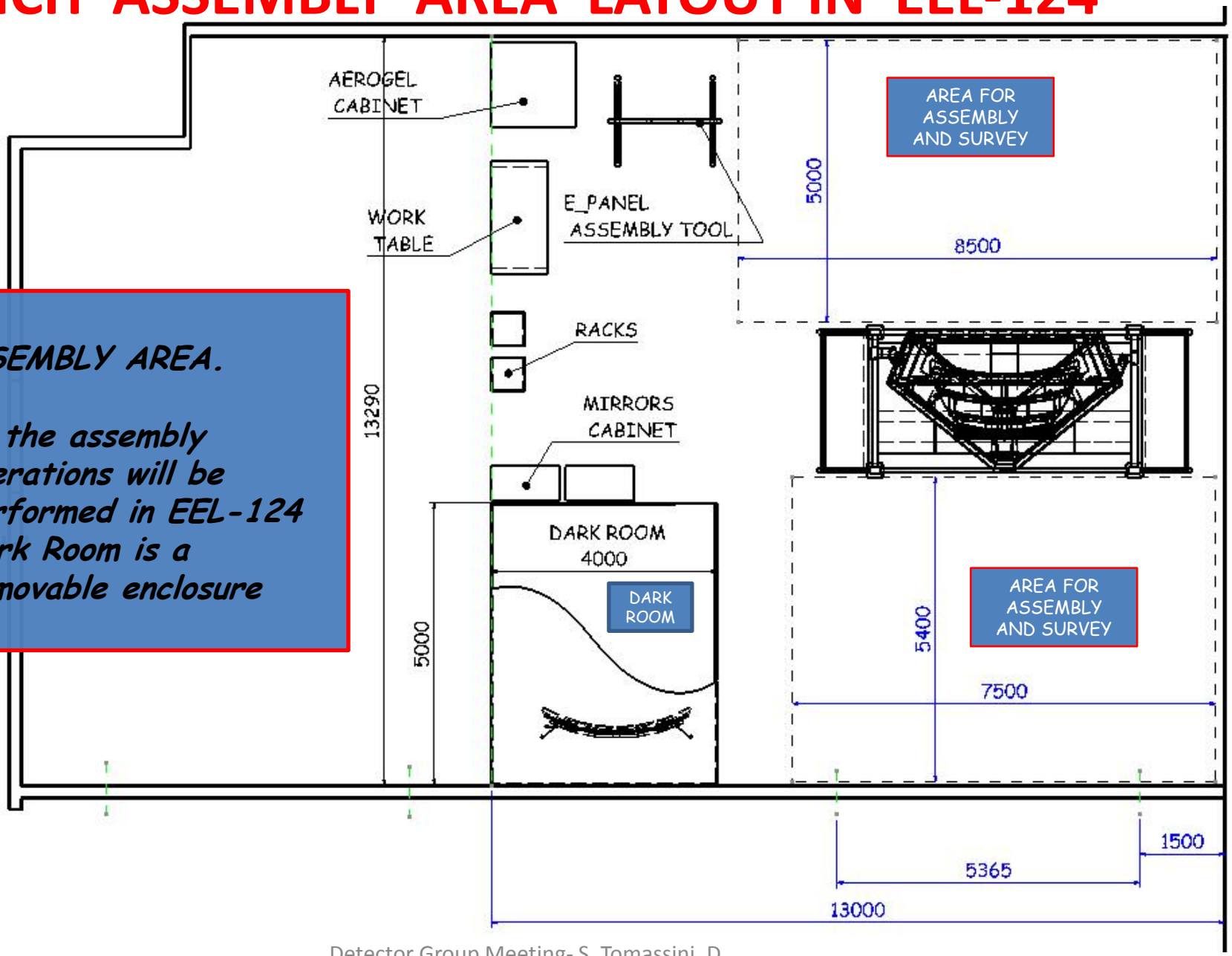
CLEAN ROOM

- *Available since **OCTOBER 2016** after the installation of the Drift chambers*
- *Small areas inside the room will be available **since first delivery of materials***

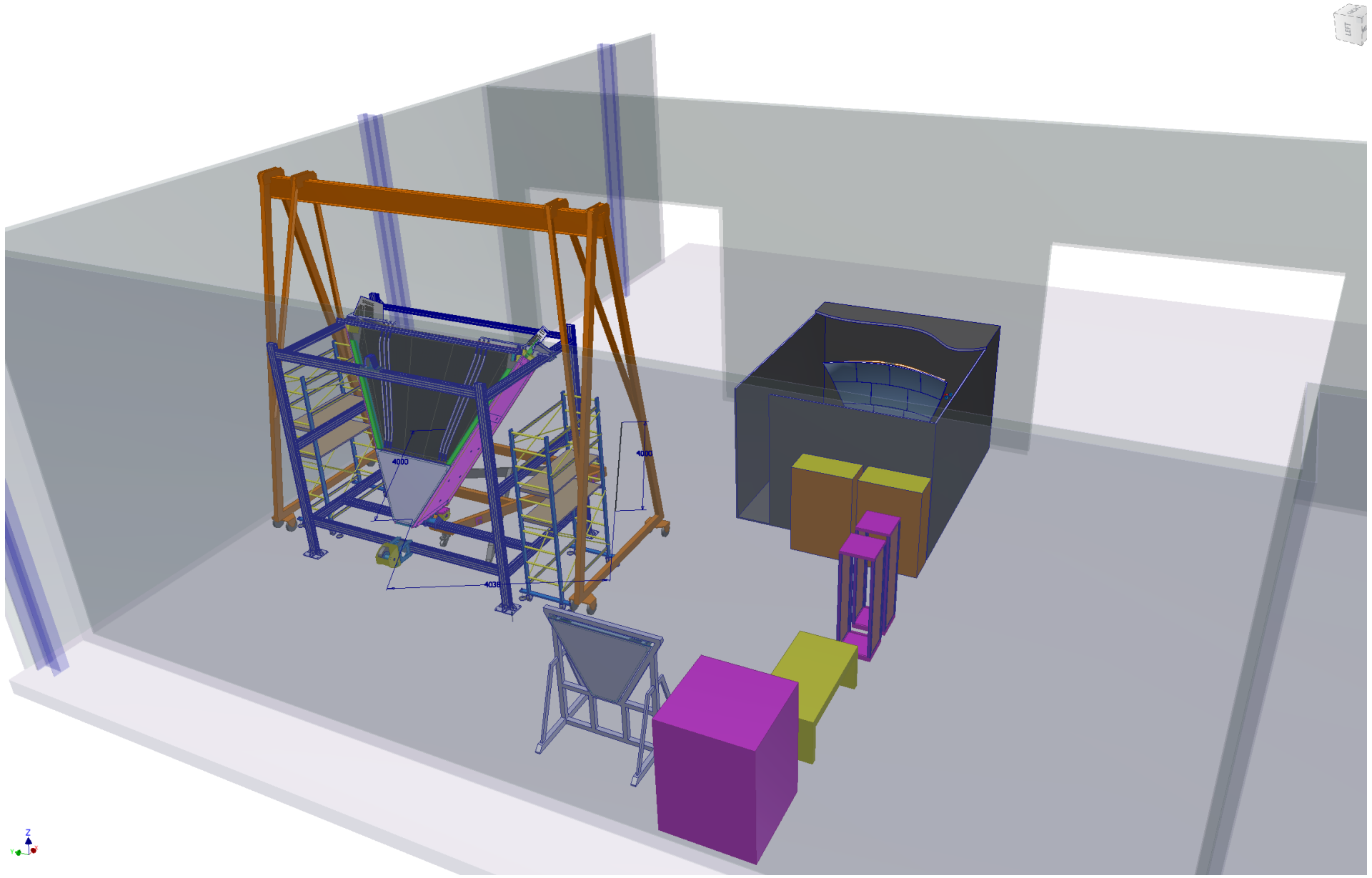
RICH ASSEMBLY AREA LAYOUT IN EEL-124

ASSEMBLY AREA.

1. ***all the assembly operations will be performed in EEL-124***
2. ***Dark Room is a removable enclosure***



RICH ASSEMBLY AREA LAYOUT IN EEL-124



CLEAN ROOM EEL-124
Is equipped with a Gantry Crane Capacity 3 TON

A Gantry Crane will be used for mechanical assembly of the RICH case. The rotation of the RICH, once the assembly will be completed, will be performed by means of a winch.

- Gantry Crane Operator?
- Are non-Jlab operators allowed?

List of operations in the EEL124

The RICH case will arrive dismounted

- It is necessary to assemble the installation structure (aluminum extrusions), fix to the floor with mechanical anchors, level…
- Assemble the RICH case (gantry crane, forklift, winch, hand-tools…)
- Assemble the Front Panel (Aerogel, Flat Mirrors, alignment …)

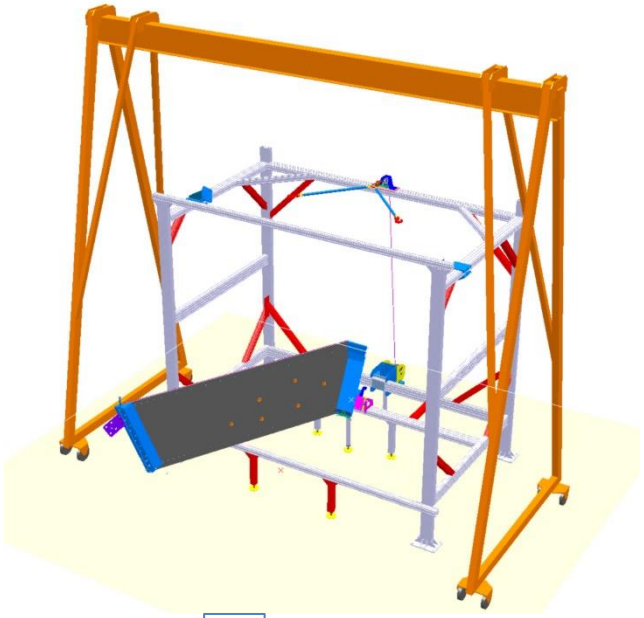
Assembly Structure

1. Drill the holes of the base plate in the floor
2. Level the base plate and anchor
3. Assemble all the components

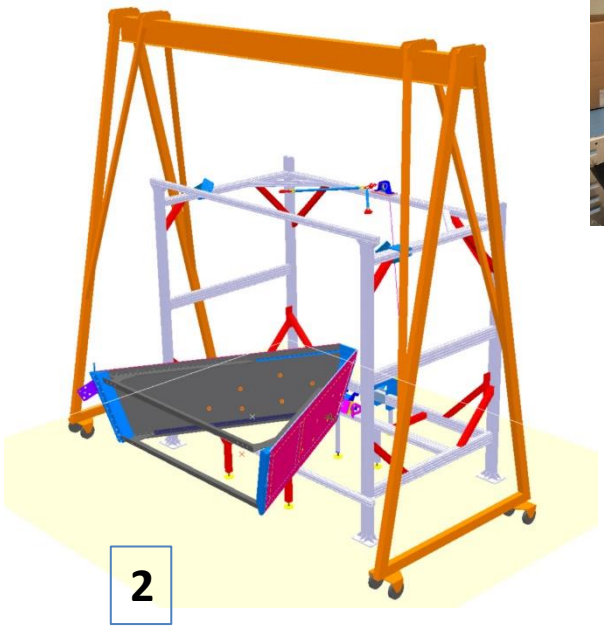
Needs:

1. Gantry crane operator
2. Two mechanical operators
3. One survey operator
4. Hand tools
5. Lifting tools

RICH assembly sequence 01



1



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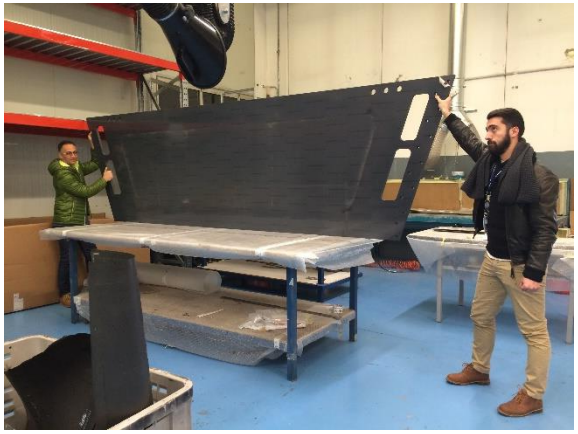
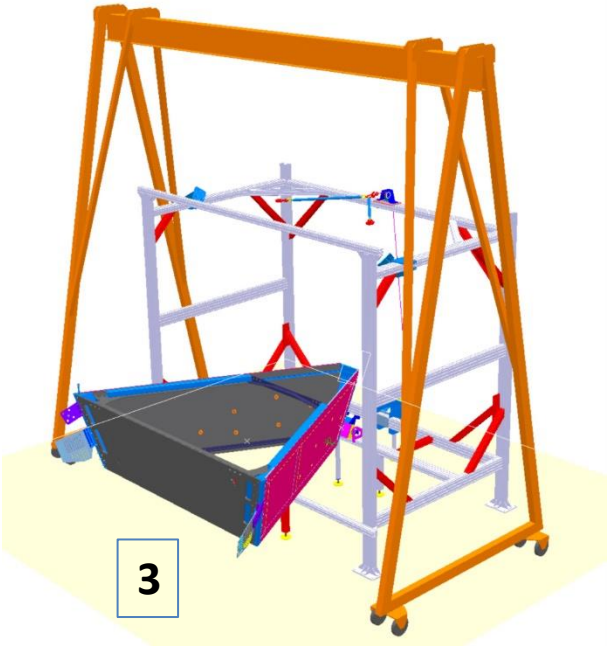
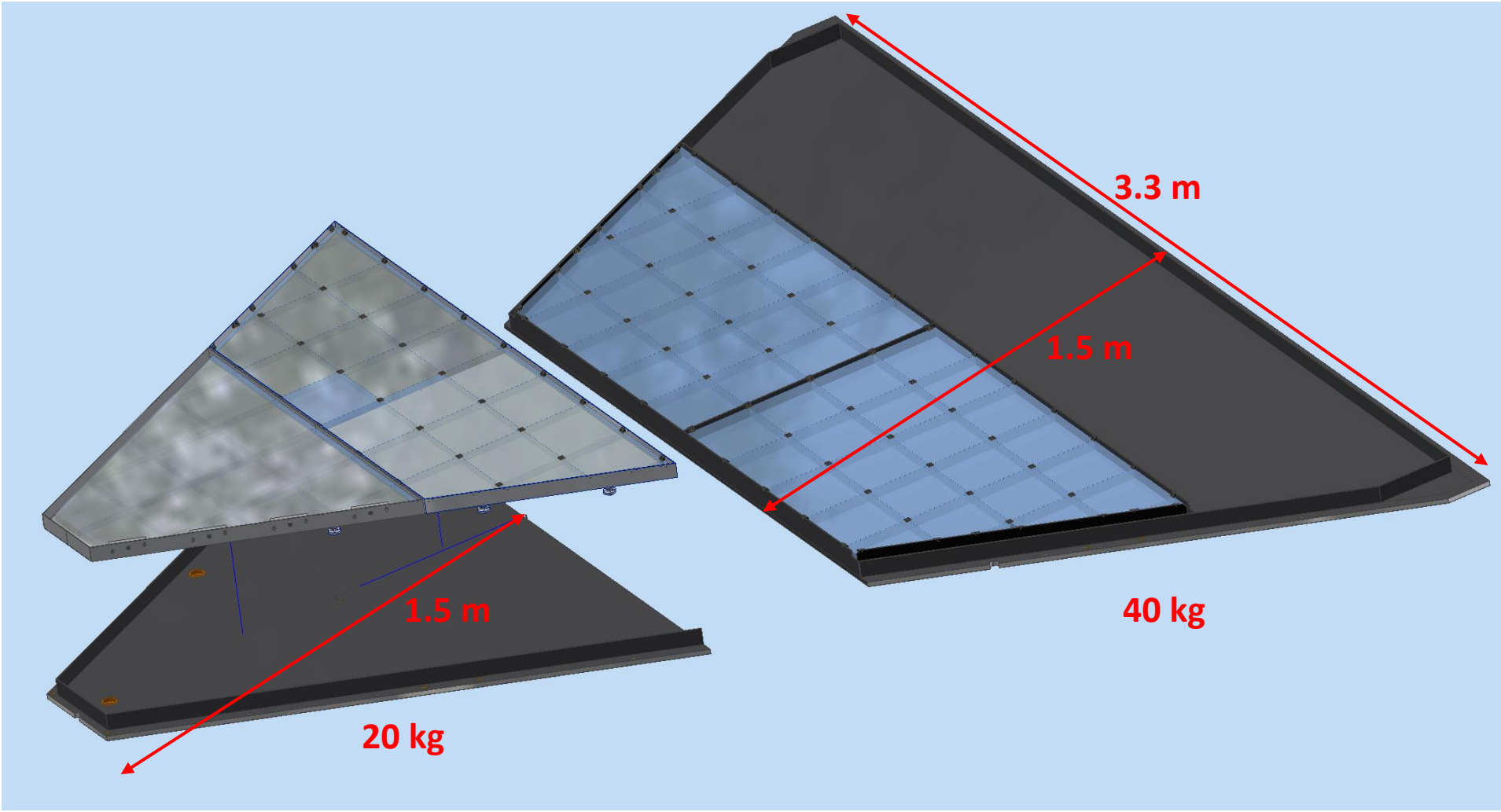


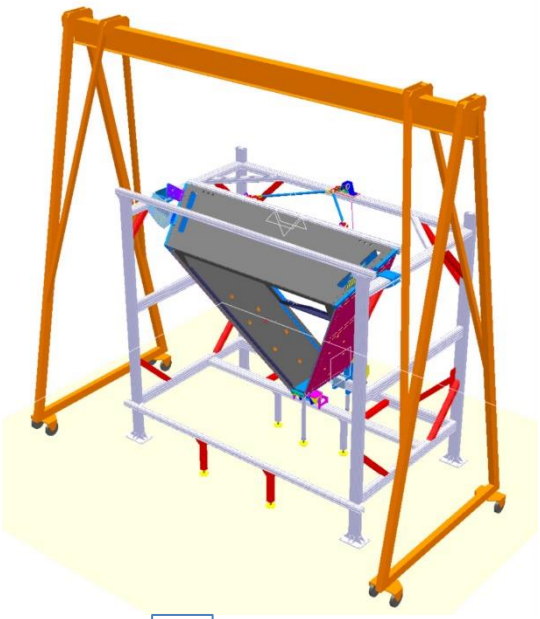


3

Frontal Panel



RICH assembly sequence 02



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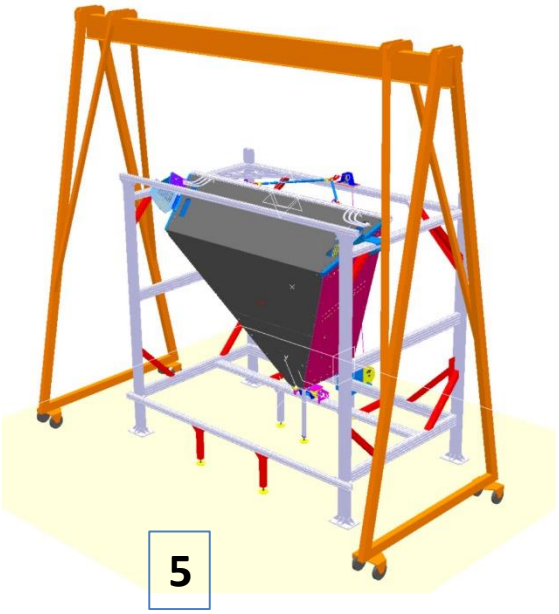

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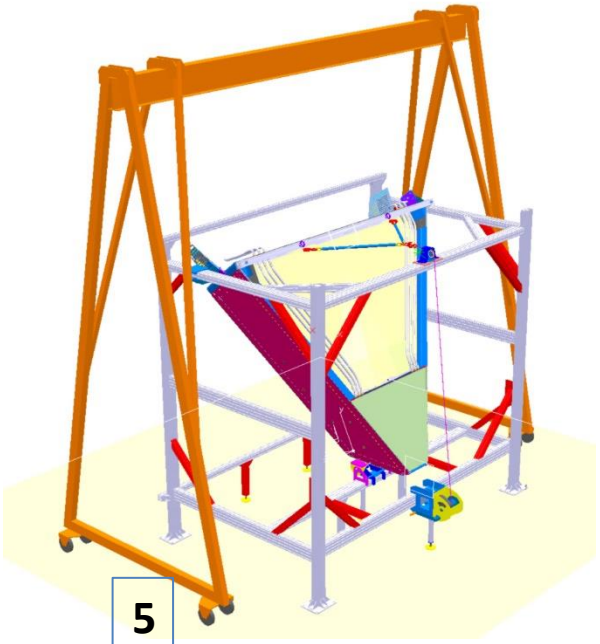


5

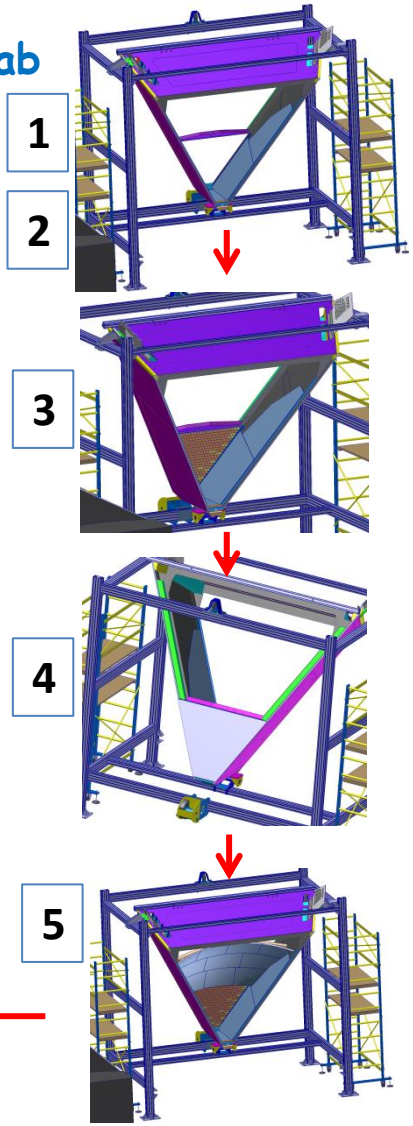
RICH assembly sequence 03

1. Mechanical assembly of the RICH case after the delivery to Jlab

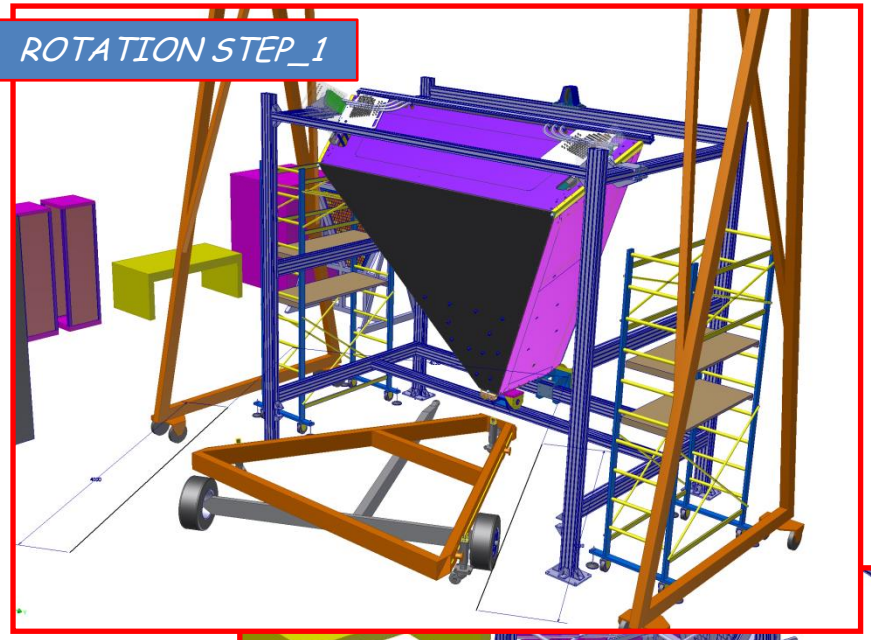
2. Installation of the glass lateral mirrors & Alignment
3. Installation of the electronic panel, cable trays
4. Cabling and Piping (cooling air and purging nitrogen)
5. Installation of the spherical mirror
6. Installation of the frontal panel
7. Installation of the exit panel

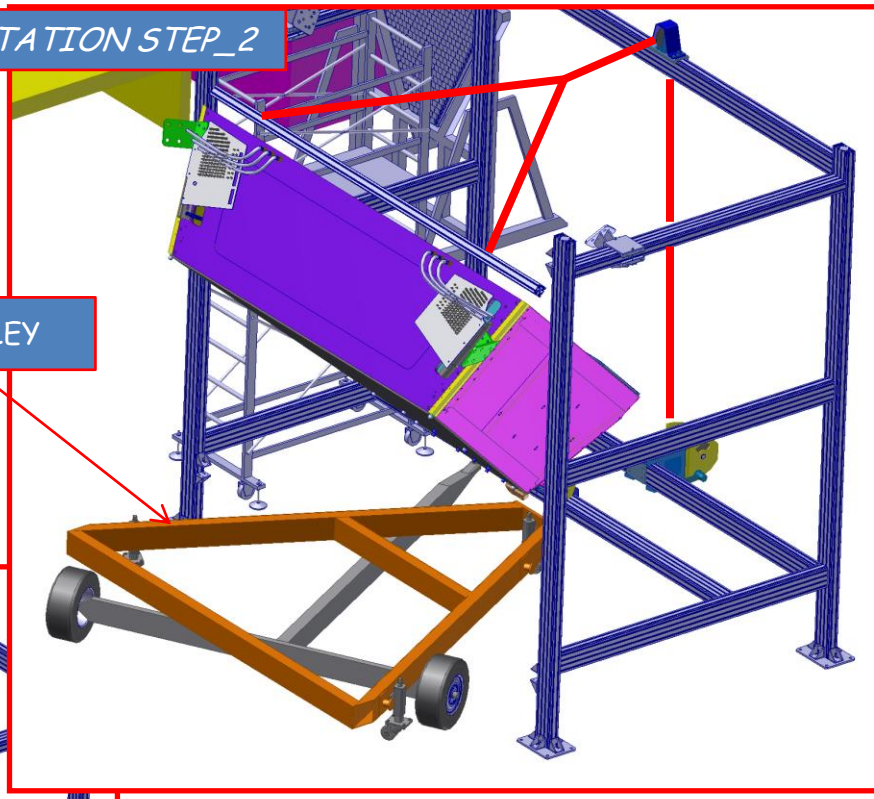
8. Light tightness test and sealing if necessary

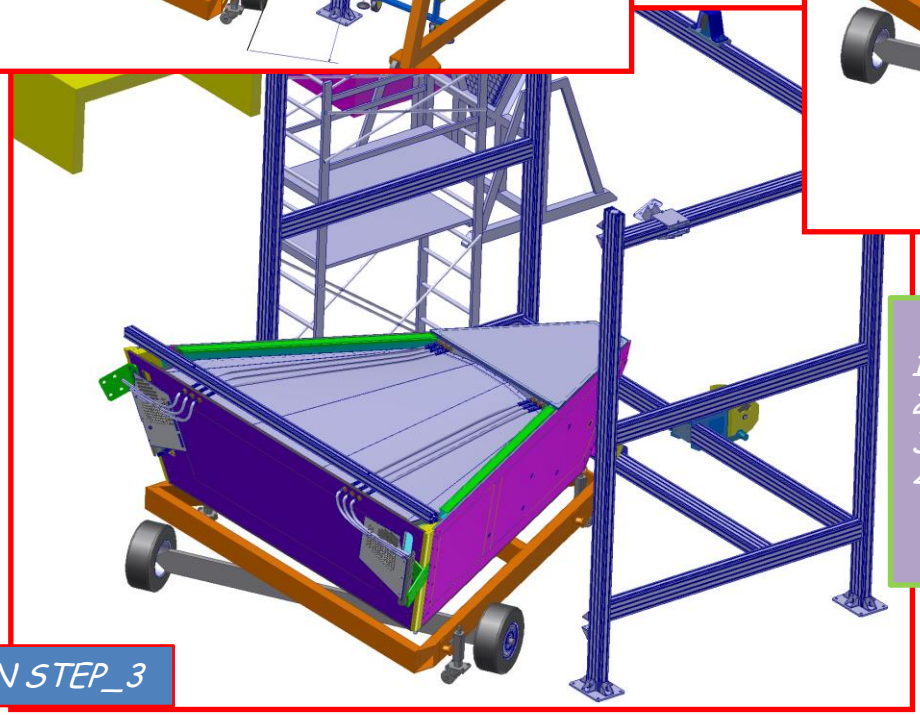
Rotation and transportation of the RICH module to the hall B



Rotation of the RICH module







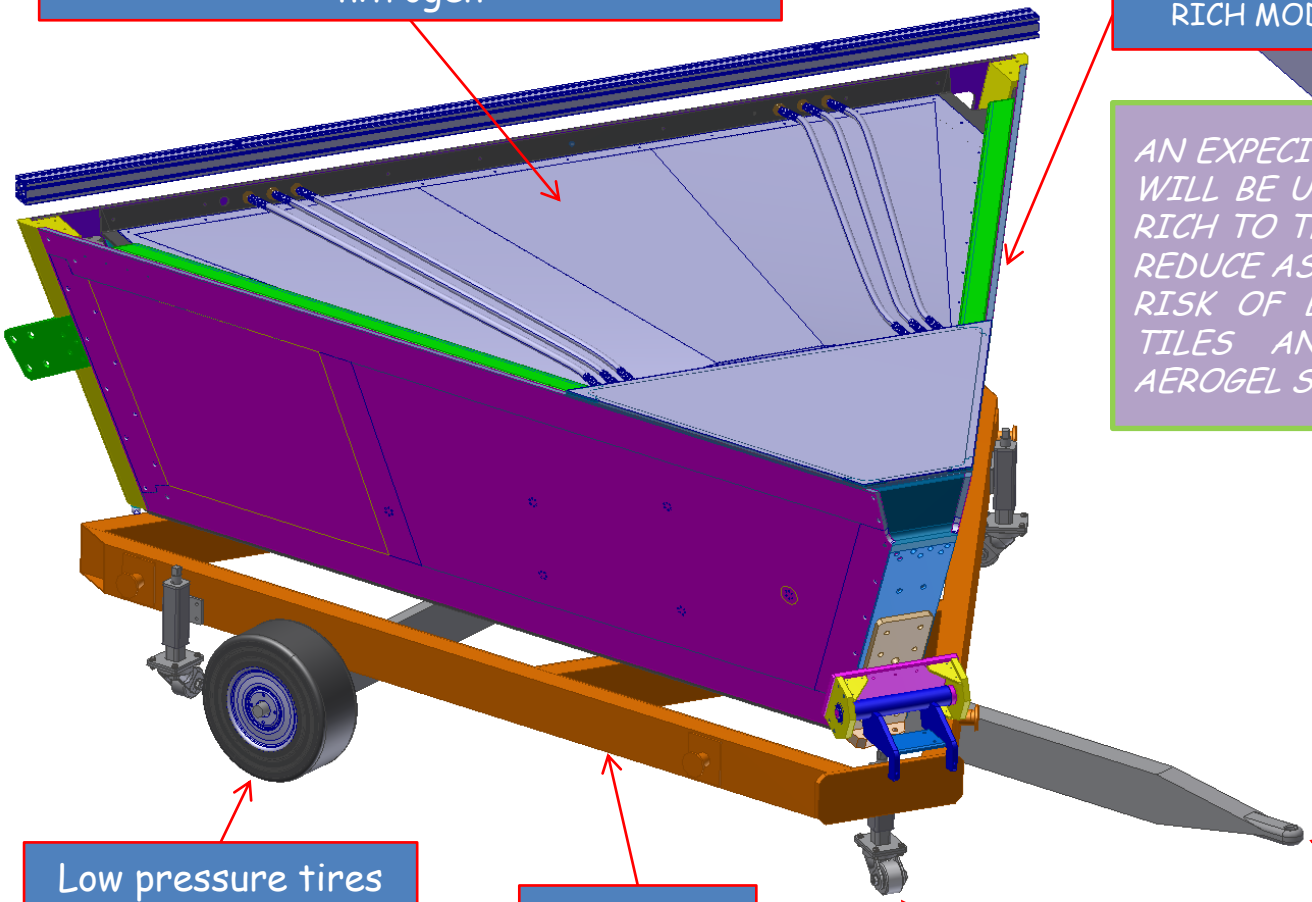
1) THE RICH HAS BEEN ASSEMBLED
2) THE RICH IS ROTATED BY THE WINCH
3) THE RICH IS SECURED ON THE TROLLEY
4) THE TROLLEY IS ROLLED OUT THE CLEAN ROOM

TROLLEY FOR THE TRANSPORTATION

The volume will be closed and sealed in its final assembly and the inner volume will be temporarily fluxed by dry nitrogen

RICH MODULE

AN EXPECIALLY DESIGNED TROLLEY WILL BE USED TO TRANSPORT THE RICH TO THE HALL B IN ORDER TO REDUCE AS MUCH AS POSSIBLE THE RISK OF BREAKING THE AEROGEL TILES AND TO NOT STRESS THE AEROGEL SUSPENTION SYSTEM



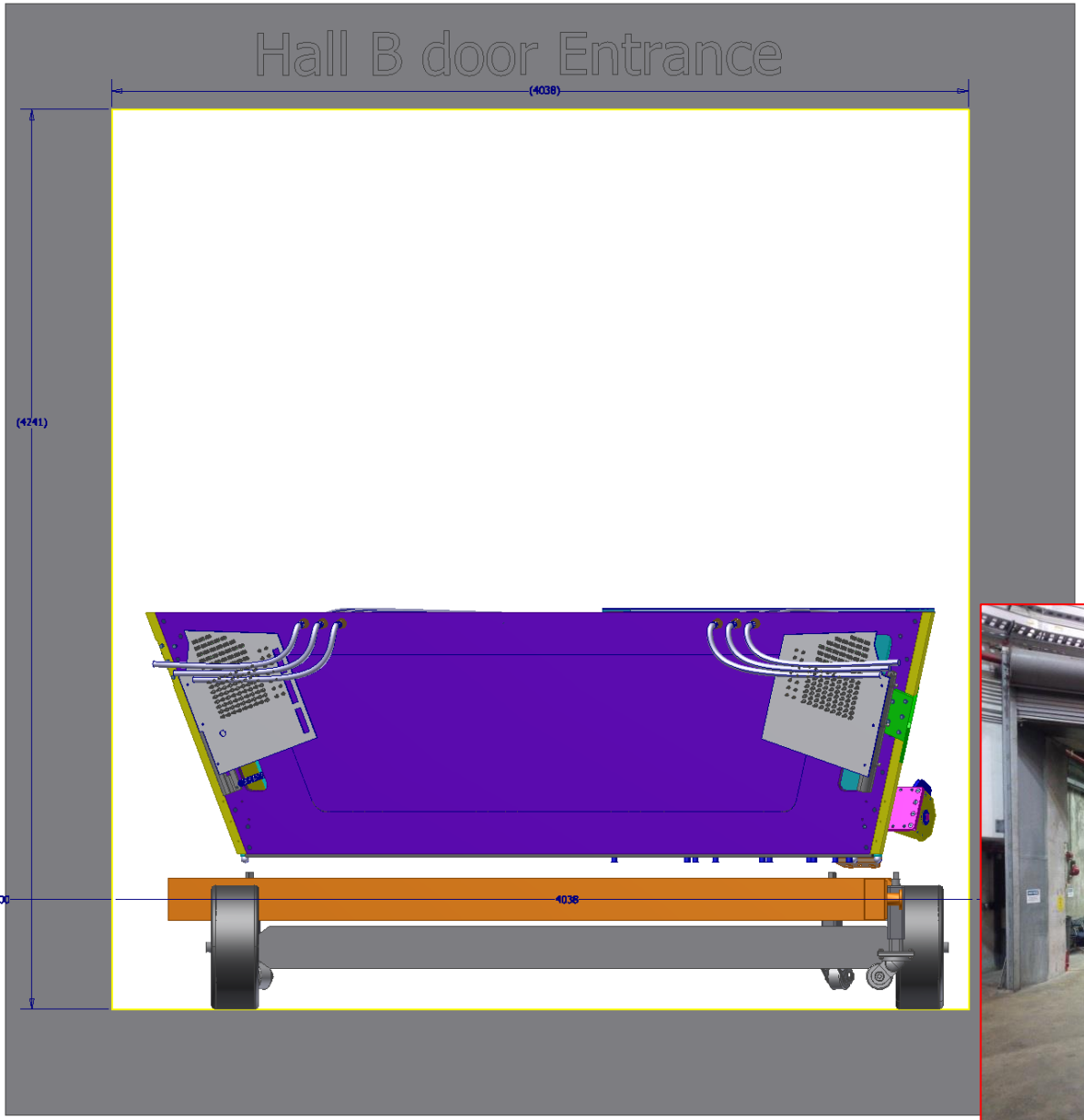
Low pressure tires to damp vibrations

TROLLEY

Jackable wheels for fine adjustment

The system can be safely pulled by a Forklift or electric tractor …

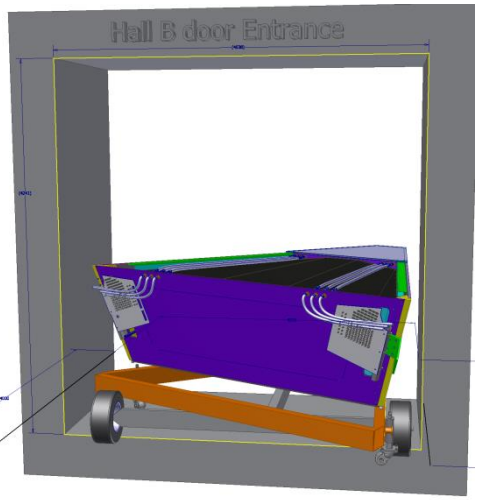
Hall B ENTRANCE



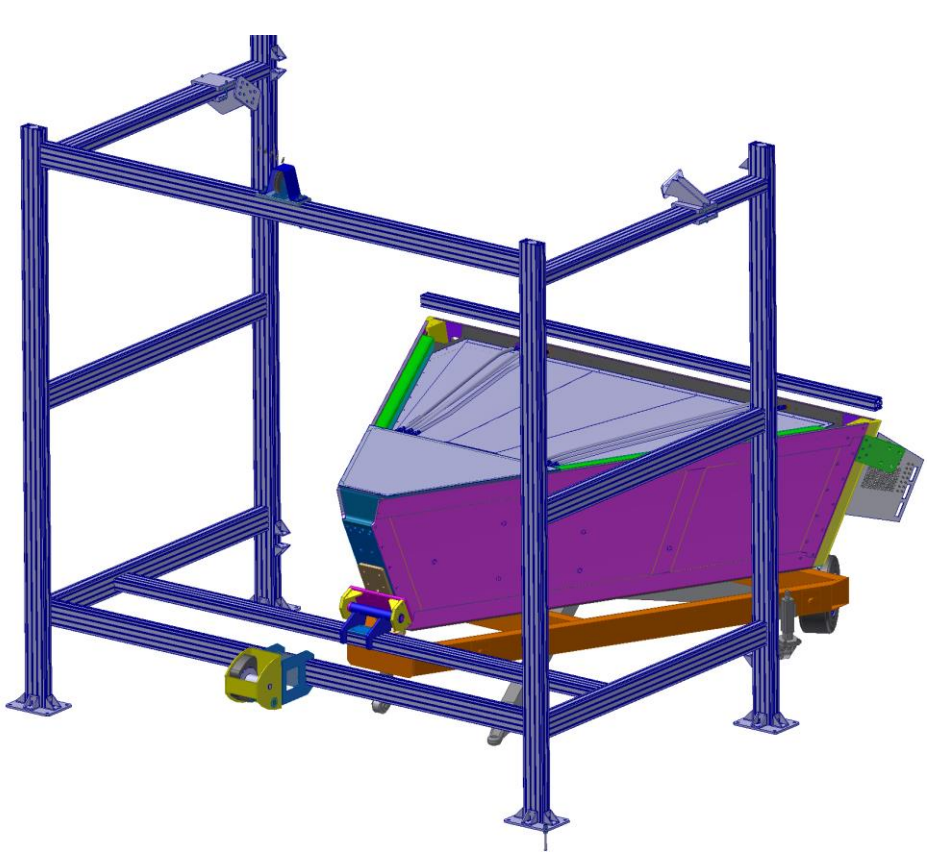
To easily enter the hall B door, the trolley has an asymmetric shape

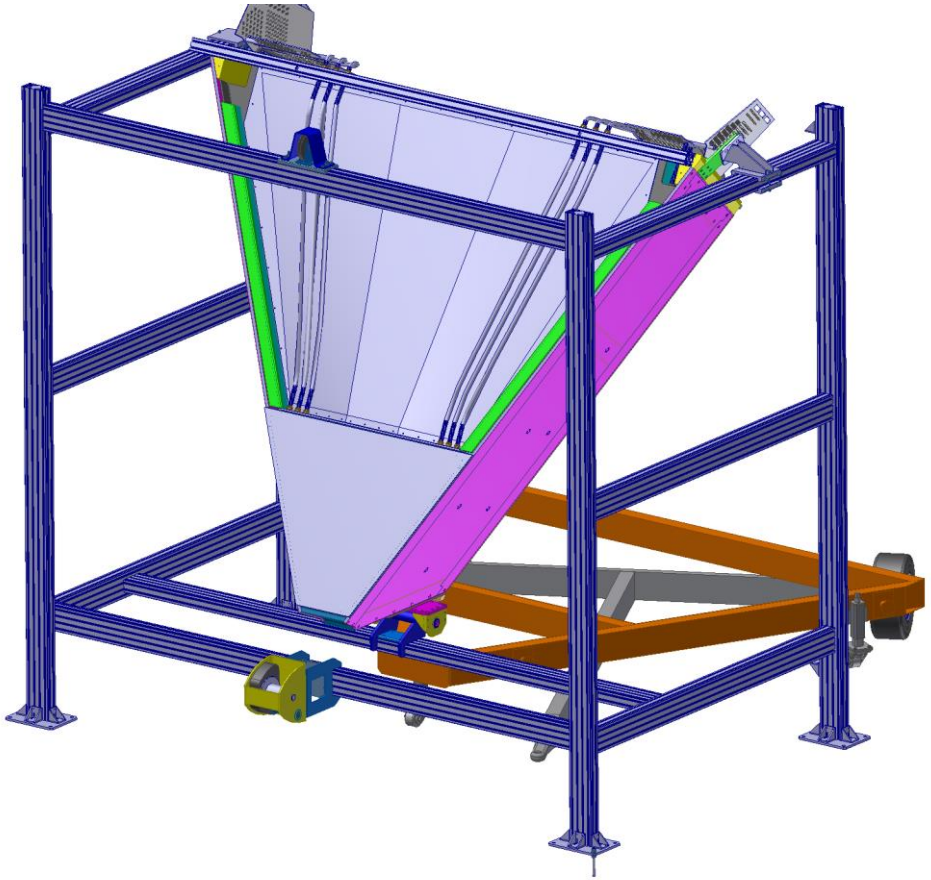
There are 10 cm of clearance on each side of the door

One stirrup must be dismounted and the two patch panels must be folded



Back Rotation once in hall B





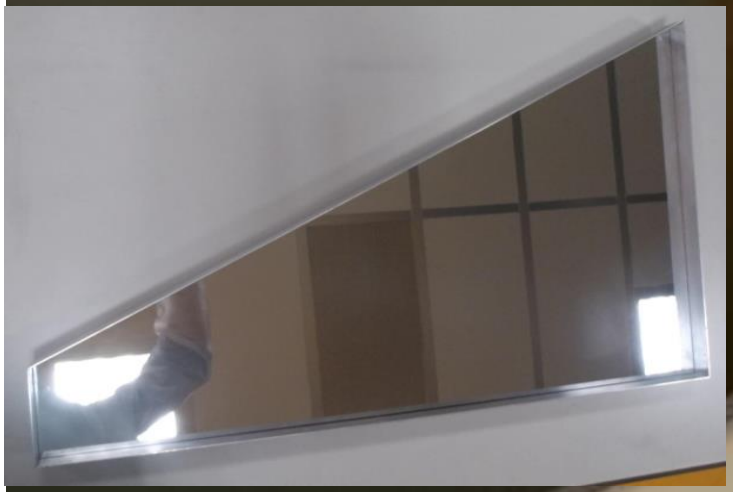
The assembly structure will be dismounted and remounted in Hall B

The RICH will be back rotated to the position ready to attach the lifting Tripod

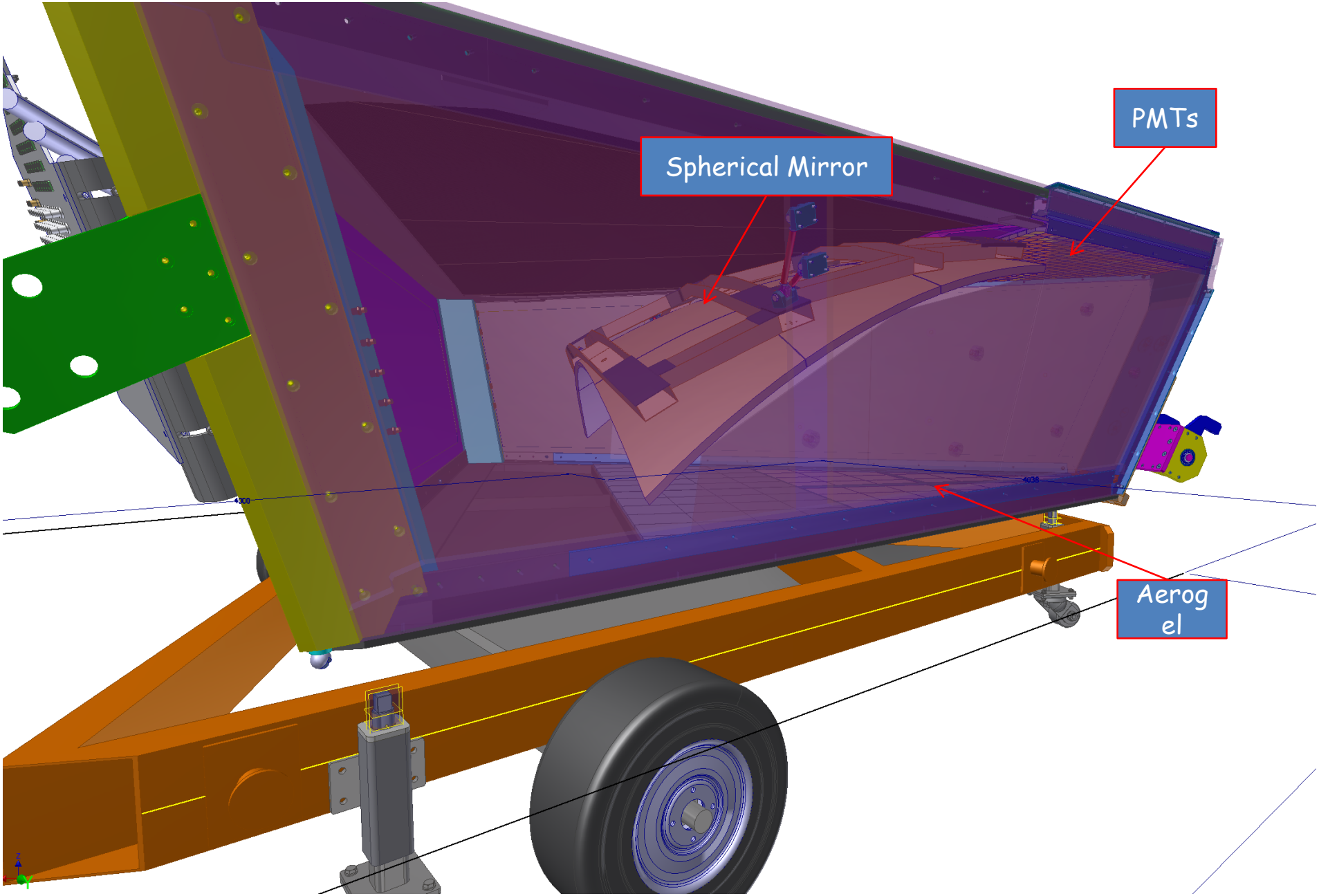
Spare Slides

Built

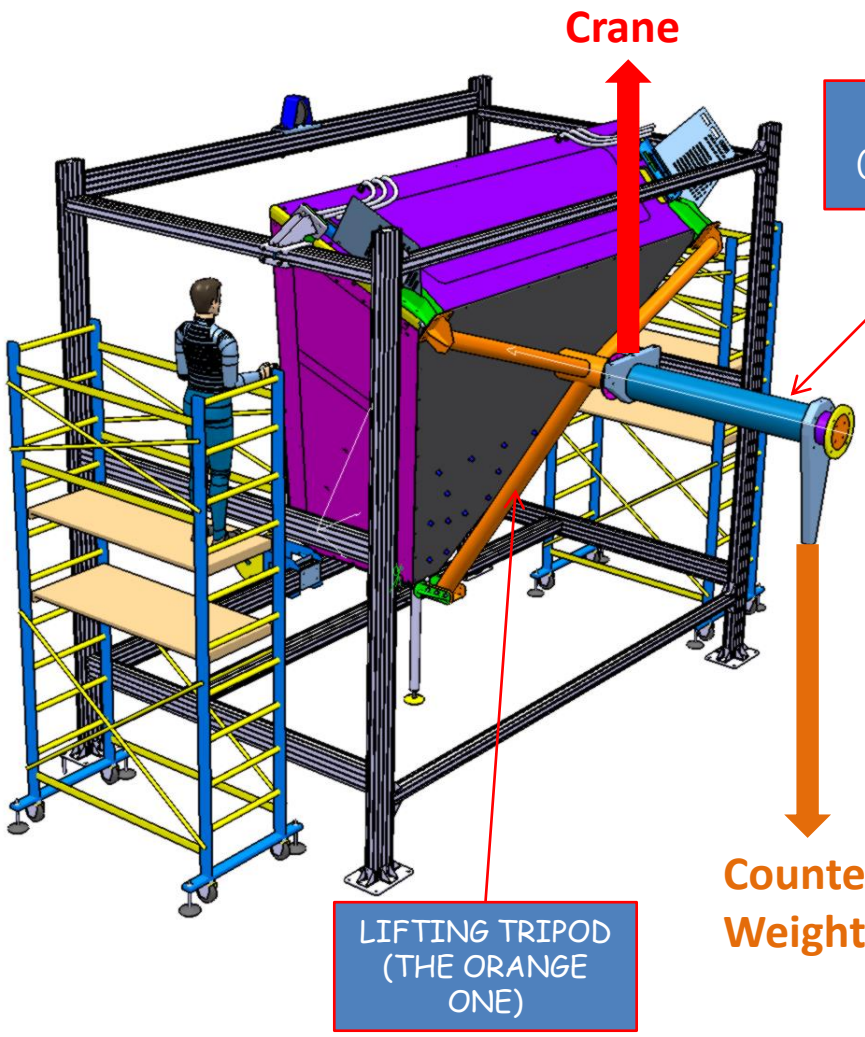
Mechanical frame with "dummy" Rohacell tiles built. Test of a Nylon wire net to sustain the Aerogel tiles

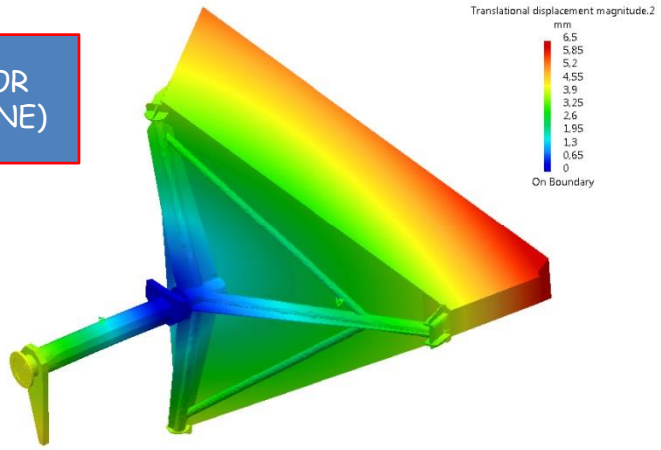


Firt test done and successful: **the method works**. Improvements under study.
- Use of inextensible nylon wire; - washers on the screws to fix the nylon "*piece to piece*"; - optimal method of tiling and weaving to minimize Aerogel tile handling.


PMTs
Spherical Mirror
Aerog
el

LIFTING TRIPOD





A LIFTING TRIPOD FOR RIGGING THE RICH MODULE ON THE FORWARD CARRIAGE HAS BEEN DESIGNED

Slow control

ELEMENTS TO BE CONTROLLED

In charge of Glasgow group

- **Electronics and MAPMT**
  - **High Voltage**
  - **Low Voltage**
- **Services**
  - **Nitrogen gas system**
    - humidity, pressure, flow rate
  - **Electronic cooling system**
    - inner temperature
    - air temperature, humidity, flow rate
  - **Air Compressors**
    - Functioning status

Only instrumentation compatible with Jlab equipments will be used (e.g. CAEN HV power supply)

(Code: Comsol Multiphysics 3.2)

Geometry

- Inner air volume only
- 3 holes for fresh air inlet

Physics

- Power source on boundary 3: 200 W/m^2
- Fresh air inlets on boundary 6: defined through inlet velocity and temperature
- All other boundaries are adiabatic
- ON/OFF Gravity volume force along coordinate of choice (e.g. X)