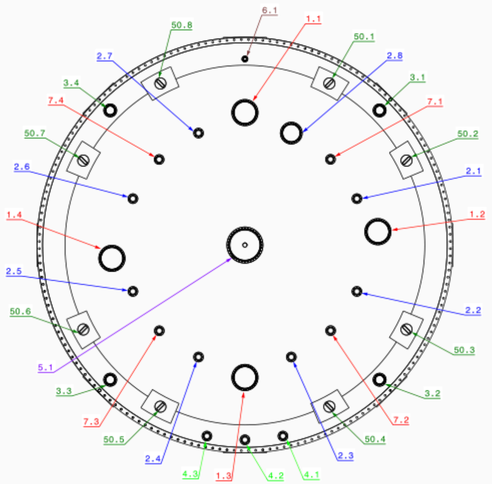
Orientation of ID sub-assemblies within the Cryostat Reference Frame

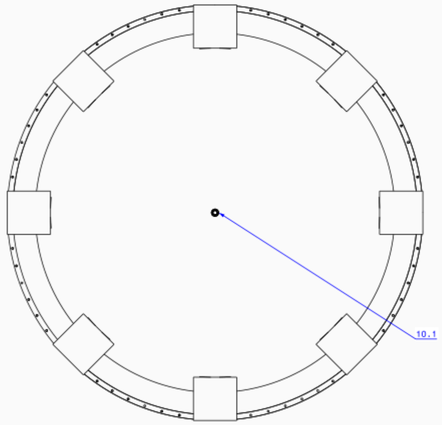
L. Grandi - June 20th, 2024

M. Carlini
June 20th, 2024

Top dome
1:20



Bottom dome
1:20



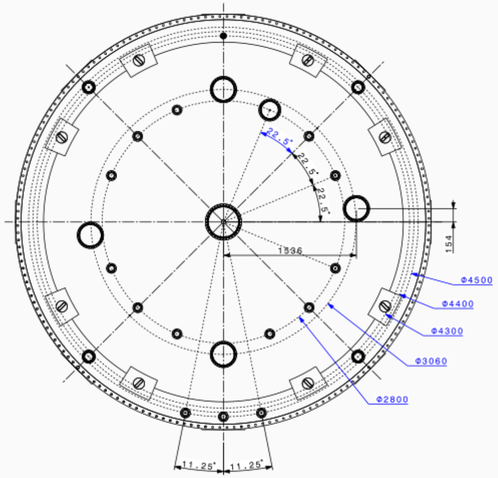
Stainless Steel vessel penetrations mapping			
Top Dome penetrations			
Pos.	ID [mm]	Flange	Description
1.1	248.5	DN 250 CF	TPC and Veto signals and power supply
1.2			TPC and Veto signals and power supply
1.3			TPC and Veto signals and power supply
1.4			TPC and Veto signals and power supply
2.1	38.2	DN 35 CF	UAr cryogenics
2.2			UAr cryogenics
2.3			UAr cryogenics
2.4			UAr cryogenics
2.5			UAr cryogenics
2.6			UAr cryogenics
2.7			UAr cryogenics
2.8	197.7	DN 200 CF	UAr pressure safety valve
3.1	97.4	DN 100 CF	Calibration
3.2			Calibration
3.3			Calibration
3.4			Calibration
4.1	60.2	DN 63 CF	High Voltage
4.2			High Voltage
4.3			High Voltage
5.1	347.6	DN 350 CF	Anode adjustment system
6.1	34.8	DN 40 CF	Motion feedthrough
7.1	60.2	DN 63 CF	Spare
7.2			Spare
7.3			Spare
7.4			Spare
Bottom dome penetrations			
Pos.	ID [mm]	Flange	Description
10.1	47.5	DN 50 CF	UAr cryogenics

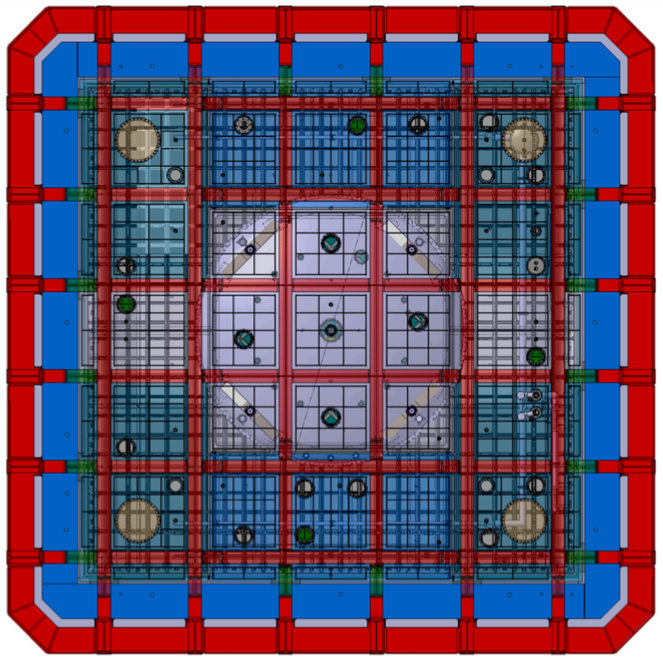
N

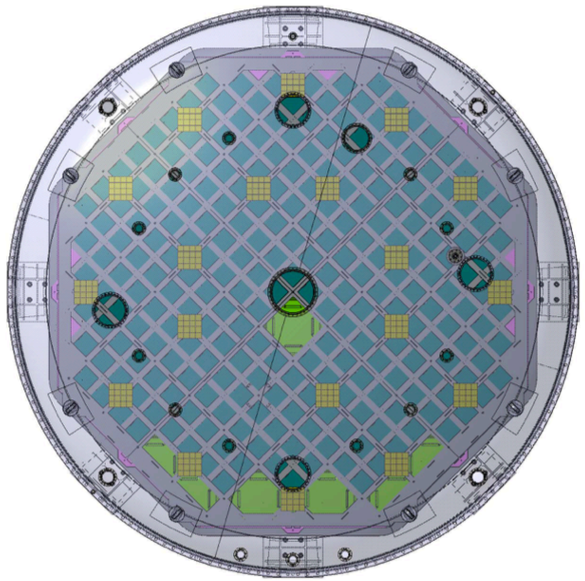
Stainless Steel vessel supports mapping	
Top Dome supports	
Pos.	Description
50.1	ID support
50.2	ID support
50.3	ID support
50.4	ID support
50.5	ID support
50.6	ID support
50.7	ID support
50.8	ID support

1. Position of the ID supports is vertically aligned with Optical planes support rods.

Top dome
1:20







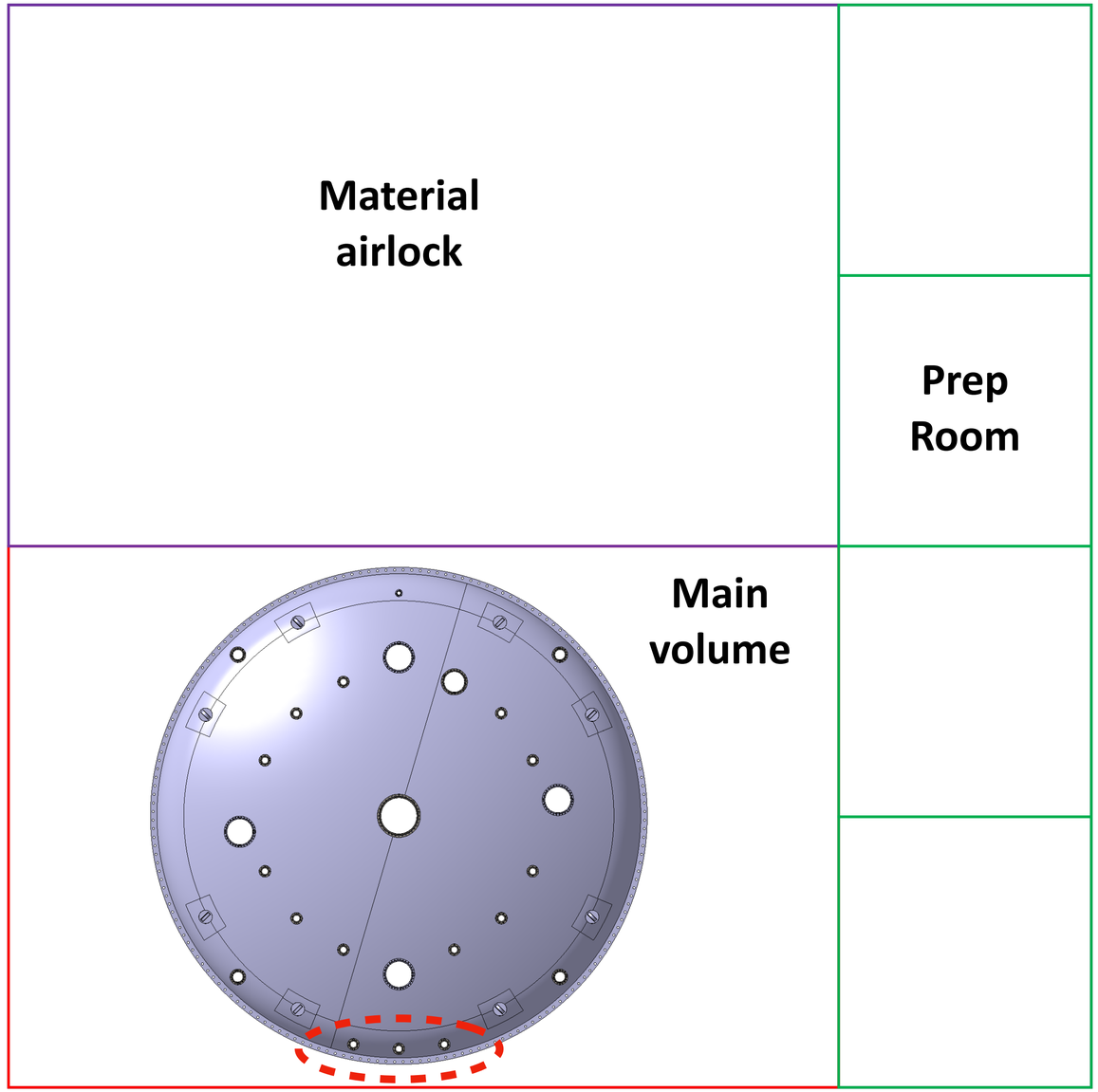
NORTH

Hall C
entrance

	Not Applicable		
DS-20k SS vessel	DESIGNED	M.CARLINI	FORMAT A0
	CHECKED		
	RELEASED		SCALE 1:20
DS-20k SS vessel - penetrations mapping	APPROVED		
	DESIGNED 2024-04-08		
REFERENCES Doc No: ST1595395_02		LABEL NOT VALID FOR EXECUTION	SHEET 1/1

M. Carlini
May 9th, 2024

Top View of the cryostat



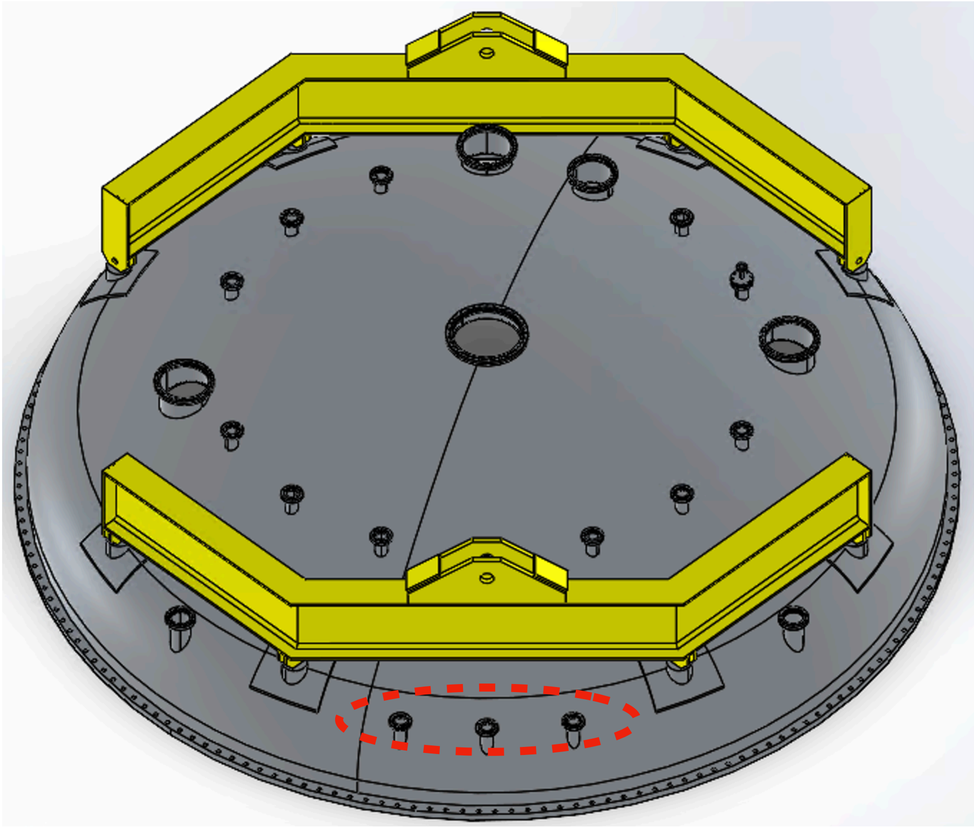
NORTH

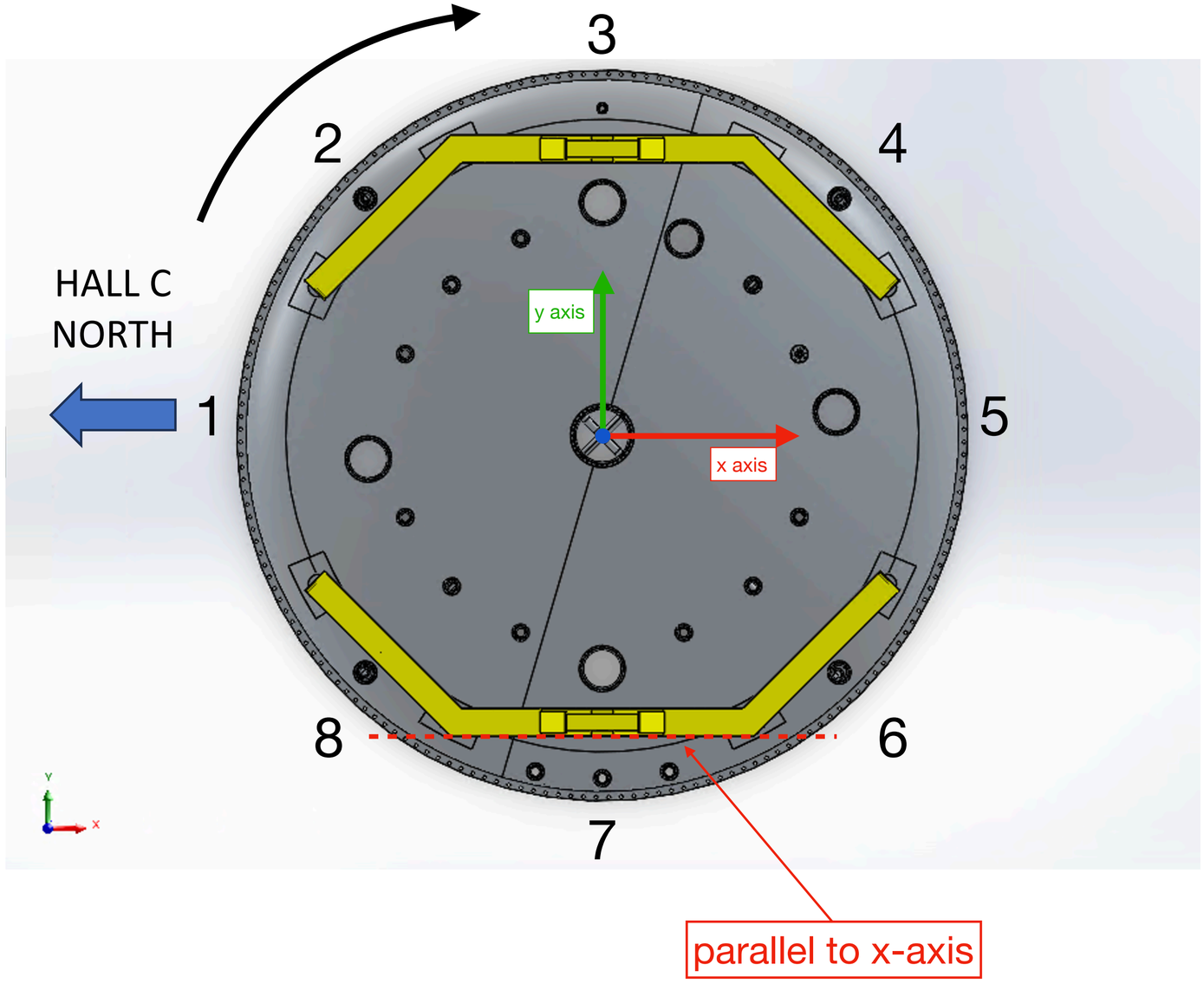
Hall C entrance

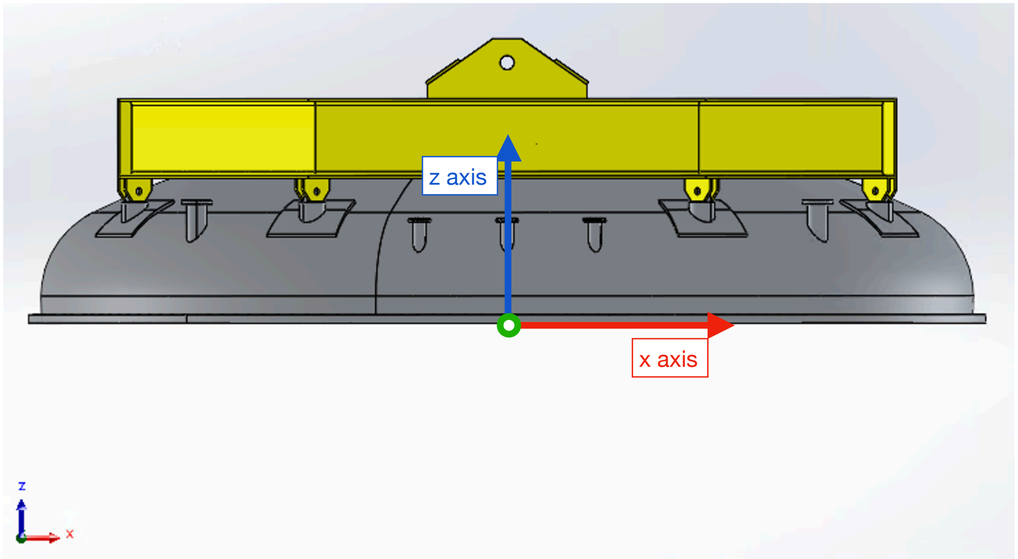
“Vessel Dome + Lifting Beams” sub-assembly

DS20k_ID_VESS_TopDome+Beams.SLDASM

- **One single orientation is allowed.**
  - Lifting Beams should align properly with hooks of the two external crane in Hall C;
  - Dome ports should align with cryostat ports;
  - 3 HV ports create an asymmetry.



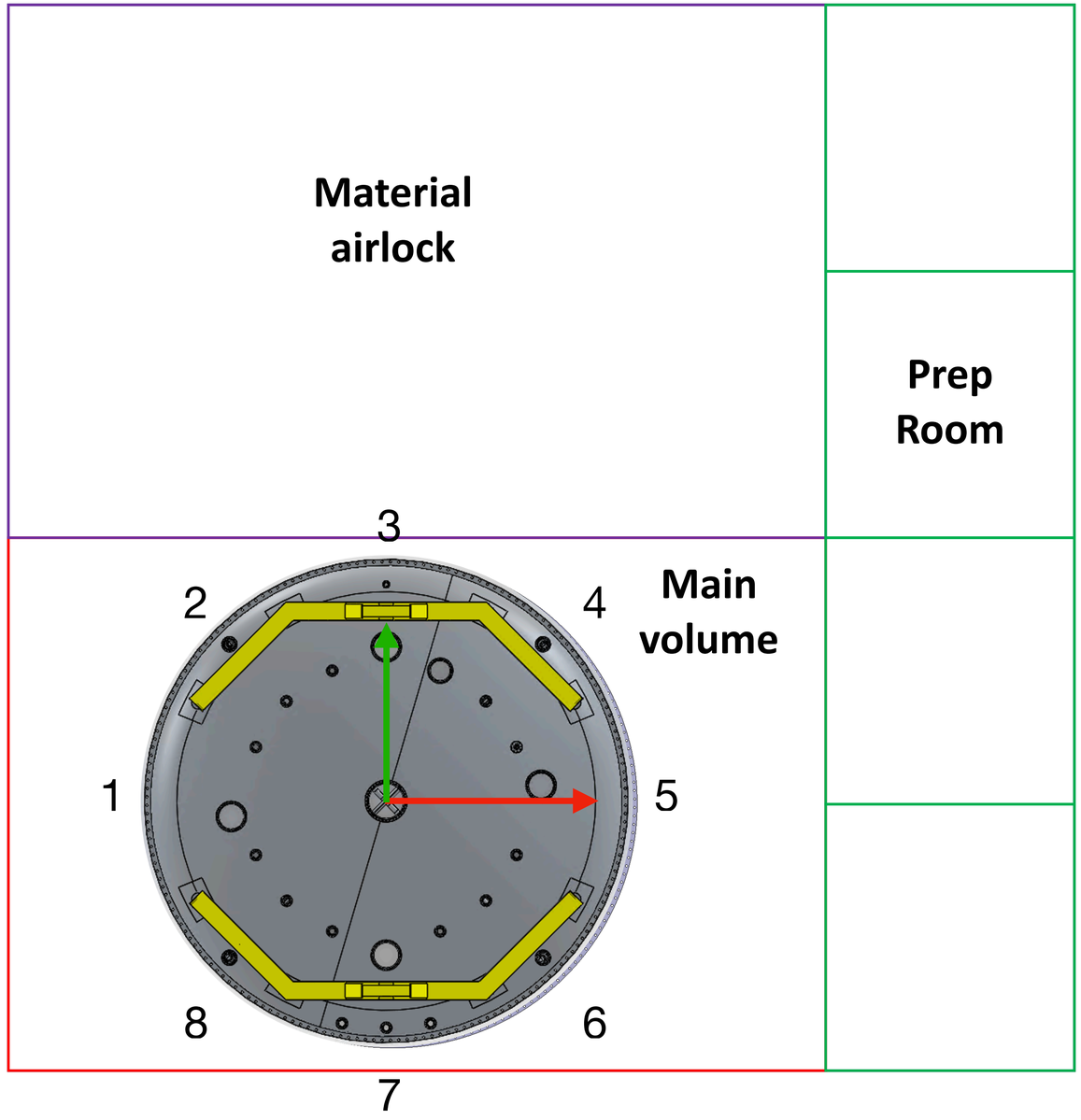




Proposed **reference frame** to be used for ID model and proposed **labeling scheme** to identify the eight sides of the octagonal components (agreed with D. Rogowsky)

M. Carlini
May 9th, 2024

Top View of the cryostat



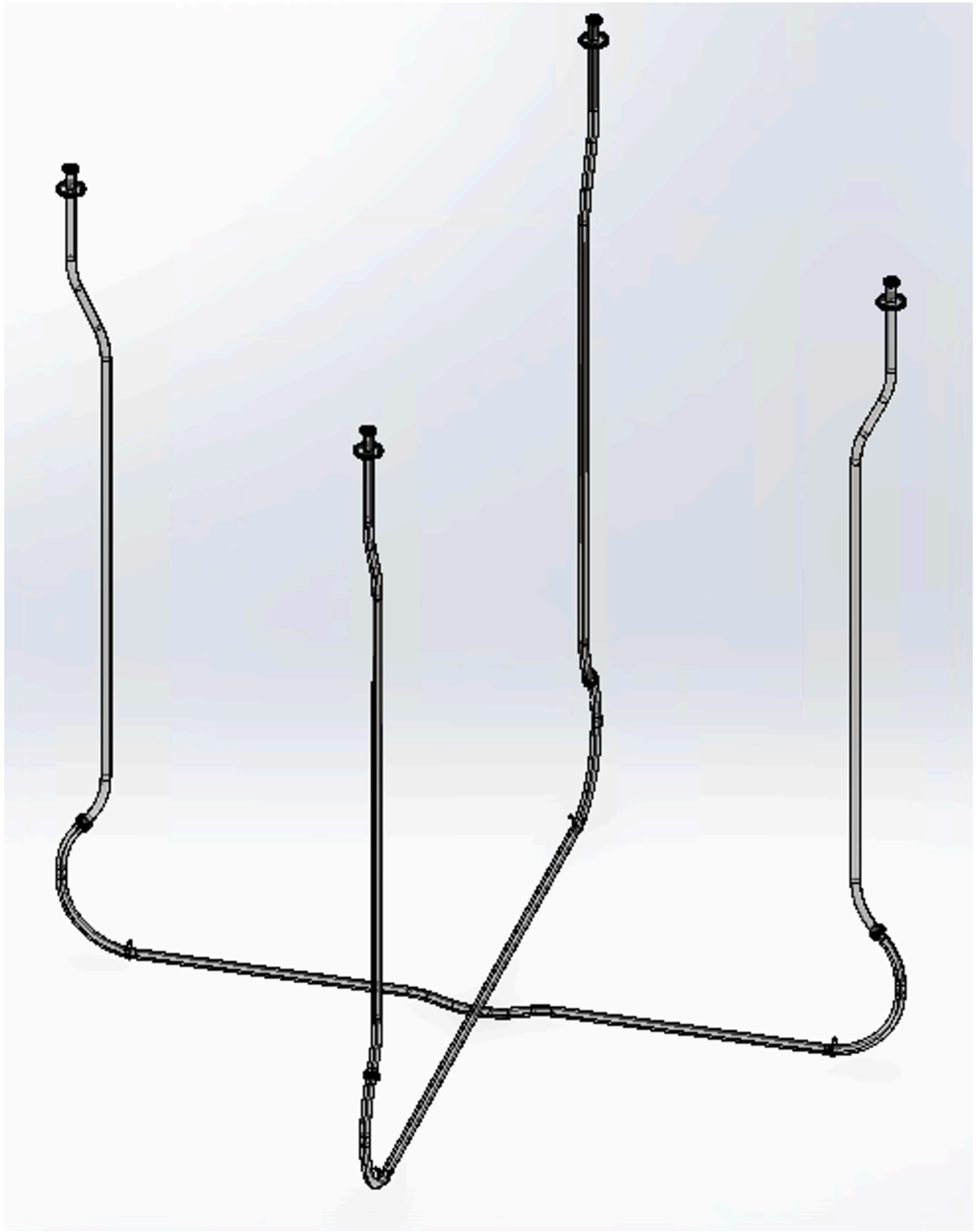
Relative constraints between ID sub-assemblies

“Calibration Pipes” sub-assembly

DS20k_ID_CAL__Cal.SLDASM

- Four orientations are in principle allowed.
  - The assembly has a 90 degree symmetry (if “upper U pipe” or “lower U pipe” can be swapped);

- The Calibration Pipe orientation constraints the orientation of the BOP once the pipe connection to BOP are put in place.
  - *the U brackets shall not conflict with vPDU locations*
  - *the U brackets shall match the brackets holes in the BOP.*

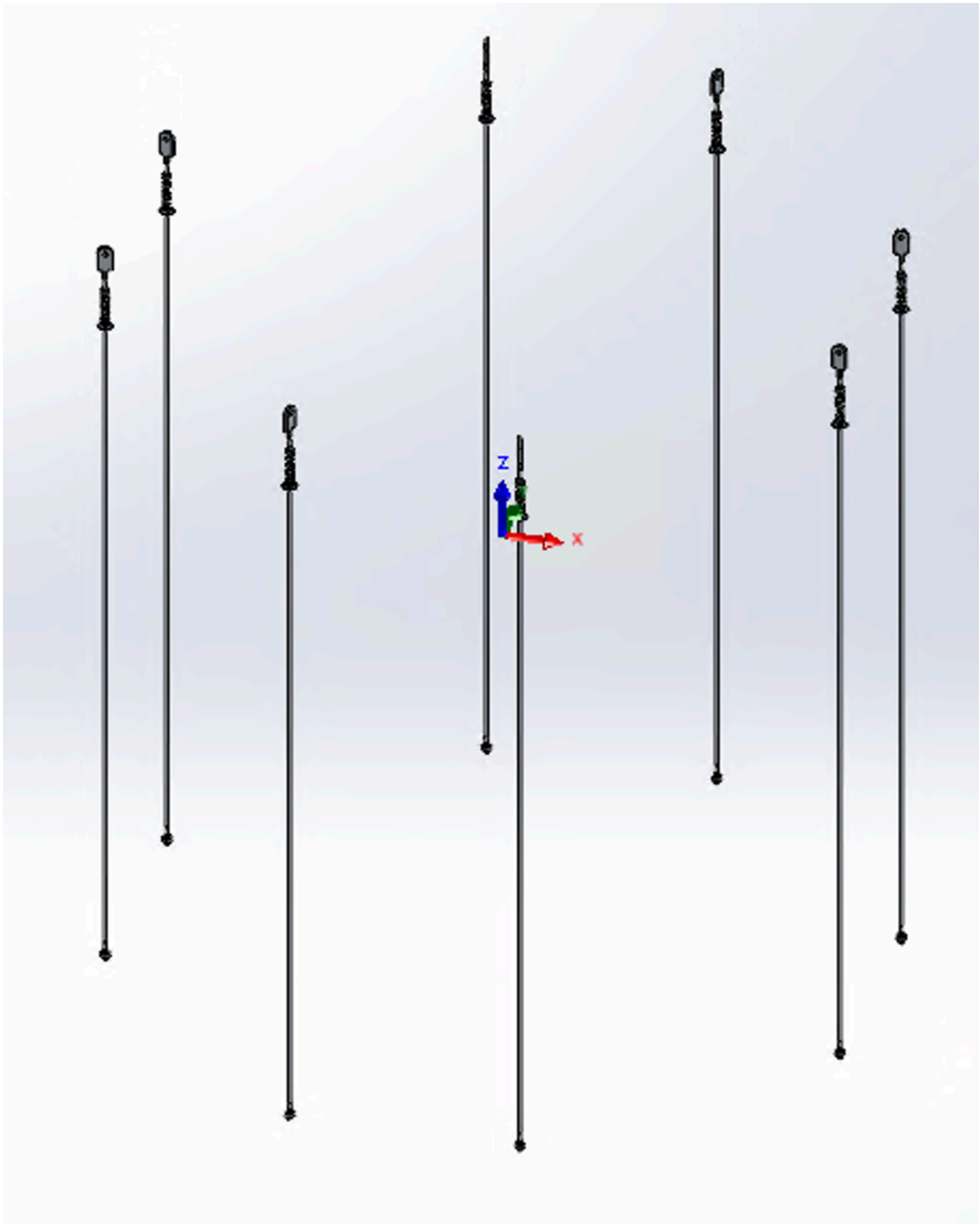


“Vertical Support Rods” sub-assembly

DS20k_ID_SUPP__Support.SLDASM

- Four orientations are in principle allowed.
  - The location of the rods in the space is defined by the dome orientation;
  - The 8-rod-assembly has a 90 degree symmetry;

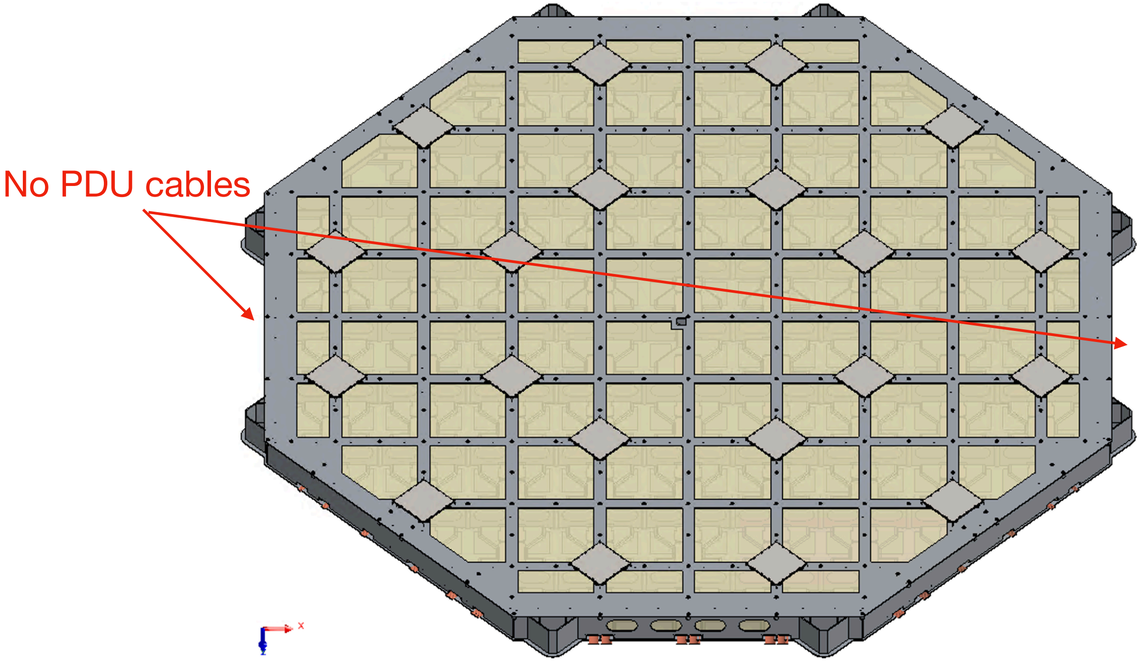
- The Vertical Support Rods orientation constraints the allowed orientations of the TOP and BOP.

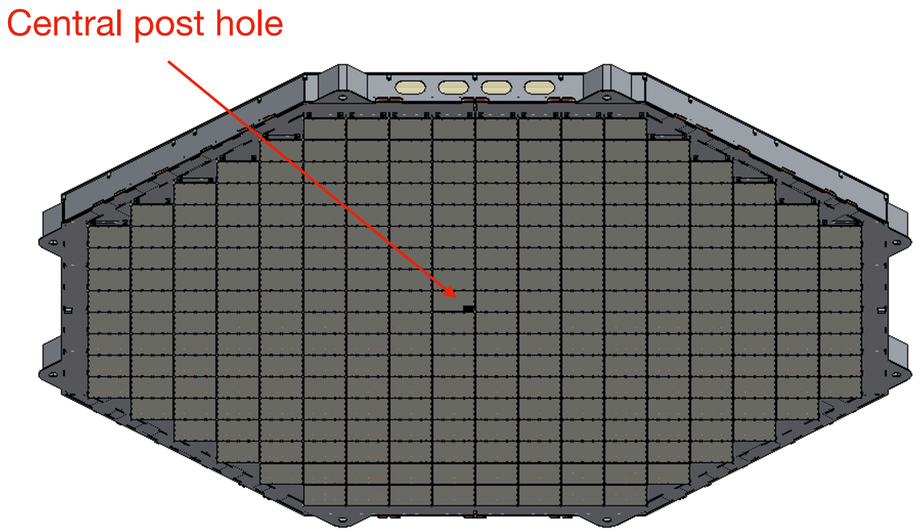


“TOP” sub-assembly

DS20k_ID_MULT__TOPFull.SLDASM

- Four orientations are in principle allowed.
  - The vertical rod positions are defined
  - The TOP assembly has a 90 degree symmetry as far as mounting is concerned;
- The TOP orientation:
  - fully constraints the orientation of the ANODE due to the central post;
    - *The push/pull system works with the Anode post being in any of the four quadrants (confirmed by Nic).*
  - defines (weakly) the cable bundles location. Cables leaves the TOP through 6 sides out of 8.
    - *Constraints (weakly) the BOP orientation through cable bundles*





“ANODE” sub-assembly

DS20k_ID_ANOD__Anode.SLDASM

- Its orientation is fully constrained by the orientation of the TOP due to the central post;

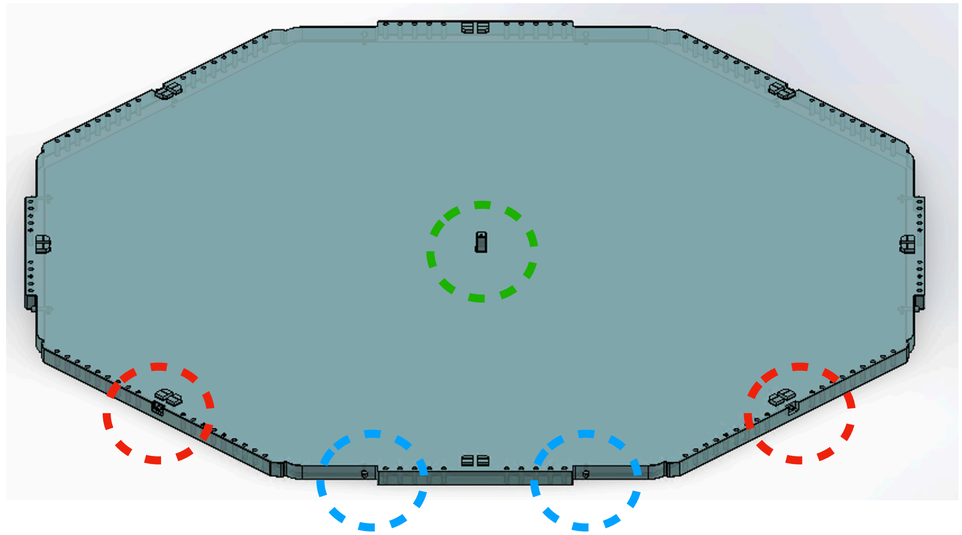
- The ANODE orientation constraints:
  - the possible orientations of the BARREL:
    - *the levelmeter ports on the ANODE/BARREL should match (90 degree symmetry).*
  - the possible orientations of the CAL pipes (conflict with levelmeter ports)

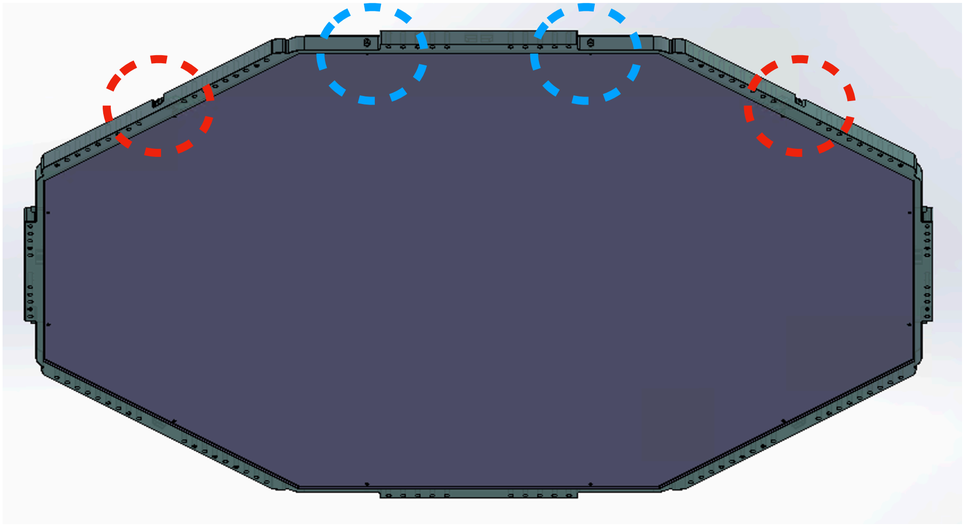
    ➡ possible locations of the bubbler and of the boiler;
  - the possible orientations of the grid;
    - *the ANODE HV connection should align with grid segments without faraday cage (no wires).*

Levelmeter ports

Bubbler/boiler ports

Central post





“BARREL” sub-assembly

DS20k_ID_MULT__Barrel+FC.SLDASM

- Its orientation is constrained by the orientation of the ANODE and by the HV feedthrough for the top-most ring
  - The assembly has a 90 degree symmetry (mostly due to the levelmeter ports);

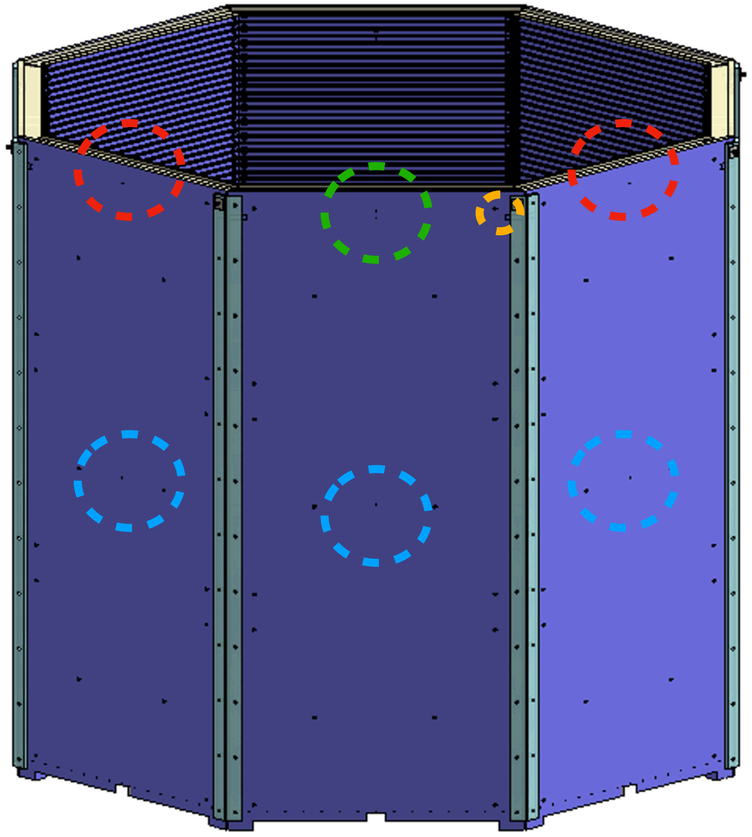
- The BARREL orientation constraints:
  - the possible orientations of the GRID:
    - *through the HV connector (shall we keep it on the HV port side)*
  - LAr inlet ports conflict with CAL pipes —> **need to shift them**
  - the possible locations of the boiler (due to a special port on a single panel);
  - the possible orientations of the CATHODE (through the locking feet);
  - the possible orientations of the IV frames (some frames will have to embed cable trays);

LAr Inlet Top Row

LAr Inlet Central Row

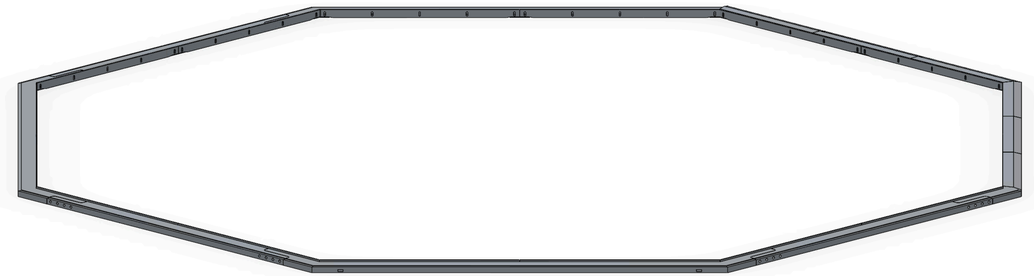
Double port: LAr Inlet+Levelmeter

Boiler port (ona. Single panel)

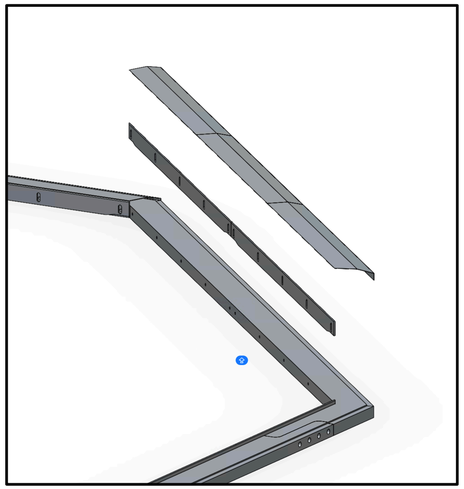


“GRID” sub-assembly

DS20k_ID_GRID__Grid.SLDASM



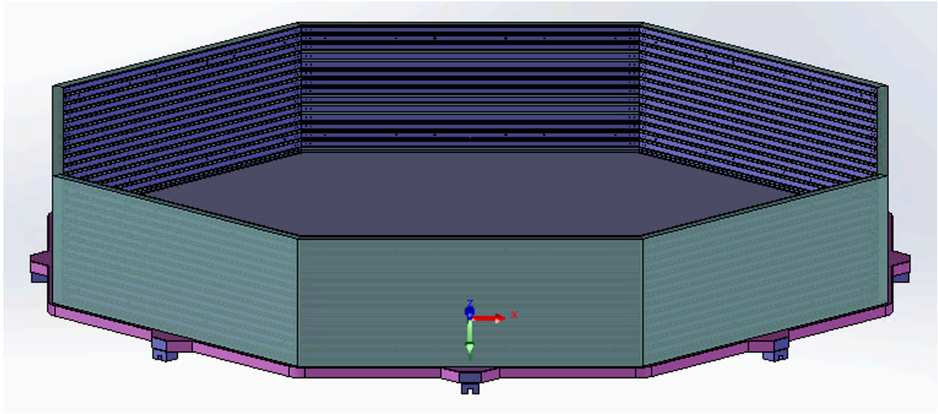
- Its orientation is constrained by:
  - the centering guides on the BARREL shelf;
  - the location of the HV connector on BARREL external lip;
  - the location of the ANODE ground connector (still to be designed).



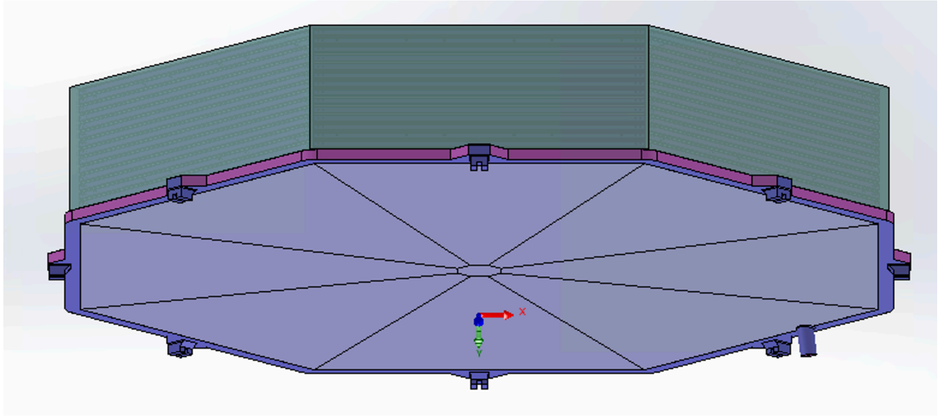
“CATHODE” sub-assembly

DS20k_ID_CATH__Cathode.SLDASM

- Its orientation is fully constrained by the orientation of the DOME
  - The HV CONE should stay on the opposite side of the DOME HV ports



- The CATHODE orientation:
  - defines uniquely the orientation of the BOP
    - *thought the opening for the HV cone and through the feet*

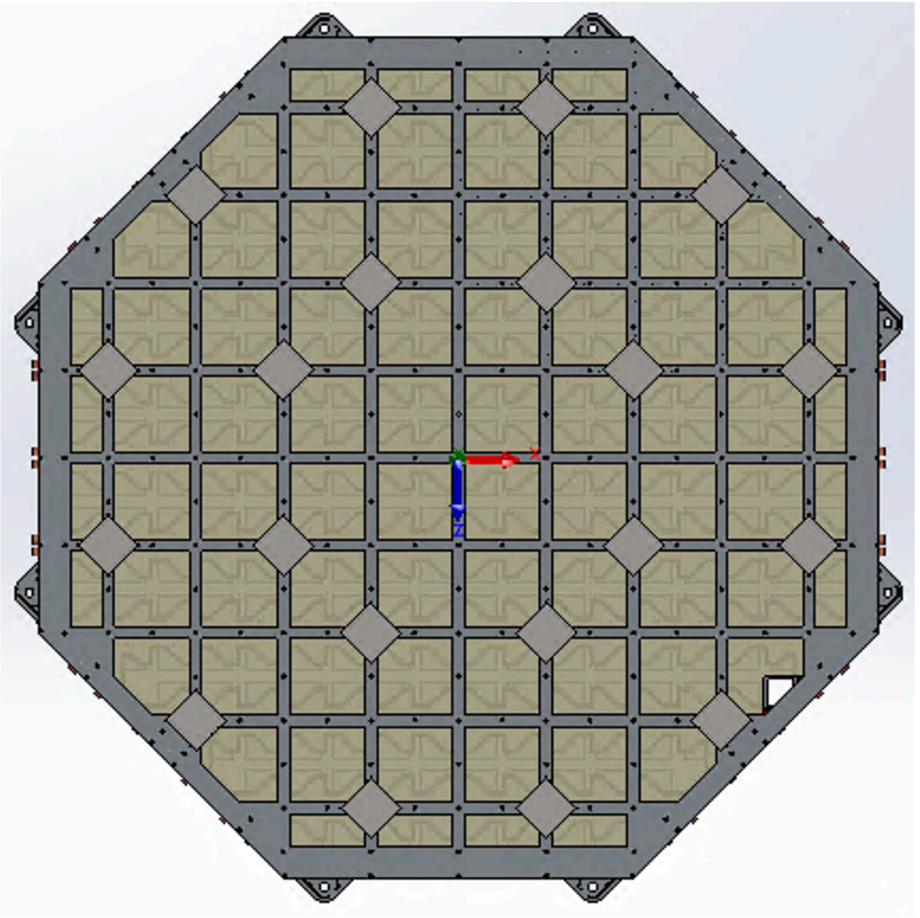


“BOP” sub-assembly

DS20k_ID_MULT__BOPFull.SLDASM

- Its orientation is fully constrained by the CATHODE orientation brought the HV CONE
- Partially constrained by the CAL pipes

- The BOP orientation constraints:
  - defines (weakly) the cable bundles location. Cables leaves the BOP through 6 sides out of 8.
    - *Constraints (weakly) the TOP orientation through cable bundles*



Assembly in the Hall C reference frame

Moving to the global reference frame

Started bottom-up knowing the vessel dome orientation is fully defined by matching of HV ports on the cryostat;

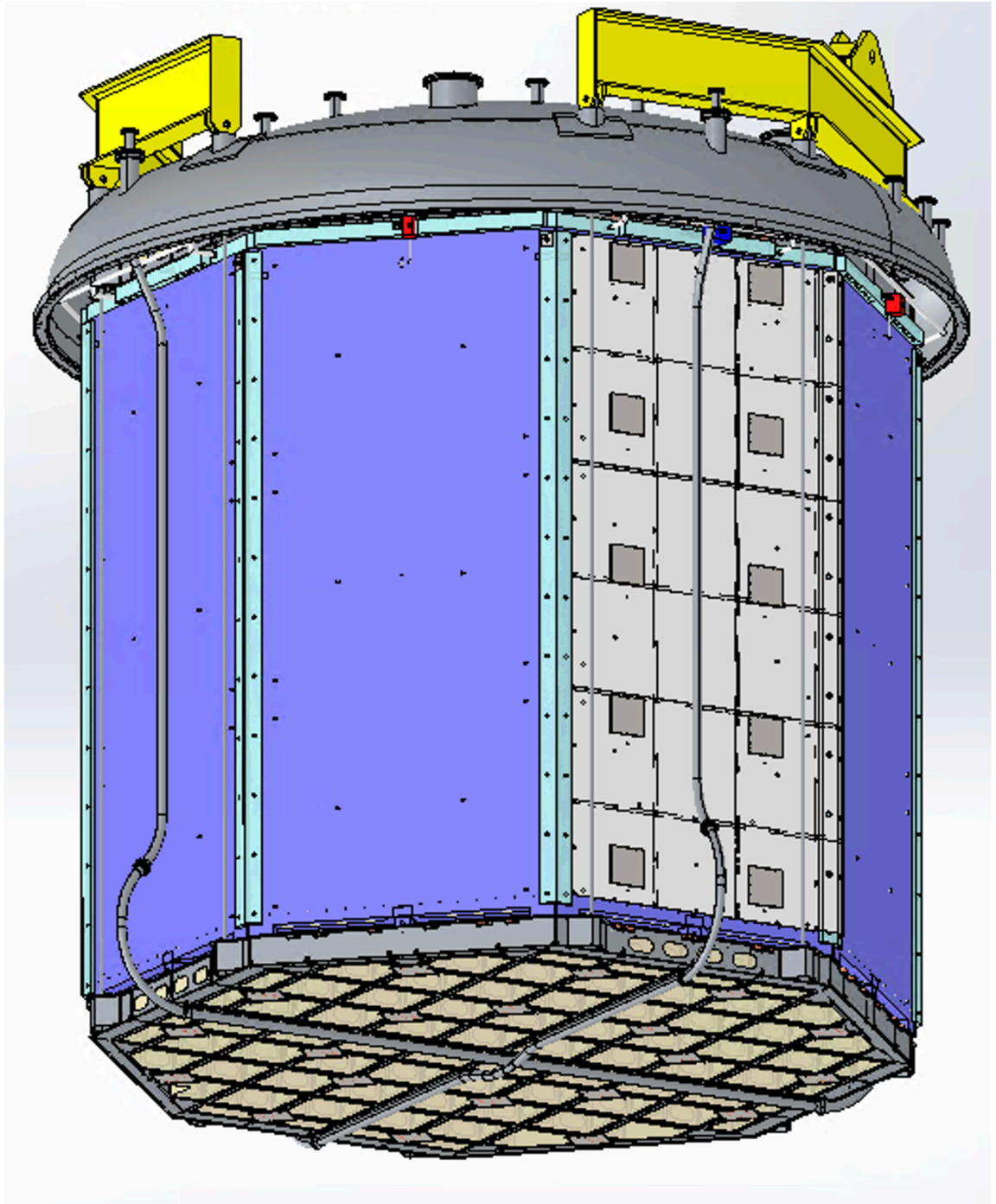
1. **BOP** orientation **fully defined** by HV cone (opposite side of dome HV ports);
   ➡ *No conflicts between vPDU and CAL pipes;*
   ➡ *Optimum alignment between potential cable bundle location and dome cable ports.*

2. **CATHODE** orientation **fully defined** by HV cone(opposite side of dome HV ports);

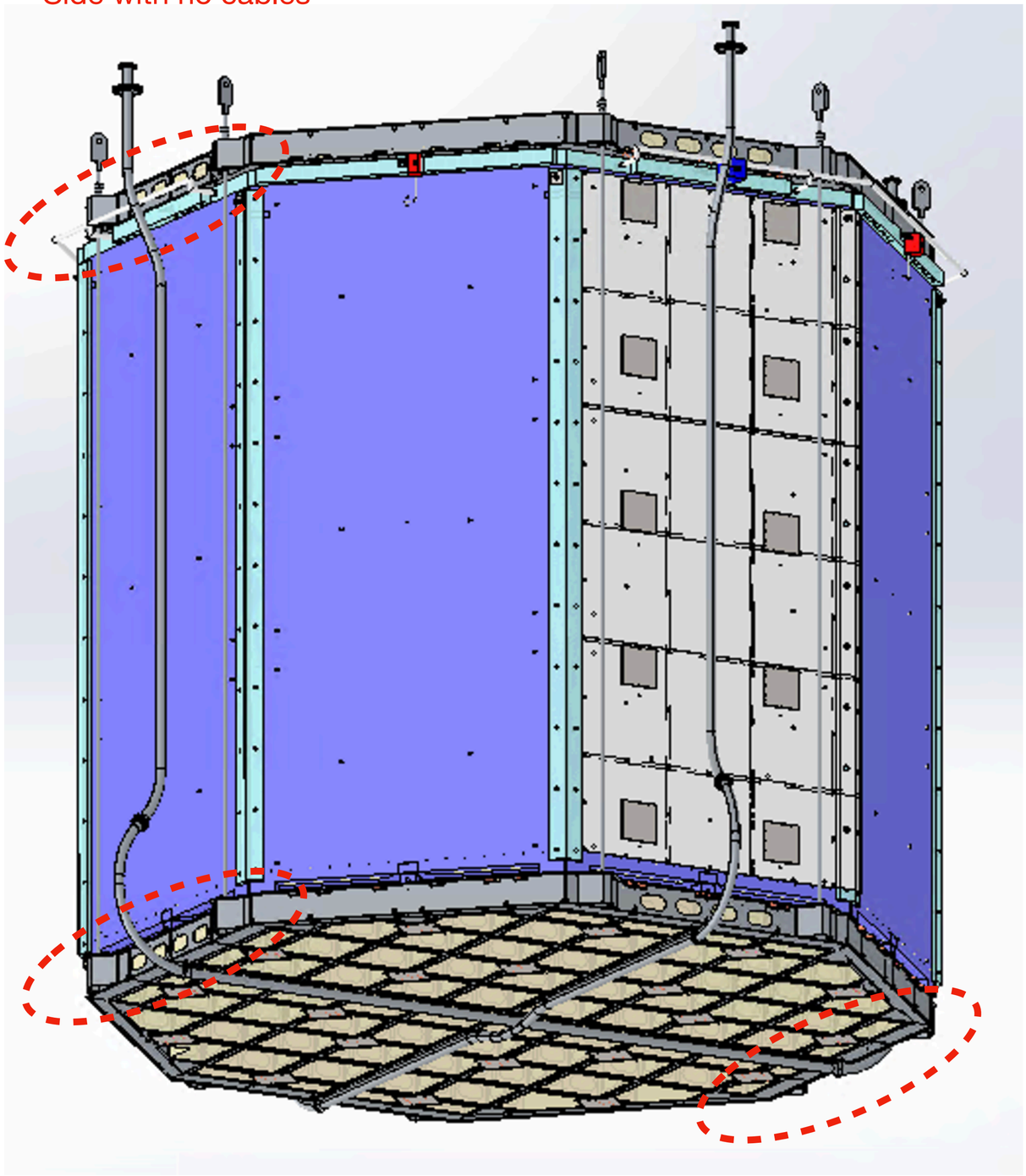
3. **TOP** has **2 orientations** fulfilling the (weak) requirement that it mirrors BOP as far as cable boundles are concerned;

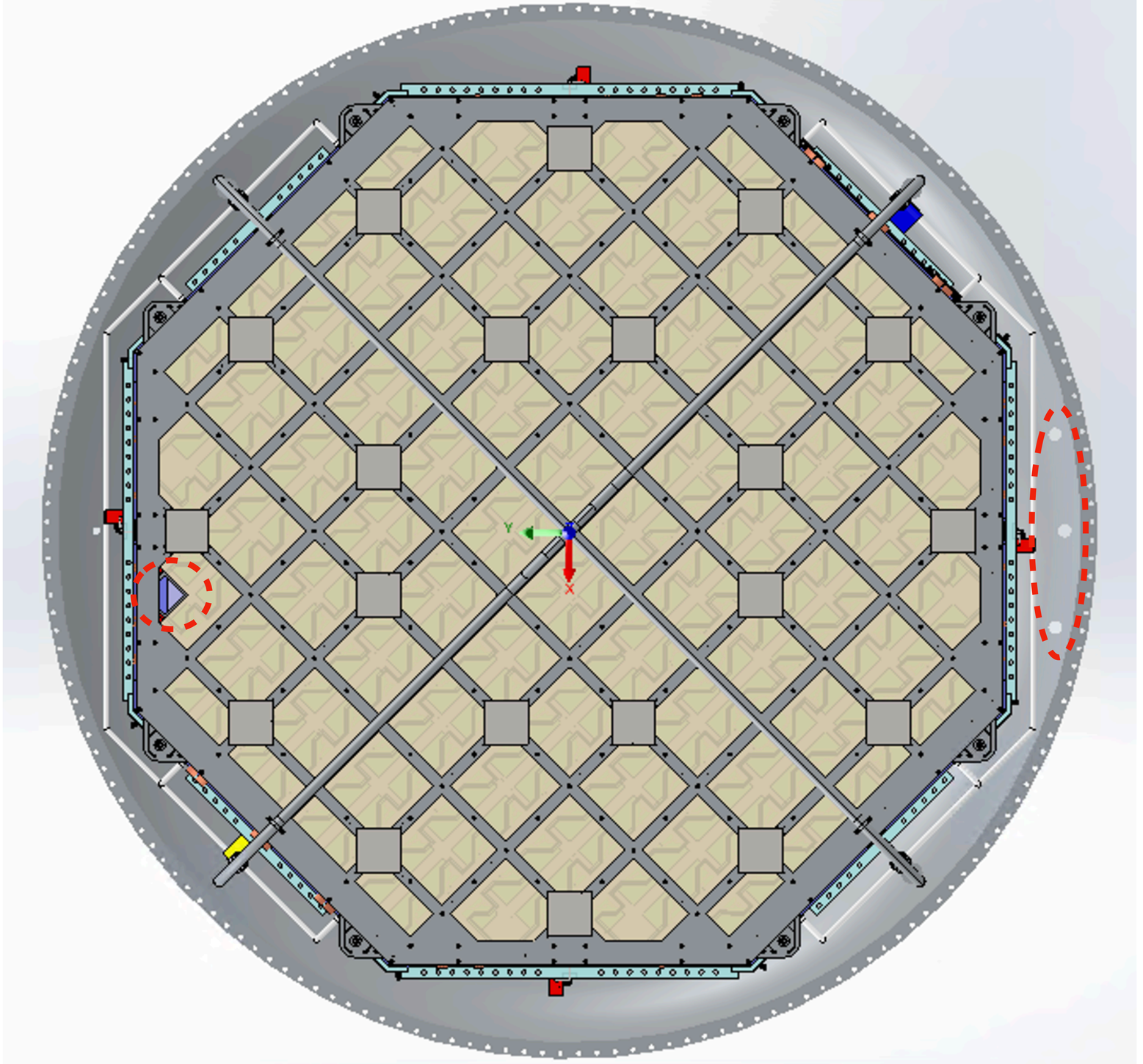
4. **ANODE** orientation **fully defined** by TOP
   ➡ *No conflicts between CAL pipes and ANODE levelmeter ports;*

5. **BARREL** has **4 orientations** fulfilling the requirement that the level meters do not conflict with CAL pipes
   ➡ *Boiler/Bubbler location will follow naturally;*



Side with no cables




Y
X

Labelling

- Need to find a way to propagate the label (1…8) to object names within the sub-assemblies;

  ➡ Need to change name of “object” in the tree of each sub-assembly and not of the component file (that is used multiple times within an assembly)

- Luca will reach out to the responsible of the component design to implement this together
  - Anode: Anson
  - Cathode & Barrel: Mitch
  - TOP & BOP: Emile
  - Grid: Tristan
  - Vertical Rods: Emile
  - Calibration Pipes: Marco
  - Boiler/Bubbler/Levelmeter: Andrea I. ?
  - Reflector cage: Andrea P.