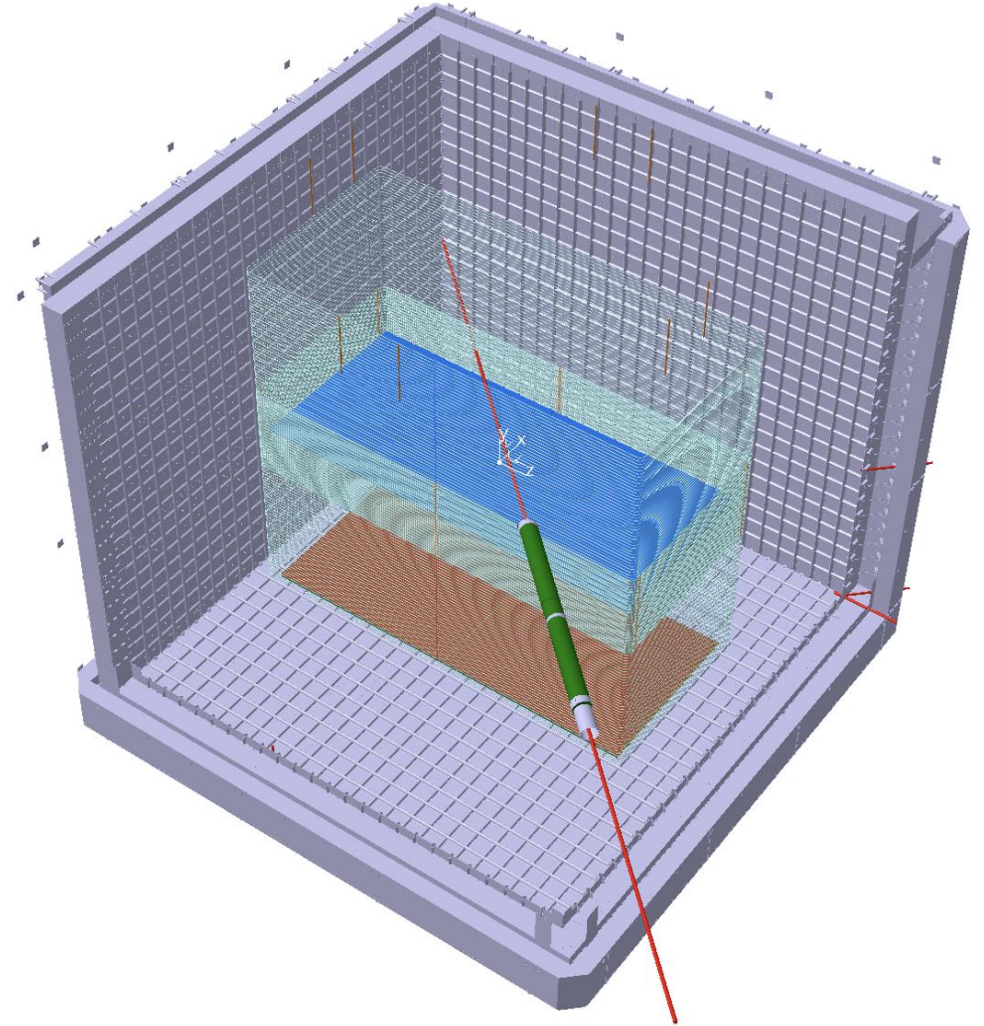
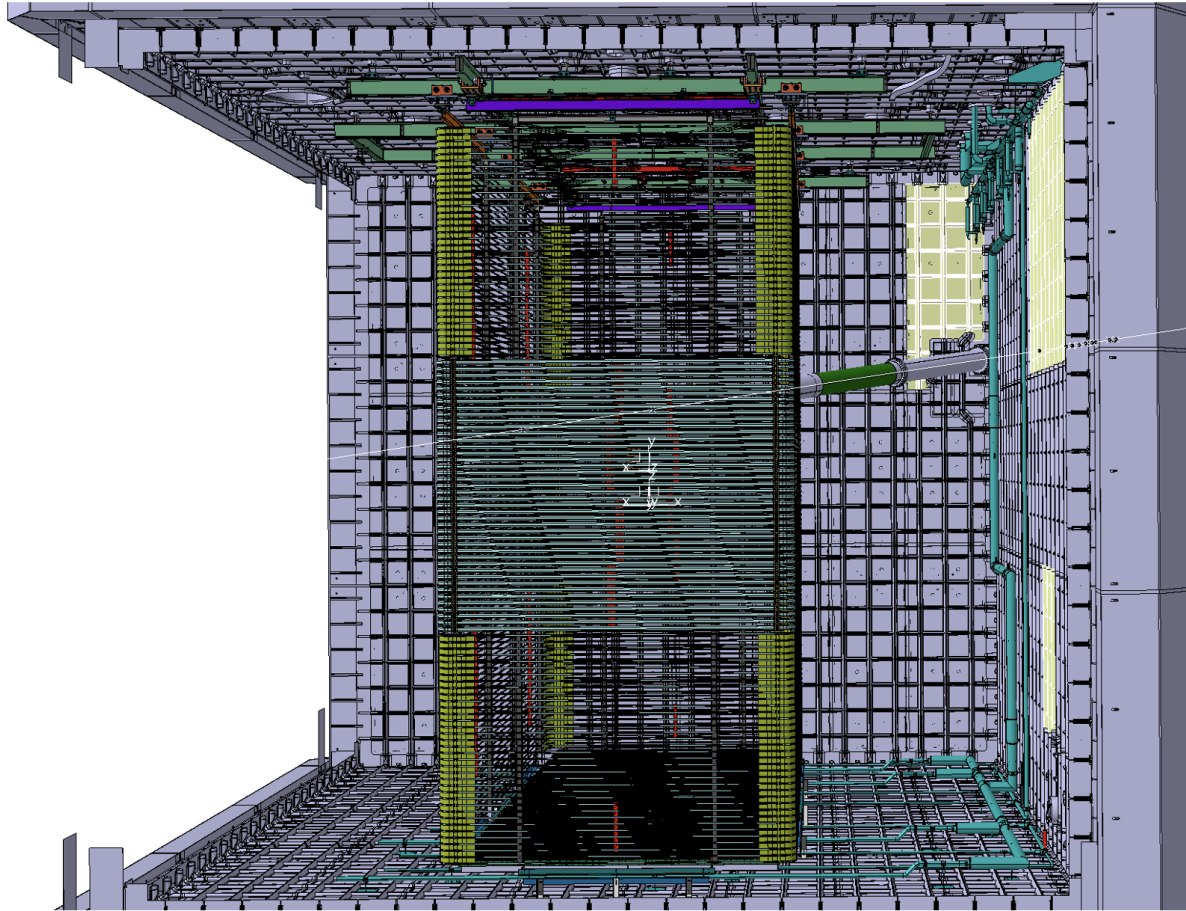


Progress on the NP02 beam plug design and installation

Francesco Pietropaolo

January 19th, 202

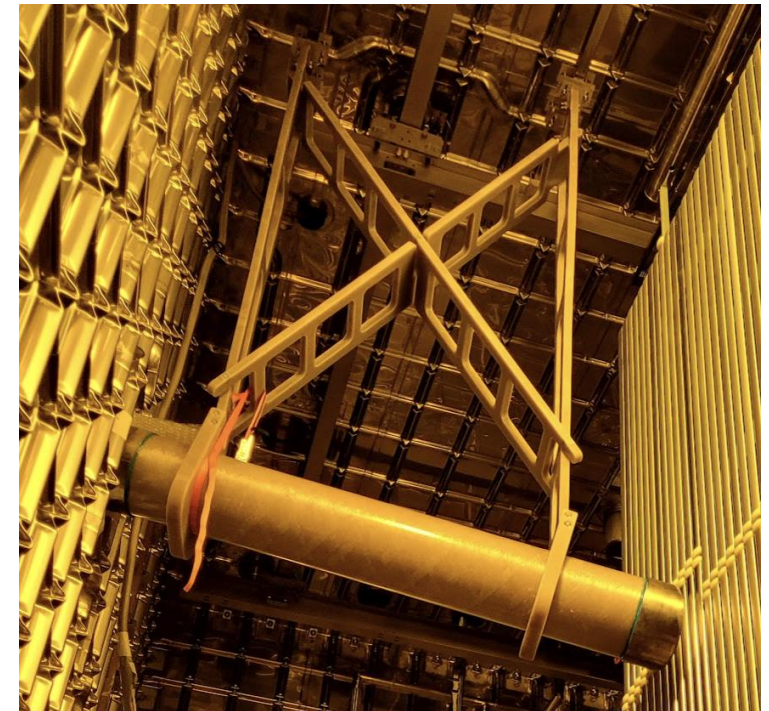
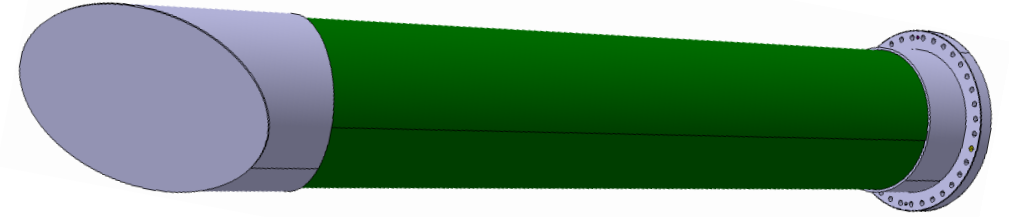
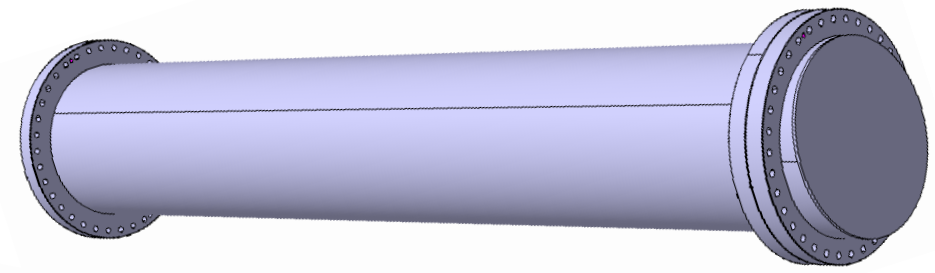
Beam Plug location



- 4.3 m long pipe along a diagonal of the cryostat
- Slightly bent downward (similarly to NP04)

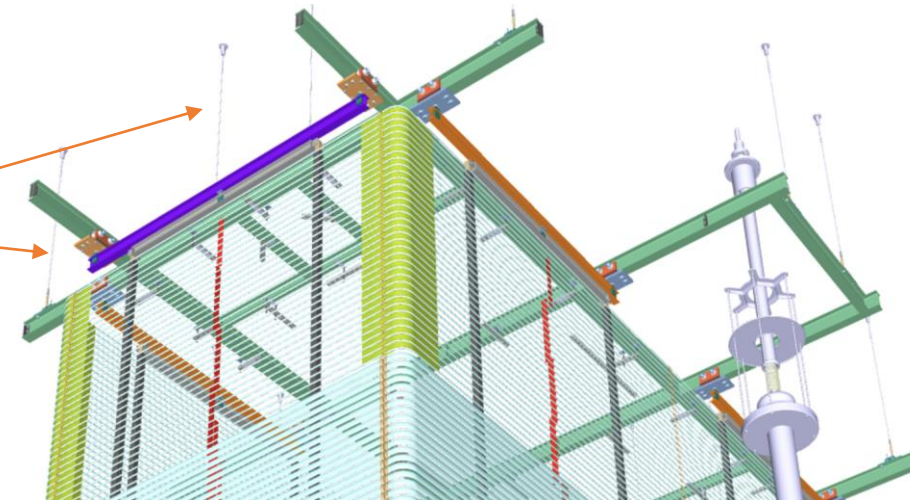
Present BP design idea

- Beam plug split into two parts of ~ the same length (~2.m) and coupled together with CF flanges.
 - The part facing the cryostat membrane is fully made out of stainless steel
 - The part facing the Field cage is realized with a G10 tube with glued SS end caps
 - construction and testing will follow the procedures developed for the NP04 BP and will be fully realized at CERN with the already available G10 pipe.
- Dimensions:
 - Outer Diameter 274mm
 - G10 tube thickness ~ 12 mm, length 1.85m
 - SS tube thickness ~ 3mm, length 1.74m
- Weights:
 - G10 Pipe ~46kg, buoyancy ~95kg
 - SS pipe ~ 60 kg, buoyancy ~ 80 kg
 - Reasonably well balanced

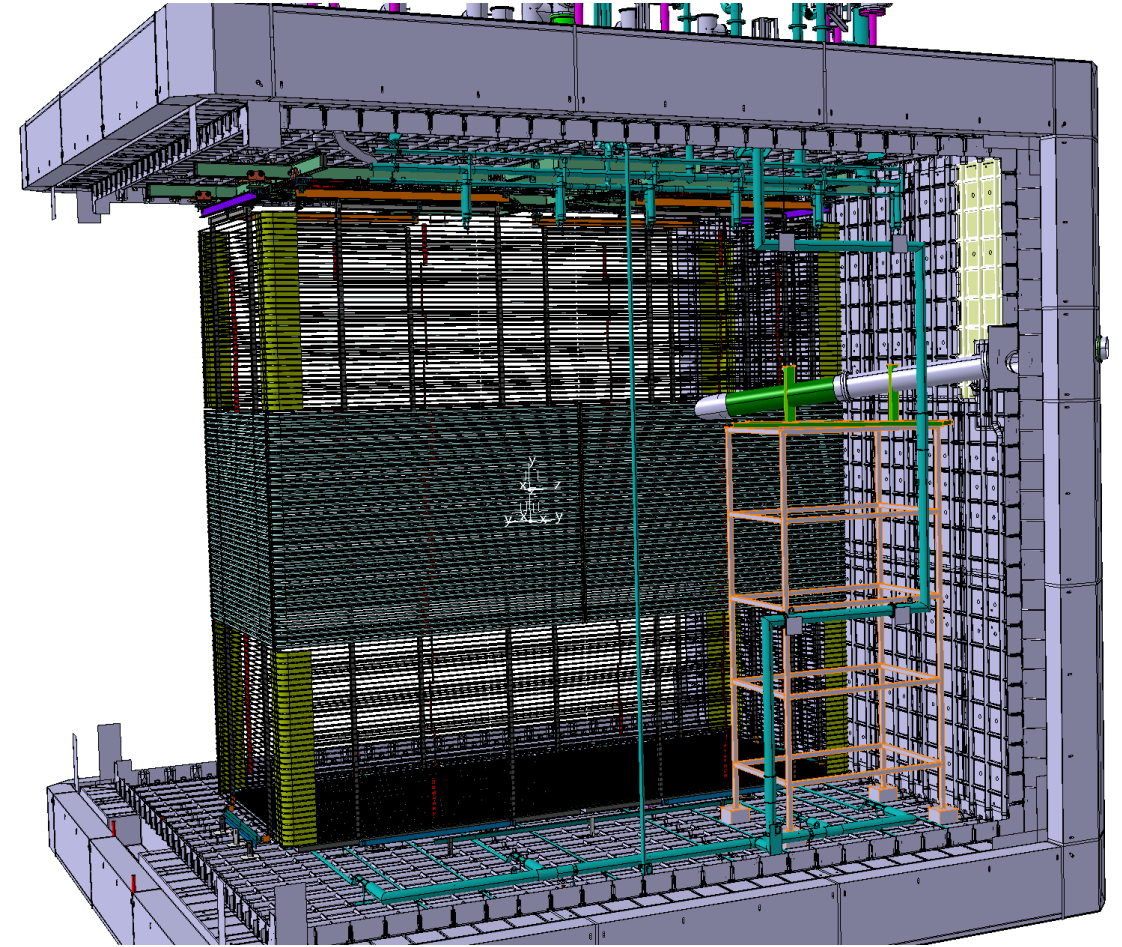
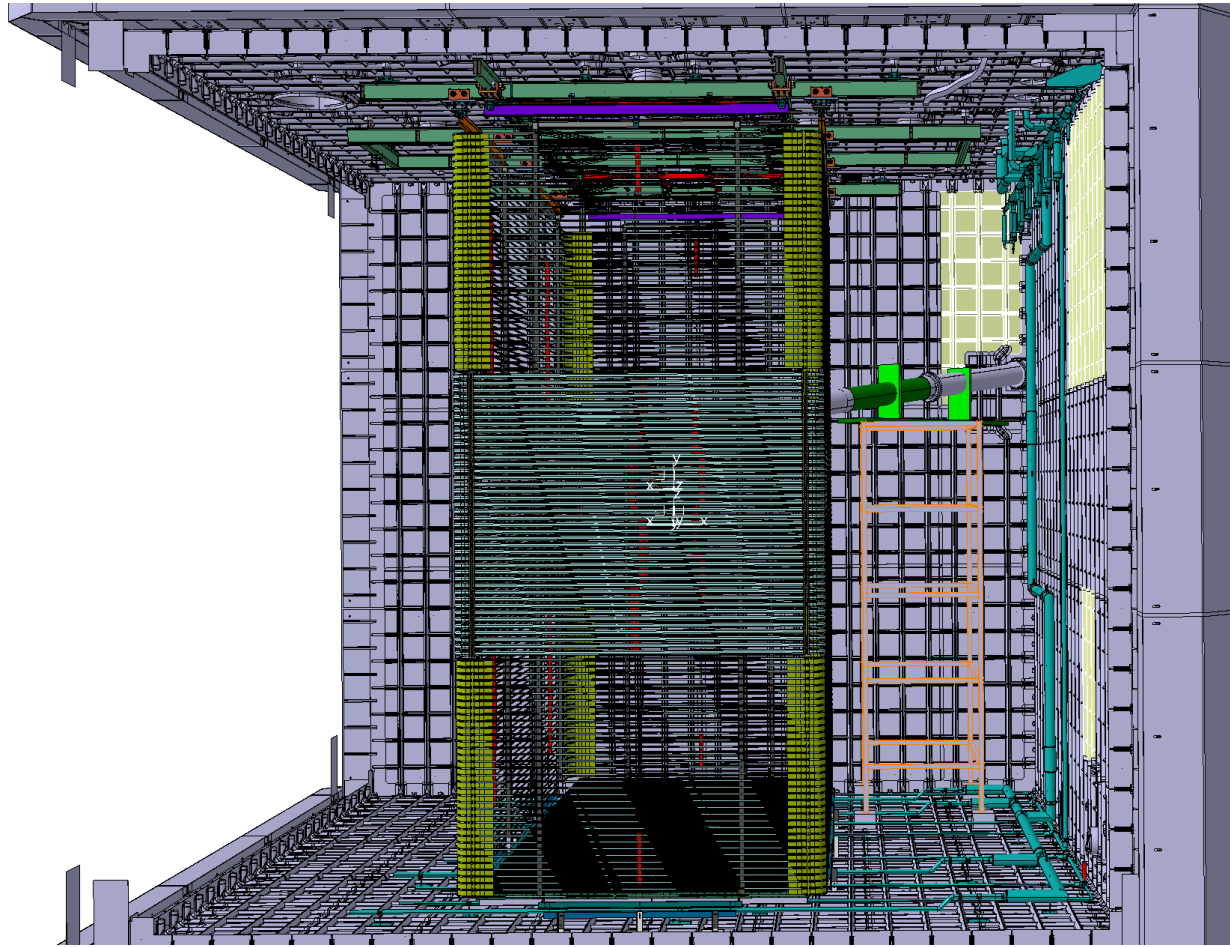


BP installation and supporting options

- With the BP split into 2 parts, it can be installed in its final location even after the full VD detector is assembled. The two parts are:
 - inserted into the cryostat through the TCO or the manhole;
 - moved to the “cryogenic side” of the cryostat along the short detector side.
 - connected together on the false floor
 - lifted to the final location and hung to the supporting structure.
- Unlike NP04, it is not recommended to exploit the FC supporting structure to support also the BP
 - The main reason is that the FC supporting structure is hanging from the cryostat roof with 12 wires.
 - A 200 kg buoyancy applied on a corner of the FC supporting structure could induce bending and rotation that will be transferred to the FC
- Few BP hanging options are being discussed

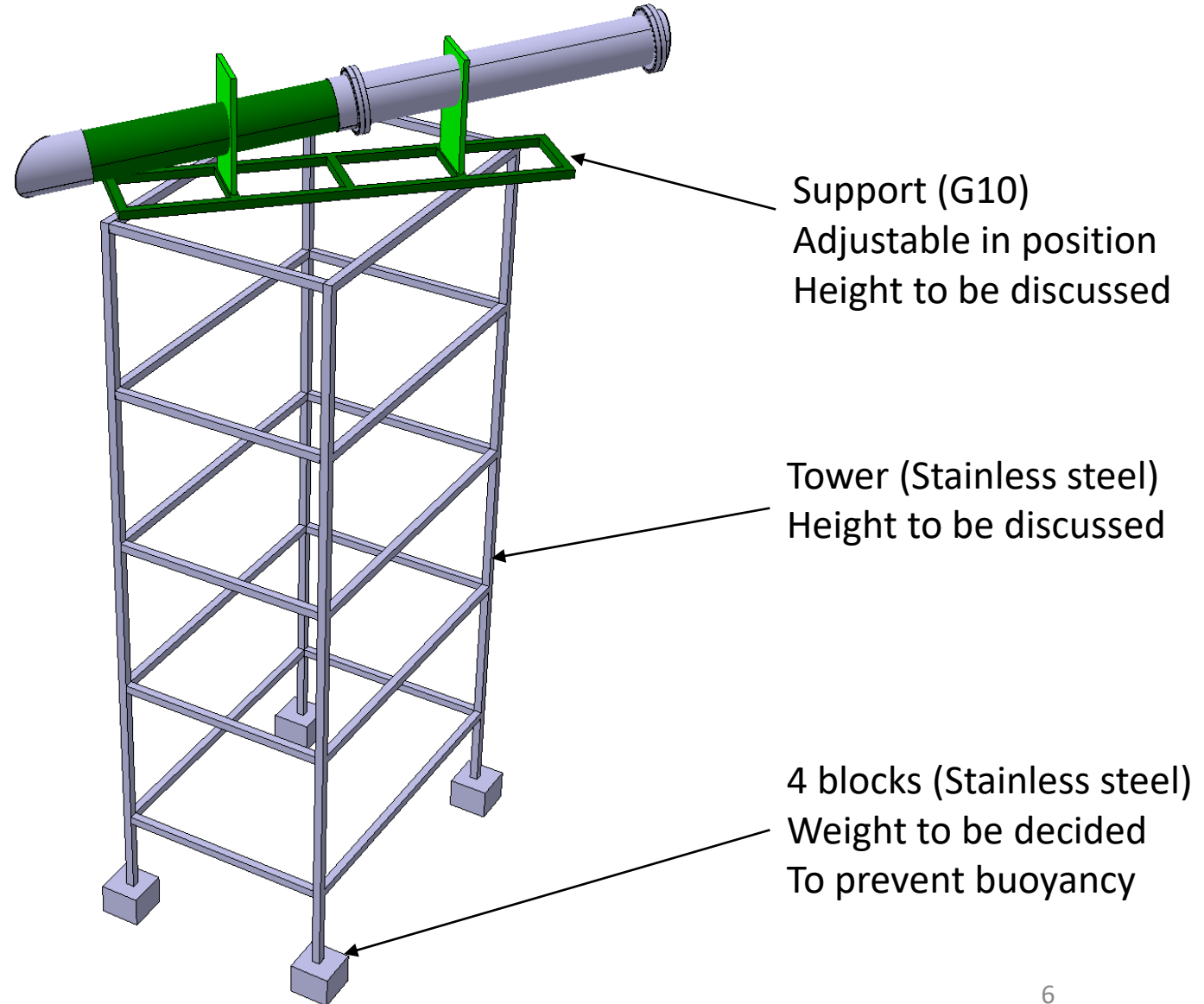


BP supporting options: "Tower"

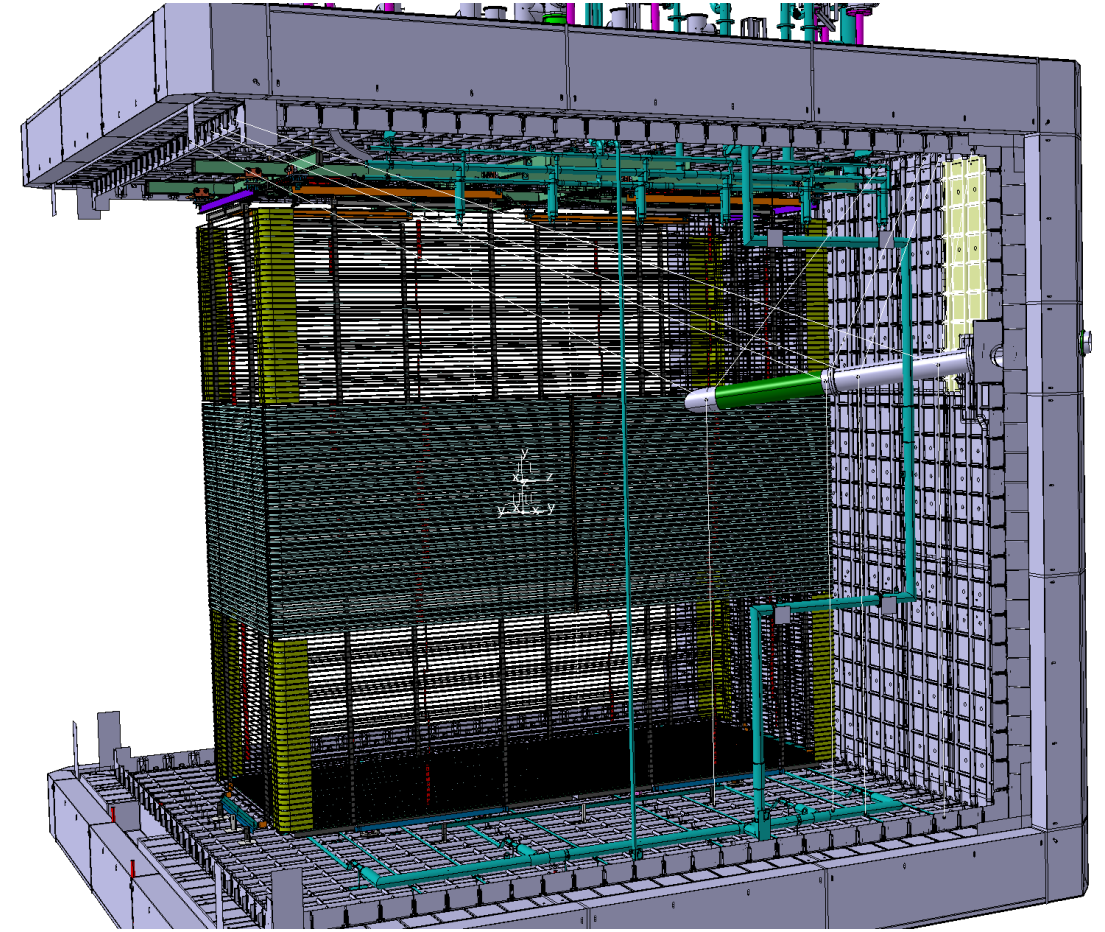
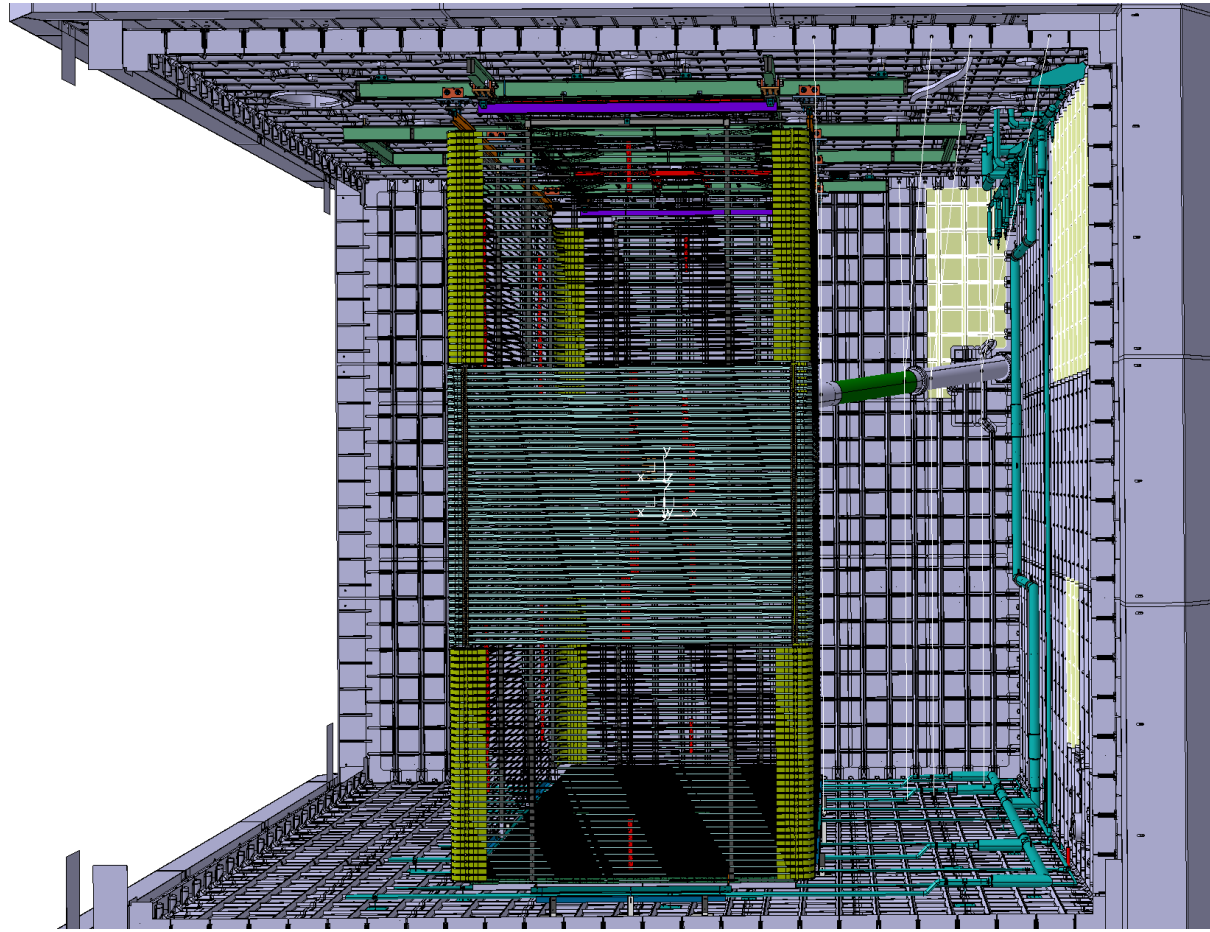


BP supporting options: "Tower"

- The tower material has to be a mix of Stainless steel and G10 to account for the high E-field in the surrounding of the Cathode height
 - A careful detailed study is required.
 - Shapes of the tower elements are also critical for E-field stability

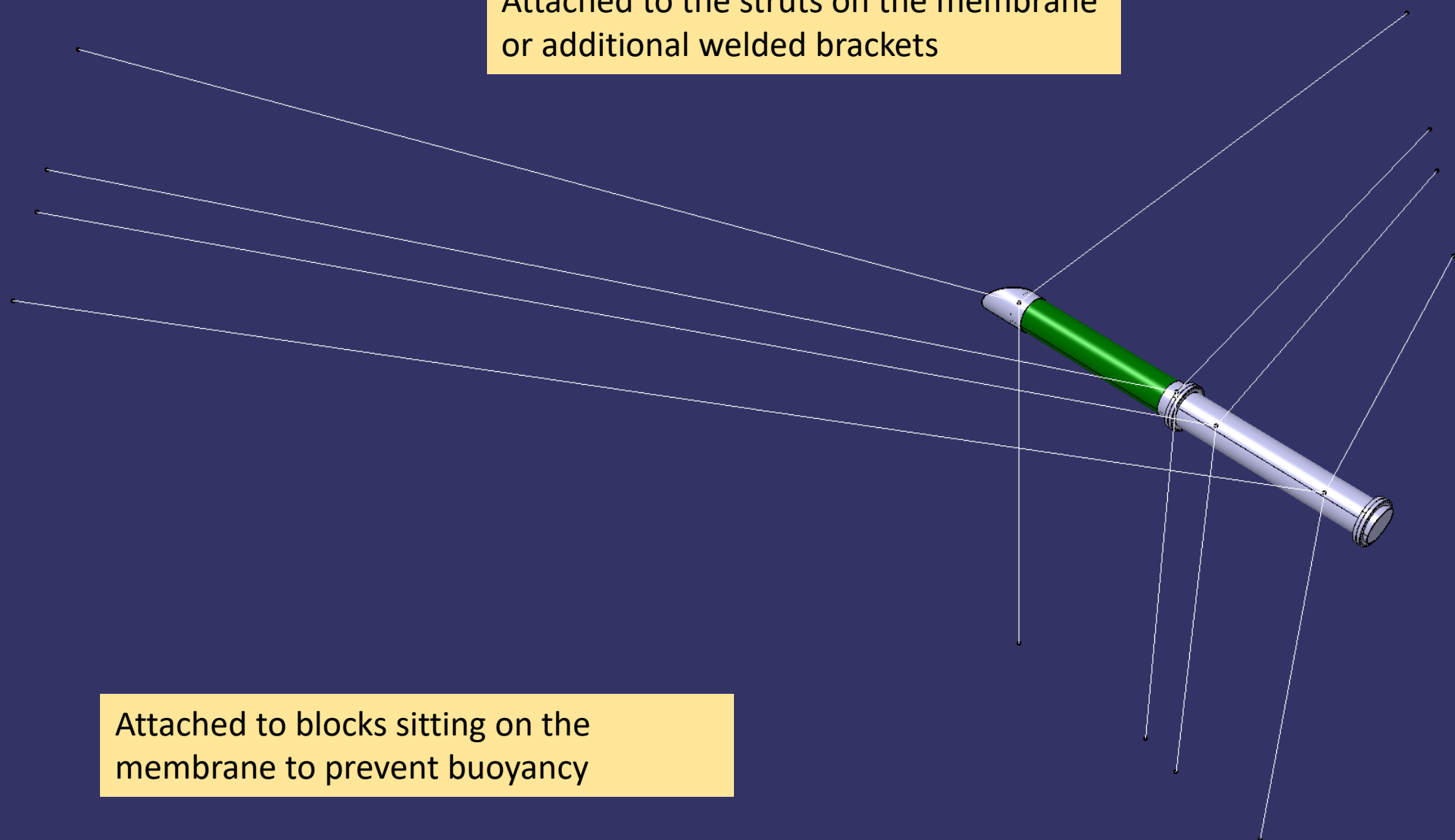


BP supporting options: "Wires"



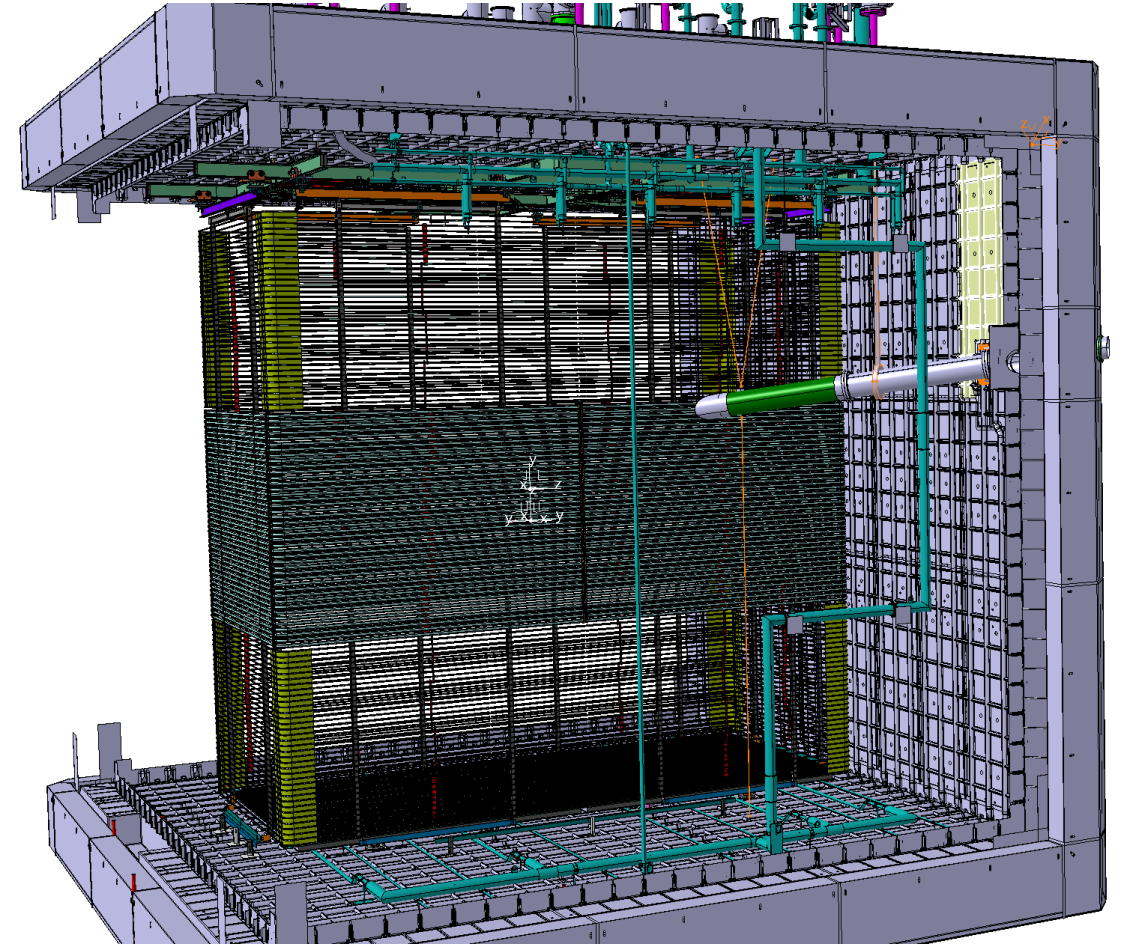
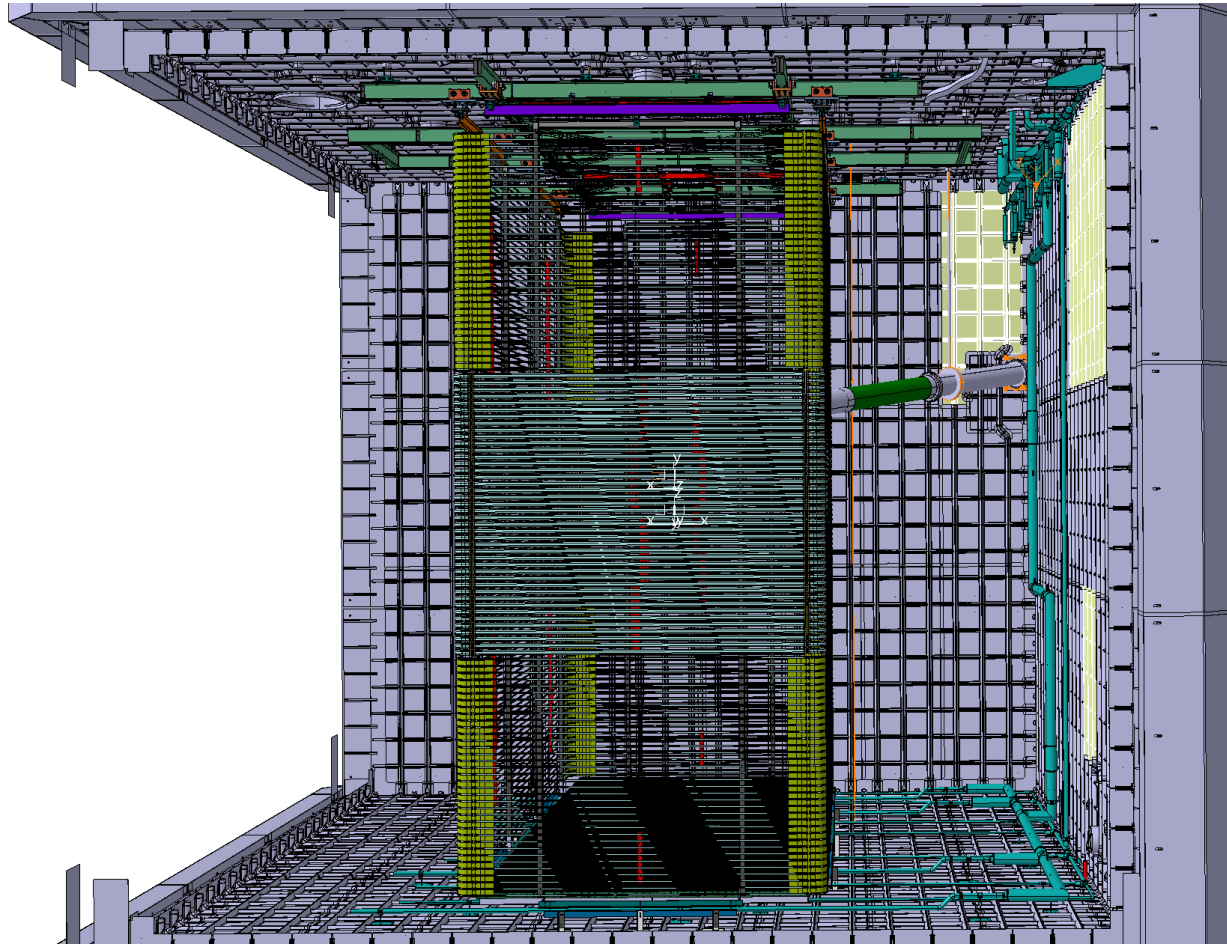
BP supporting options: "Wires"

Attached to the struts on the membrane or additional welded brackets

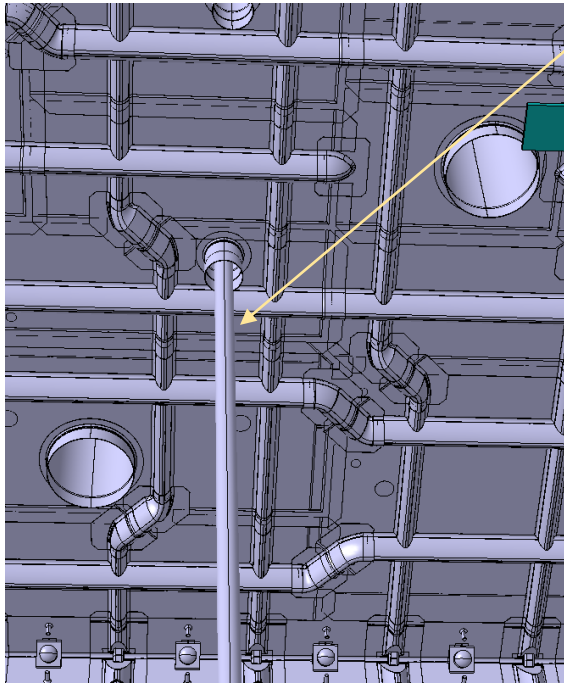


Attached to blocks sitting on the membrane to prevent buoyancy

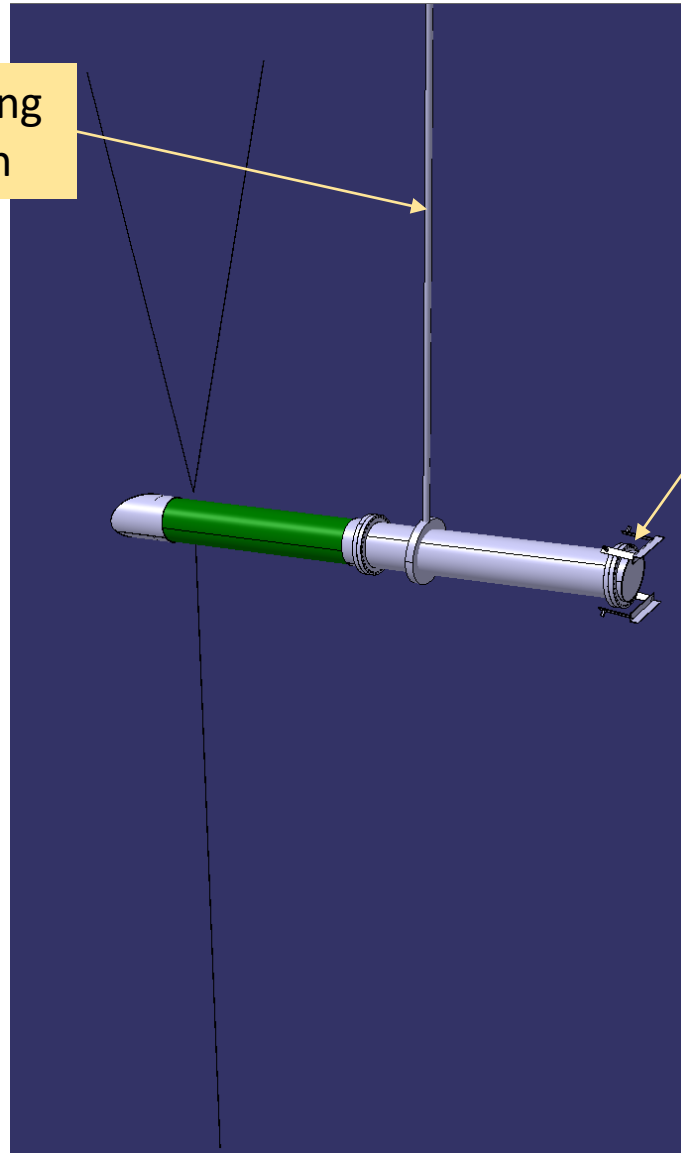
BP supporting options: "Roof penetration support"



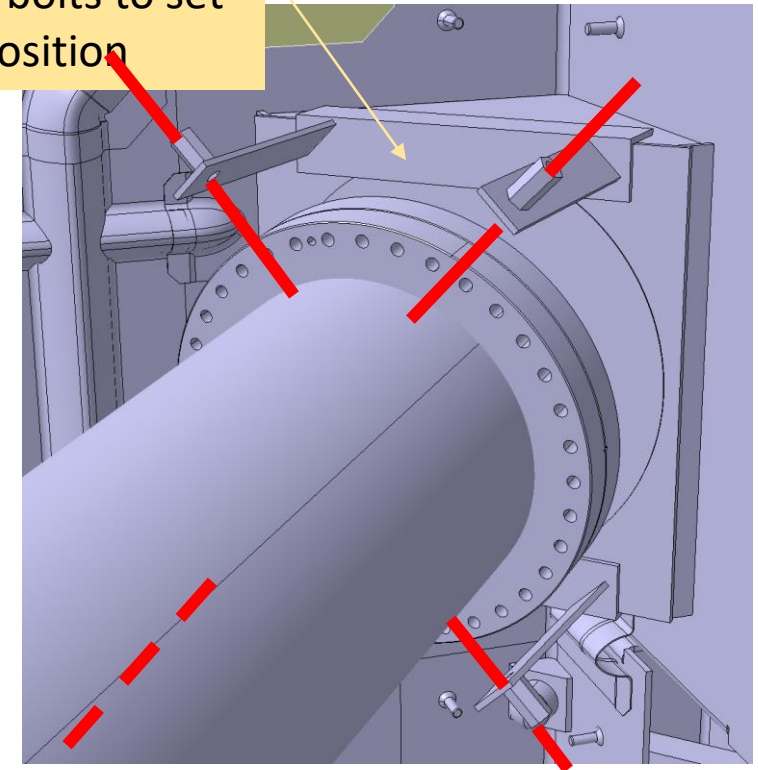
BP supporting options: “Roof penetration support”



From existing penetration

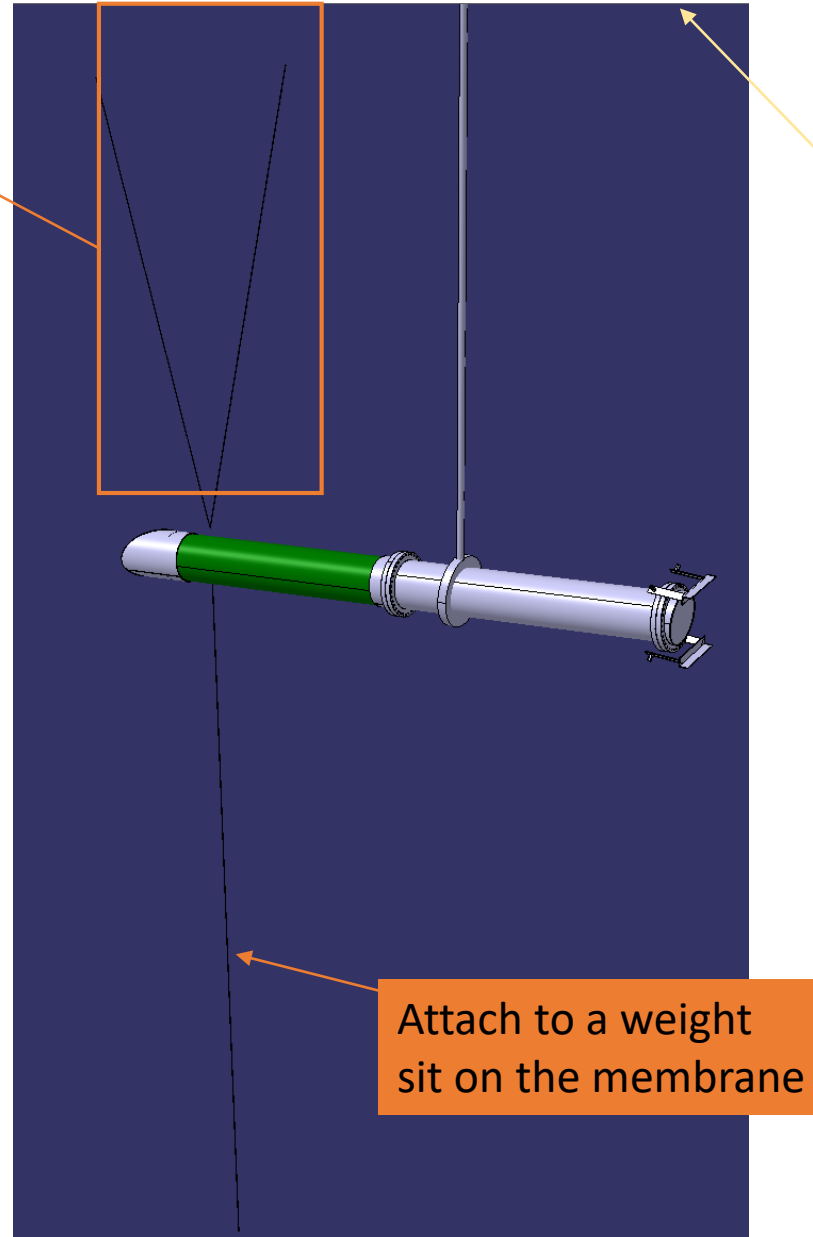
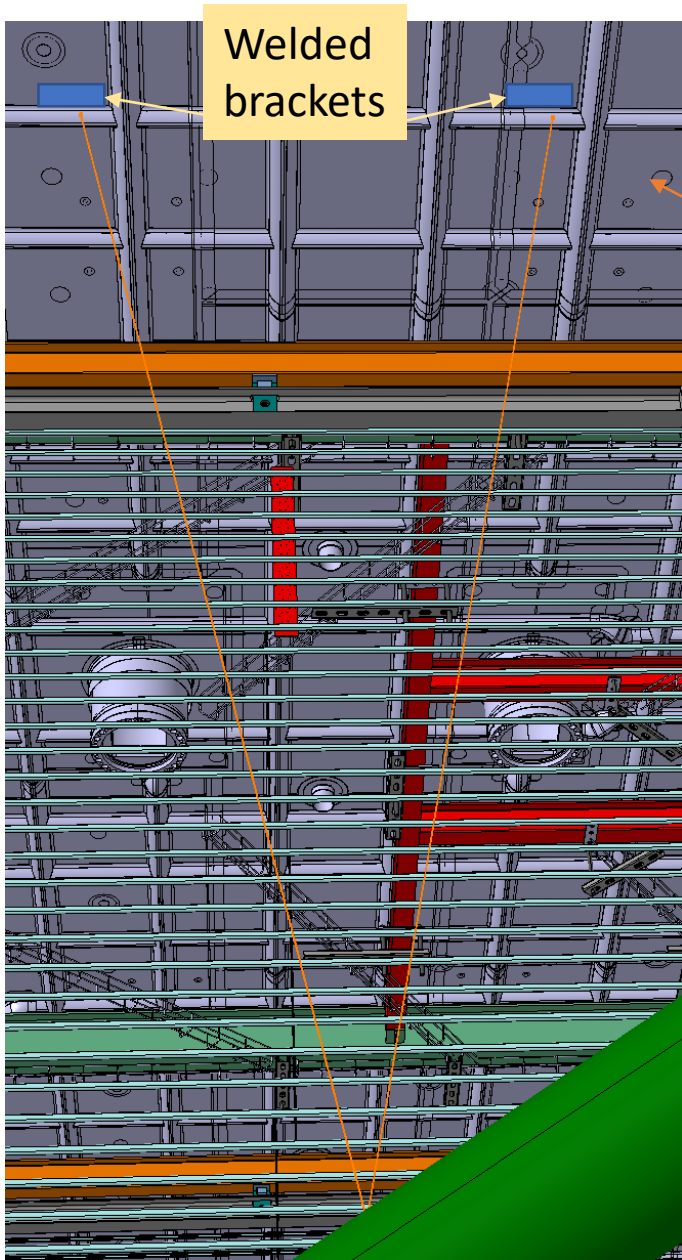


Welded on beamline cap + bolts to set position



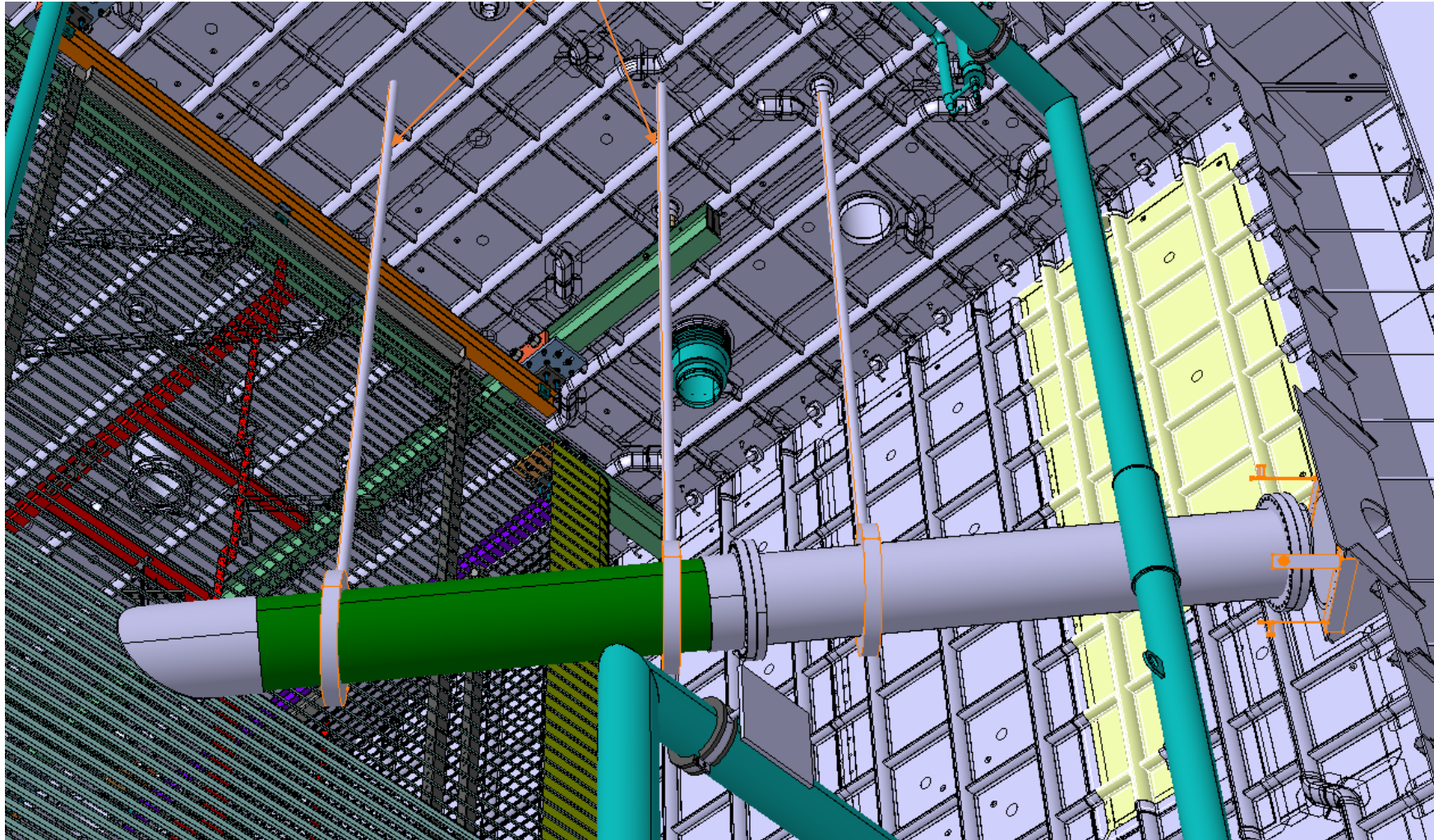
- To ensure BP stability additional supporting system are possibly required:
 - This is under study

BP supporting options: "Roof+wires"



BP supporting options: “Roof + roof drilling”

Need of 2 new penetrations



Summary

- BP design is advanced, based on the NP04 experience
- The BP installation can be performed after the whole VD detector is in place
- Several viable BP hanging options are under study