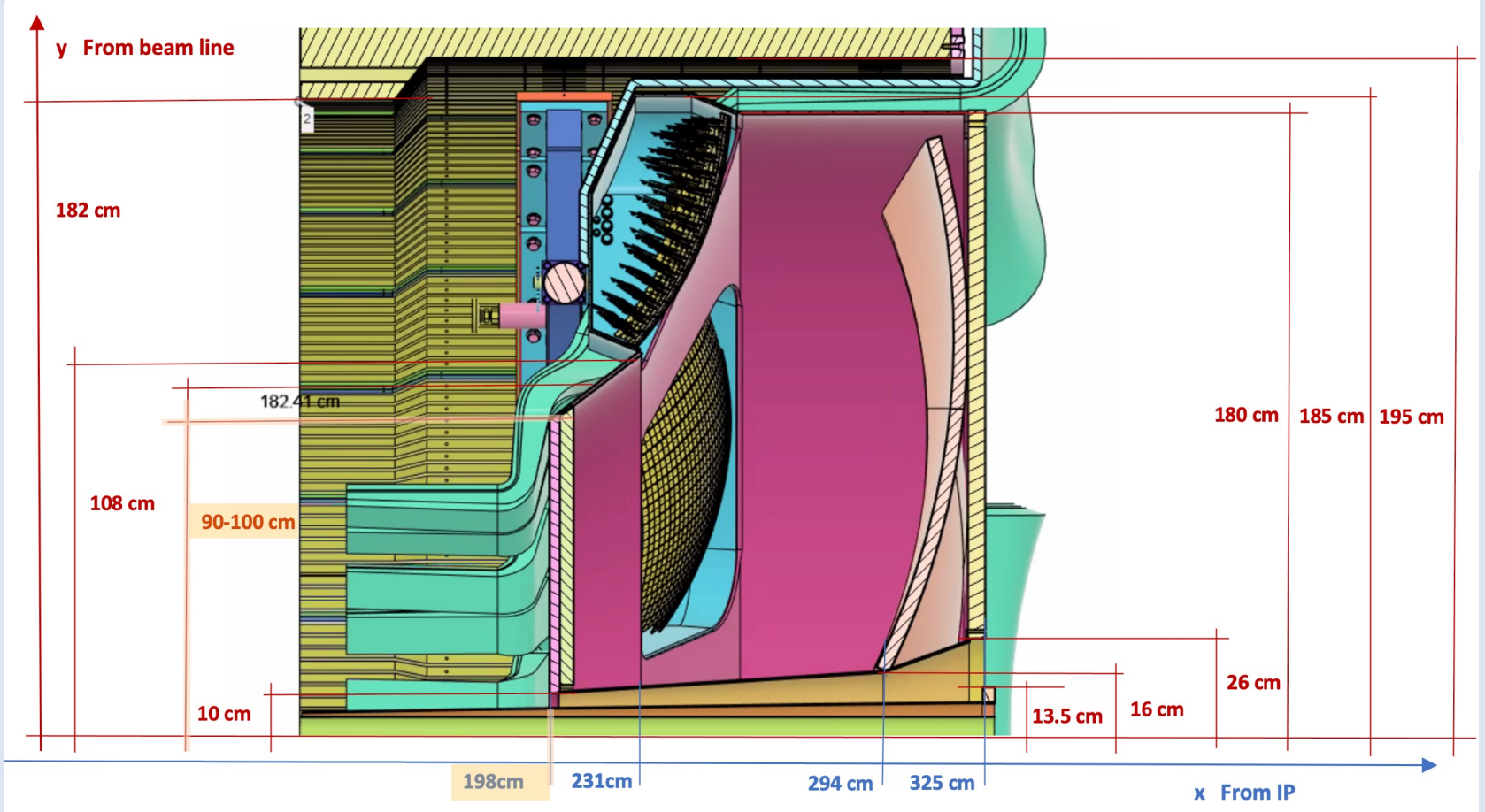
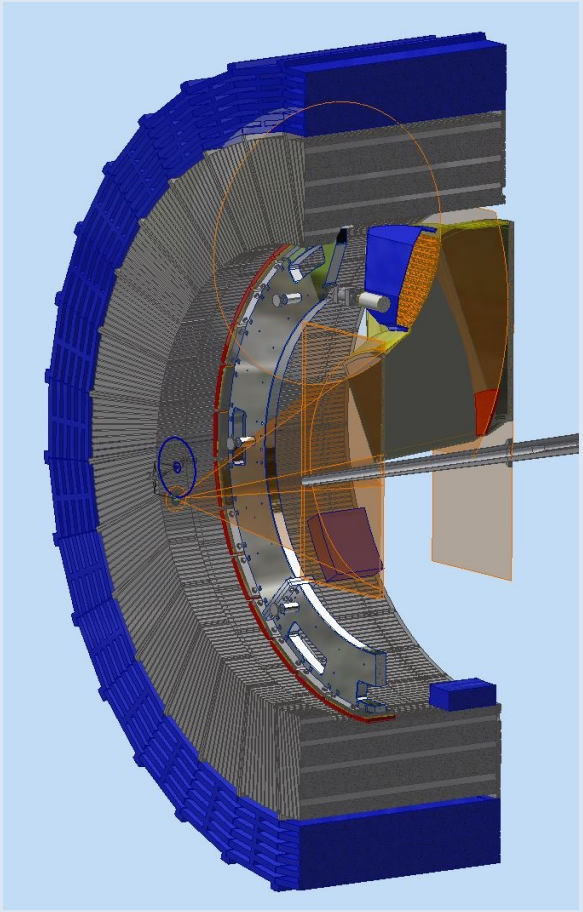
dRICH Integration

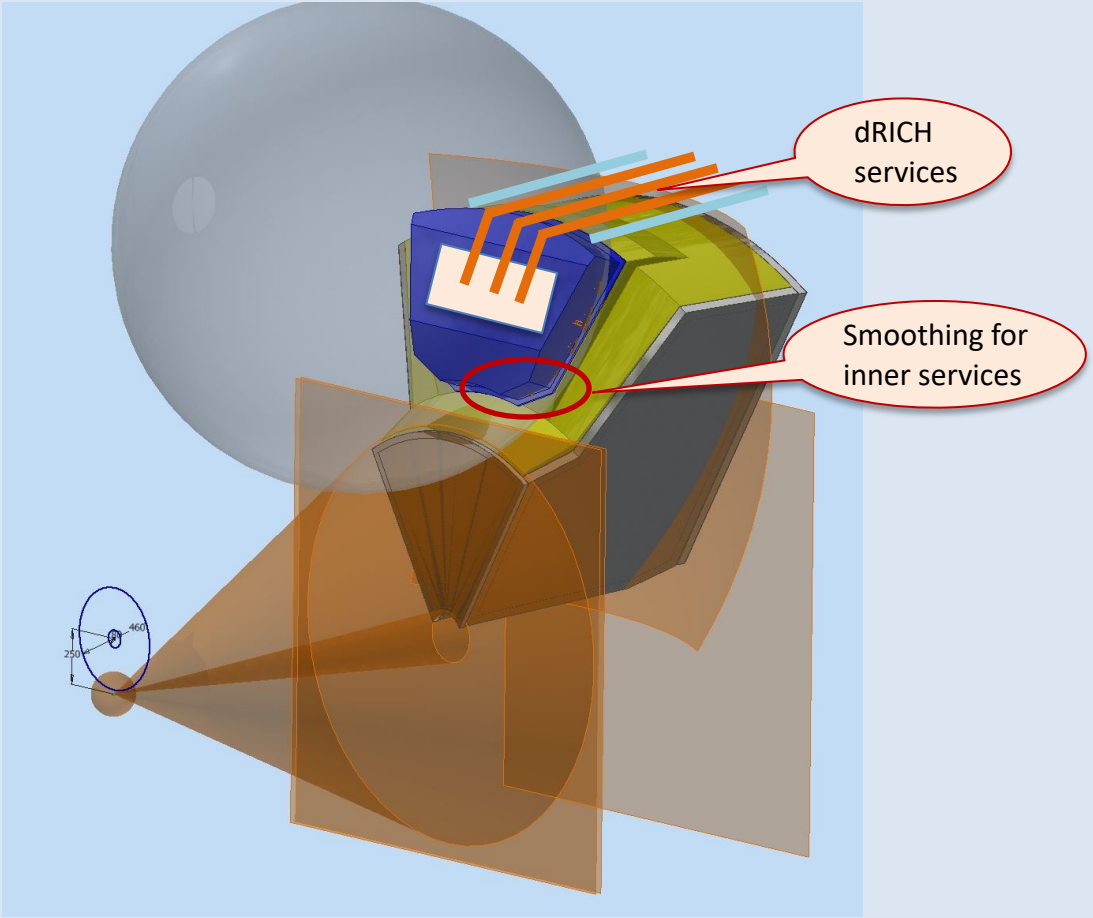
News: +3 cm downstream shift with respect the IP, O(10 cm) tolerance in aerogel disk radius



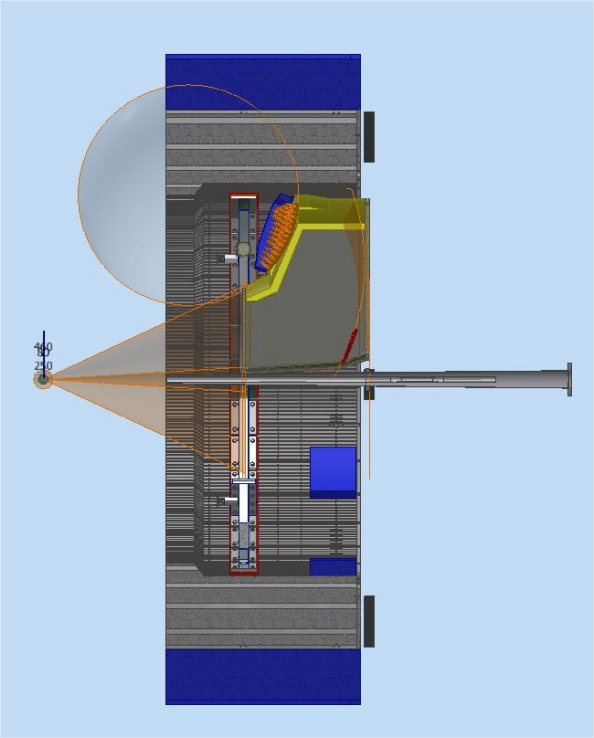
Scalable to the wanted shape

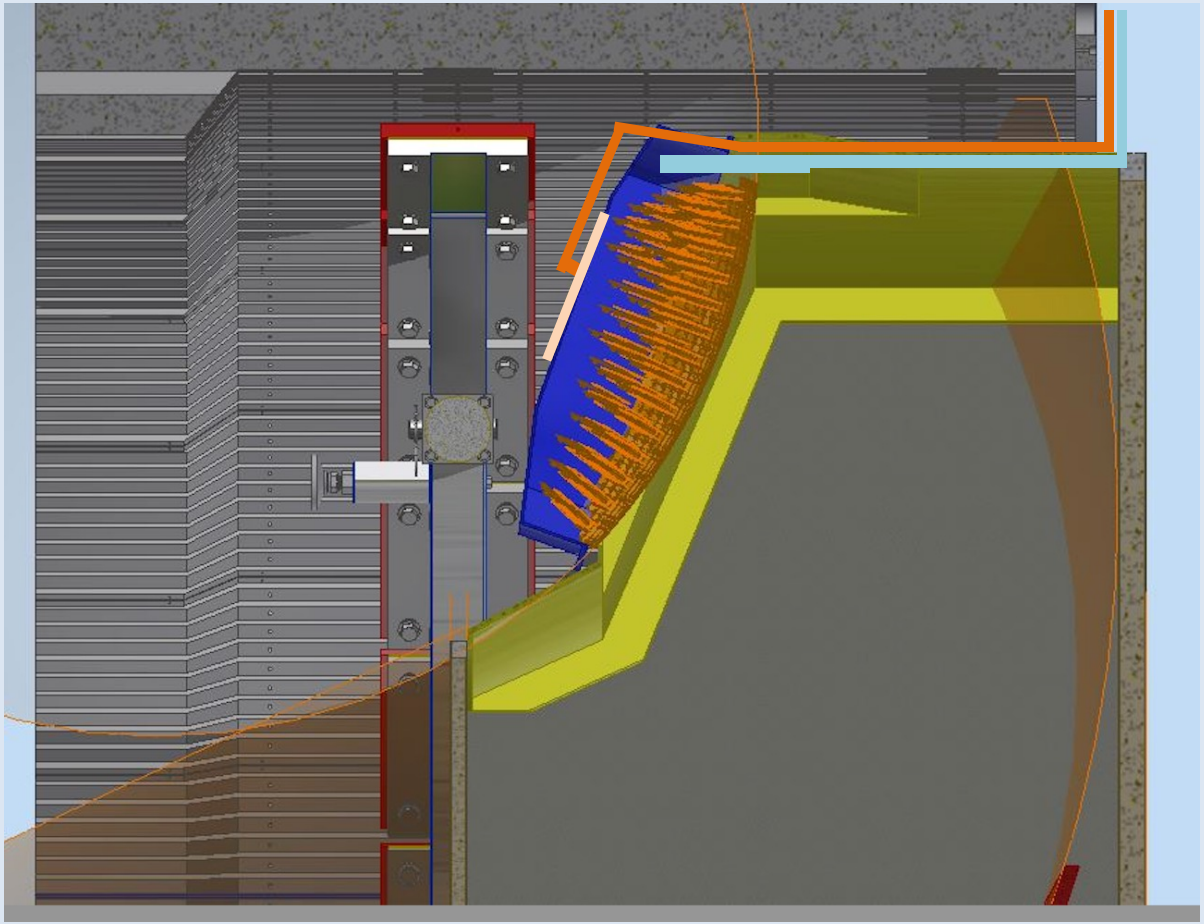


Baseline for the real-scale prototype



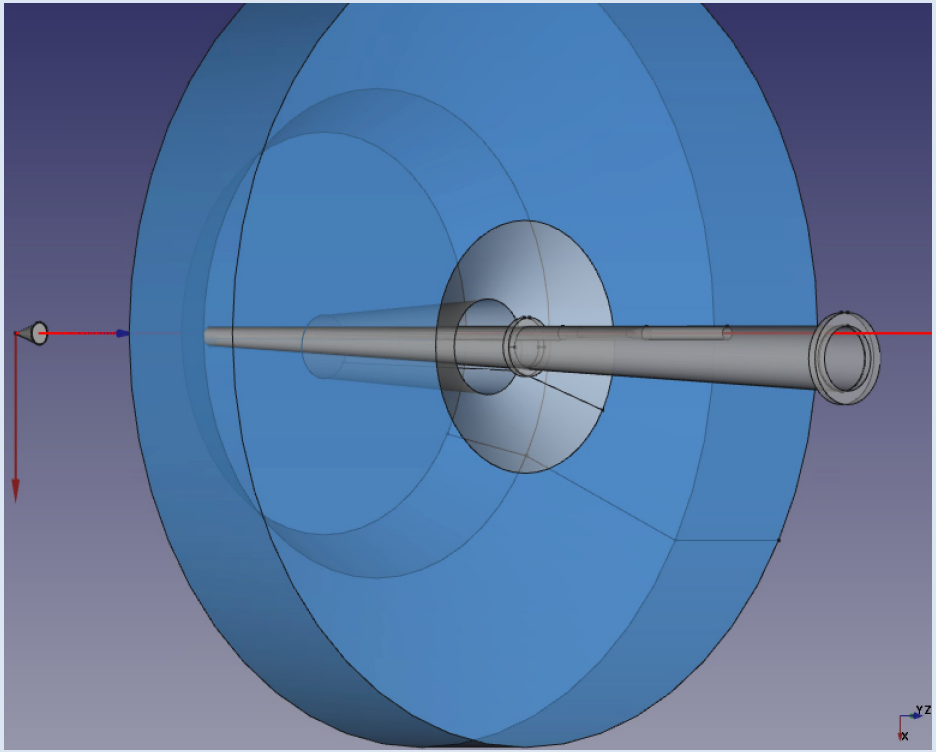
dRICH Shell

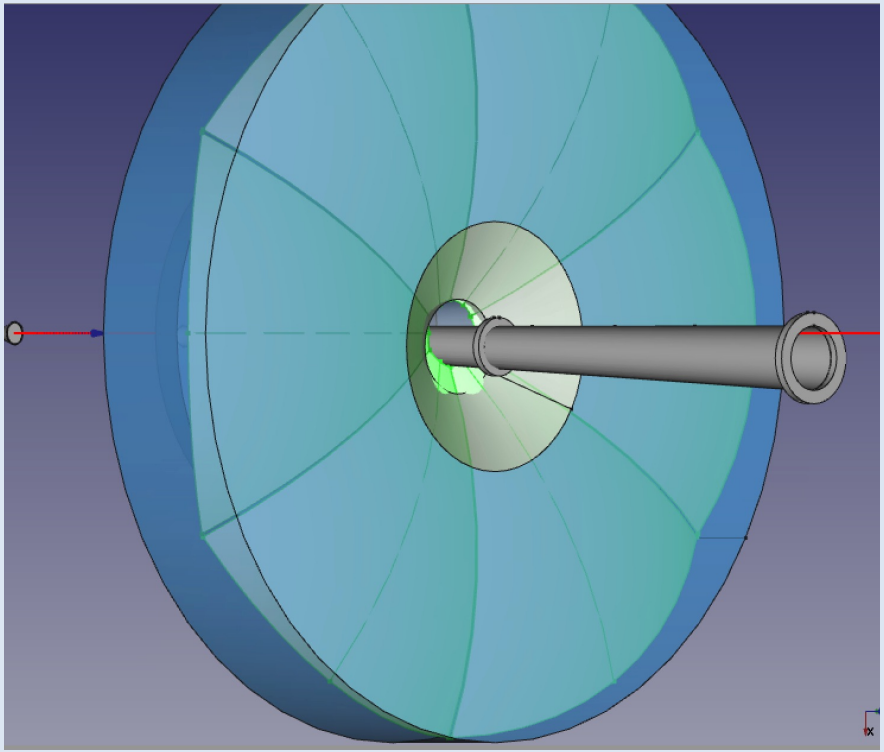




dRICH Bore

The hadron beam angle forces an expanding pipe and a off-axis dRICH bore
dRICH bore should be big enough to provide clearance for the beam pipe during operations



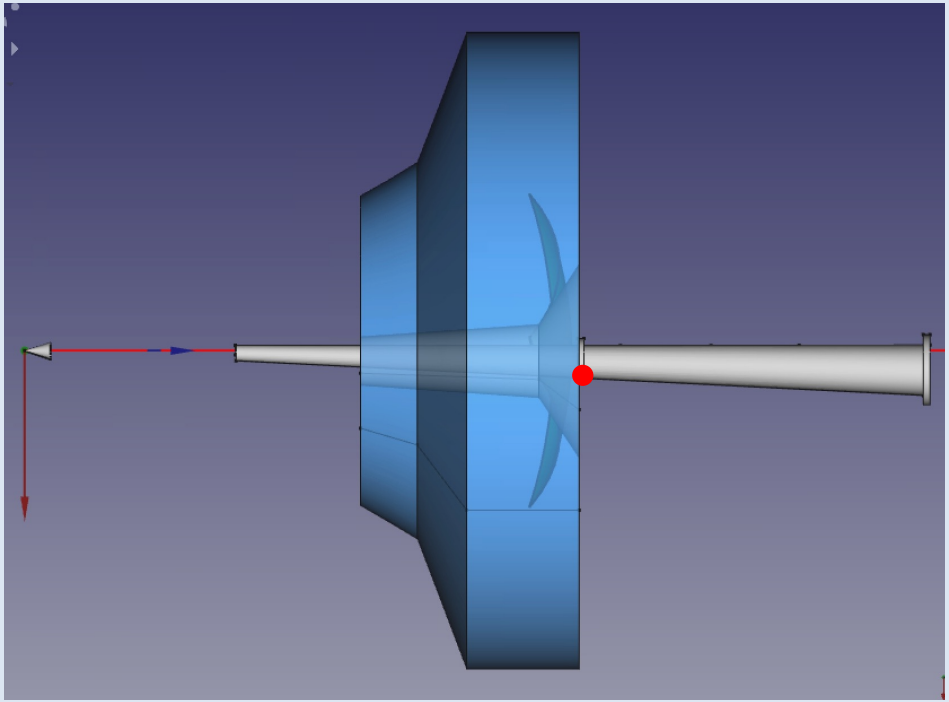


Case 1: single dRICH volume rolling in and out along the beam pipe

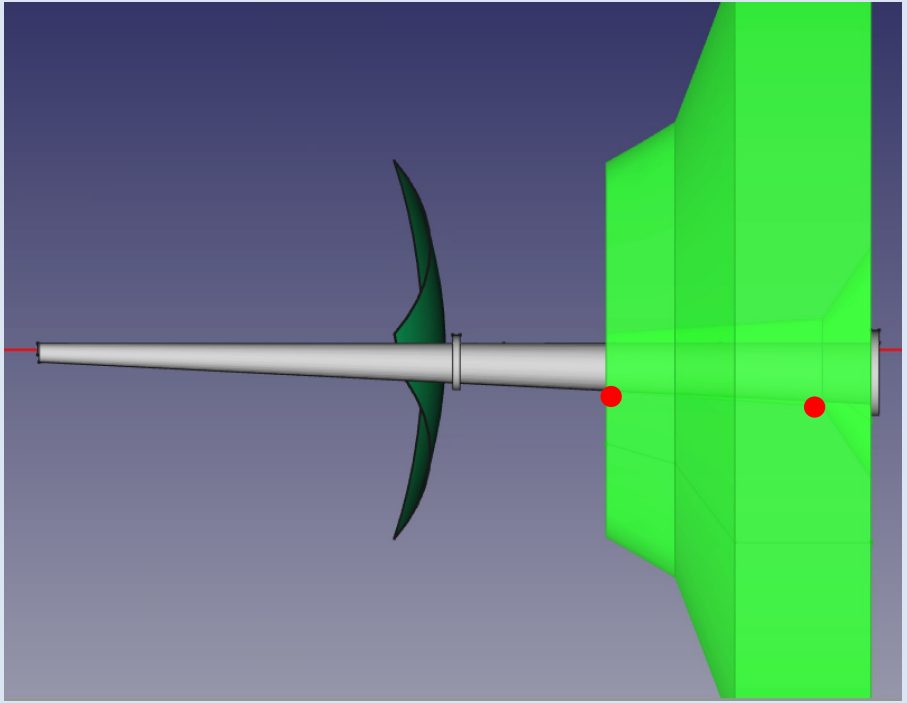
dRICH bore should be enlarged to remove all interferences along the pipe

Mid-flange and pipe cross-section at the parking position provide similar constraint

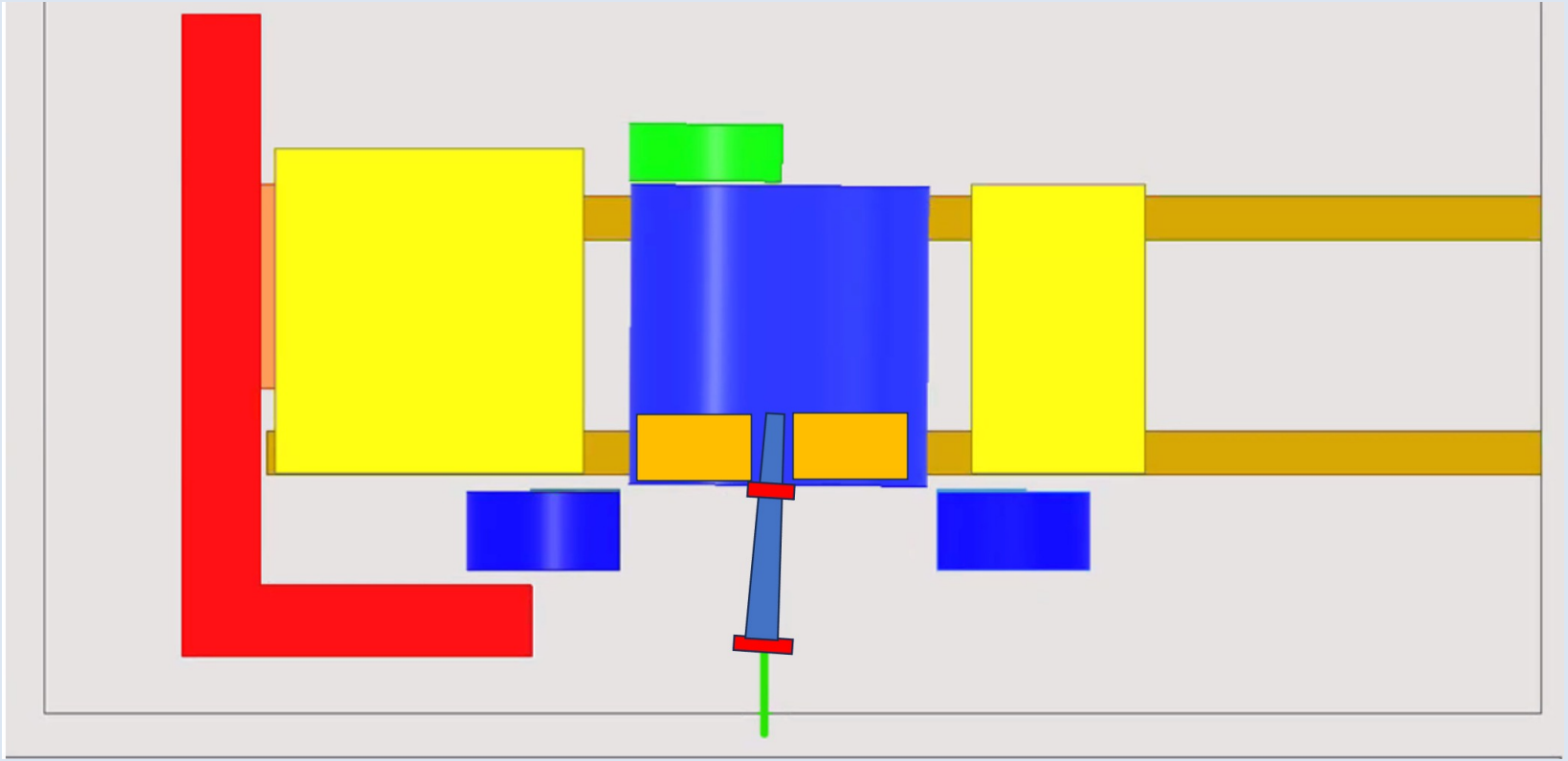
Running position within ePIC



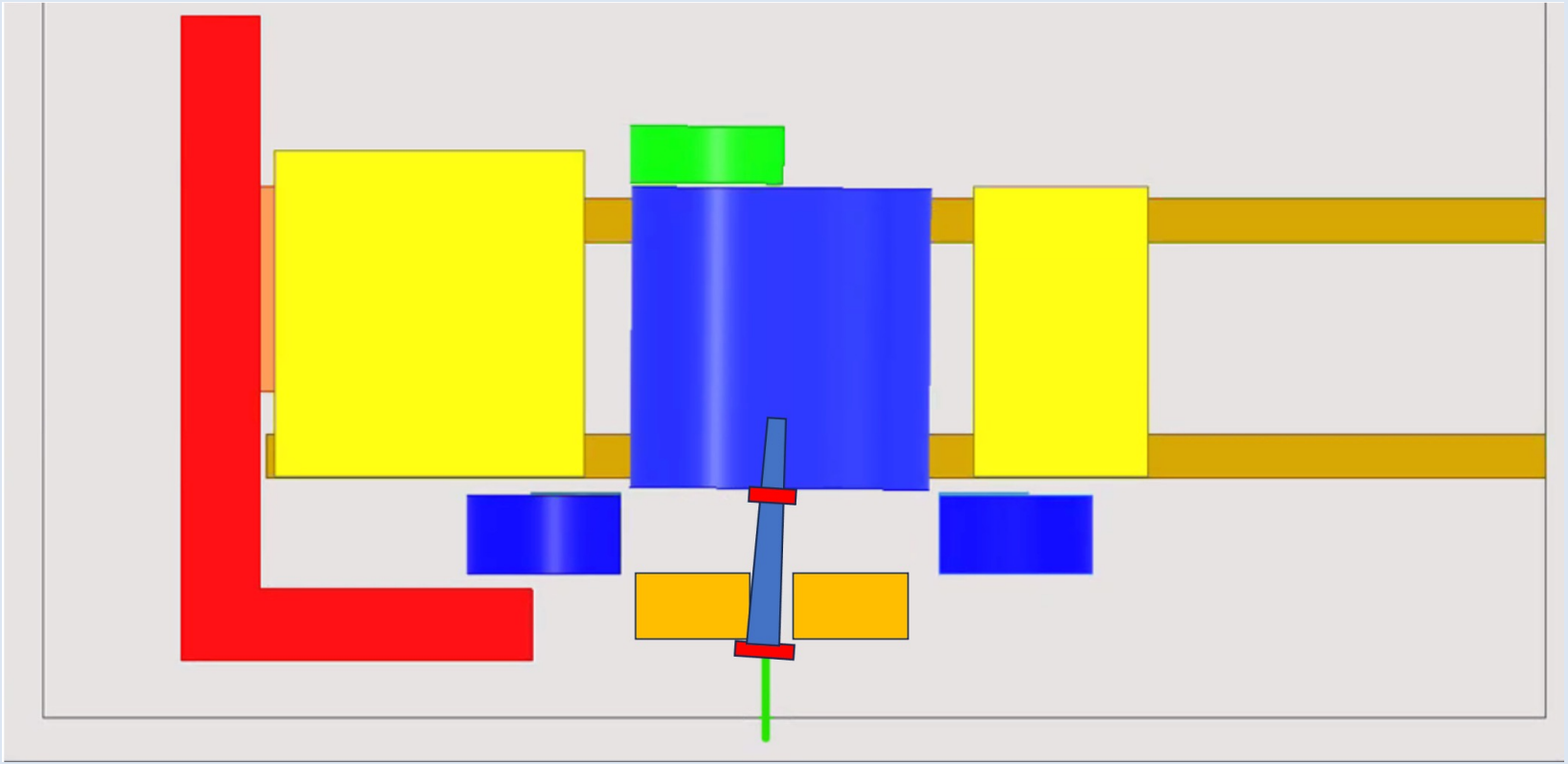
Parking position for maintenance

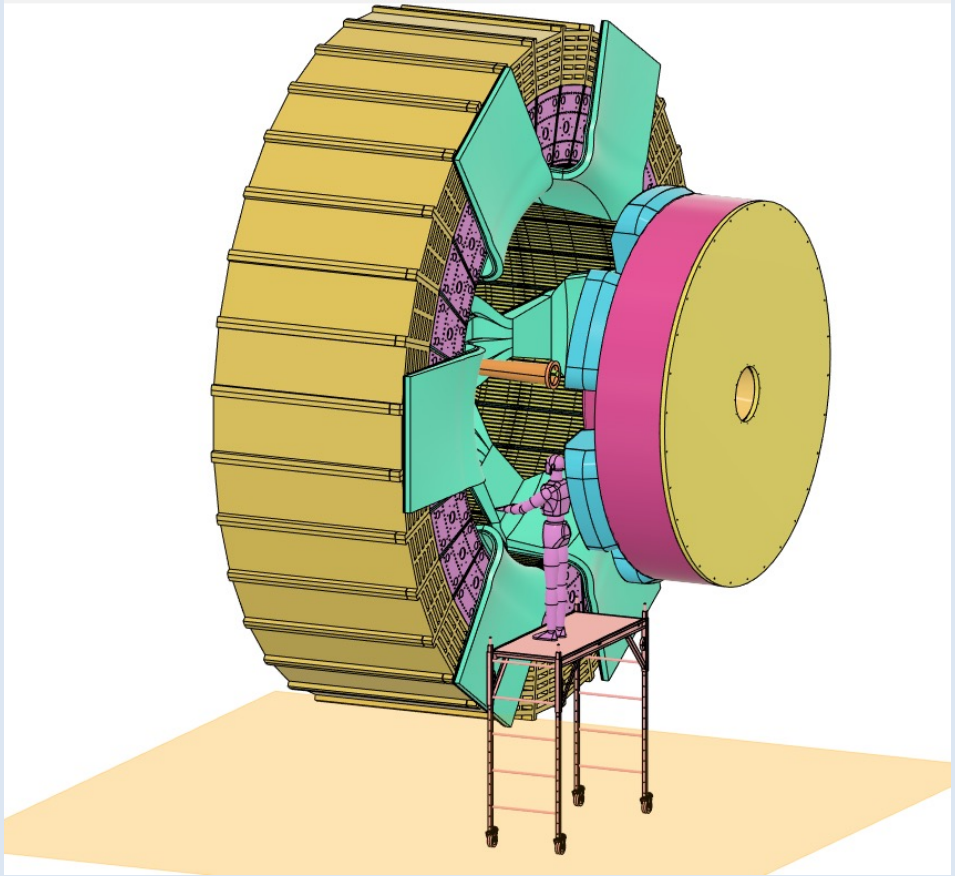


Rolling in and out a single piece

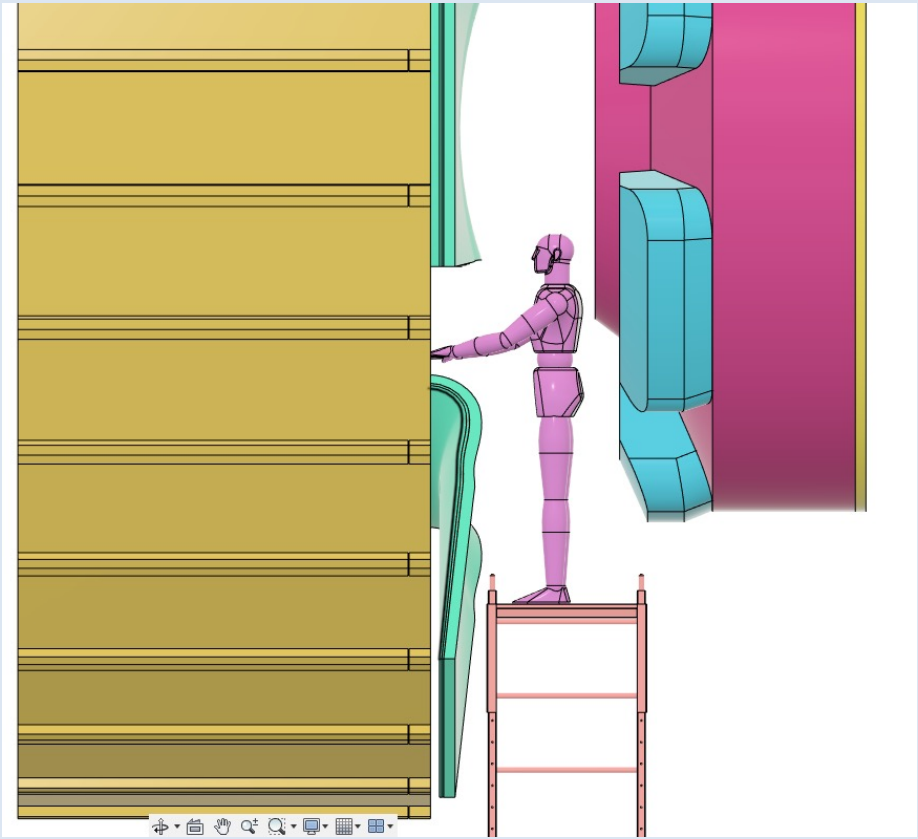


Rolling in and out a single piece





~ 70 cm clearance to enter the barrel

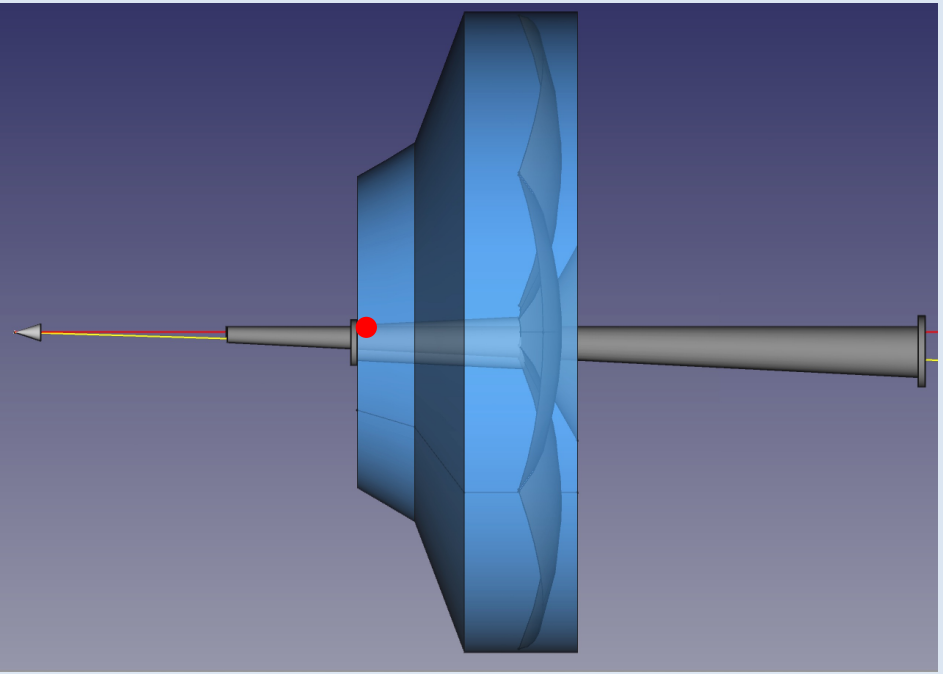


Case 2: two dRICH halvesto be divided as soon as outside ePIC

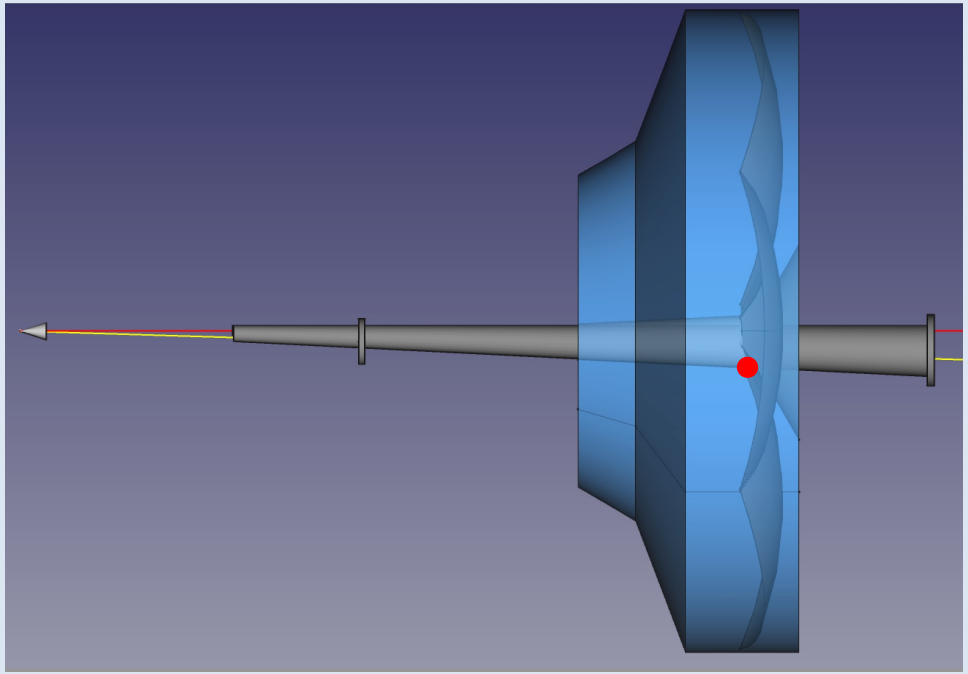
dRICH bore could be minimized if the mid-flange is moved in front of dRICH

The septum will obstruct inter-sector photon propagation.

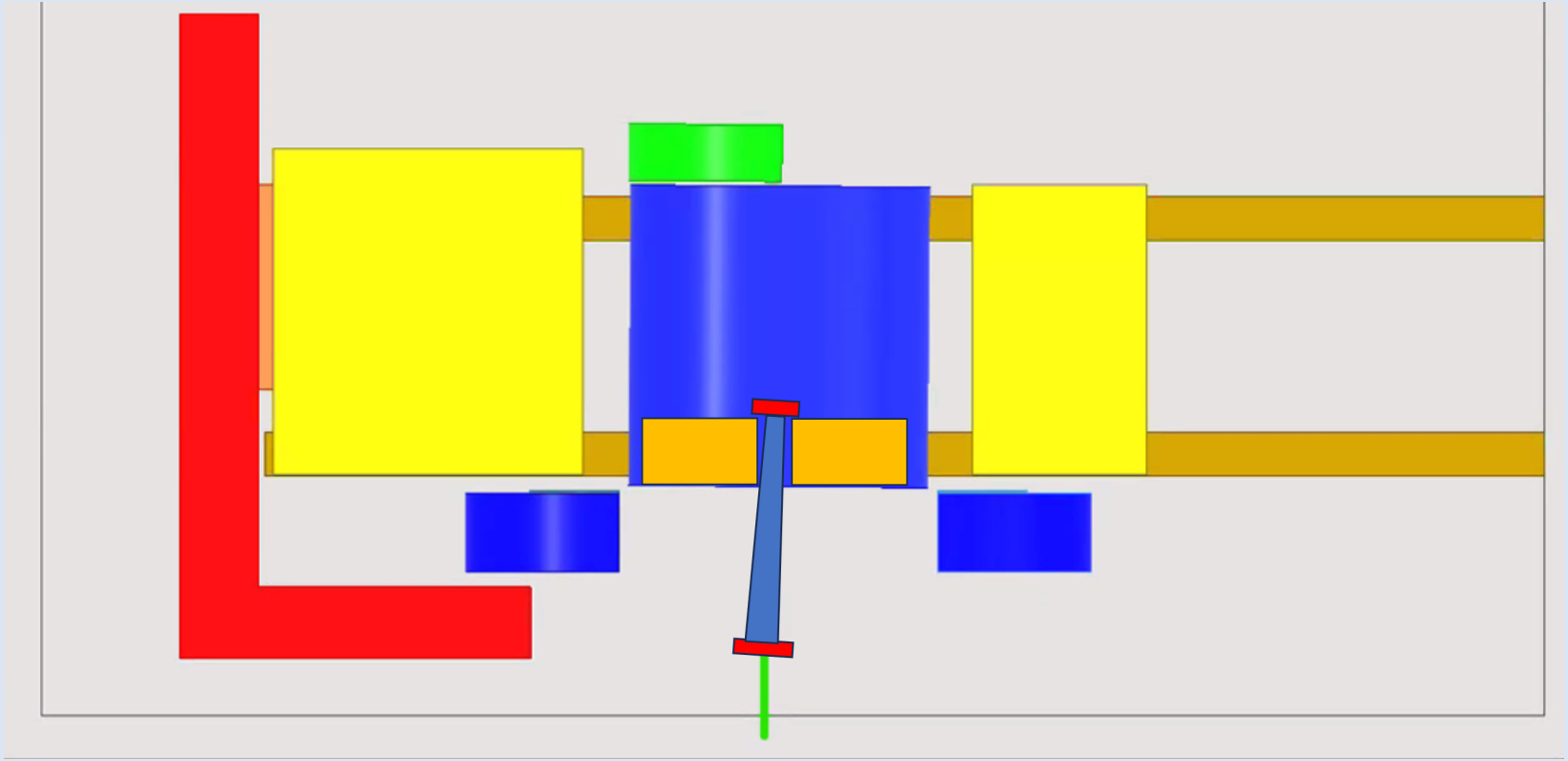
Running position within ePIC



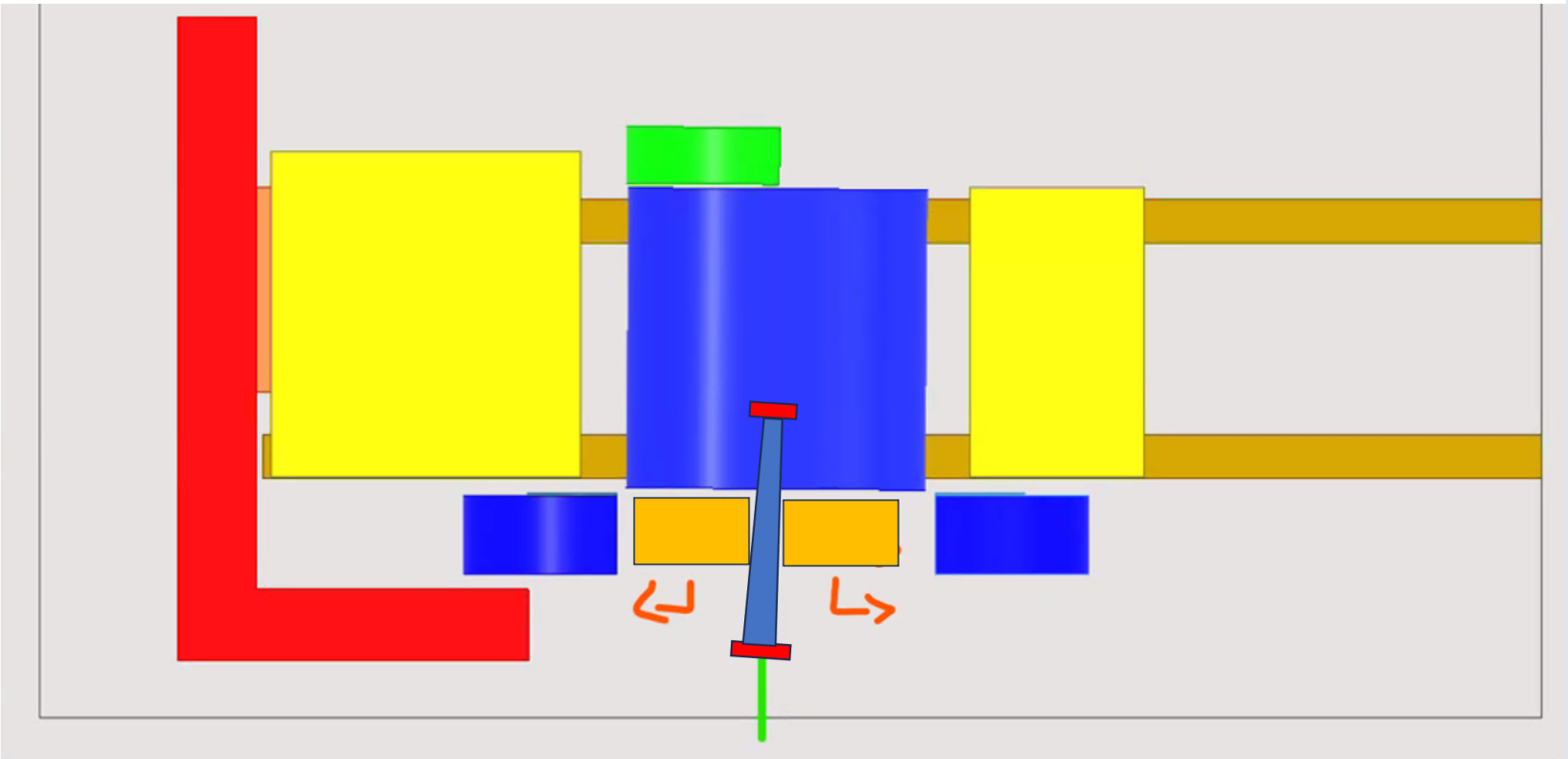
Extraction position



Divide into two halves as soon as out of ePIC

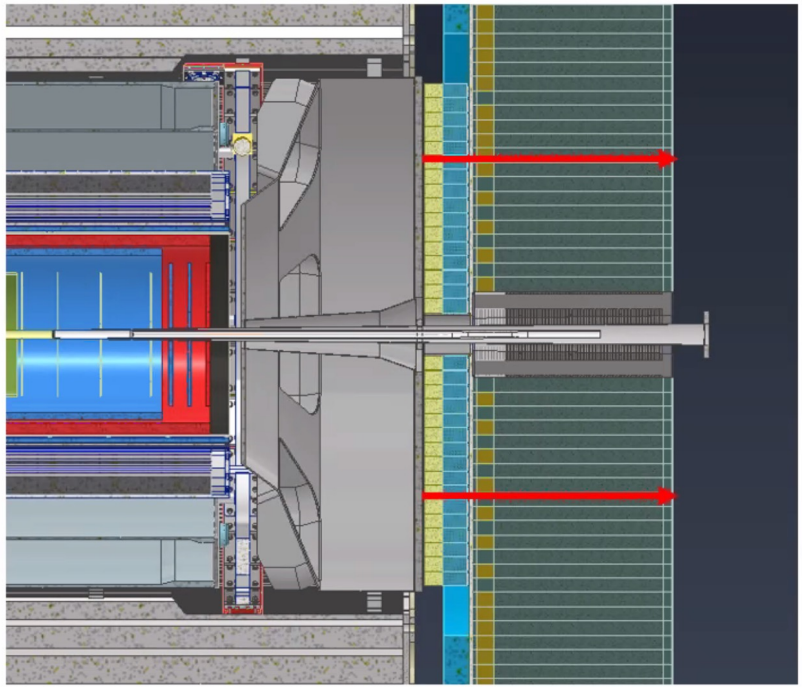


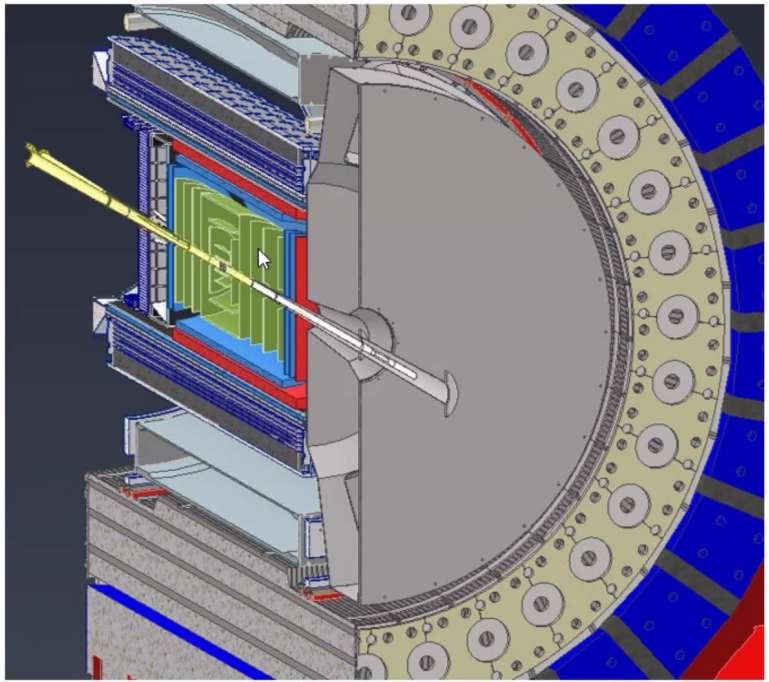
Divide into two halves as soon as out of ePIC

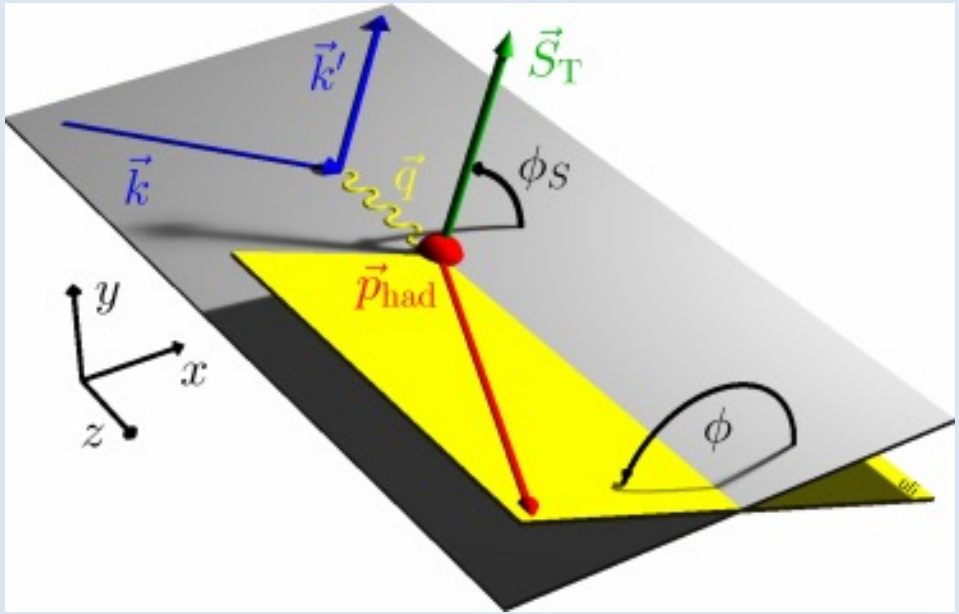


Decision pending on the maintenance plan at IP6 + dRICH acceptance study

Large (2x4 m^2) septum would be inside the acceptance
with implications for the mechanical stability vs pressure gradients we need to explore





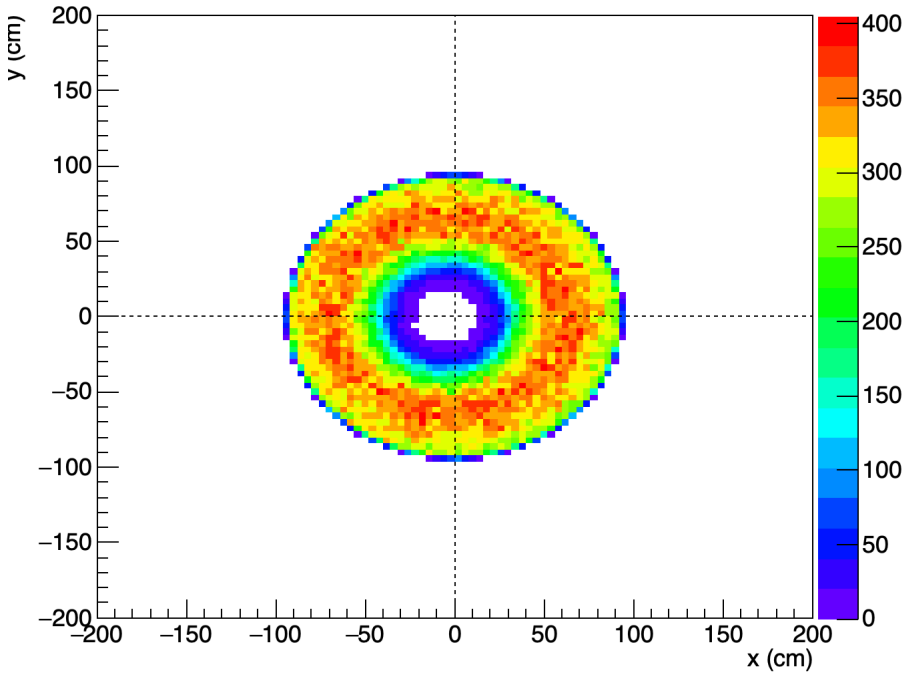


Notes (provisional):

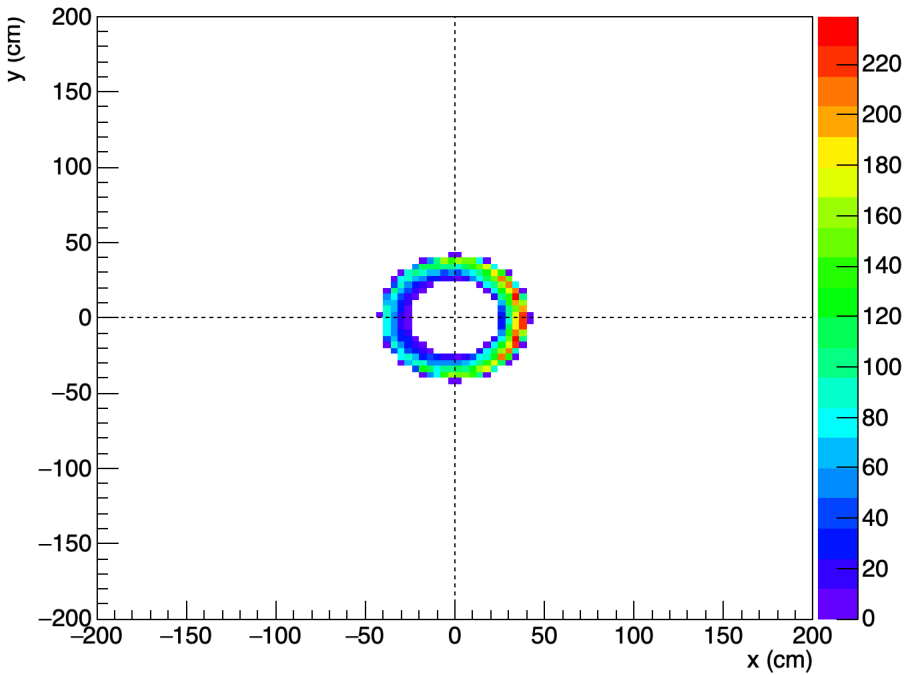
- **physics ϕ is defined vs the electron scattering plane, i.e. is not the laboratory ϕ_{LAB}**
- **pseudorapidity (and physics) should be defined with respect $\vec{q}$ vector (≠ solenoid axis)**

Impact point of the hadron track projected (w/o megnetic filed) on the dRICH entrance window
Psudorapidity defined with respect the electron axis (ePIC axis)

$\eta_e > 1.5$

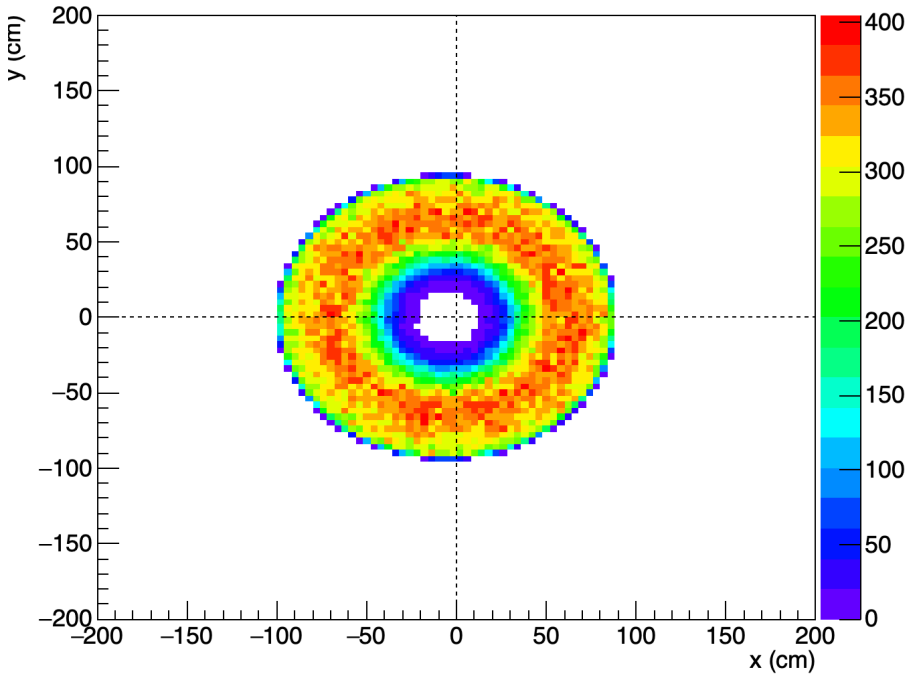


$\eta_e = 2.5 +/- 0.2$

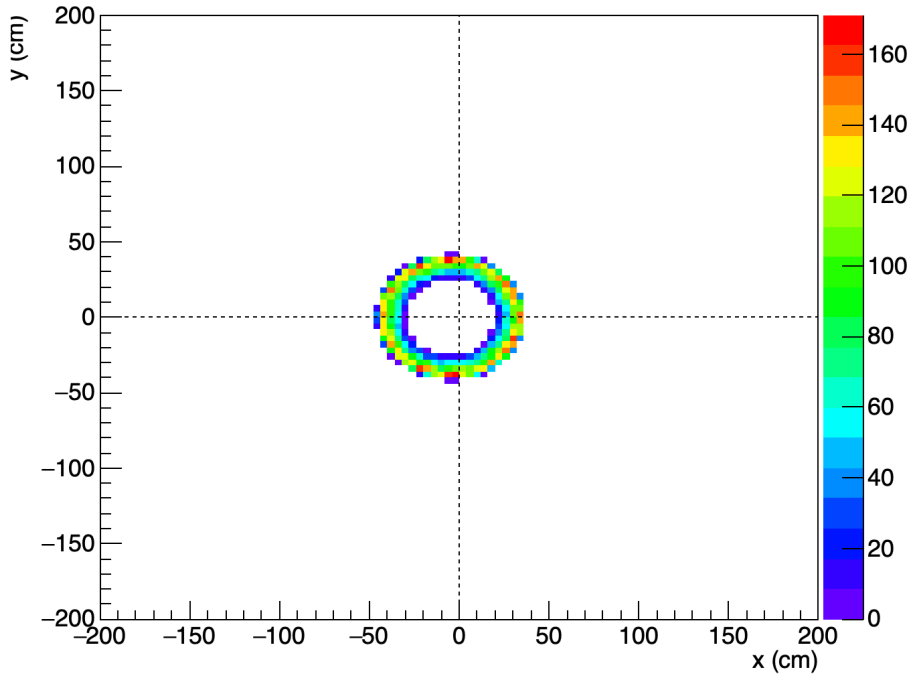


Impact point of the hadron track projected (w/o megnetic filed) on the dRICH entrance window
Psudorapidity defined with respect the q axis (~ beam pipe axis)

$\eta_h > 1.5$



$\eta_h = 2.5 +/- 0.2$



Single piece

Surviving photon fraction

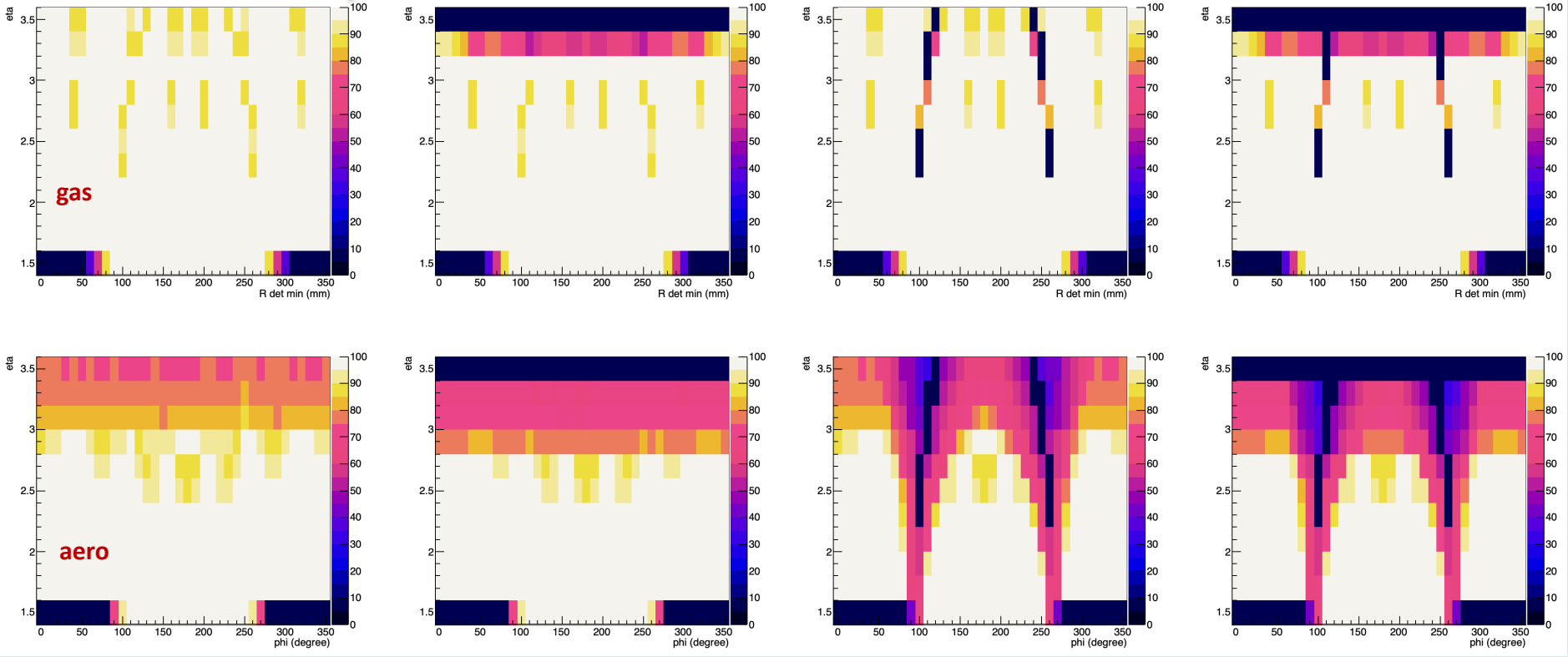
Two halves

R_{bore} = 10-14 cm

R_{bore} = 14-21 cm

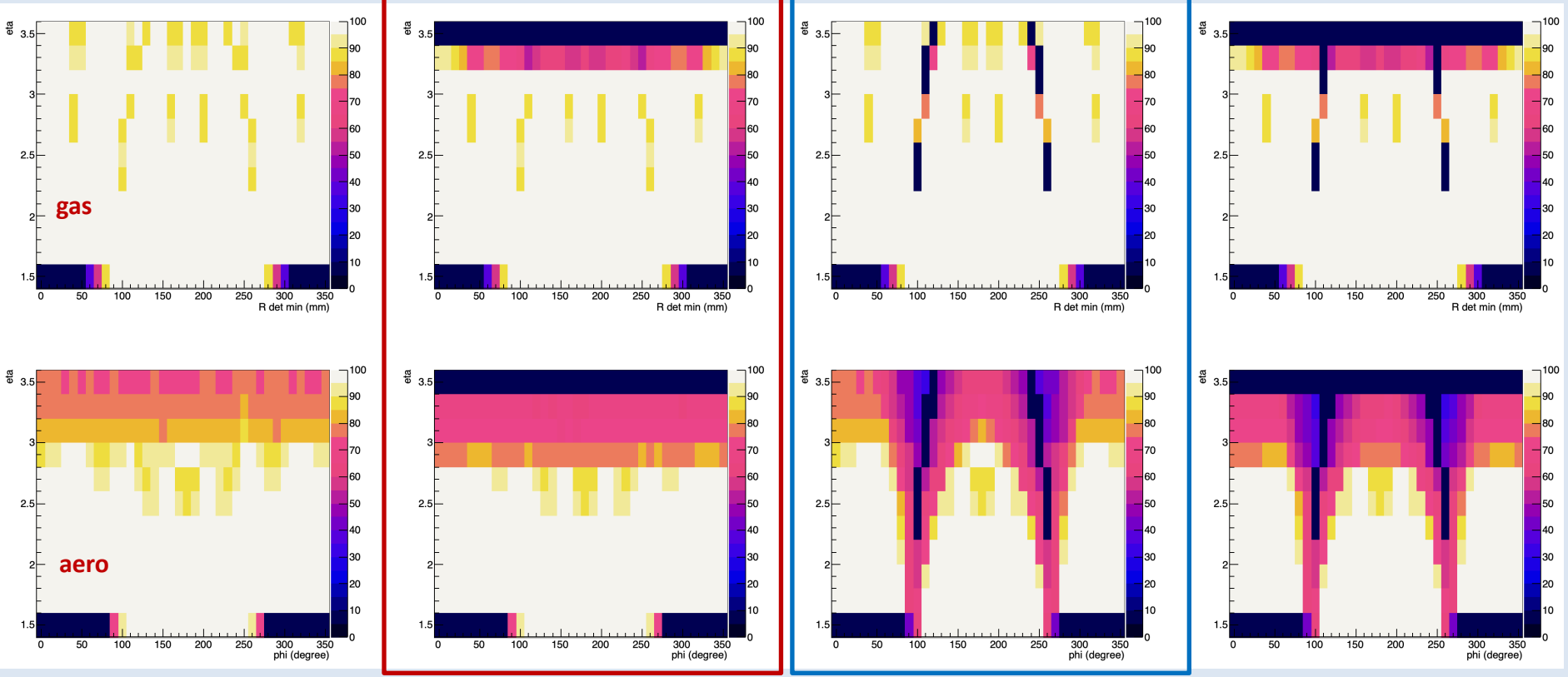
R_{bore} = 10-14 cm

R_{bore} = 14-21 cm



Case 1
Single piece – Large bore

Case 2
Two halves – Optimized bore



Conclusions

There is some flexibility on the maximum aerogel radius:
potential benefit for acceptance;
important tolerance for mechanics / insulation.

The ePIC asymmetric pipe suggests an off-axis bore for the dRICH.

This should be fine from the physics point of view.

The maintenance at IP6 (without beam vacuum break) impose constraints on the dRICH model

- large bore: loss in pseudorapidity acceptance (unrecoverable)

- split into two halves: loss in azimuthal acceptance (mitigated by ϕ_{LAB} invariance)

The design of the dRICH basic block (sector) is ongoing as basis for a real-scale demonstrator
(with realistic components, assembling, sealing, thermal insulation, services, off-axis optics, ….)

Detector box :

The detector box is being optimized to preserve internal optics without blind areas

Services lines are being defined to stay in the detector box ”shadow”

The 3 cm shift downstream is useful to relax space constraints

Beam pipe:

Maintenance at IP6 is posing some serious constraint on the dRICH structure and performance impact:

A large bore with “irreducible” losses in pseudorapidity

A septum with significant impact on aerogel photon yield in 4 out of 6 sectors.

Consequences and mitigations are being studied together with the Project