Updates of GLD-MDI

IP optimization updates

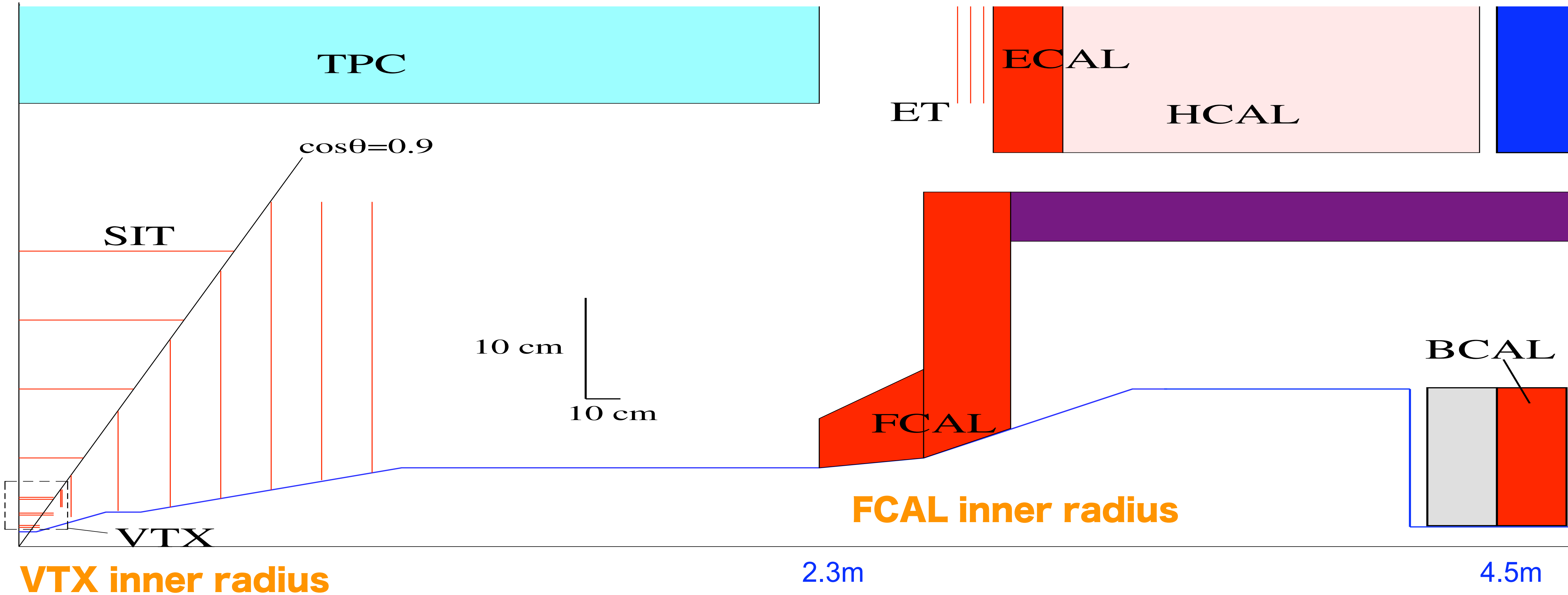
GLD updates with no push pull

GLD push pull adaptation

-questions

T. Tauchi (KEK) on behalf of GLD IR Task Force

LCWS2007, DESY, 30 May - 3 June 2007

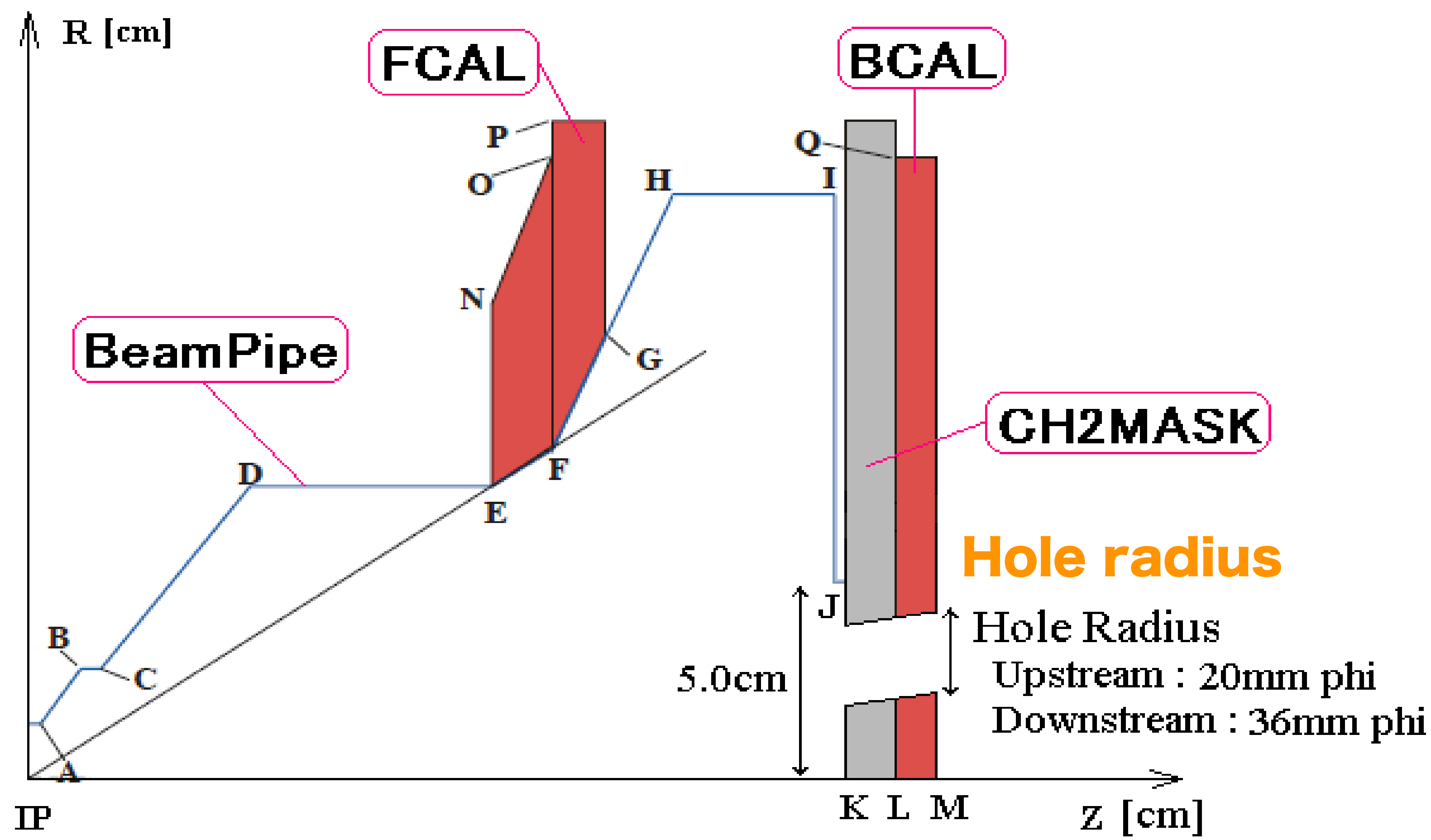


IR Optimization

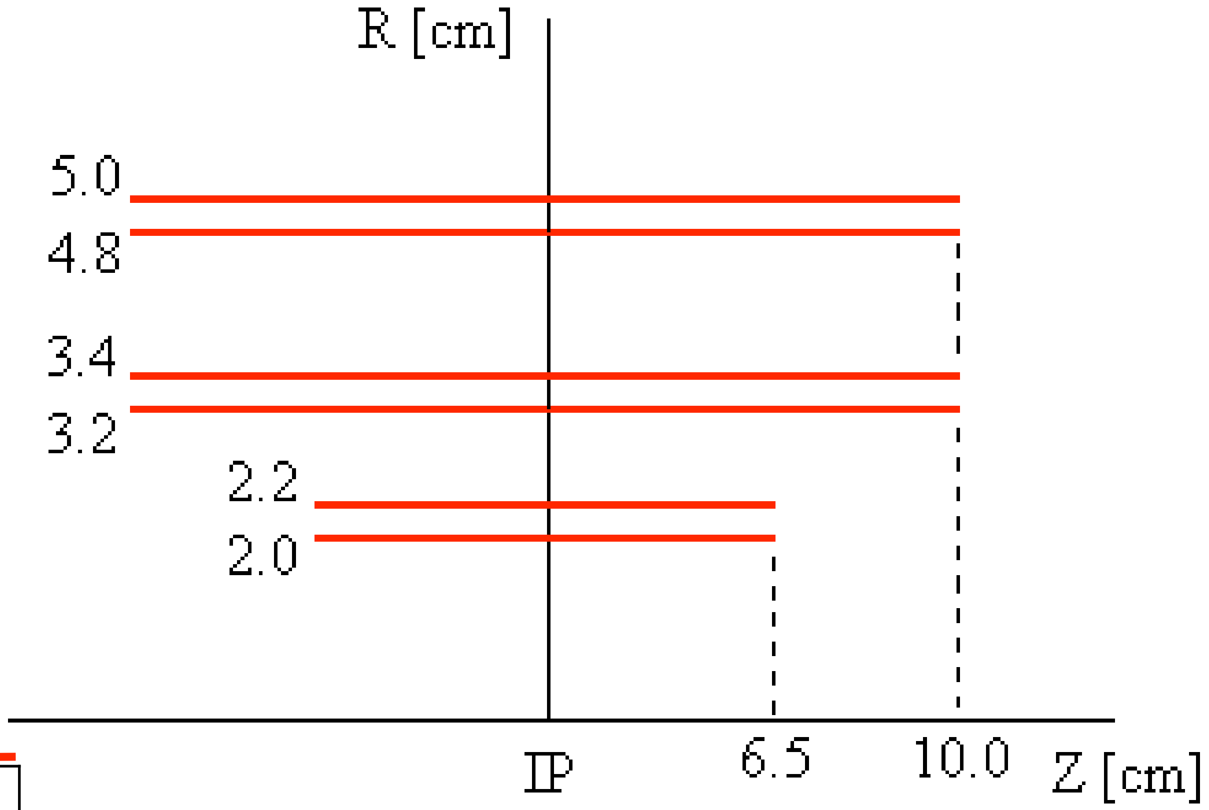
FCAL inner radius for TPC background hits.

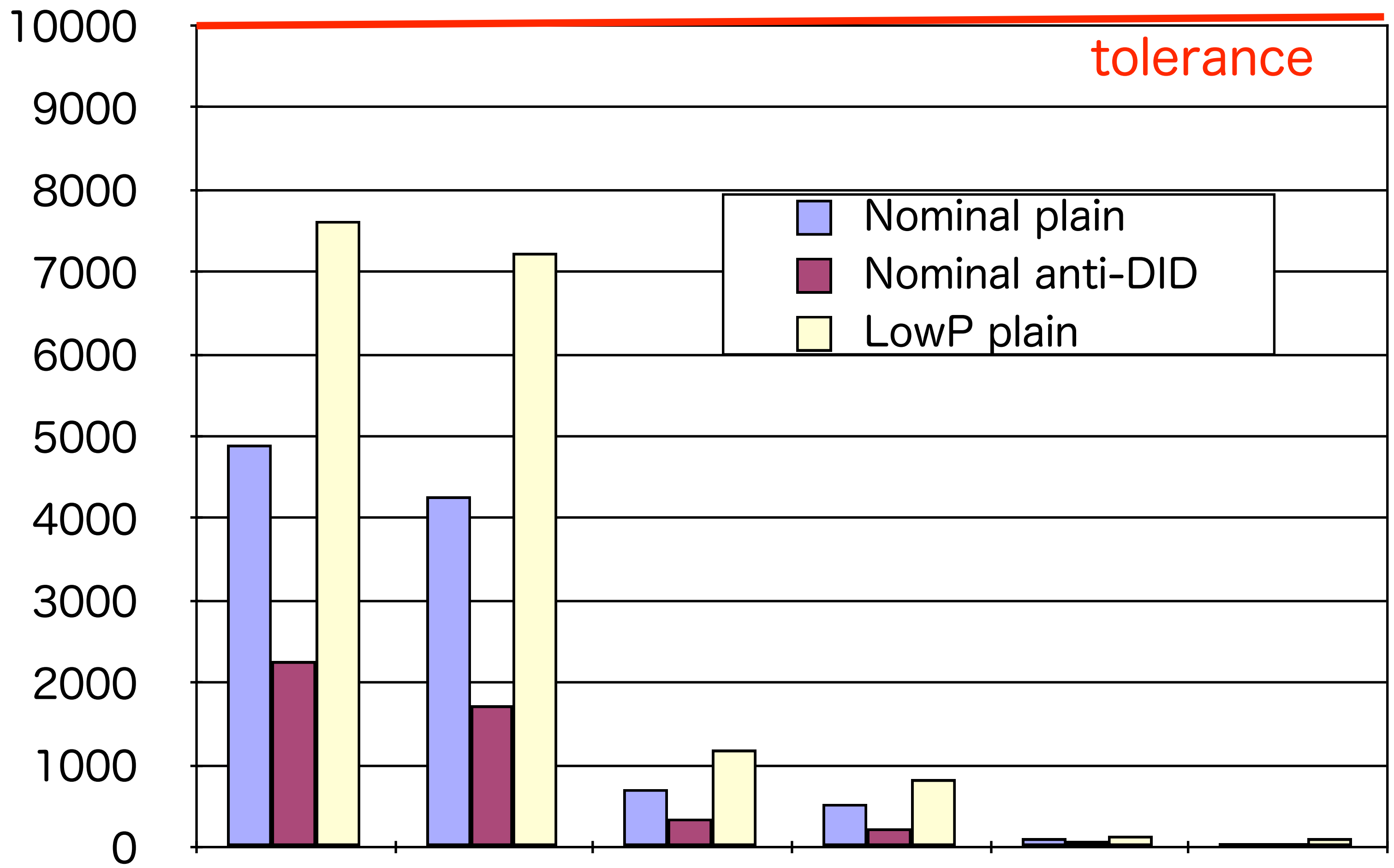
Hole radius of extraction to decrease backscattering.

Radius of beam pipe @VTX



VTX hit distribution



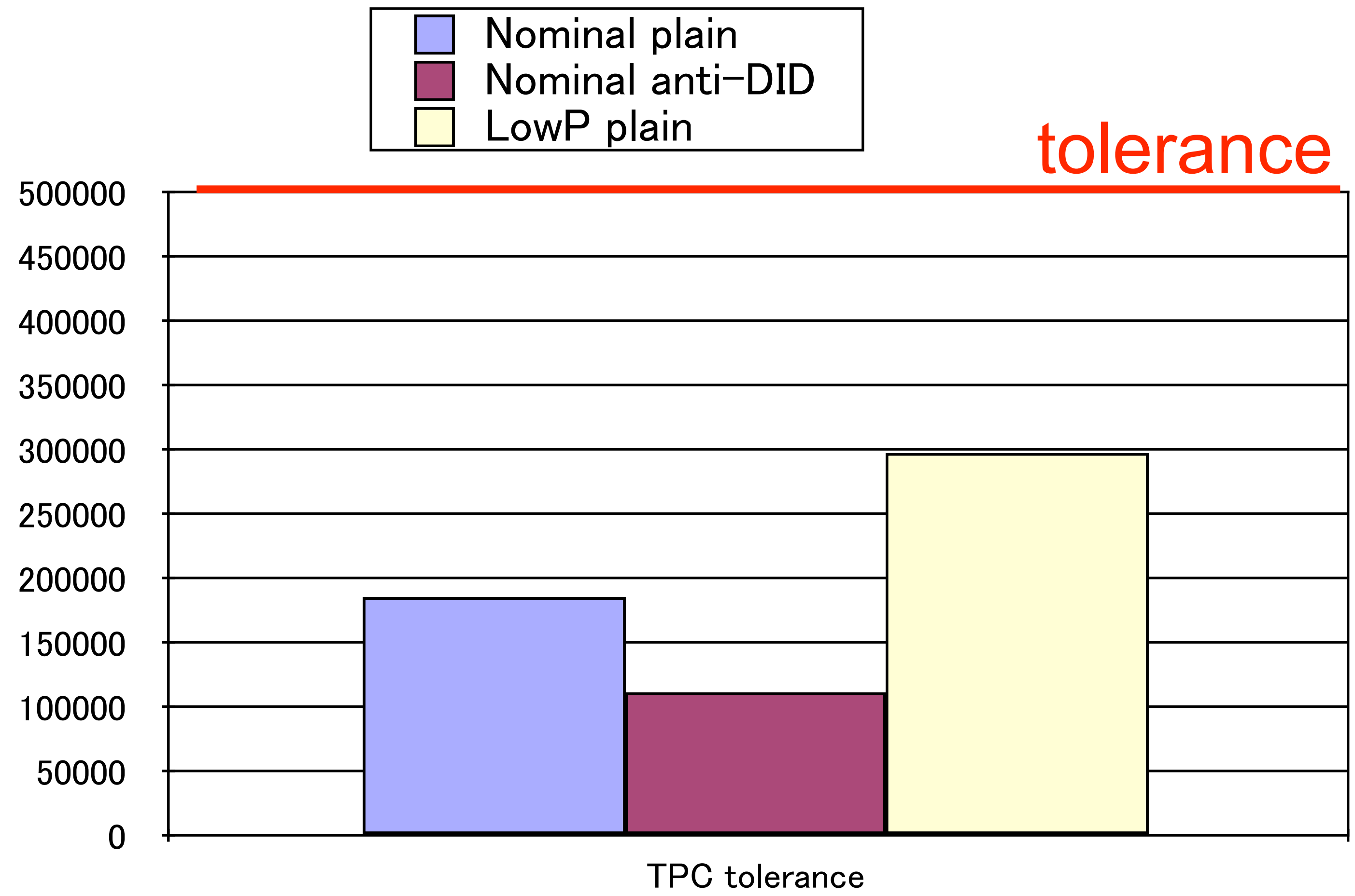


Nominal plain:20bunch

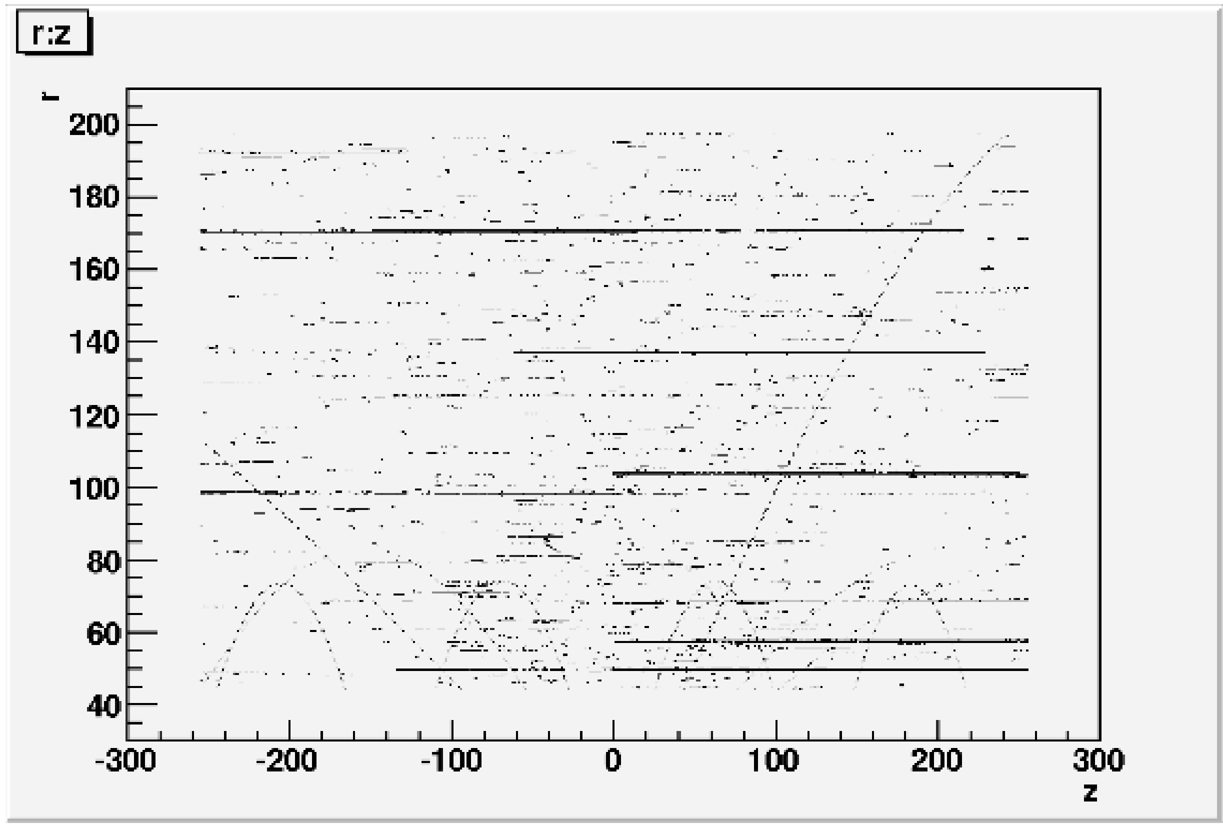
Nominal anti-DID:10bunch

Low P plain:1bunch

TPC hit



TPC digital hits

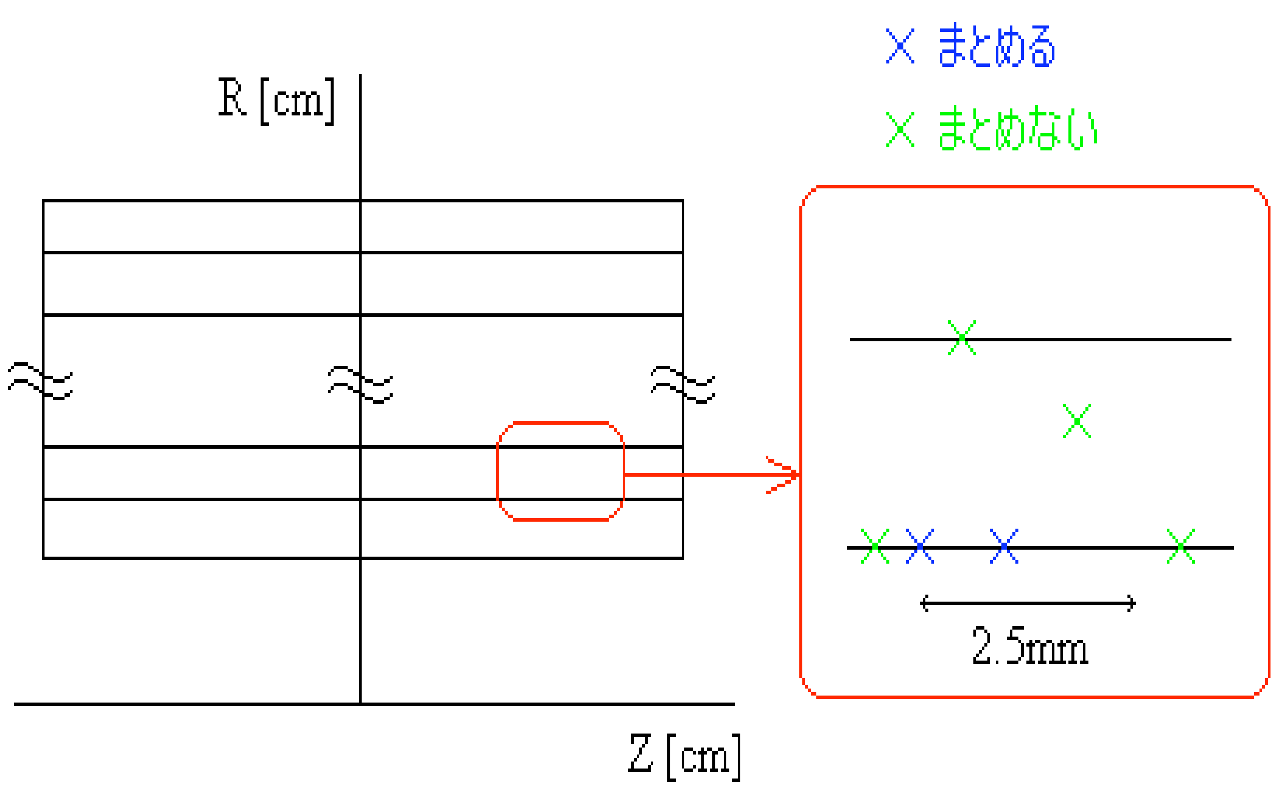


TPC Exact hits

Nominal plain:20bunch

Nominal anti-DID:10bunch

Low P plain:1bunch

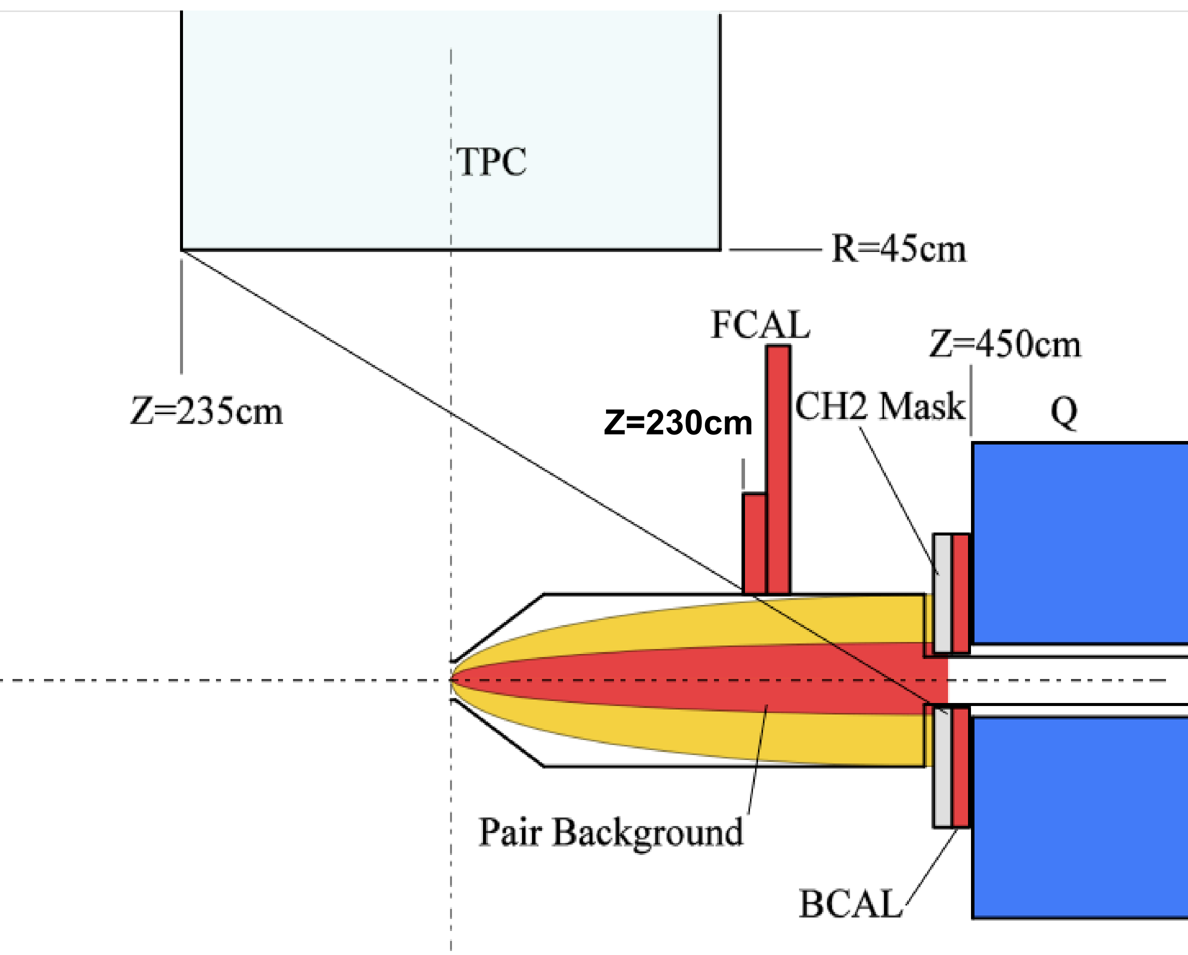


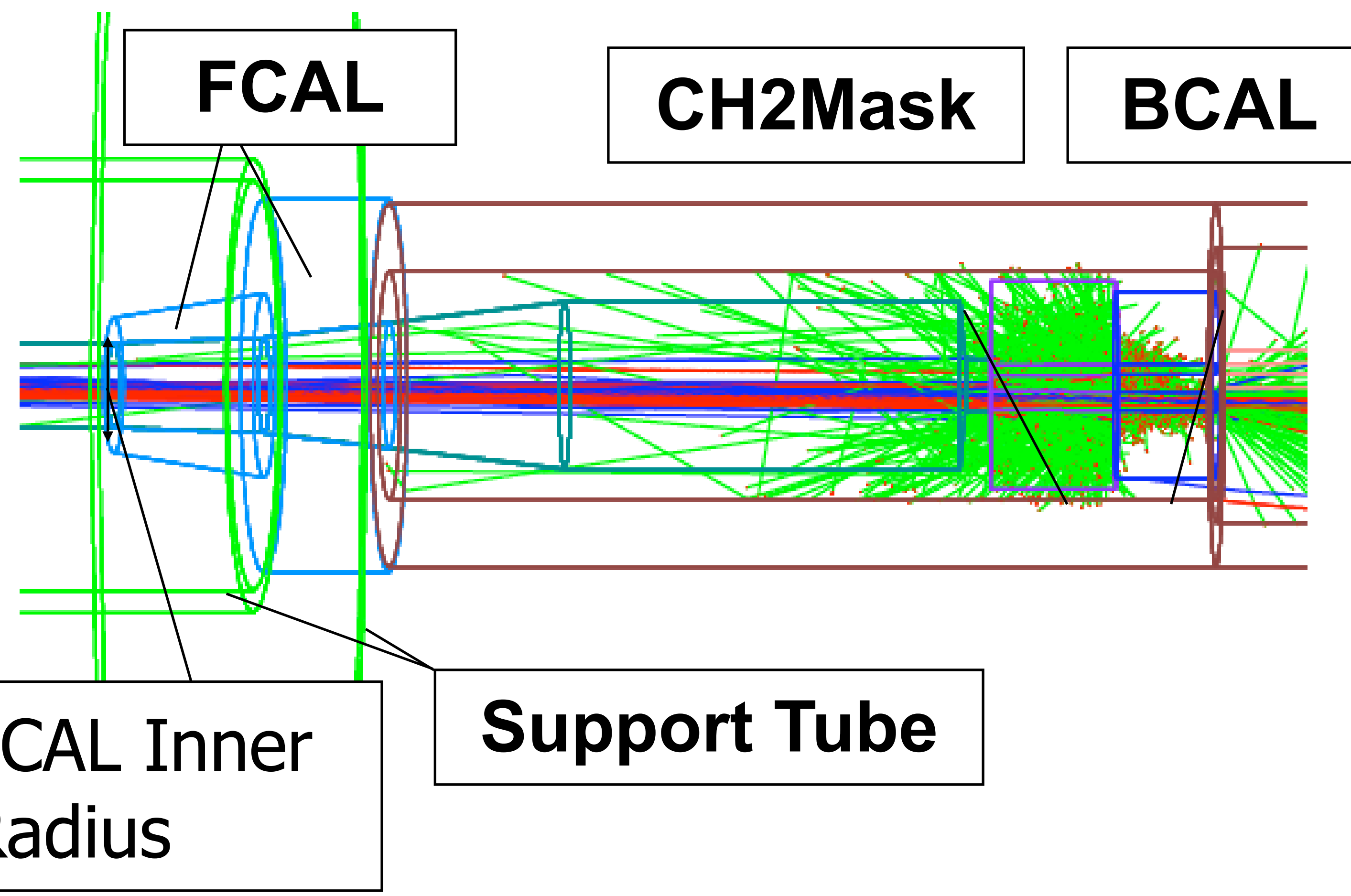
FCAL Inner Radius Optimization

The purpose is to optimize forward calorimeter (FCAL) inner radius to decrease TPC background.

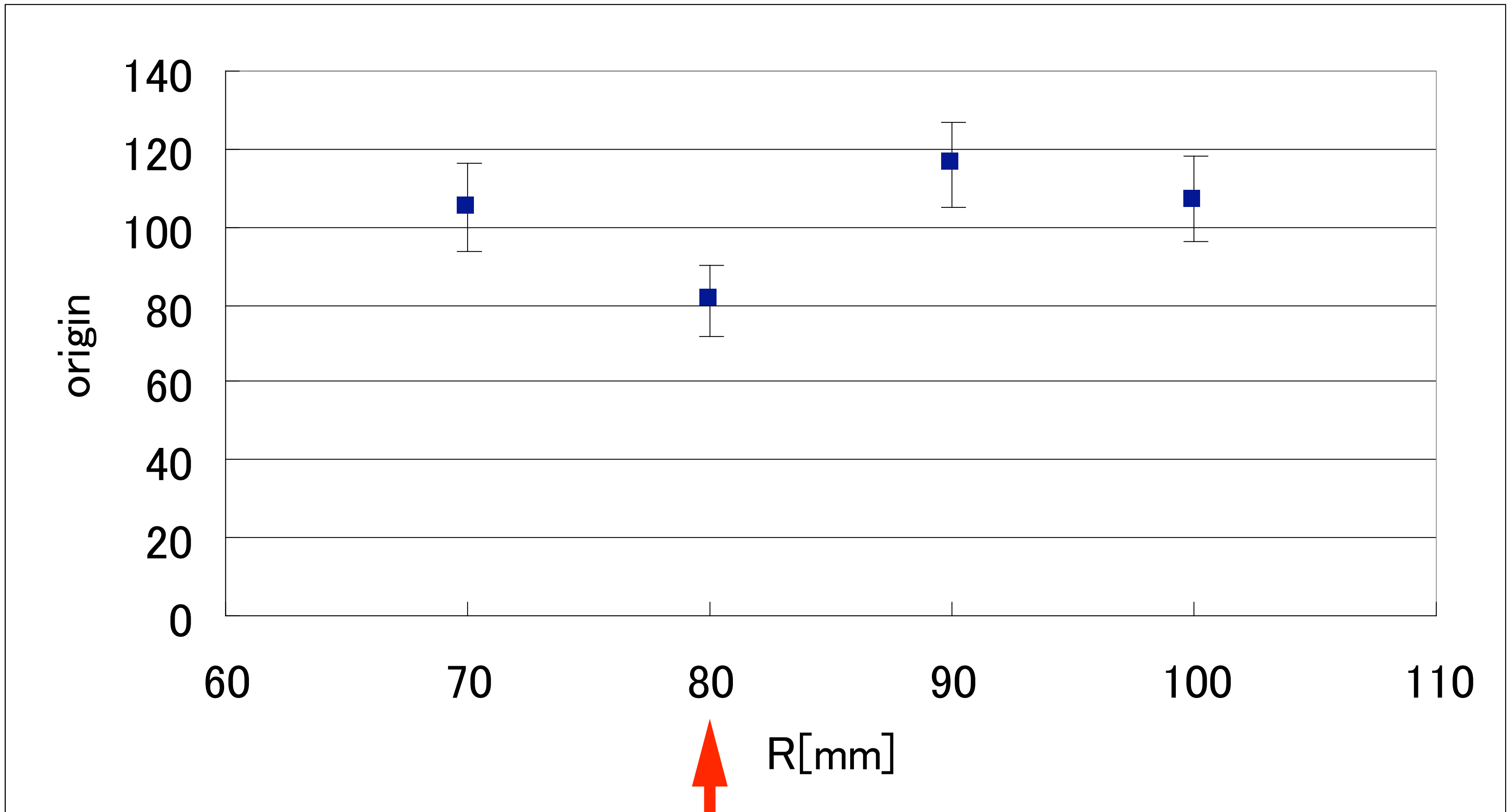
Default value of FCAL inner radius was determined by simple head on geometry.

But… we have to verify it by full simulation.





No. of particles entered TPC as a function of FCAL inner radius



nominal

full simulation (Jupiter) : statistics/10 bunches with anti-DID

GLD Updates

without push-pull scheme

(1) GLD overall size

z 8m to 7.5m with compensation coils

R 7.65m to 7.2m -15cm,45cm iron in z,R, respectively

(2) Experimental (EXP.) hall size

Exp.hall 32m x 72m to 25m x 55m

width : shorten by free end yokes with air pads

{ 7.5m (detector) +

2.5m (crane access for concrete shielding) +

2.5m (3 cable chains (two for endcaps and one for barrel)) } x2

= 25m

length : shorten by surface assembly

(3) Assembly procedure

two assembly schemes at surface and EXP. hall

iron structure assembly

segmentation in sector v.s. ring (CMS style)

- movement at the B-excitation ON and OFF

(4) EXP. hall crane access area (WxL)

18m x 39 m

Is this the size of plat form?

(5) Updates of "table of IR assumptions" @Beijing07

- At hall
  - largest item to lift   400t to 280t*
  - EXP hall crane   400t to 300t*
    - e.g. endcap(ϕ/4, z/3), barrel (ϕ/12, R/2), coil

- At surface
  - largest item to lift   280t (end/ϕ4/z3. barrel/ϕ12/R2, coil)
  - surface assembly cranes   300t and >20t   (400t , 20t)
    - - hook height 25m (vertical installation of coil into cryostat)
  - Welding operation is only here.
  - All the detectors are tested here before the integration.
  - Surface assembly hall crane access area   TBD
  - Resulted volume of surface assembly hall   TBD
    - (two assembly buildings 100x25x25m)

ILC Detector Magnets
Possible Design Parameters

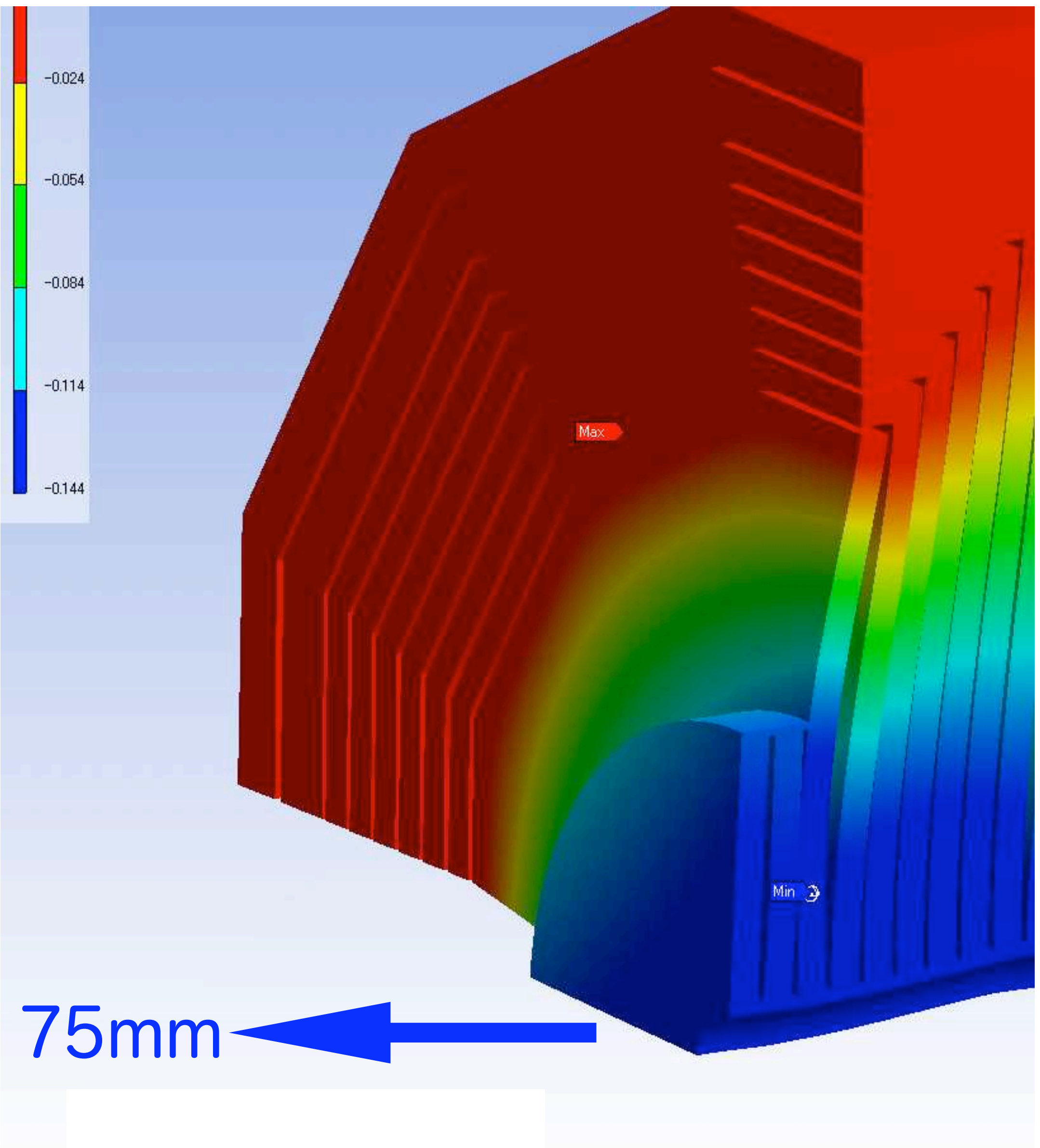
		LHC		ILC			
	unit	ATLAS-CS	CMS	GLD	LDC	SiD	4th
Mag. Field	T	2	4	3	4	5	3.5/-1.5
Diameter	m	2.5	6.5	8	6.3	5.3	6 / 11
Coil thick.	m	0.045	0.3	~0.4(0.7*)	~0.3	0.4	
Length	m	5.4	12.5	8.9	6,6	5	11
St. Energy	GJ	0,04	2.6	1.6	1.7	1.4	5.7
E/M	kJ/kg	7	12	~ 20 (12*)	13	12	

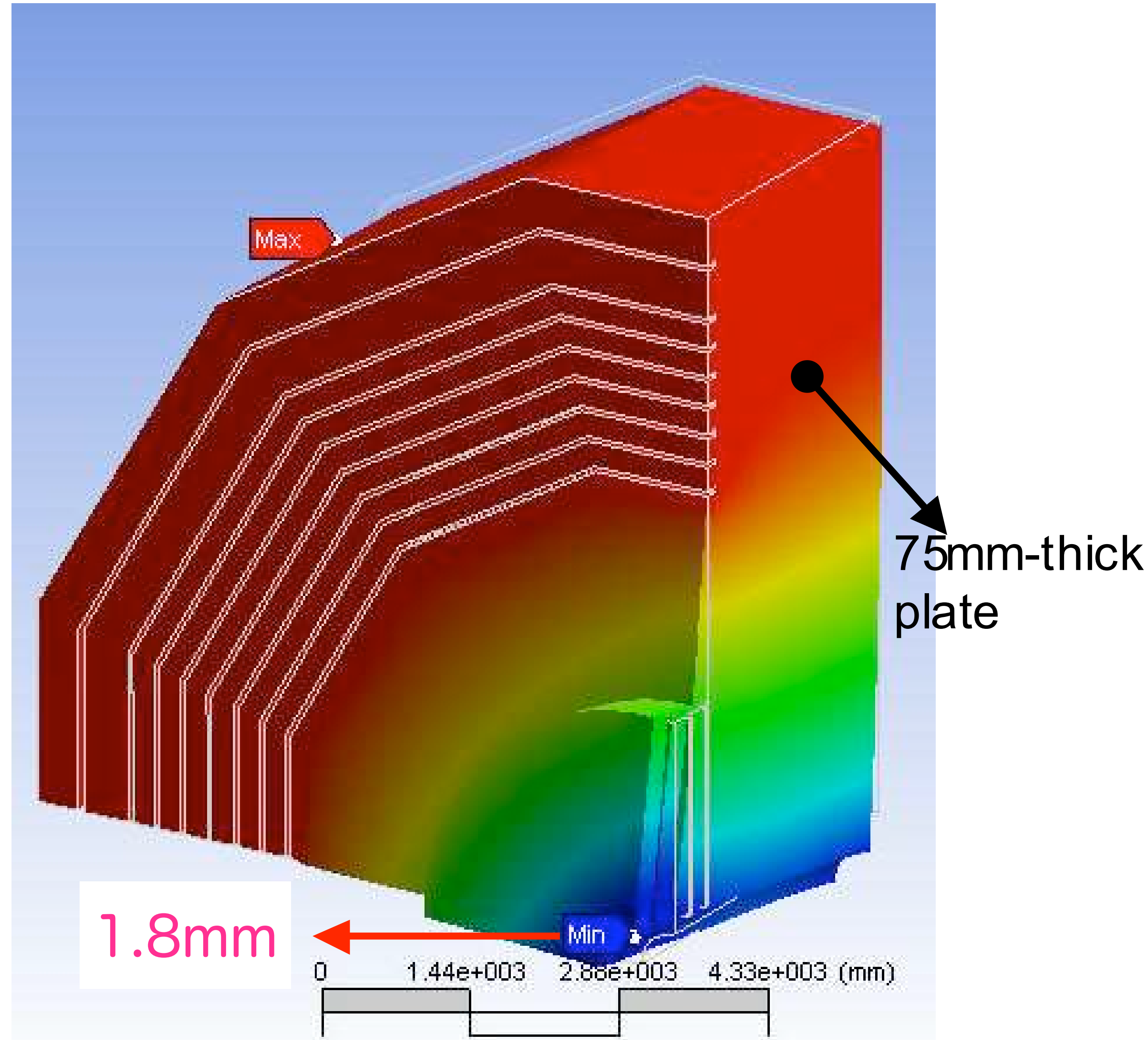
* Revision suggested

GLD solenoid total weight would change from 270t to 330 t

GLD-DOD: Magnetic forces 18,000 t !

Iron structure 16,000t (7,500t barrel and 6,500t endcap)





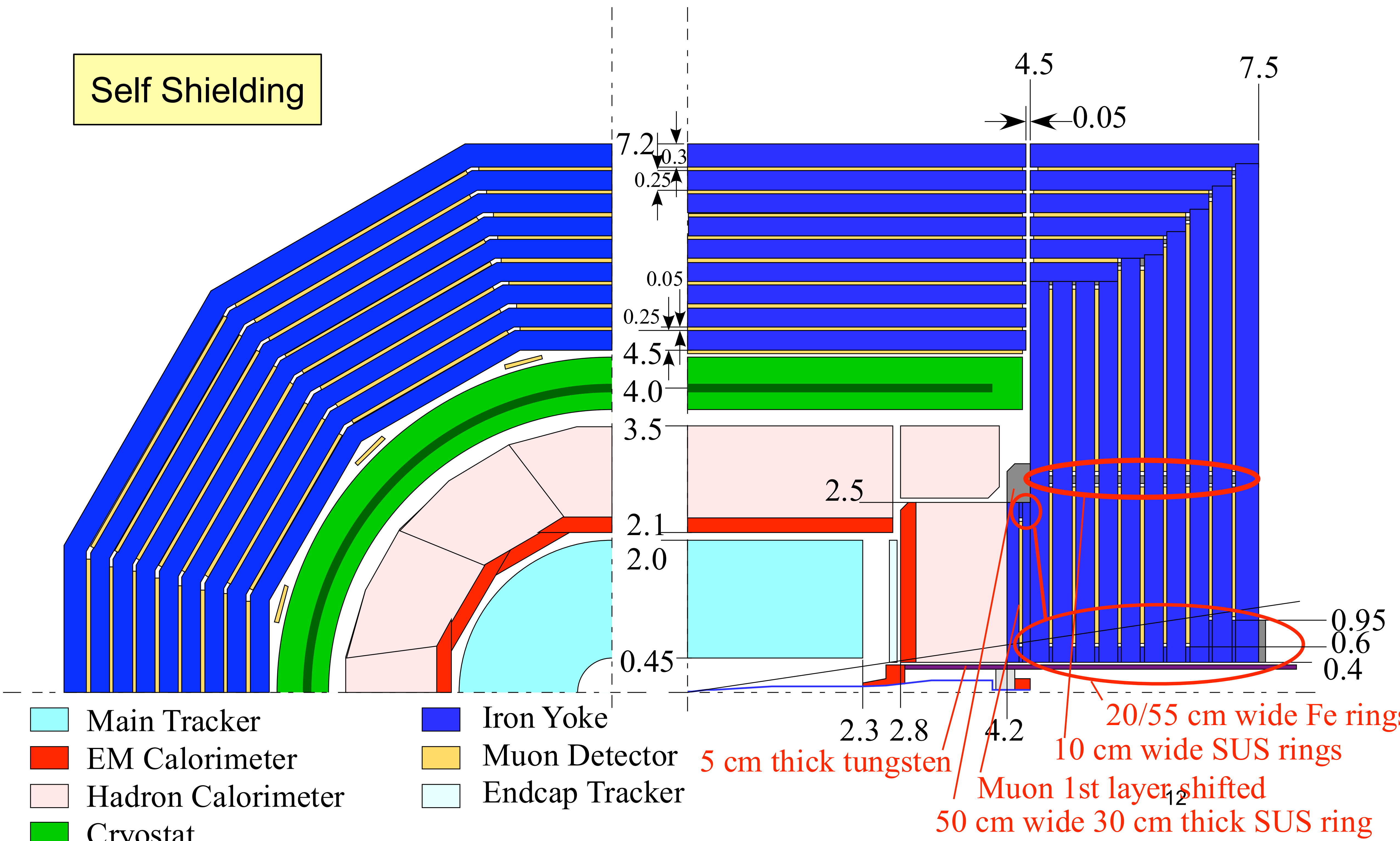
with no “75mm^t plates”

with “75mm^t plates” in every 90^o

gravitational sag in barrel yoke = 1.8mm

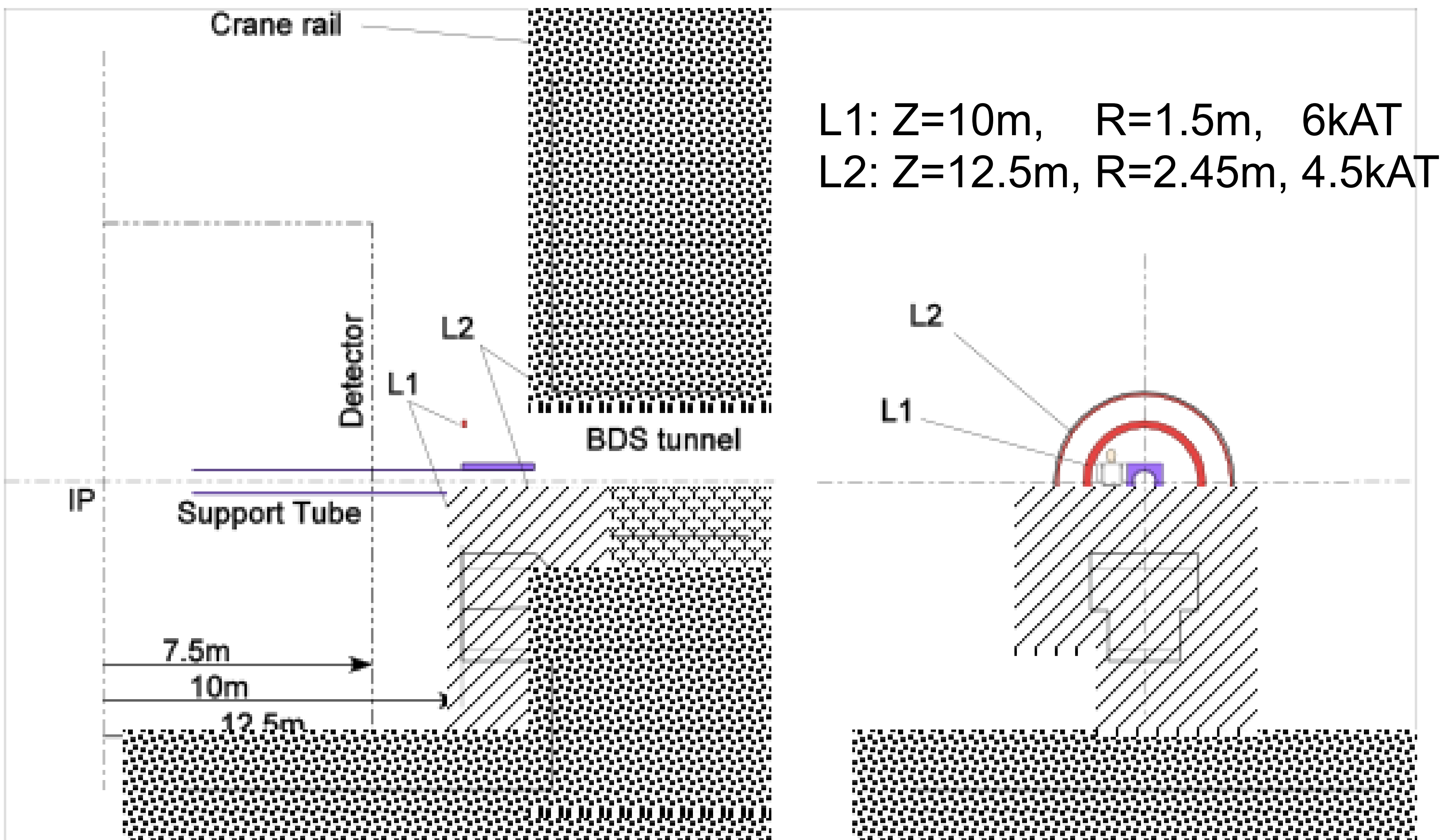
seismic movement with 0.3G = 2.8mm (horizontal)

GLD: "thinner iron structure"



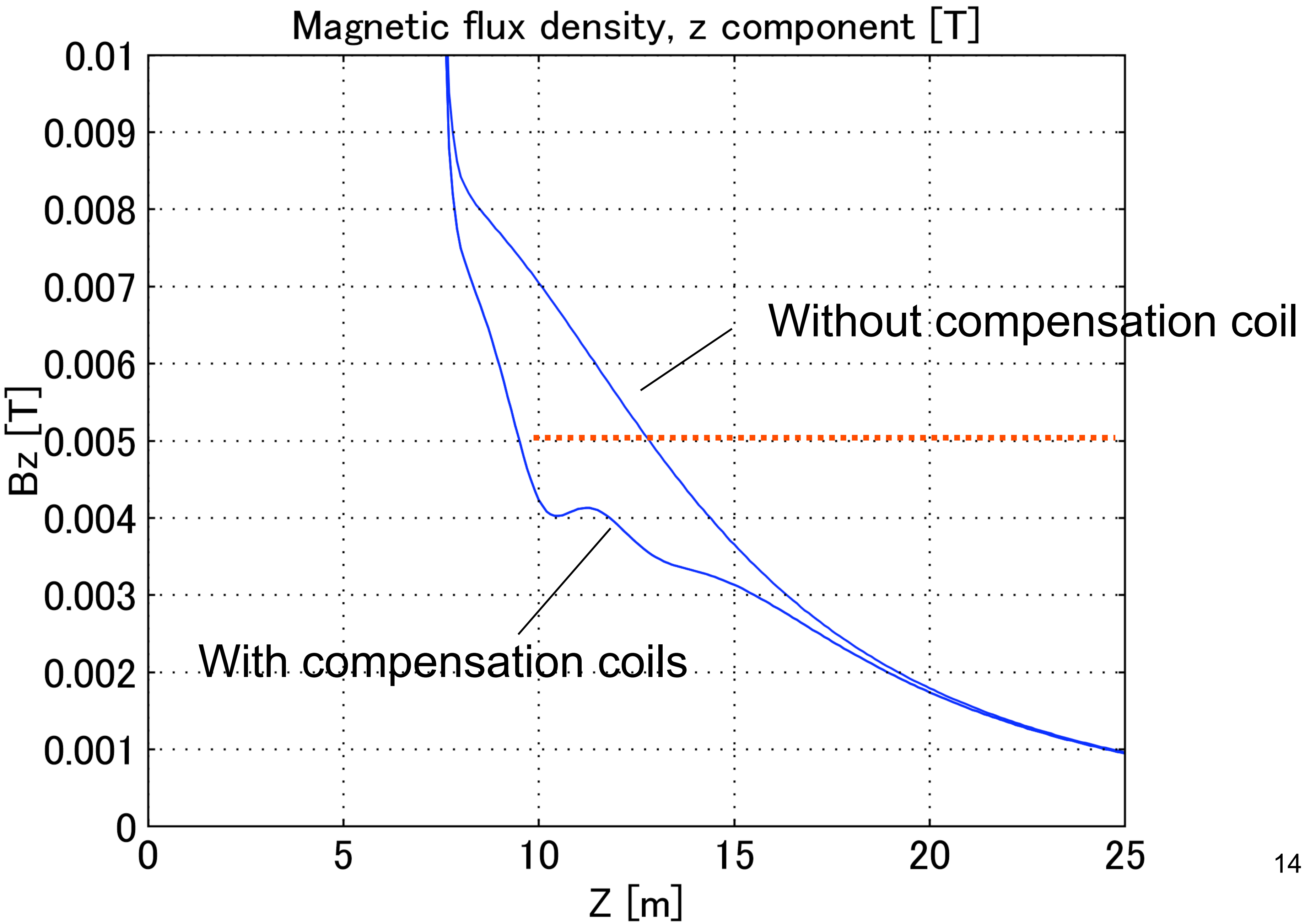
New iron yoke design

- Compensation coils for leakage field

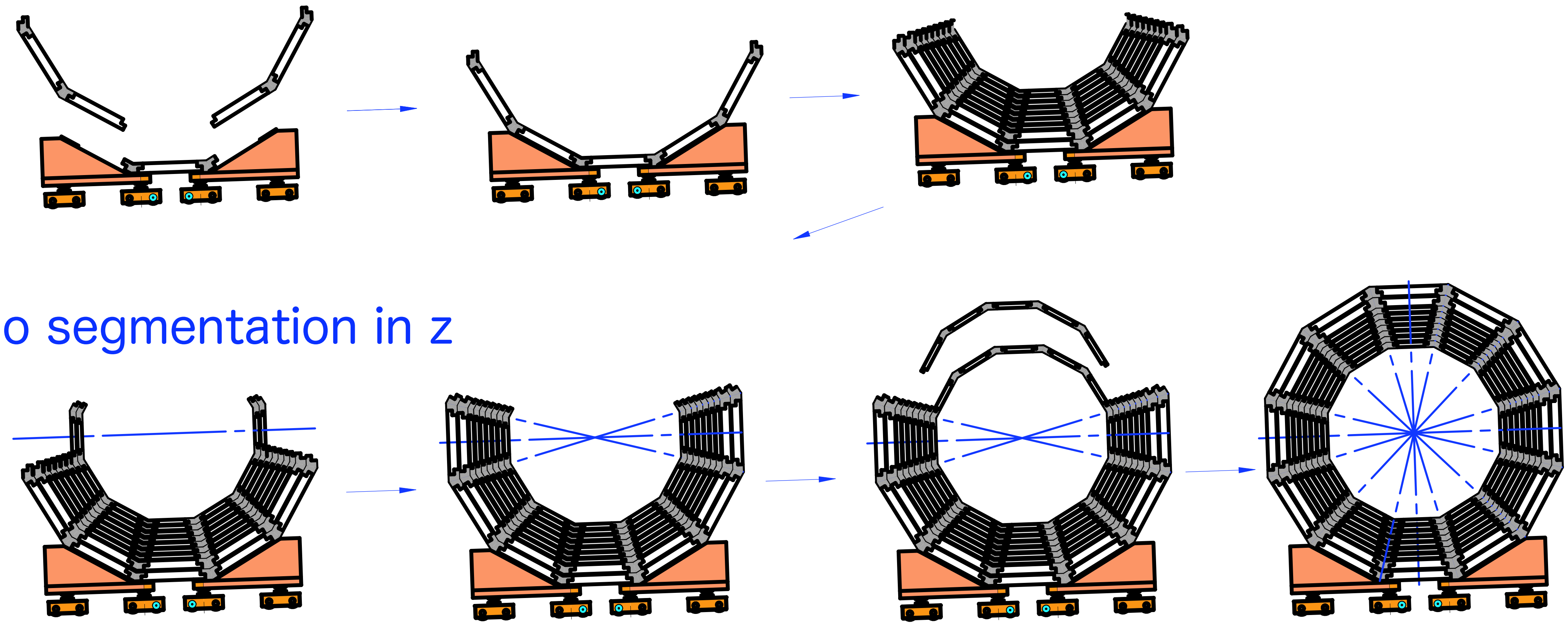


Leakage B-field

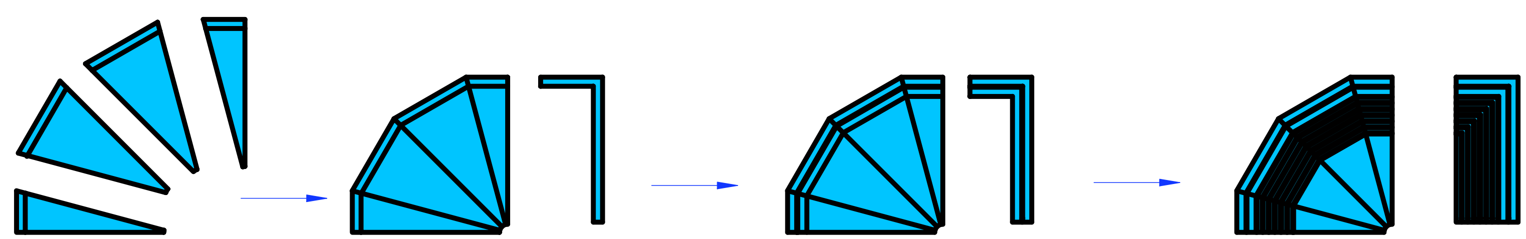
- B field along r=0



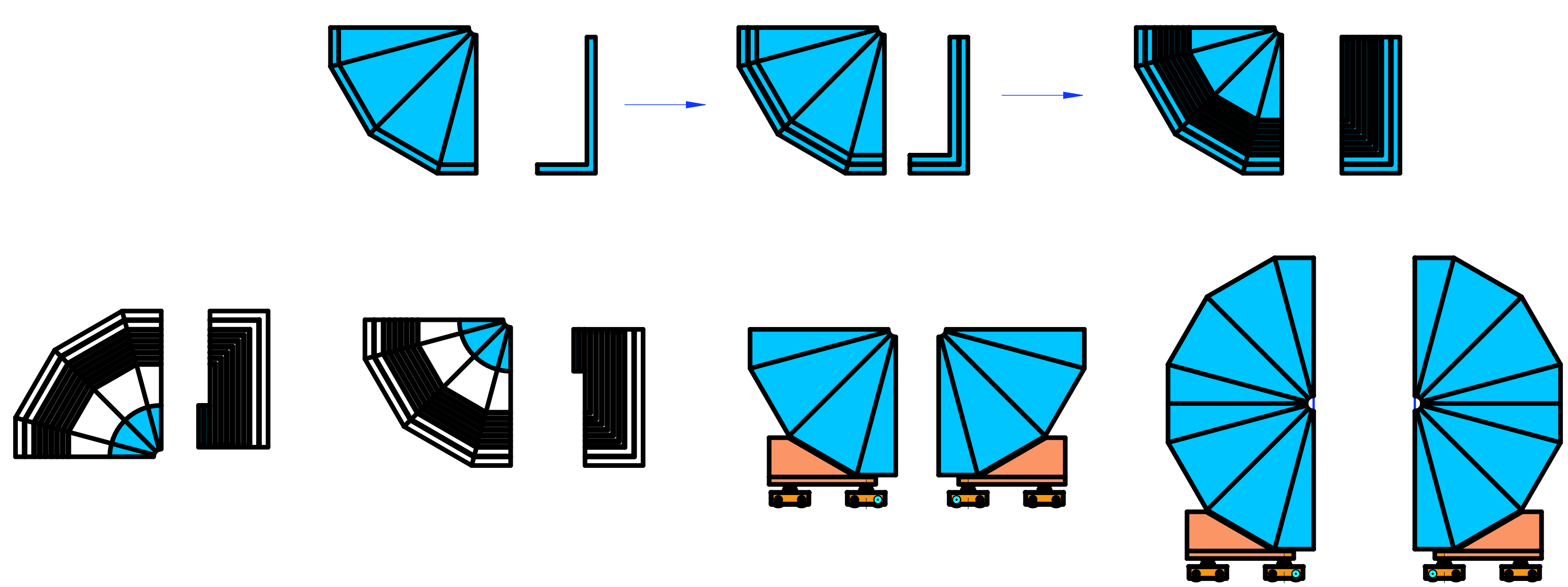
GLD-DOD: Assembling at EXP. Hall

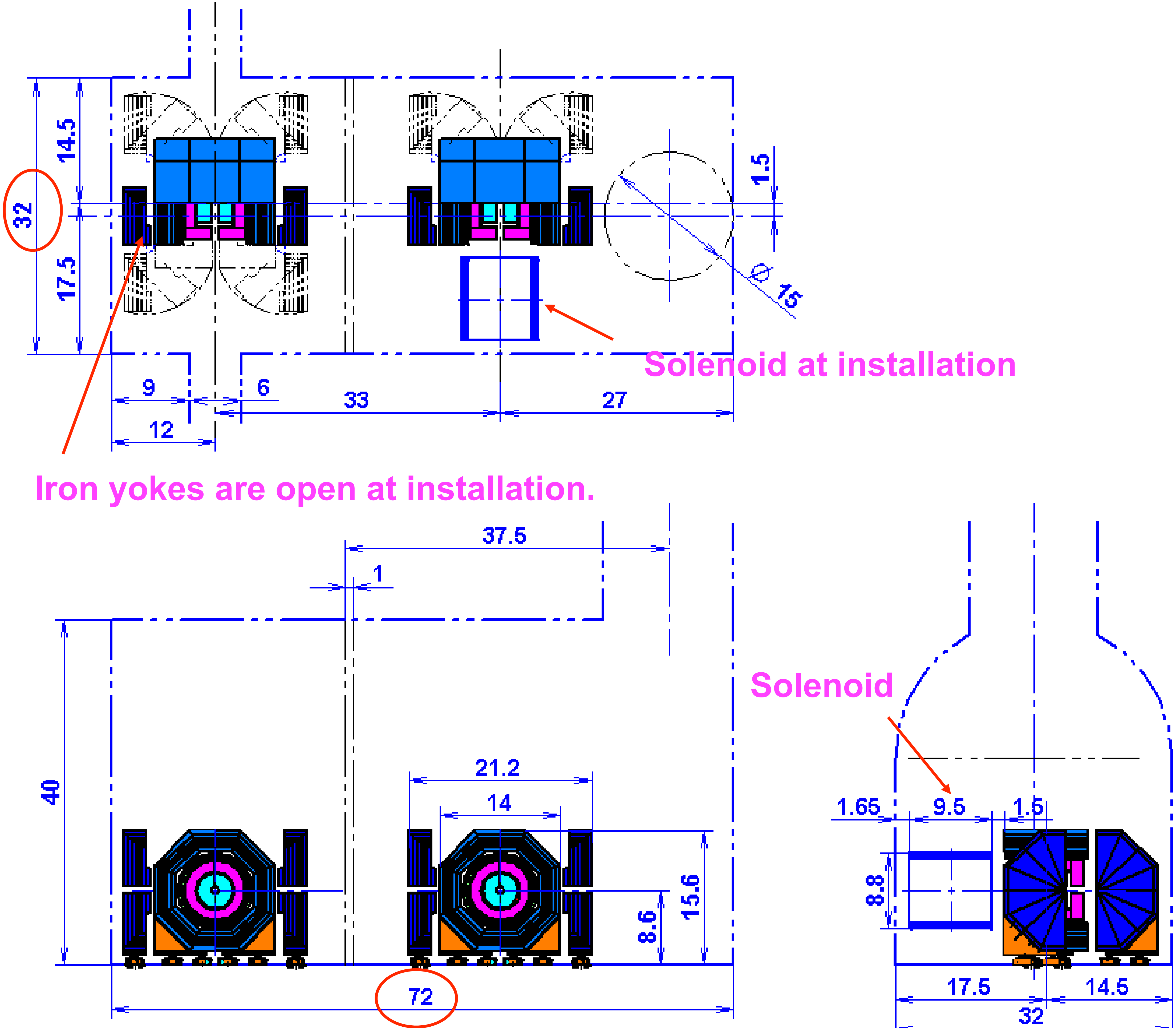


Barrel   no segmentation in z

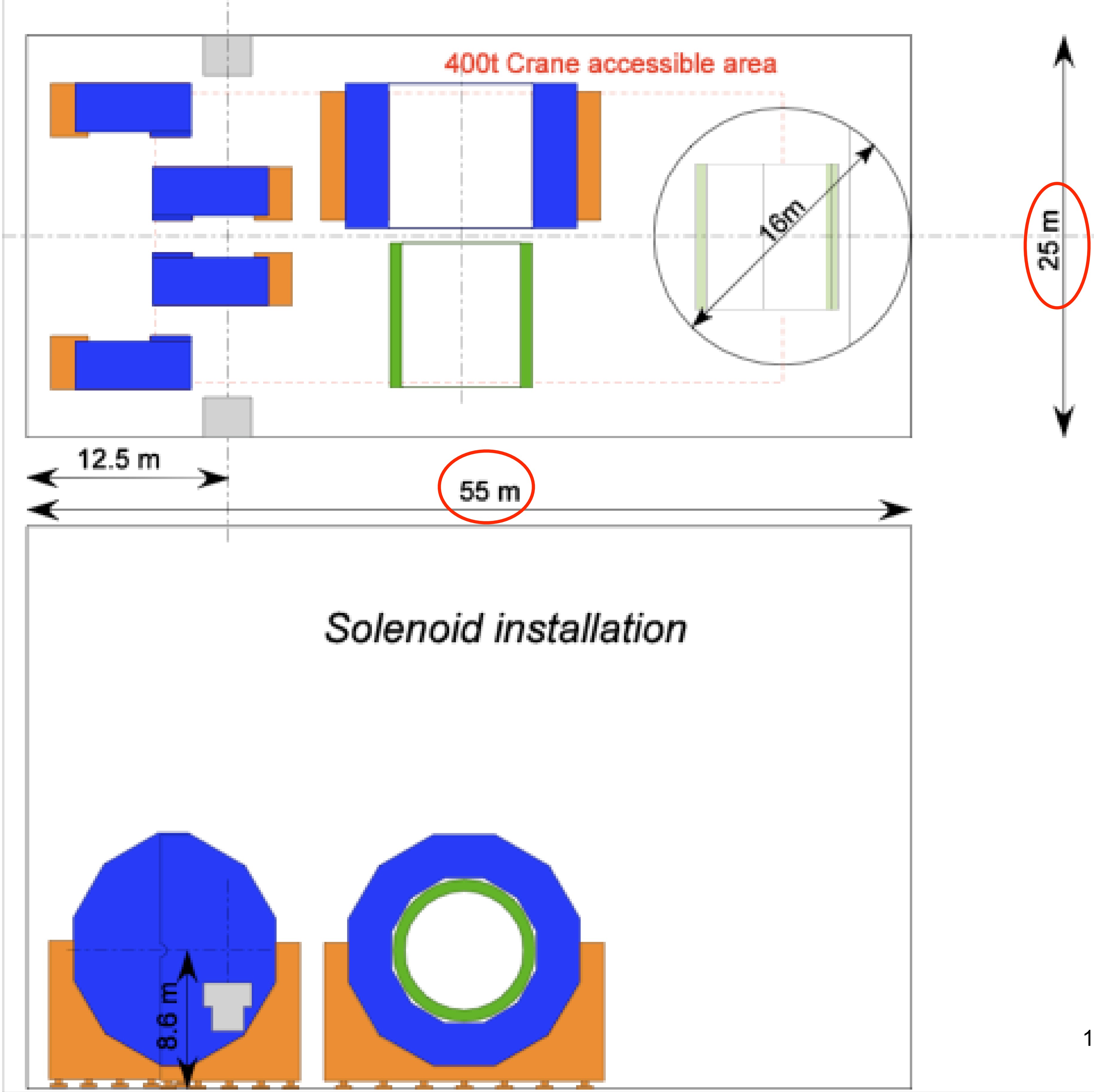


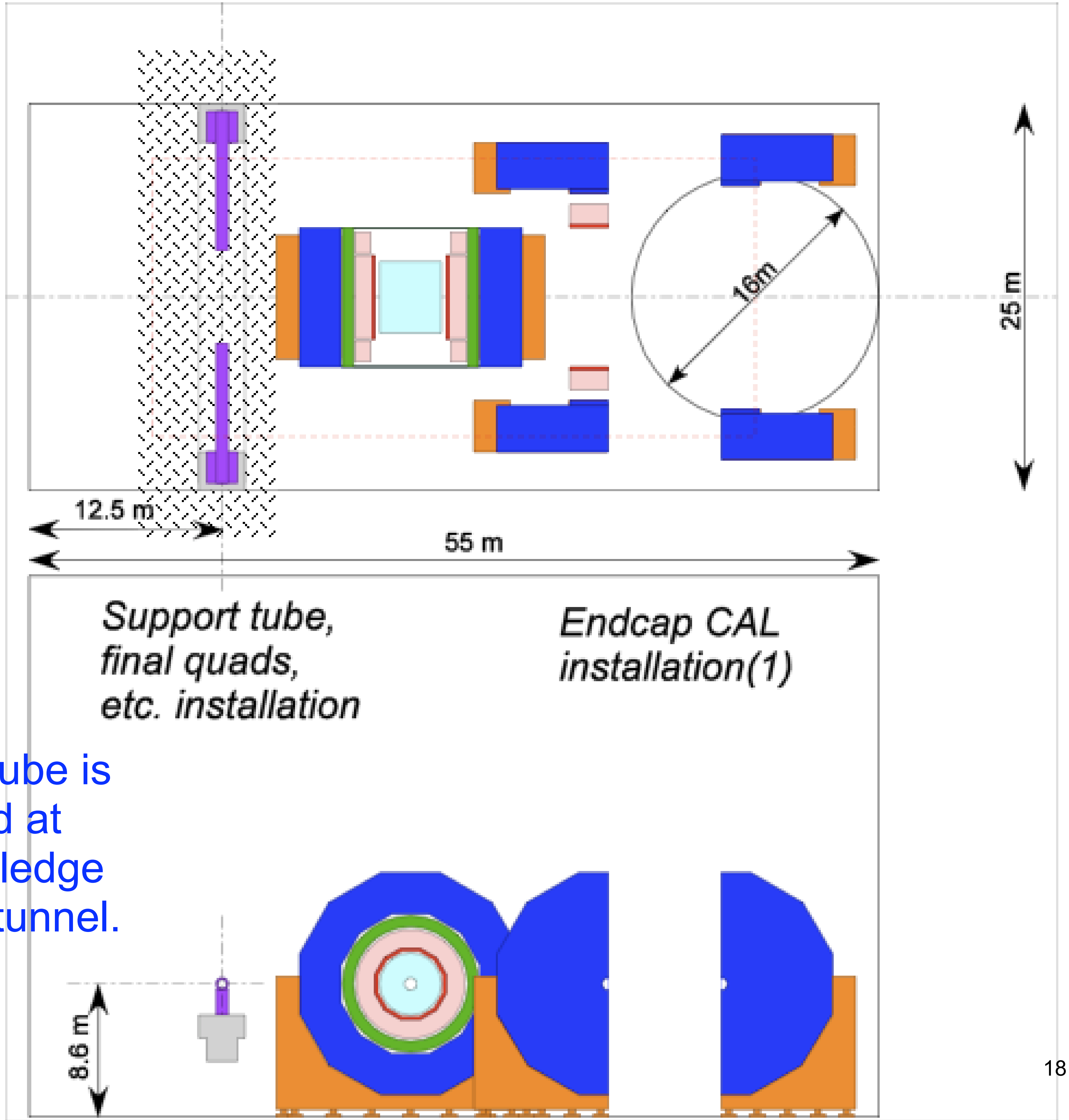
Endcap



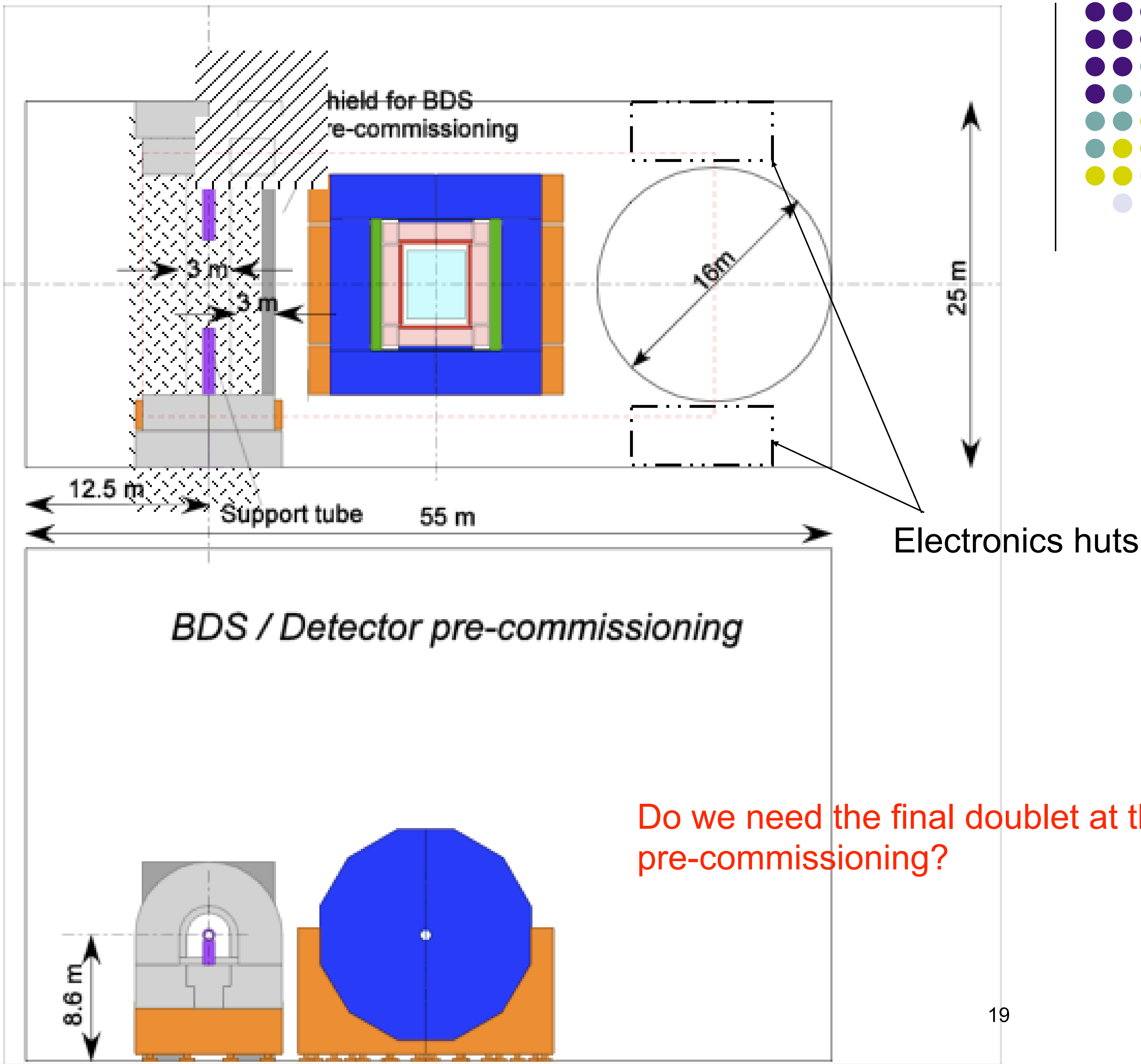

Solenoid at installation
Iron yokes are open at installation.
Solenoid
32
14.5
17.5
9
6
12
33
27
1.5
Ø 15
37.5
1
40
21.2
14
8.6
15.6
72
1.65
9.5
1.5
8.8
17.5
14.5
32

GLD-Surface: Assembling at EXP. Hall

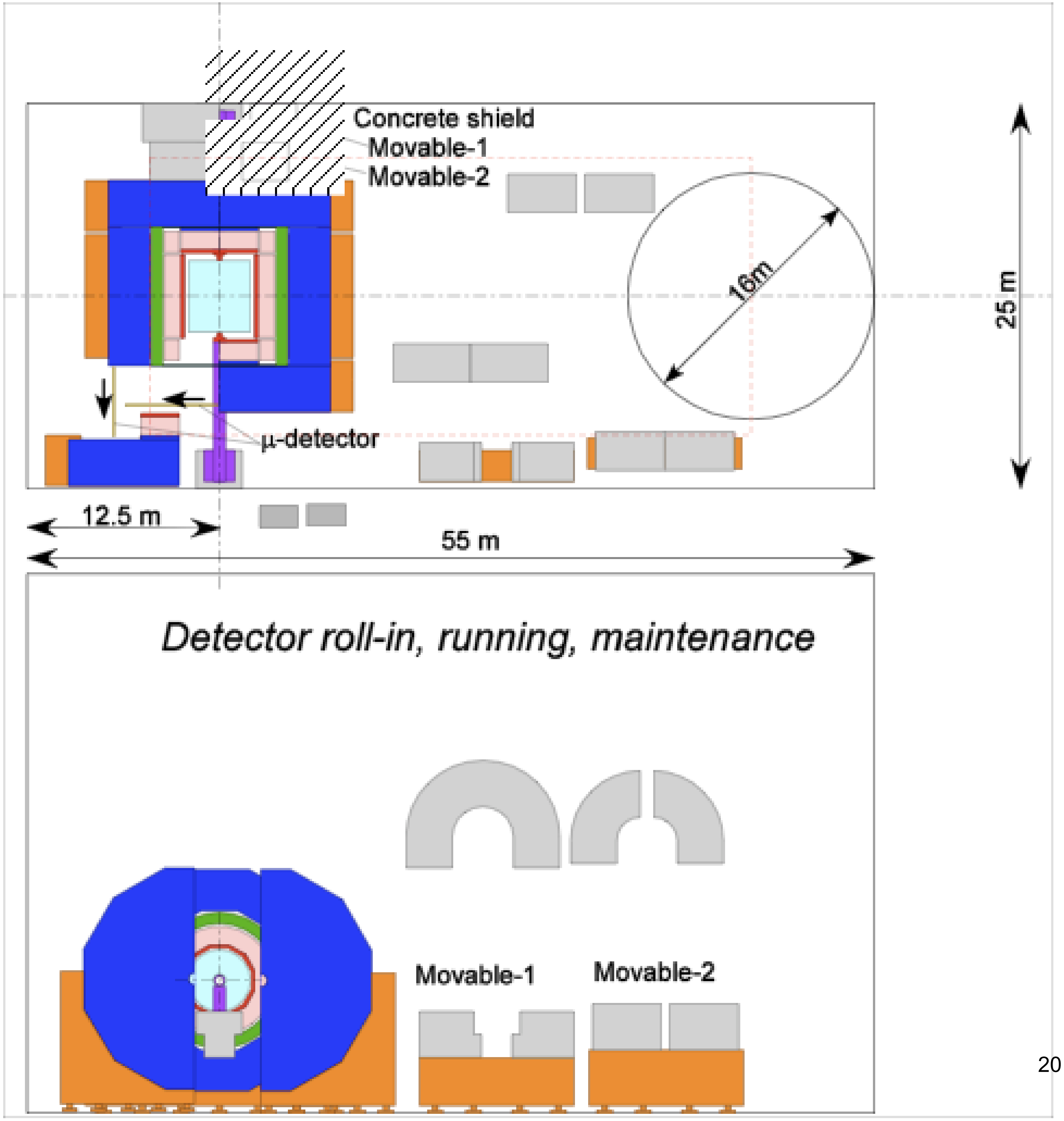




Support tube is supported at concrete ledge from the tunnel.



Do we need the final doublet at the pre-commissioning?


Concrete shield
Movable-1
Movable-2
16m
25 m
μ-detector
12.5 m
55 m
Detector roll-in, running, maintenance
Movable-1
Movable-2

GLD push-pull adaptation

Questions

Q1: Can we move the barrel,endcap and support tubes
without deformation?
(deformation could destroy the beam pipe)

Q2 : How to support FD ?
- maintenance of VTX, SIT
- disconnection of beam pipes
- mm movement of endcap during 3T solenoid excitation
- vibration and rigidity

The original scheme is as follows;
ledge to support tube to FD,BCAL,FCAL,beam pipe to VTX,SIT

Q3 : Can the support tube is supported from floor on a platform ?
or it is supported on the endcap ?

- FD support may be common for all the detector concepts.

Q4: How to monitor the alignment of sub-detectors
during push-pull movement ?

- estimation of displacement is also need.

Q5 : Is the detector assembling scheme the same
with platform ?

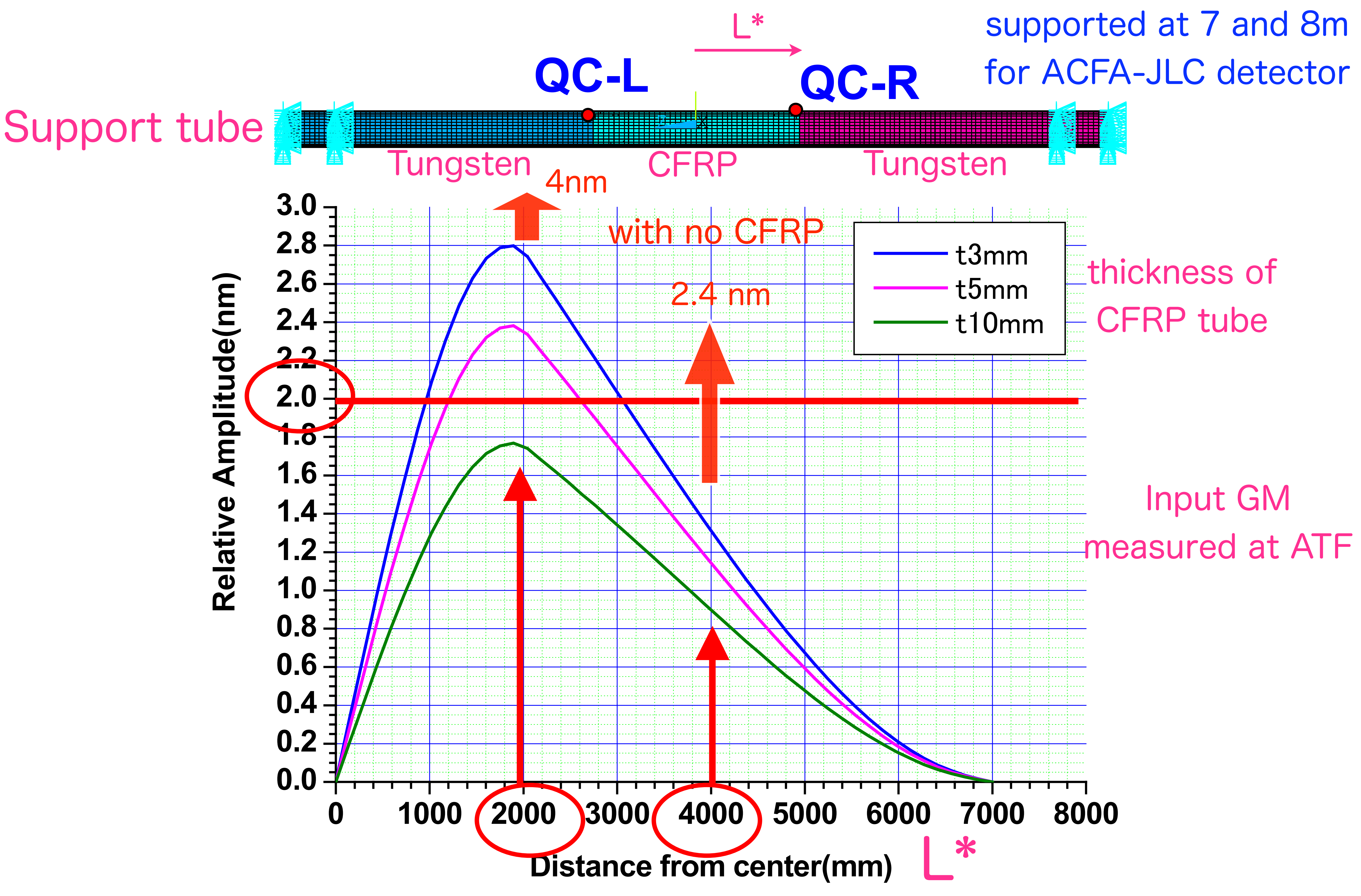
Q6 : Detector calibration/performance stability
after push-pull movements ?

- effects of solenoid magnetic field excitation ON and OFF

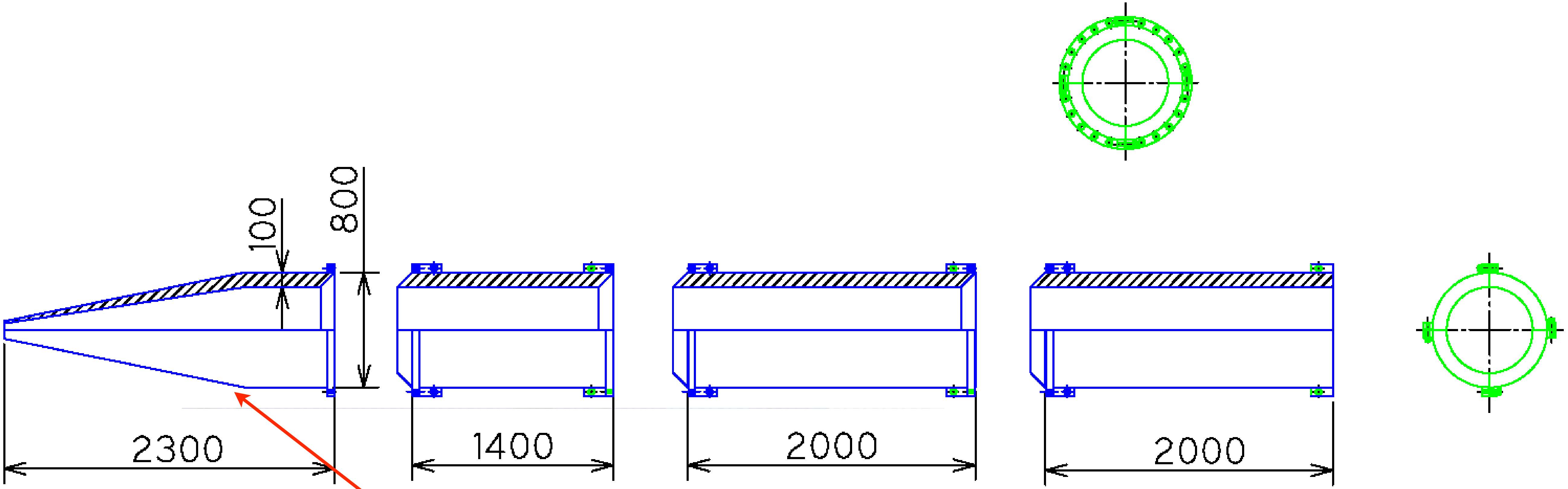

CMS "Platform"
22m x 22m x 2m
closed in 30min.
142 tons of high
tensile steel in plug

H.Yamaoka's talk at LCWS2005

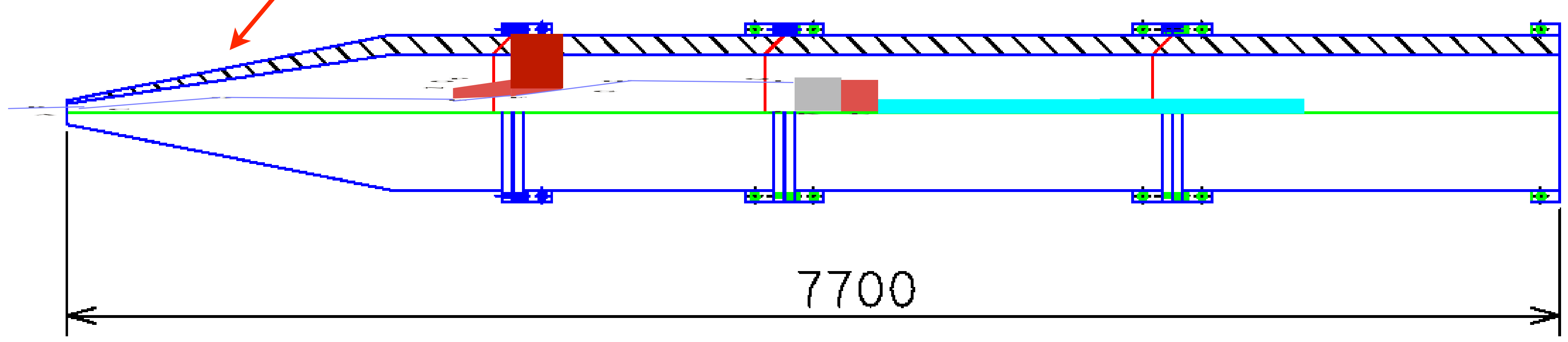
Stability of two final quadrupoles



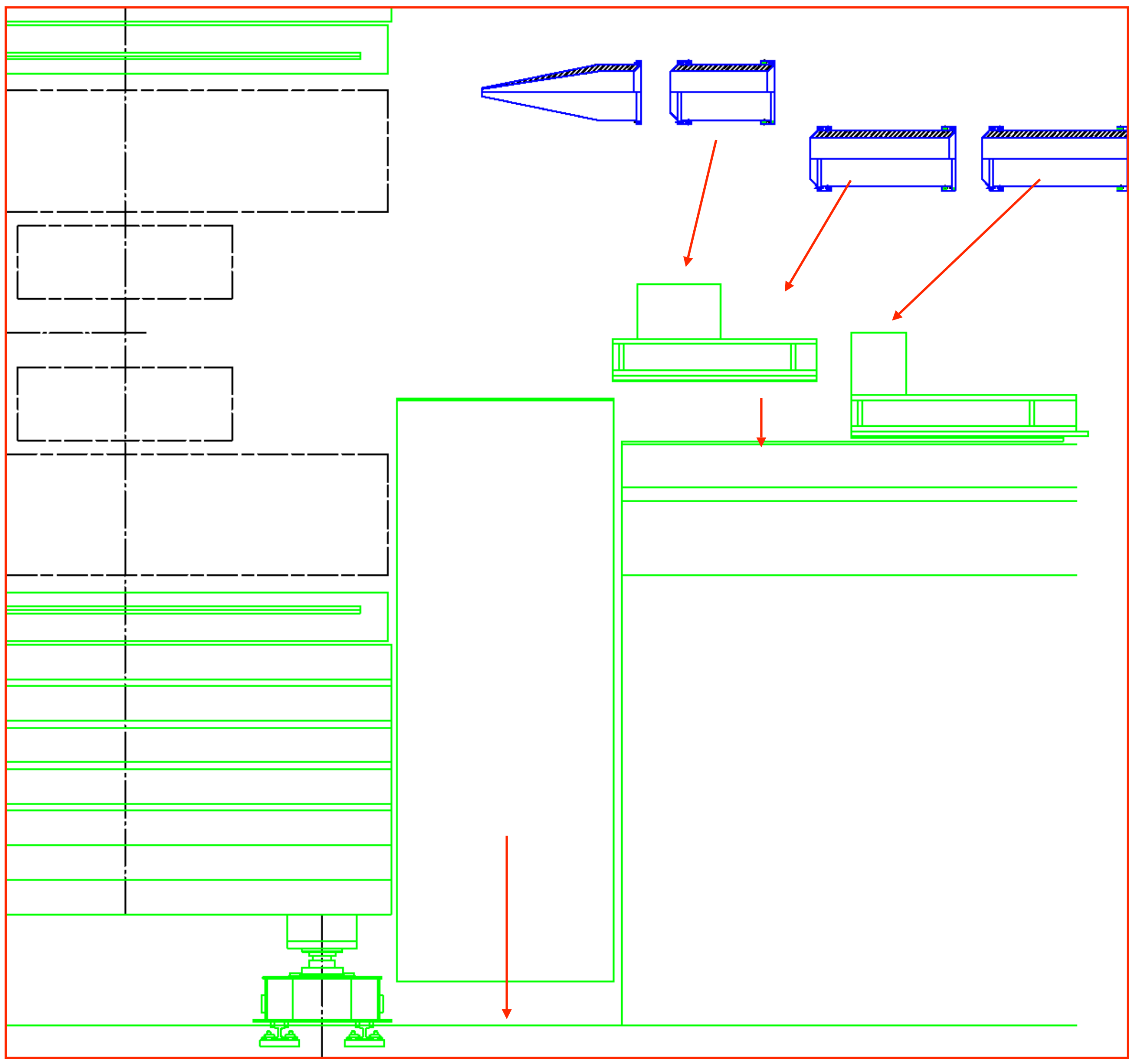
Tungsten masks (JLC, L*=2m)

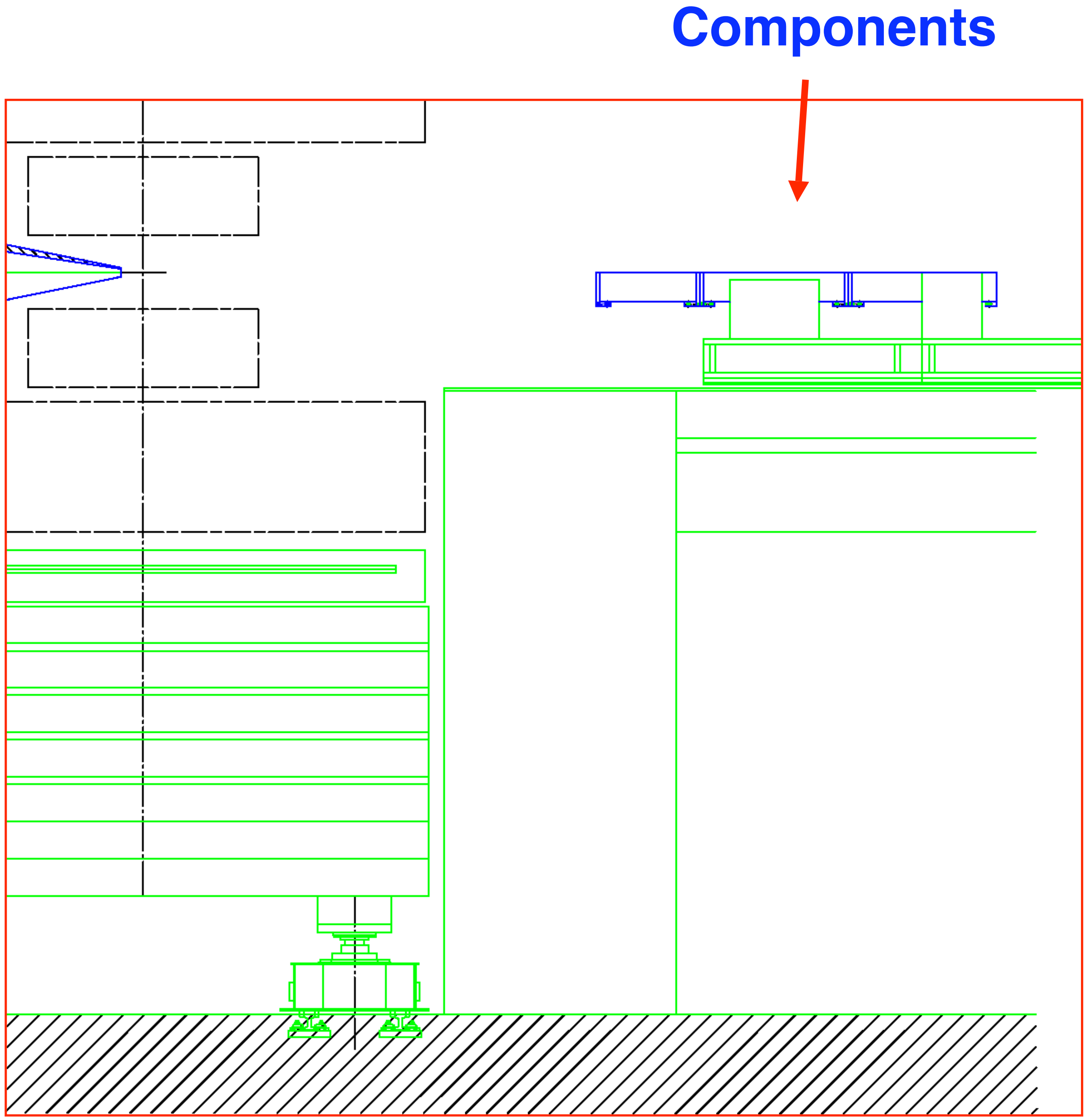


no conical mask but FCAL and BCAL at GLD

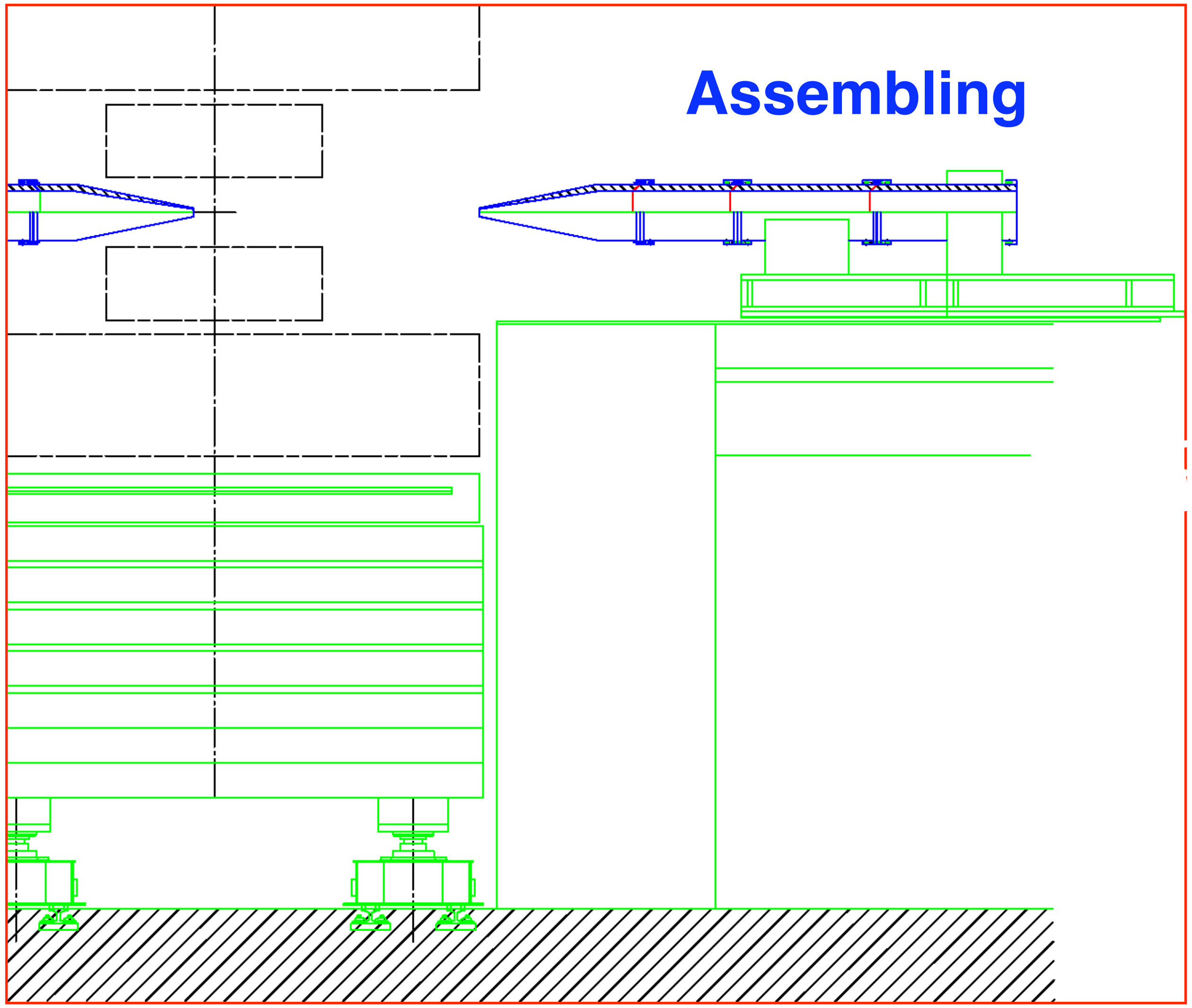


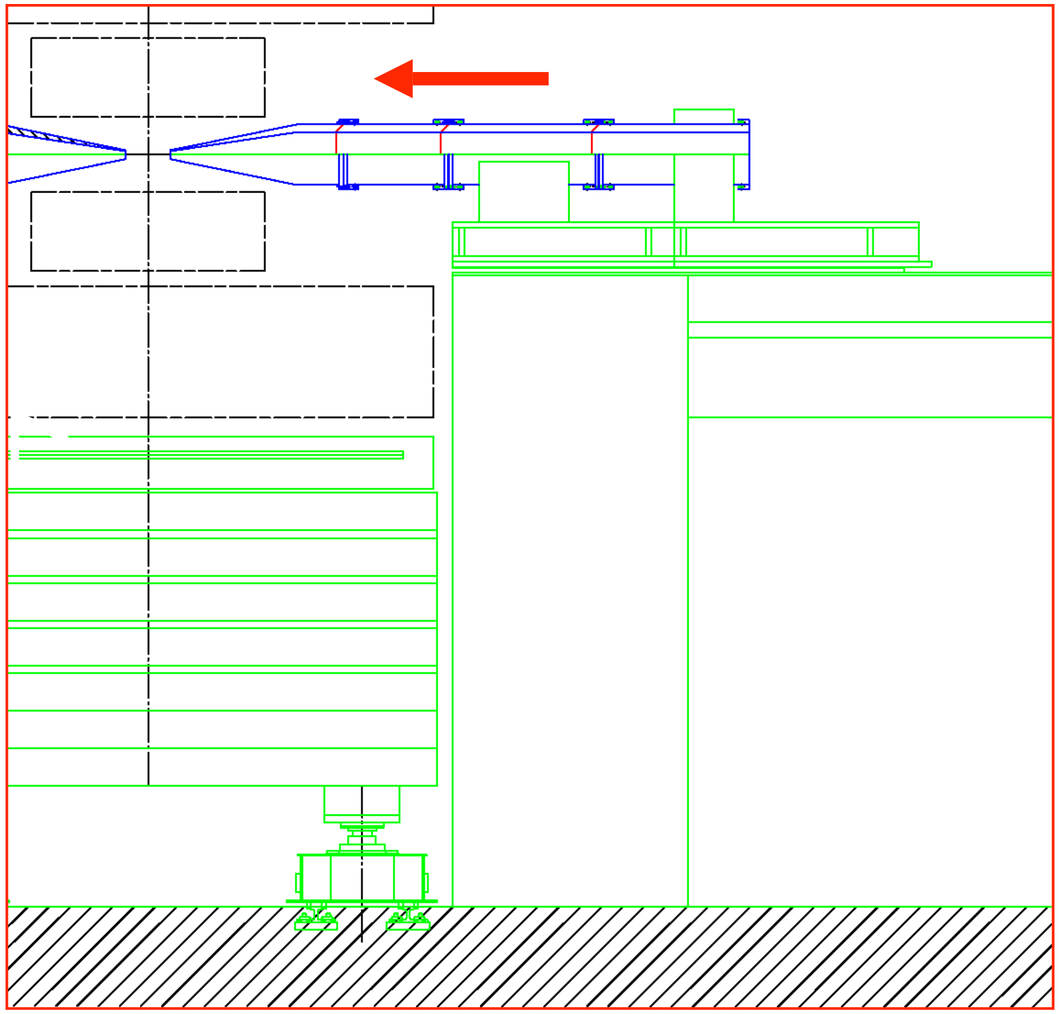
Assembling (JLC, L*=2m)



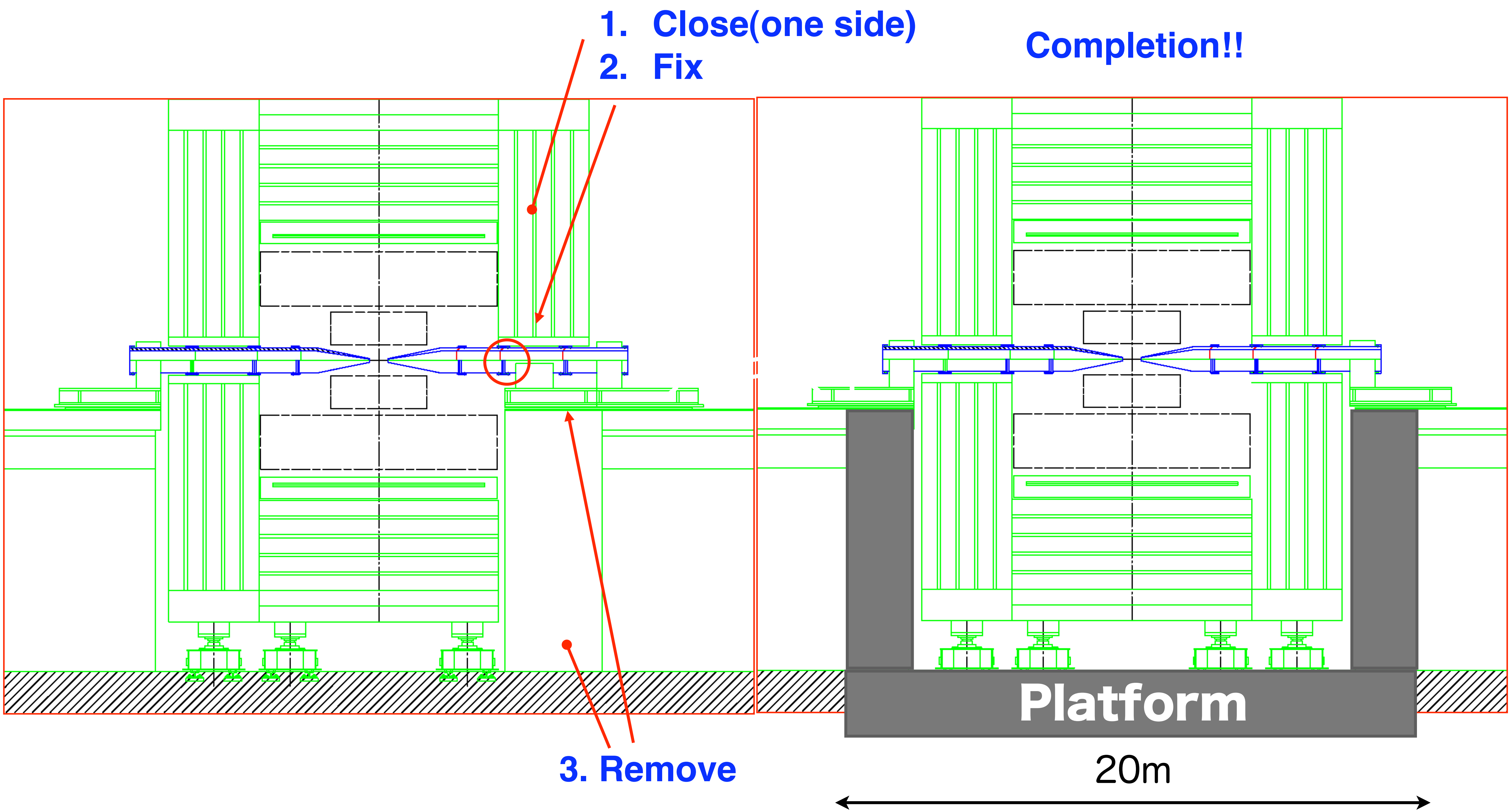


Assembling (JLC, L*=2m)





Assembling (JLC, L*=2m)



push-pull : ledge to concrete base on the platform

or suport tube on the endcap

Summary

1. IR optimization will be continued.
2. At present, GLD has no solution for push-pull scheme.
3. There are a number of questions for the adaptation.
4. We would like to investigate these questions

   toward the EDR.
5. We concern about stability of two final quadrupoles;

   How to support them ?

   - on the platform   or on the detector ?