MDI at LCWS2007

T. Tauchi (KEK)

Science Creation “ILC Detector”, 14 June 2007

LCWS2007 MDI sessions

Thursday 31 May 2007

LCWS: MDI - DESY Auditorium (14:00-15:30)

LCWS 2007: Machine Detector Interface

GamCal, BamCal , polarimeter

- Conveners: Dr. BUESSER, Karsten

time	title	presenter
14:00	GamCal, a device for beam diagnostics	MORSE, Bill
14:20	ILC beam diagnostics using BeamCal and GamCal	SAPRONOV, Andrey
14:40	Simulation studies and detector scenarios for an ILC polarimeter	EYSER, Oleg
15:00	Test stand measurements for an ILC polarimeter	KAEFER, Daniela

Thursday 31 May 2007 BDS-joint-1

LCWS: MDI: Joint LCWS/ILC - DESY Auditorium (16:00-18:30)

LCWS 2007: Machine Detector Interface

ESA experiments, GLD,SiD small angle crossing, FONT

- Conveners: Dr. BUESSER, Karsten

time	title	presenter
16:00	ESA program overview	WOODS, Michael
16:20	Status report on design and engineering progress of the head-on IR scheme	NAPOLY, Olivier
16:40	Improved 2 mrad IR layout : current status and plans	BAMBADE, Philip
17:00	Status of FONT4 IP intra-train feedback prototype at ATF	BURROWS, Philip
17:20	Results of the FONT@ESA IP feedback EM background experiment	HARTIN, Tony
17:40	Updates of GLD-MDI	TAUCHI, Toshiaki
18:05	Updates on SiD MDI	MARKIEWICZ, Thomas

Friday 01 June 2007 BDS-joint-2

LCWS: MDI: Joint MDI/BDS - Main Tent (09:00-10:30)

LCWS 2007: Machine Detector Interface

Push-pull, anti-solenoid, QD0 integration

- Conveners: Dr. ANGAL-KALININ, Deepa

time	title	presenter
09:00	Status report on push-pull study	SERYI, Andrei
09:15	Extraction line design for push-pull	NOSOCHKOV, Yuri
09:35	Integration of force-neutral anti-solenoid into QD0 cryostat	PARKER, Brett
09:50	IR systems integration issues relevant to push-pull	PARKER, Brett
10:20	Discussion about IR engineering design workshop	

Friday 01 June 2007

LCWS: MDI - SemRm 4b (14:00-16:30)

LCWS 2007: Machine Detector Interface

LDC backgournds, luminosity pair monitor, GP++ simulation

- Conveners: Dr. BUESSER, Karsten

time	title	presenter
14:00	Physics background as a systematic effect in luminosity measurement at ILC	PANDUROVIC, Mila
14:20	Limitation on precision luminosity measurement from beam-beam effects	RIMBAULT, Cecile
14:40	Update on the beam related backgrounds in the LDC detector	VOGEL, Adrian
15:00	Detector impact of photon backscattering from the extraction line	DADOUN, Olivier
15:20	Pair monitor studies	TAKUBO, Yosuke
15:40	Status of the GP++ beam-beam interaction simulation tool	TOUZE, Francois

Saturday 02 June 2007

LCWS: MDI - SemRm 4b (14:00-15:40)

LCWS 2007: Machine Detector Interface

Energy spectrometer (Comton backscattering and BPMs @ ESA), BeamCal

- Conveners: YAMAMOTO, Hitoshi

time	title	presenter
14:00	ILC beam energy measurement using compton backcattering	MUCHNOI, Nickolai
14:20	Energy measurement with Compton backscattering: updates	VITI, Michele
14:40	Progress report for the Energy Spectrometer test experiment at ESA	MAIHEU, Bino
15:00	BeamCal performance	NAUENBERG, Uriel

Very Forward Instrumentation of the ILC Detector

Wolfgang Lohmann
at 9th ACFA-LC

FCAL Collaboration
High precision design

'Old' Kernel

Univ. of Colorado, Boulder,
AGH Univ., INP & Jagiell. Univ. Cracow,
JINR, Dubna,
NCPHEP, Minsk,
FZU, Prague,
IHEP, Protvino,
TAU, Tel Aviv,
DESY, Zeuthen

New Members

Vinča Institute of Nuclear Sciences, Belgrade
Royal Holloway, London,
BNL, Brookhaven, NY,
LAL, Orsay
Yale Univ.

No Asian participation at present ! Pair monitor ?

Goal-Design and R&D for:

- BeamCal
- GamCal
- LumiCal

Luminosity measurement
Goal: Precision ~10^{-4}

Inner Radius of Cal.:	< 4 µm
Distance between Cals.:	< 60 µm
Radial beam position:	< 0.7 mm

see: PRC R&D 01/02 (2002)

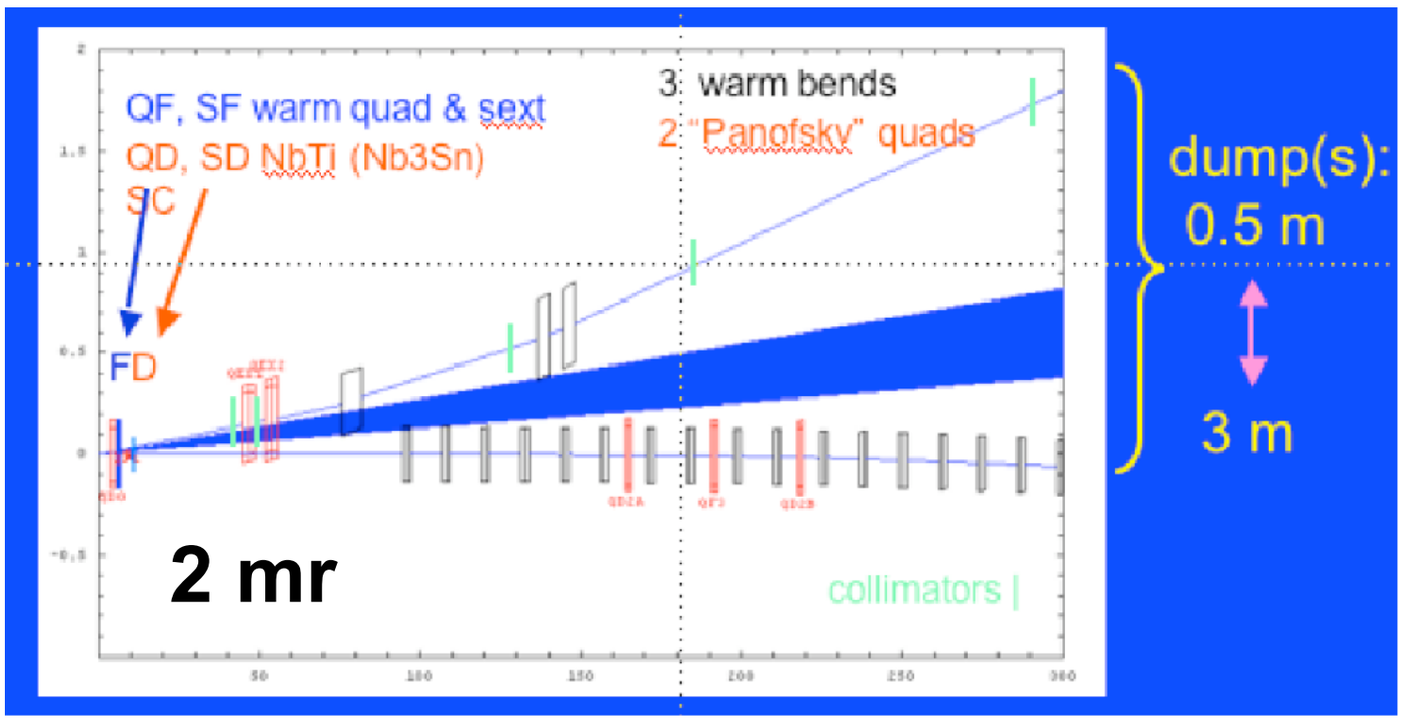
Theme: Work on IR Scheme Alternatives.

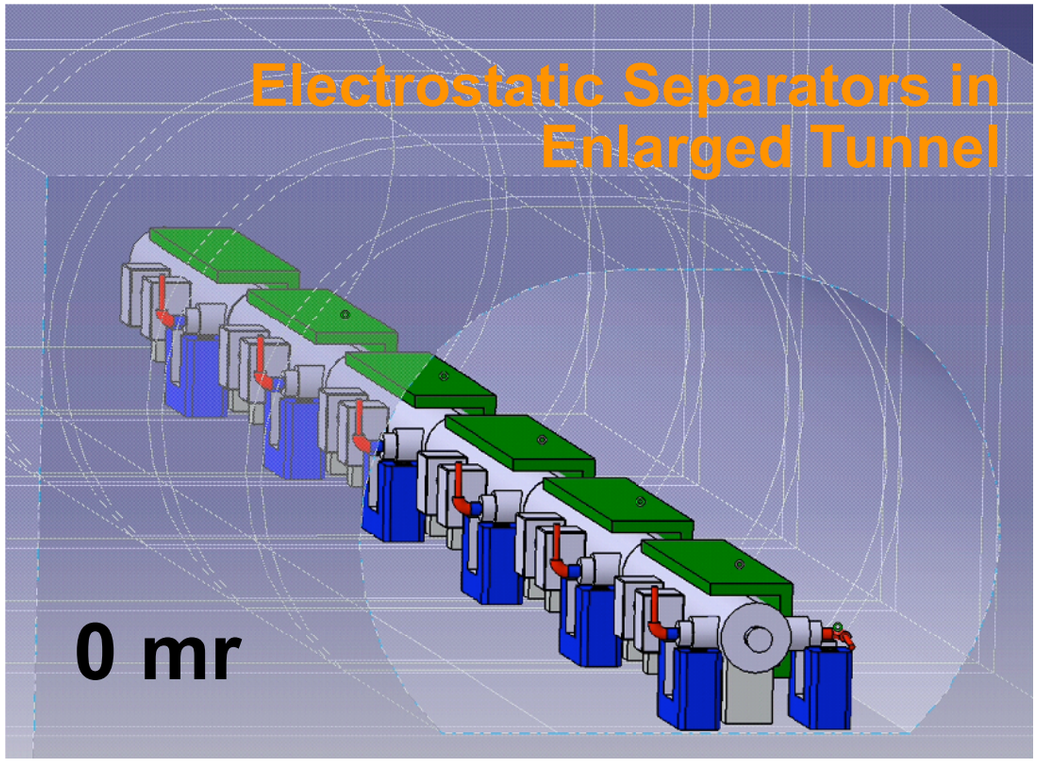
Status report on design and engineering progress of the head-on IR scheme
by Dr. Olivier NAPOLY (CEA)

Improved 2 mrad IR layout : current status and plans
by Philip BAMBADE (Laboratoire de Accelerateur Lineaire (LAL) (IN2P3) (LAL))

Detector impact of photon backscattering from the extraction line
by Dr. Olivier DADOUN (LAL Orsay)

Certainly a lot of effort has been put into streamlining the two "head-on" IR schemes and a lot of progress has recently been made. The groups involved are continuing to develop expertise, training and collaborations to tackle quite thorny issues. The stated goals are to broaden the ILC program without taking resources away from the 14 mr baseline.





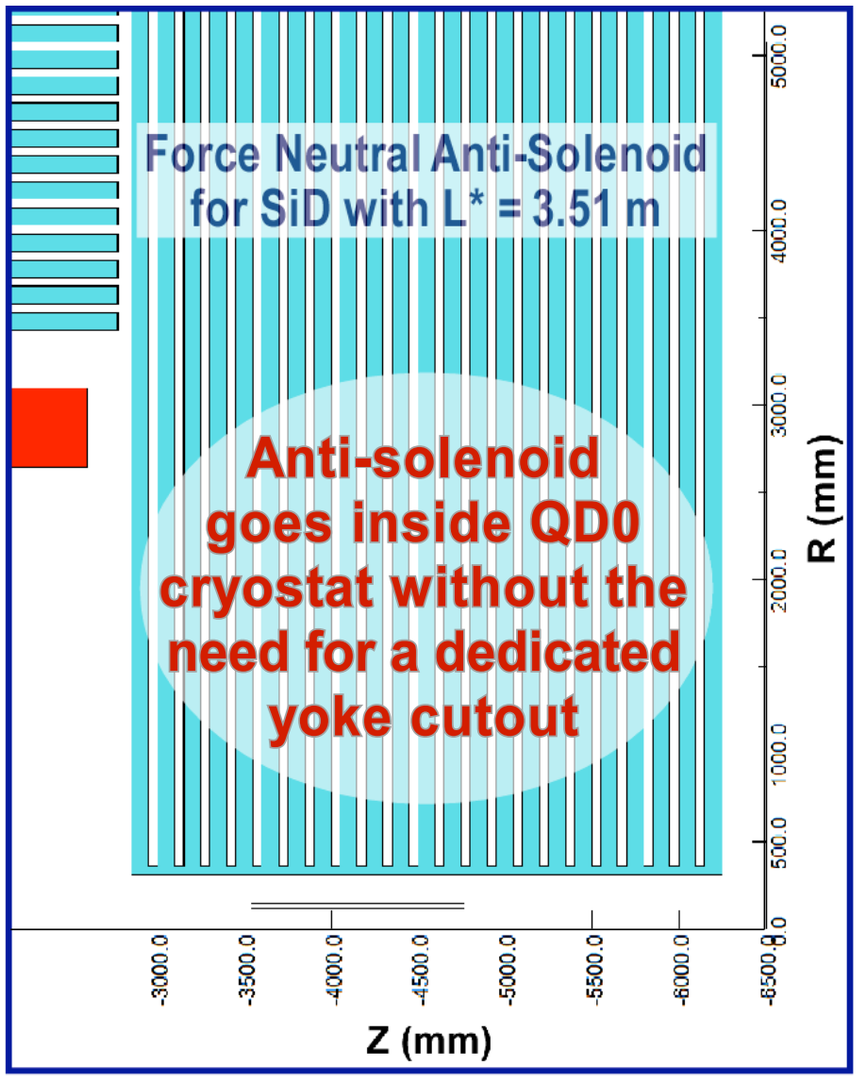
New Concept: The Force Neutral Anti-Solenoid.

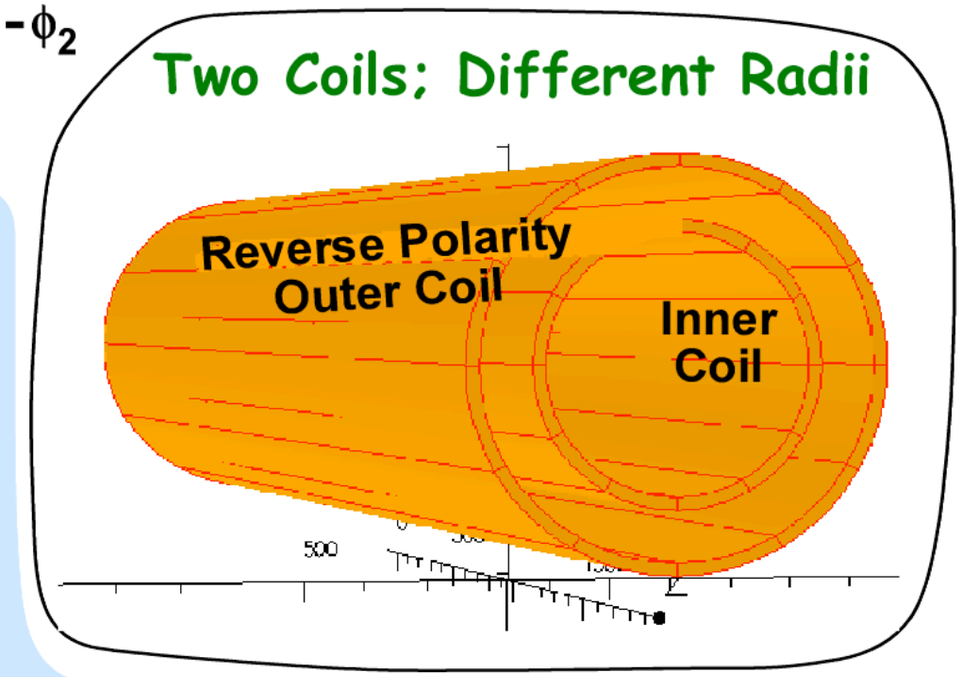
For a loop of circumference C carrying current I the longitudinal force is proportional to Br, thus

We want $\sum_{j=1}^{N_1} (I_1 C_1 Br_1)_j + \sum_{k=1}^{N_2} (I_2 C_2 Br_2)_k = 0$

Since $C \propto R$ and $Br \propto R$, so $CBr \propto R^2$ and for $I_1 = -I_2$ we have

$N_1 \overline{A}_1 = N_2 \overline{A}_2$ or $\phi_1 = -\phi_2$





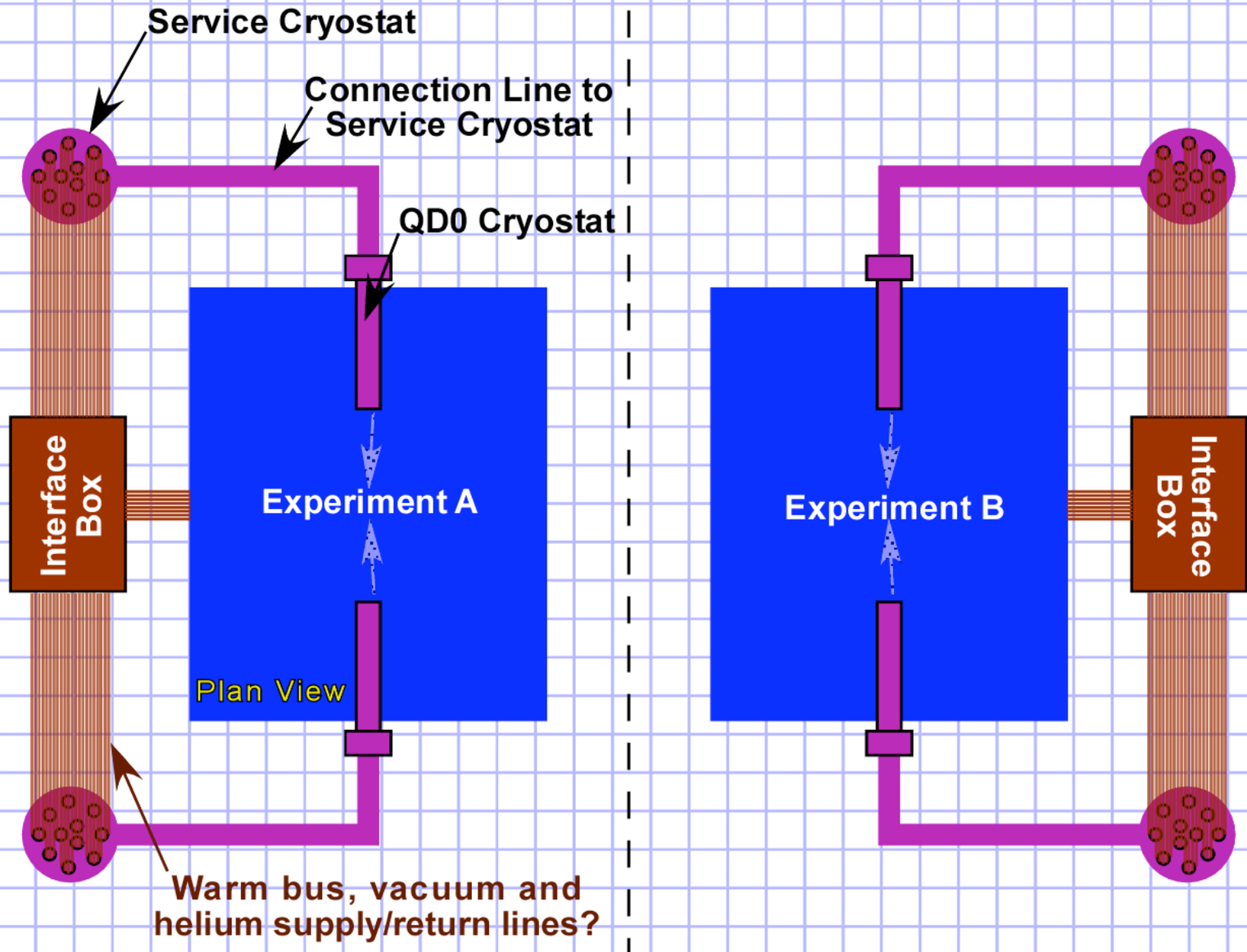
We can arrange for the sum of the forces on the inner and outer coils to fully cancel... but still have a net anti-solenoidal field inside the inner coil.

Note: This solution does not require detector changes for different L*.

Homework Item #3: Path & Length Between QD0 and Service Cryostat.

BROOKHAVEN NATIONAL LABORATORY
Superconducting Magnet Division

Topology proposed for push-pull to keep the path length between QD0 and the service cryostat to about 10 m...



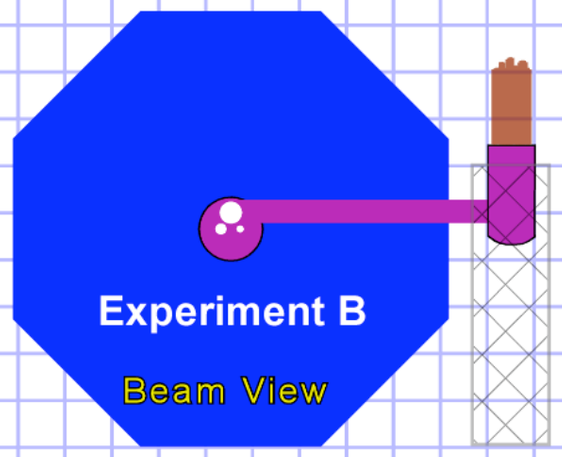
Impact on cryo of a net elevation change?

If/how each experiment opens up while at beam position?

Separate the recooler and current lead functionality?

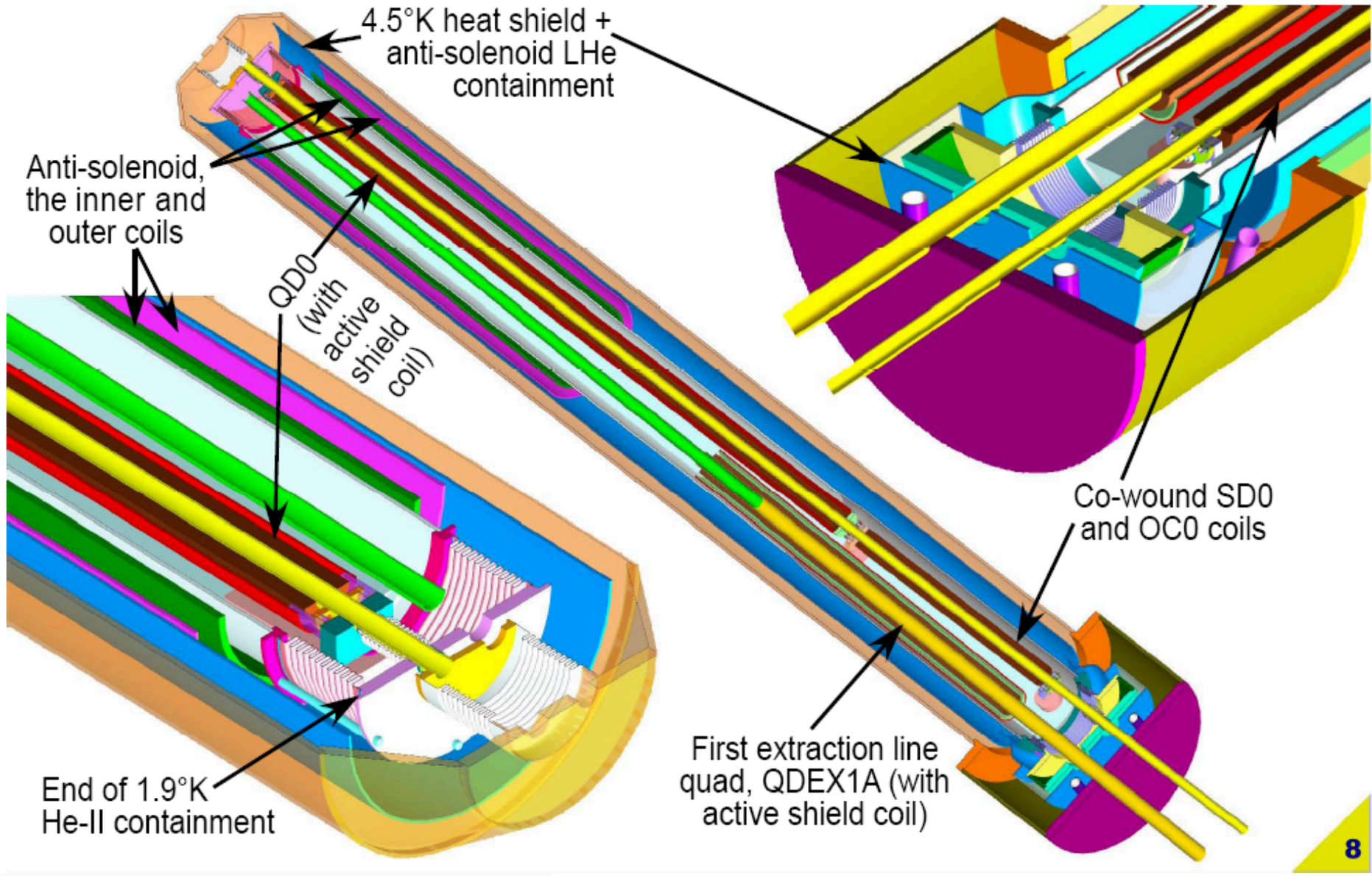
Where is the interface box and connection to umbilical?

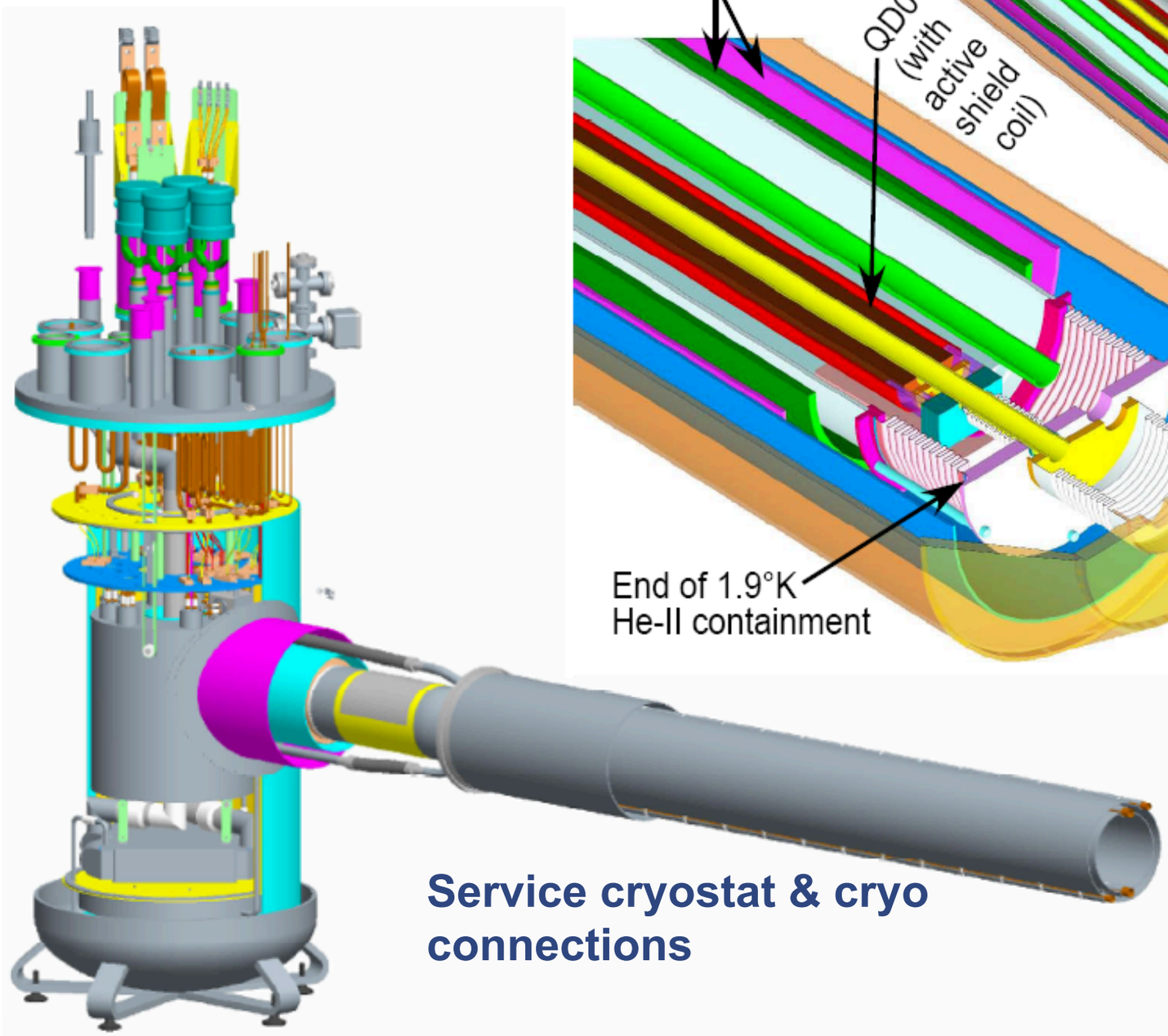
What about the pacman?



while keeping heat exchanger's elevation close to that of QD0.

FD & IR cryo design, start





Service cryostat & cryo connections

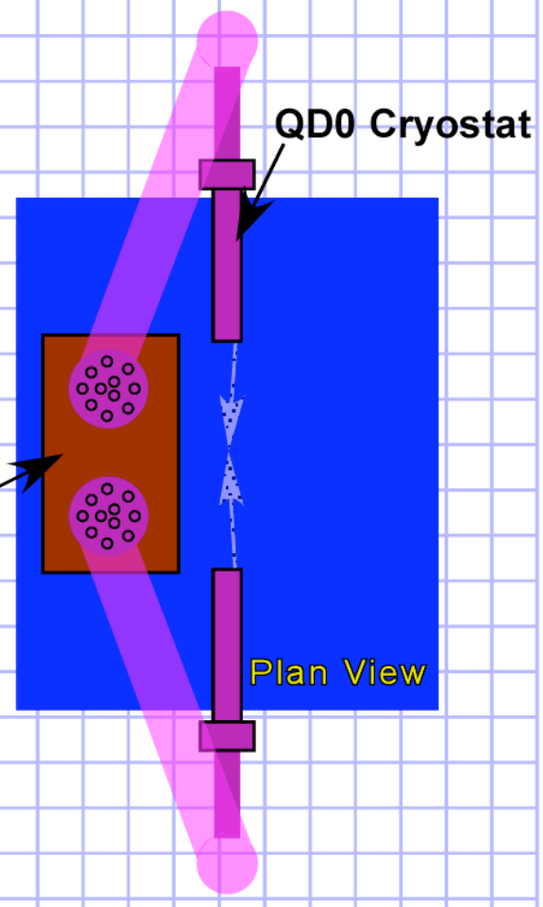
BNL

Homework Item #3': Path & Length Between QD0 and Service Cryostat.

BROOKHAVEN NATIONAL LABORATORY
Superconducting Magnet Division

Suggestion to consider: Separate out functionality of service cryostat to keep He-II heat exchangers close to QD0 but then make a vertical transfer to a more complicated control box that then houses all the current leads and umbilical interface.

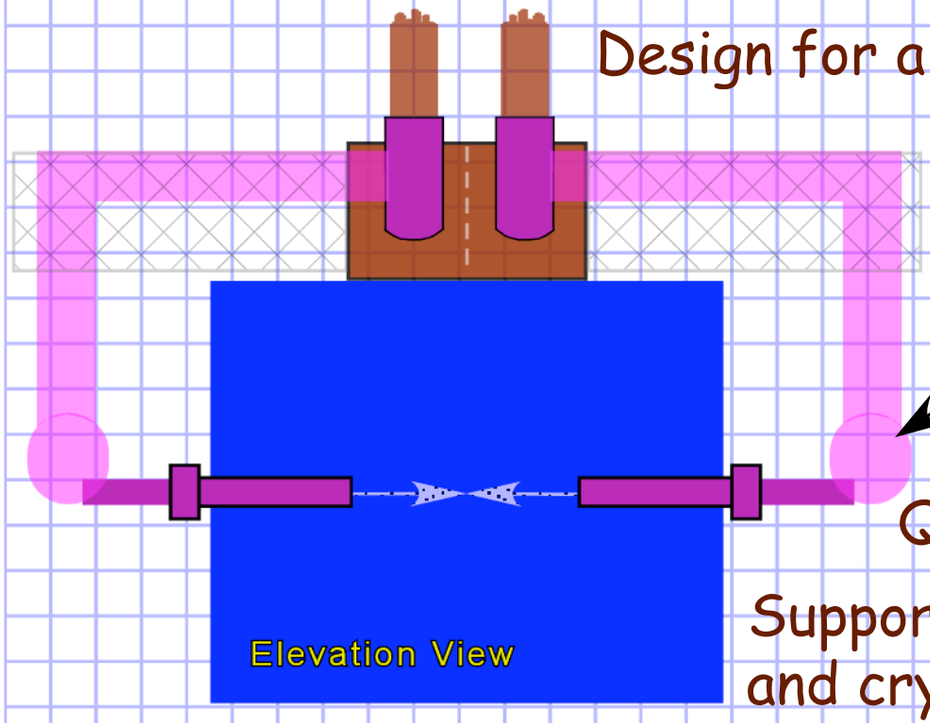
With a different layout it may still be possible to keep the He-II heat exchanger close to the QD0 cryostat but run the cryogenic connection lines vertically so that the pacman shielding can separate horizontally instead of vertically.



Pacman needs cavity for heat exchanger.

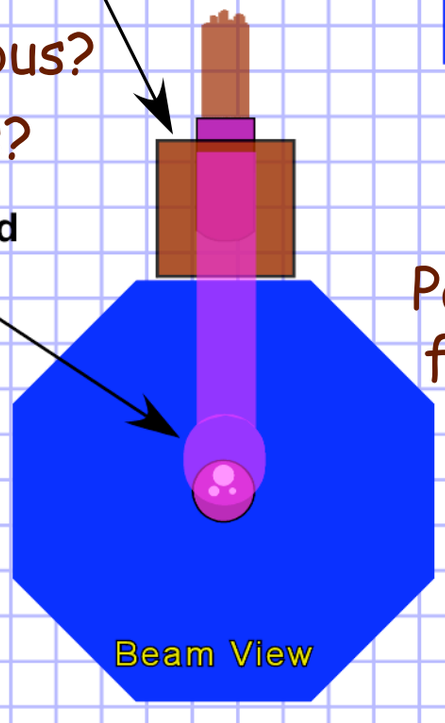
Design for a long run of cold bus?

Cool-down issues?



QF1 interference?

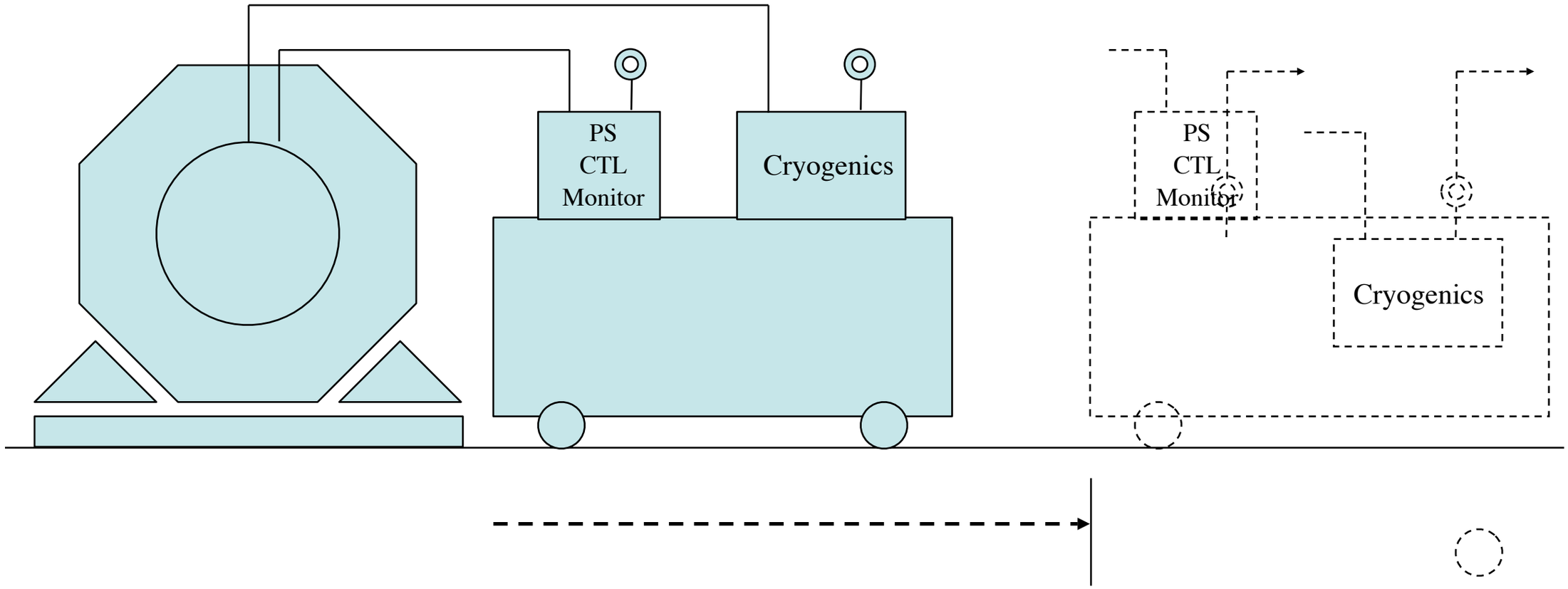
Support heat exchanger and cryo lines from top?



Vertical cryo line's diameter?

Concept of Pushpull Detector System with SC Magnet and Cryogenics

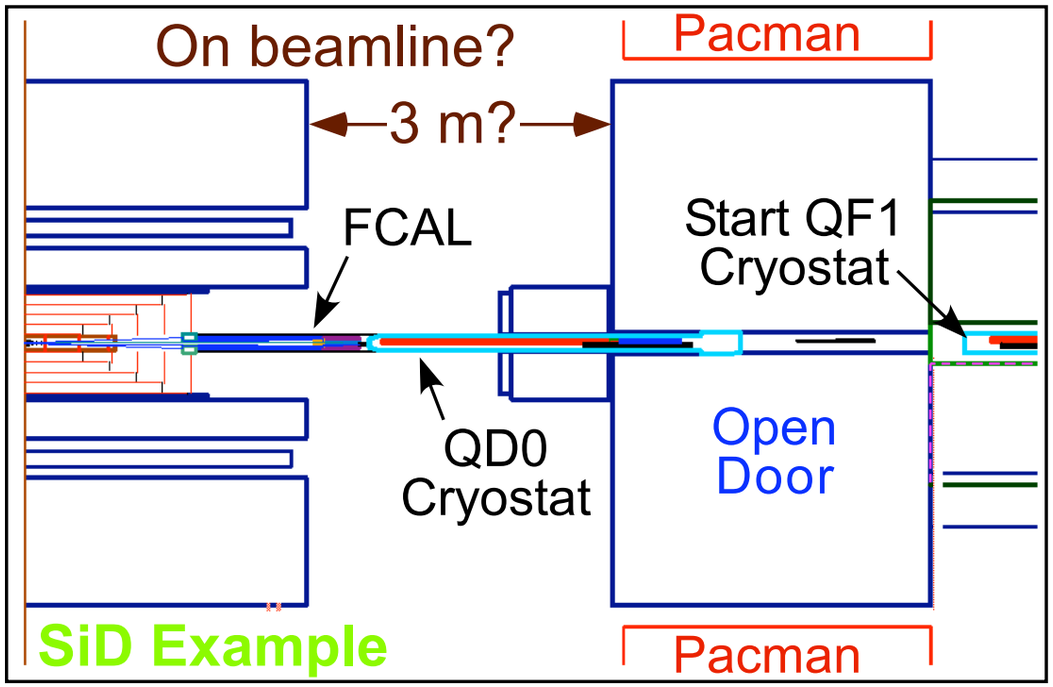
common cryogenics for QD0 ? (T.Tauchi)

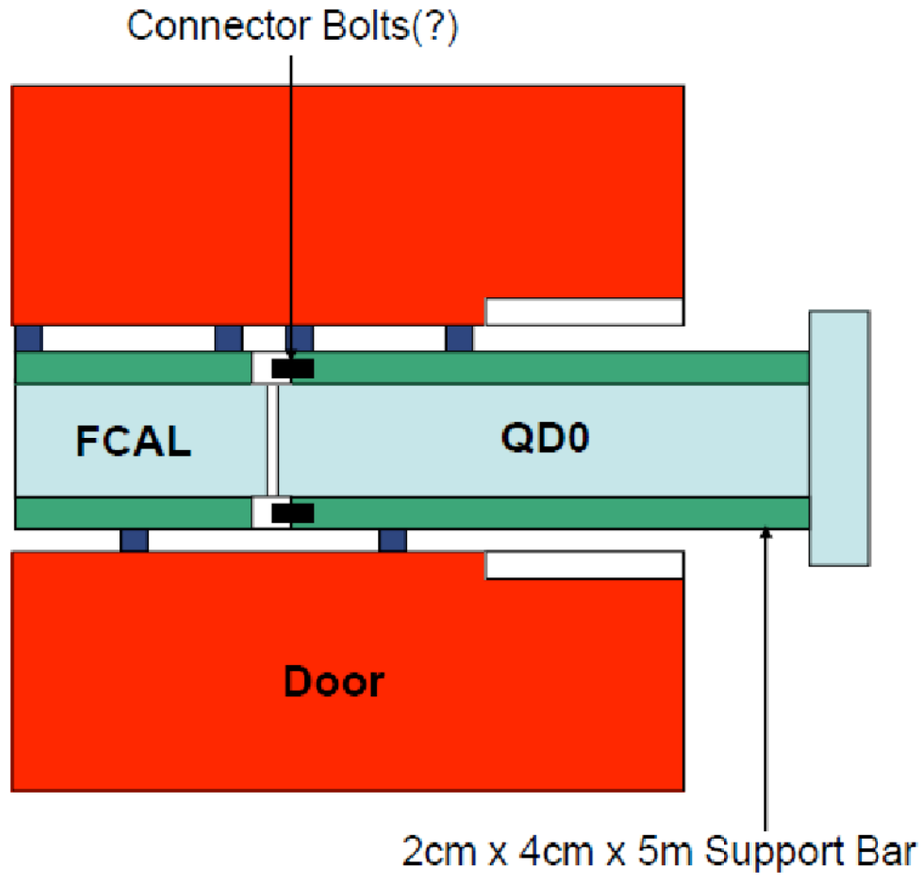


Detector magnet system needs to be movable together with the cryogenics .

Homework Item #5: All Detector Concepts! We Need QD0 Support / Access Scenarios.

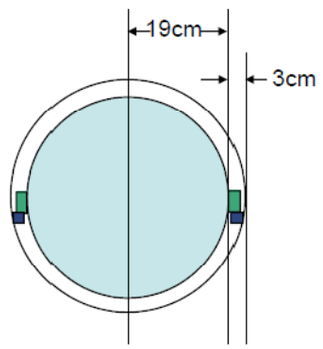
Use "support tube," rails or something else?





Door opens longitudinally or has a vertical split?

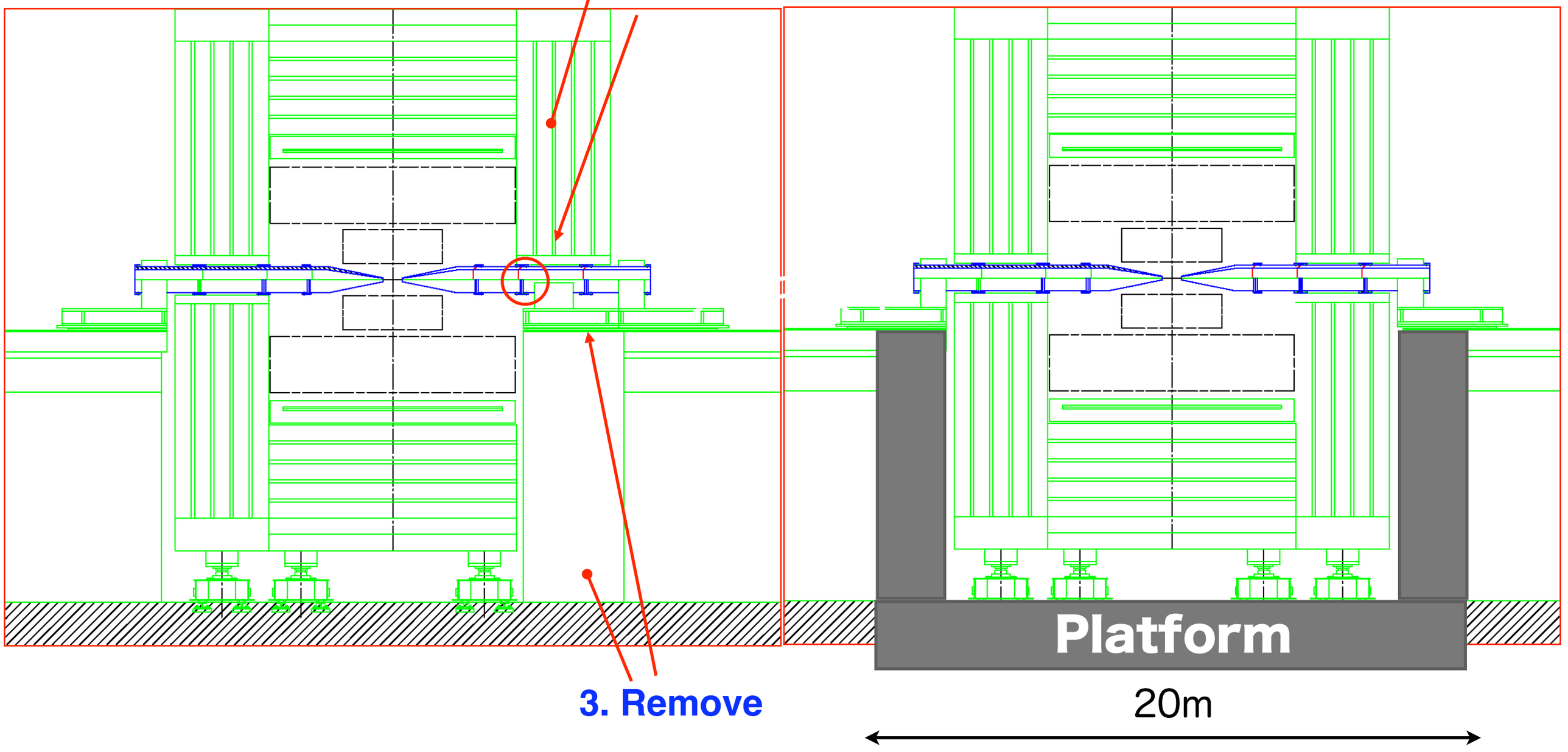
Interference with QF1, transfer line, pacman or service cryostat during access?



Assembling (JLC, L*=2m)

1. Close(one side)
2. Fix

Completion!!

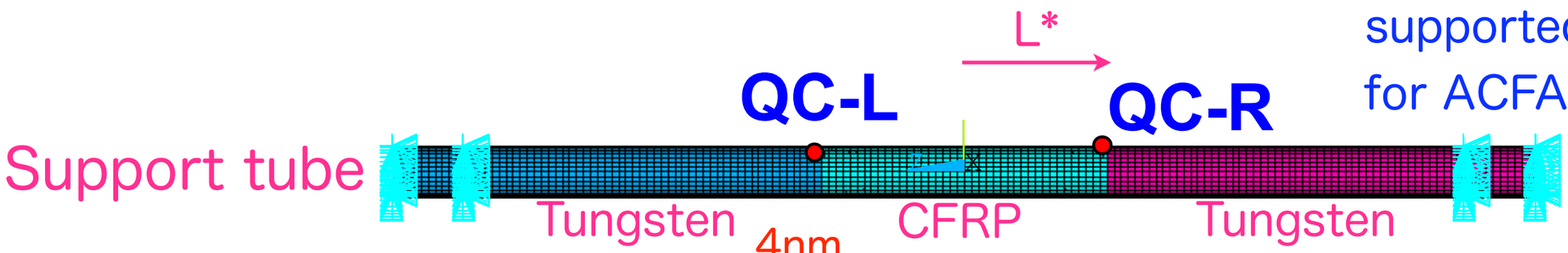


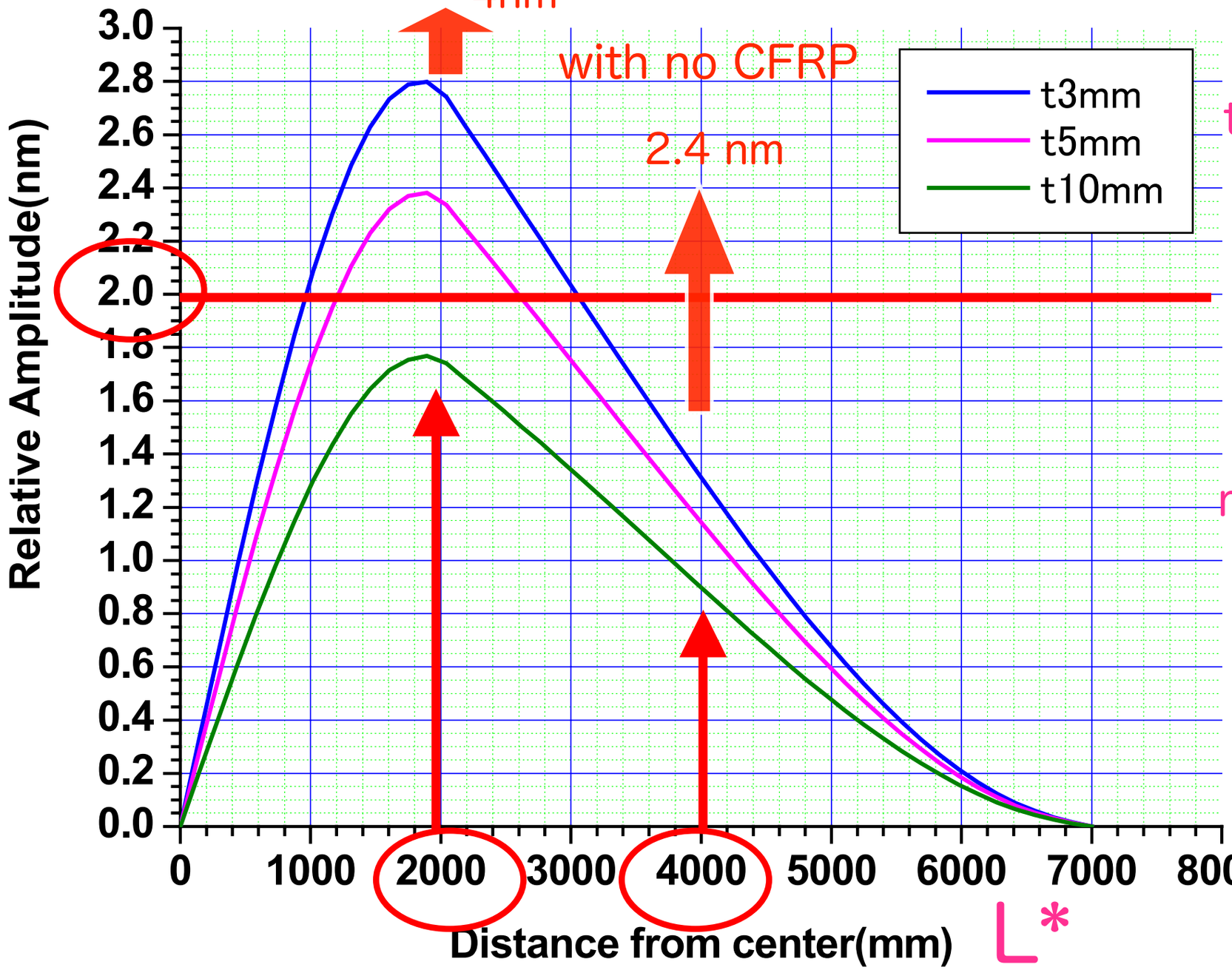
push-pull : ledge to concrete base on the platform
or support tube on the endcap

H.Yamaoka's talk at LCWS2005

Stability of two final quadrupoles

supported at 7 and 8m
for ACFA-JLC detector

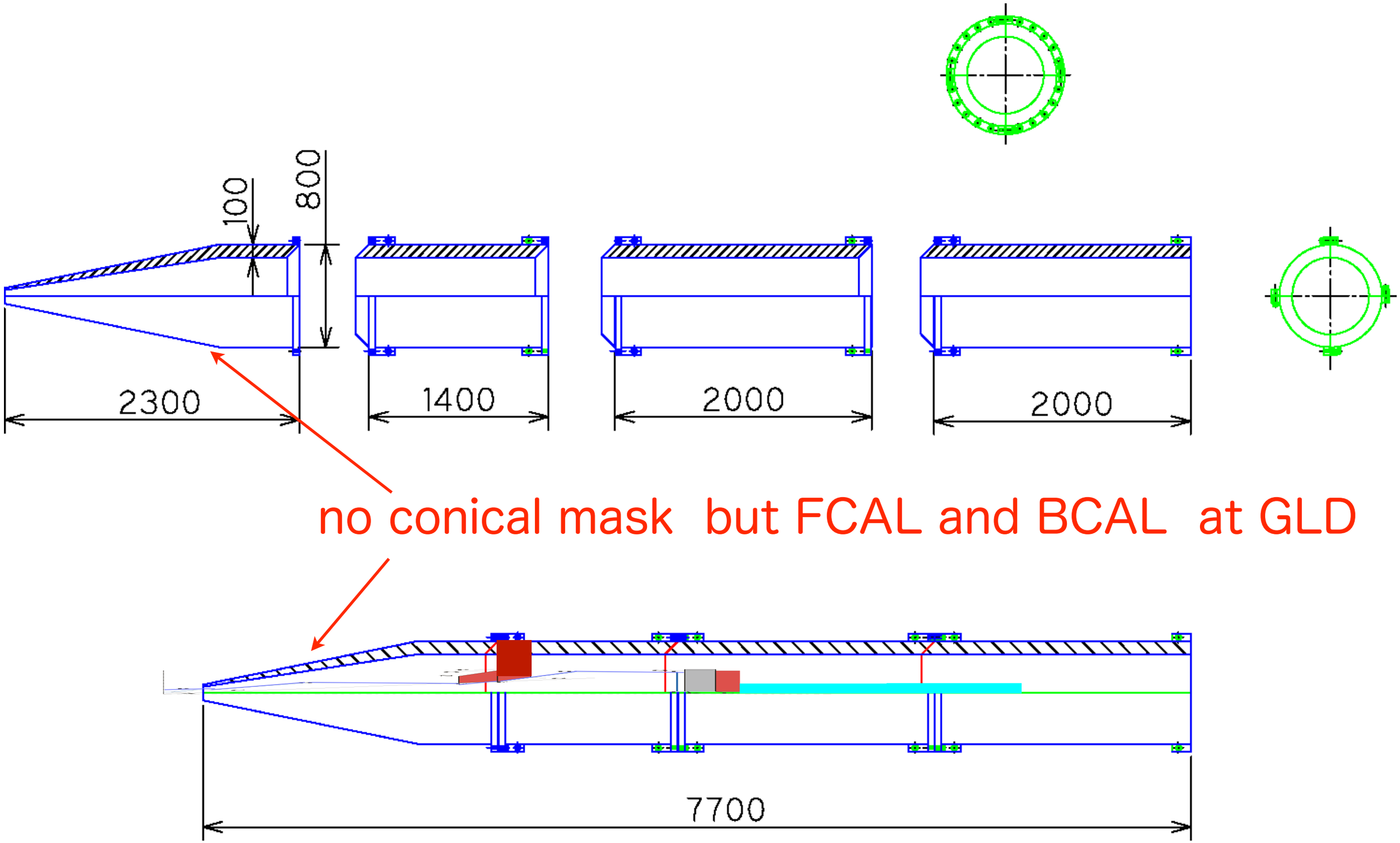




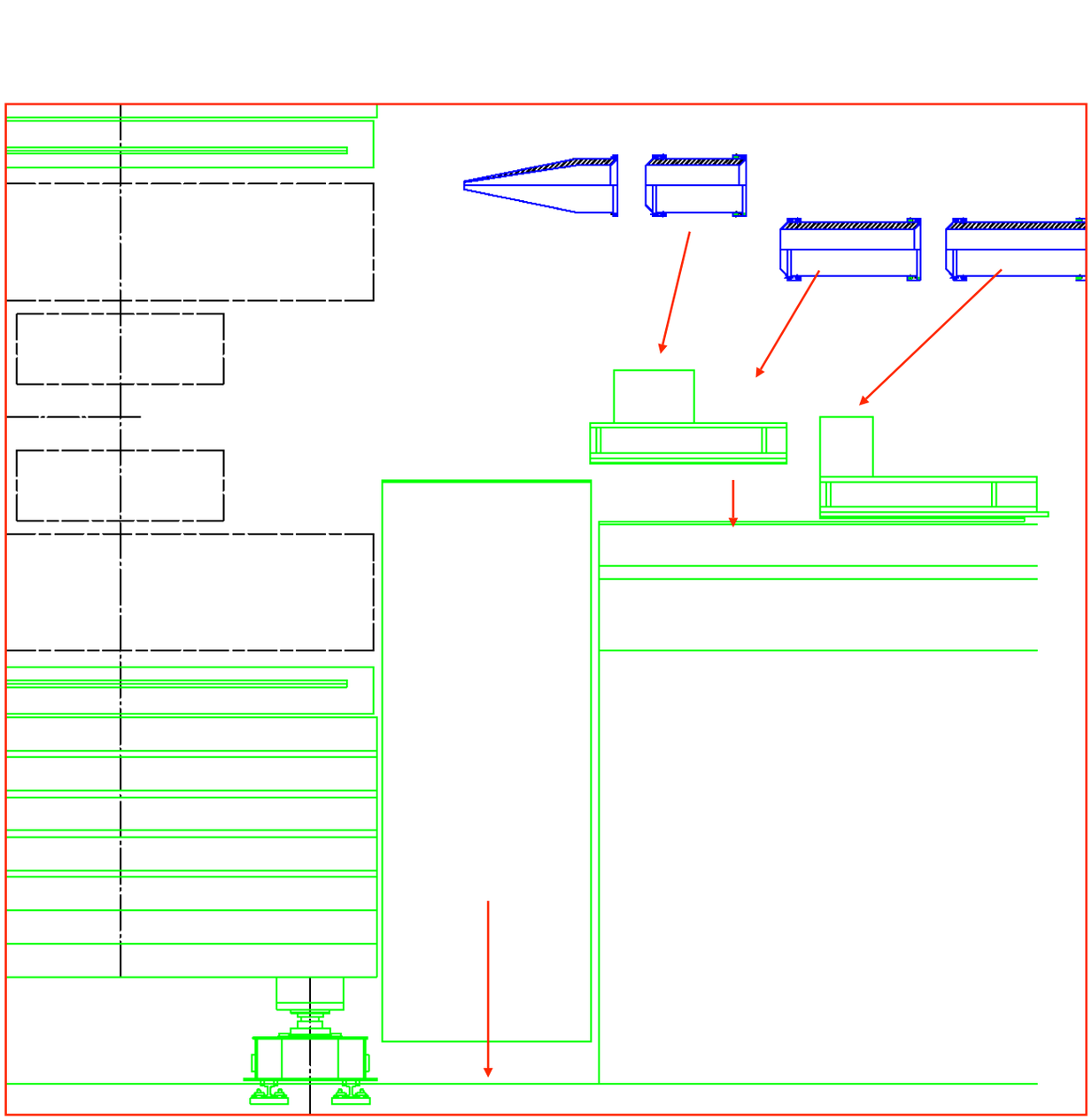
thickness of
CFRP tube

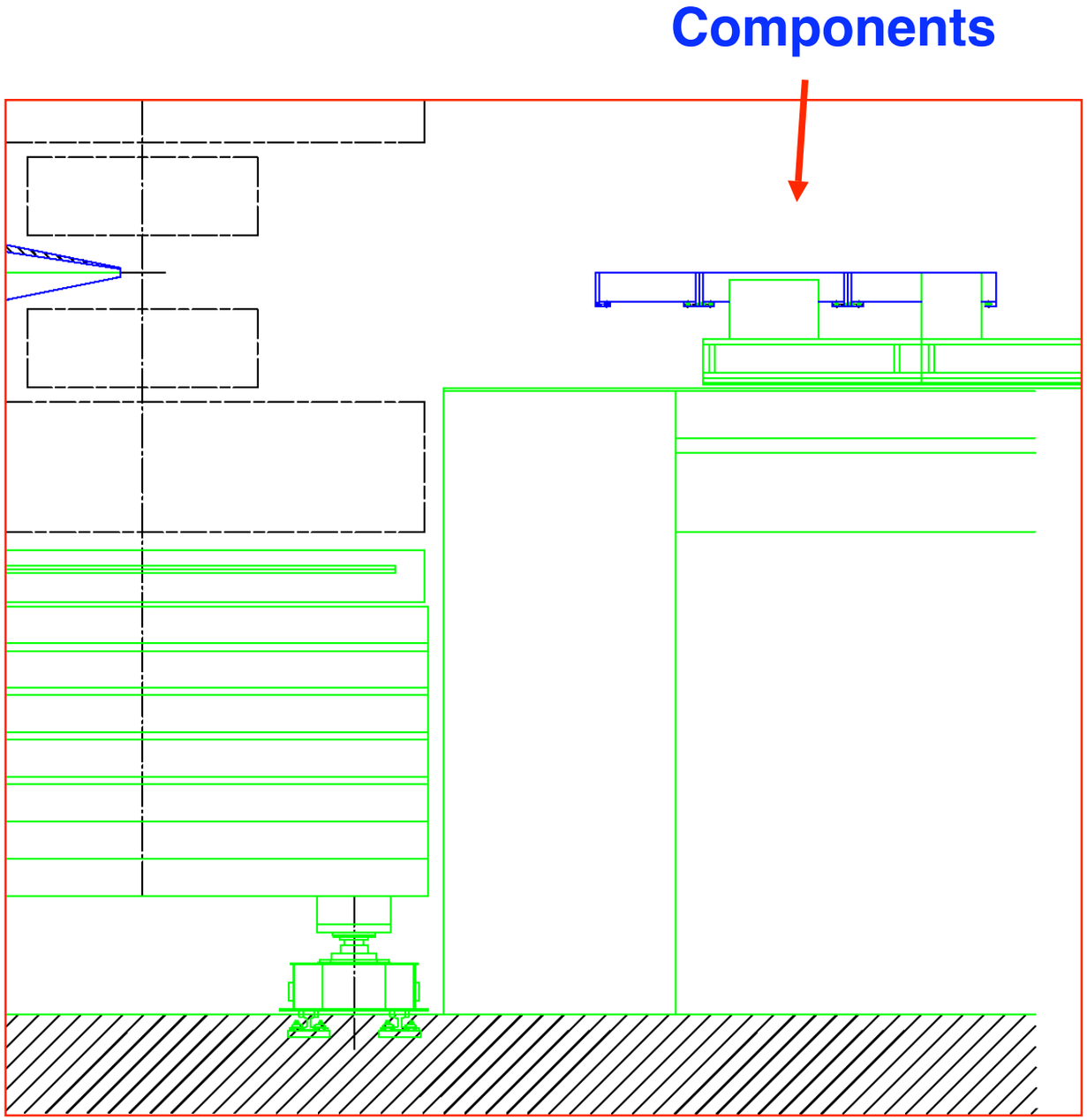
Input GM
measured at ATF

Tungsten masks (JLC, L*=2m)

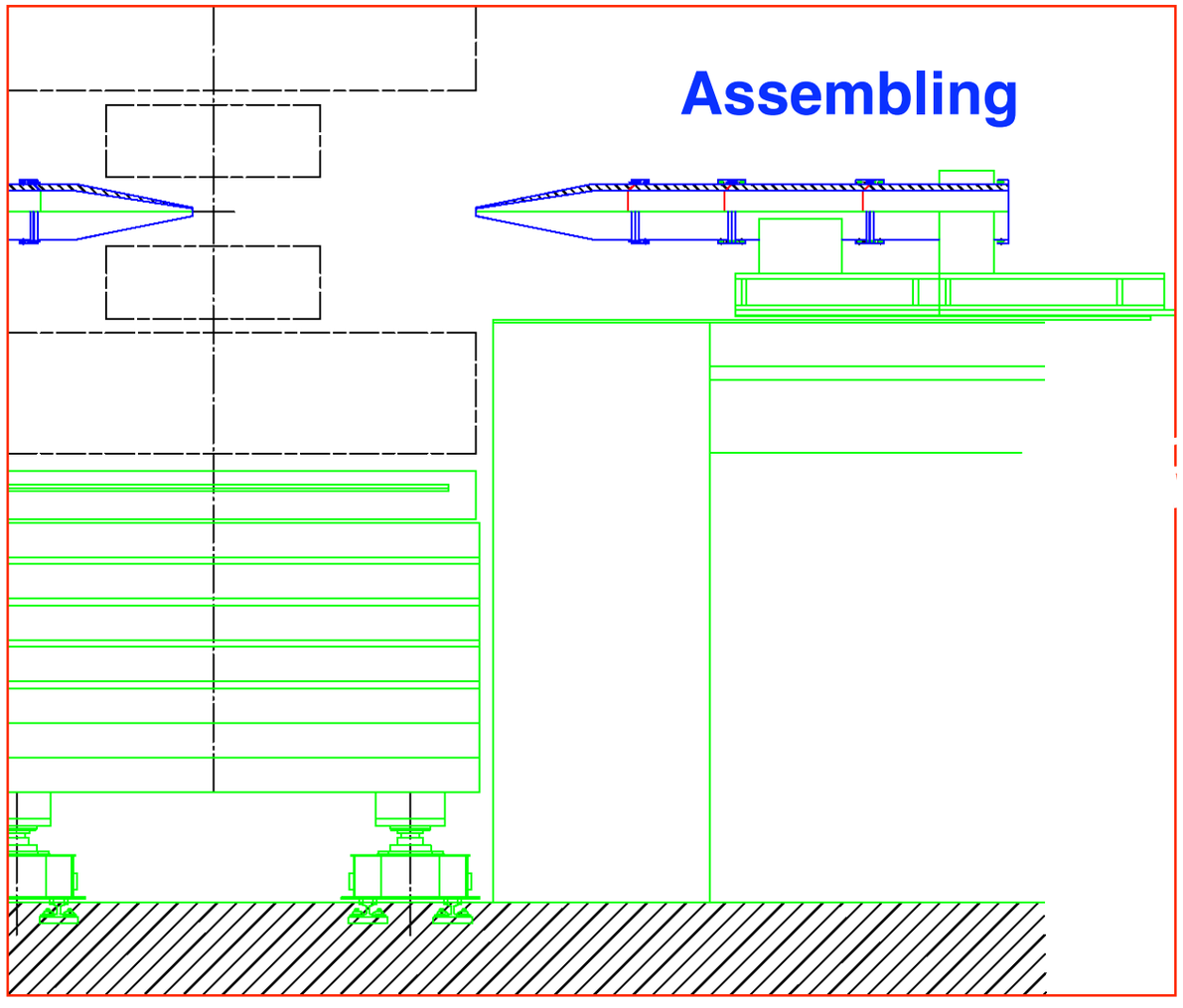


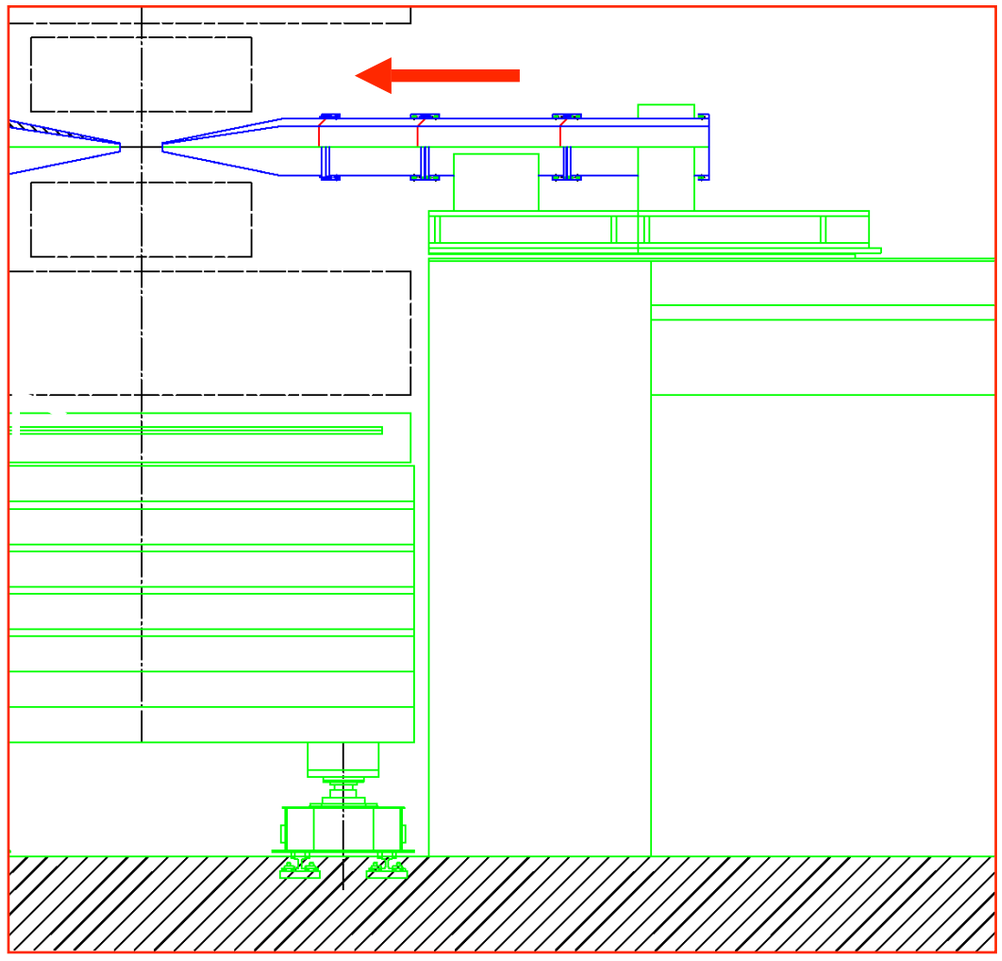
Assembling (JLC, L*=2m)





Assembling (JLC, L*=2m)





Homework Item #6: Space and Position of QD0 Cryostat for Each Detector Concept.

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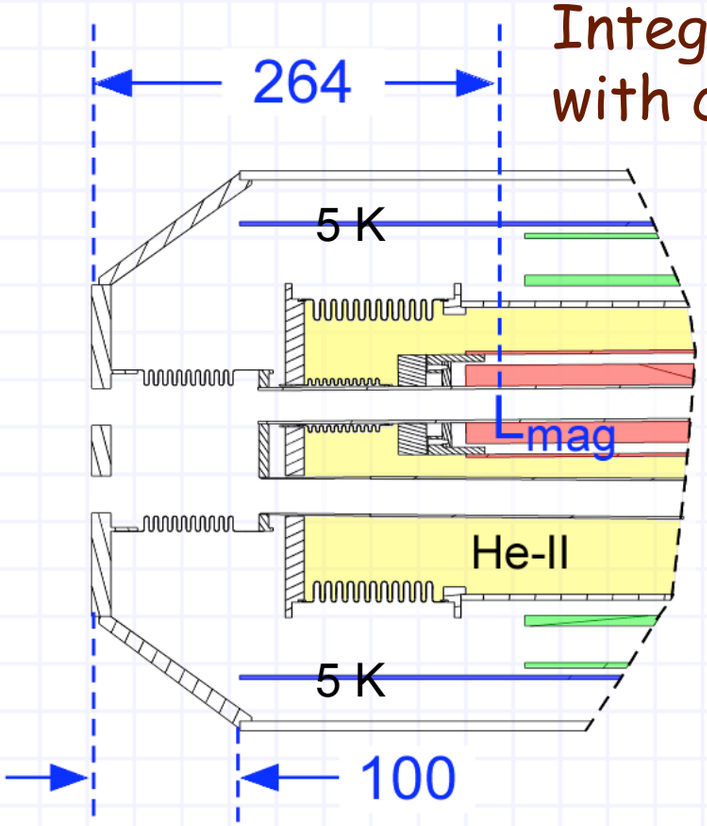
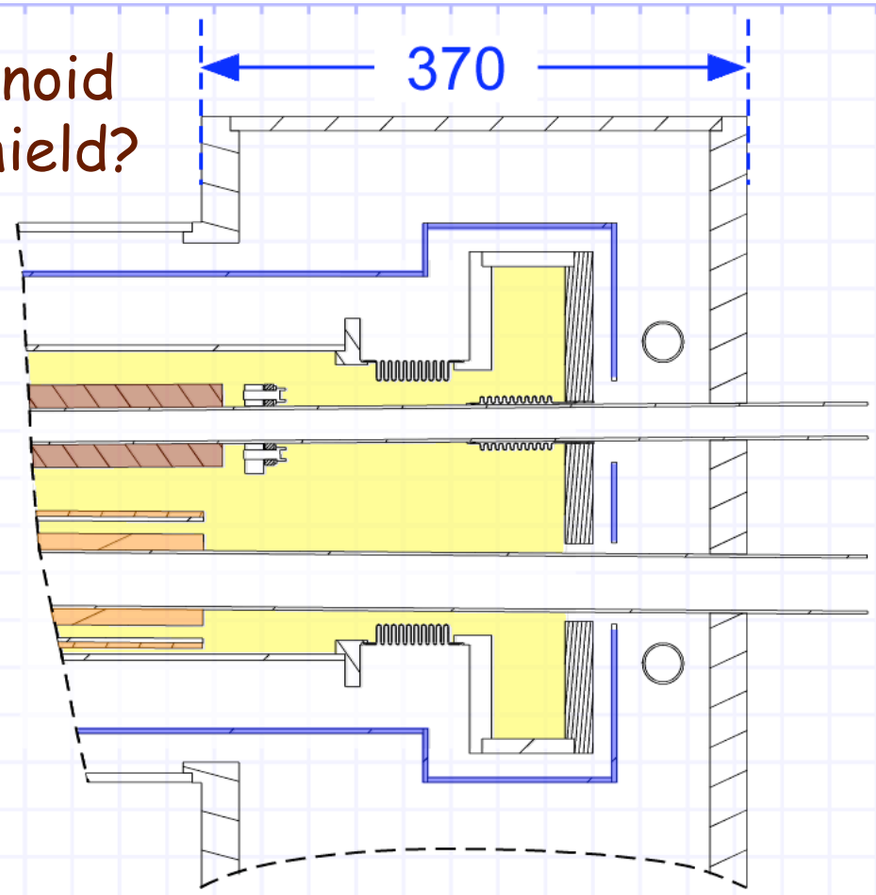
Superconducting Magnet Division

Integrate force neutral anti-solenoid with cold mass instead of heat shield?

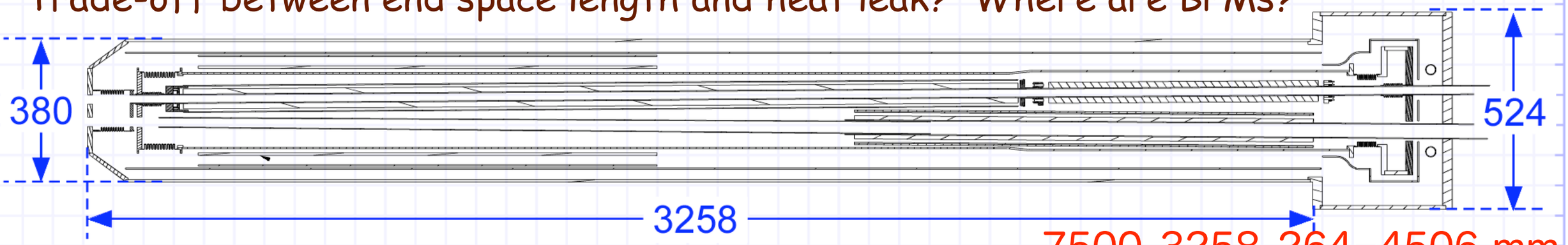


QD0 cryostat with a force neural anti-solenoid compatible with L* of up to 4.5 m.

Plan views are drawn at beams' common midplane; dimensions are as indicated in millimeters.



Trade-off between end space length and heat leak? Where are BPMs?

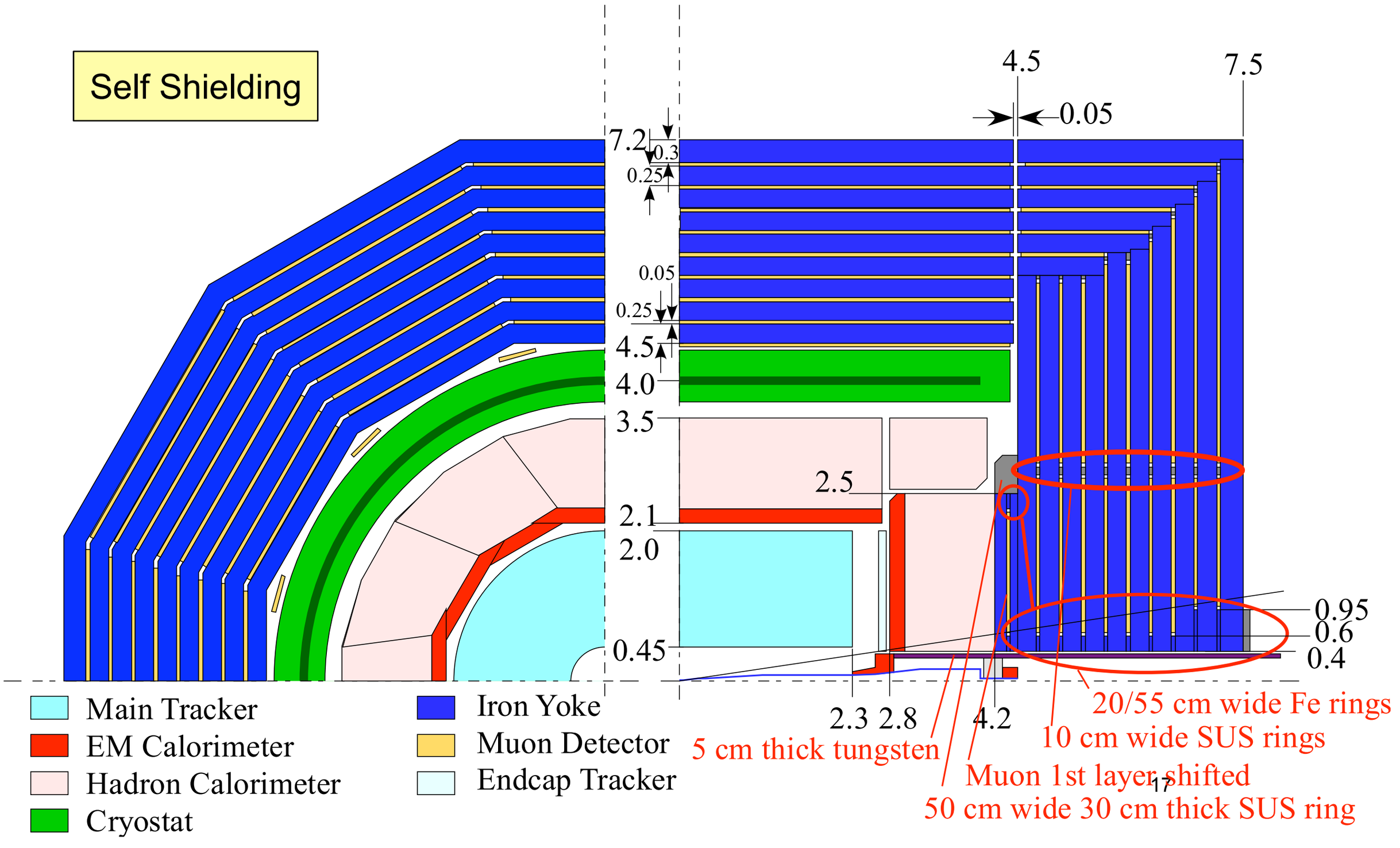


7500-3258-264=4506 mm

What is L*? Can all experiments agree upon the same L*? Use two different L*s?

Minimum cryostat diameter depends upon L*; worst case scenario, 4.5m is shown.

GLD: “thinner iron structure”



Homework Item #7: All Detector Concepts! Backgrounds & Magnet Energy Deposition.

BROOKHAVEN NATIONAL LABORATORY
Superconducting Magnet Division

Experiments are especially concerned with computing (minimizing) detector backgrounds. For the magnet system we need to understand the expected level of energy deposition in magnets.

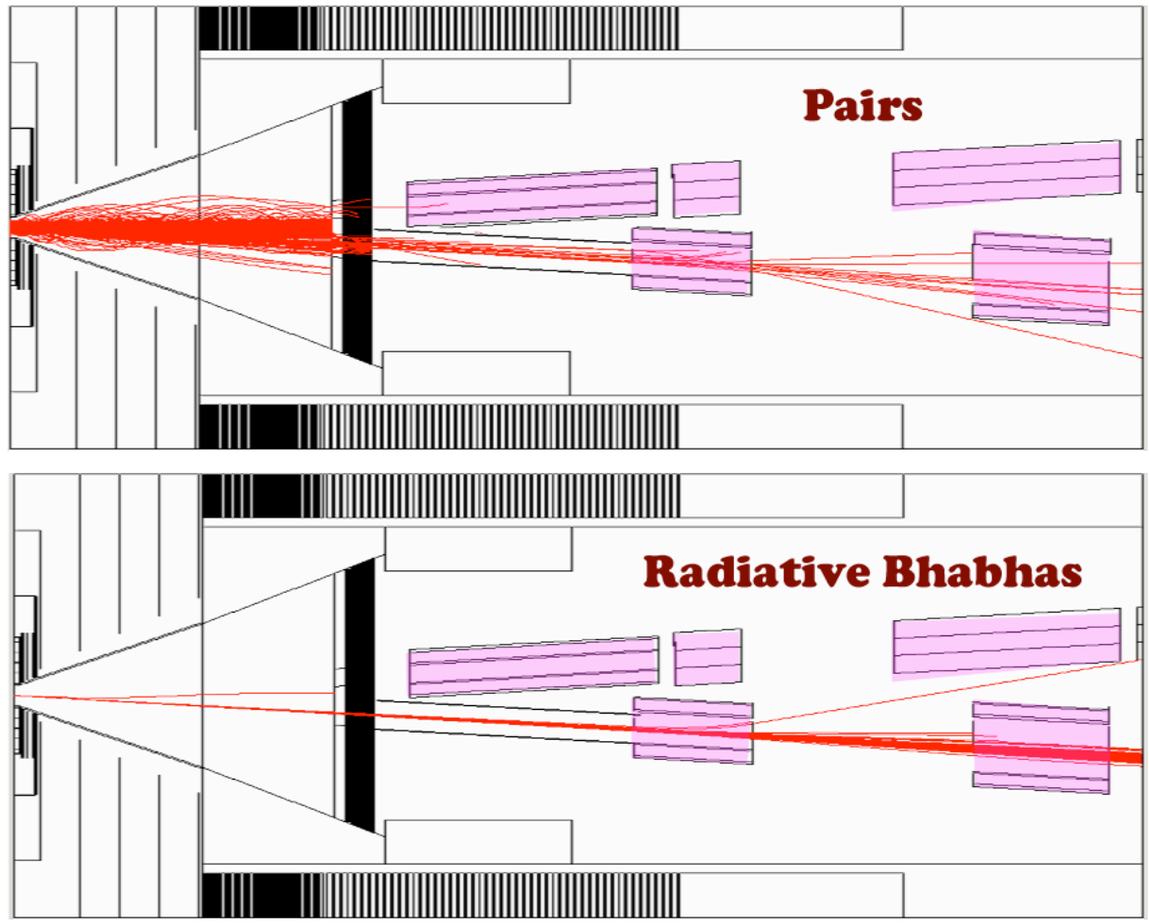
Optimized (anti)-DID field profile?

Optimized anti-solenoid field profile?

Get ED results from tracking?

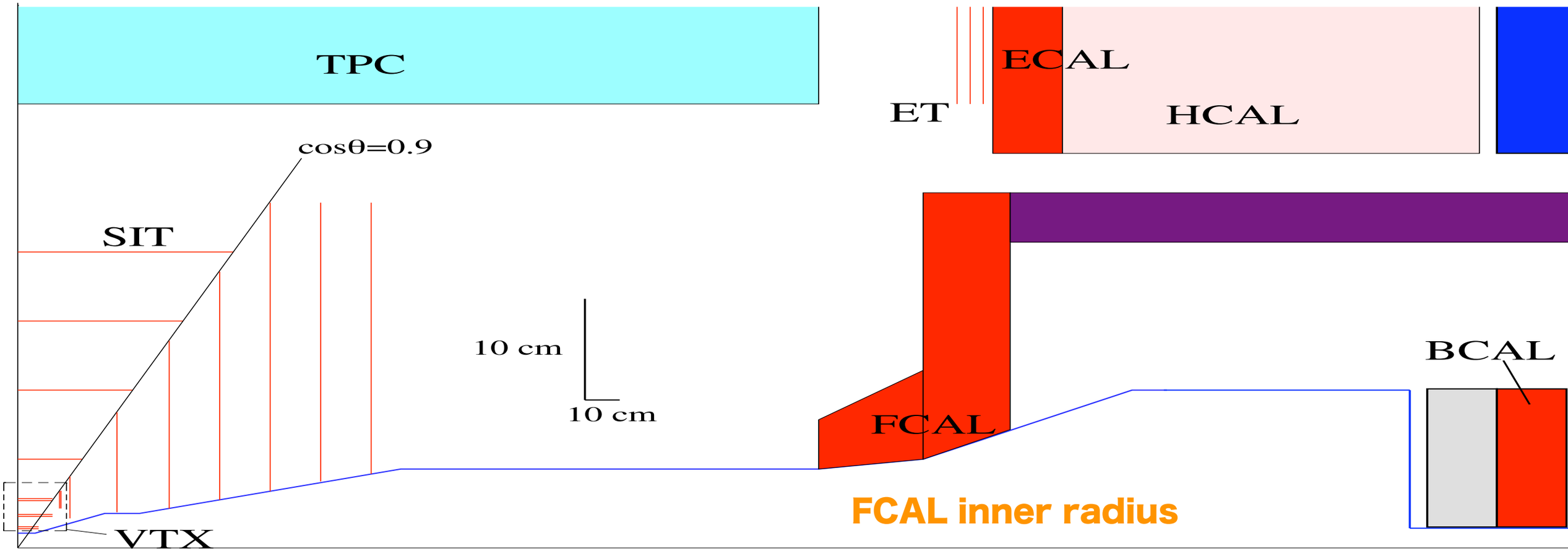
What about beam tuning or abnormal operating conditions? What are "safe" (but not too conservative) ED budgets? (see Homework Item #2)

Pairs and Radiative Bhabhas in 14 mrad Crossing Geometry (interaction turned off).



"Detector Background Update for L*=3.51 m, L*(ext)=5.5m," Takashi Maruyama, BDS Weekly Meeting at SLAC.

Right now I (BP) can generate sample field profiles for the DID and anti-solenoid but to go further we need agreed upon requirements for each detector concept. Maintaining multiple L*s and layouts does increase the work to be done.

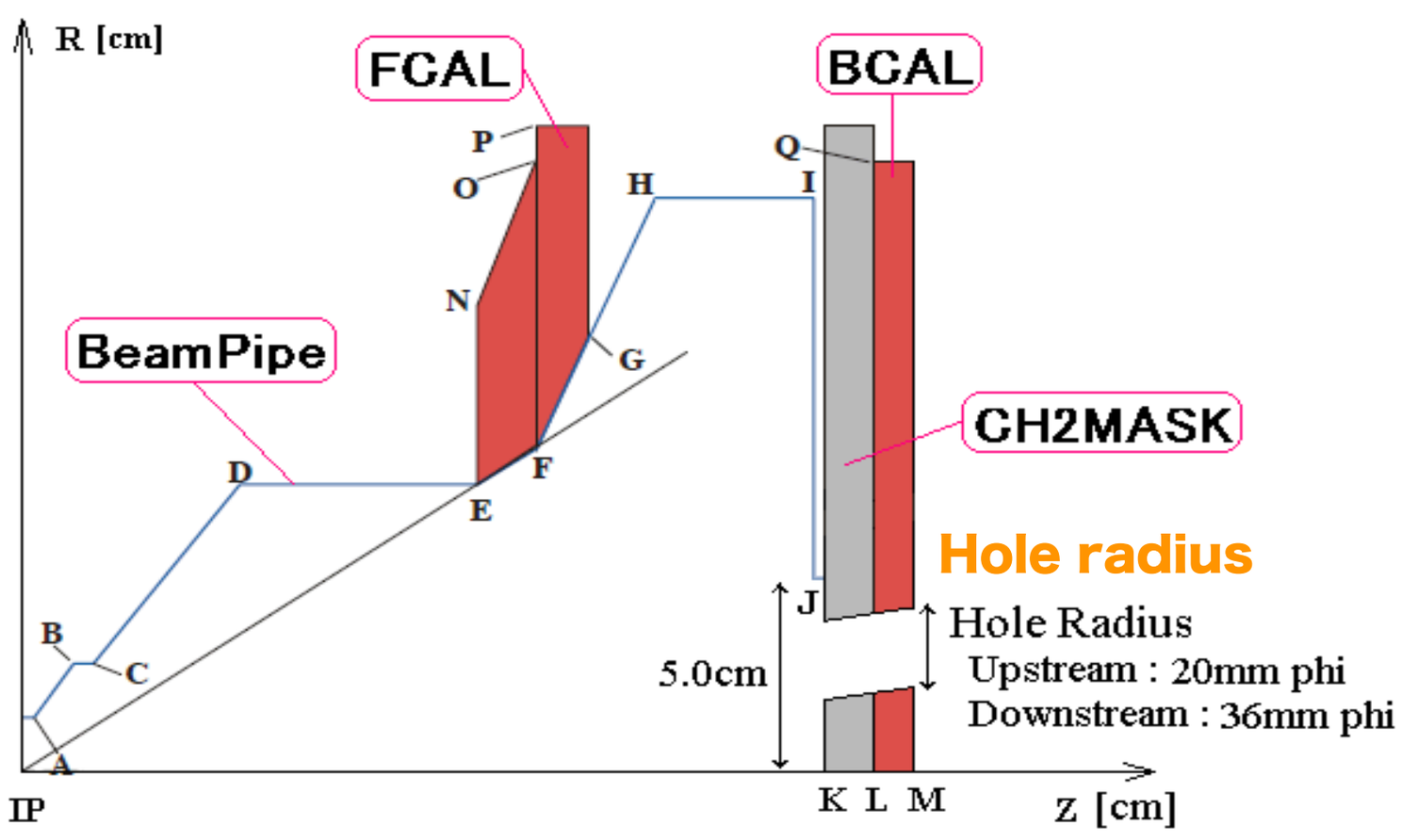


IR Optimization

FCAL inner radius for TPC background hits.

Hole radius of extraction to decrease backscattering.

Radius of beam pipe @VTX



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

Workshop on ILC Interaction Region Engineering Design

SLAC, September 17-21, 2007

http://www-conf.slac.stanford.edu/ireng07/

- **Goal: To review and advance the design of the subsystem of the Interaction Region of ILC, focusing in particular on their integration, engineering design and arrangements for push-pull operation.**

- **… goal is to make progress on the design of the ILC IR through focused preparation before and during the workshop…**

- **The International Program and Advisory Committee is being formed. Its charge includes organization of preparatory work before the workshop and production of conceptual solutions and drawings that could be further discussed and reviewed at the workshop…**
  - **this is an attempt to align the organization of the workshop with EDR WP organization → how to do it optimally?**

IR Eng. workshop: tentative working groups

Group A	**Overall detector design, assembly, detector moving, shielding.** Detector design for on-surface assembly and underground assembly procedures. Beamline pacman shielding, detector shielding design.
Group B	**IR magnets design and cryogenics system design.** Cryogenic system design, connections, flexible cryo lines, safety issues. IR magnet engineering design, support, integration with IR, masks, Luminosity & Beam calorimeters, deign of IR vacuum chamber, connection to elements, assembly-disassembly procedures, integration of near IR masks and overall integration of crab cavity.
Group C	**Conventional construction of IR hall and external systems.** Lifting equipment, IR electronics hut, cabling plant, services, shafts, service caverns, utilities, movable shielding;design solutions to meet alignment and vibration tolerances
Group D	**Accelerator and particle physics requirements.** Including masking, collimation, shielding requirements, image charges, wakes, external radiation, accelerator physics & optics design and constraints on IR engineering design, on alignment tolerances and stability for the IR components and IR hall floor.

Does this map optimally to EDR WP structure

IR Eng. Workshop
Very tentative schedule

	9/17/2007	9/18/2007	9/19/2007	9/20/2007	9/21/2007
9:00-10:30	Introduction plenary, Kavli auditorium. Talks: 1) ILC IR and BDS design and workshop goals. 2) Physics requirements to IR design; 3) IR design experience from existing machines (LHC); 4) Experience from D0, CDF, PEP-II, KEK-B;	Plenary, Kavli. Talks: 1-3) Design and assembly of SiD, GLD-LDC, 4th concept; 4) Accelerator physics design of IR; 5) Alternative designs of IR	Parallel working groups, WG-A, WG-B. ROB rooms	Parallel working groups, WG-B, WG-D. ROB rooms	Post-summary work of working groups. ROB rooms or local offices
10:30-11:00	break	break	break	break	
11:00-12:30	Plenary, Kavli. Talks: Continue on IR design from existing machines (IHEP, Frascati, etc).	Parallel working groups, WG-A: Overall detector design; WG-D: Acc and phys requirements. ROB rooms	Parallel working groups, WG-A, WG-C. ROB rooms	WG-A-B-C-D; Working tour to SLD hall	Post-summary work of working groups. ROB rooms or local offices
12:30-13:30	lunch	lunch	lunch	lunch	lunch
13:30-15:00	Plenary, Kavli. Talks: 1) IR conventional facility design 2) IR magnet and cryogenics design	Parallel working groups, WG-A, WG-D. ROB rooms	Parallel working groups, WG-B, WG-C. ROB rooms	Parallel working groups, WG-A-B-C-D, Summary preparation. ROB rooms	Post-summary work of working groups. ROB rooms or local offices
15:00-15:30	break	break	break	break	
15:30-17:00	Parallel working groups, WG-B: IR magnets design and Cryogenics systems. WG-C: IR hall conventional facility design. ROB rooms	Parallel working groups, WG-B, WG-C. ROB rooms	End of the day plenary discussions, Kavli auditorium	Plenary, Kavli. Summary talks, WG-B; WG-A	Reserve
17:00-18:00	Parallel working groups, WG-B: IR magnets design and Cryogenics systems. WG-A: Overall detector design. ROB rooms	End of the day plenary discussions, Kavli auditorium	End of the day plenary discussions, Kavli auditorium	Plenary, Kavli. Summary talks, WG-C; WG-D	Reserve