

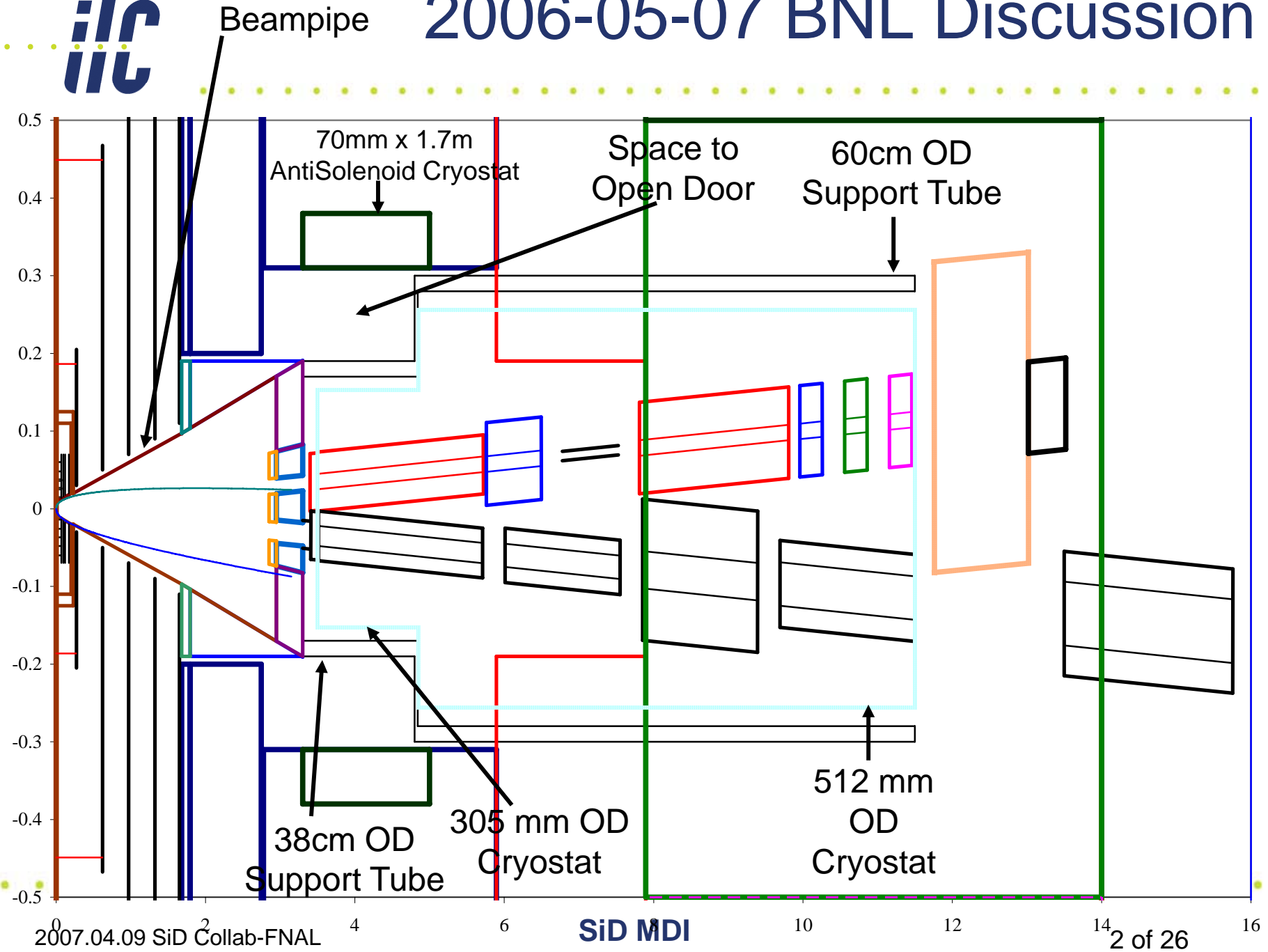


# SiD MDI Issues

Tom Markiewicz/SLAC  
SiD Collaboration Meeting  
09 April 2007



# 2006-05-07 BNL Discussion





## Pre-Push Pull, 20mrad crossing angle, $L^*=3.5\text{m}$ Final Doublet Support and Access Plan

- One cryostat with radial step support tube with corresponding step
- Cryostat step @  $z=4.8\text{m}$ : door can open 2m; radii from BNL

Theta	OD1	OD2
14 mrad	290mm	477mm
20mrad	305mm	512mm

May 7, 2006

- Tube cantilevered from removable base just behind closed end cap door
- Full coverage endcap Ecal/Hcal @  $r>20\text{cm}$
- Forward instrumented steel return flux cut back  $\sim 10\text{cm}$  to clear step in cryostat when door open
- Antisolenoid cryostat begins at  $r=30\text{cm}$
- Conic beampipe to ID of outer part of LUMICAL

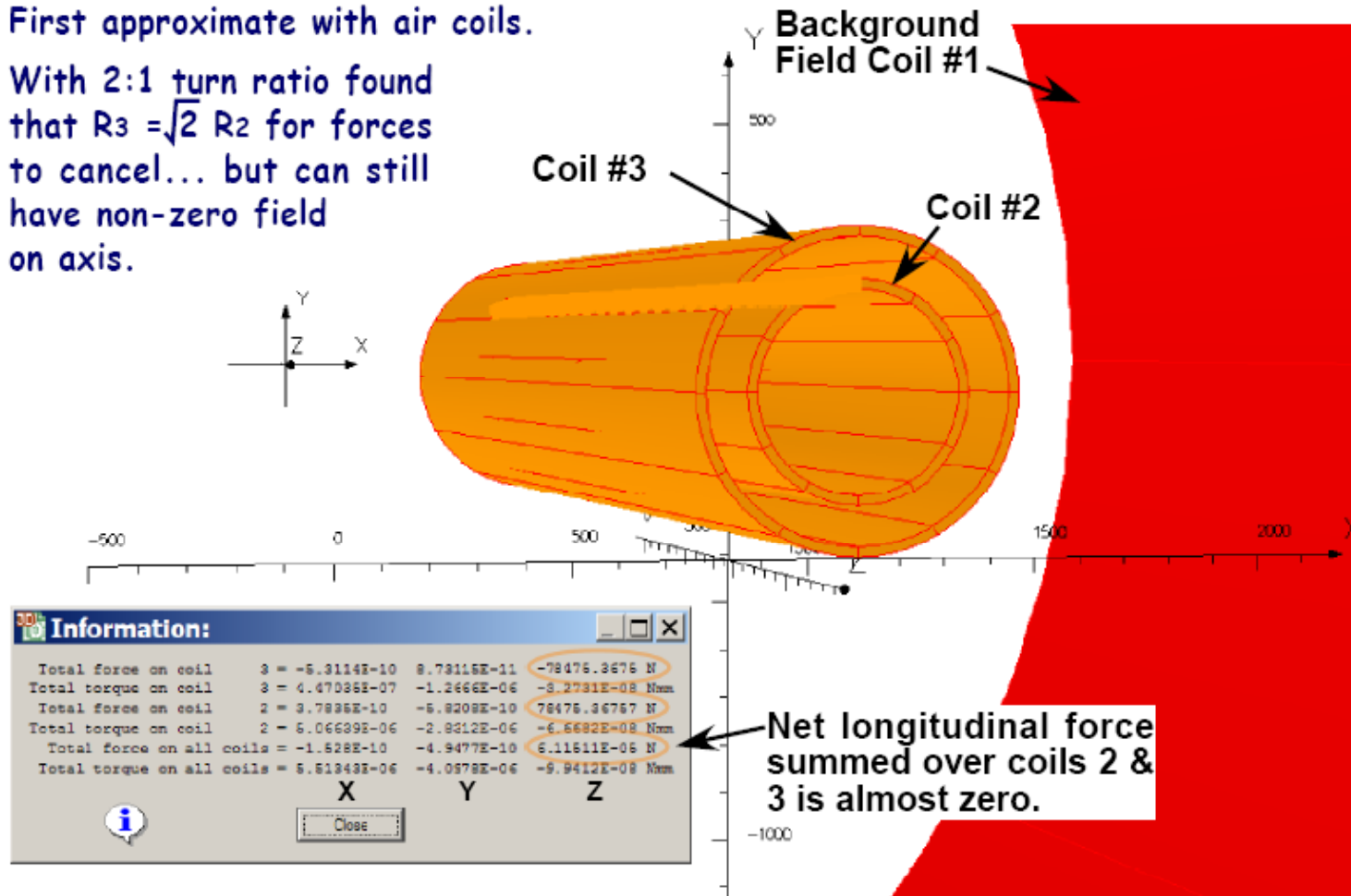


20 Feb 2007 BDS mtg: Brett Parker

## Concept for Force Neutral Anti-Solenoid

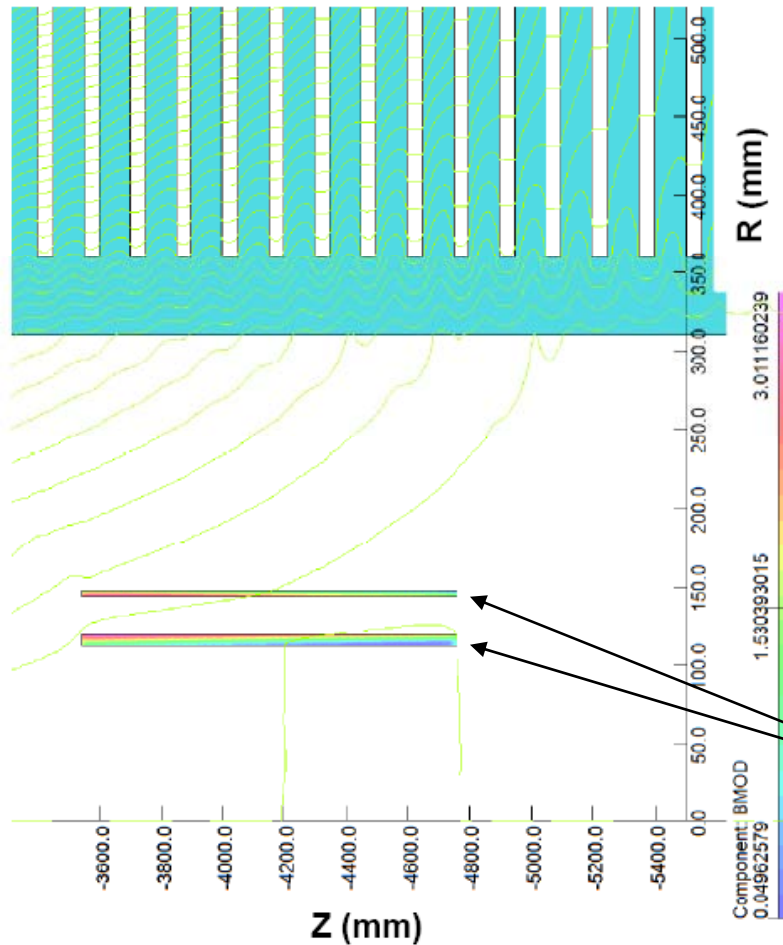
First approximate with air coils.

With 2:1 turn ratio found that  $R_3 = \sqrt{2} R_2$  for forces to cancel... but can still have non-zero field on axis.





# Force Neutral Anti-Solenoid for SiD



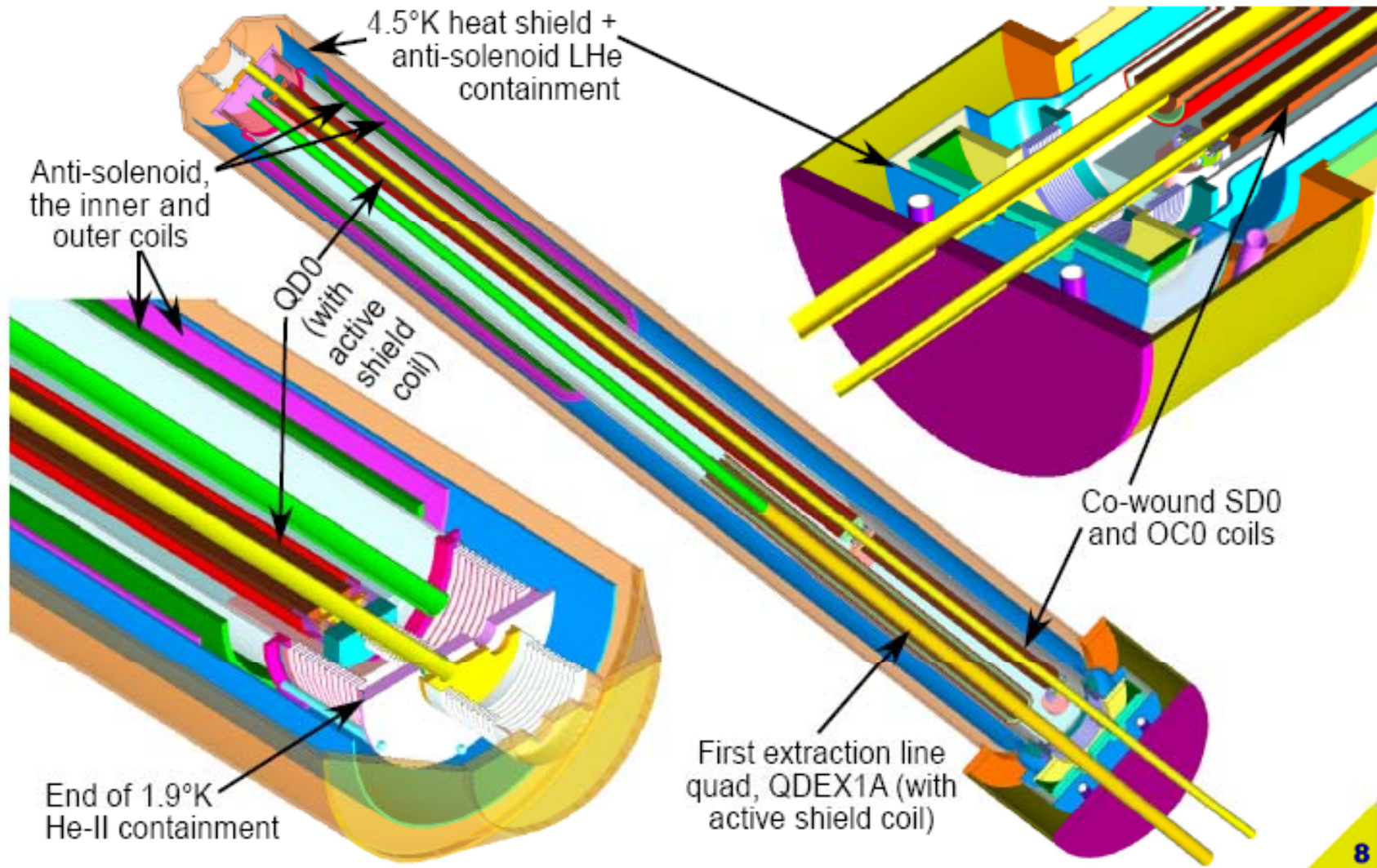
Inner-Outer Coil  
Forces Cancel

New Antisolensoid  
Coils Integrated into  
QD0 package

B. Parker, 20.02.07

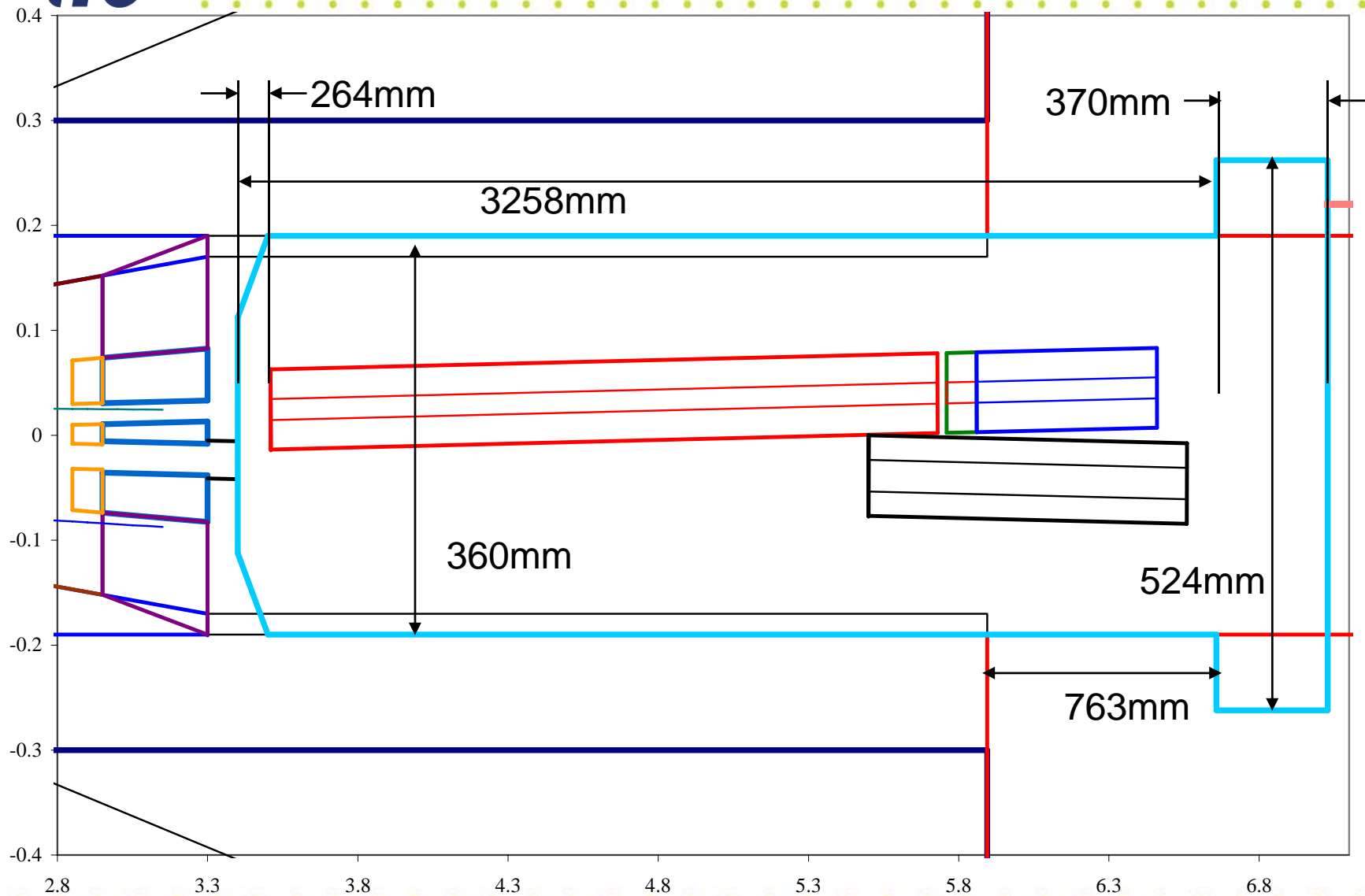


# QD0 + QDEX1A + Anti-Solenoid in Cryostat





# QD0 Cryostat in SiD @ $L^*=3.664\text{m}$



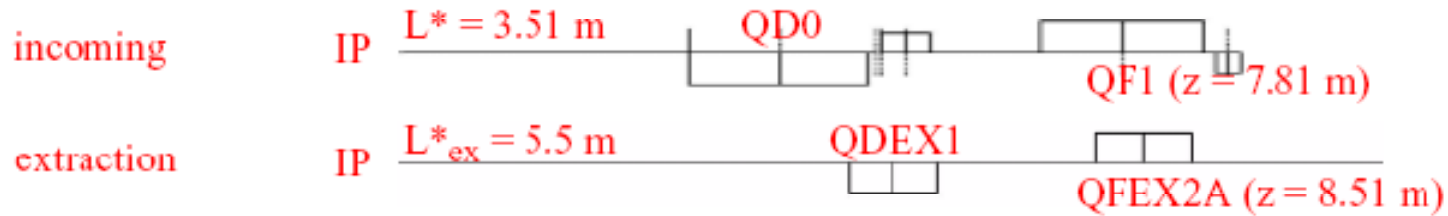




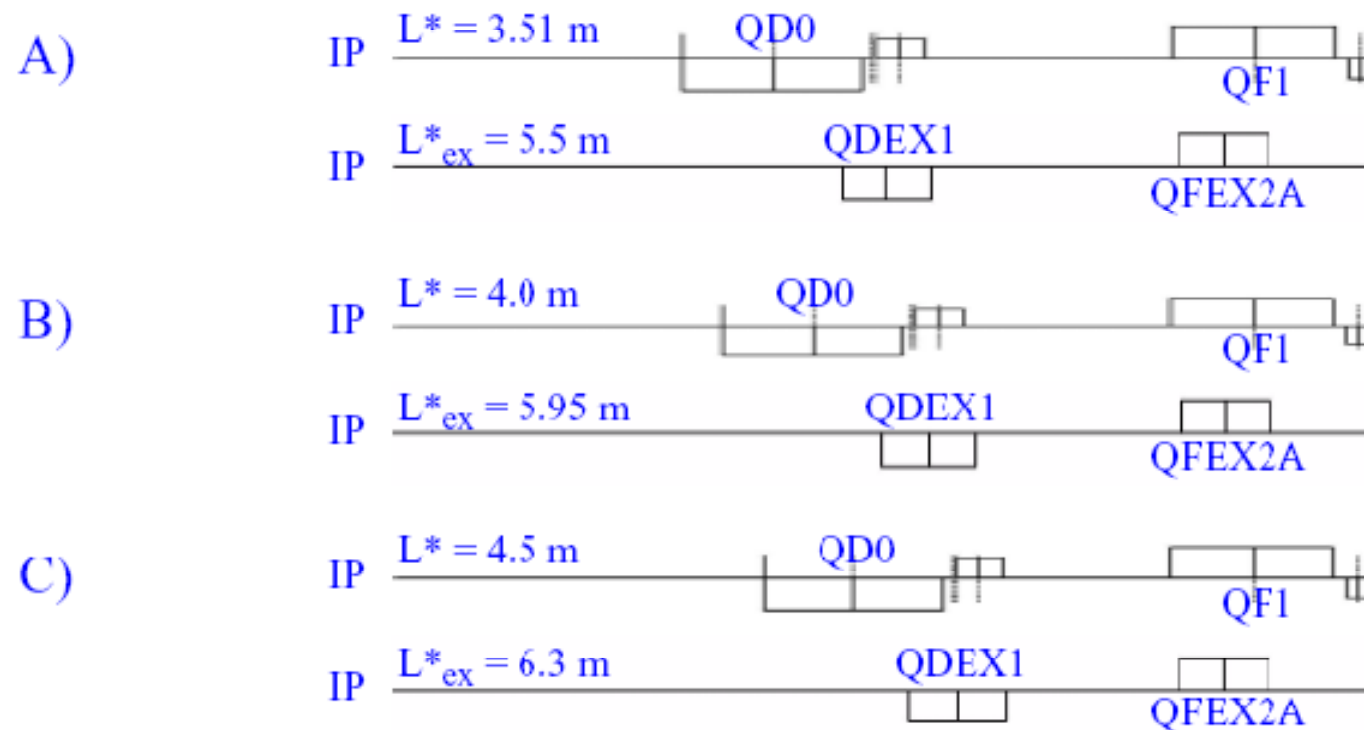
# Seryi Proposal: Fix QF1 @ 9.6m, L\* chosen by Detector

## Concept: Study Collimation & Optics Sensitivity

### Nominal positions near IP for push-pull



Modified positions near IP: QDEX1 moves along with QD0, QF1 and QFEX2A are fixed at  $z = 9.5$  m and  $9.6$  m, respectively.



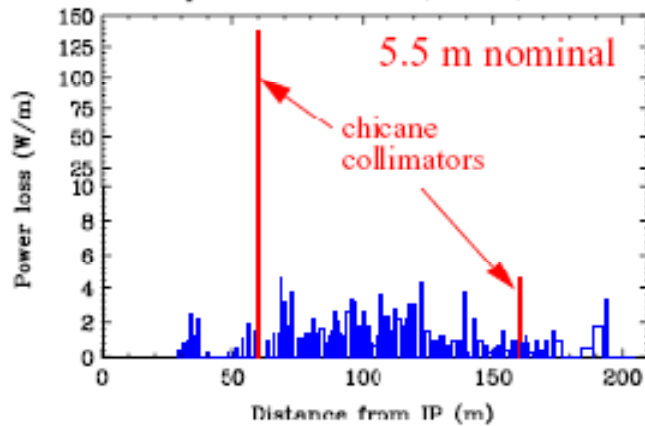




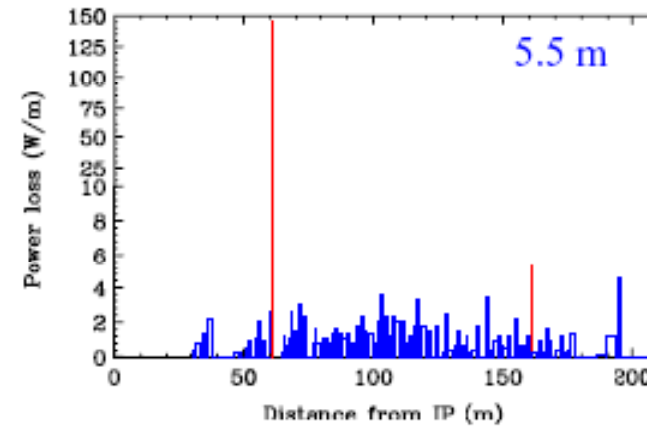
# Incoming Beam & Extracted Beam Look OK for Each Solution

## Disrupted beam loss for 250 GeV low beam power option (cs14)

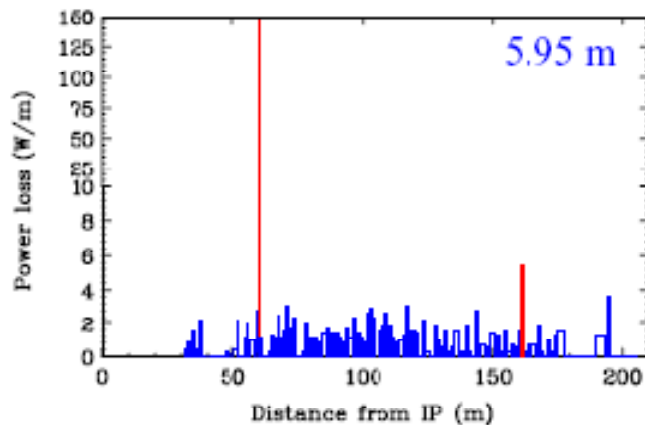
Total loss on magnets and pipe: 152 W  
At chicane collimators: 42 W, 2.2 W  
At dump collimators: 2.8 kW, 6.7 kW, 10.7 kW



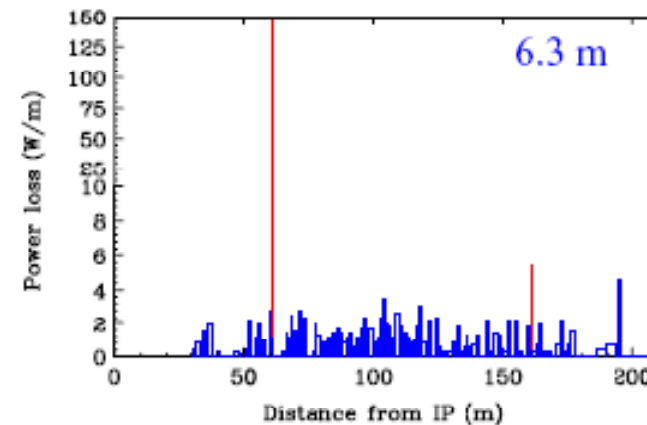
Total loss on magnets and pipe: 126 W  
At chicane collimators: 44 W, 2.7 W



Total loss on magnets and pipe: 125 W  
At chicane collimators: 44 W, 2.7 W

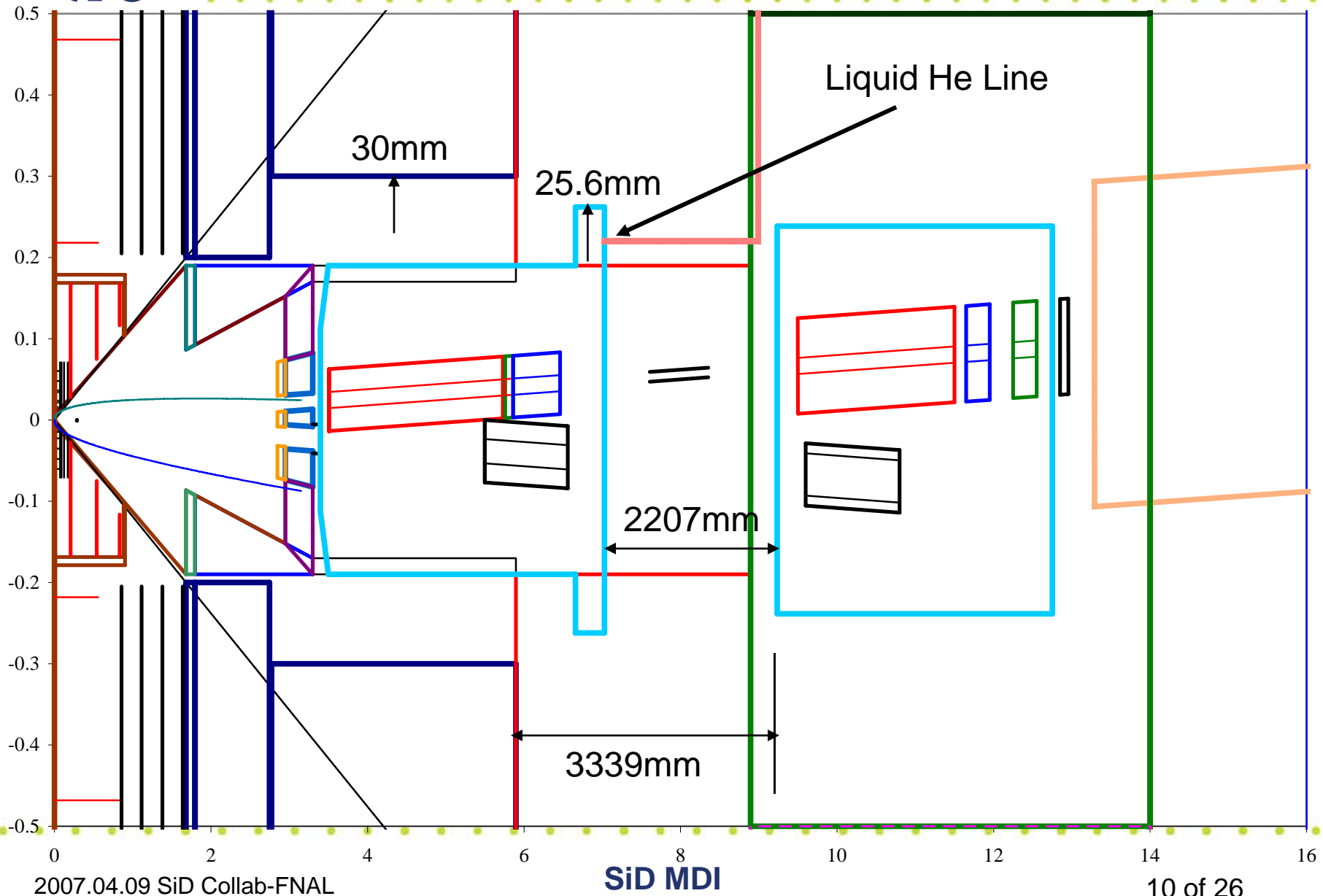


Total loss on magnets and pipe: 123 W  
At chicane collimators: 44 W, 2.7 W





# SiD $r < 50\text{cm}$ , $L^* = 3.664\text{m}$ , $14\text{mrad}$ , Push-Pull, QF @ $9.5\text{m}$ , Door Closed





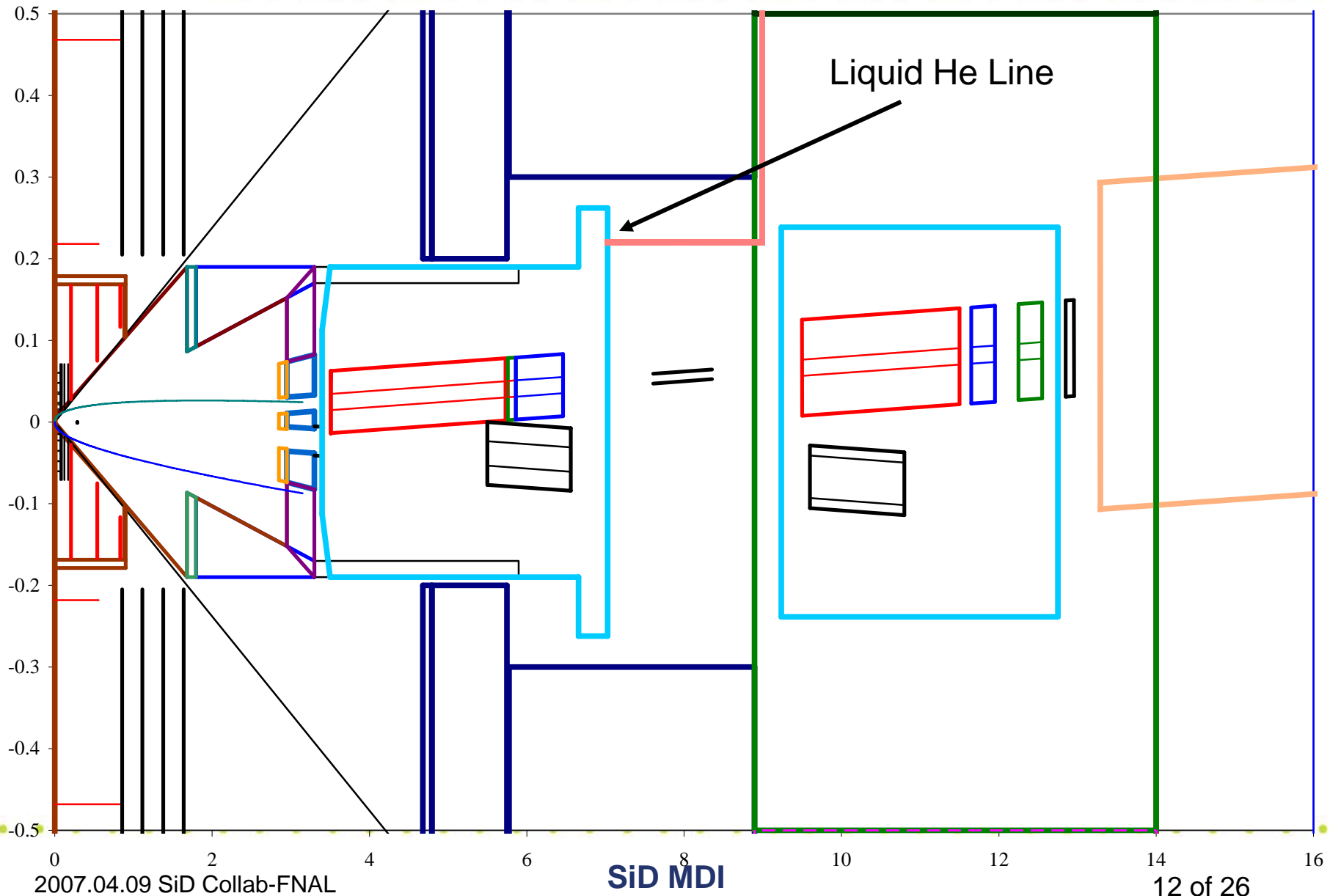
## SiD Final Doublet Support and Access Plan with Push Pull @ 14mrad Crossing angle, $L^*=3.664\text{m}$

- Three concepts
  - Permanent liquid He feed line from barrel to QD0 with loop large enough to allow 3m door opening
  - 10cm (?) radial cutback in endcap iron yoke to allow it to pass over back end of QD0 cryostat
  - Drop idea of cantilevered support tube
    - QD cryostat and FCAL package supported off rails in endcap doors
    - Rails incorporate telescoping “rail extensions” to support cryostat and FCAL when door is open
    - Is this compatible with “cutback”?



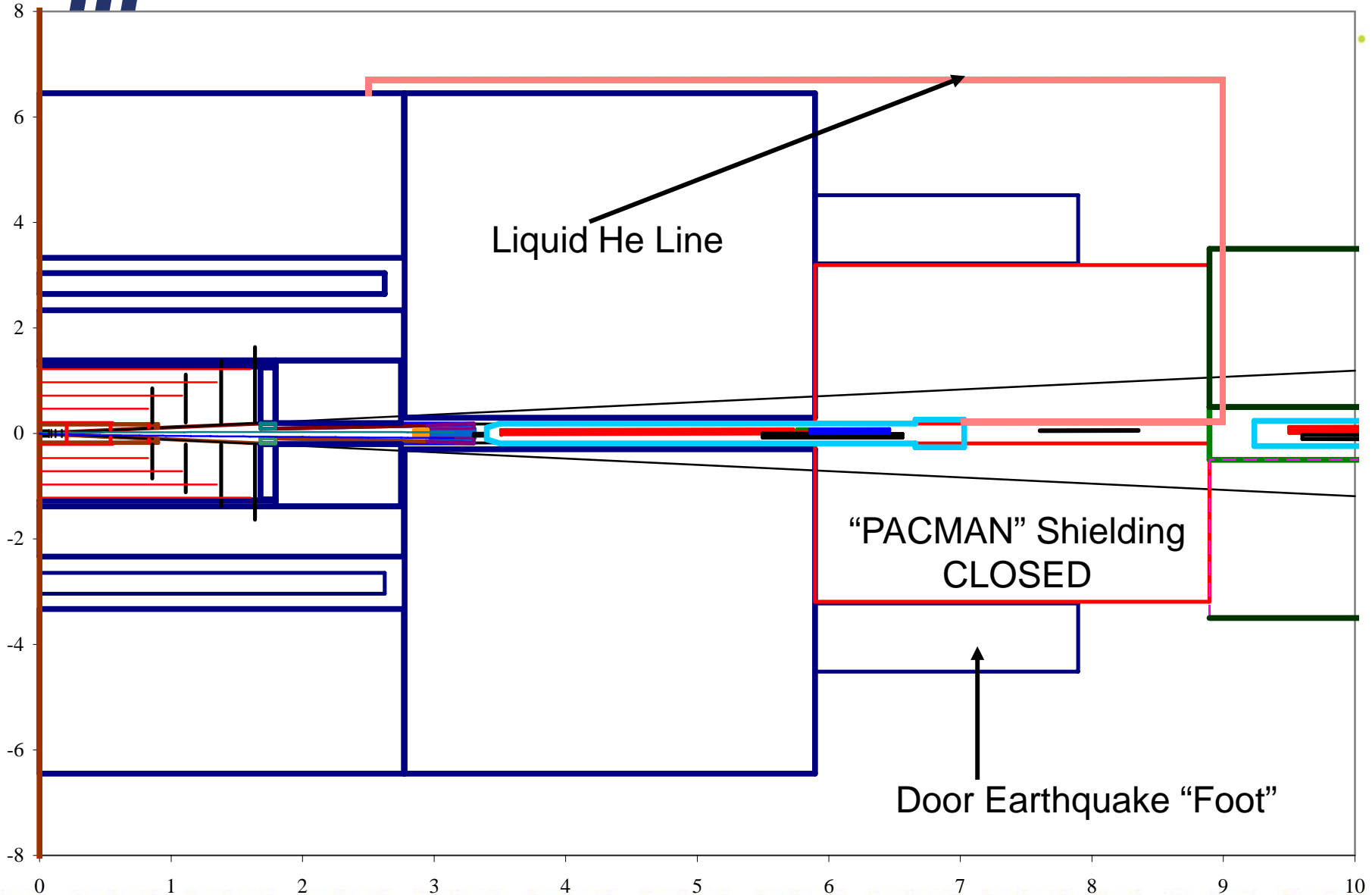
# SiD $r < 50\text{cm}$ , $L^* = 3.664$ , 14mrad

## Crossing Angle, Push-Pull, Door **Open**



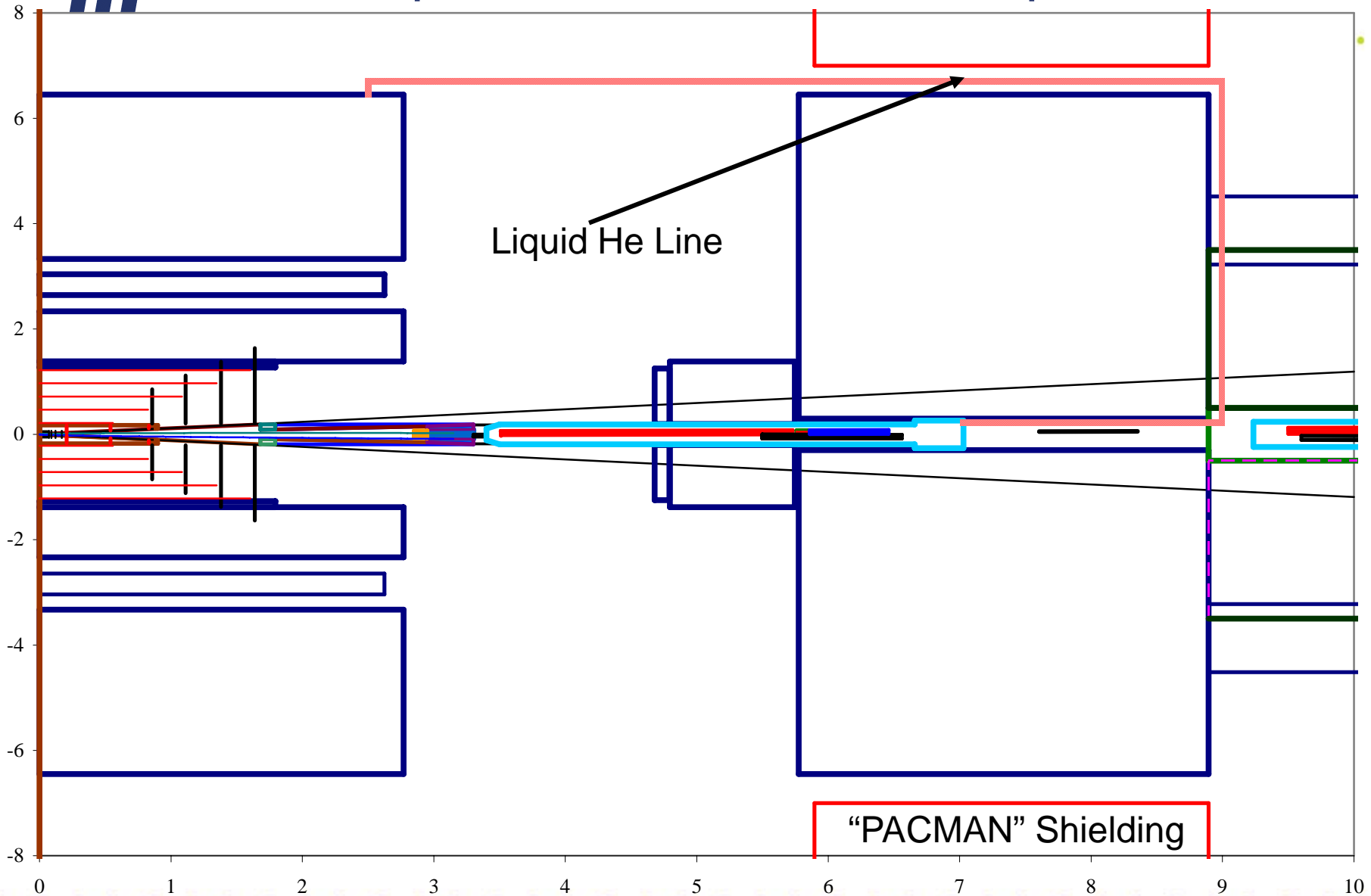


# Door Closed, Permanent QD0 Liquid He Line





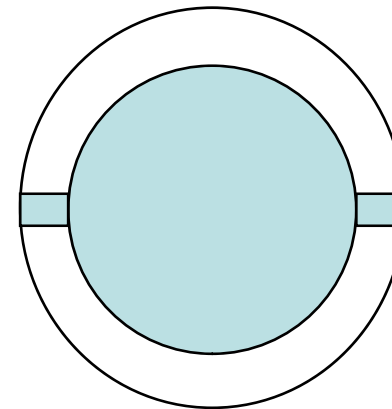
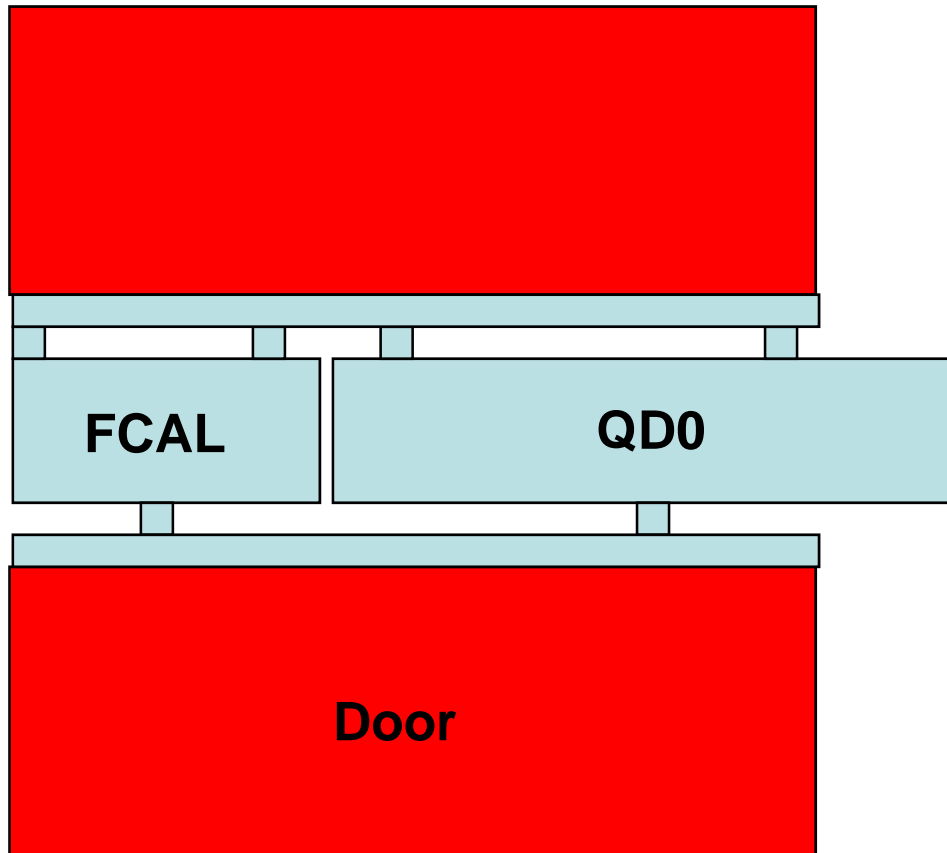
# Door Open, Permanent QD0 Liquid He Line





# Plan & Elevation View of FCAL/QD0 Support

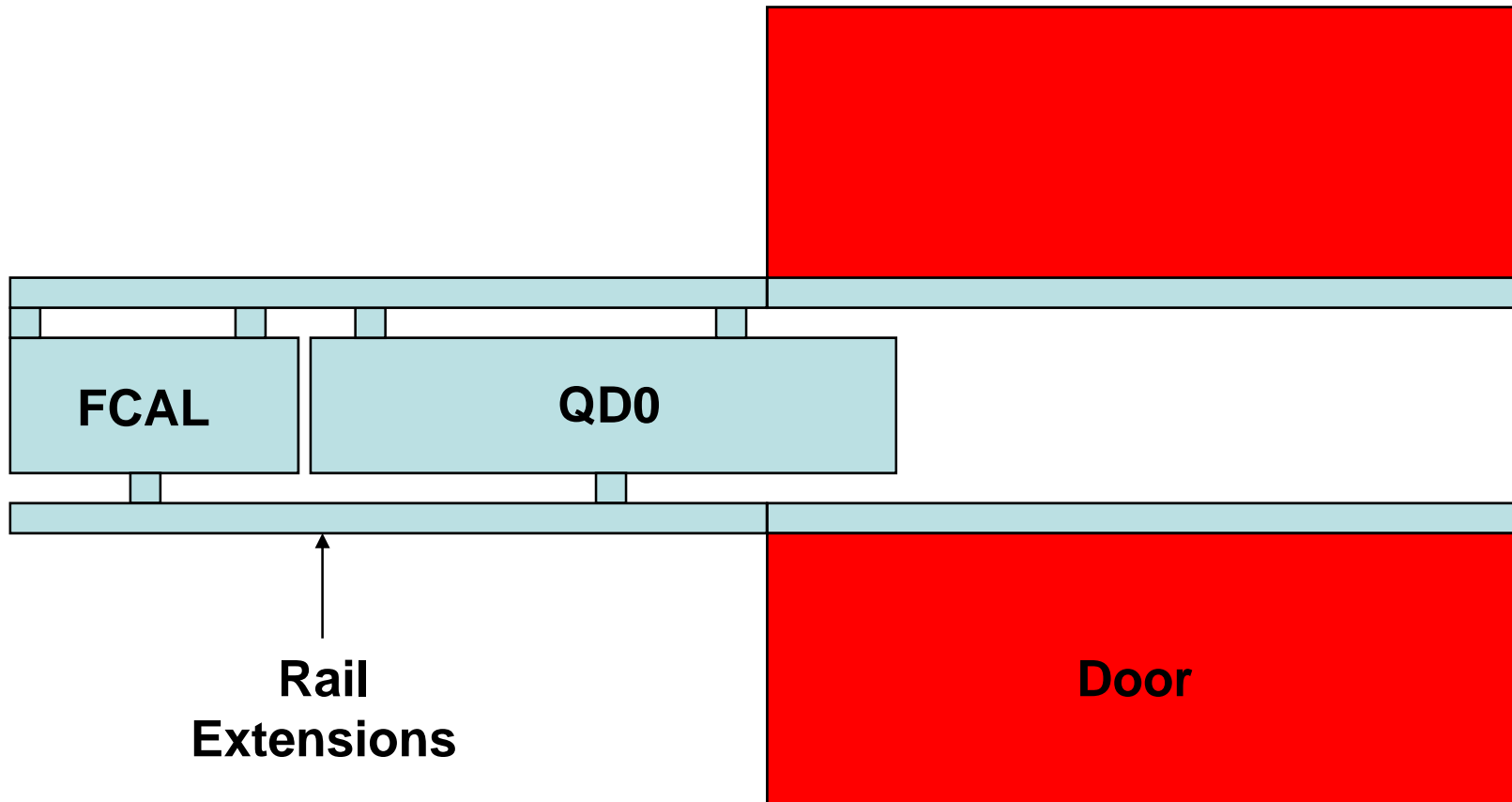
Ignore for the moment fact that I have drawn endcap ECAL/HCAL down to  $r=20\text{cm}$  and yoke at  $30\text{cm}$







# FCAL/QD0 Supported with Door Open



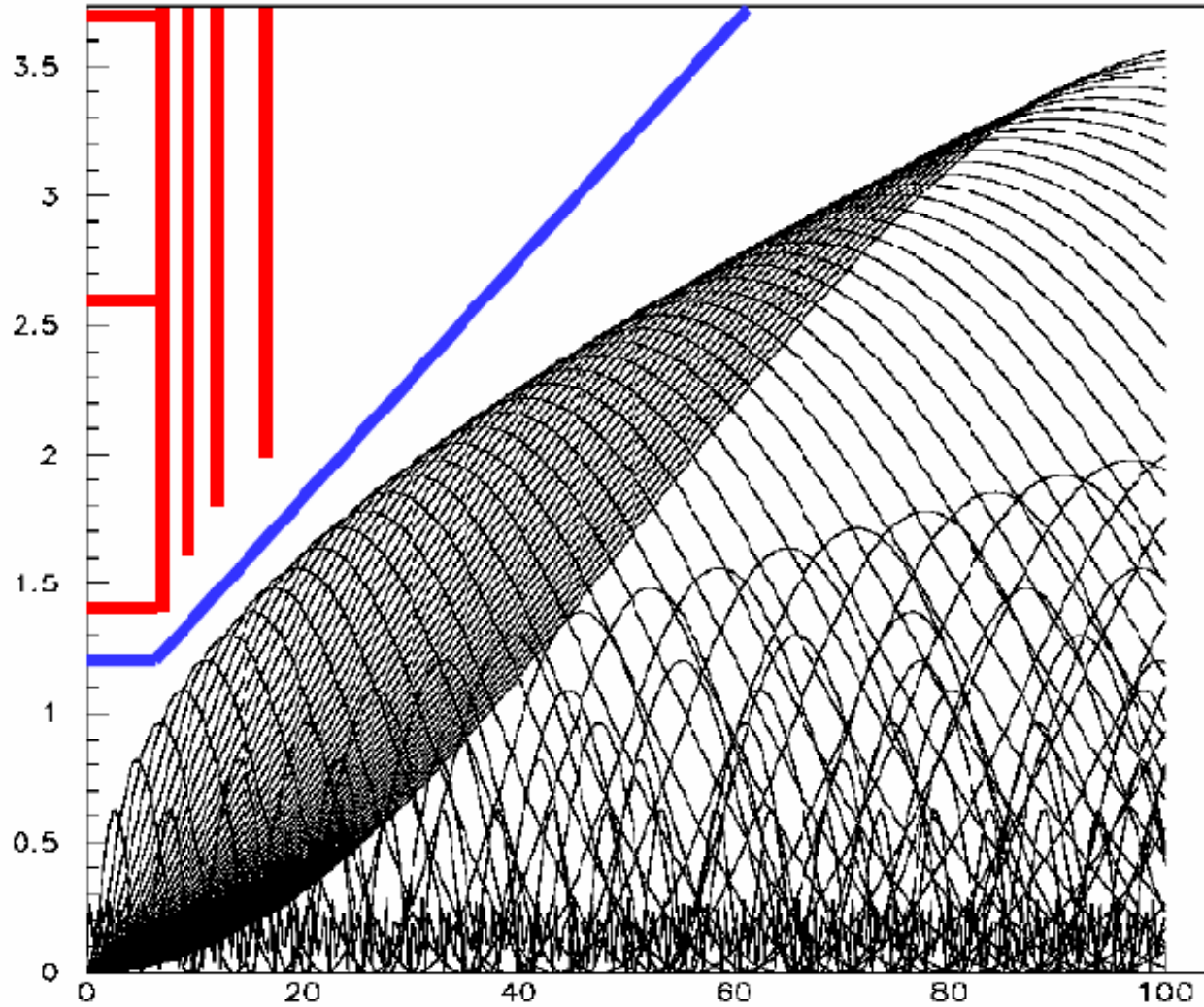


## Three beampipe shapes have been considered over time for SiD

- Flat at 12mm for VXD, flared to O.D. of Lumical (190mm) @  $z_{\min} = 1.68\text{m}$  of endcap ECAL
- Flat at 12mm for VXD, flared to I.D. of Lumical (86.5mm) @  $z_{\min} = 1.68\text{m}$  of endcap ECAL
- Flat at 12mm for VXD, flared rapidly to clear pair stay free until  $r=86.5\text{mm}$  ( $r_{\min}$  of Lumical @  $z_{\min} = 1.68\text{m}$ ), then cylindrical
- In all cases, beam pipe then becomes conic and follows inner surface of mask until beampipe

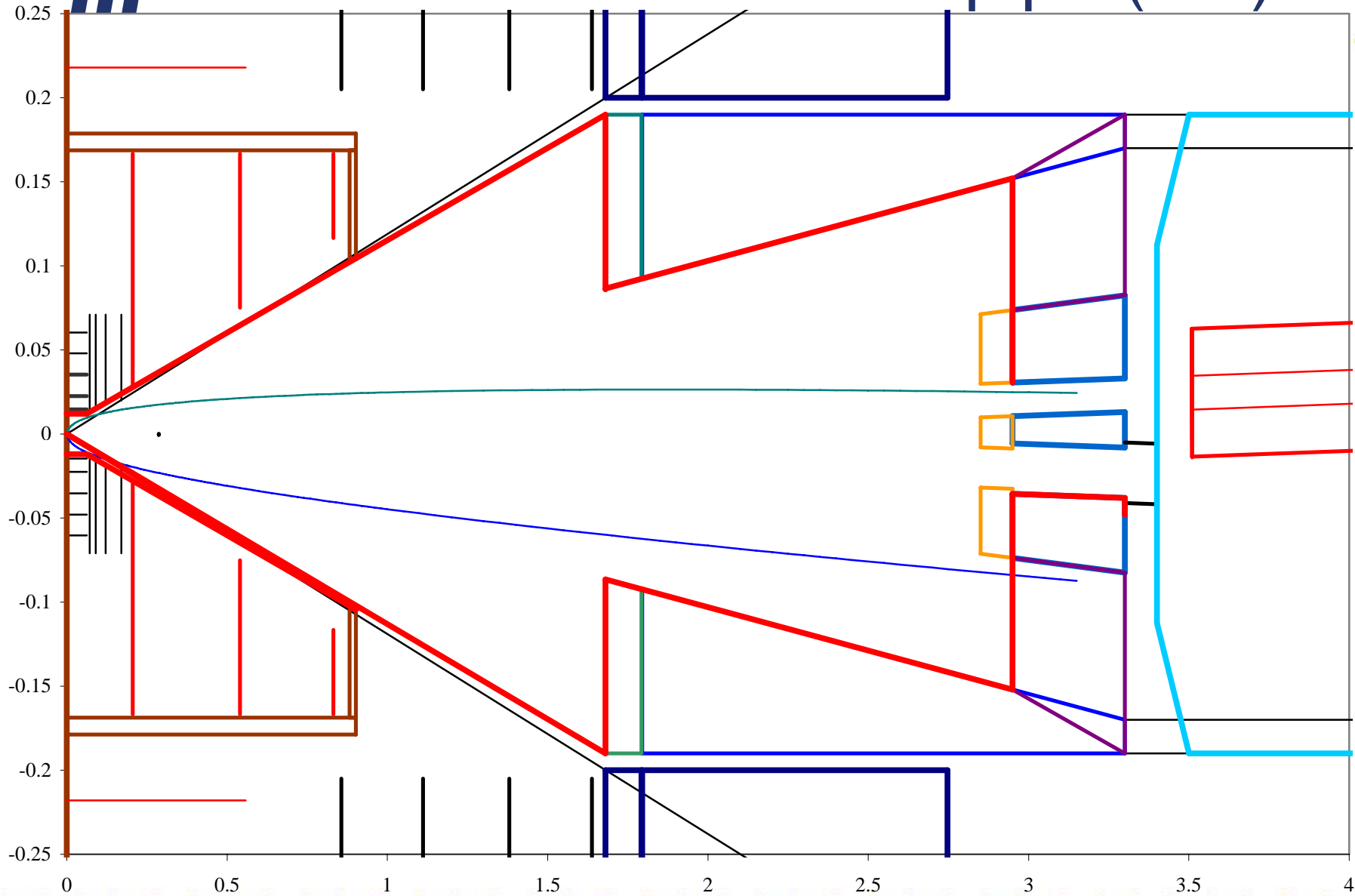


# 12mm Beam Pipe and VXD Detail





# Detail of current beampipe (red)





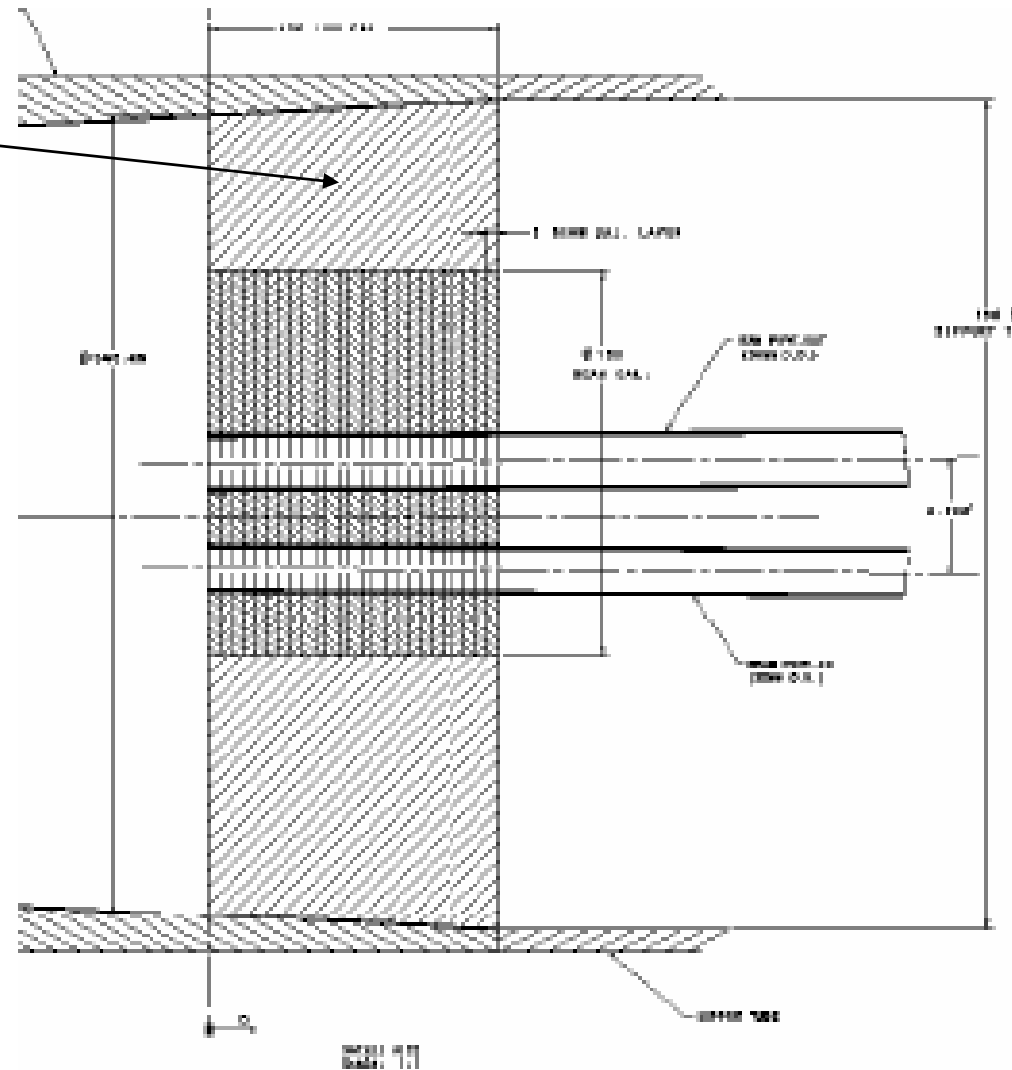
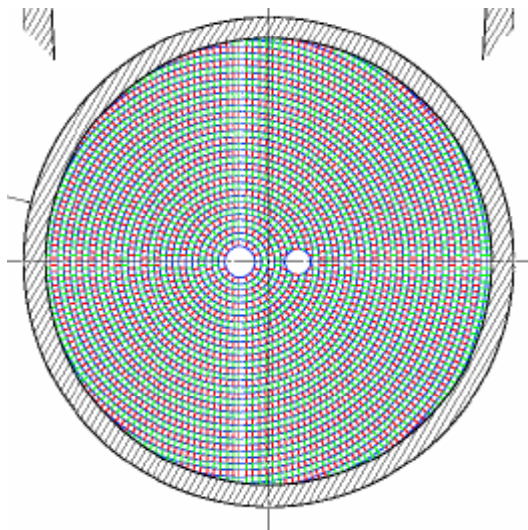
## Often forgotten points that need discussion

- There are **TWO** parts to “LumiCAL” whose relative importance has yet to be studied
  - **Low radius extension of endcap ECAL=Lumi1**
  - **Large radius part of “Beamcal” beyond region where pairs hit= Lumi2**
- The very heavy forward detector and masking system (Lum1, Mask (instrumented as HCAL or not?), Lum2+Beamcal package must **NOT** be cantilevered off QD0 cryostat **EXCEPT** when the door is open



# Elevation & Plan Views of Far-Lumi/BeamCal from SiD DOD

Has any thought been given to details of the Far Luminosity Monitor?





# Conceptual Solution for R20 Mechanics is Needed

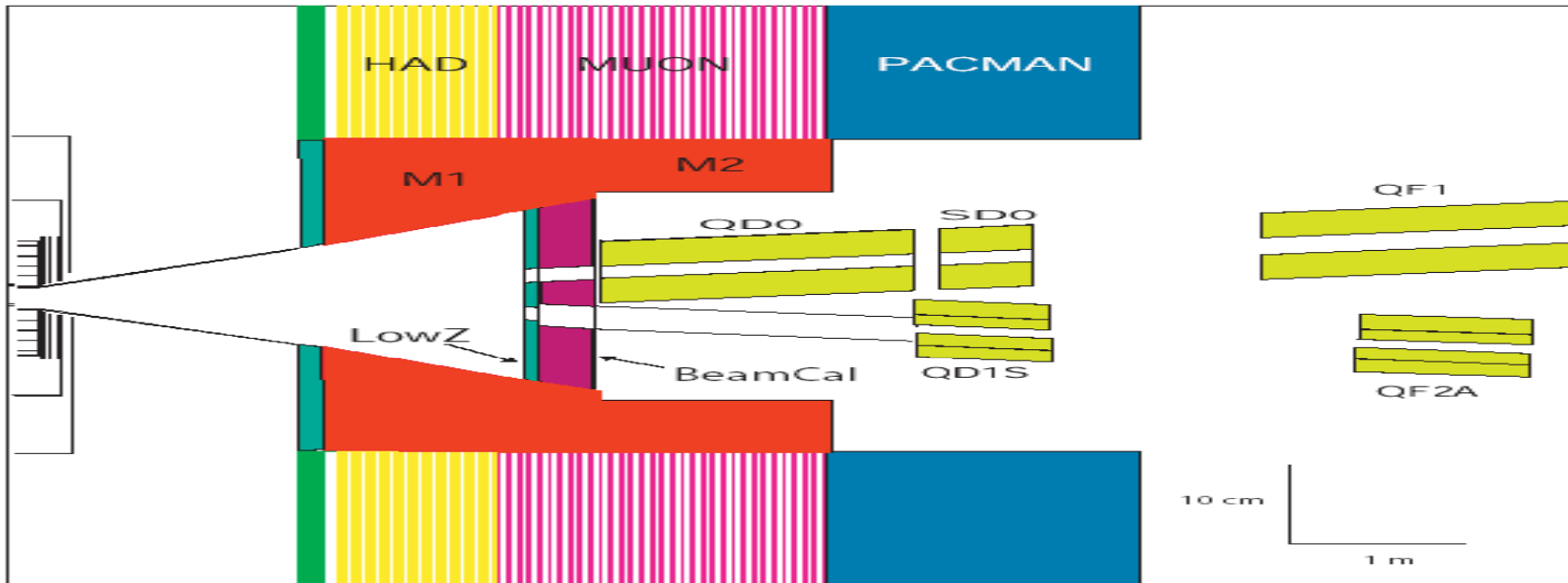
- Support points
- Bellows
- Flanges
- Alignment and adjustment features
- Vacuum features (if any) at  $z < 7\text{m}$  (end of QD0 cryostat)
- Cable & Gas service routing
- Rethinking of access requirements in PUSH-PULL
  - **On-beamline access for rapid repair**
  - **Off-beamline access for VXD or TRACKER replacement**



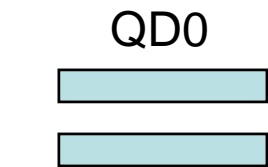


# T. Maruyama Recalculation of ALL Backgrounds for Current Layout 03 April 2007 (see BDS)

14 mrad crossing geometry in Geant 3 and FLUKA

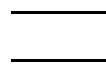


Apertures:



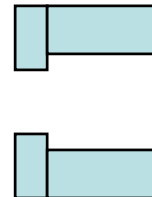
R=1.0 cm @ z=-3.51 m

Beampipe@IP



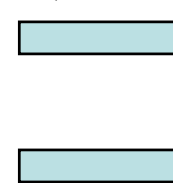
1.2 cm @ 0.0m

Low Z



1.35 cm  
@2.85-2.95m

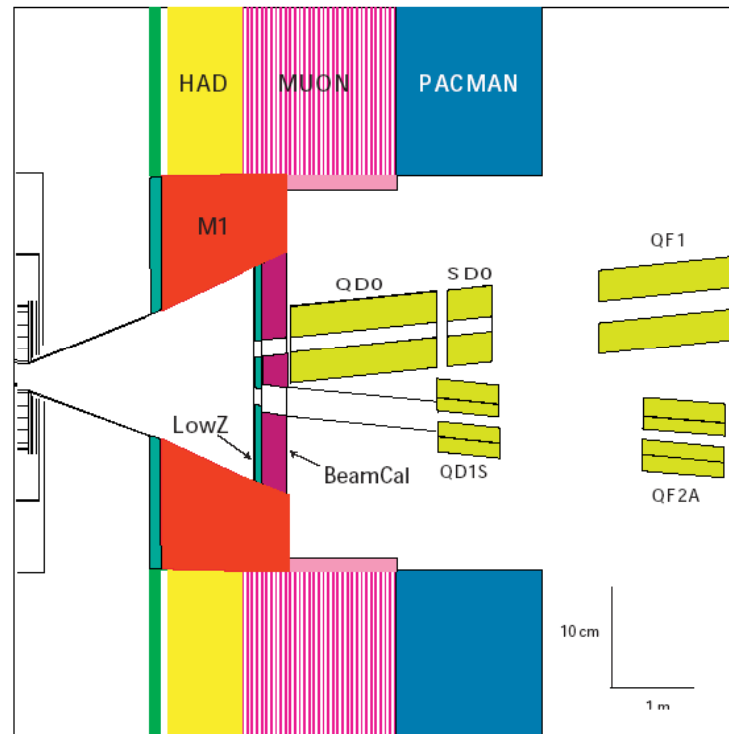
QD1S



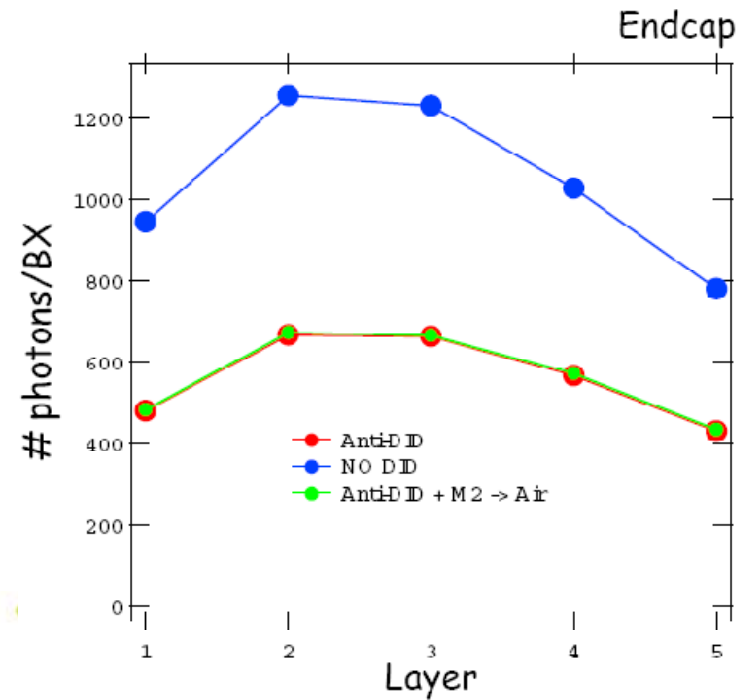
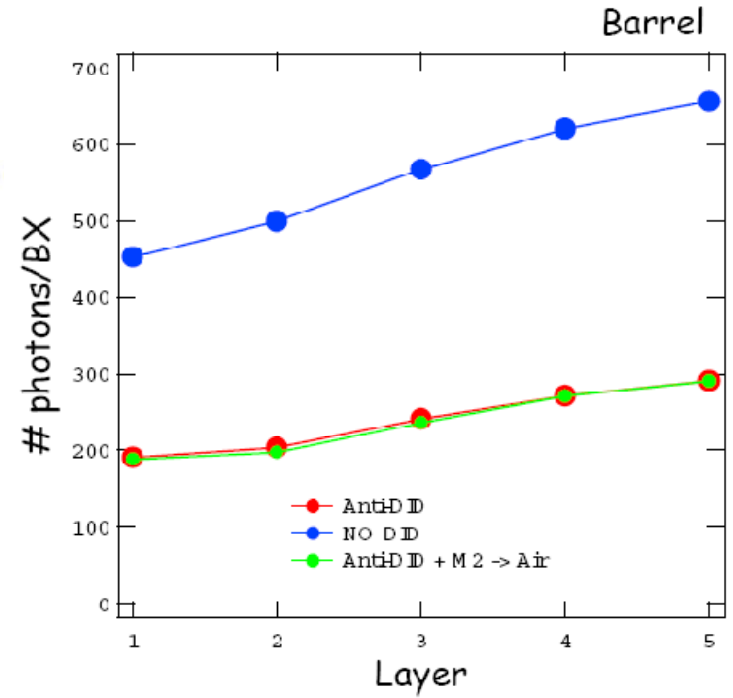
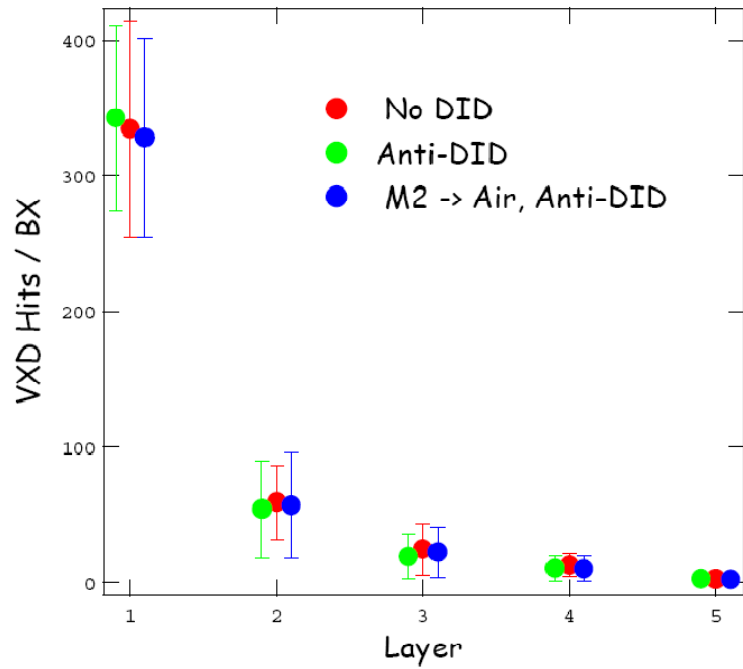
1.5 cm  
@5.5-6.56m



# Is M2 NEEDED or NOT????



# ilc No M2 Mask Needed





# ILC IR Engineering Workshop

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

## Workshop on ILC Interaction Region Engineering Design

SLAC, September 17-21, 2007 (tentative)

### Goal

To review and advance the design of the subsystem of the Interaction Region of ILC, such as

- Final focusing magnets
- Forward instrumentation
- Detector central regions
- IR vacuum chambers
- Cryogenic systems
- Supports for magnets and detectors
- Shielding
- Collider hall

focusing in particular on their integration, engineering and arrangements for push-pull operation.

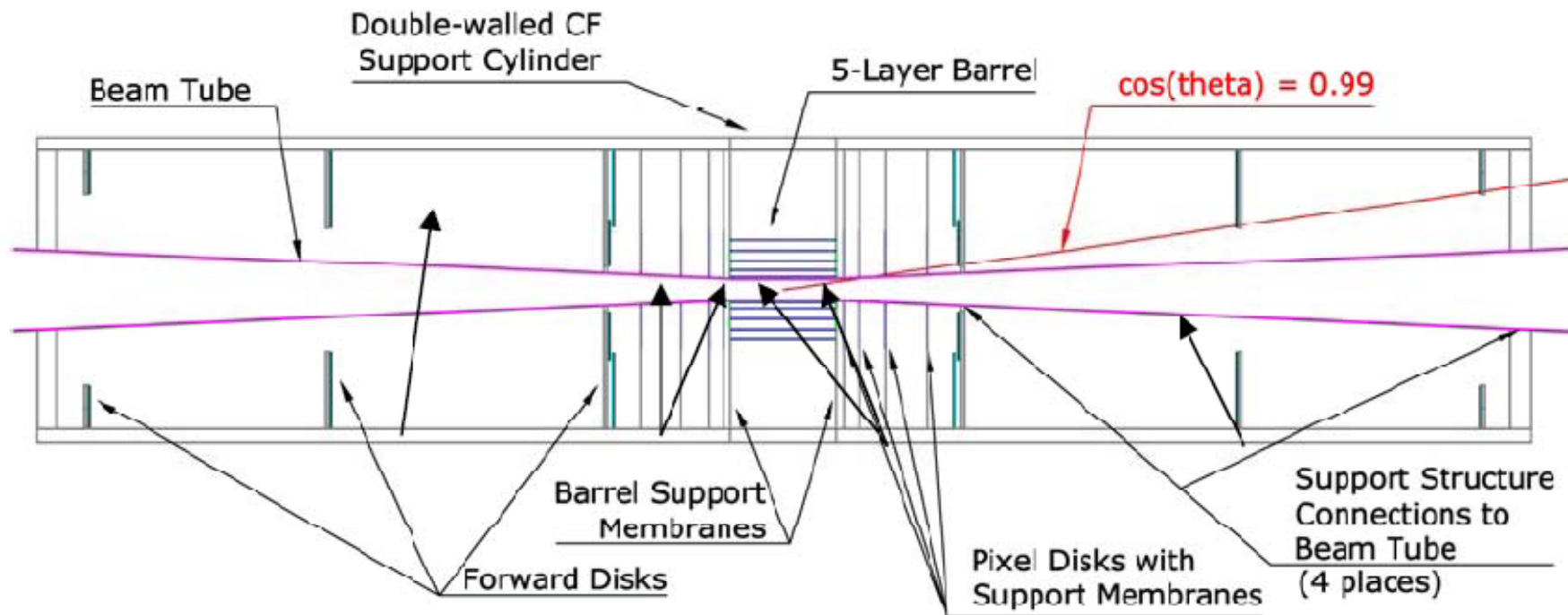


**Bonus Material Follows**



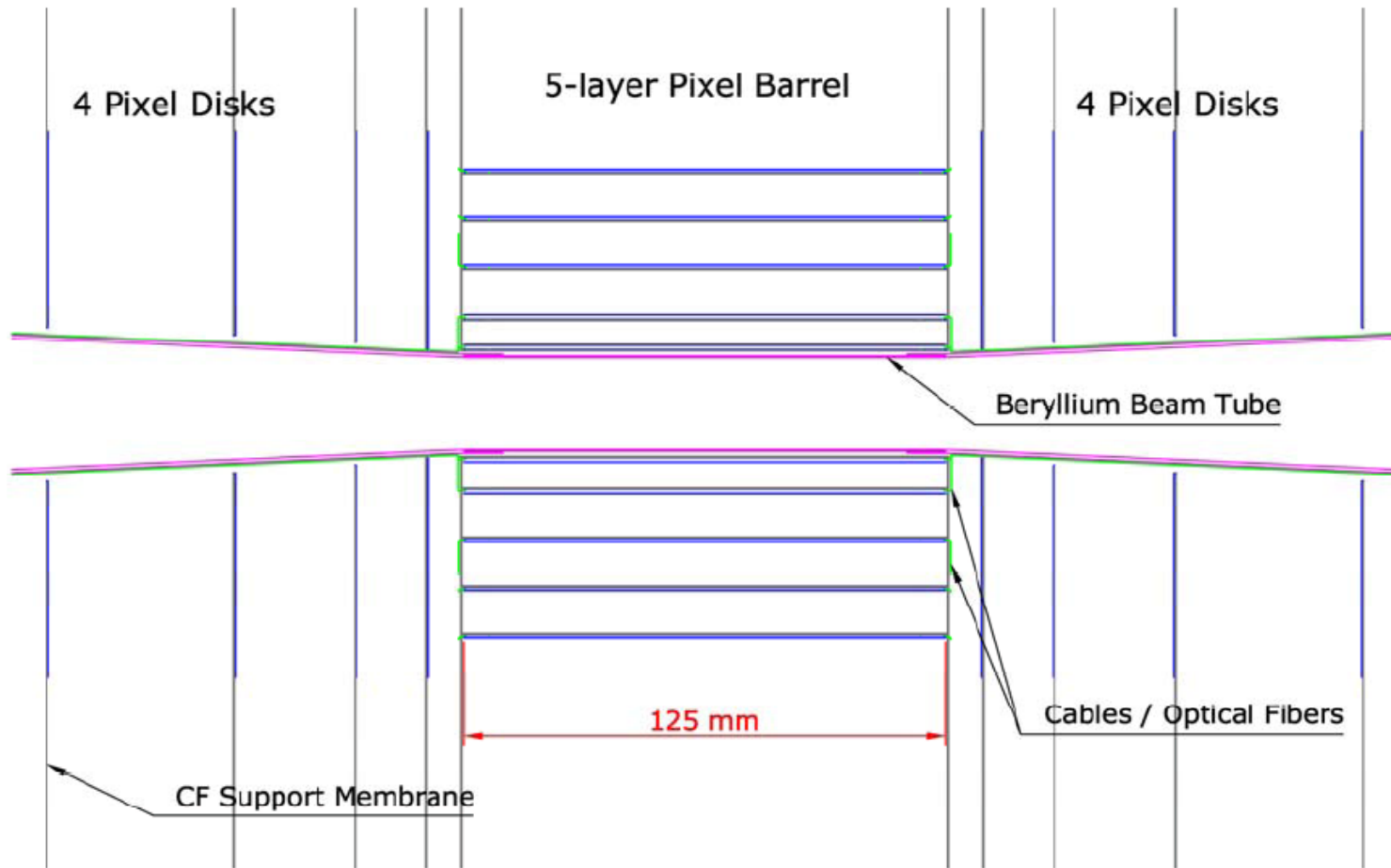


# VXD and Support Structures





# R-Z View of the Pixel VXD

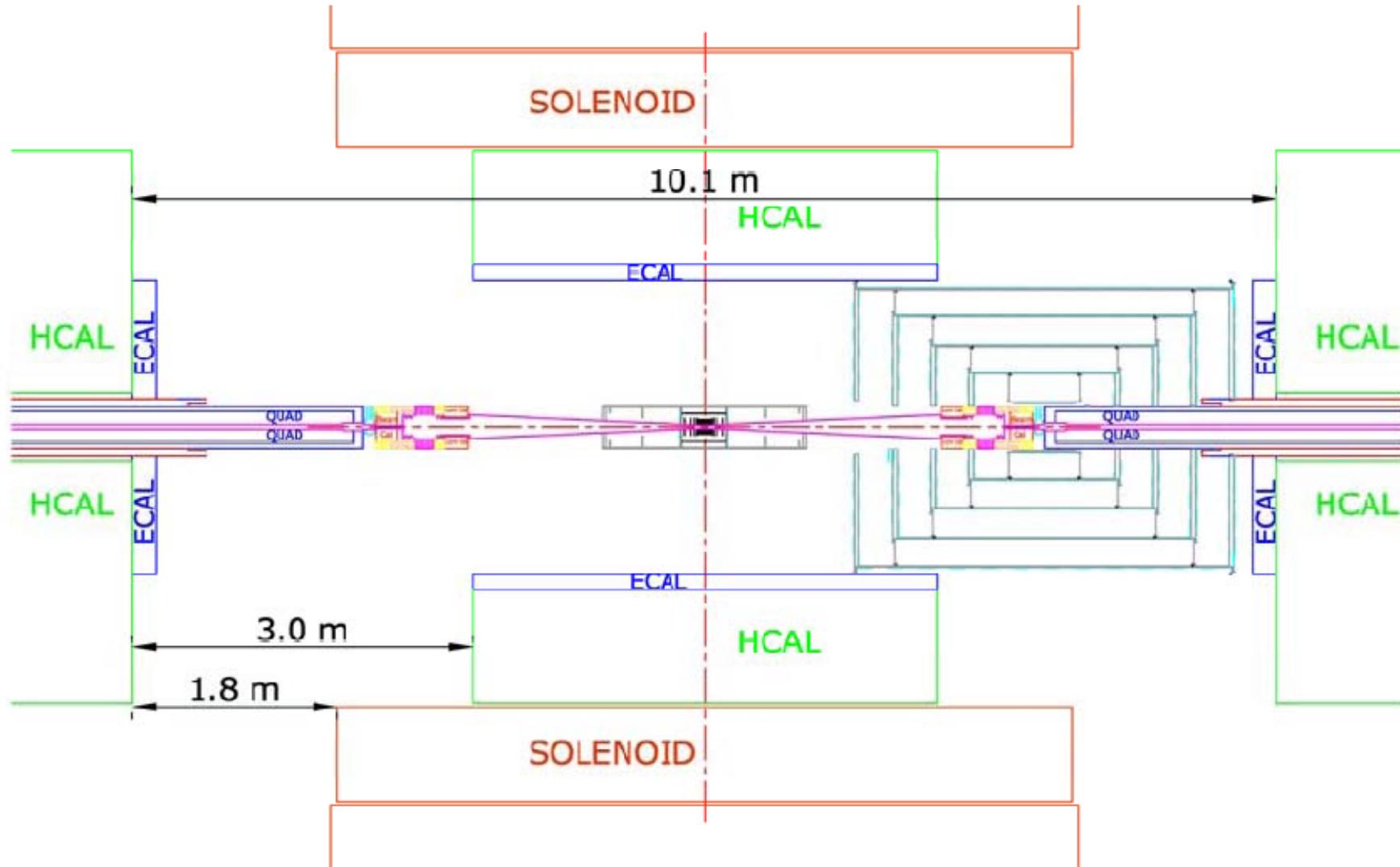






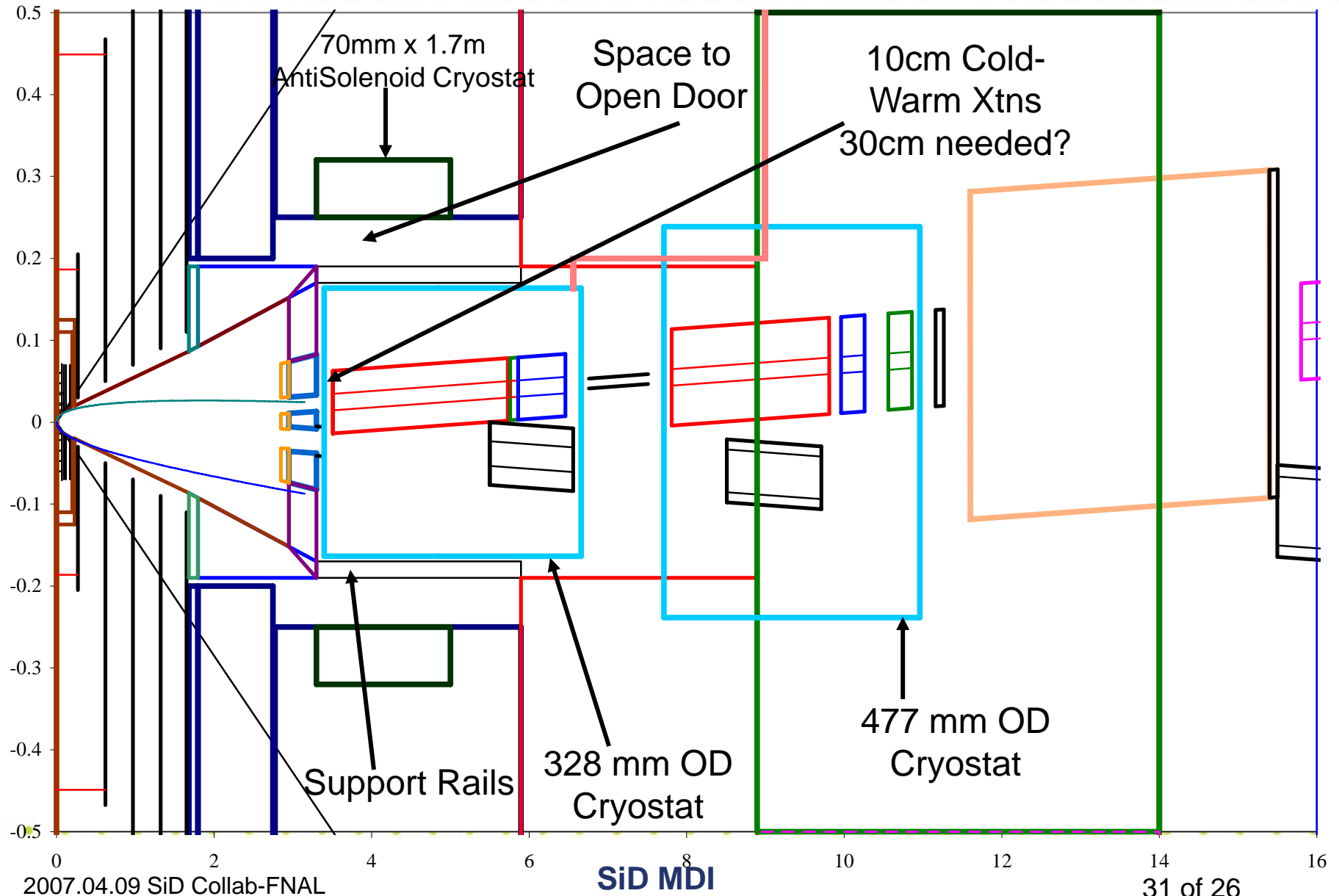
# SiD Open for Access to the VXD Region

What Opening is Required for Access ON Beamline?





# SiD $r < 50\text{cm}$ , $L^* = 3.5$ , 14mrad Crossing Angle, Push-Pull, Door Closed





# SiD $r < 50\text{cm}$ , $L^* = 3.5$ , 14mrad Crossing Angle, Push-Pull, Door **Open**

