
# Final Focus Magnet & IR Integration Status

Presented by Brett Parker.

MDI: Interaction Region Integration and Optimization. GDE/ACFA Joint Session.

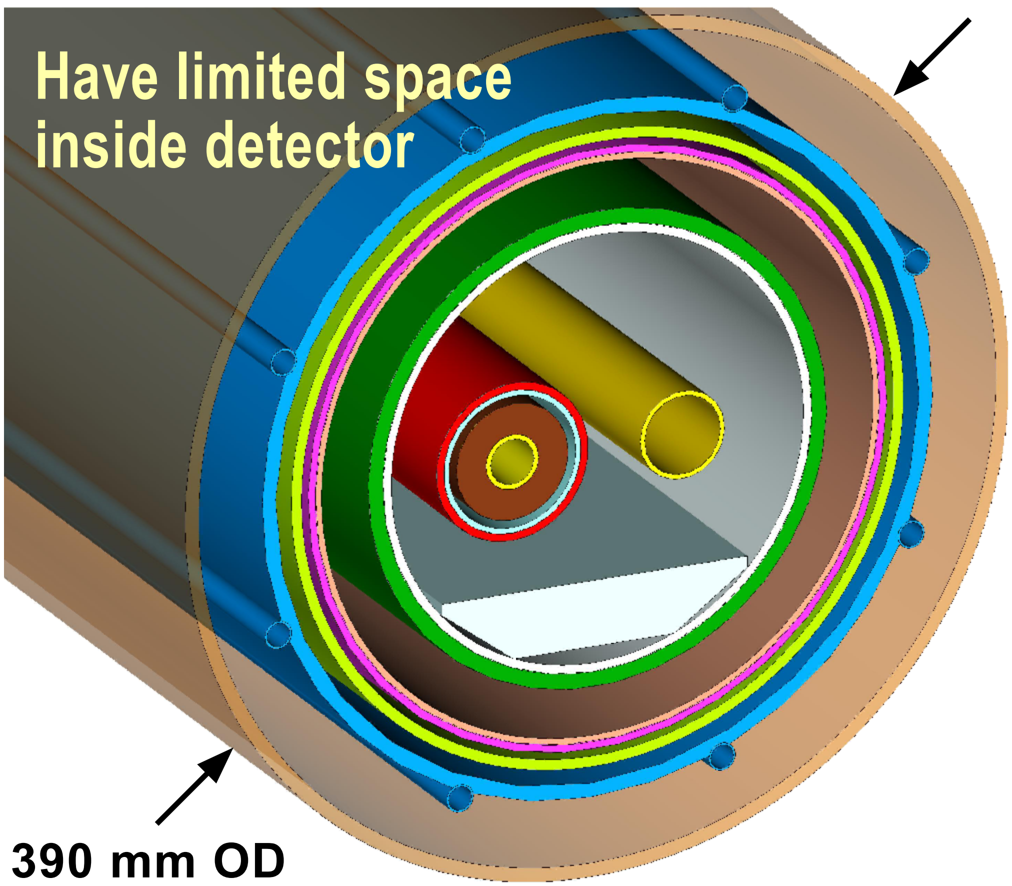
# Introduction*

- With USA "Black Monday..." little change since SLAC/IRENG'07.
- Review Post-IRENG'07 14 mr Final Focus Magnet Configuration along with the Cryogenic "Straw-Man" Design.
- So yes we know that cost reduction is important, but (I fear) that with MDI we will have to work hard on "cost avoidance" (will use push-pull as an example where many implications are still TBD). Need for Value Engineering.
- Need to refine cryogenic distribution system (impact hall design).
- Need to refine the QD0 support structure (machine performance).
- Need to refine the Anti-DID designs (experimental backgrounds).

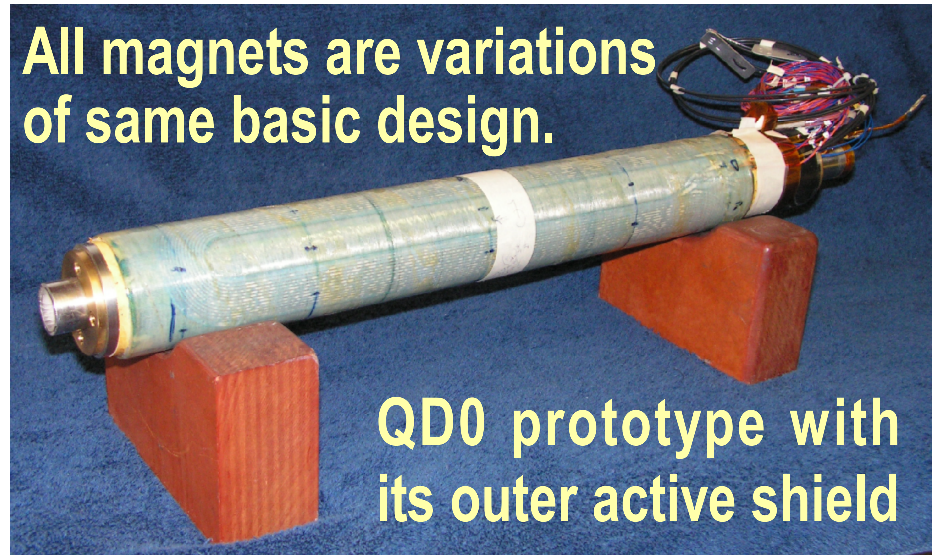
*Apologize in advance for omitting any work from other regions as I may not be up to date due to BNL stop work, 31-Dec-2007, on FF magnets; thankfully there is still limited MDI support. So this presentation is a personal reflection on issues that were discussed at the SLAC IRENG'07 workshop.

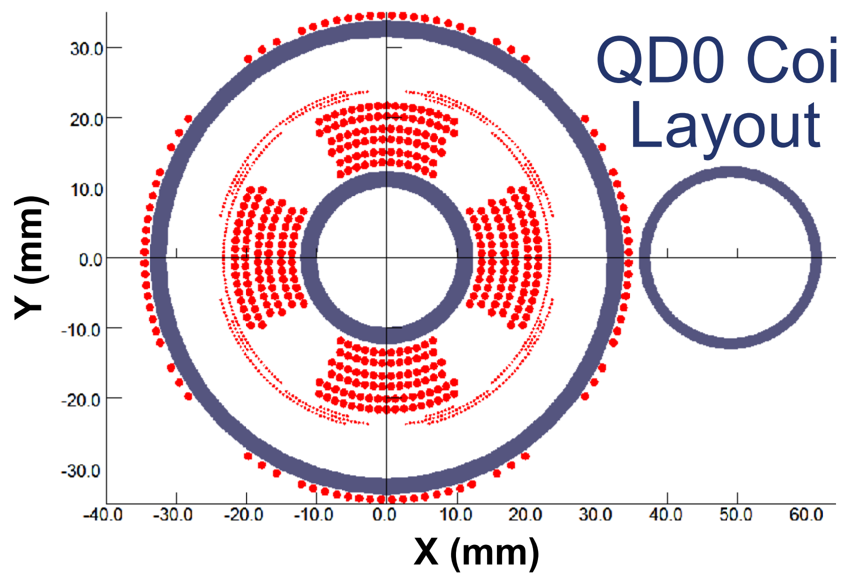
# 14 mr Compact Superconducting Magnets

**QD0 Cryostat design for L* = 4.5 m.**

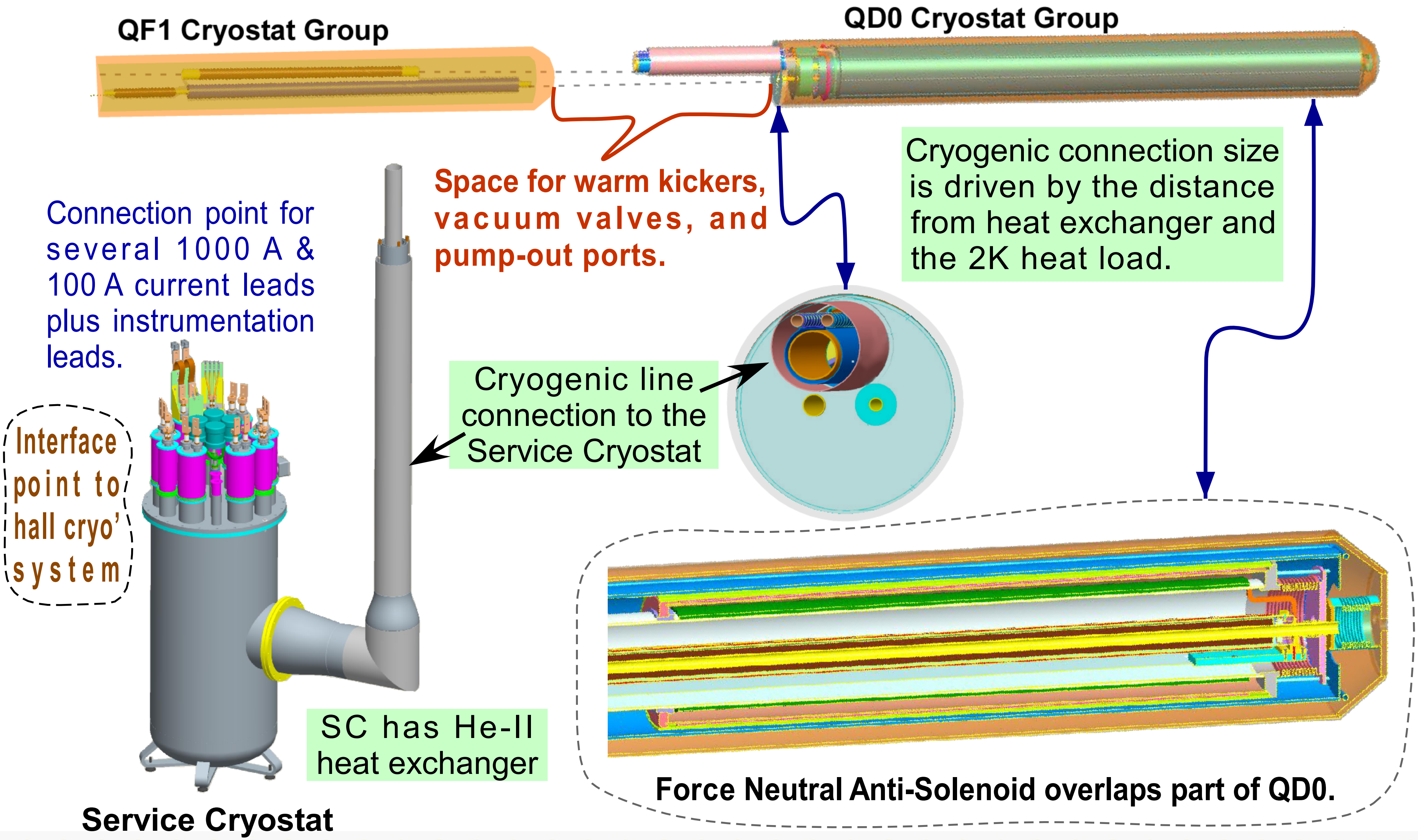




**390 mm OD**



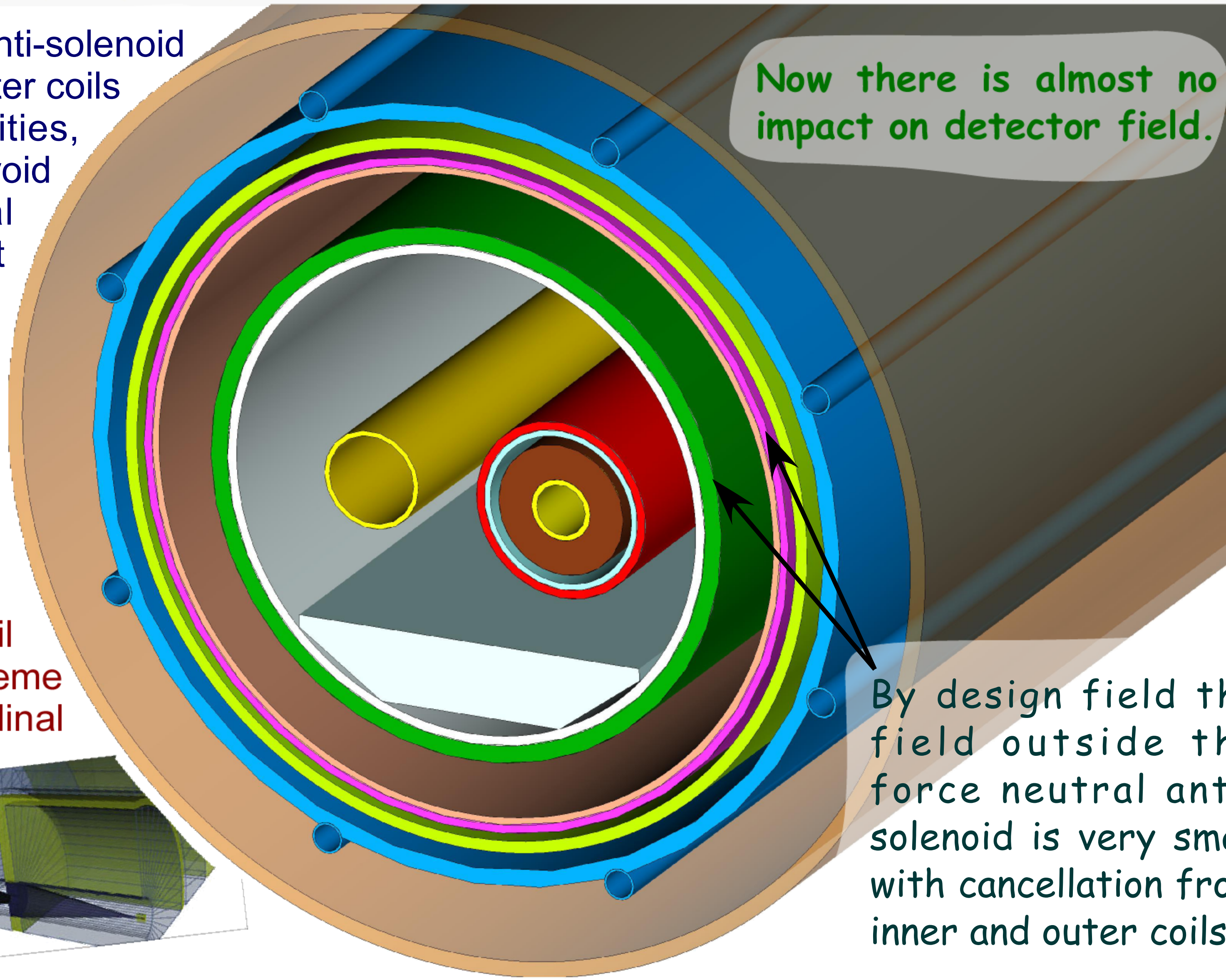



# Magnet & Cryo' System Components

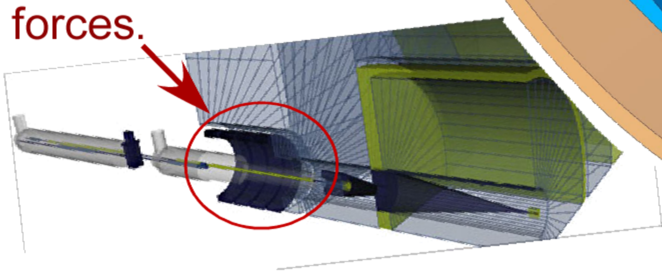


# Force Neutral Anti-Solenoid Design

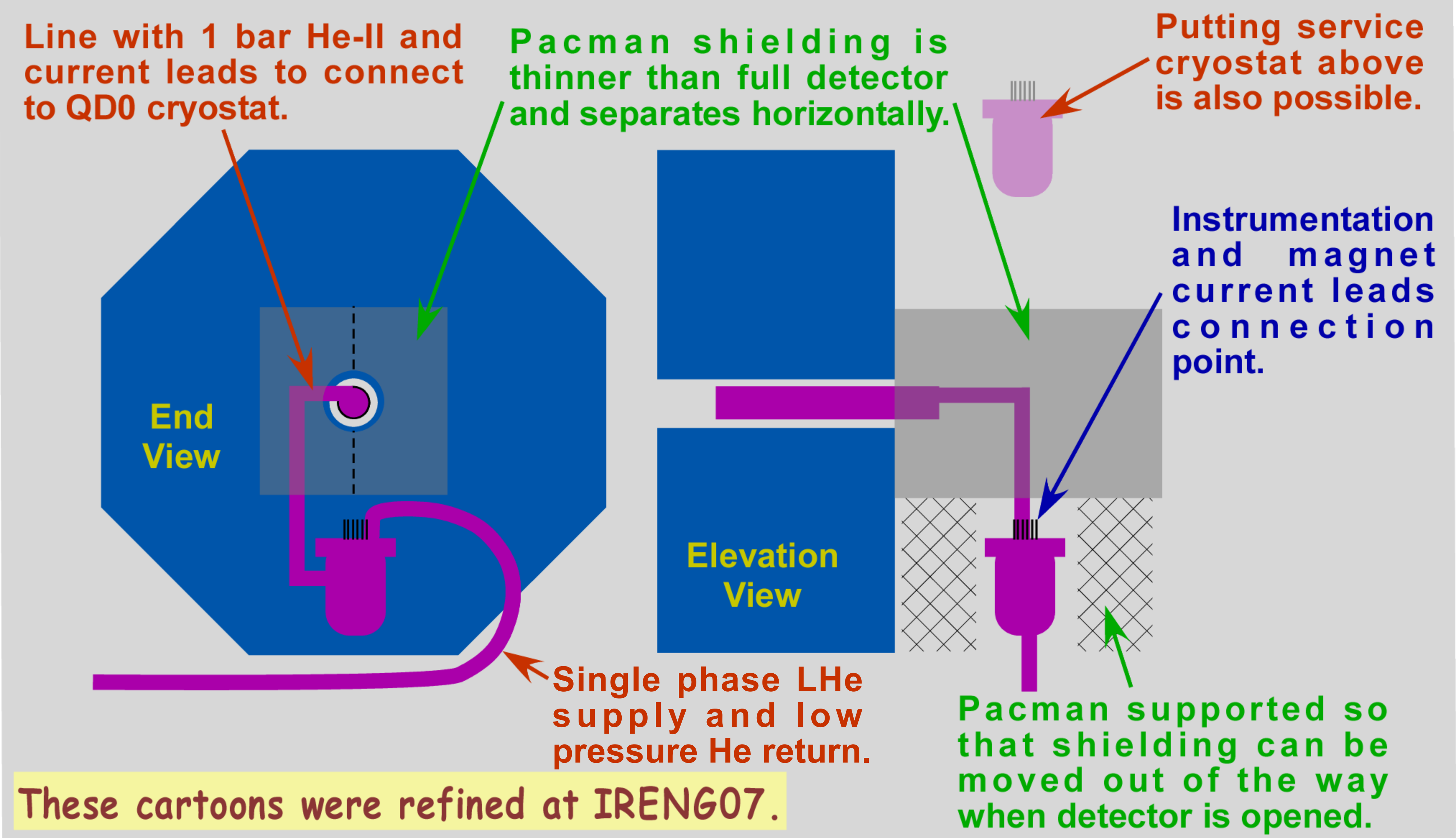
By constructing anti-solenoid with inner and outer coils of opposite polarities, it is possible to avoid large longitudinal net forces so that anti-solenoid can be combined with the other magnet coils inside the QD0 cryostat.




Previous large coil anti-solenoid scheme had large longitudinal forces.

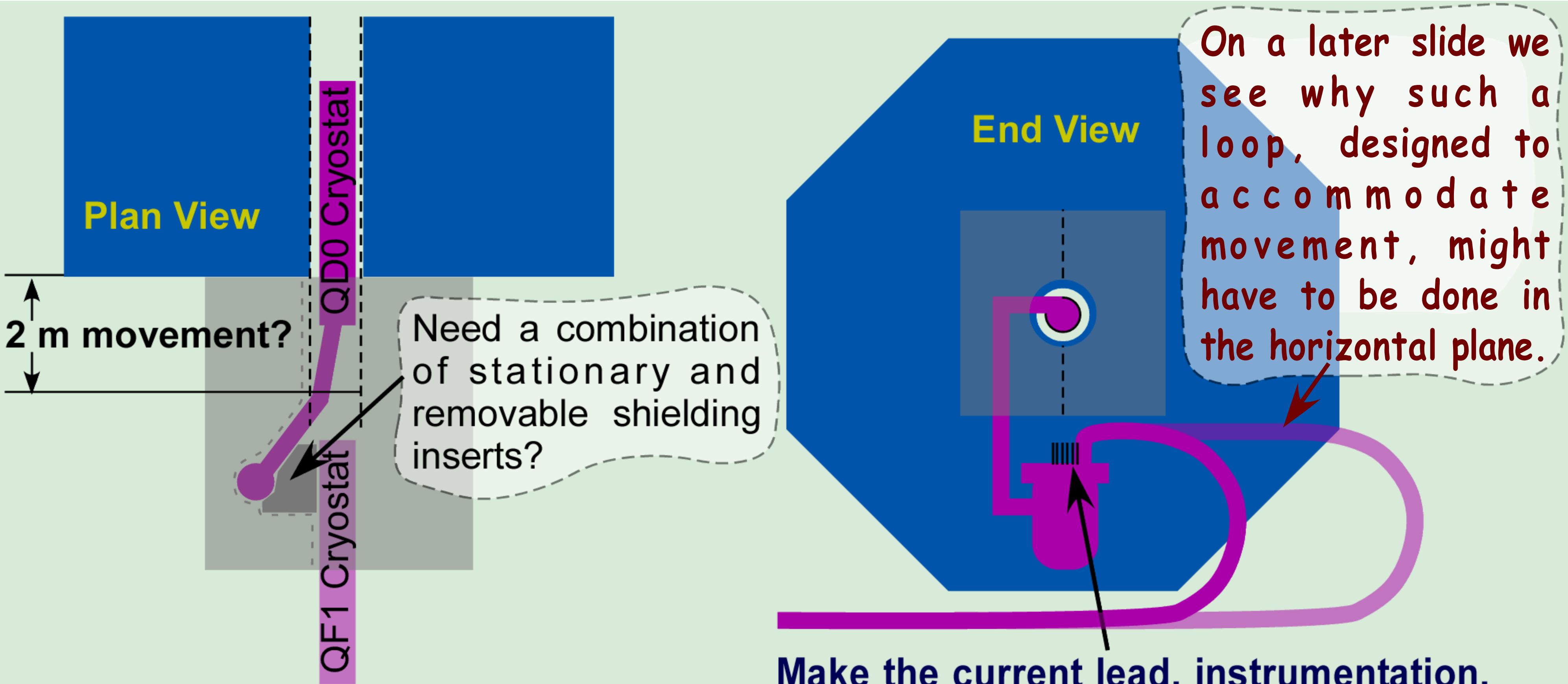


# Cryogenic “Straw Man” Design




These cartoons were refined at IRENG07.

# Design Constraints: Push-pull plus opening the detector door 2 m for access & compatibility with radiation shielding.

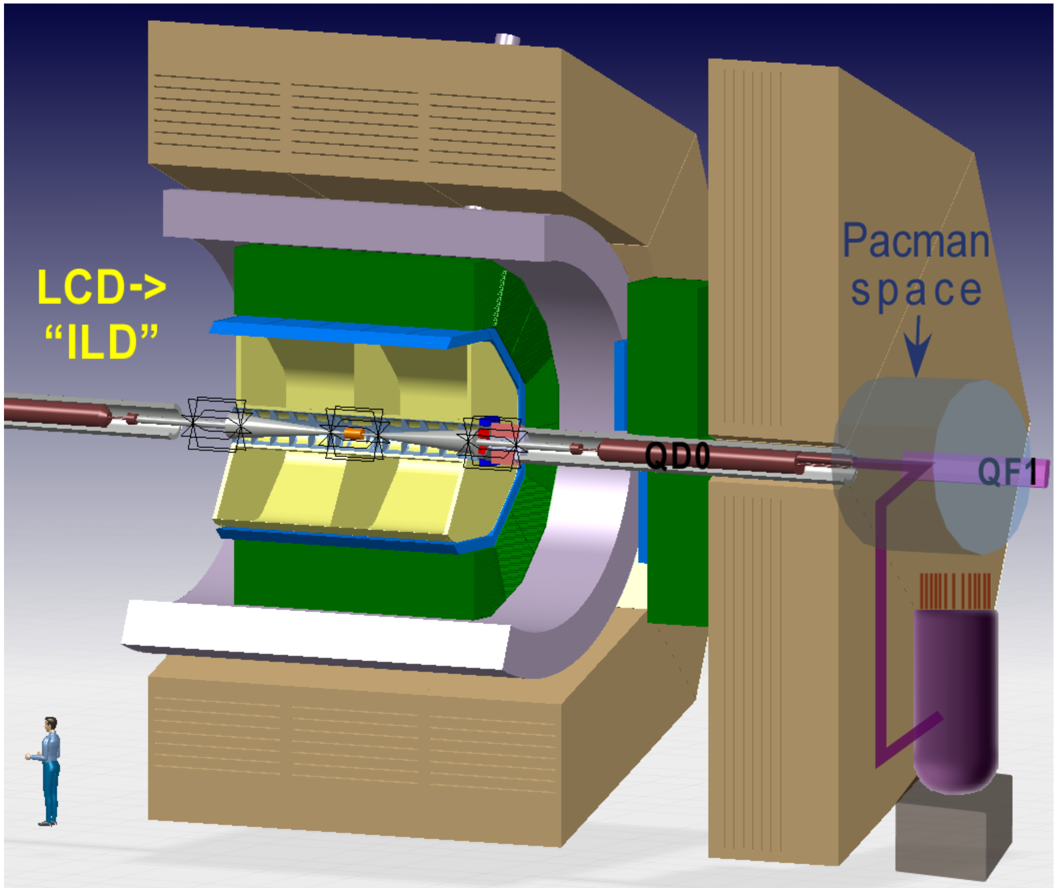


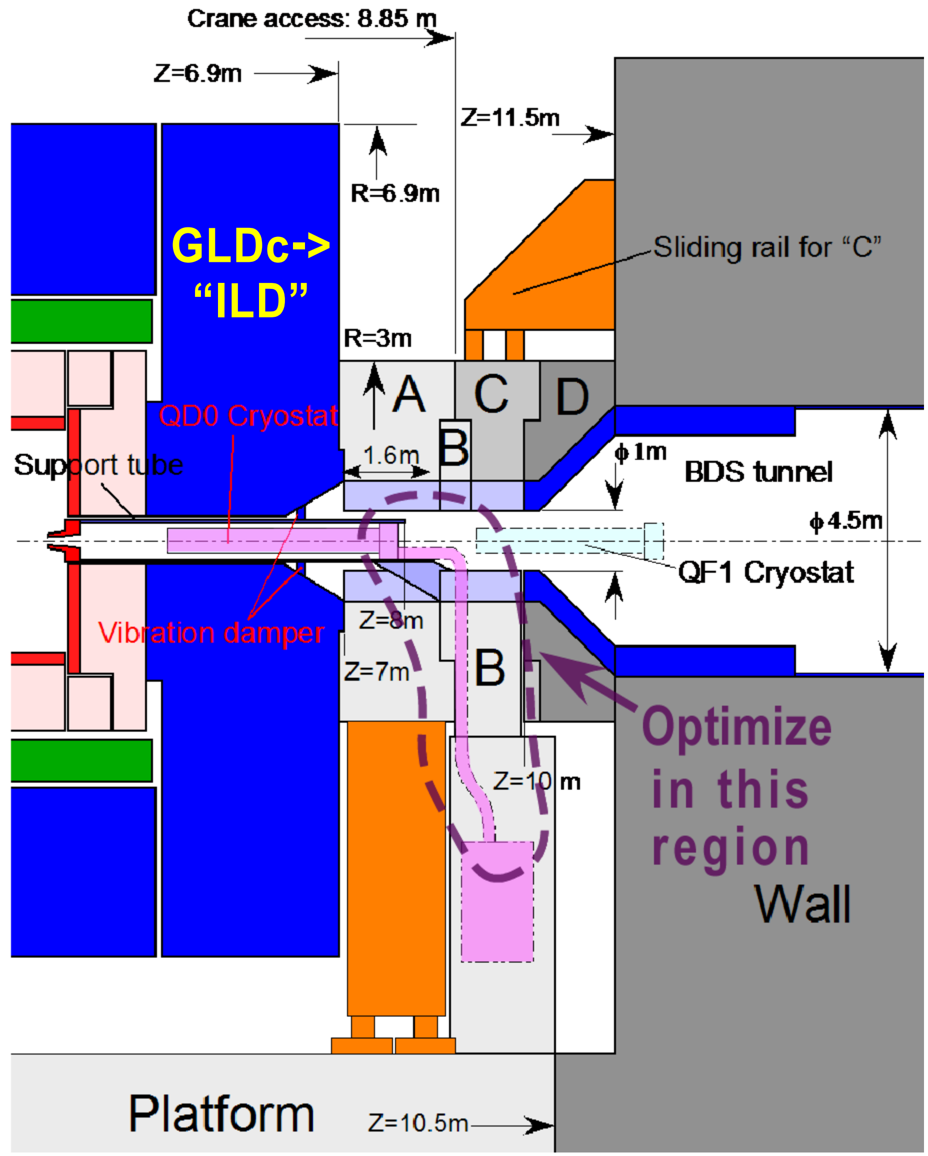

**QD0-Service Cryostat connection line has to permit 2 m opening by door but vertical section must not point directly to incoming/outgoing beamlines.**

**Make the current lead, instrumentation, process gas, vacuum line, etc. connections outside to minimize penetration of pacman.**

(Mirror cryogenic layout for two experiments)

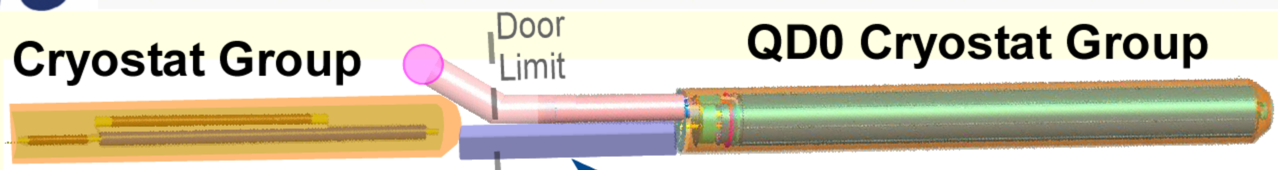
# For Push-Pull, many seemingly small details can impact technical system access, crane coverage and even hall size.



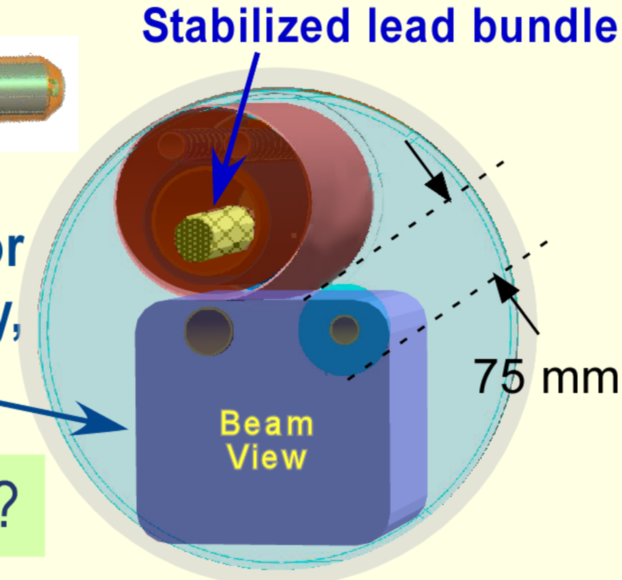

Horizontal opening up of pacman is strongly favored. Design requirements are being worked out with each detector concept.

# Cryogenic Considerations & Push-Pull




Remember we have similar space constraint in the "garage position" unless we cut into transfer line (say for major repair or upgrade).

Only this space available for beamline flanges, kicker body, vacuum pumps and valves.




Now asked to open 2.5-3 m?

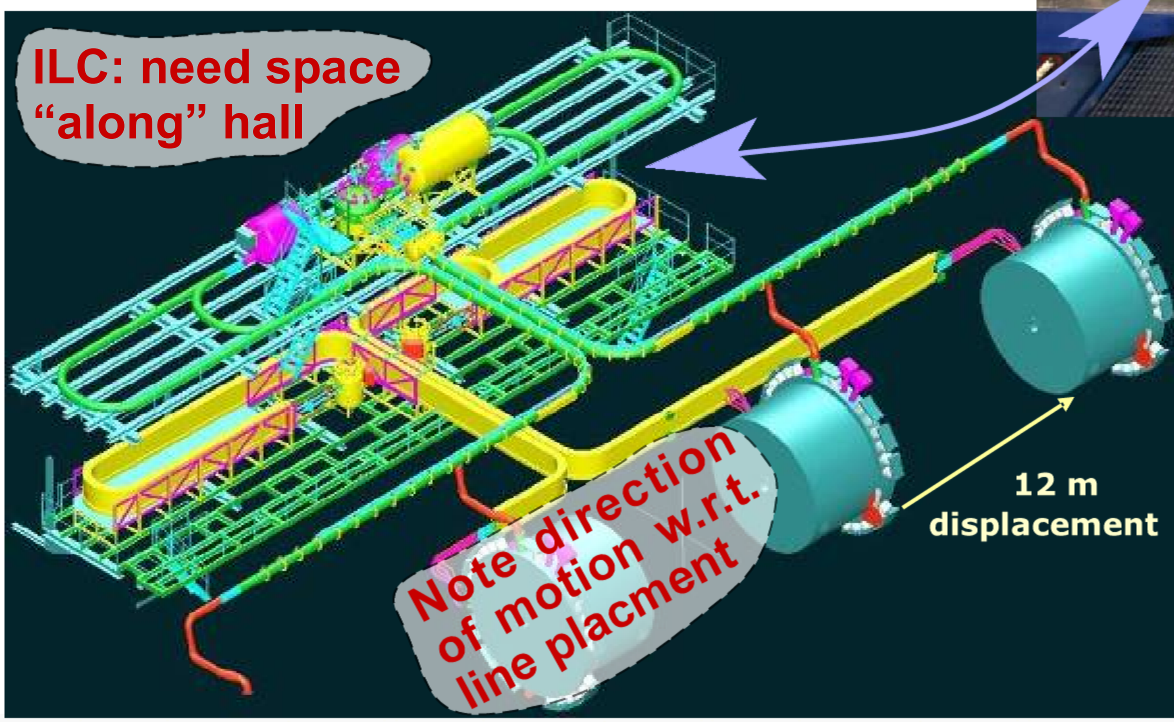
For **sizing the connection** between QD0 and the service cryostat we take the maximum 1.9K heat load to be 15 watts (14 static + 1 dynamic). Note that QD0 is conduction cooled and when the area for He-II gets very small then minor changes in parameters, such as the size of the cable bundle, can then make a big difference in performance and cool down time.

**By adopting a 1 watt budget for dynamic heat load we had better be sure to consider all possible energy deposition scenarios (beam tuning, upsets, wakefield heating etc.).**

# Flexible Cryogenic Line Technology

**Use flexible chain support and constrained semi-flexible transfer lines, in a controlled way, to enable linear motion of cryogenic components.**


Ruggero Pengo, **Status of the cryogenics project (LAr, He, N2)** at Glasgow Meeting, *July 10$^{th}$, 2007*

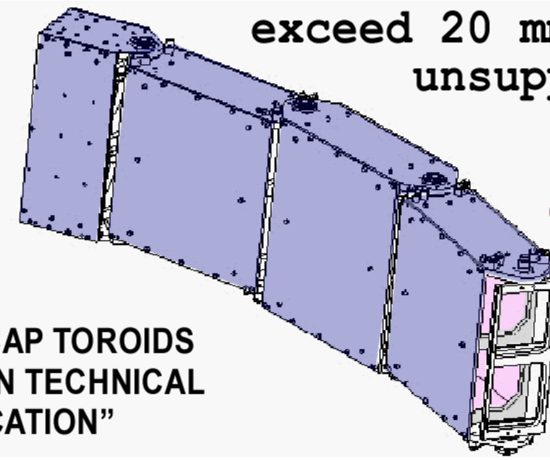



- ILC push-pull needs an even larger range of motion.
- Note that total cryogenic path length is several times longer than the range of motion.

# Flexible Cryogenic Line Technology

**Overhead chain routing complicates crane access; can we get adequate bend radius in trench under platform?**

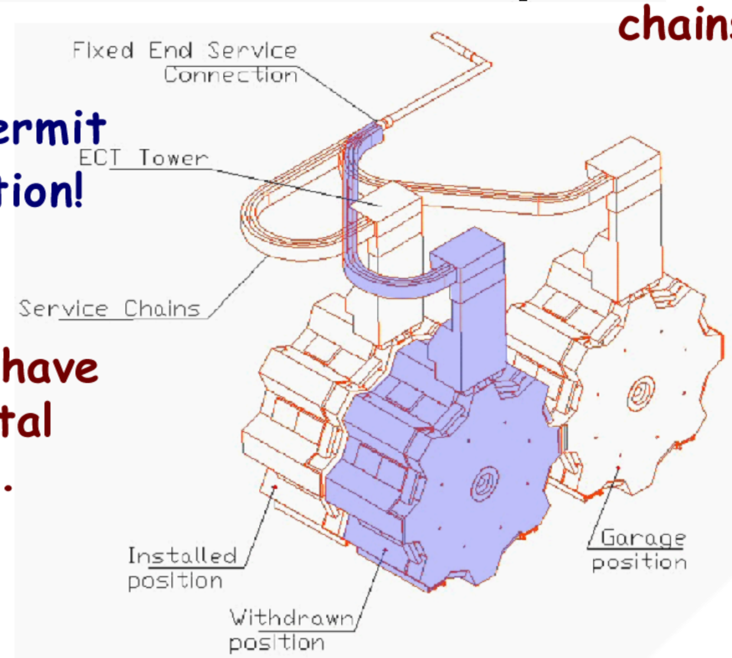

LHC: Deflection is not to exceed 20 mm over unsupported 9 m.



"ATLAS END CAP TOROIDS SERVICE CHAIN TECHNICAL SPECIFICATION"

Our ILC IR will need longer length chains.

Such chains permit compound motion!

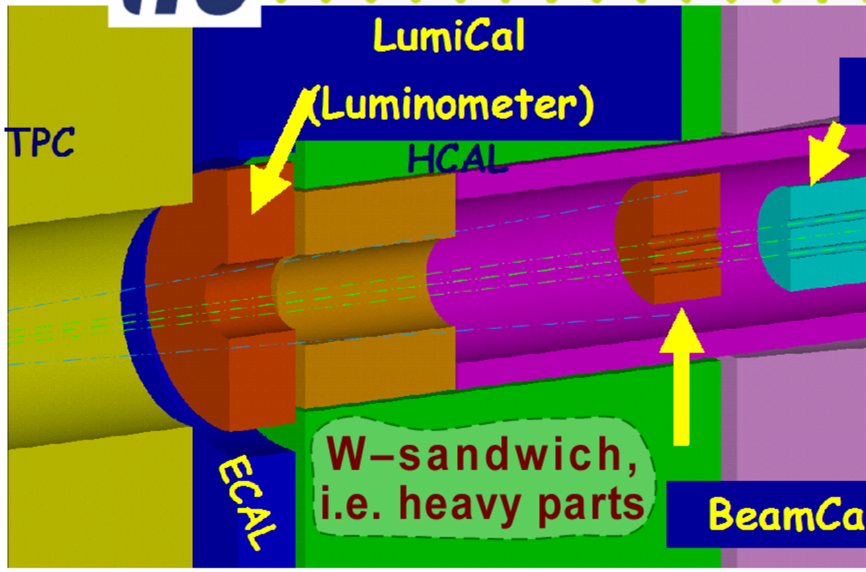



But then have horizontal bends.

↓

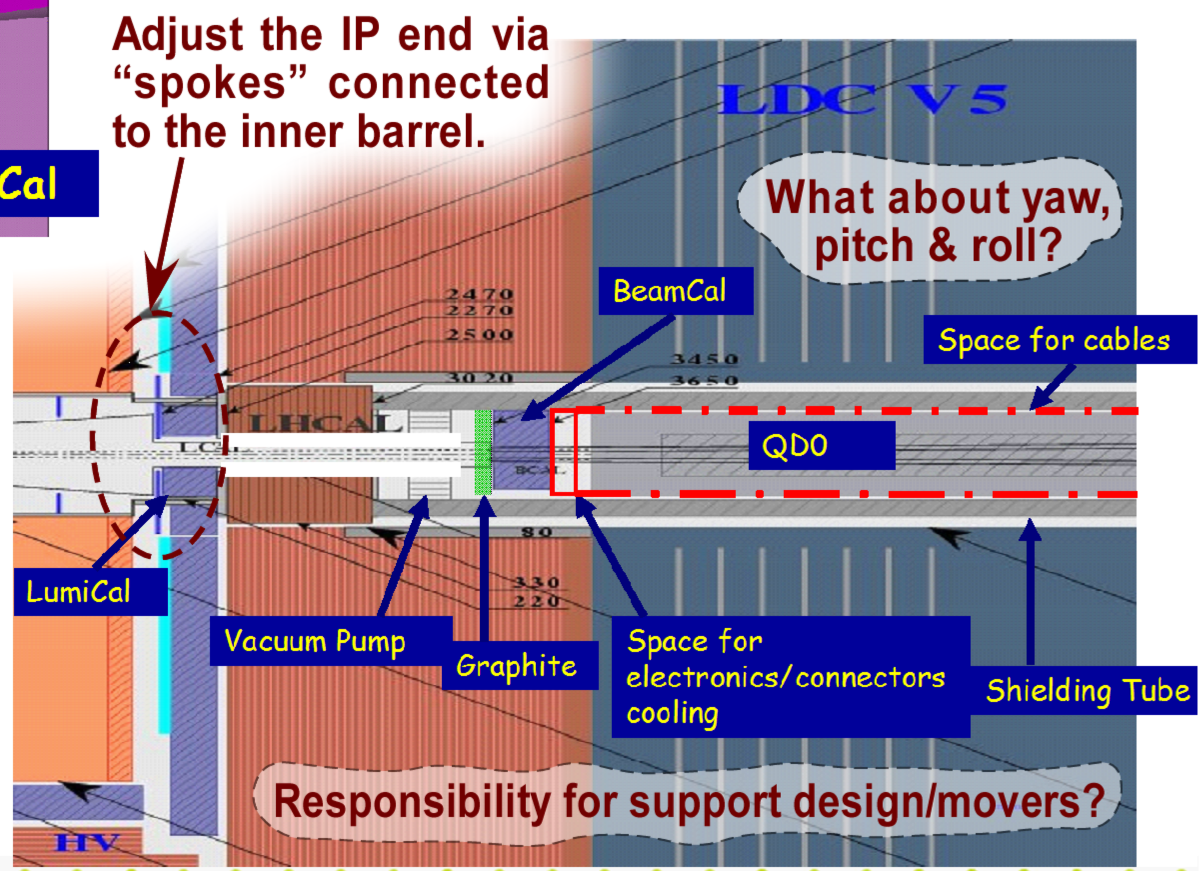
Space in IR hall?

# QD0 support is (still) a bit "up in the air."

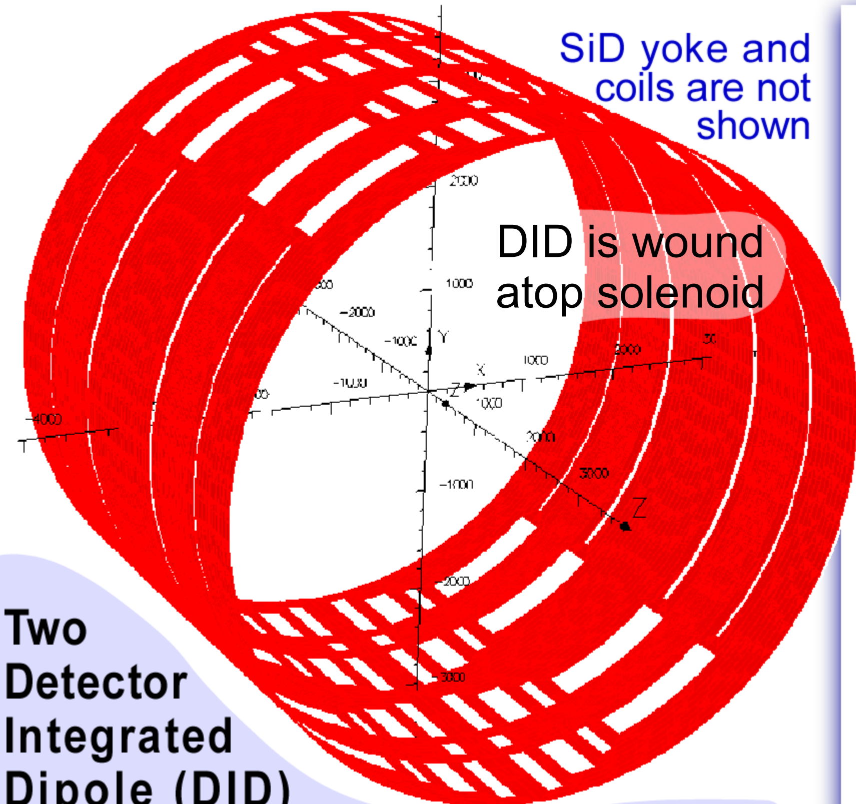


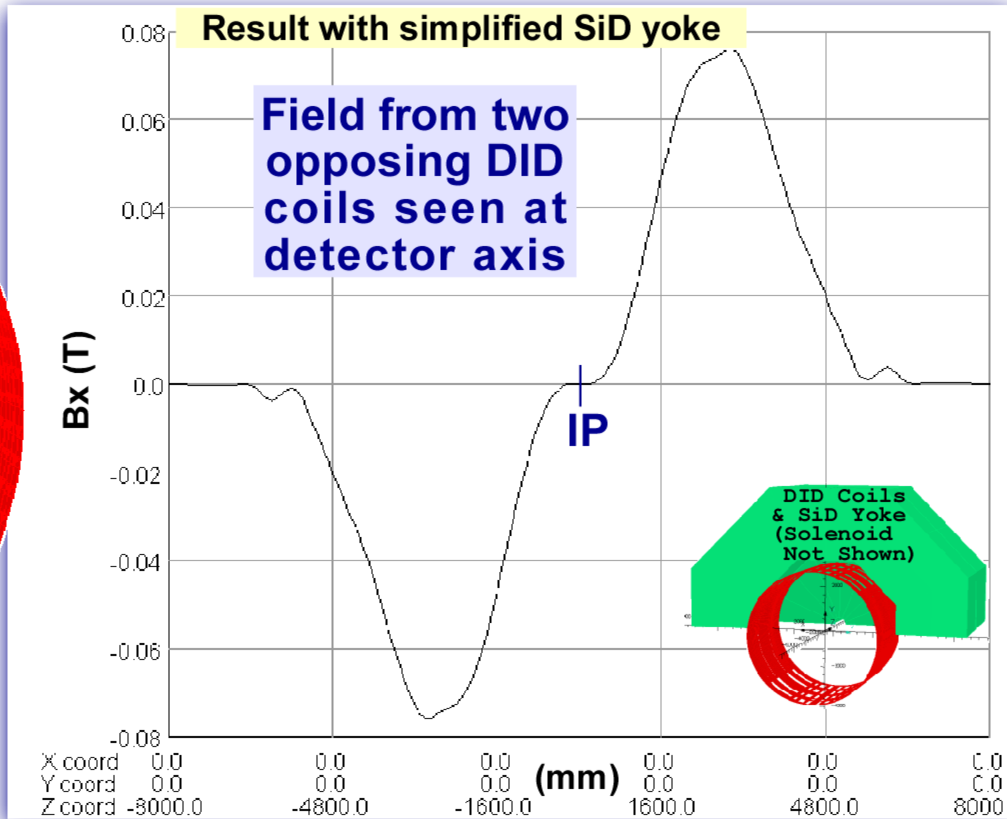


After a push-pull detector swap we assume rough alignment is good at the millimeter level, but we want to get the magnet centers back closer than this to an "ideal" position to minimize luminosity retuning. Maybe 10-100µm (TBD)?



# Anti-DID is required to control background?




**Two Detector Integrated Dipole (DID) coils can be used to improve the field uniformity near the IP (important for TPC based detectors).**

**If so ... then we really need to go beyond the present toy model.**


Hopefully in 2009 our MDI picture settles
down and we will see smooth sailing.
Thank you for your attention, B.P.