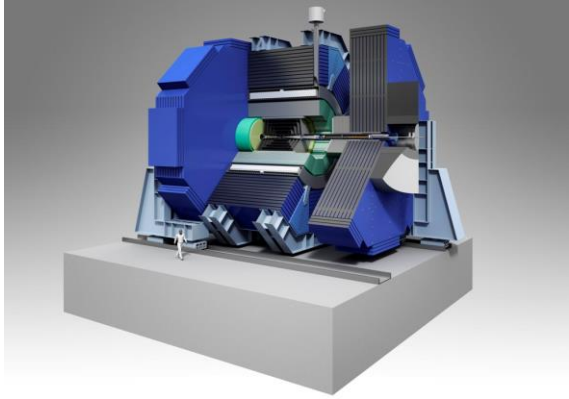


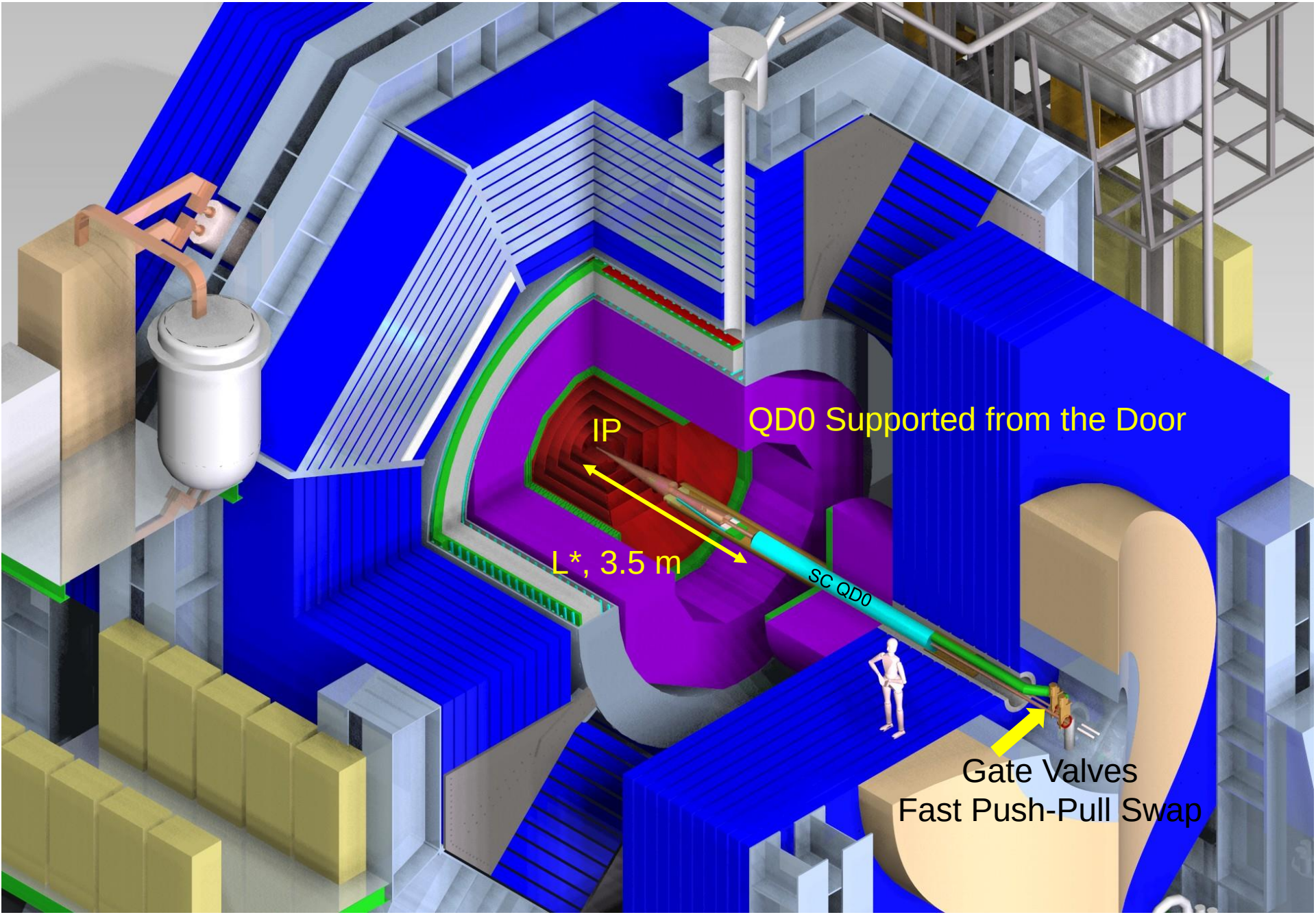
An Hybrid QD0 for SID ?

Marco Oriunno (SLAC), Nov. 14, 2013

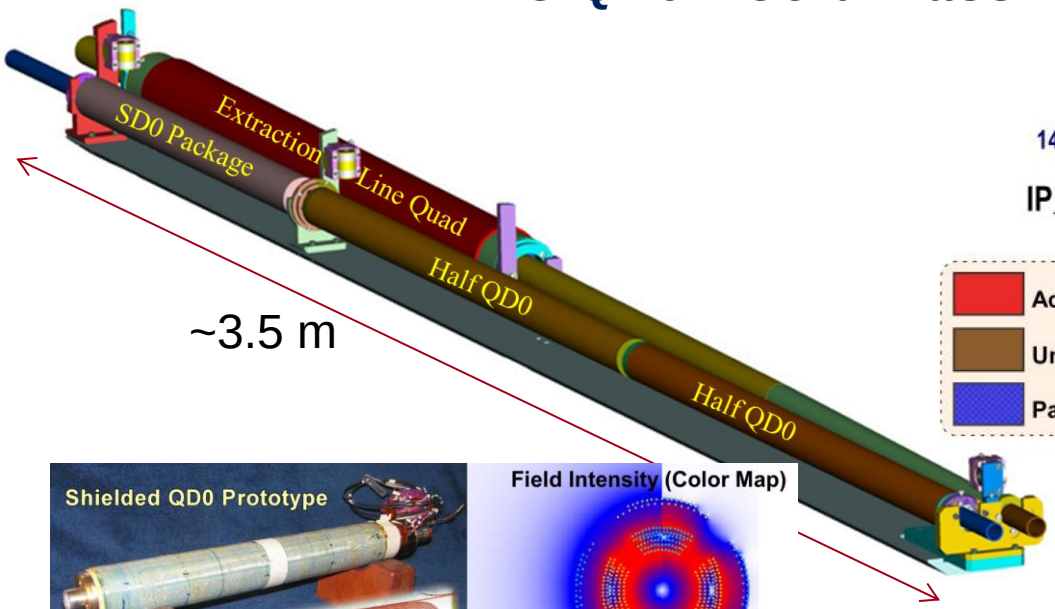
LCWS13, TOKYO

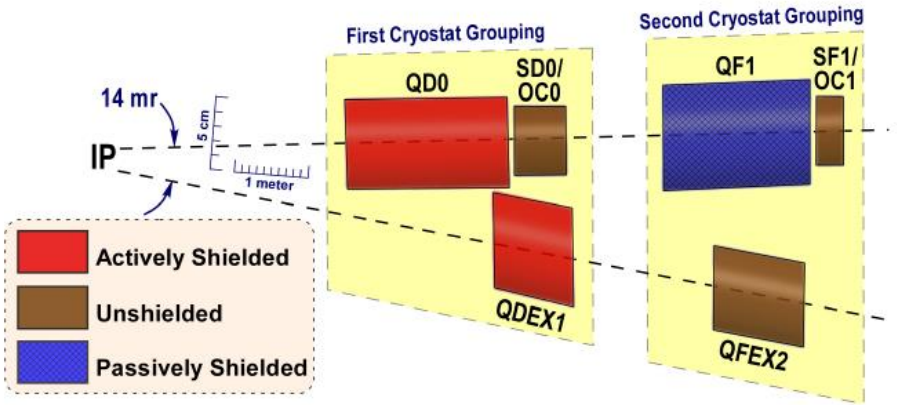
U.S. DEPARTMENT OF ENERGY
Office of Science

SLAC NATIONAL ACCELERATOR LABORATORY


QD0 Supported from the Door
IP
L*, 3.5 m
SC QD0
Gate Valves
Fast Push-Pull Swap

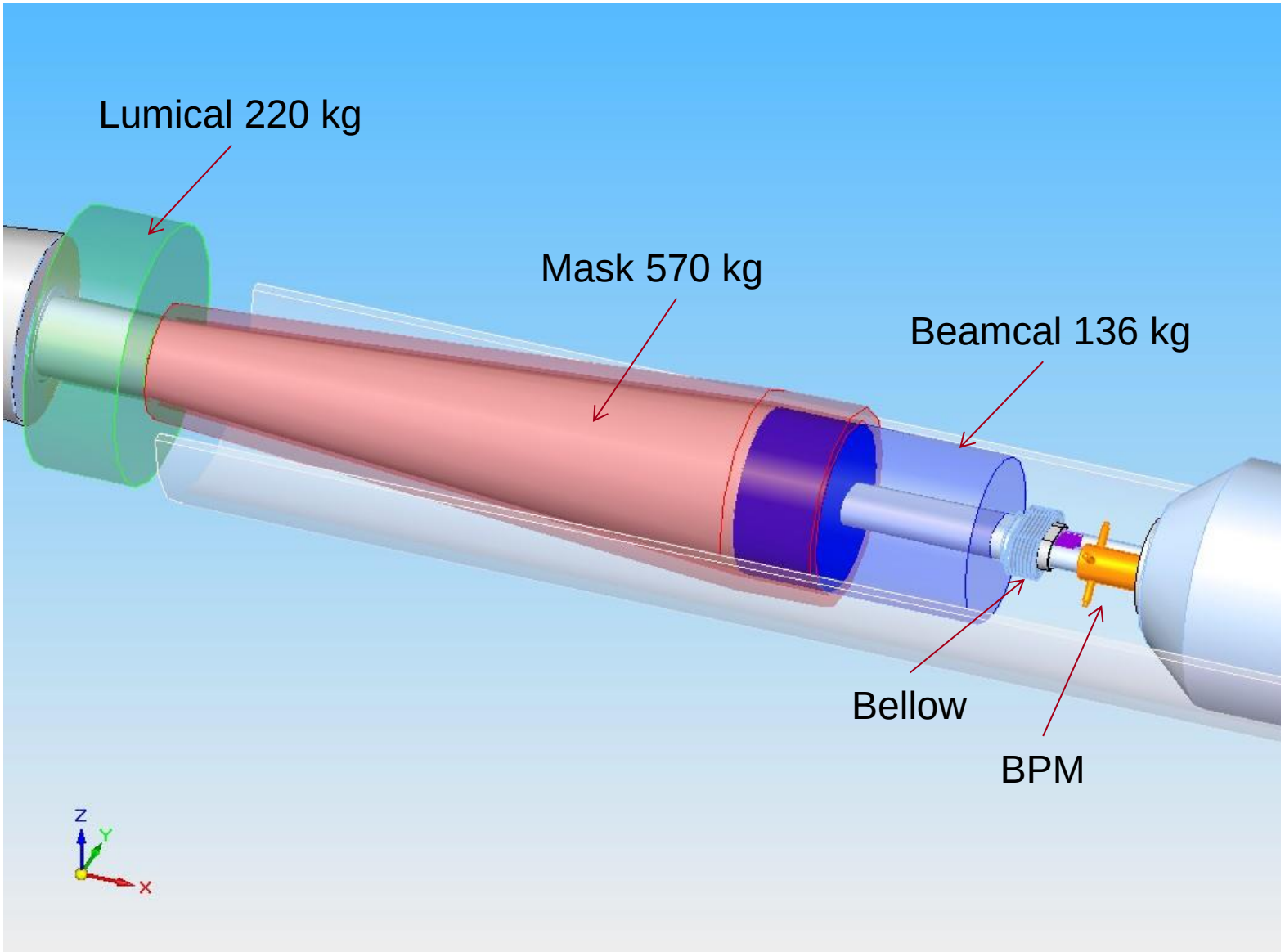
ILC QD0 : Cold Mass 2K Helium (BNL)





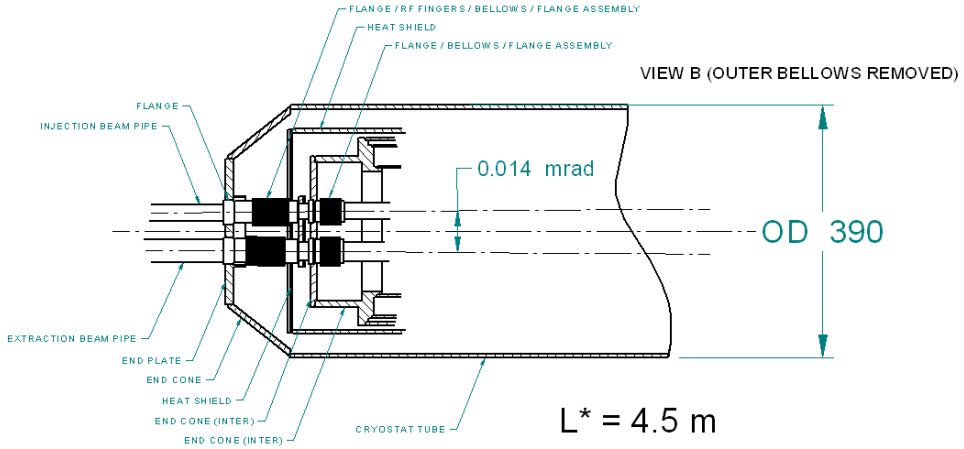
- Technology of the superconducting final focus magnets has been demonstrated by a series of short prototype multi-pole coils.
- QD0 magnet split into two coils to allow higher flexibility at lower energies.
- The quadrupoles closest to the IP are actually inside the detector solenoid.
- Actively shielded coil to control magnetic cross talk
- Additional large aperture anti-solenoid in the endcap region to avoid luminosity loss due to beam optics effects.
  - Large aperture Detector Integrated Dipole (DID) used to reduce detector background at high beam energies or to minimize orbit deflections at low beam energies.

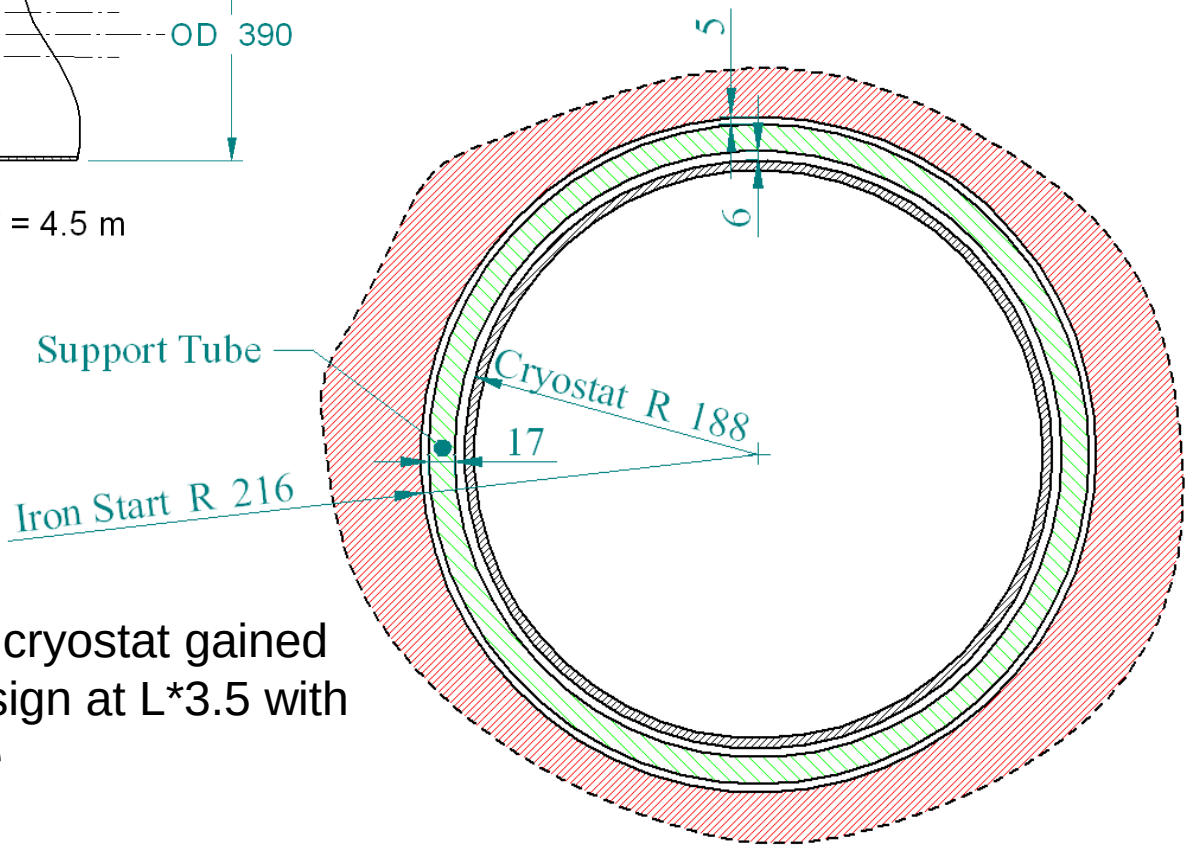
SID Forward Region



Space Requirements

Current QD0 Prototype is designed for L* 4.5 m





14 mm reduction of the QD0 cryostat gained moving the present QDO design at L*3.5 with the 14mrad crossing scheme
(1 m x 14 mrad = 14 mm)

L* 3.5 m cross section

Vacuum Spec from Beam Gas Scattering

- Scattering inside the detector is negligible up to 1'000 nT

250 GeV e- ⟶ OD2.4 cm x 7 m long gas (H_2/CO/CO_2)

Luminosity backgrounds (pairs, $\gamma\gamma \rightarrow$hadrons) are much higher

No need of permanent Pumps

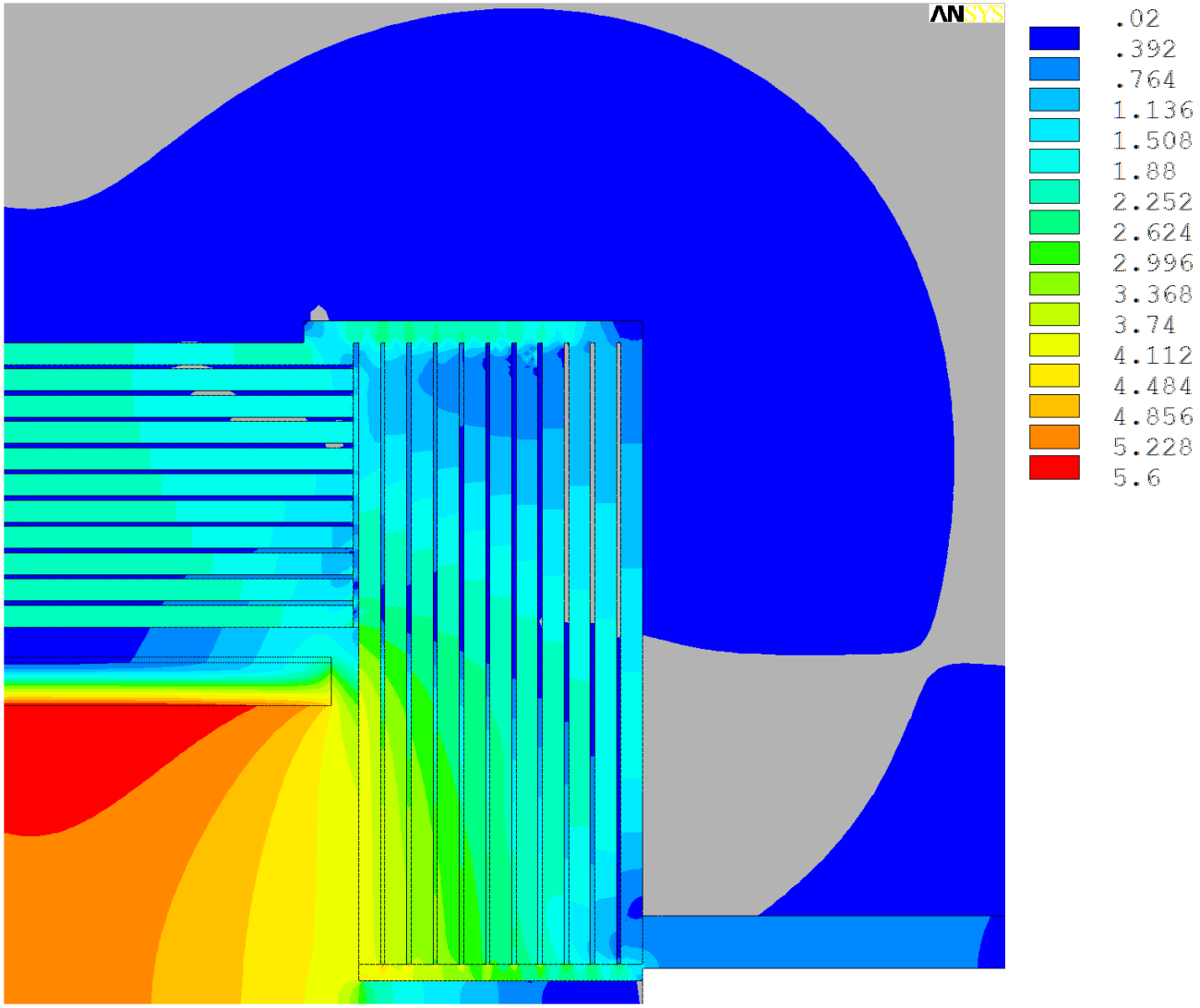
Cryopumping is free benefit

Within the IP region there are 0.02 - 0.04 hits/bunch (3-6 hits TPC) at an average energy of about 100 GeV/hit originating QD0–200 m from the IP.

Therefore 1 nT from QD0–200 m is conservative.

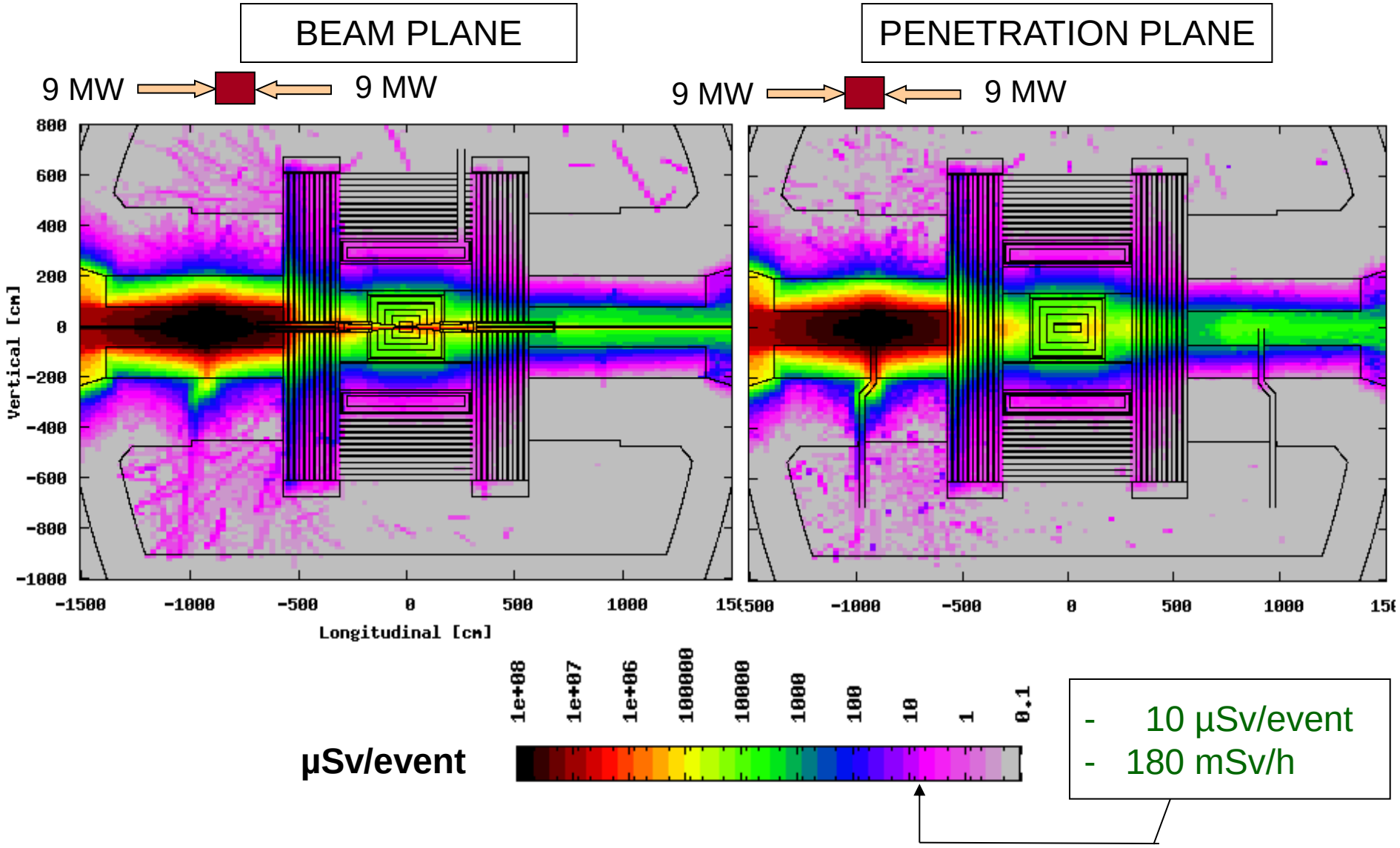
Fringe Field for a quadrant view of SiD - Cut off @ 200 Gauss

More Iron at low radius - Better flux return – Lower fringe field

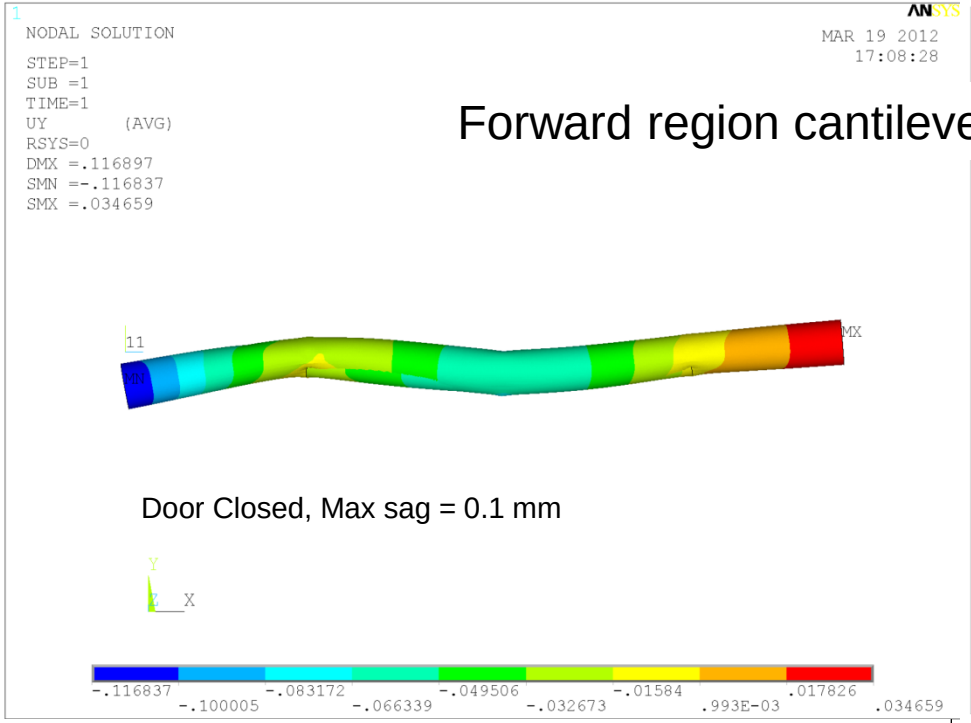


20 R.L. Cu target in IP-9 m. Large pacman.

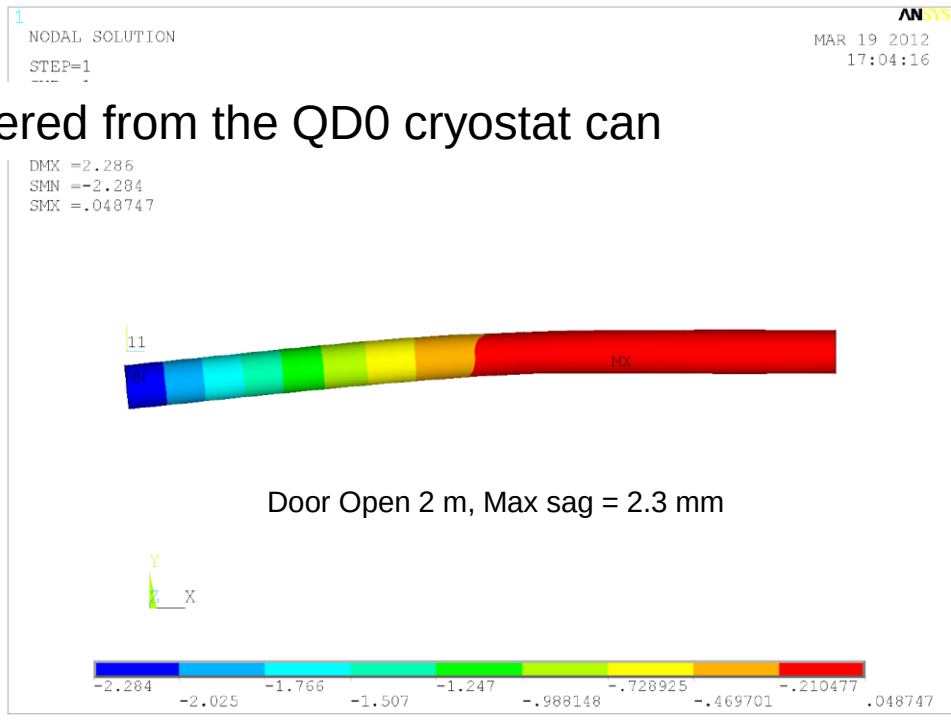
M.Santana, SLAC



Forward region cantilevered from the QD0 cryostat can



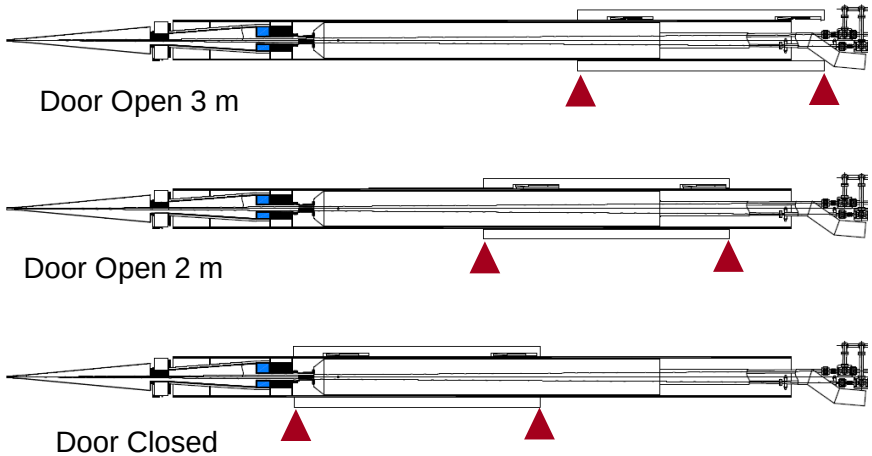
Door Closed, Max sag = 0.1 mm



Door Open 2 m, Max sag = 2.3 mm

Door Open 3 m, Max sag = 6 mm

Displacements (mm)

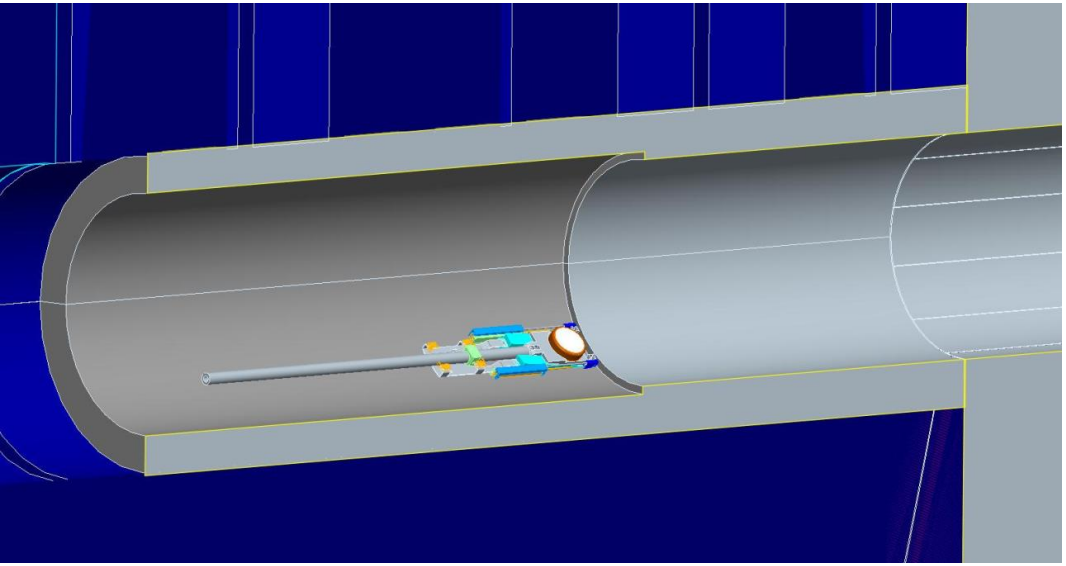


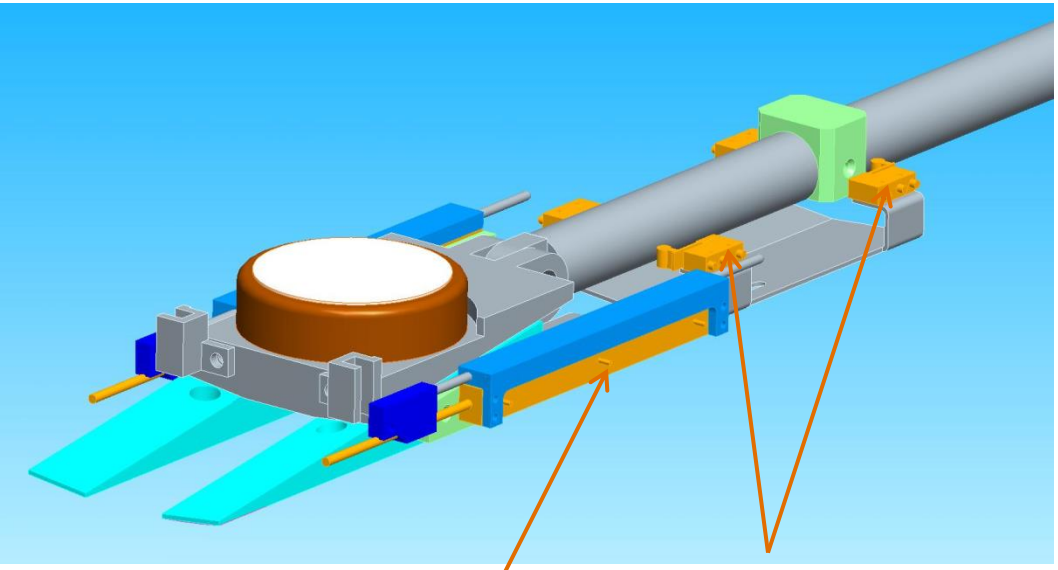
Door Open 3 m

Door Open 2 m

Door Closed

QD0 Wedge Design Concept

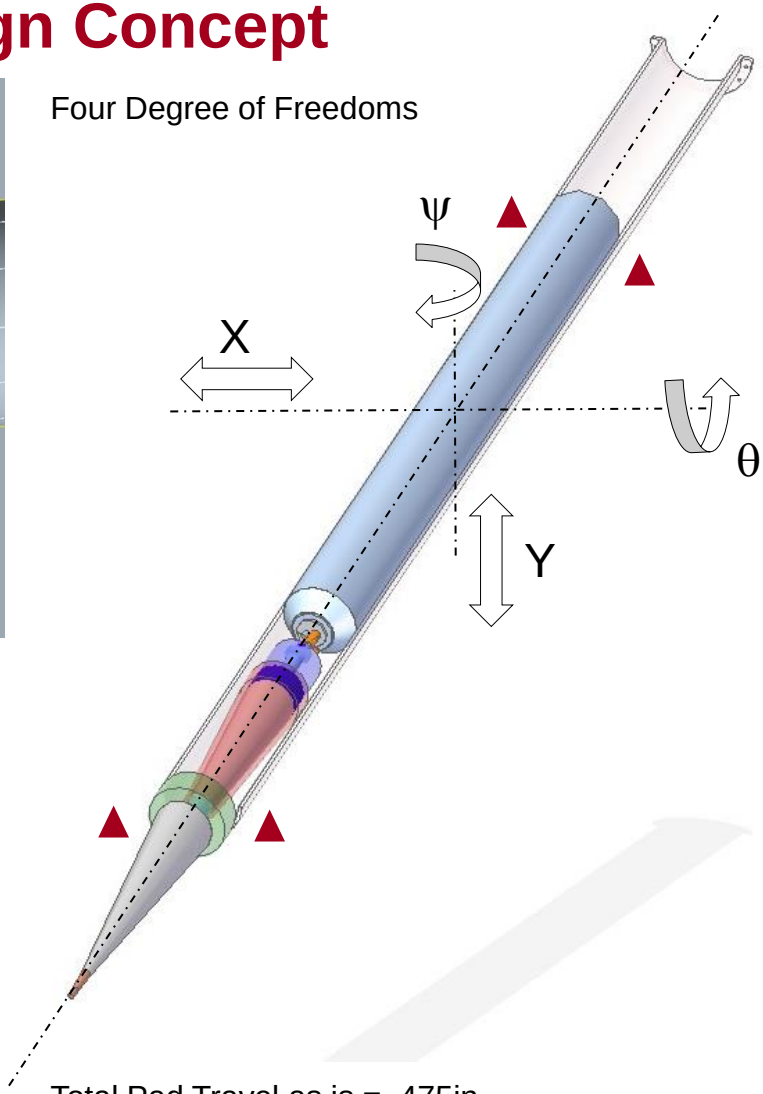




Potentiometer

Limit Switches

Four Degree of Freedoms

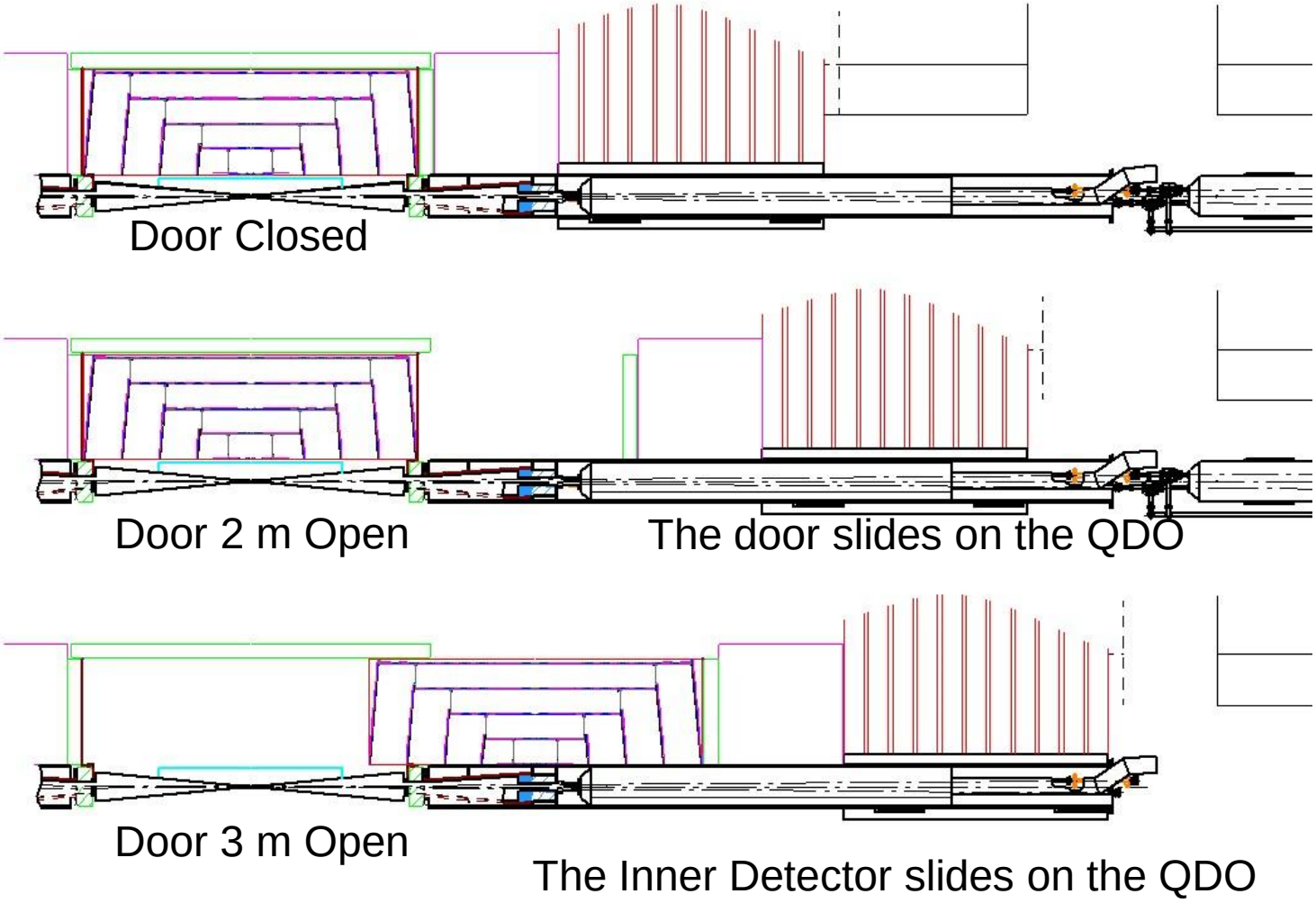


Total Pad Travel as is = .475in

Height of pad and distance of displacement will be changed pending analysis on sagging of beam line.

Conceptual design only at this point

Forward Region Diameter – Inner Detector maintenance



Interface QD0-QF1: Critical for Fast&Reliable Push-Pulls