A 12-min Introduction to The ILC Machine Detector Interface and SiD

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LCWS'10, Beijing, China

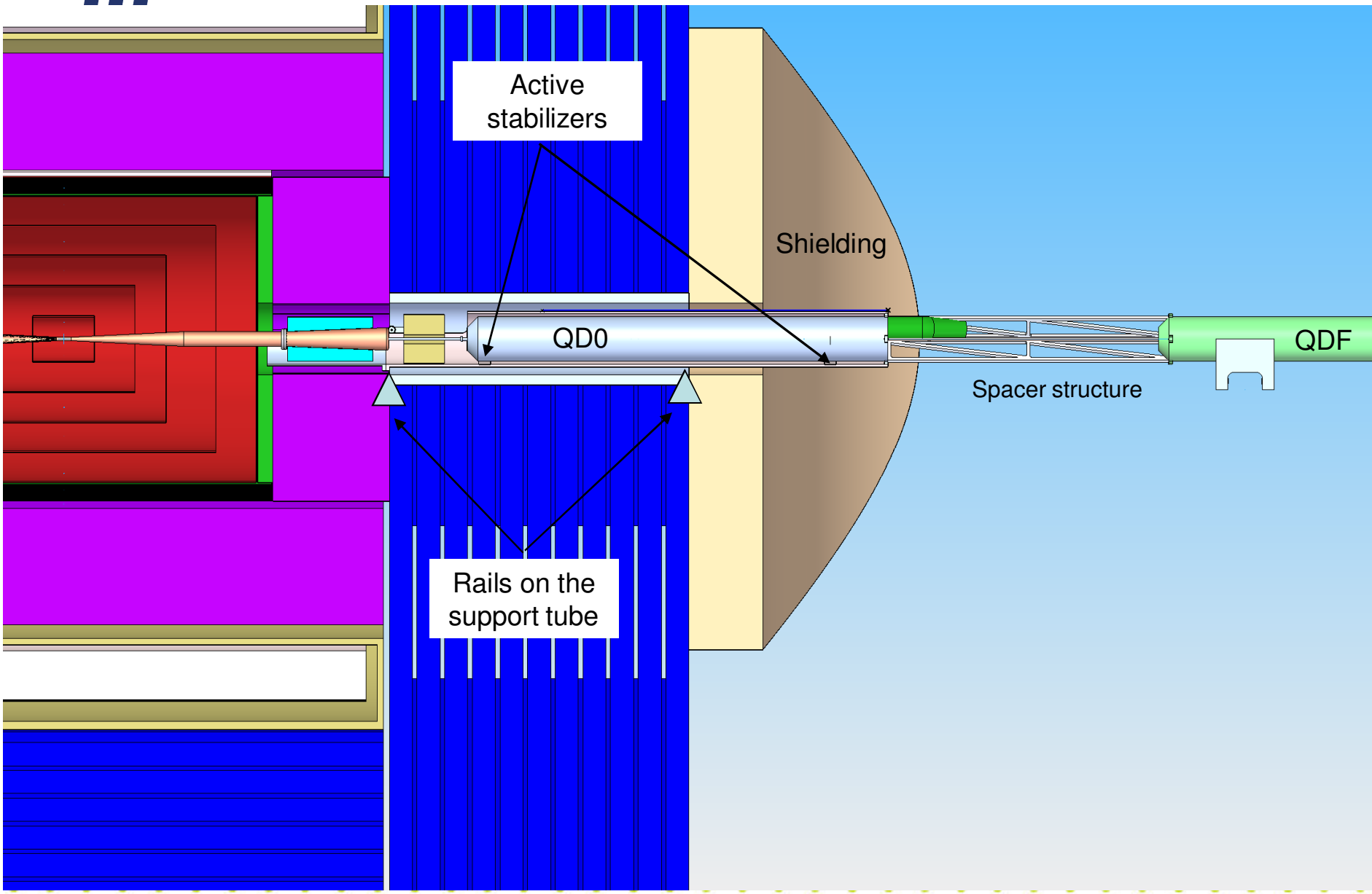
27 March 2010

QD0 Support System

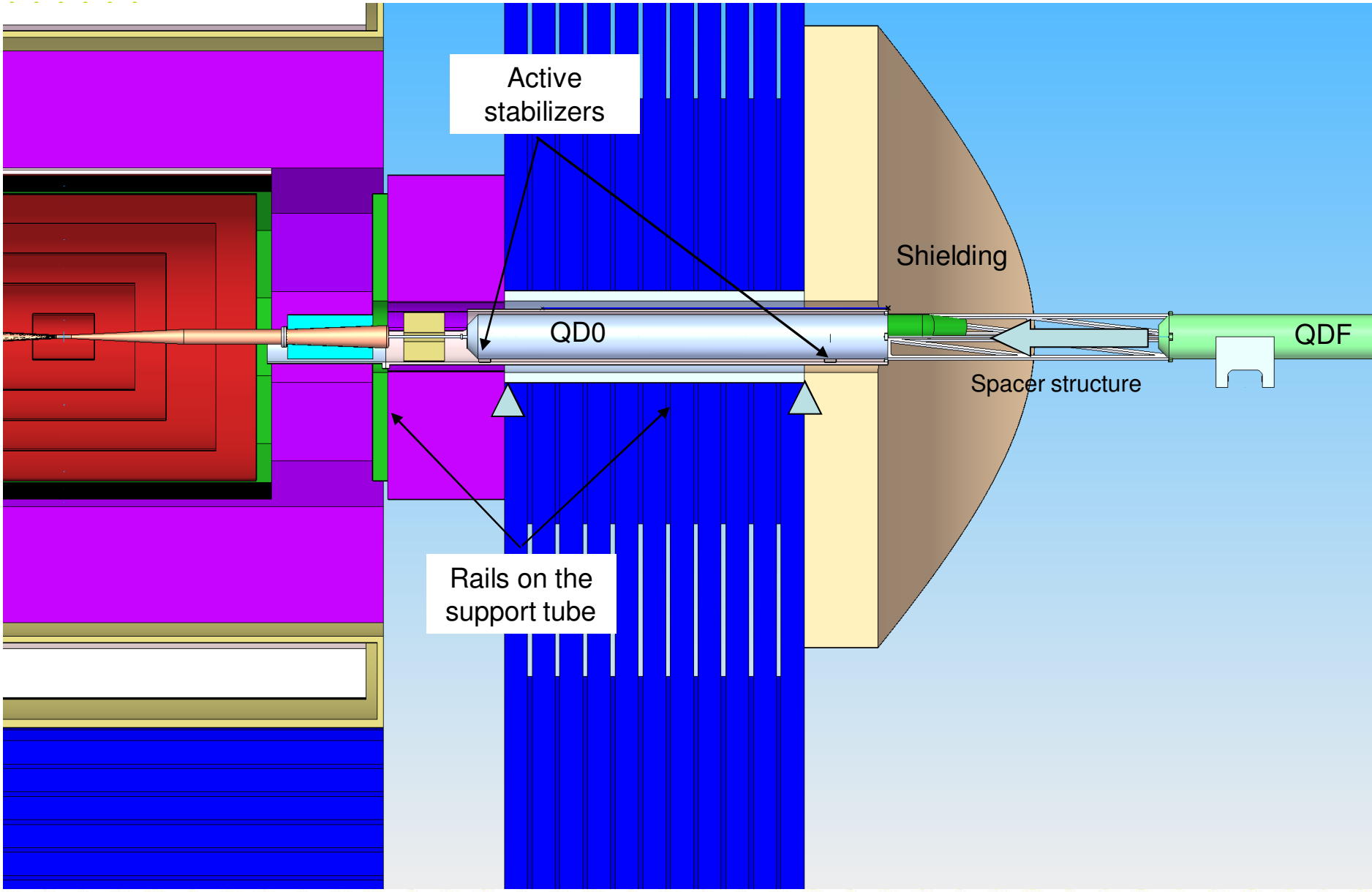
Vibration-cognizant support of the final quadrupole ("QD0") cryostat and its semi-permanently attached 1.9K heat exchanger & feed box, consistent with "Push/Pull" motion of the detector

- QD0 "owned" by SiD & rests on door
  - Not cantilevered off a rear support (ILD)
  - Not in unmoveable tunnel extension (CLIC)
- QD0 travels "cold" along w/ SiD during push/pull after beamline vacuum broken at designated valves
- Vibration mitigated by having facing QD0 lenses as logically connected to the supporting bedrock floor as possible & relying on coherence length of natural seismic ground motion to correlate motion of lenses while minimizing/eliminating all vibration sources that SiD or BDS equipment in IR hall might produce
  - Prejudice AGAINST a platform as it might serve to amplify motion to detector
  - Benefit from Barrel-Door design that does not have a "Salami-sliced" barrel
- ANSYS studies of QD0 vibration begun in 2009 & to be updated at this conference tomorrow (Oriunno)

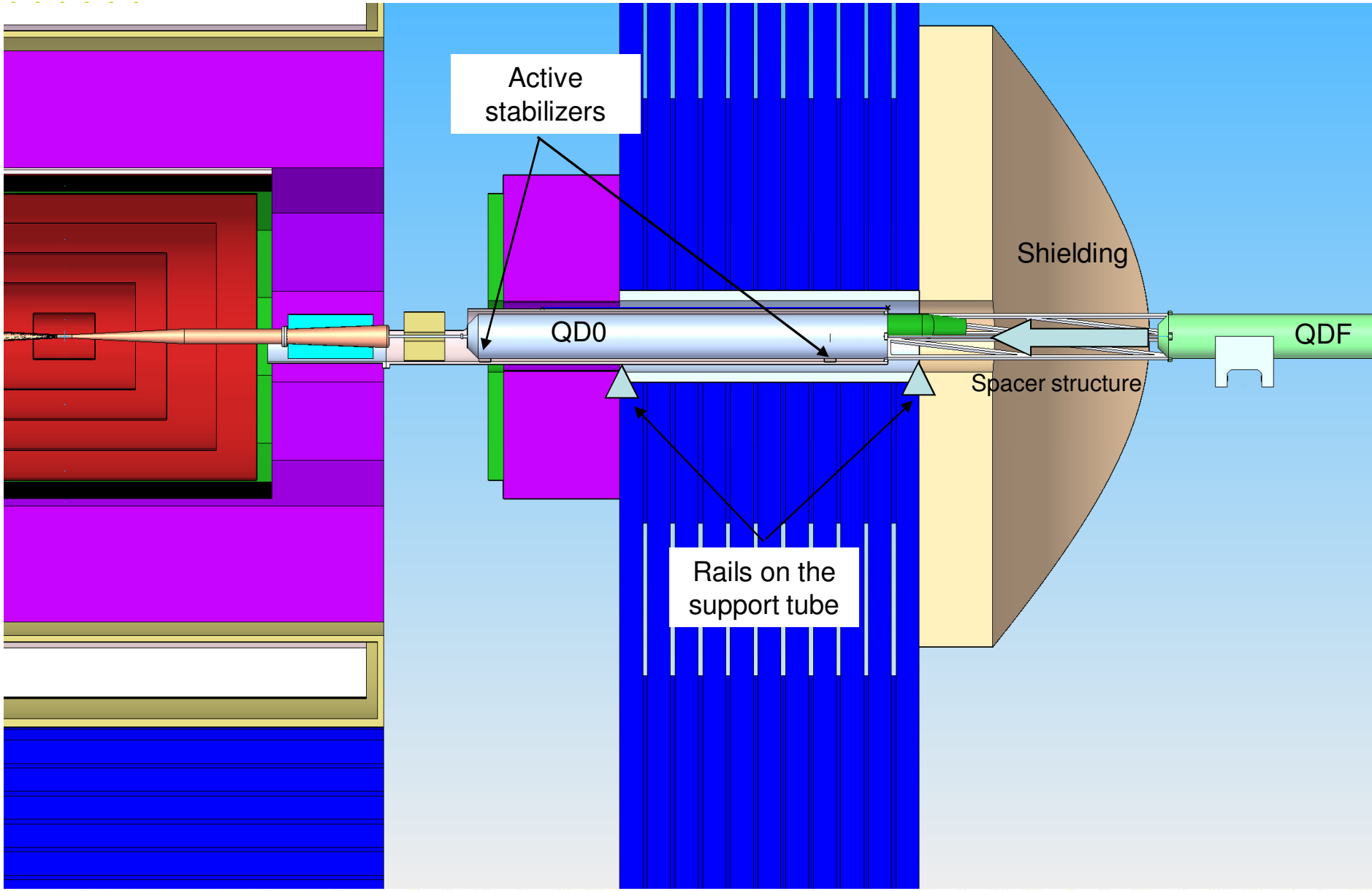
2m Door opening Procedure, on the beam I



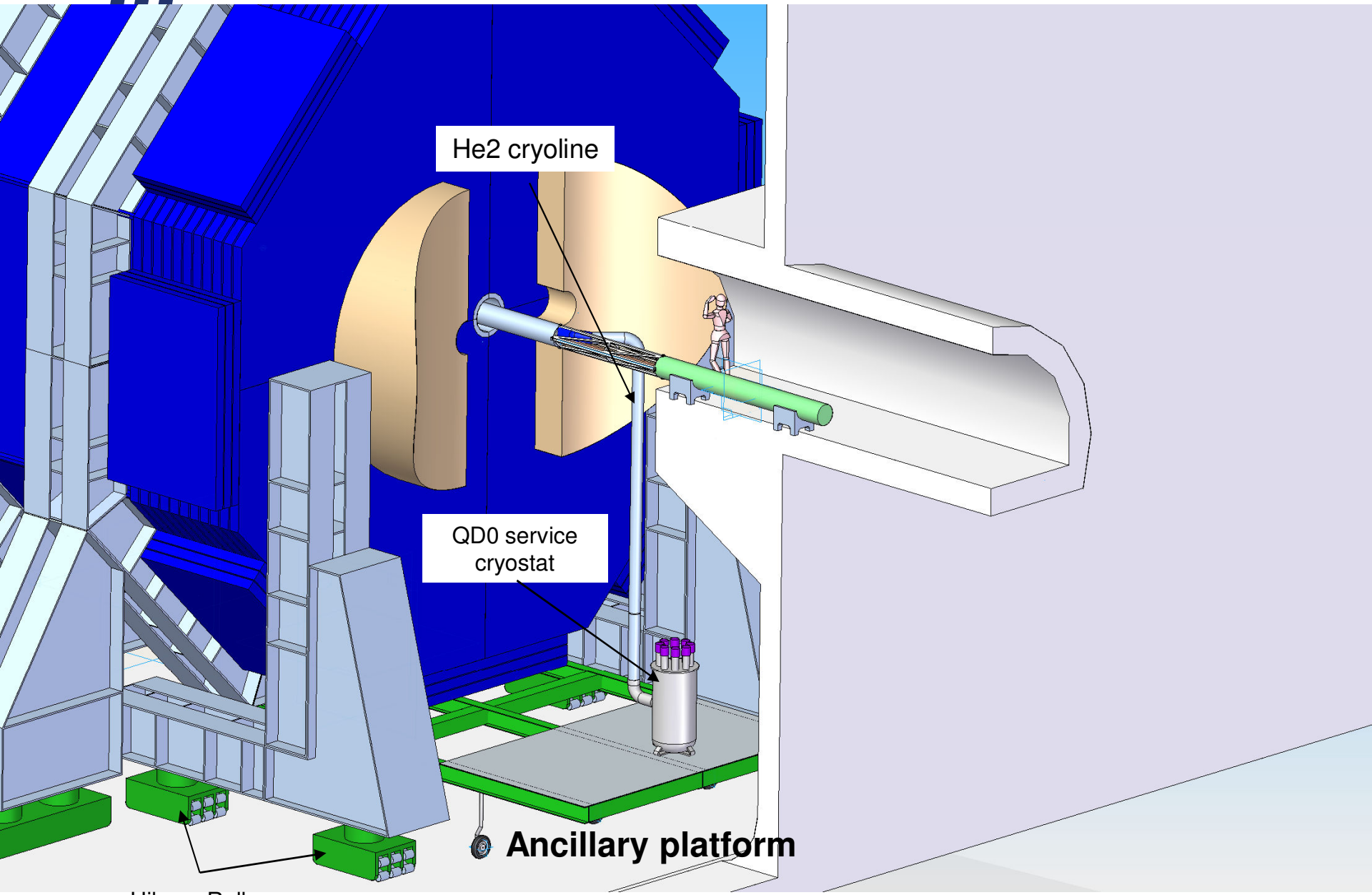
2m Door opening Procedure, on the beam II



2m Door opening Procedure, on the beam III



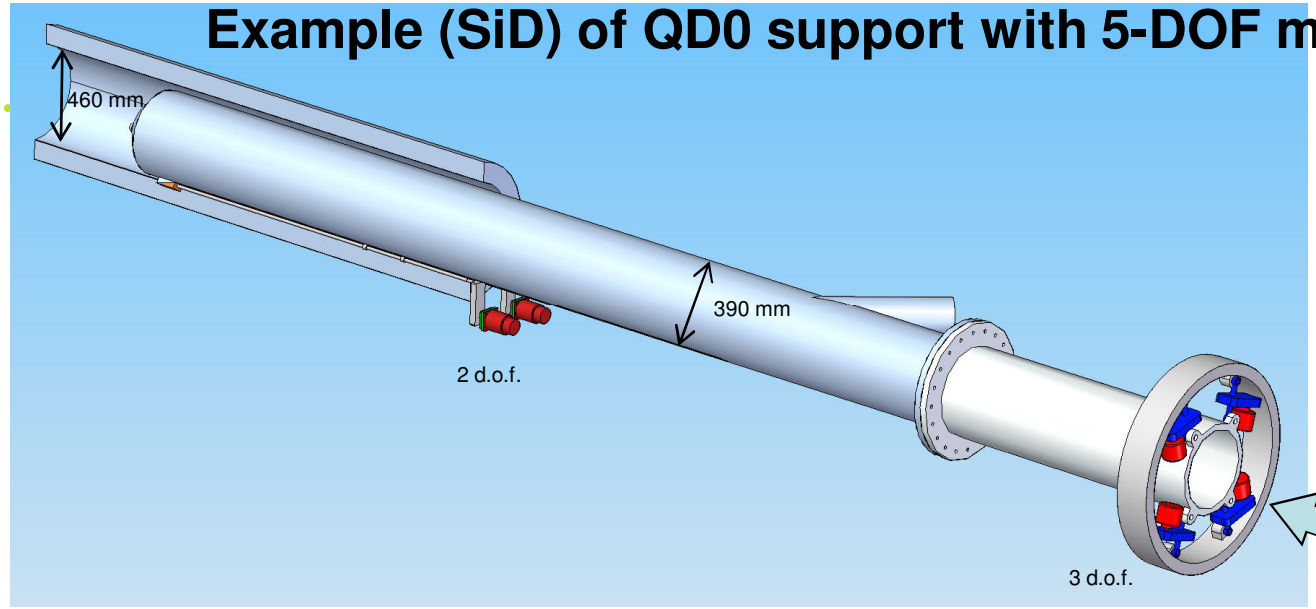
Integration of the QD0 cryoline

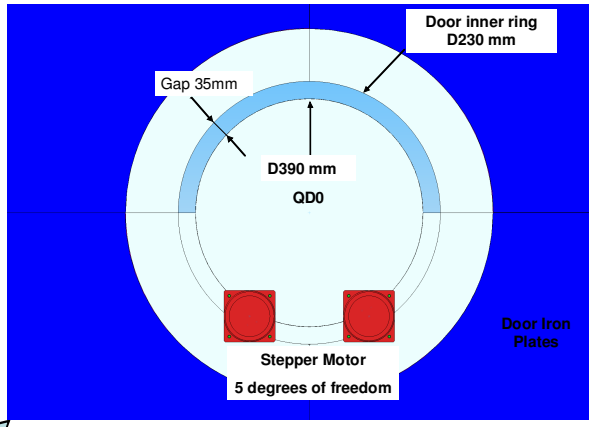


QD0 Alignment System

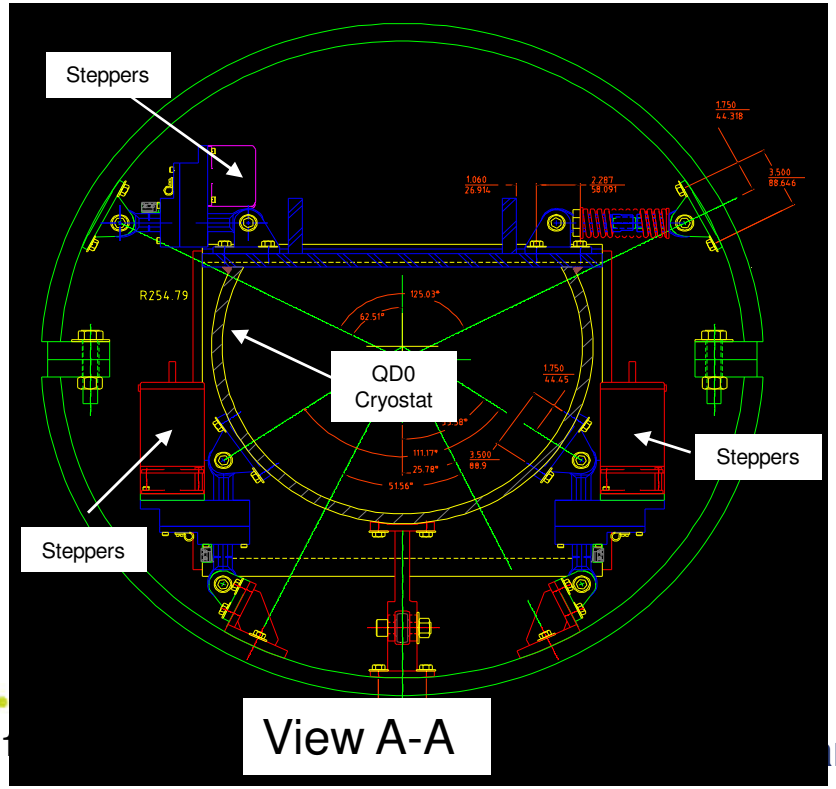
- Conceptual 5 d.o.f. magnet mover system to satisfy the alignment requirements of the beam delivery system proposed but needs an engineering design
  - **As in FFTB (now at ATF2)**
  - **As used for LCLS wigglers**
- "Mona Lisa" Frequency Scanning Interferometry system with associated free lines of sight to confirm alignment suggested but not currently included in SiD baseline

Example (SiD) of QD0 support with 5-DOF magnet mover system

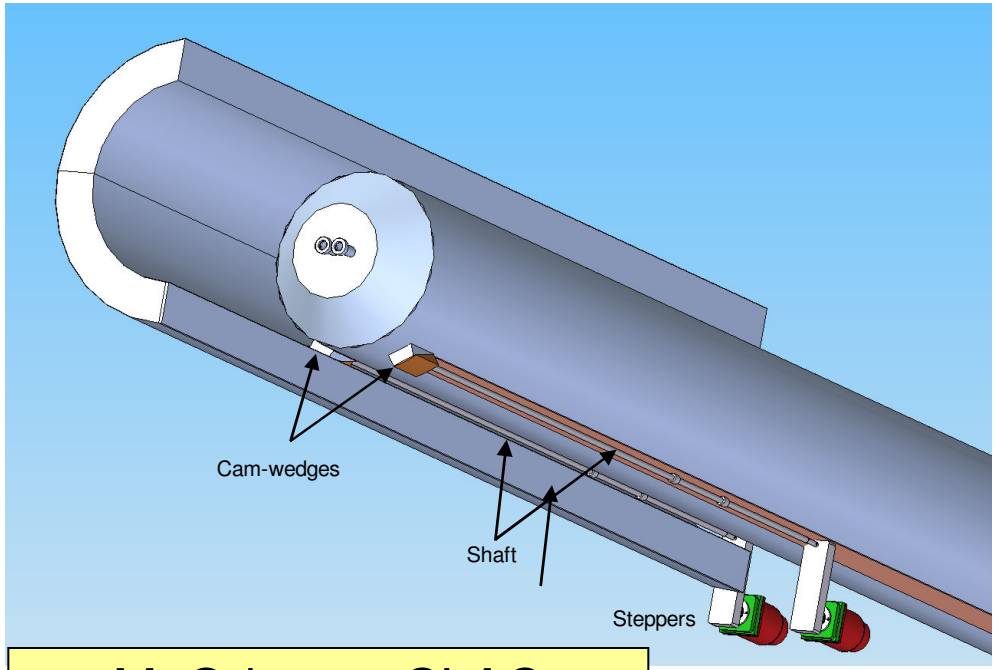




View A-A



View A-A



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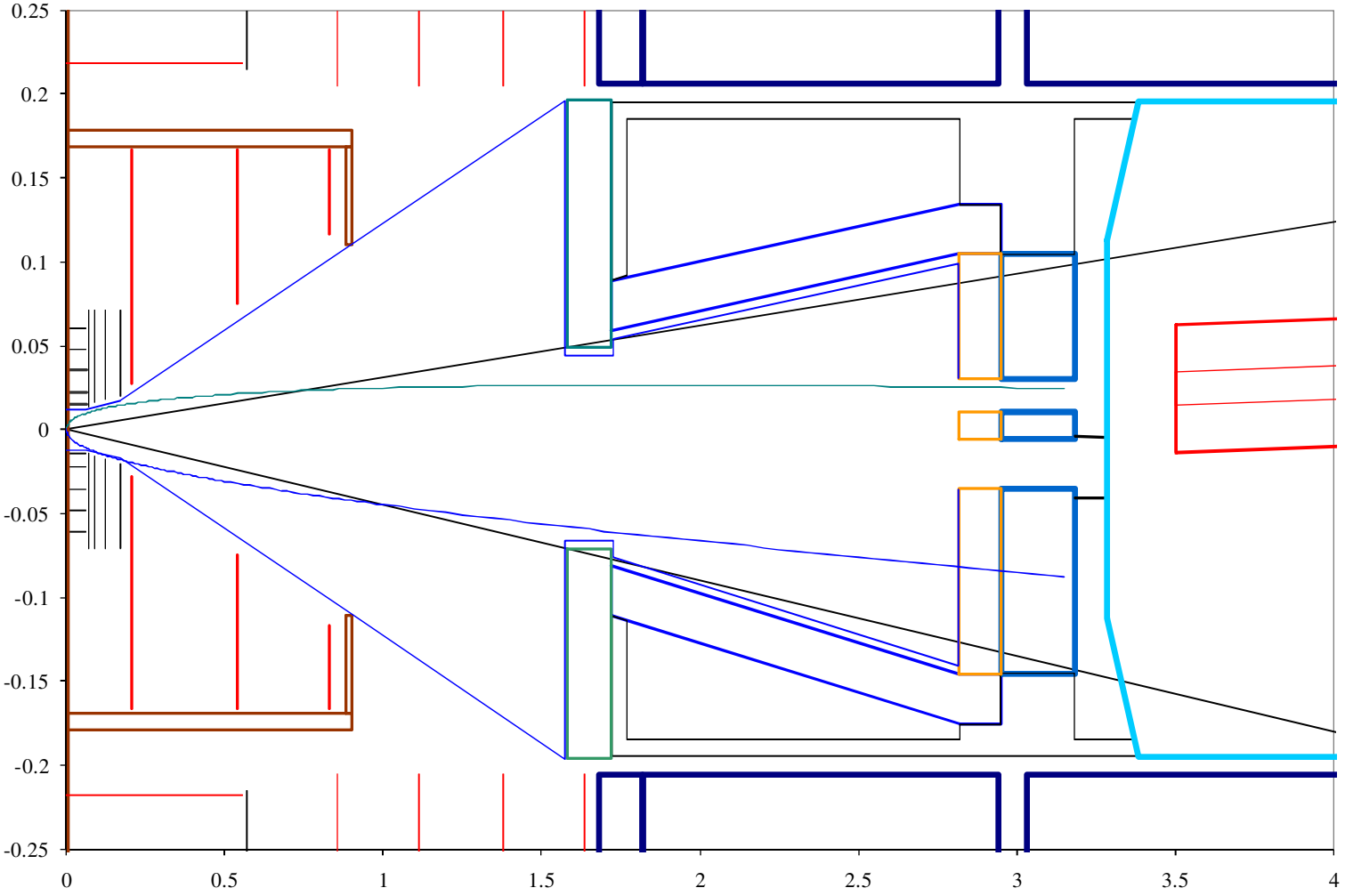
Integration of the "R20" region

"R20" region = all detectors within ~20cm of beamline):

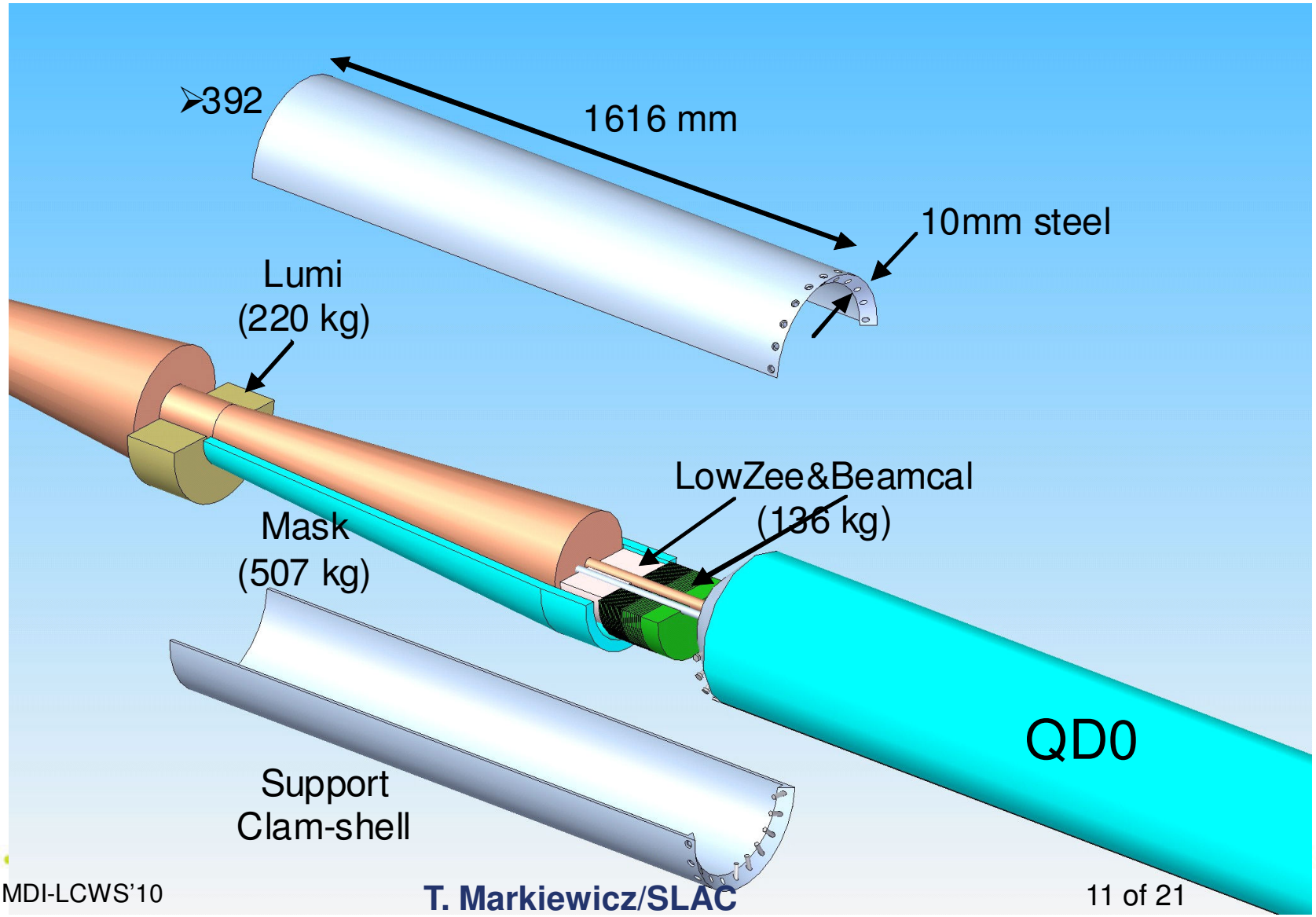
- **beampipe, FCAL=LumiCal + Beamcal, Masking, Feedback BPMs & Kickers, Vacuum pumps(?)**

- Conceptual solution to support massive Lumical+mask+Beamcal cantilevered from nose of QD0
  - **Effect on QD0 vibration stability**
  - **Precise and reproducible positioning of Lumical**

R20 Detailed Schematic



Current Implementation of FCAL support & Alignment Movers



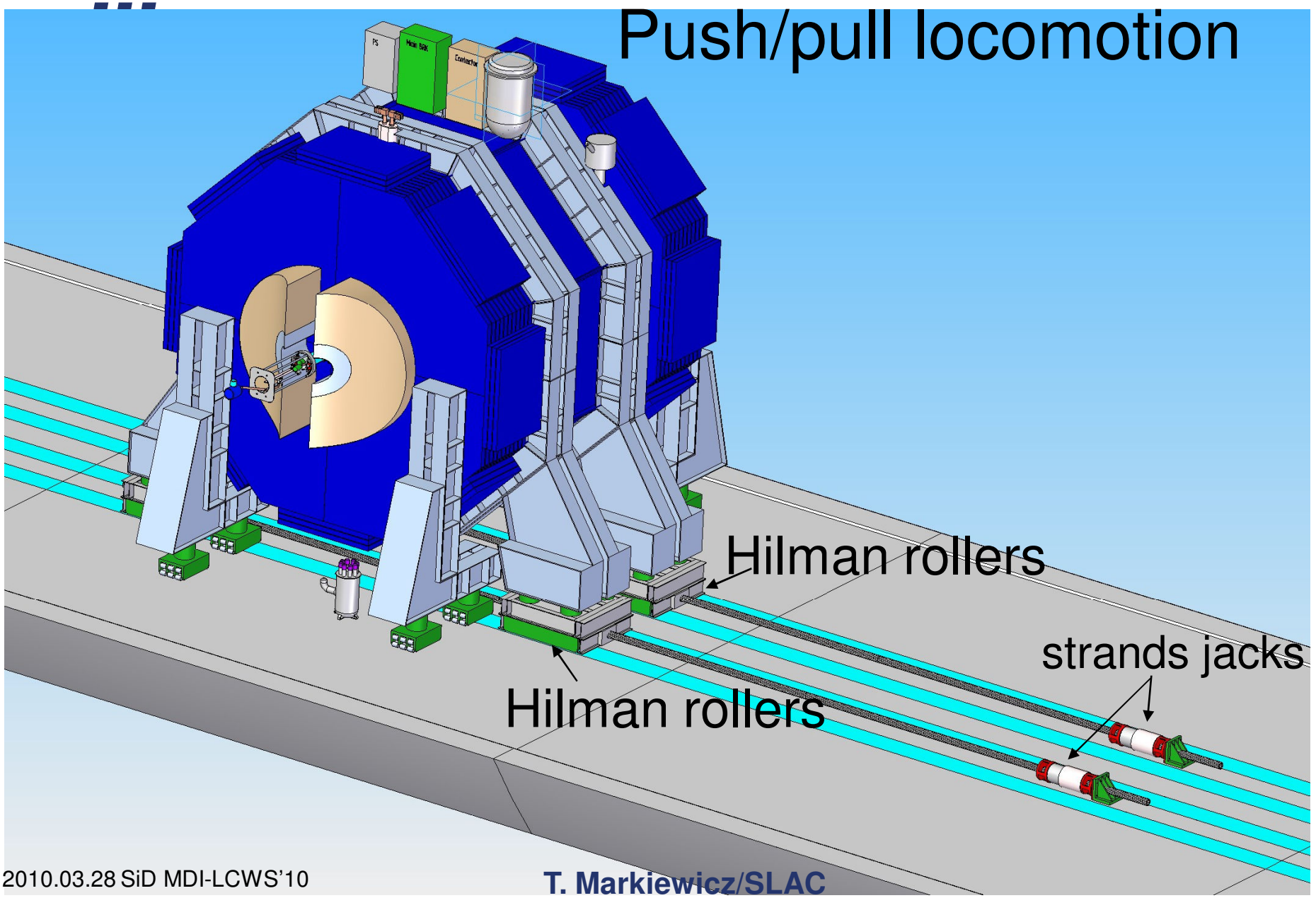
Support and locomotion of SiD within the IR Hall

Hot Button Compatibility Issues with ILD tend to make this subject dominate MDI discussions

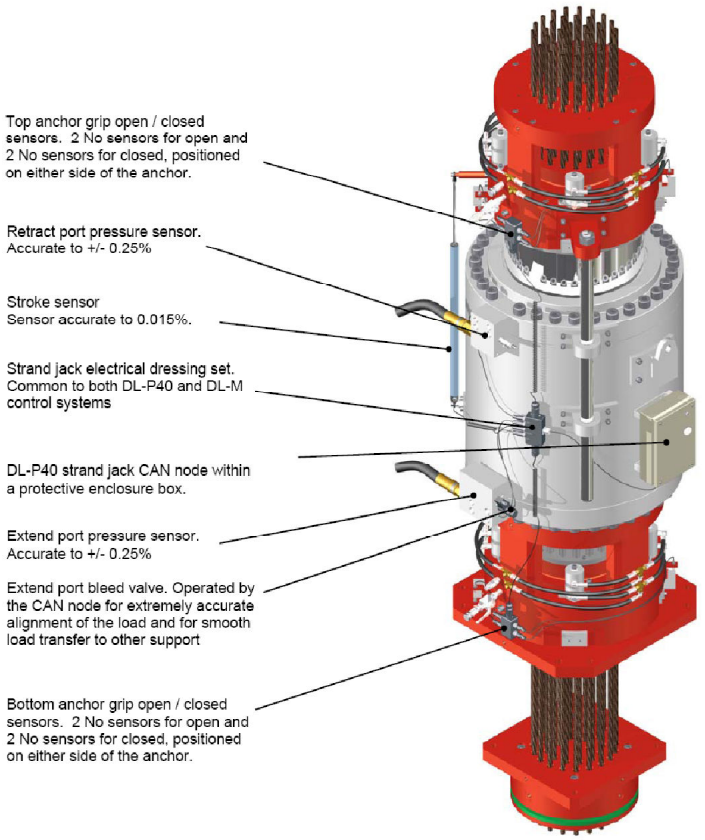
- Platform (or not) solution
  - **Prejudice is that it exposes SiD to increased vibration risk**
- Rollers, airpads, strand jacks
- Height difference

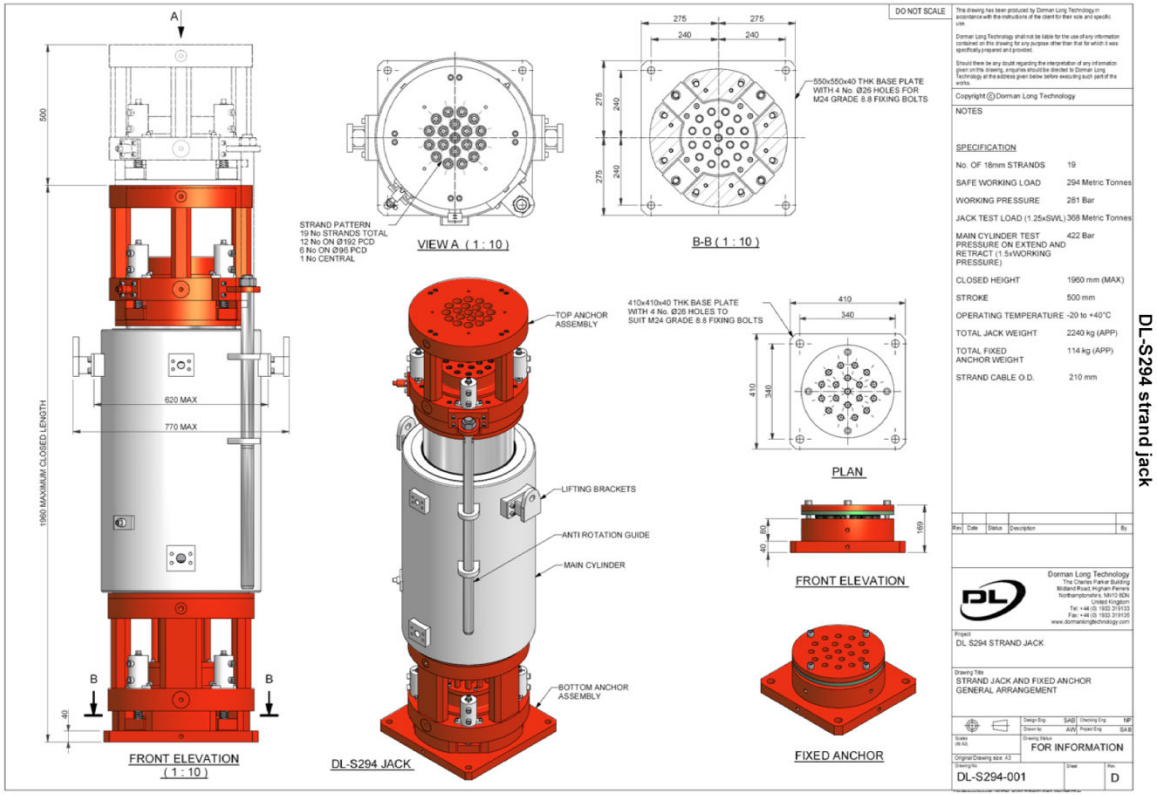
General agreement to try to move from “personal experience based prejudices” to decision based on prototypes and measurements

SiD Preferred Push/pull locomotion



Off-the shelf Strand Jacks





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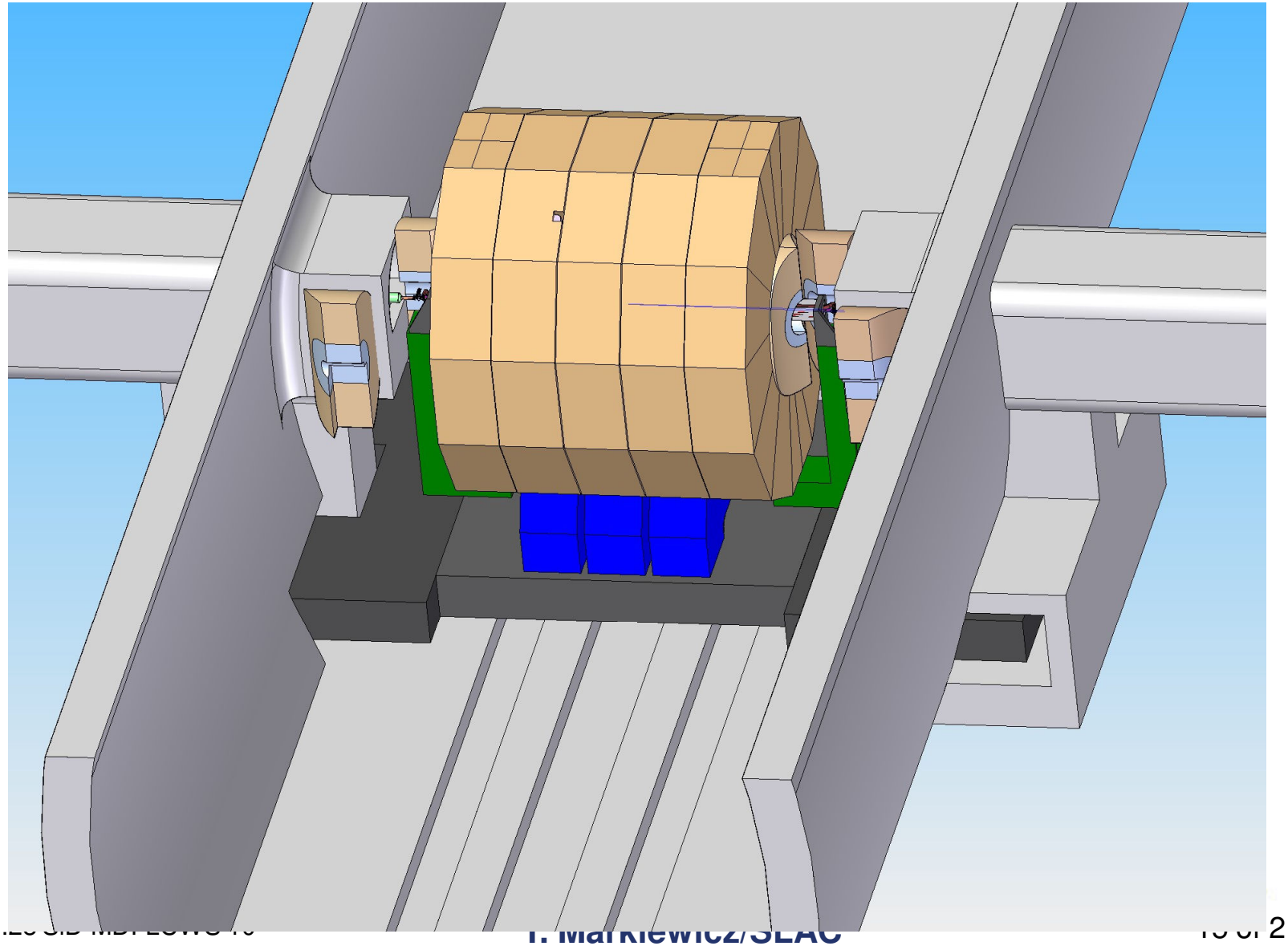
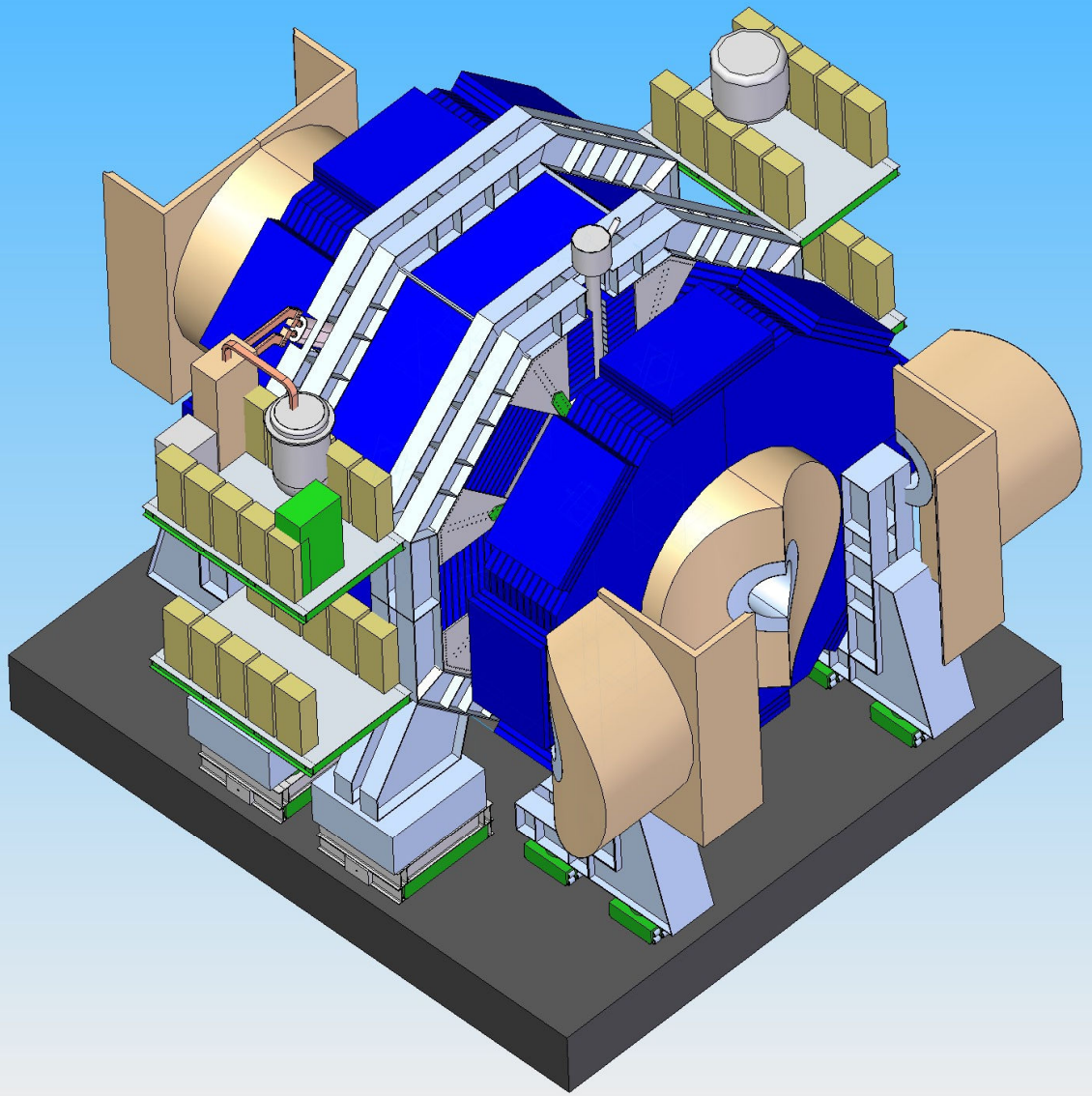
SiD on Half-Platform Stored in Lateral Alcoves (rejected)



SiD on a platform (under study)



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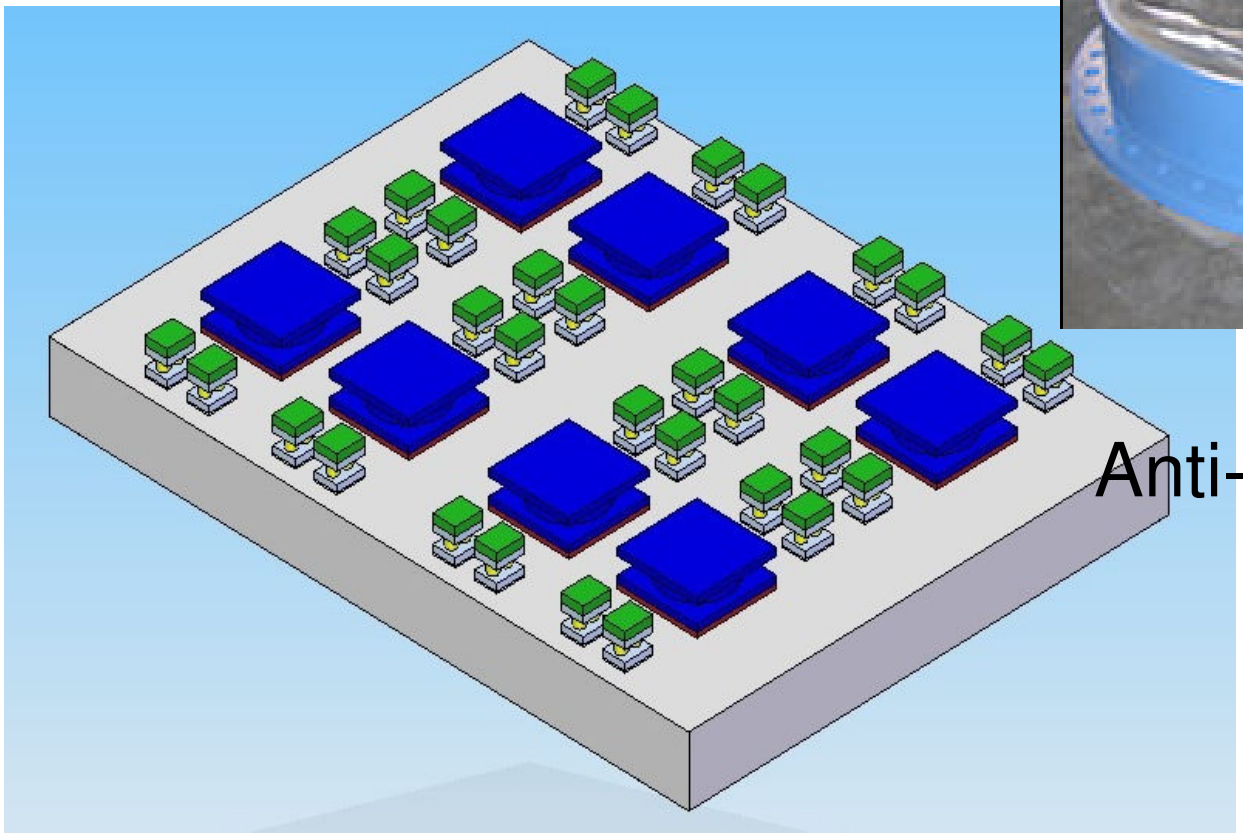
Proposed Roller & Support Sceme for a Platform

View from below (Rollers)

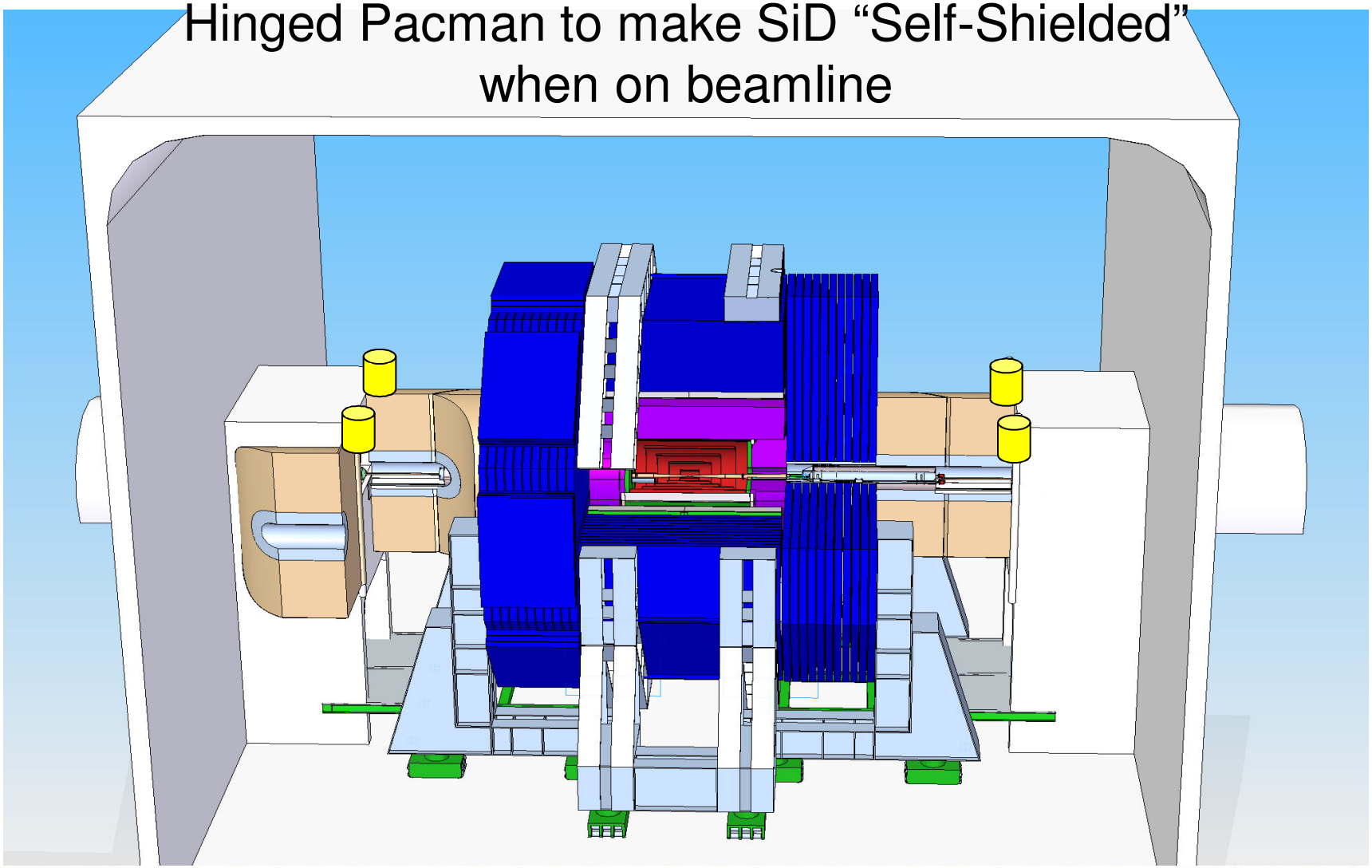


10kt unit
Anti-Seismic support

Four support lines for 4’000 tons each

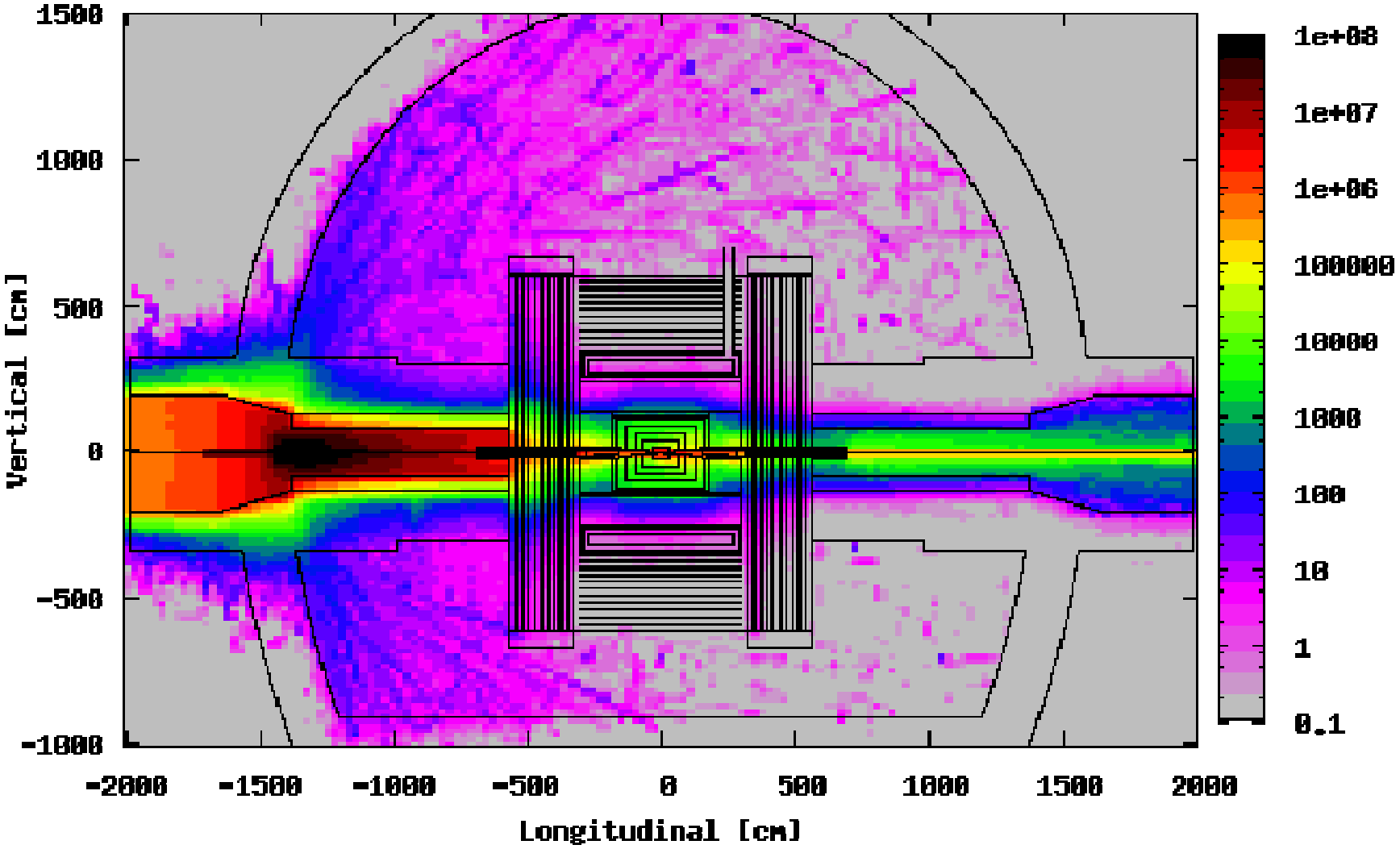
Radiation Shielding design & associated calculations

Hinged Pacman to make SiD "Self-Shielded" when on beamline



20 R.L. Cu target in IP-14 m

µSv/lost_train. 500 GeV, 9 MW



Other "MDI" Topics Not Discussed Today

- Fringe Field specification & compliance
- Calculation of & remediation of beam-beam backgrounds and incoming beam backgrounds
  - **Pairs from beamstrahlung**
  - **Muons from collimation**
  - **Synchrotron radiation Photons**
- IR Hall Design
  - **Sizes, Heights, Crane Capacity, Shaft diameters, etc.**
  - **Hall Services**
    - Cryo systems, power supplies, readout, racks, etc.
- Assembly Procedures
  - **Above Ground (CMS) or below groud**
- Sometimes "LEP"=Luminosity, Energy & Polarization measurement devices
- Sometimes the FCAL devices themselves

Summary of ILC MDI

- A complete **conceptual** MDI design is documented in the SiD LOI and October 2009 talks at ALCPG'09 Albuquerque

- People involved:
  - **Marco Oriunno ←**
  - **Phil Burrows**
  - **Takashi Maruyama←**
  - **Mario Santana**
  - **Marty Breidenbach ←**
  - **TWM**

- SiD is not yet doing the kind of work required for an engineering design (e.g. 2012 TDR) nor keeping up (imho) with the quality of prototyping and measurements we are seeing from ILD and CLIC
- There are many areas where more help would be useful and welcome