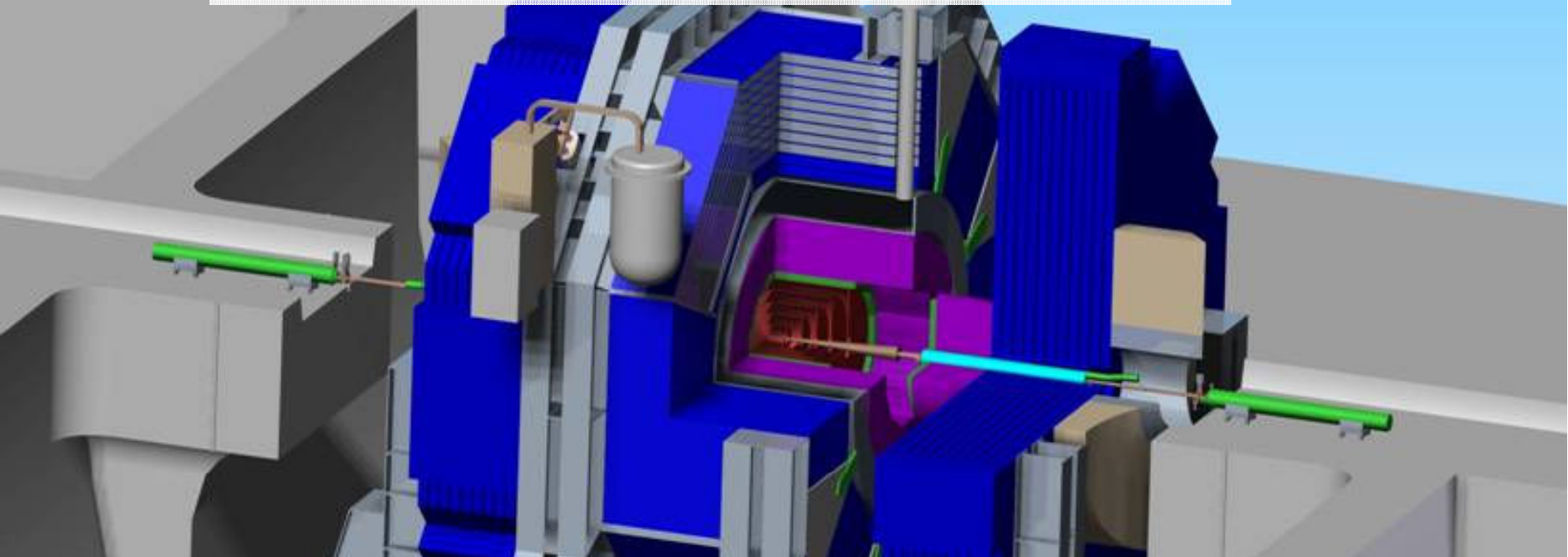


2009 Linear Collider Workshop of the Americas

Albuquerque, New Mexico, September 2009



Progress on Push-Pull IR Studies

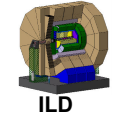
Marco Oriunno, SLAC

A.Herve (ETH-Zurich), K.Simran (DESY)

A.Seryi, T.Marckiewicz, J.Amann, M.Santana (SLAC)

T.Sanami (KEK)





The push-pull technical and the Experimental Region Interfaces solutions of the detectors have been described in the respective Lols submitted to IDAG.

Different approaches on some issues : the platform, the pacmen , rollers and air pads, the QD0 support.

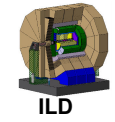
Waiting for the IDAG deliberation, last summer A.Seryi took the initiative to set an engineering effort at SLAC to work proactively on the MDI engineering issues.

A.Herve (ETH) accepted the invitation to come for 2 months.

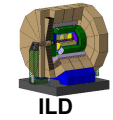
K.Simran(DESY) joined us for ten days, in addition to the SLAC residents : myself, T.Markiewicz, J.Amann and with the inputs of M.Breidenbach and K.Krempetz (FNAL)

A lucky coincidence brought very often in our meetings the colleagues M.Santana (SLAC) and T.Sanami (KEK), experts on radiation.

This talk is the summary of the outcomes of this working group



Pacman



PACMEN

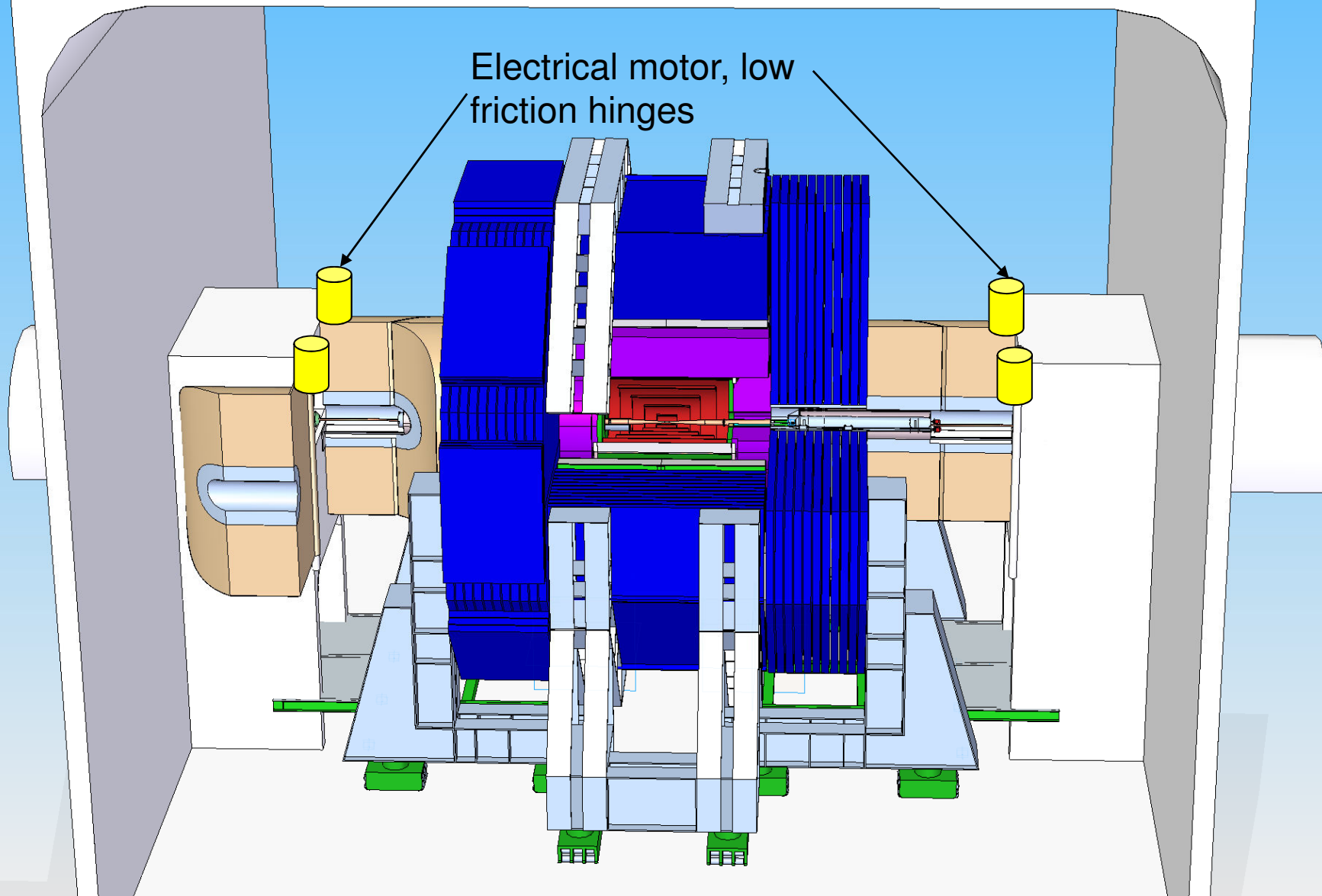
Pacman requirements : keep the dose below 250mSv/h in case of a 18MW full beam loss. Preliminary radiation simulations ask for : Inner bore R80cm-50cmFE-200cmConcrete -> 120 tons per wing

After some studies we all agreed that a common rotating Pacman hinged on the cavern wall, is compatible with both detectors.

Each detector concept will have to carry on the doors a fraction of the shielding, different for ILD and SiD

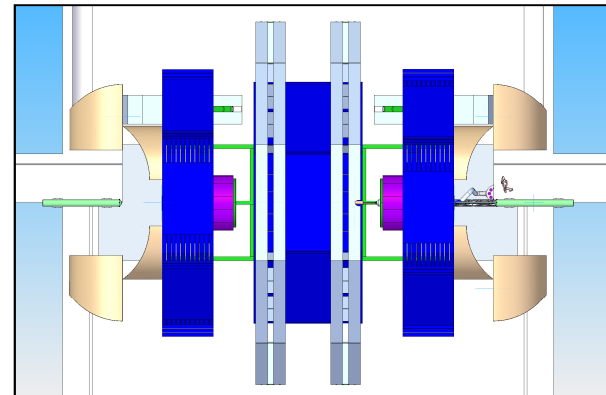
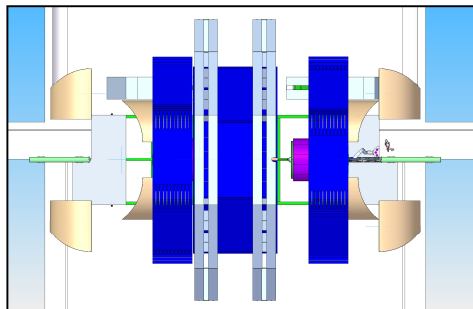
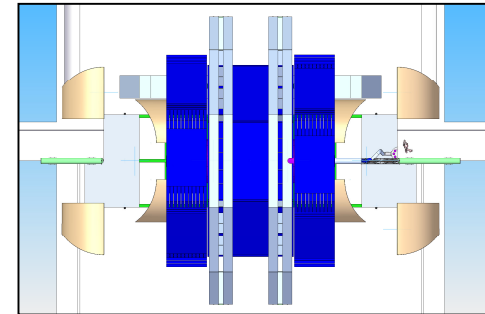
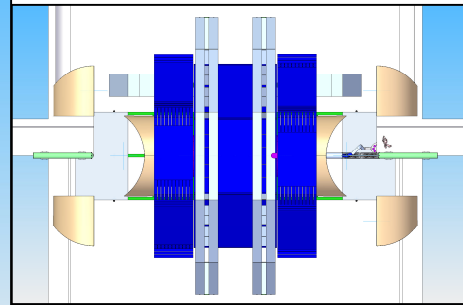
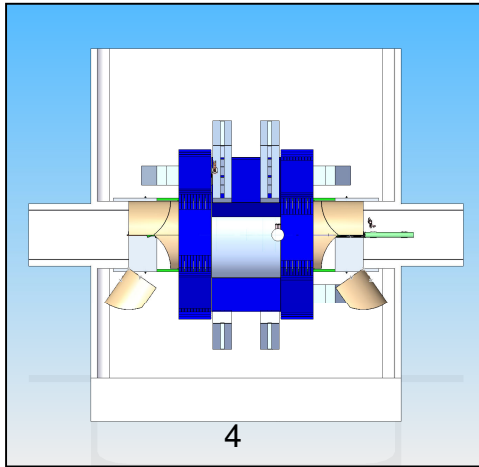
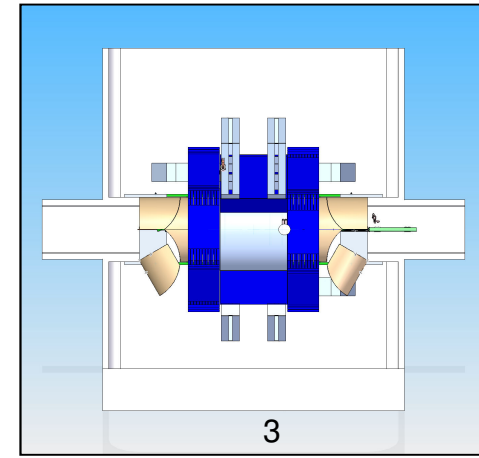
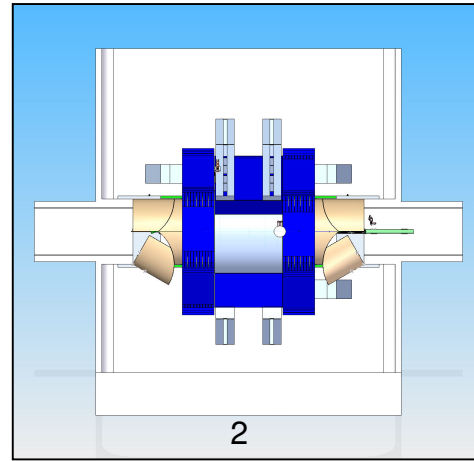
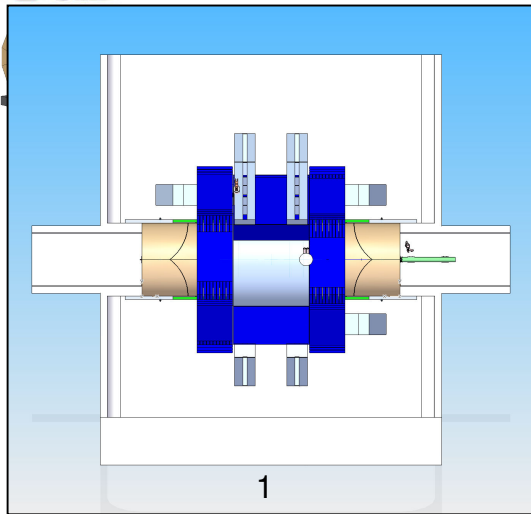
ILD adopt a pillar support for QD0, SiD carry the doublet in the door : it may implies to add or remove shielding patches on the rotating pacmen. The size and the time required will be in the shadow of the pus pull operations.

SiD Lol Proposal: Rotating Pacmen

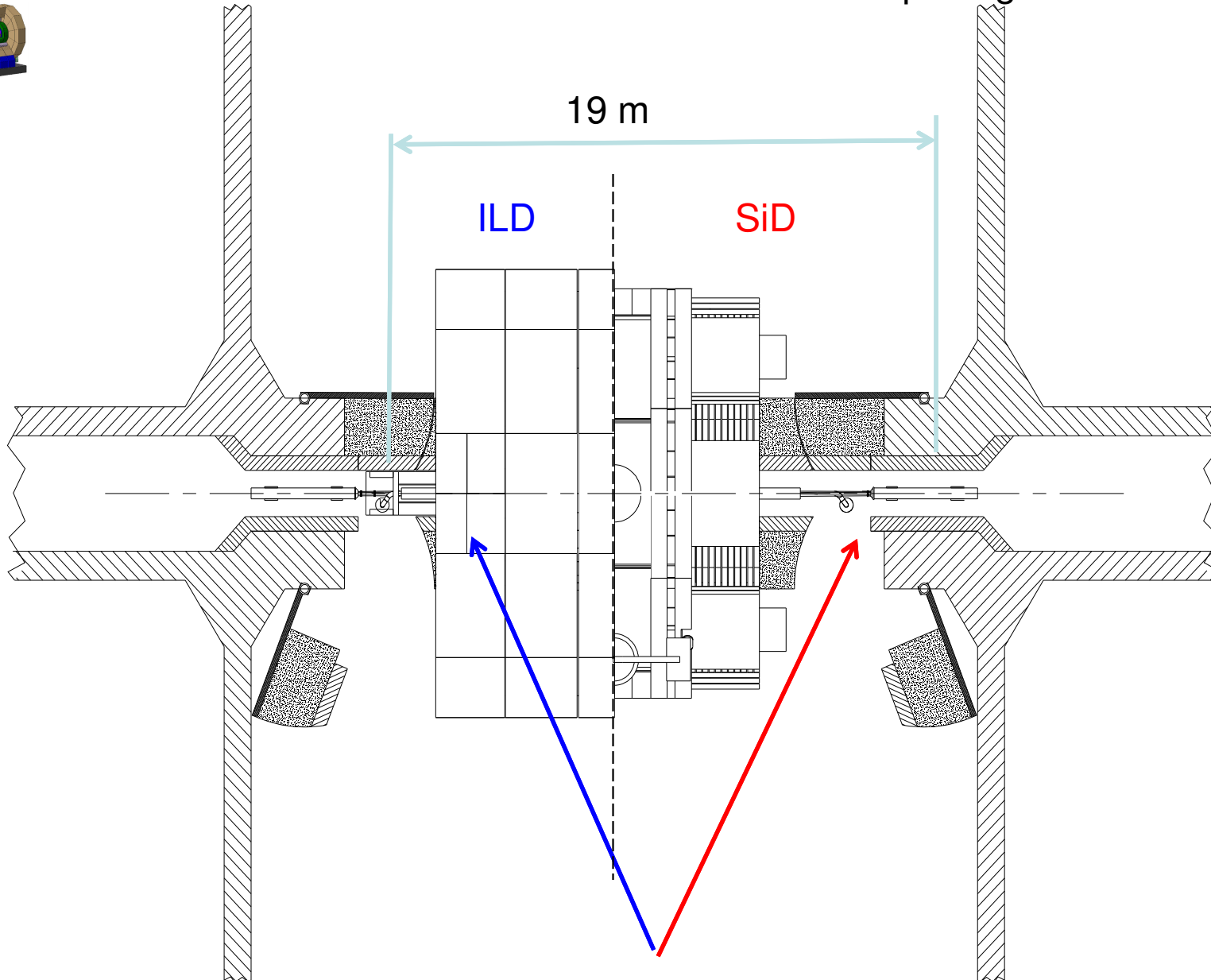


Electrical motor, low
friction hinges

SiD opening on the beam

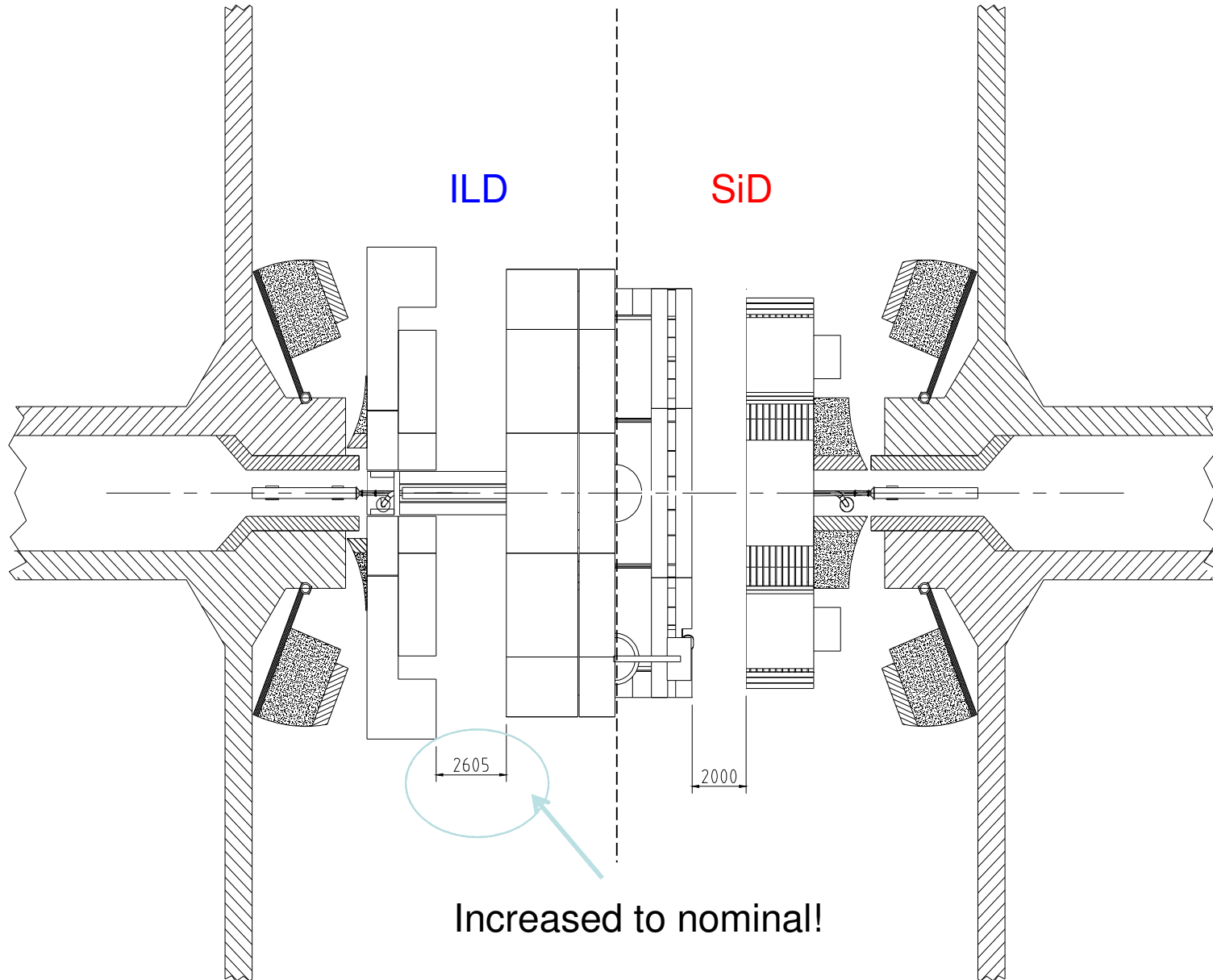
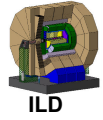


Pacmen closed: Modified to allow ILD opening

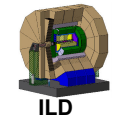


Interface pieces born by each experiment

Pacmen open

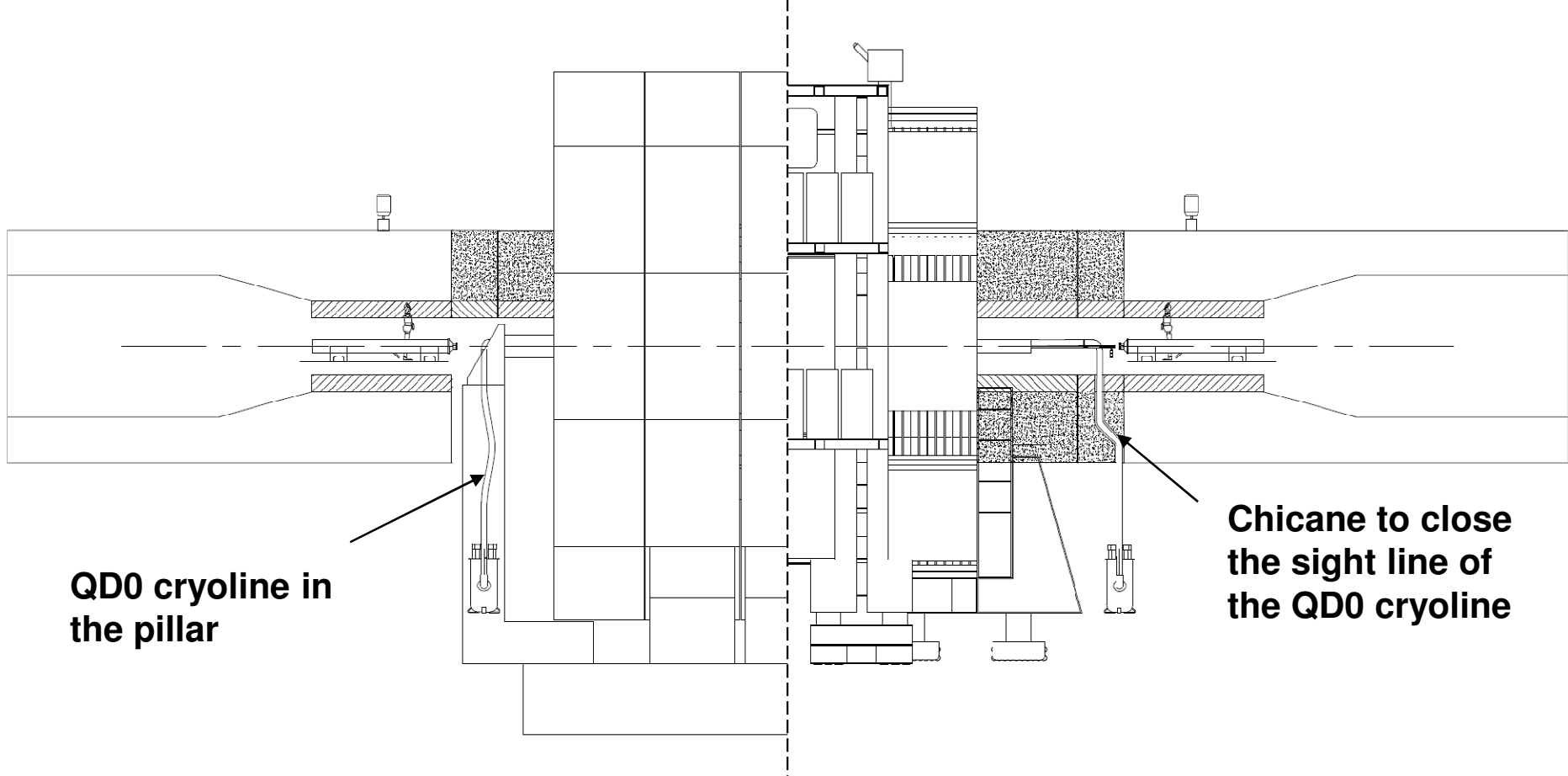


Increased to nominal!



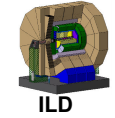
ILD

SiD



**QD0 cryoline in
the pillar**

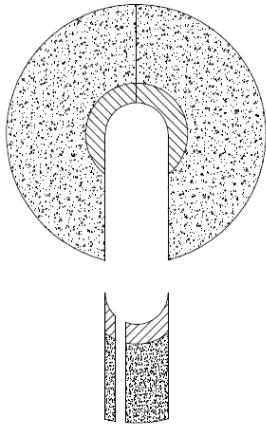
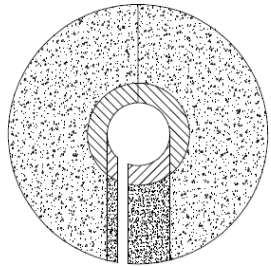
**Chicane to close
the sight line of
the QD0 cryoline**



Iron 50 cm thick starting at radius 80cm followed by 200 cm of concret

SiD

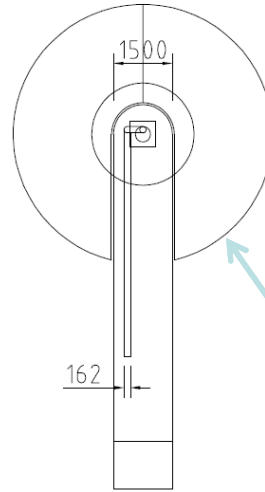
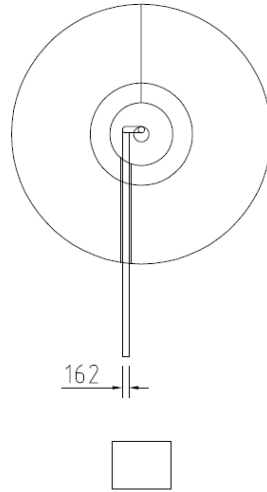
ILD



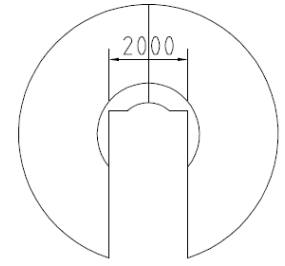
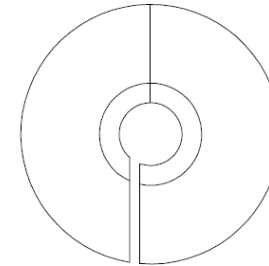
Plug for SiD needed to compensate the ILD pillar volume

SiD

ILD



Modified pillar for ILD
1500 mm wide



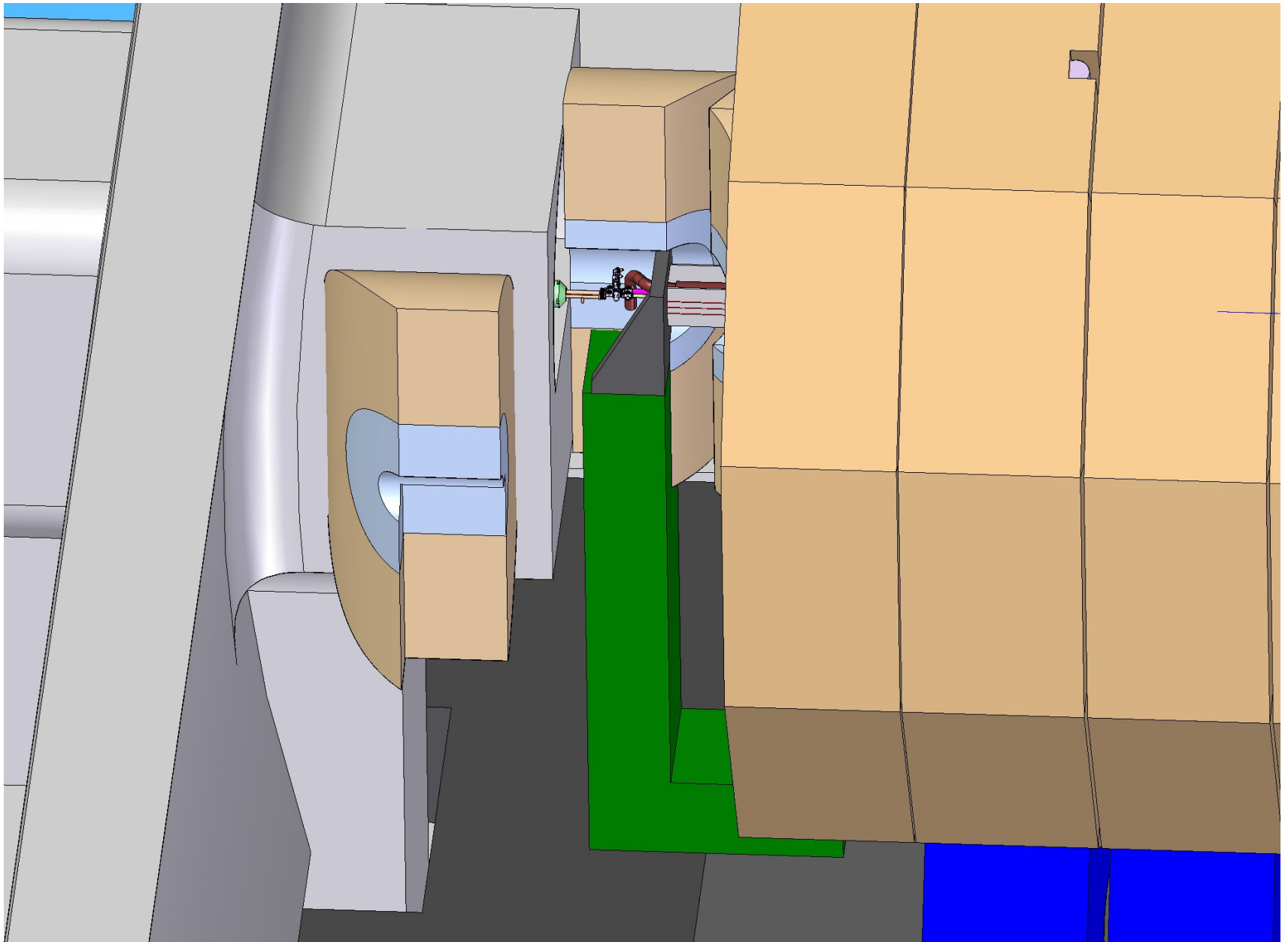
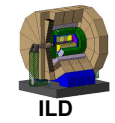
SiD

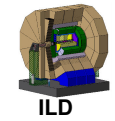
ILD

Original footprint for the material needed for the supports

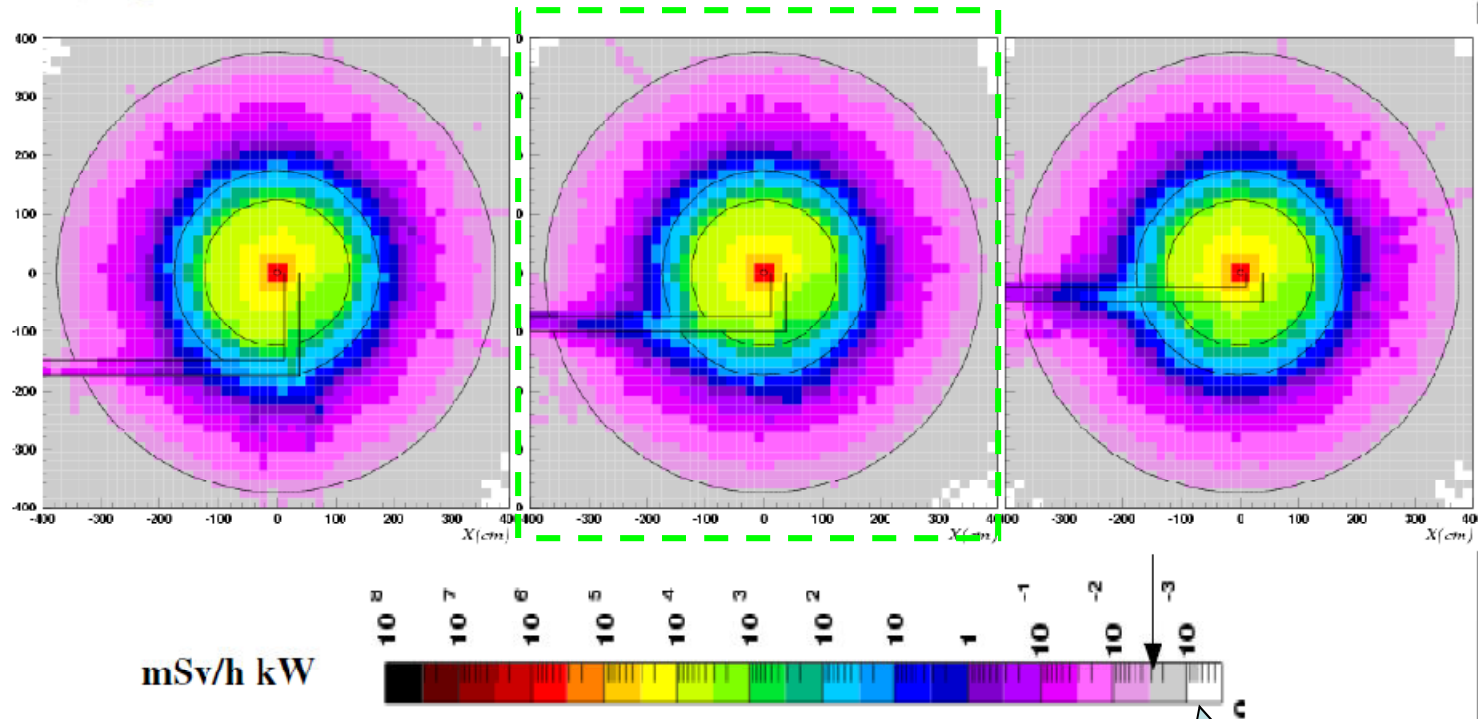
Additional shielding may be needed in the pillar to mitigate effect of cryo penetration

* T. Sanami & M. Santana





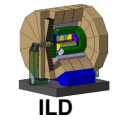
Results [mSv/h kW]



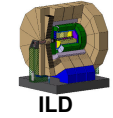
- Average dose around perimeter < 3 mSv / h MW
- Longer elbow--> more balanced peak dose

IRENG 09/ 15/ 2007

0.033mSv/hr/kW → 600 mSv/hr for 18 MW
 It seems to be high, however maze structure and fence out area would reduce it



Push-Pull mechanism



Choice of the mechanism that provide ~500t push/pull in a safe and smooth way

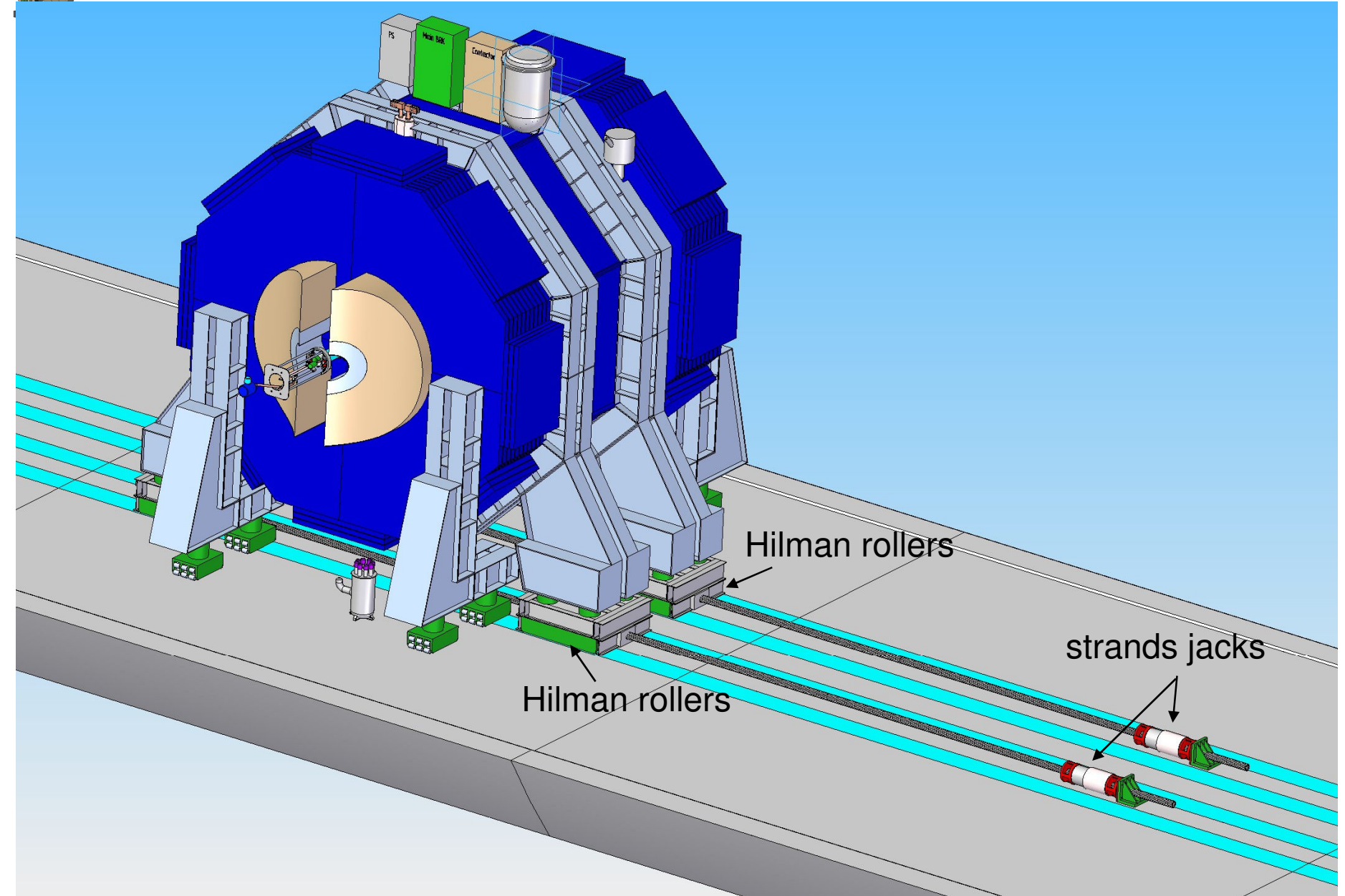
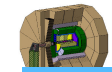
Full convergence on strand jacks : compact, reliable, straightforward integration in the IR

Quick Comparison with other possibilities

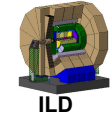
	Availability	Detector Integration	IR Integration	Cost	Flexibility/Scalability
Gears/Screws	R&D required	High	High	High	Low (permanent installation)
Plunger Jack	Off-the shelf	Low	High	Low	Medium
Strand Jacks	Off-the shelf	Low	Low	Low	High

Push/pull locomotion

Dedicated session in this workshop



Off-the shelf ~ 523 metric Tonnes



Top anchor grip open / closed sensors. 2 No sensors for open and 2 No sensors for closed, positioned on either side of the anchor.

Retract port pressure sensor. Accurate to +/- 0.25%

Stroke sensor. Sensor accurate to 0.015%.

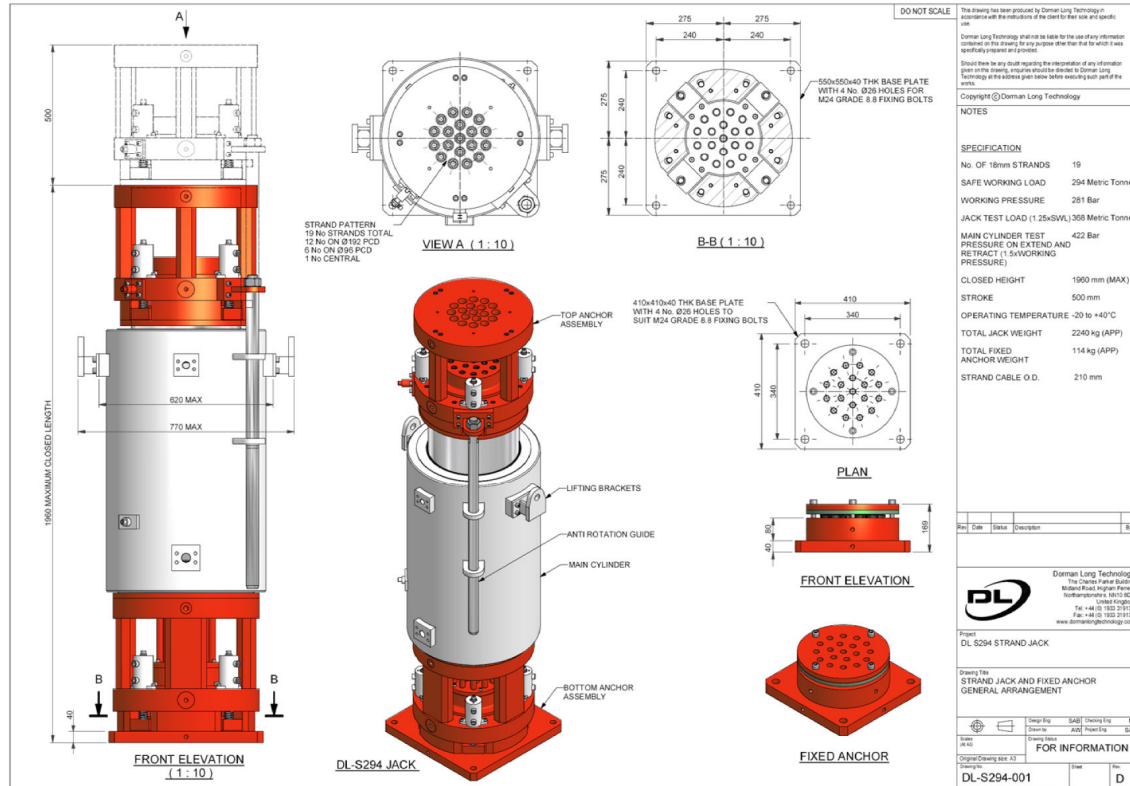
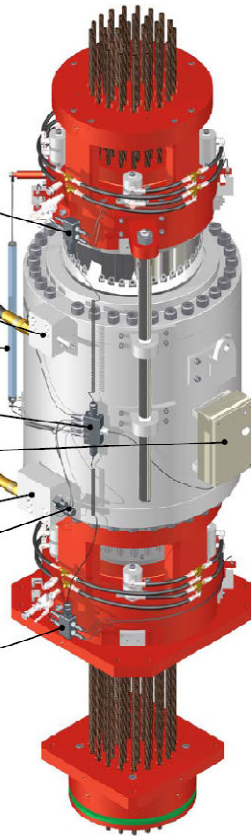
Strand jack electrical dressing set. Common to both DL-F40 and DL-M control systems

DL-P40 strand jack CAN node within a protective enclosure box.

Extend port pressure sensor. Accurate to +/- 0.25%

Extend port bleed valve. Operated by the CAN node for extremely accurate alignment of the load and for smooth load transfer to other support

Bottom anchor grip open / closed sensors. 2 No sensors for open and 2 No sensors for closed, positioned on either side of the anchor.



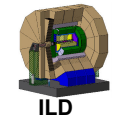
DL-S294 strand jack



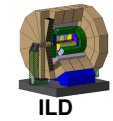
Project: DL S294 STRAND JACK

Drawing Title: STRAND JACK AND FIXED ANCHOR GENERAL ARRANGEMENT

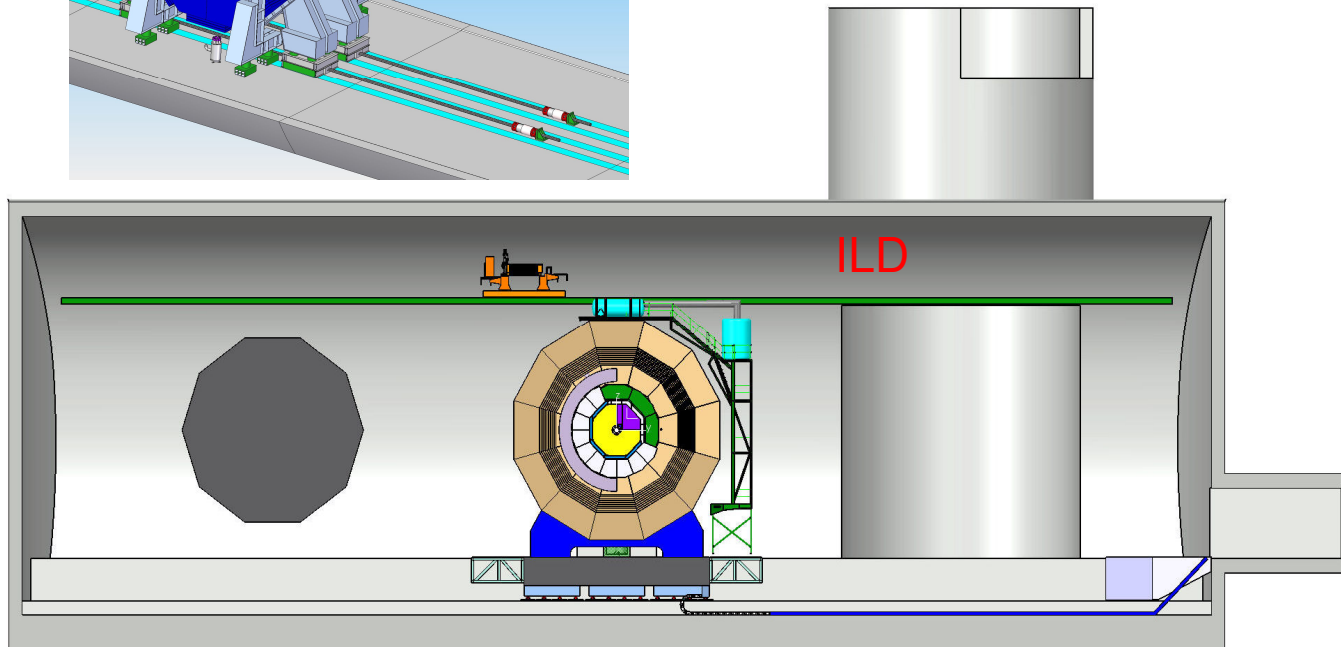
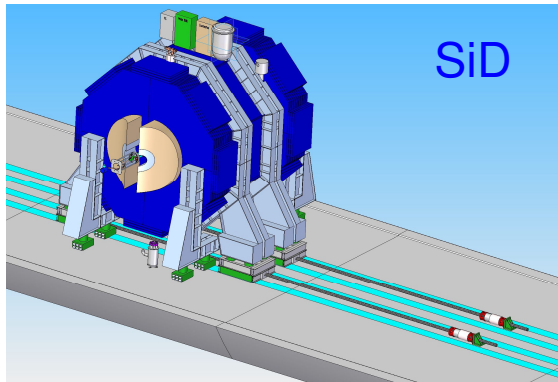
Author	Checked	Drawn	Scale
Original Drawing Size: A3	Sheet: 1	Total: 1	Rev: D



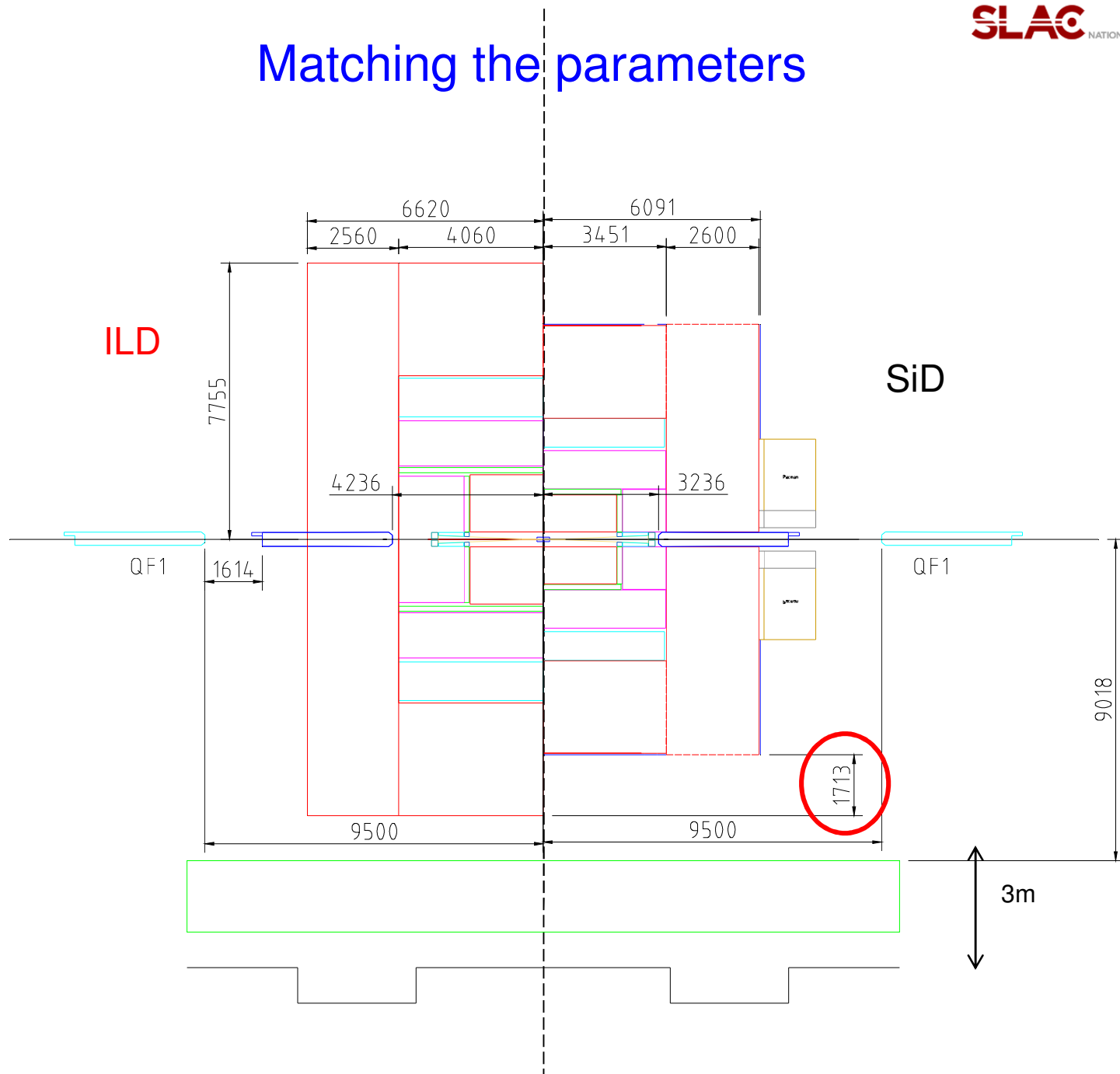
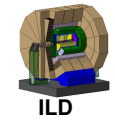
With or without the Platform ?



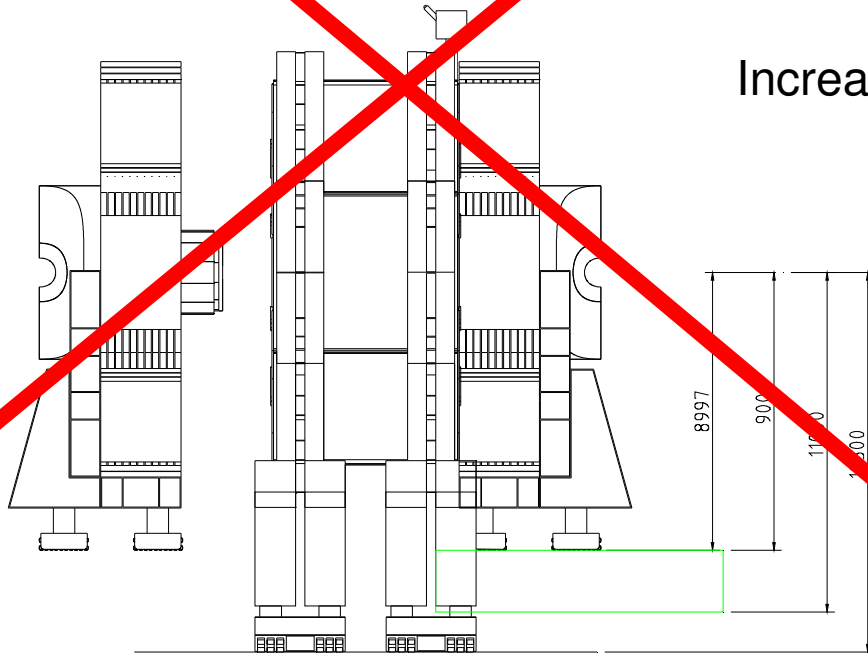
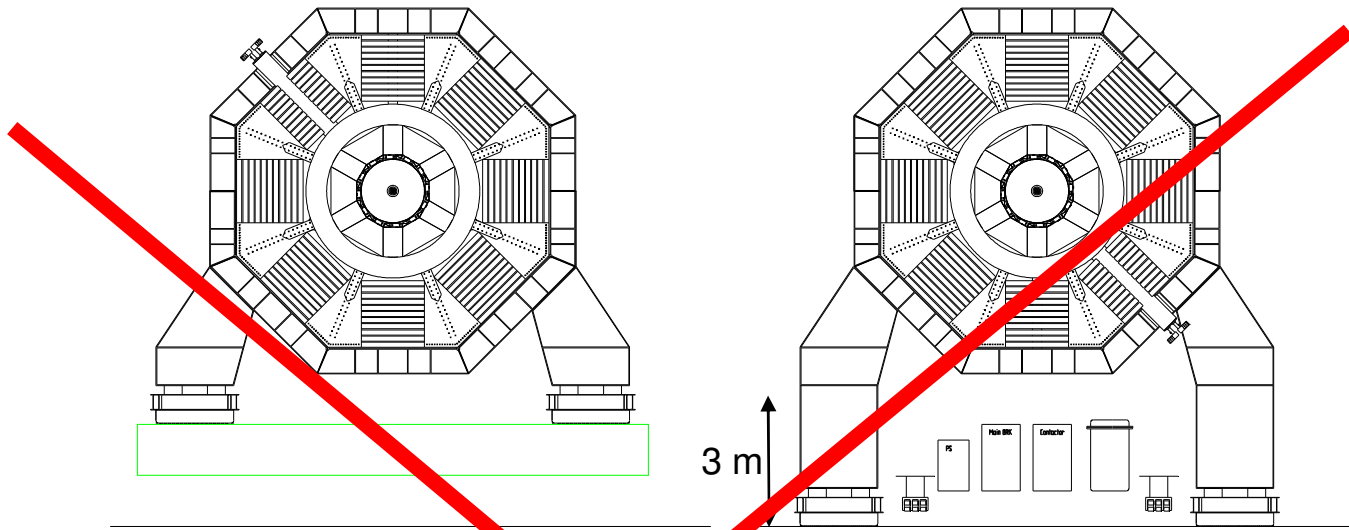
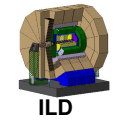
We tried to merge the technical solutions described in their respective Lols
Drafted few possibilities, not the most elegant by definition of compromise



Matching the parameters

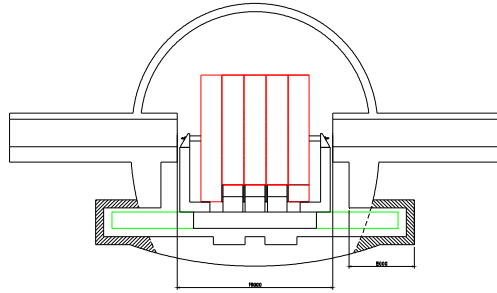
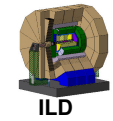


Option 1: Pulling SiD's legs

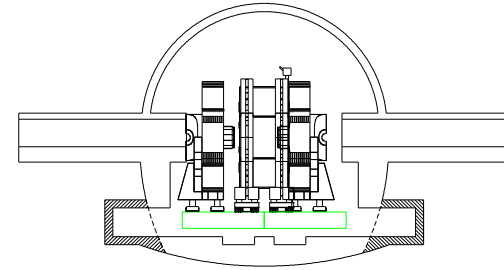


Increased exposition to vibrations

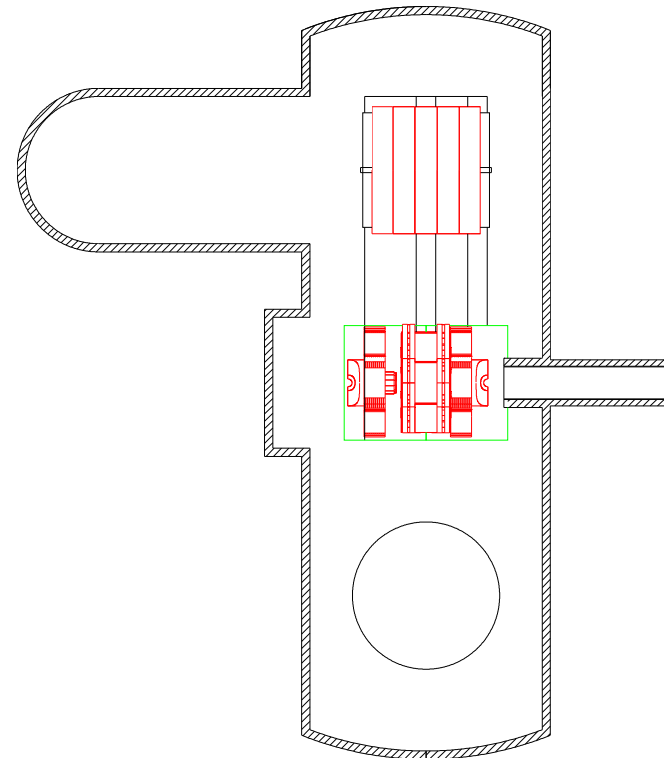
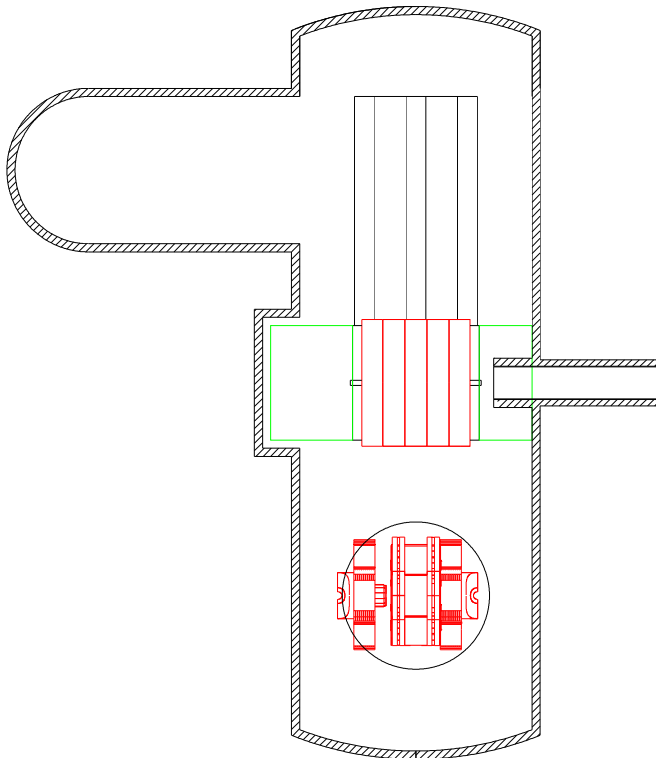
Option 2: Half platforms

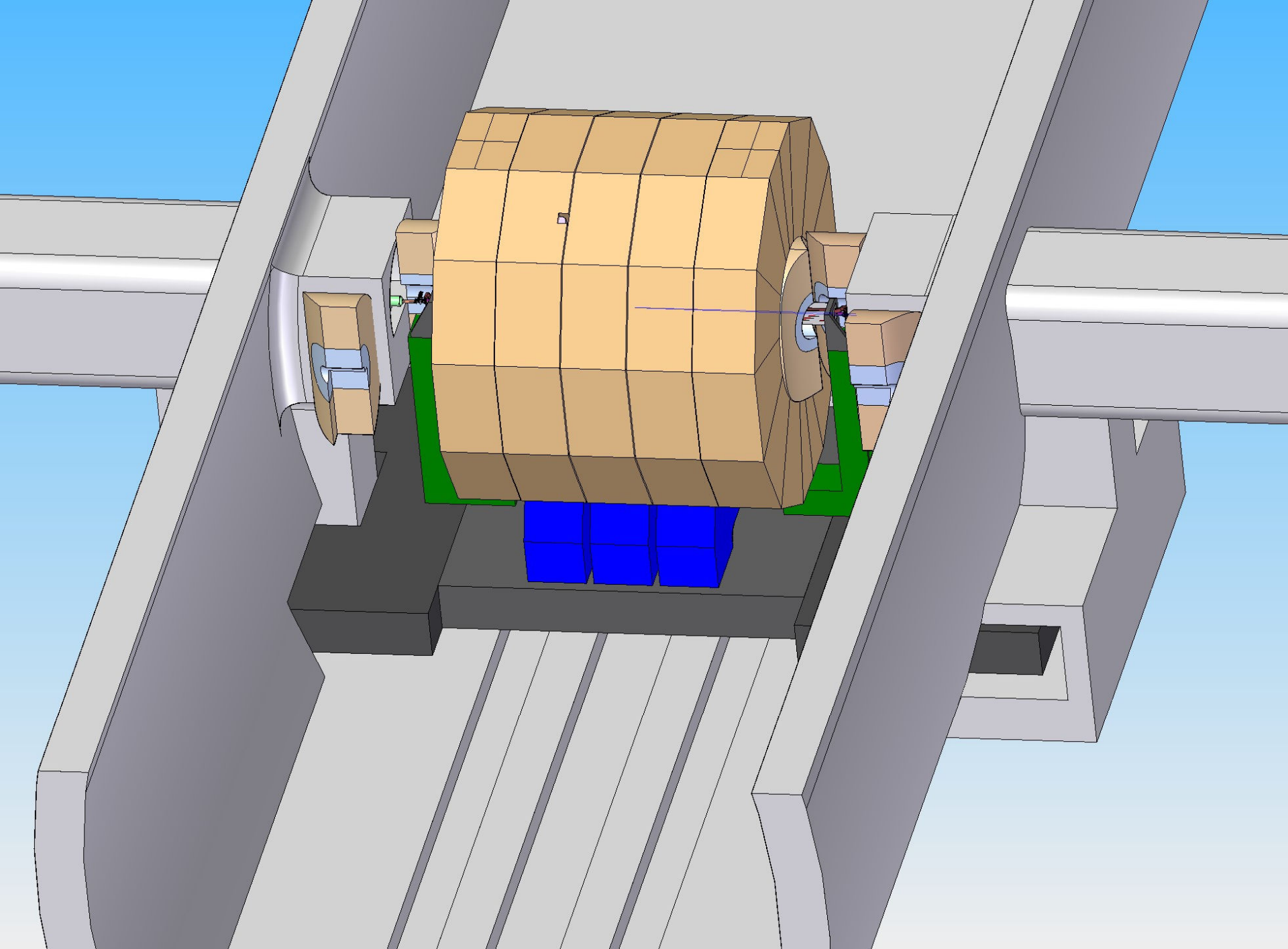


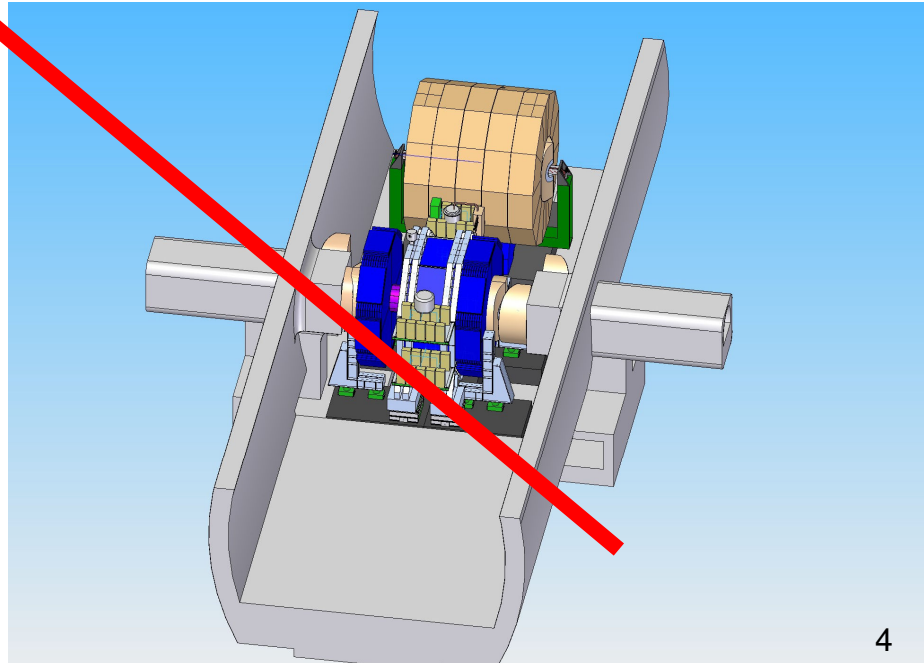
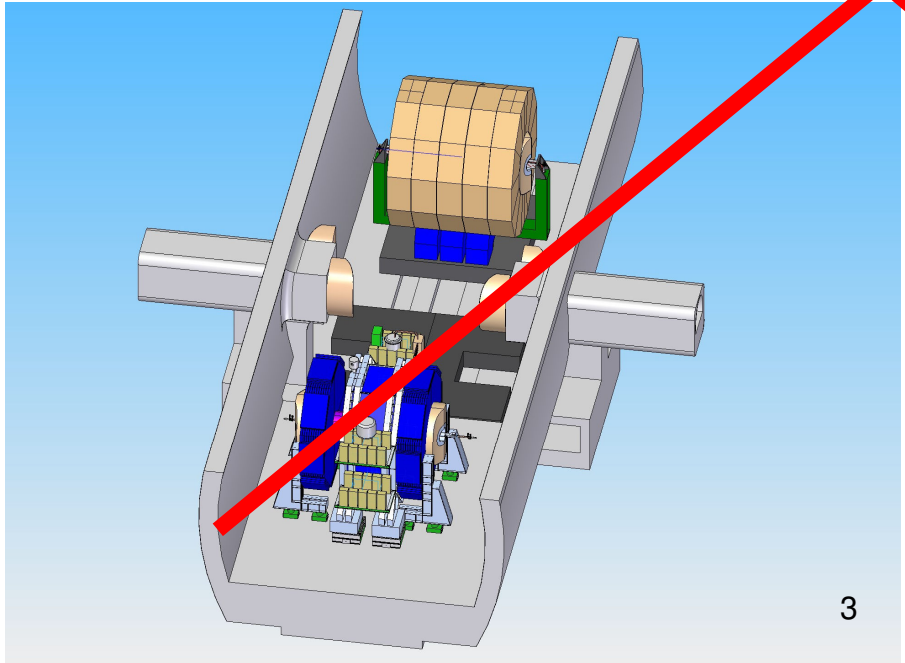
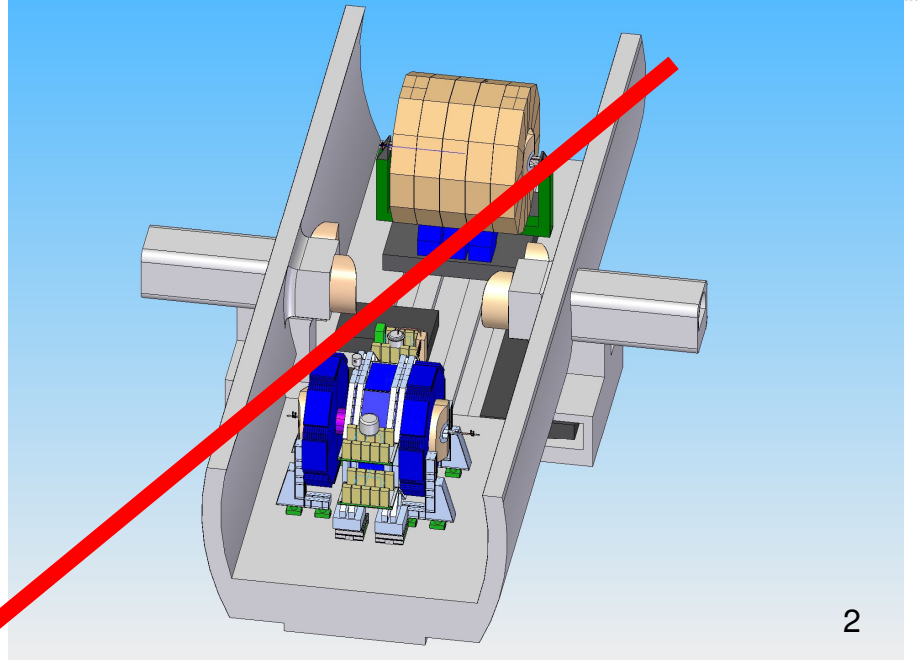
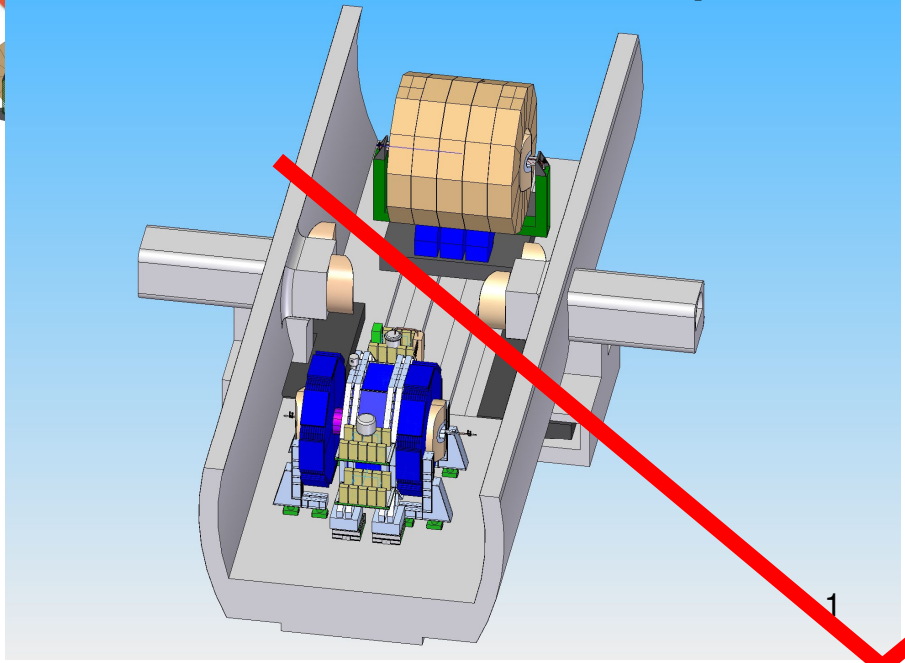
ILD on beam

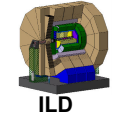


SiD on beam









Both detector Lol's make strong technical cases with and without platform, showing that it is possible to make sound engineering with two different approaches

General questions we should start to address to move forward :

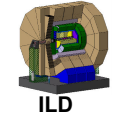
1. Does the platform scores any point for the Alignment issues, Cryogenics or General services integration ?
2. Is the platform needed for the QD0 support and stabilization ?
3. Is the platform design enough understood vs. costs and site integration (molasse-granite-shallow site) ?
4. Is the platform concept compatible with the nano-metric vibration requirements ?
5. Which are the benefit of SiD moving on a platform ?
6. Can ILD move without a platform ?
7. Rollers vs. air pads is a discussion independent form the platform.

From a SiD point of view:

The longer feet jeopardize the stability and the anti-seismic requirements

The half platforms may turn out sources of more trouble than the simple platform

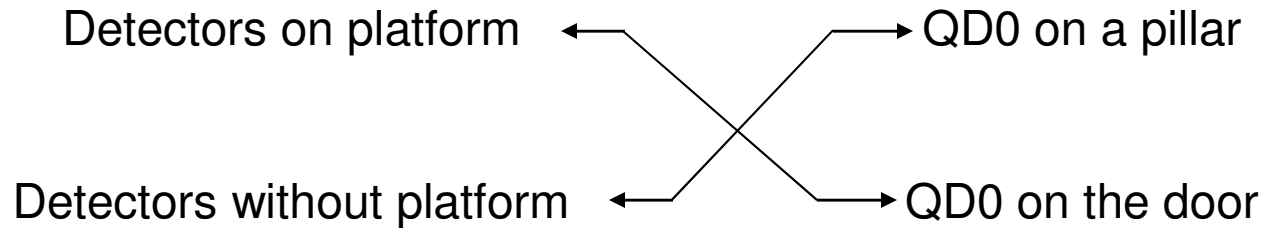
Comments II



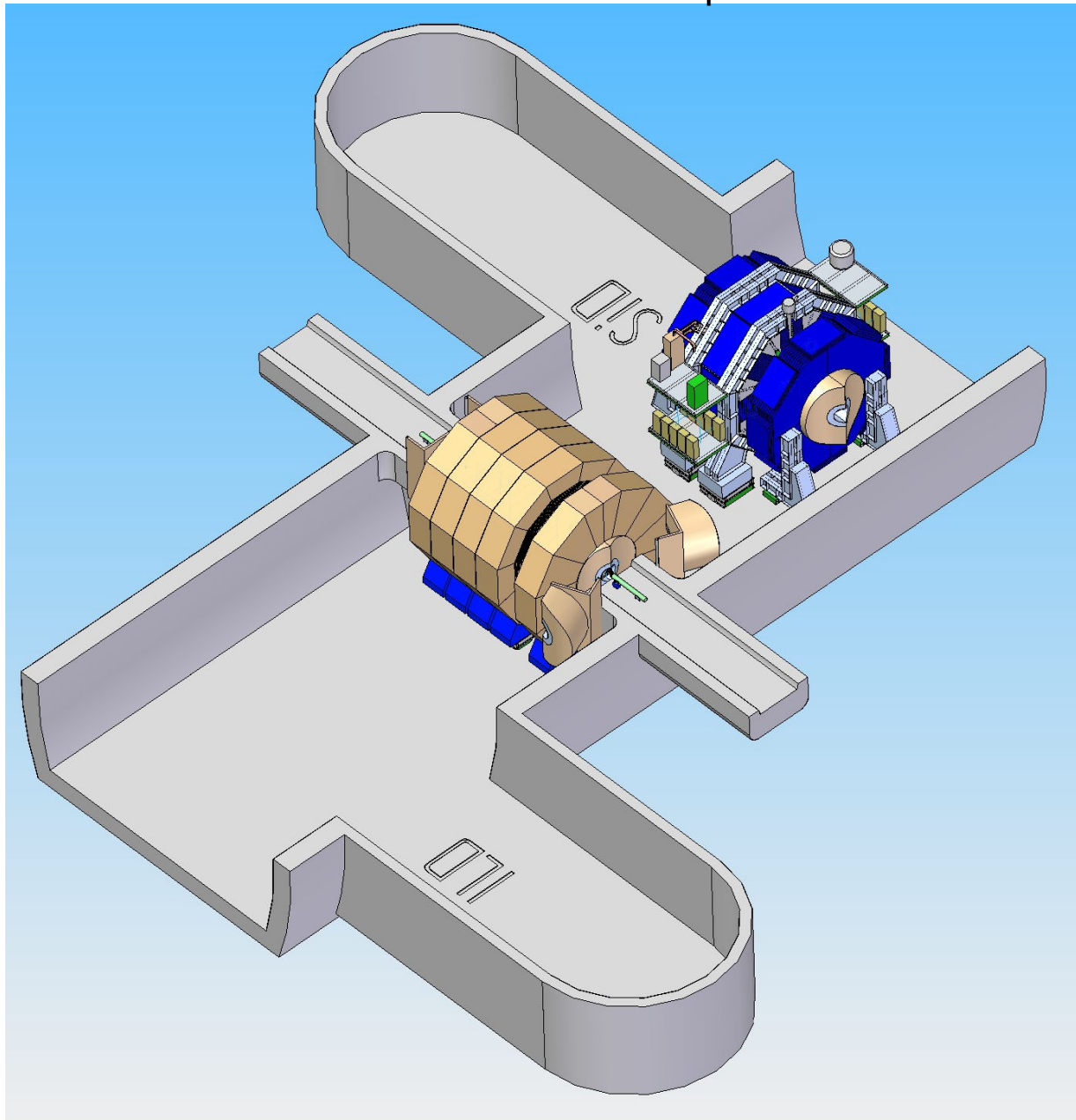
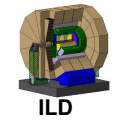
The outstanding issue is not how to push&pull detectors on the IP but how the assembly of the Detector+QD0 is immunized from the ground vibrations one on the IP.

Vibration studies of both detectors are set as first priority

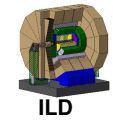
Cases to be Studied :



All detectors without platform

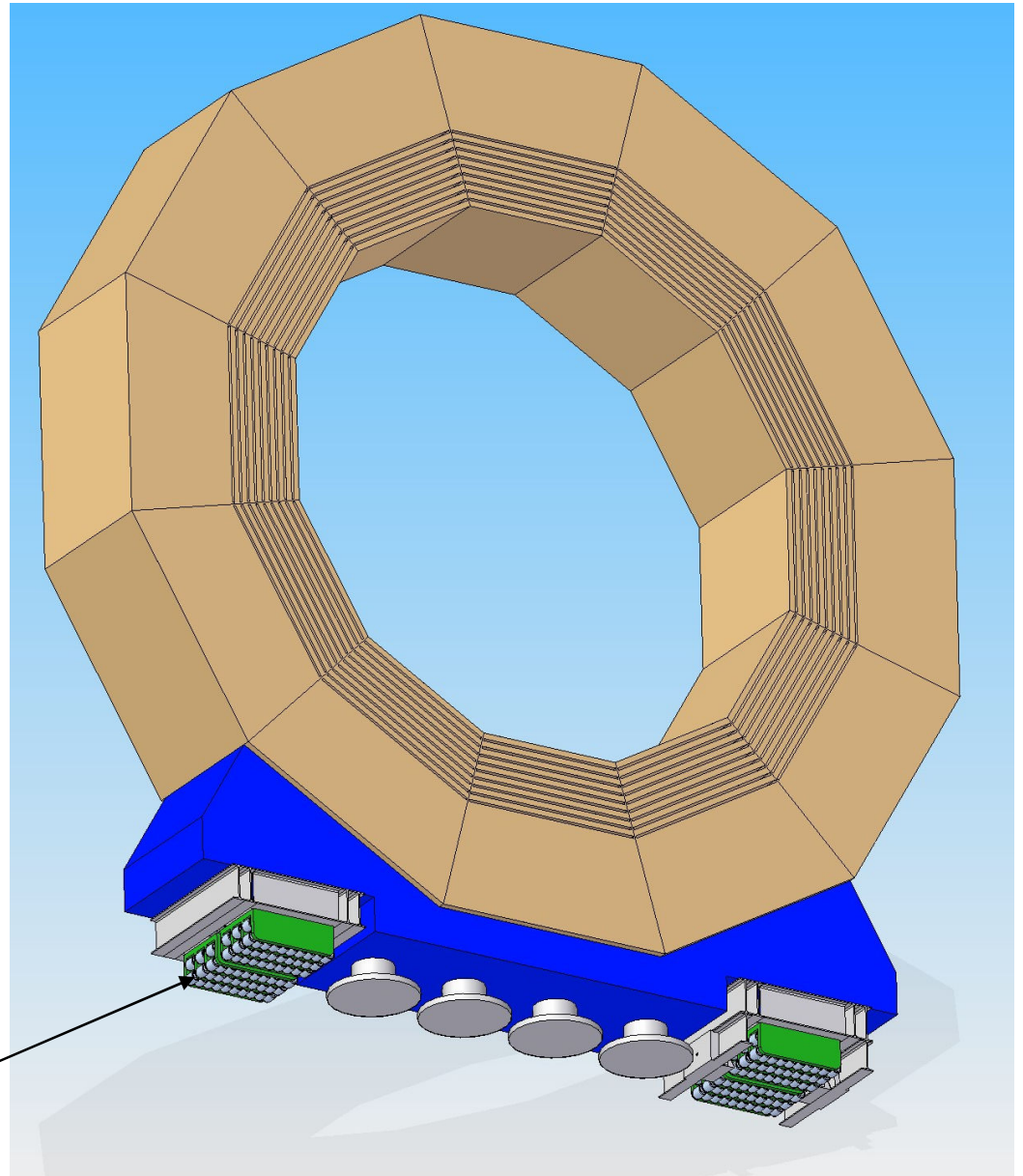
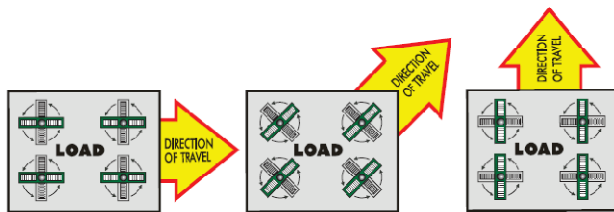


ILD ring on air-pad+roller without platform

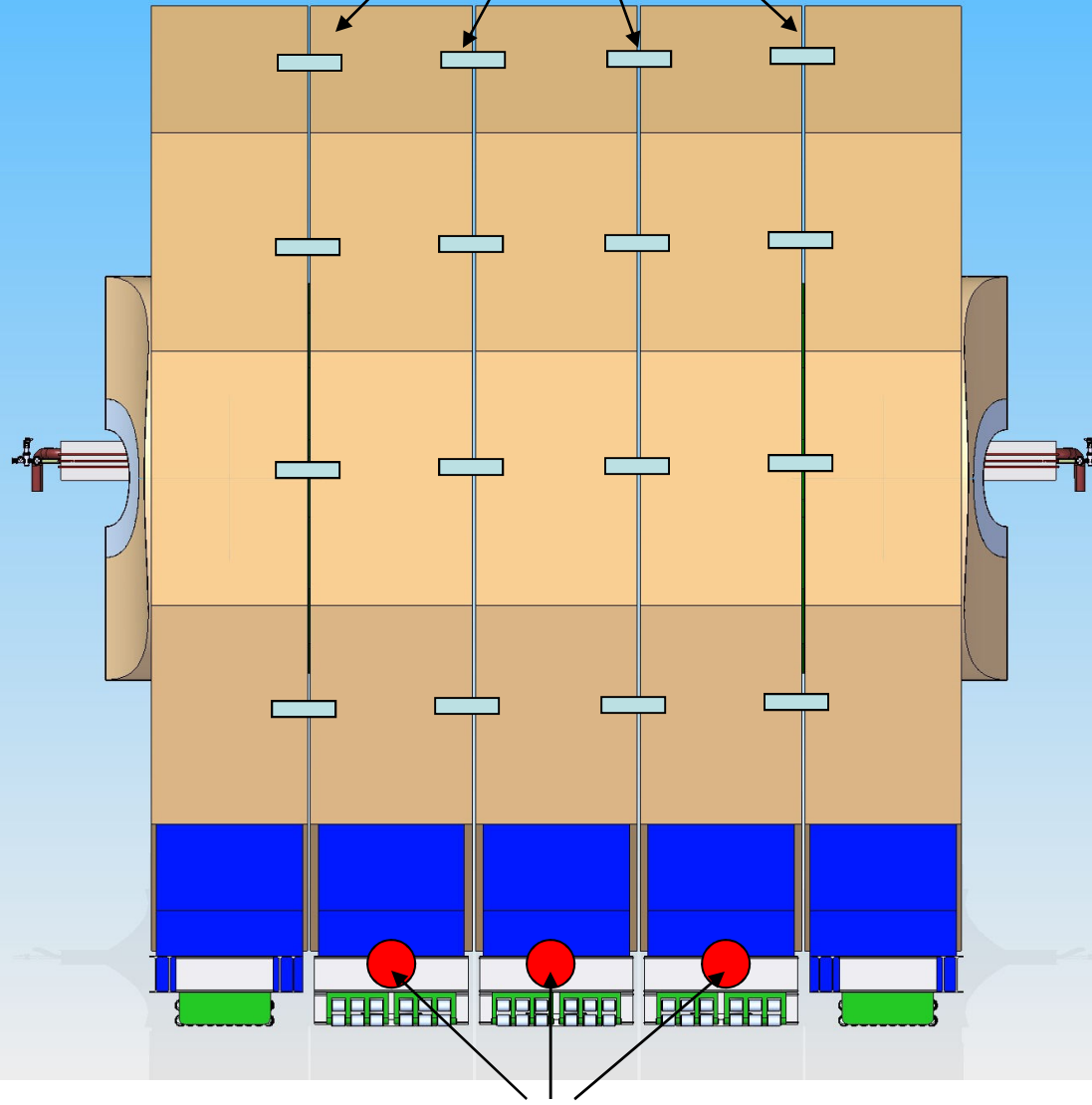


HILMAN SWIVEL RAM ROLLERS

Model	Metric Tons	Height		Length		Width	
		inches	mm	inches	mm	inches	mm
1U-SRR	10	6.125	156	20	508	5.31	135
20-SRR	20	6.5	165	27	686	5.5	140
50-SRR	50	8	203	38	965	8	203
100-SRR	100	12	305	40	1020	12	305
150-SRR	150	12	305	43	1170	14	356
200-SRR	200	13.5	343	52.75	1340	16	406
300-SRR	300	16	406	45	1170	16	406
400-SRR	400	consult factory	consult factory	consult factory	consult factory	consult factory	consult factory
600-SRR	600	consult factory	consult factory	consult factory	consult factory	consult factory	consult factory
800-SRR	800	consult factory	consult factory	consult factory	consult factory	consult factory	consult factory
1000-SRR	1000	consult factory	consult factory	consult factory	consult factory	consult factory	consult factory



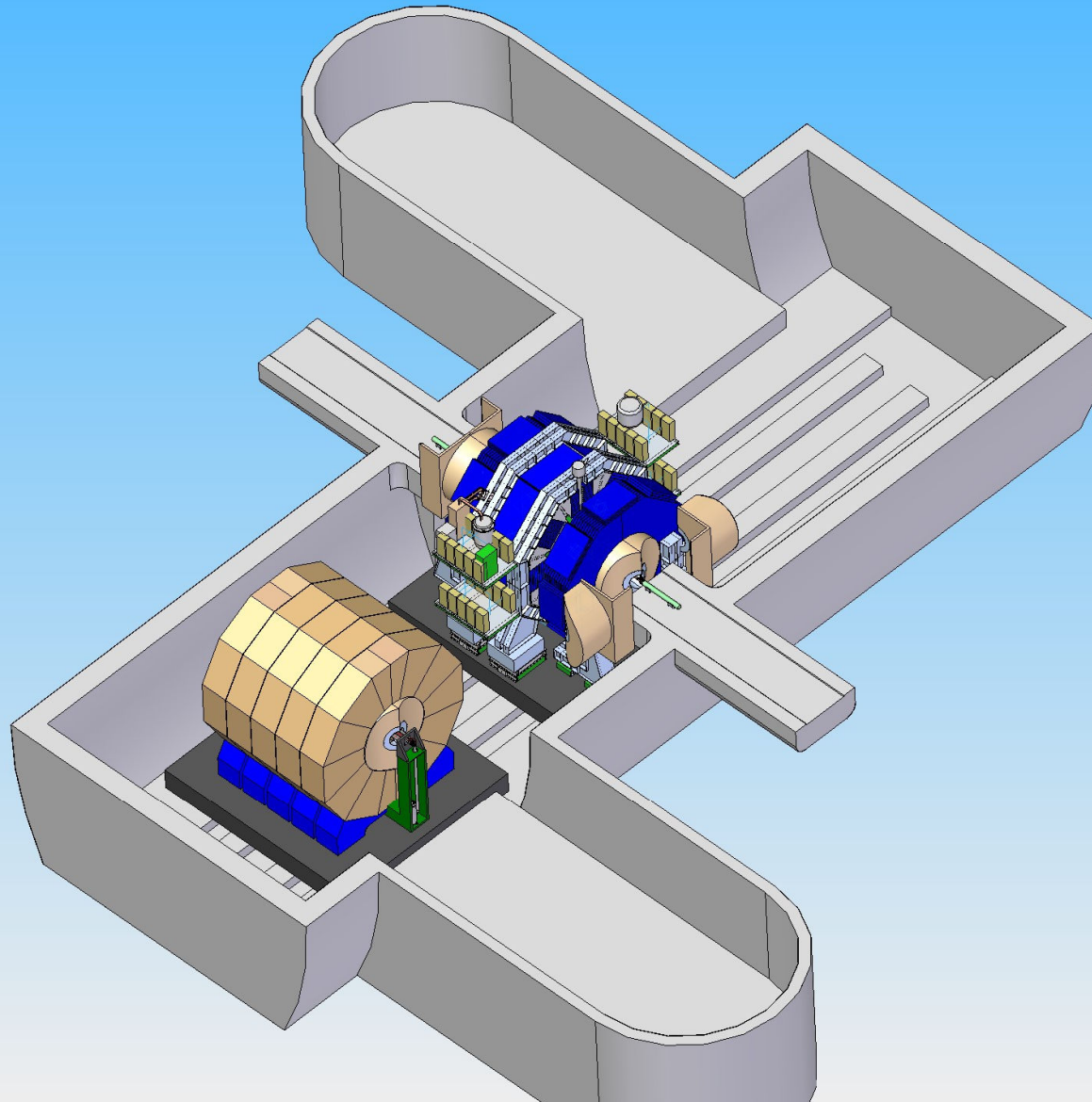
Latched Ring



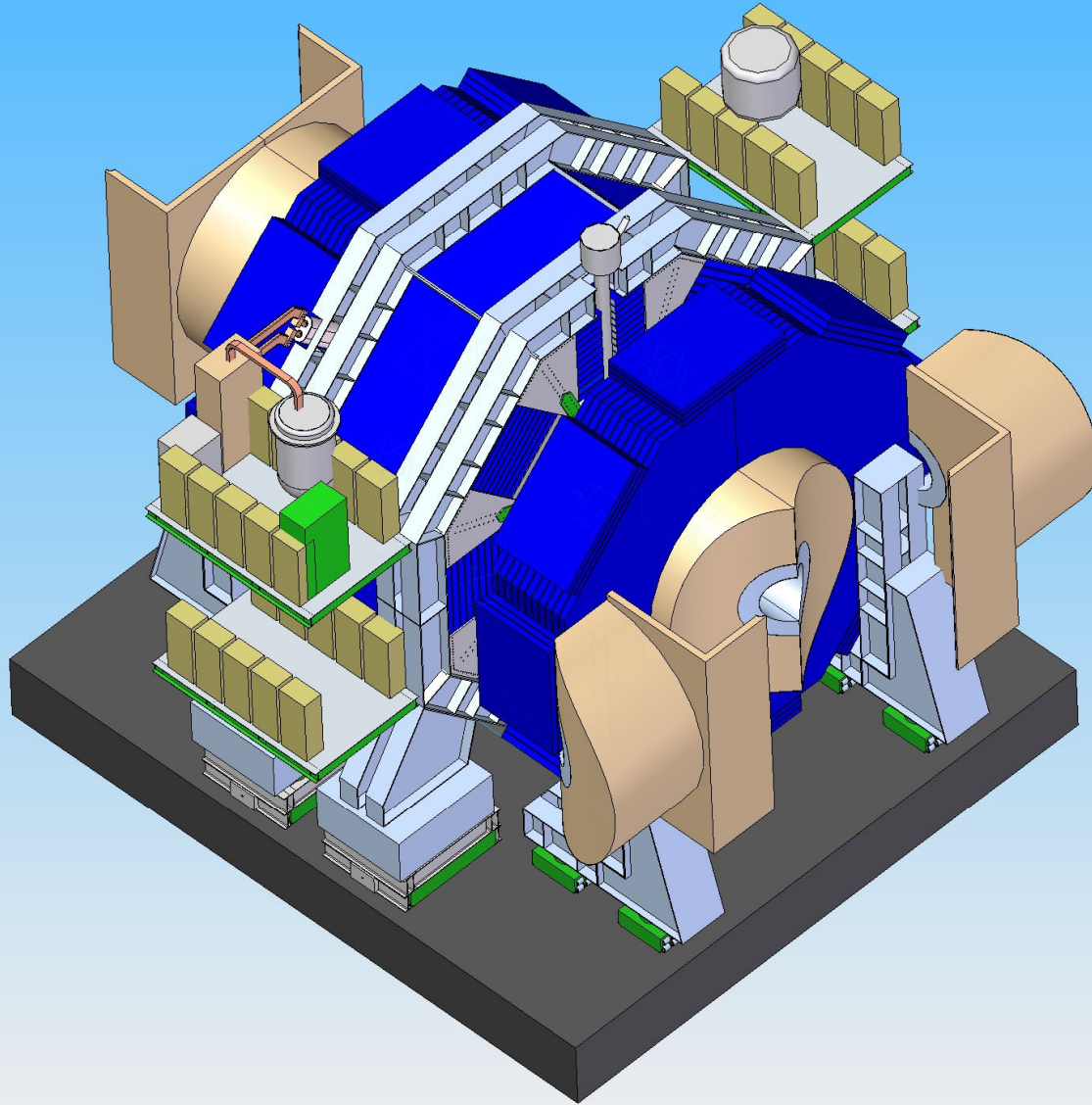
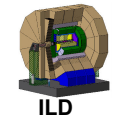
Strand Jacks pull zone

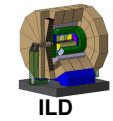
ALCPG September '09

All detectors on platform

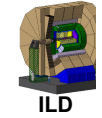


SiD on the platform



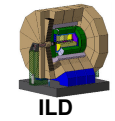


Supporting of Platform

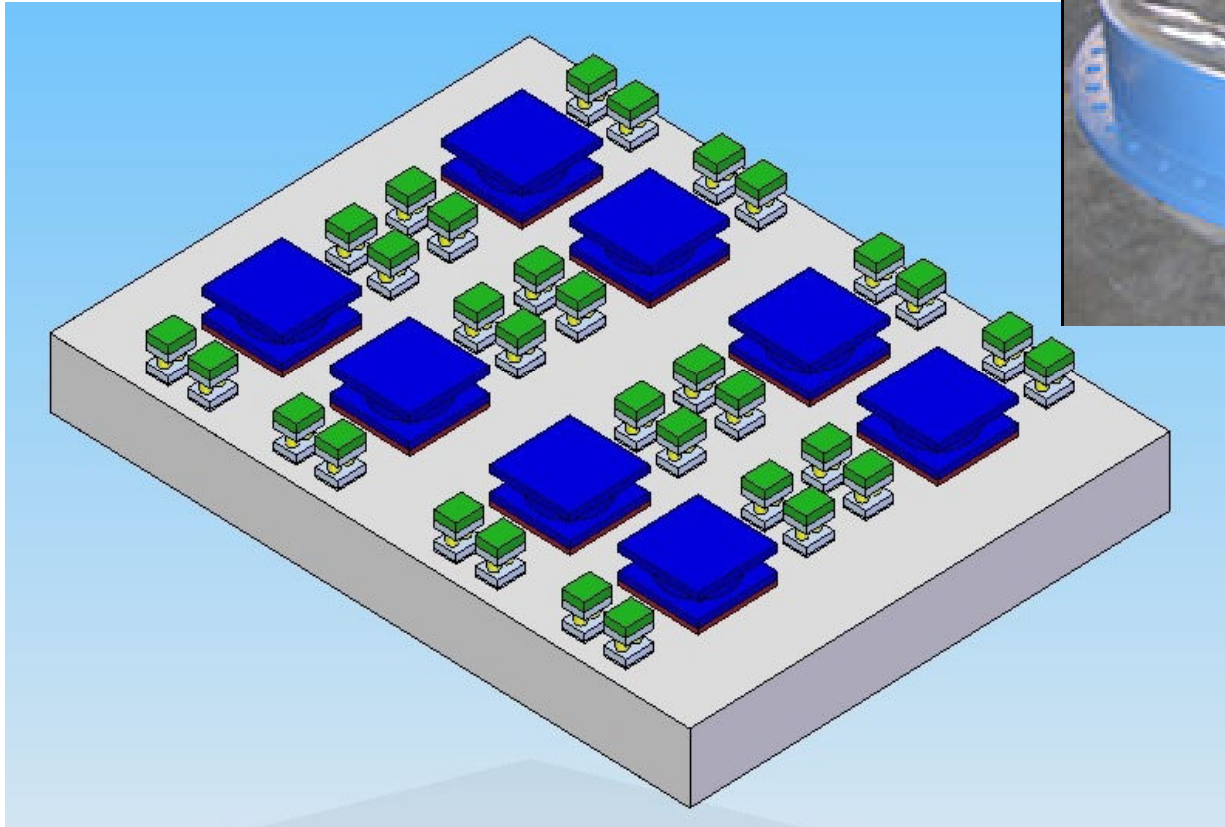


Roller considerations

- The Platform/Roller/Rail Foundation has to be considered as an ensemble.
- A good solution seems to multiply the number of rollers and distribute the load through hydraulic jacks in parallel.
- 750-ton rollers used at 500-ton capacity with two 300-ton hydraulic jack on top look OK.

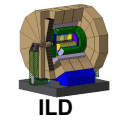


View from below (Rollers)

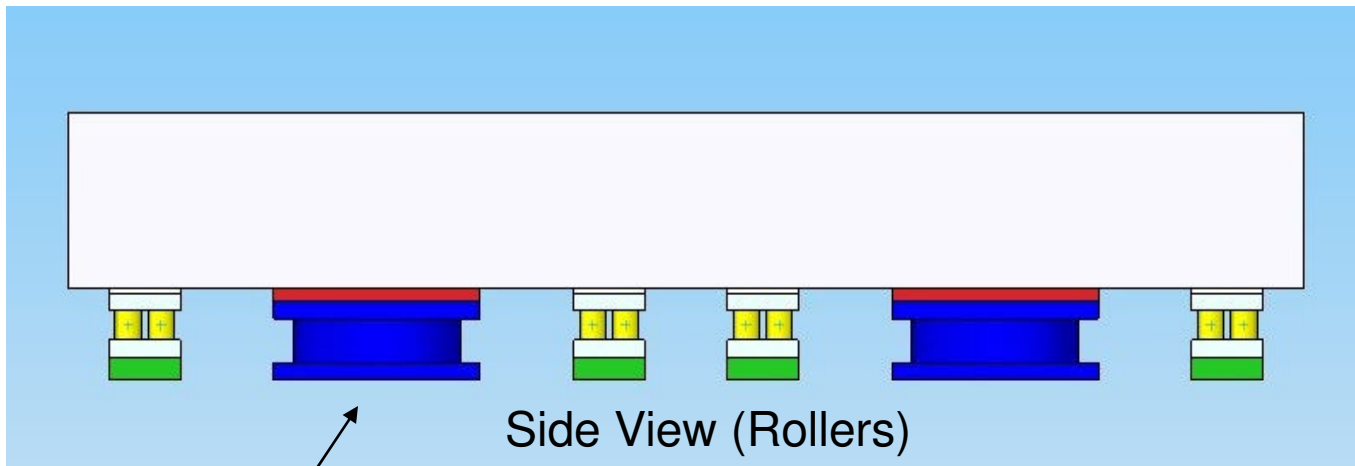
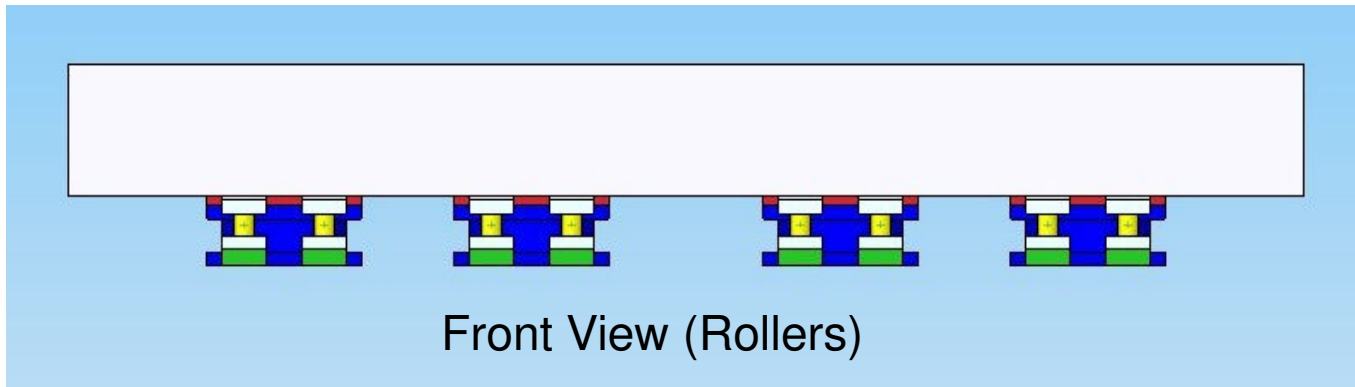


10kt unit
Anti-Seismic support

Four support lines for 4'000 tons each

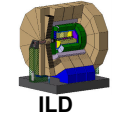


Total Mass ~1200 tons



Anti-seismic Supports

Summary



Common solutions agreed for the pacmen shielding and the push-pull mechanism

Different QD0's supports can be accommodate, a common solution would simplify the pacmen design.

Found hard to design a common a solution that can accommodate different technical approaches.

The concerns of vibration effects due to ground motion have been recognized by all as real.

Need to evaluate how a platform contribute to vibrations

Vibration Studies have been started for ILD and SiD (two talks on Friday at the Joint BDS/MDI meeting in this workshop)

Vibration effects for ILC can be even more critical for CLIC. Ground motion measurements are being taken at LCH (CMS-Point 5); interest on common actions on the matter; to be shared through the existing ILC/CLIC WGs