



Critical Interaction Region Issues, Report from the IR engineering workshop

Andrei Seryi, SLAC

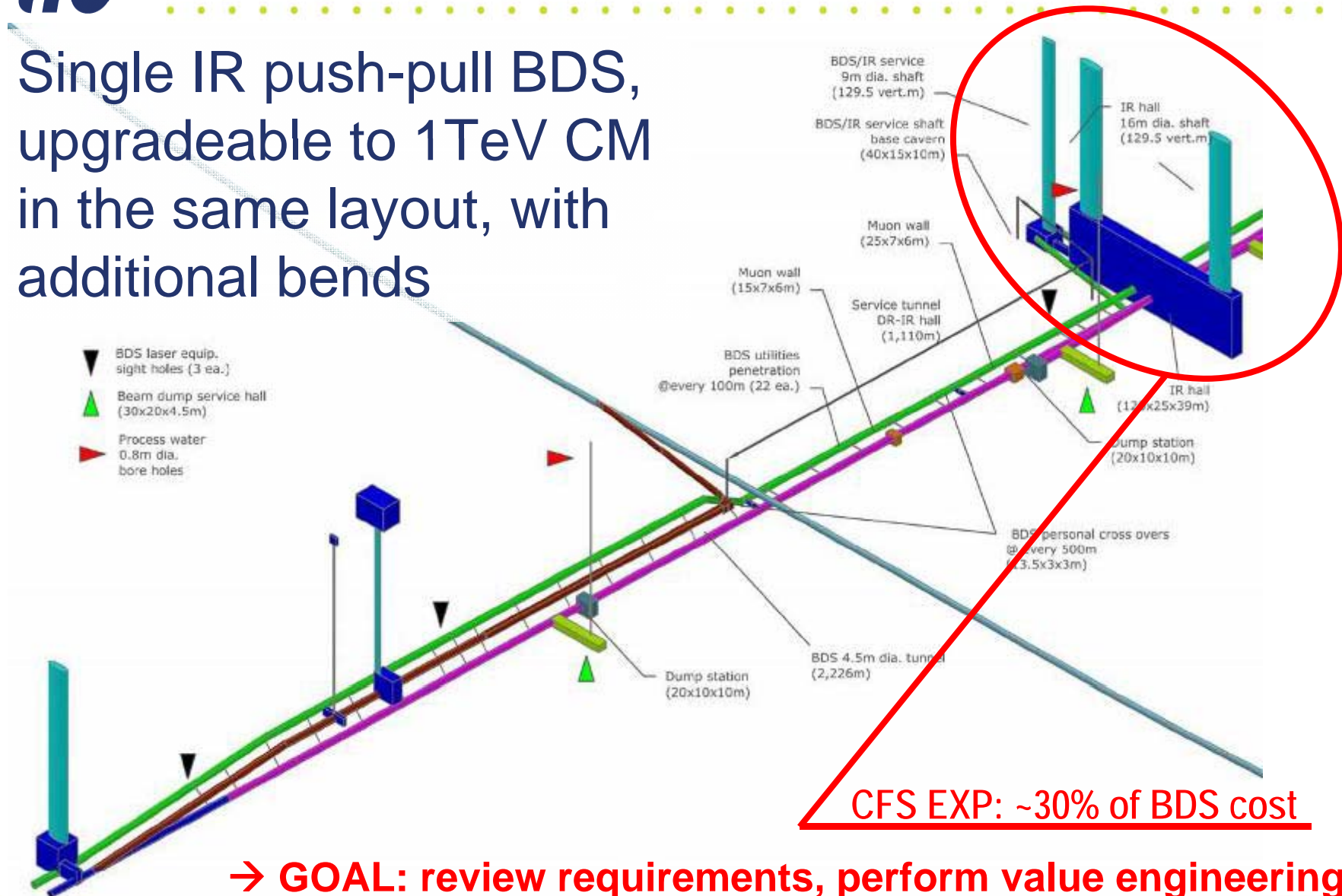
October 24, 2007

Global Design Effort



BDS layout

- Single IR push-pull BDS, upgradeable to 1TeV CM in the same layout, with additional bends



→ **GOAL: review requirements, perform value engineering**



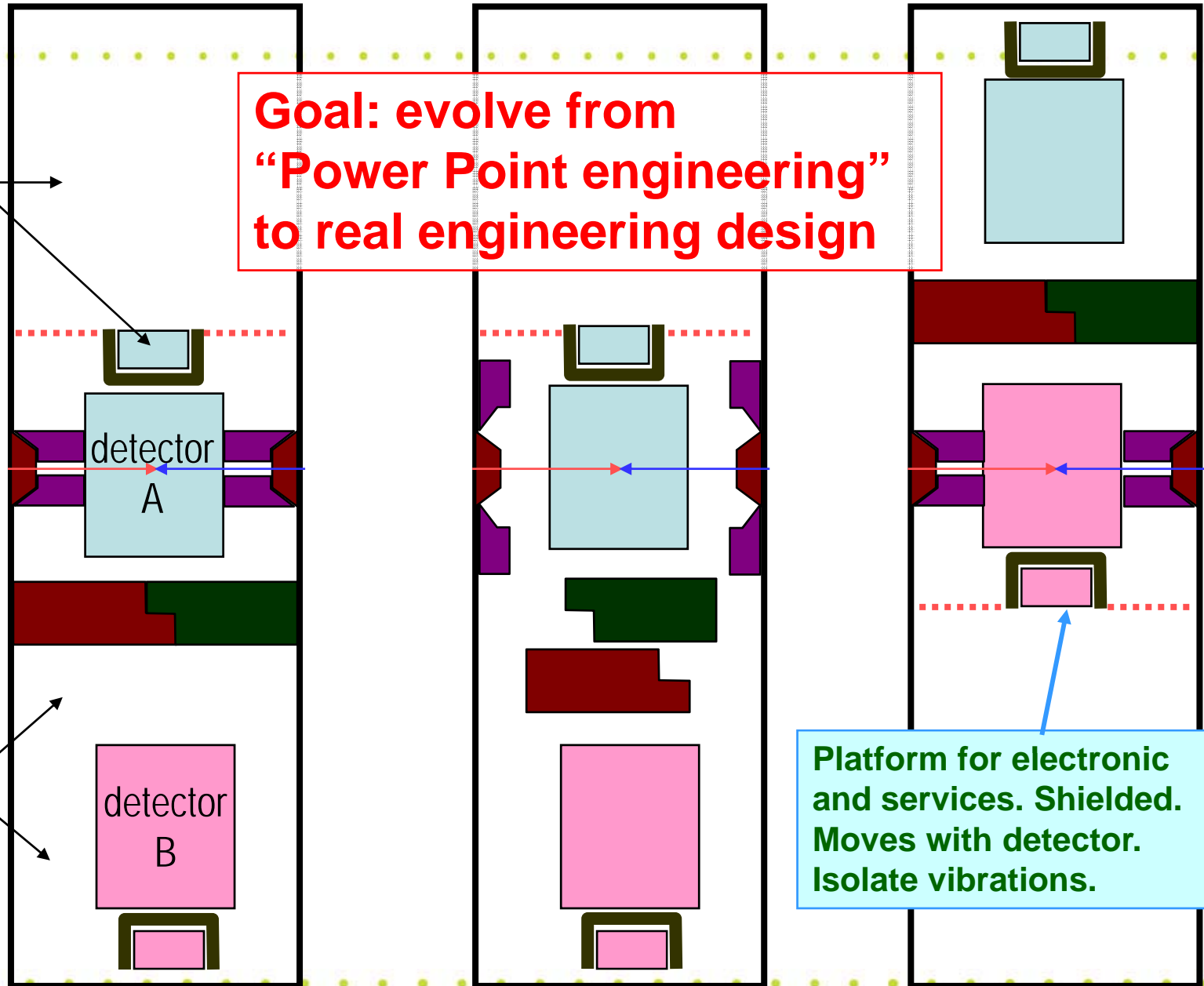
Concept of single IR with two detectors

**Goal: evolve from
“Power Point engineering”
to real engineering design**

may be
accessible
during run

Slide as of
~Oct 2006

accessible
during run

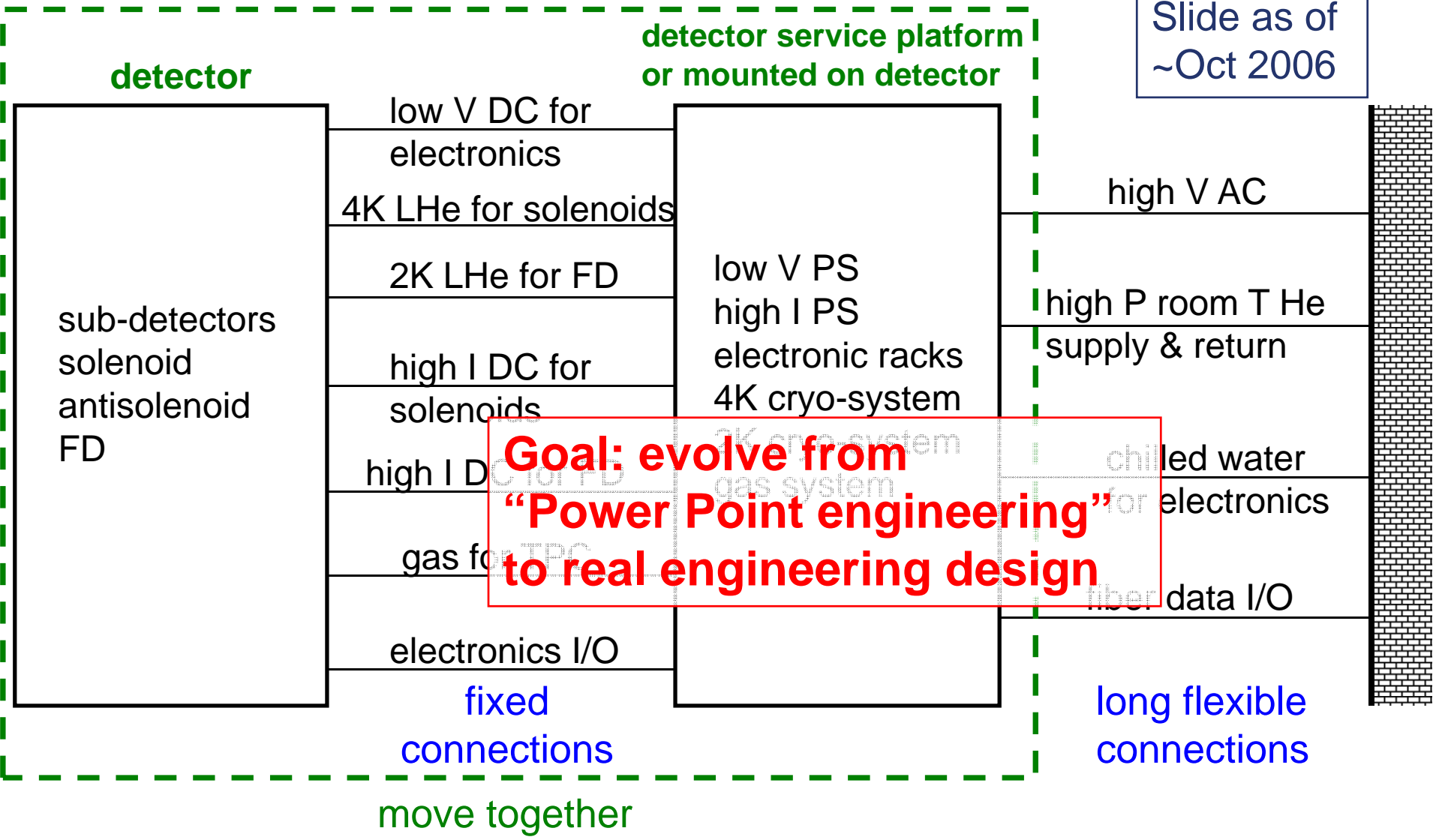


Platform for electronic
and services. Shielded.
Moves with detector.
Isolate vibrations.



Concept of detector systems connections

Slide as of
~Oct 2006



**Goal: evolve from
"Power Point engineering"
to real engineering design**



IRENG07 Workshop

ILC INTERACTION REGION ENGINEERING DESIGN WORKSHOP		SLAC
Home		RECENT NEWS - Agenda has been updated.
Goals		REGISTRATION Registration is necessary to participate in the workshop. Registration fee is \$30 and reception fee is \$20. → Register
Registration		ACCOMMODATIONS A block of 40 rooms is reserved until July 15, 2007 at the Stanford Guest House . Please reserve your room early and mention that you are attending this workshop. → More Information
Payment Information		
Agenda		
Organizing Committees		
The Charge to the IPAC		
Accommodations		
Travel and Directions		
Visa Information		
Social Events		
Contact		
	<h2>ILC Interaction Region Engineering Design Workshop</h2> <p>September 17-21, 2007 Stanford Linear Accelerator Center Menlo Park, California</p> <p>Please join us to review and advance the design of the subsystem of the Interaction Region of ILC, focusing in particular on their integration, engineering design and arrangements for push-pull operation.</p> <p>http://www-conf.slac.stanford.edu/ireng07/</p>	

Graphics logo based on generic IR design made by John Amann, SLAC



Work in preparation for IRENG07

- **WG-A: Overall detector design, assembly, detector moving, shielding.**
 - Including detector design for on-surface assembly and underground assembly procedures. Beamline pacman & detector shielding...
 - Conveners: Alain Herve (CERN), Tom Markiewicz (SLAC), Tomoyuki Sanuki (Tohoku Univ.), Yasuhiro Sugimoto (KEK)
 - **WG-B: IR magnets design and cryogenics system design.**
 - Including cryo system, IR magnet engineering design, support, integration with IR, masks, Lumi & Beamcals, IR vacuum chamber...
 - Conveners: Brett Parker (BNL), John Weisend (SLAC/NSF), Kiyosumi Tsuchiya (KEK)
 - **WG-C: Conventional construction of IR hall and external systems.**
 - Including lifting equipment, electronics hut, cabling plant, services, shafts, caverns, movable shielding; solutions to meet alignment tolerances...
 - Conveners: Vic Kuchler (FNAL), Atsushi Enomoto (KEK), John Osborne (CERN)
 - **WG-D: Accelerator and particle physics requirements.**
 - Including collimation, shielding, RF, background, vibration and stability and other accelerator & detector physics requirements...
 - Conveners: Deepa Angal-Kalinin (STFC), Nikolai Mokhov (FNAL), Mike Sullivan (SLAC), Hitoshi Yamamoto (Tohoku Univ.)
- WG-A, conveners meeting, July 5
 - WG-D, conveners meeting, July 11
 - WG-A, group meeting, July 12
 - WG-B, conveners meeting, July 13
 - WG-C, group meeting, July 17
 - WG-B, group meeting, July 23
 - WG-C, group meeting, July 24
 - WG-A, group meeting, July 30
 - WG-C, group meeting, July 31
 - WG-D, group meeting, August 1
 - WG-B, group meeting, August 2
 - WG-A, group meeting, August 6
 - WG-C, group meeting, August 7
 - WG-A, group meeting, August 13
 - WG-D, group meeting, August 15
 - WG-B, group meeting, August 16
 - WG-A, group meeting, August 20
 - WG-C, group meeting, August 21
 - WG-A, group meeting, August 27
 - WG-C, group meeting, August 28
 - Conveners and IPAC mtg, August 29
 - WG-B, group meeting, August 30
 - WG-B, group meeting, September 13



ILC Interaction Region Engineering Design Workshop

September 17-21, 2007
Stanford Linear Accelerator Center

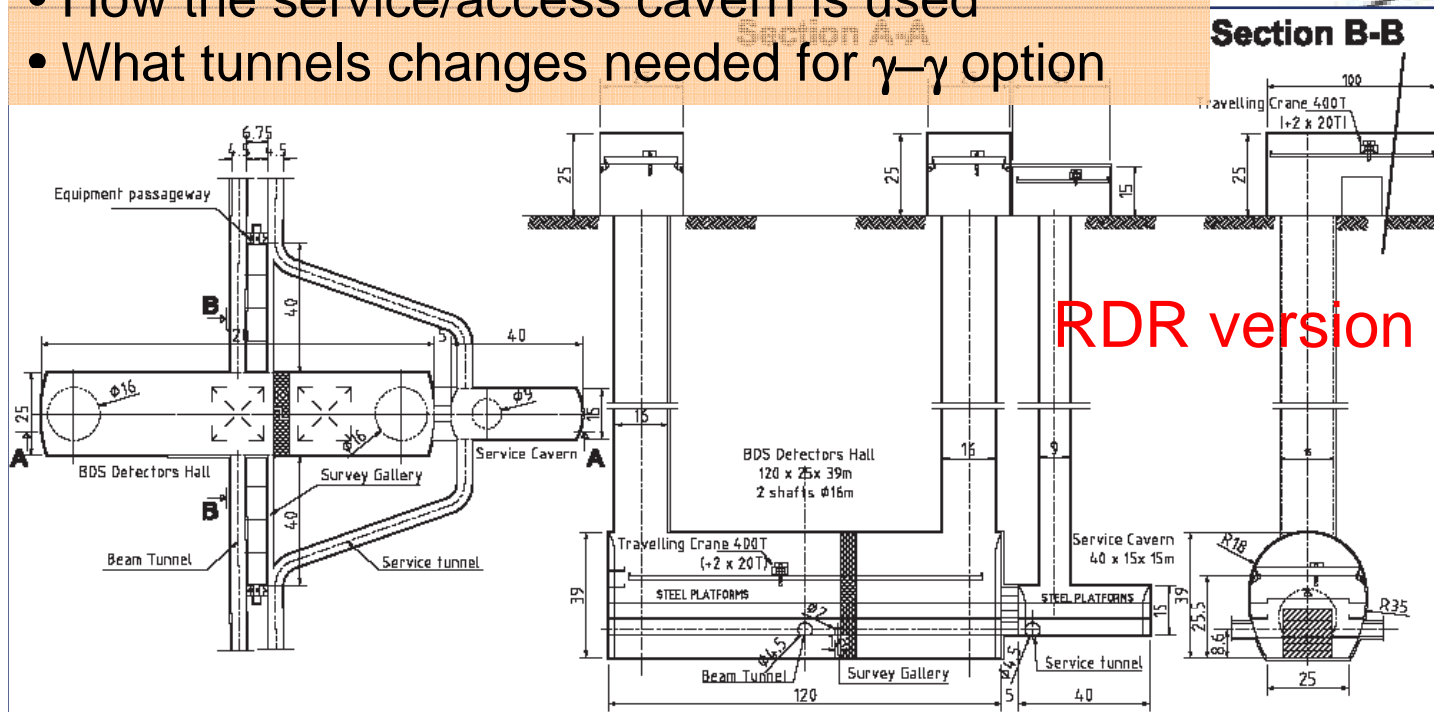
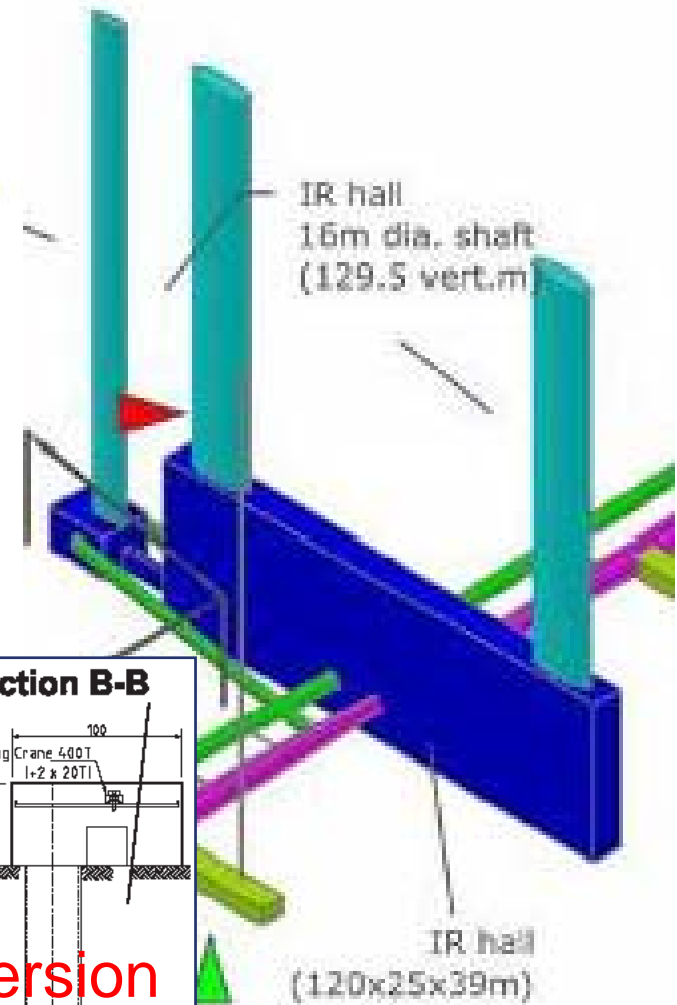
Oct 24, 2007

Global Design Effort

BDS: 7

IRENG07 questions:

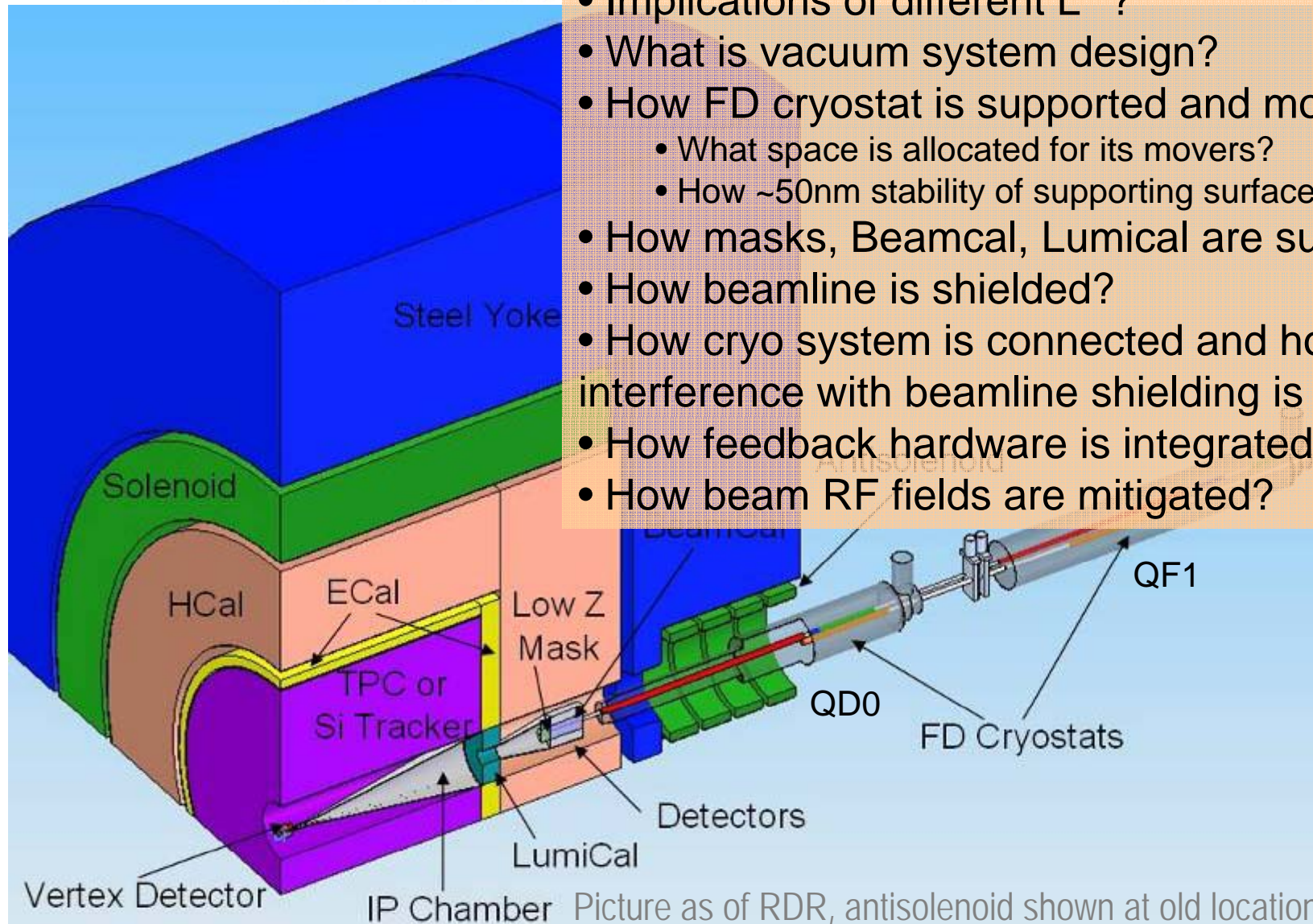
- Modifications of layout to meet safety rules
- Optimization of sizes, layout, number of shafts
- Optimization of capacity of cranes
- Power, water and other needs of detectors
- Detector services, locations, connections
- Alignment system arrangements
- How the service/access cavern is used
- What tunnels changes needed for γ - γ option





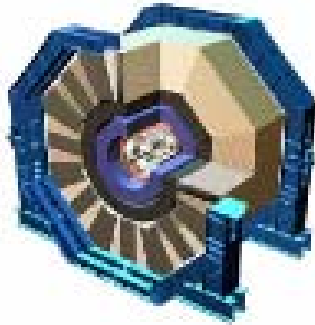
IR configuration ?s, at IRENG07:

- Implications of different L^* ?
- What is vacuum system design?
- How FD cryostat is supported and moved?
 - What space is allocated for its movers?
 - How $\sim 50\text{nm}$ stability of supporting surface is provided?
- How masks, Beamcal, Lumical are supported
- How beamline is shielded?
- How cryo system is connected and how interference with beamline shielding is avoided?
- How feedback hardware is integrated?
- How beam RF fields are mitigated?

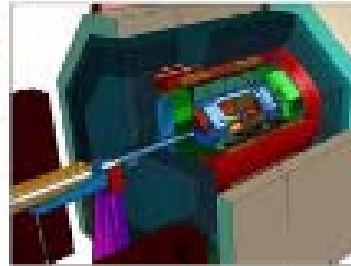




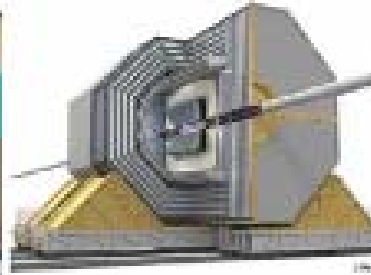
Detector design ?s at IRENG07:



SiD



LDC



GLD

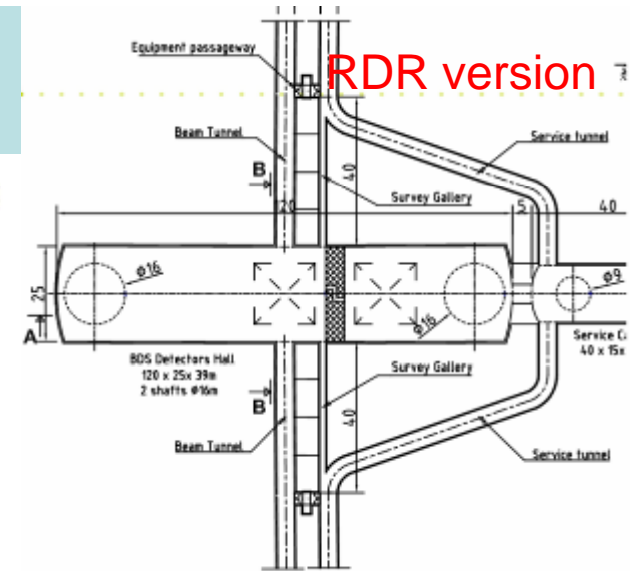
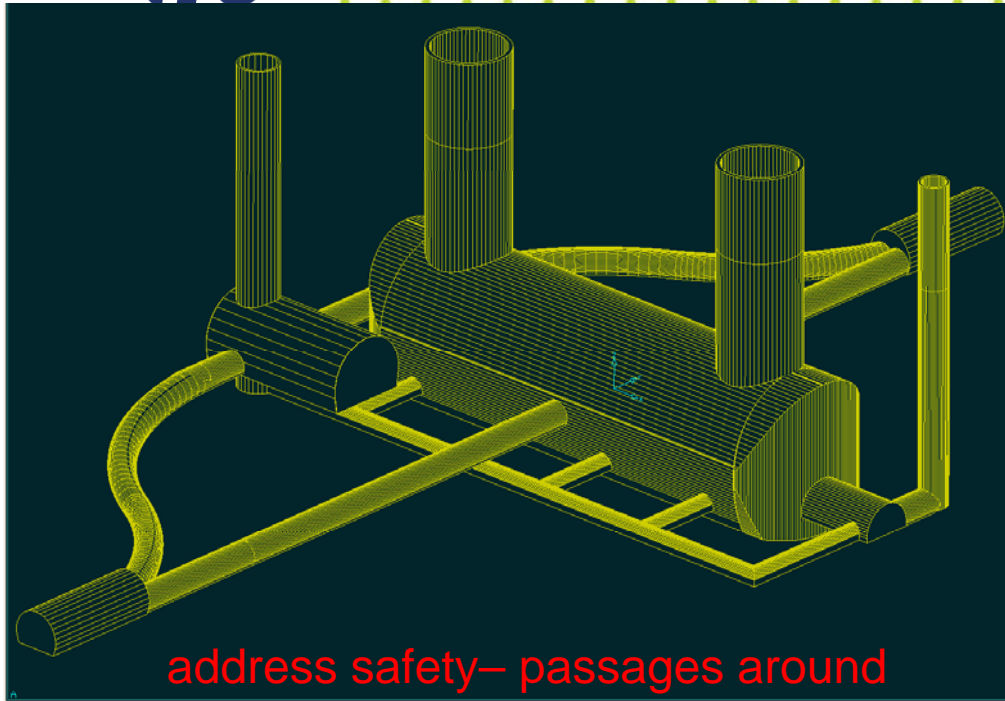


4th

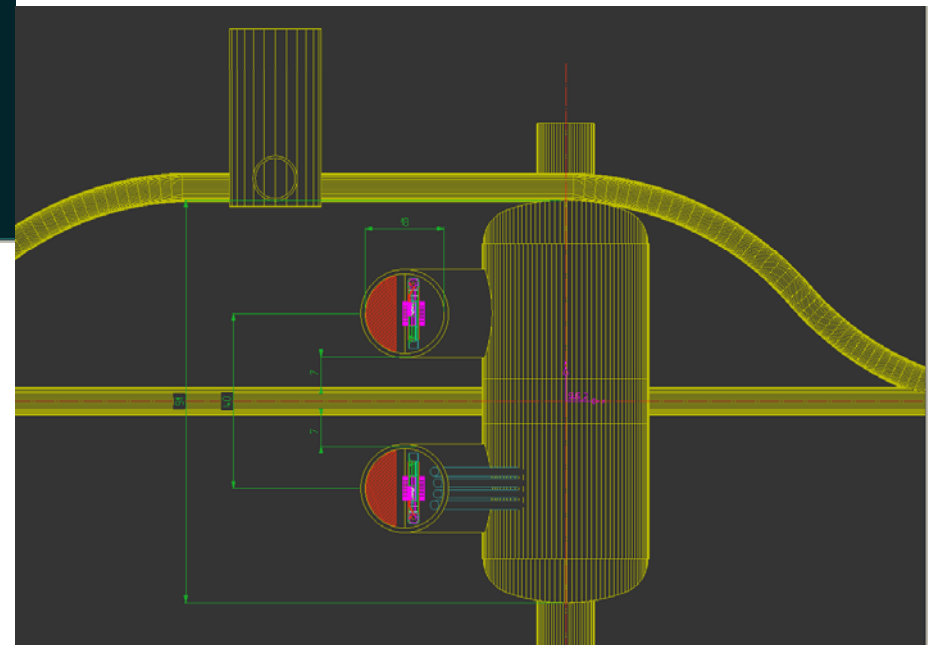
- General parameters (size, weight, field in & out, acceptable L^* , segmentation)
- How on surface & final underground assembly is done
 - What are space, cranes requirements, how pieces are moved
- What positioning accuracy needed after push-pull
 - What are detector alignment adjustment systems
- What are opening procedures on-beamline & in garage position
 - What are space requirements in either case and size of the platform
- What are gaps and how radiation shielding is provided
- How fire safety is provided, including these mandatory requirements
 - No flammable gases; only halogen-free cables; smoke sensors in sub-detectors



Explore optimization of IR arrangements during IRENG07 workshop

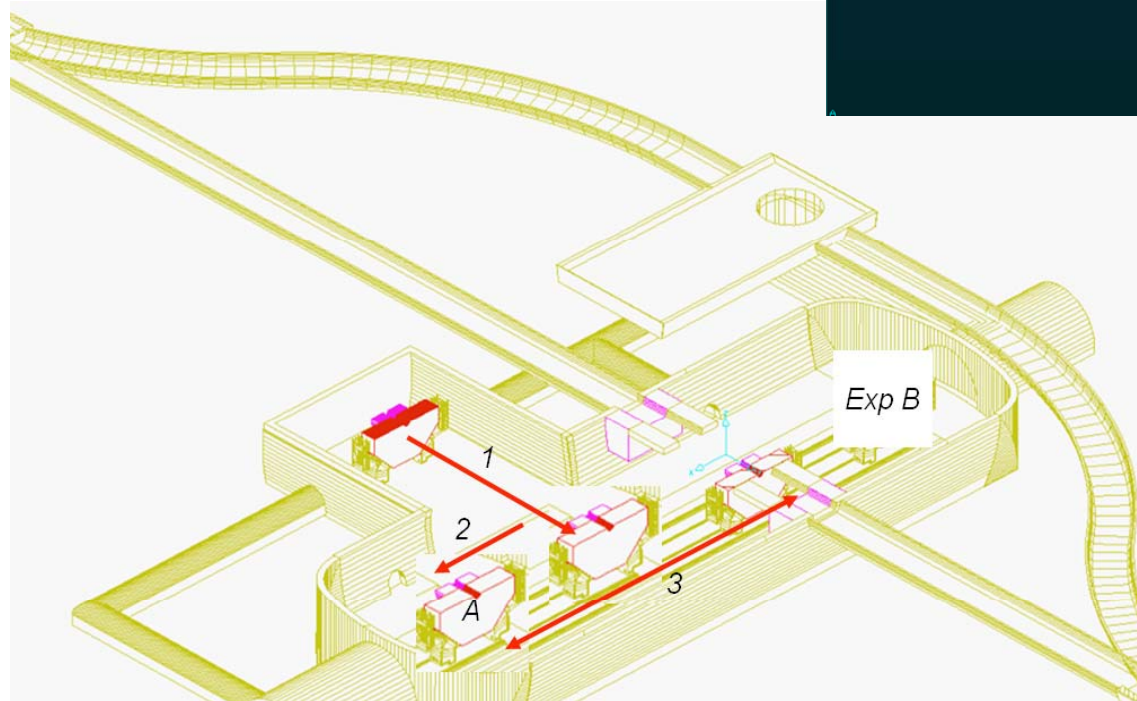
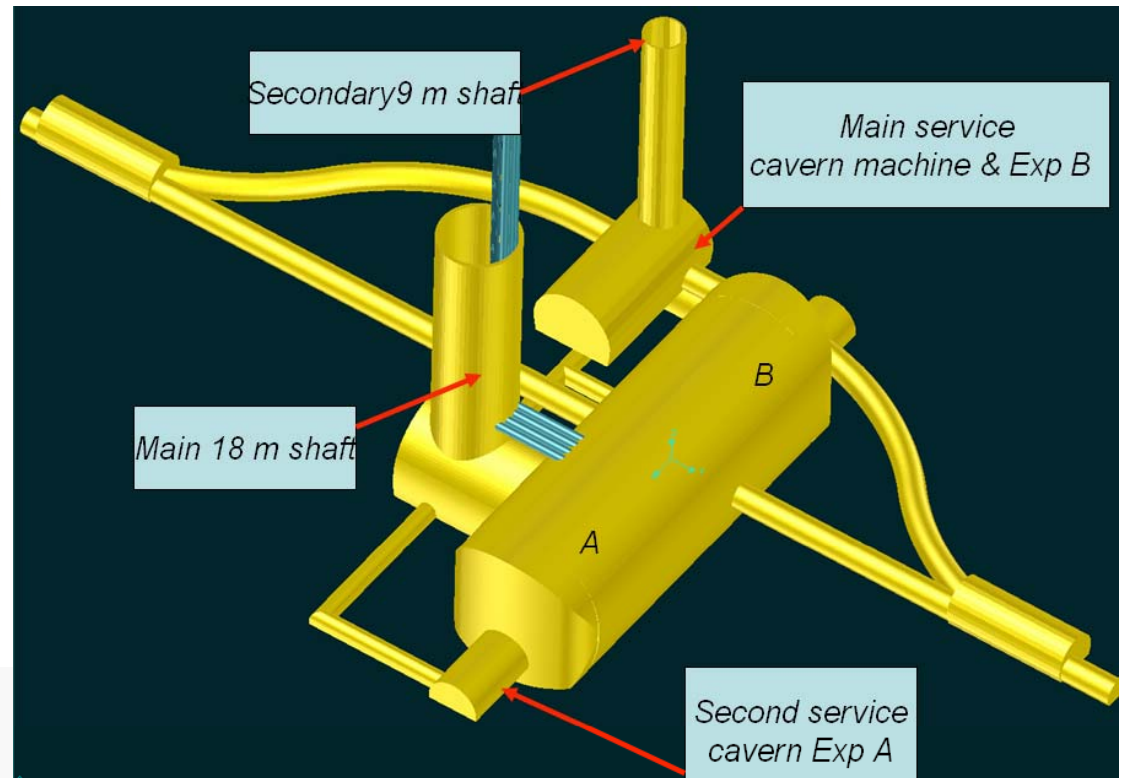


Optimization was possible due to work of IRENG07 participants, conveners, CFS group and in particular CERN's Alain Herve, John Osborne and their colleagues





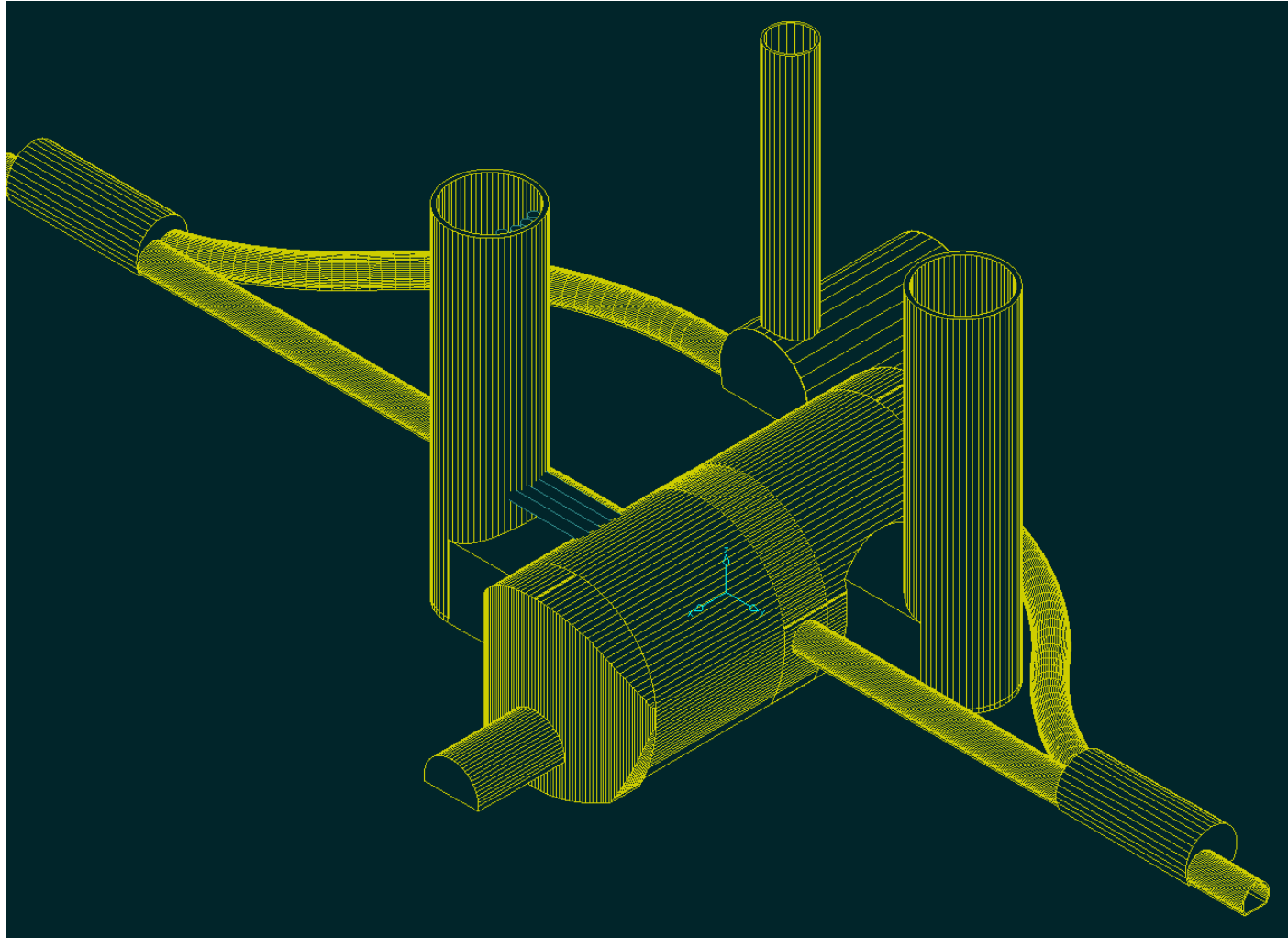
Single detector access shaft



Was considered as value engineering exercise. Was found in principle possible. However it would create disadvantages for one of experiments and severe interference between them.



To be considered as an alternative for IR layout during EDR:



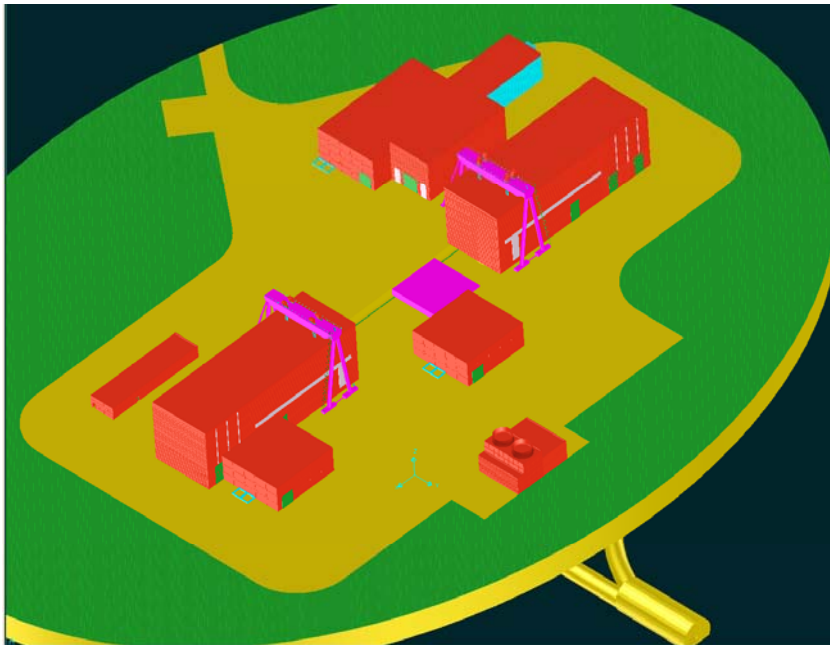
Two shafts offset from the main cavern on the diagonal, to address interferences (in safety and schedule) between loading/unloading areas and working areas



Optimization of surface buildings

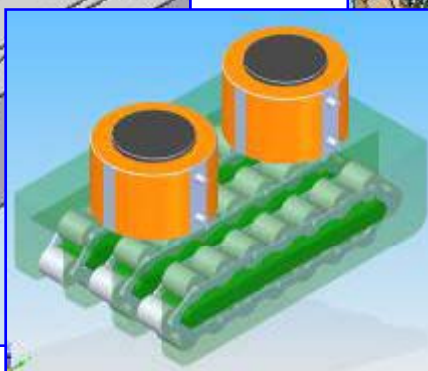
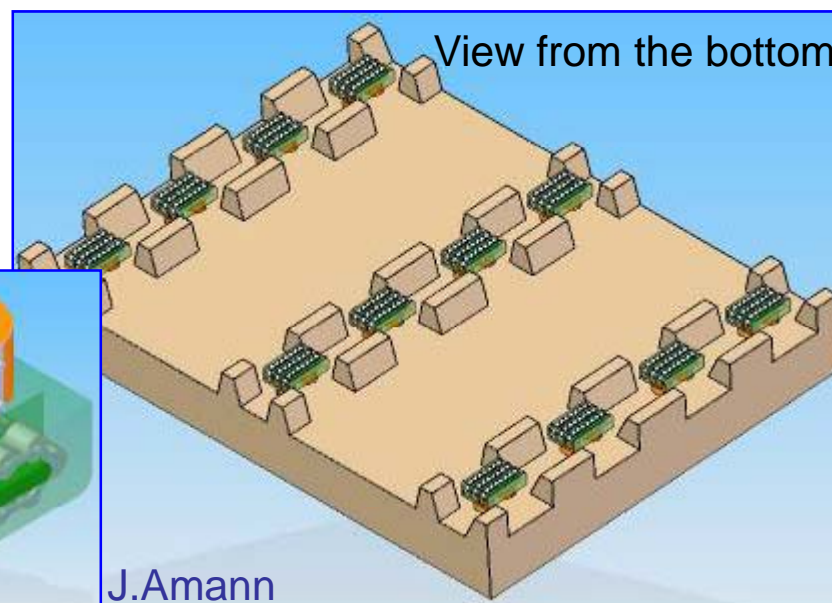
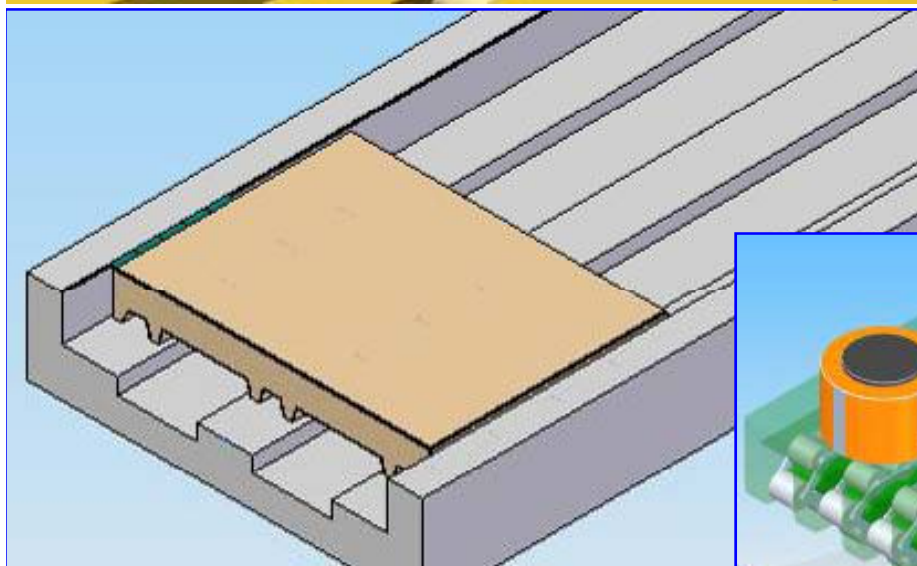
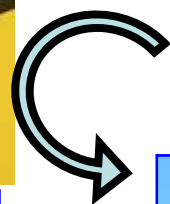
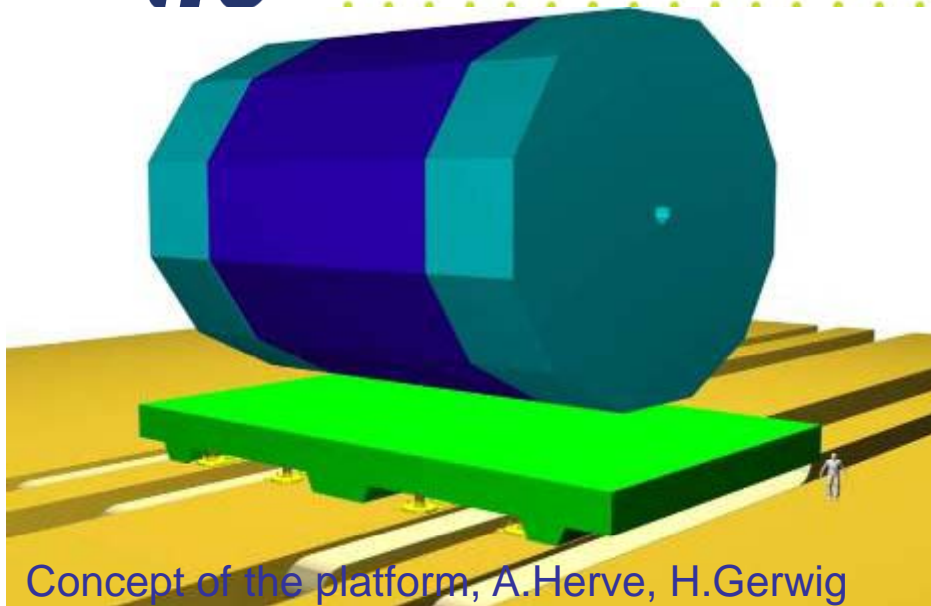


Considering common or independent building for surface assembly of two detectors. Shared or independent rented gantry cranes, shared shaft cover, etc.



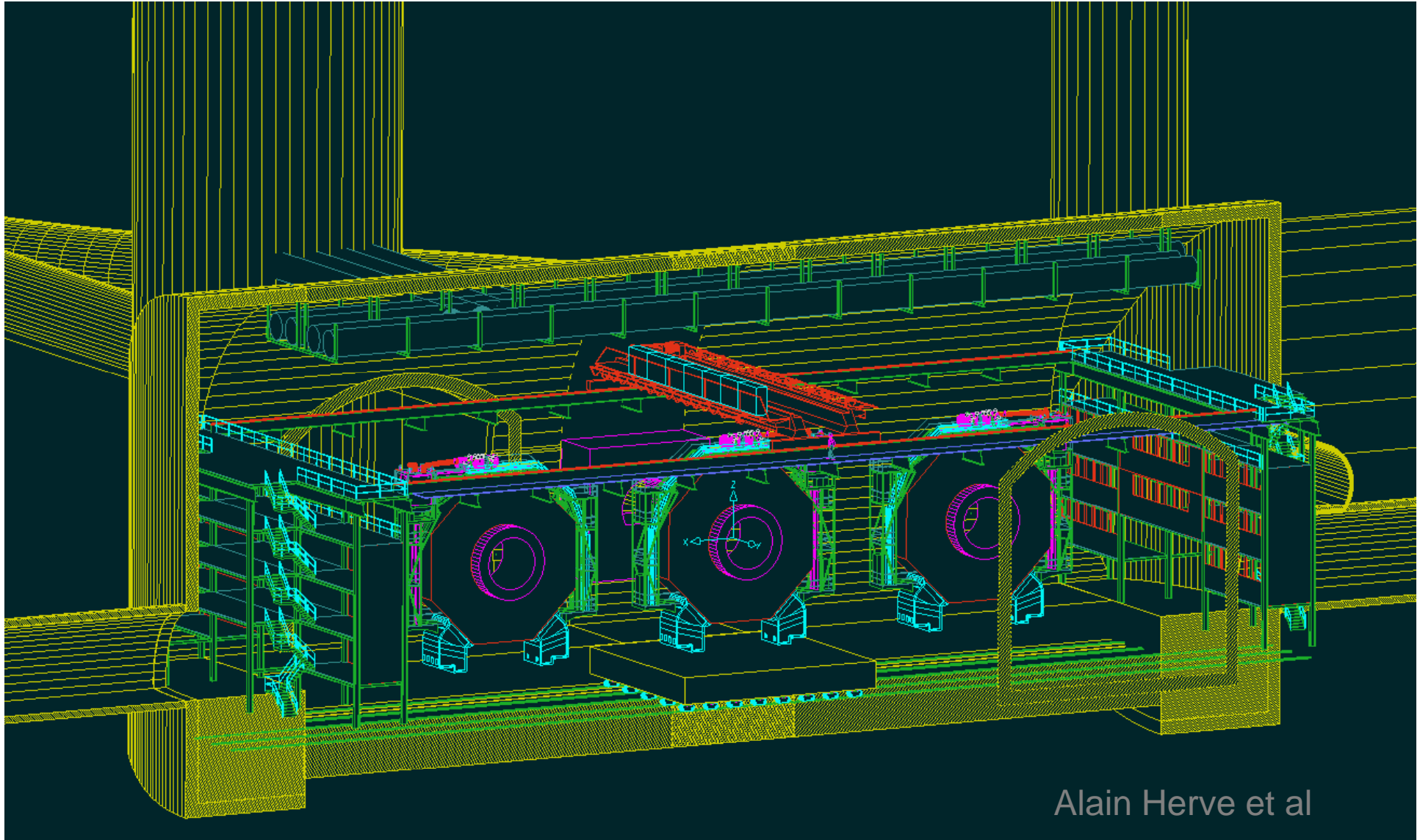


Moving the detector





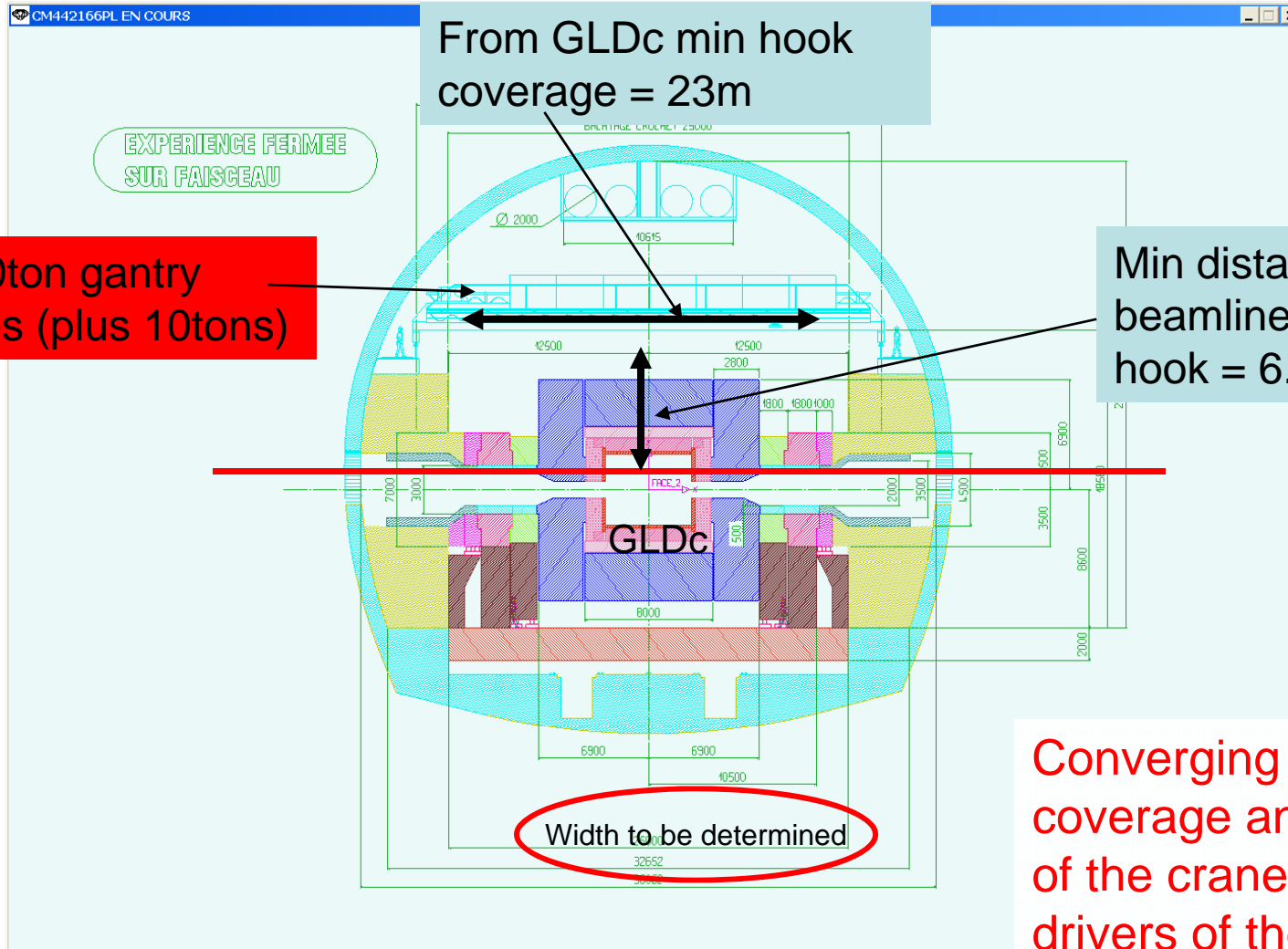
Details of the Push-Pull configuration and of the platform



Alain Herve et al



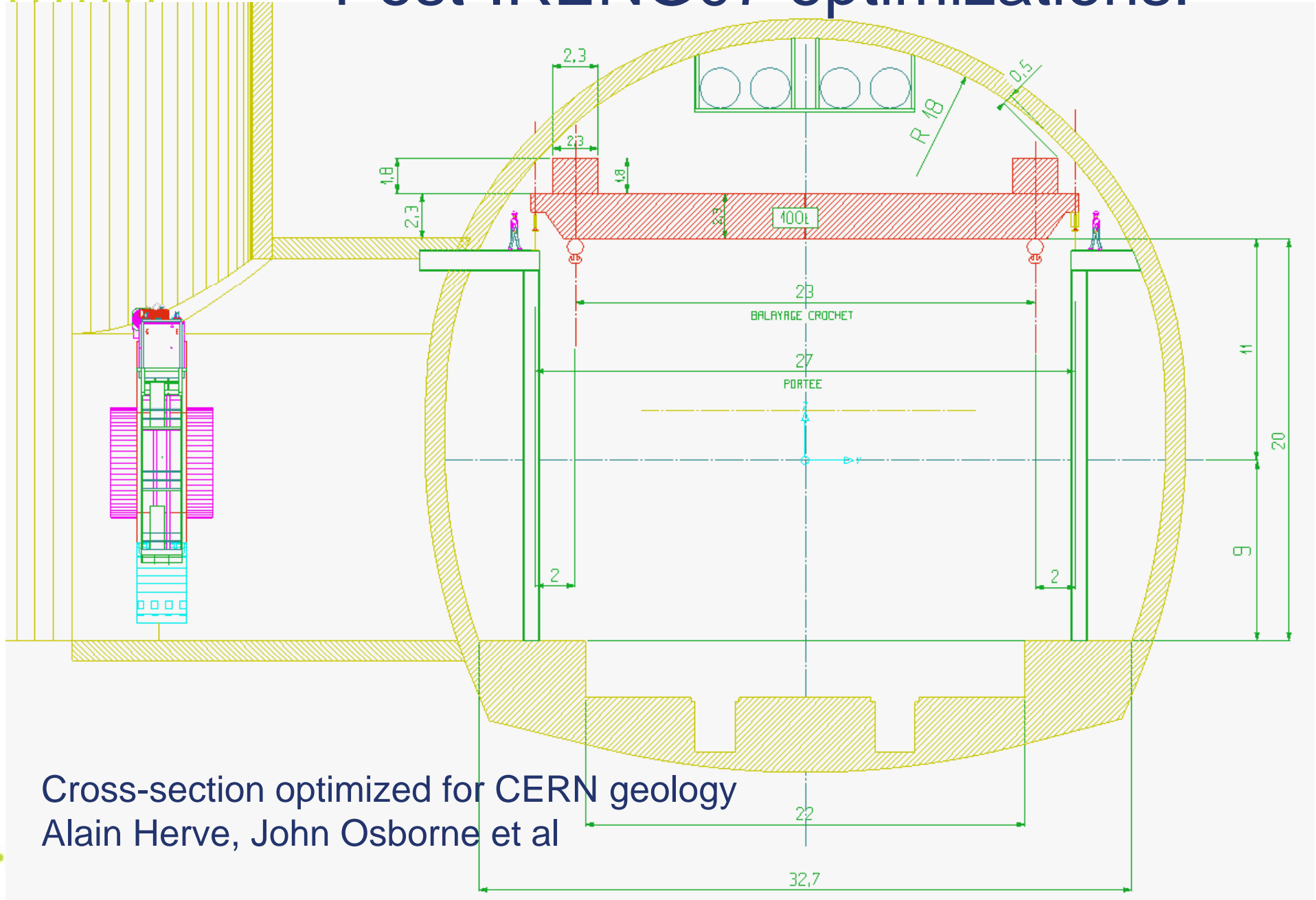
IREN07 : Experimental Cavern Criteria



Converging on required coverage and capacity of the crane: one of the drivers of the hall size



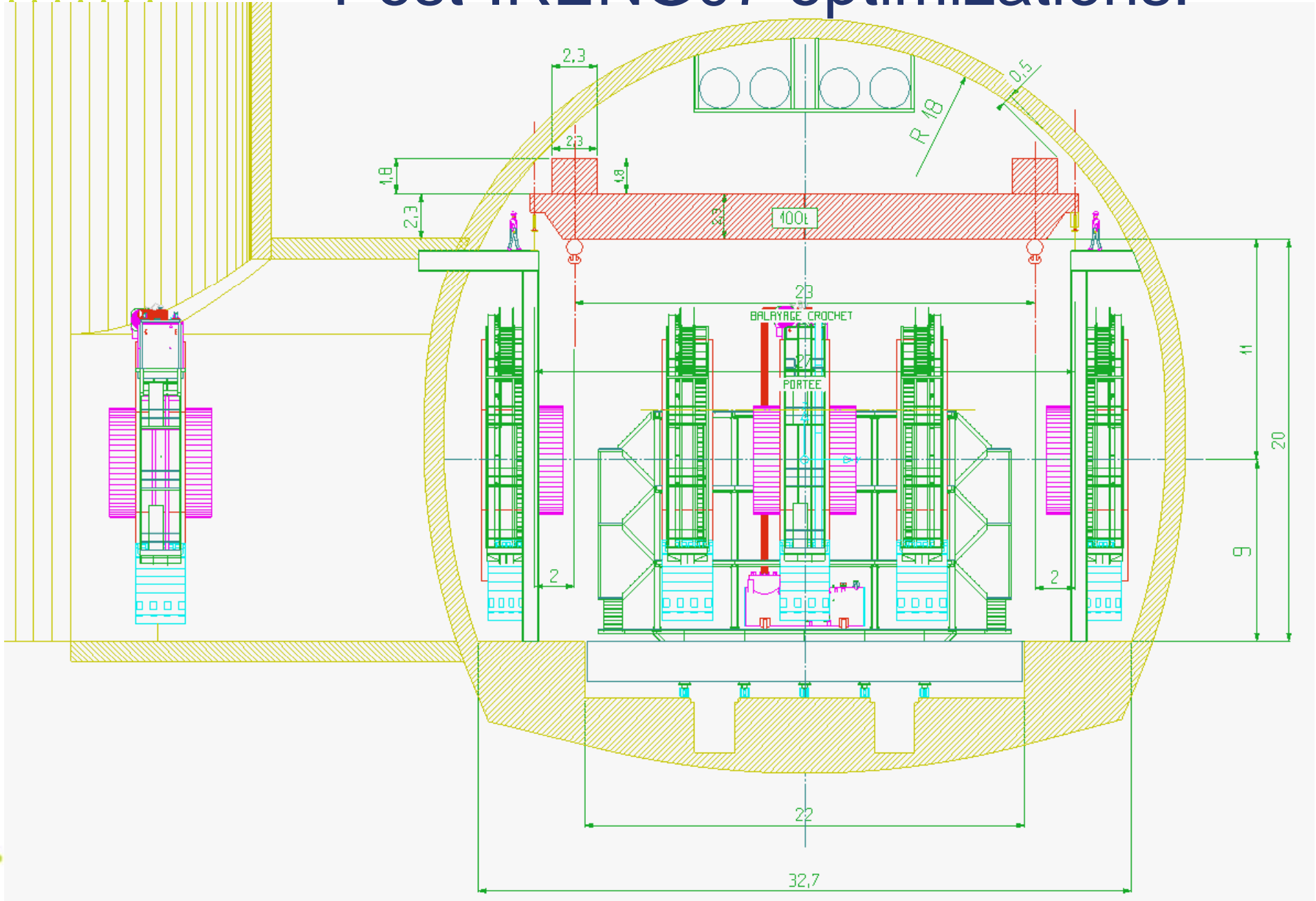
Post-IRENG07 optimizations:



Cross-section optimized for CERN geology
Alain Herve, John Osborne et al

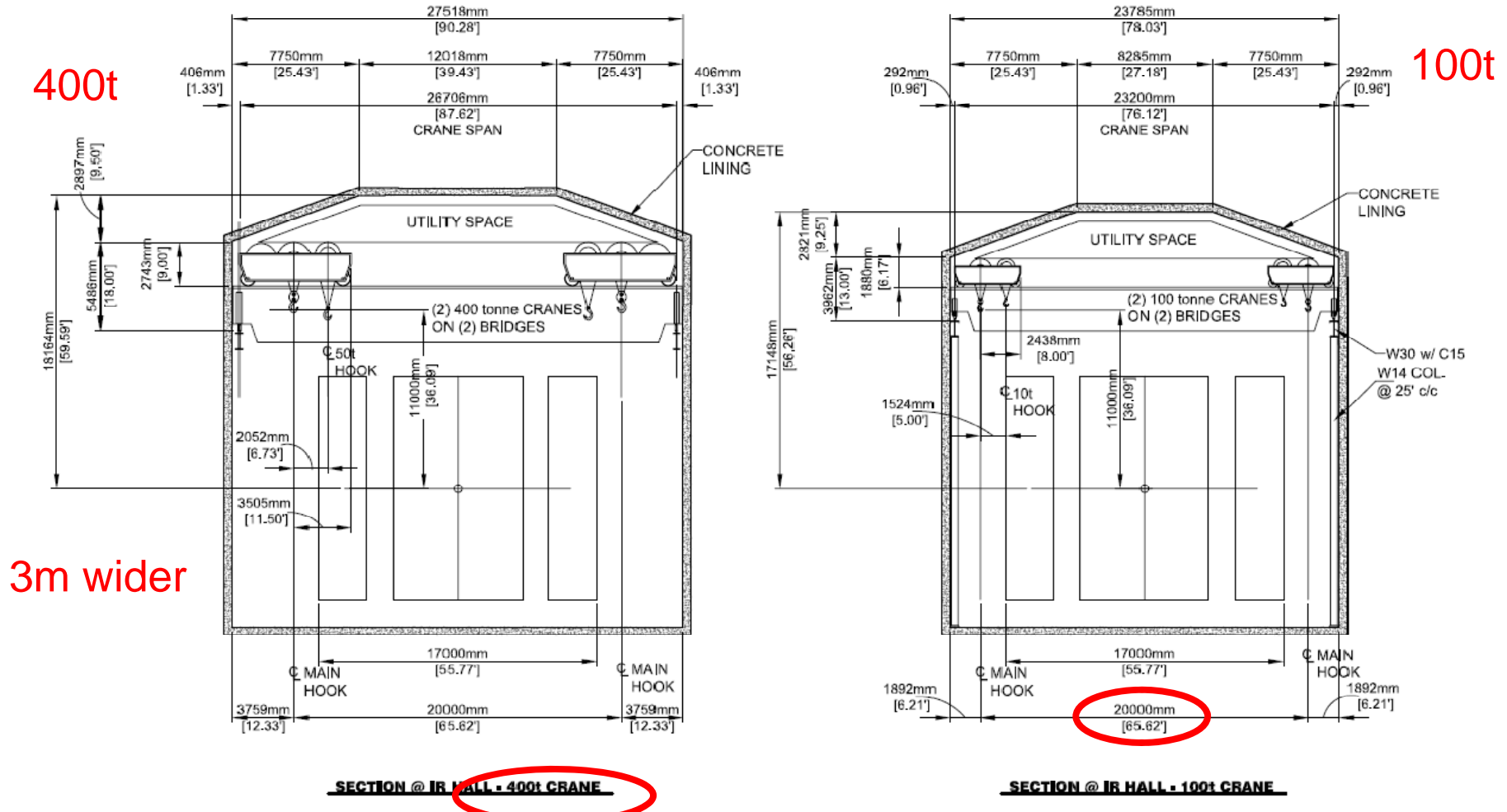


Post-IRENG07 optimizations:





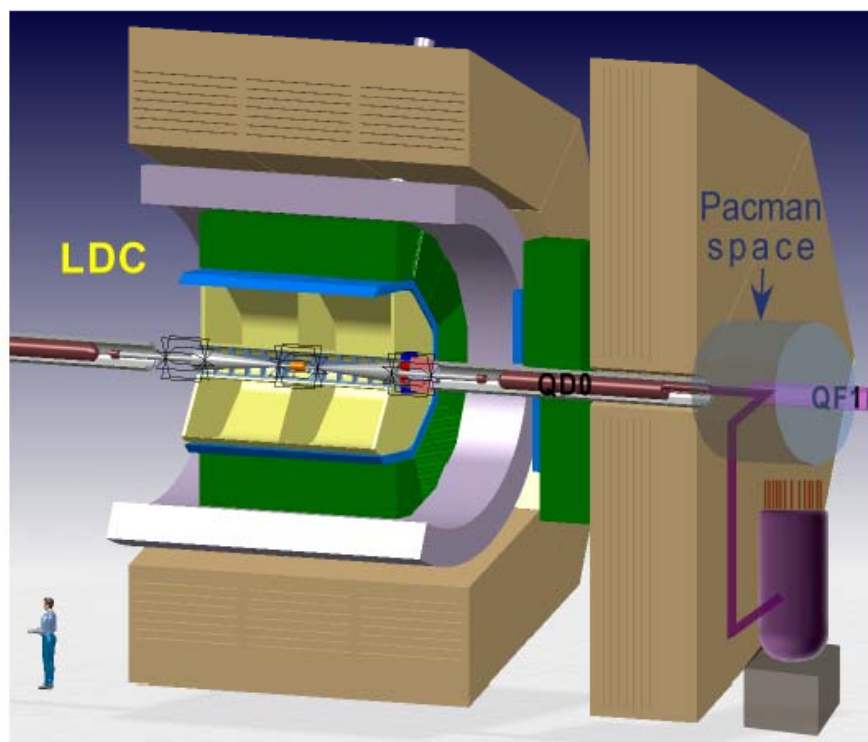
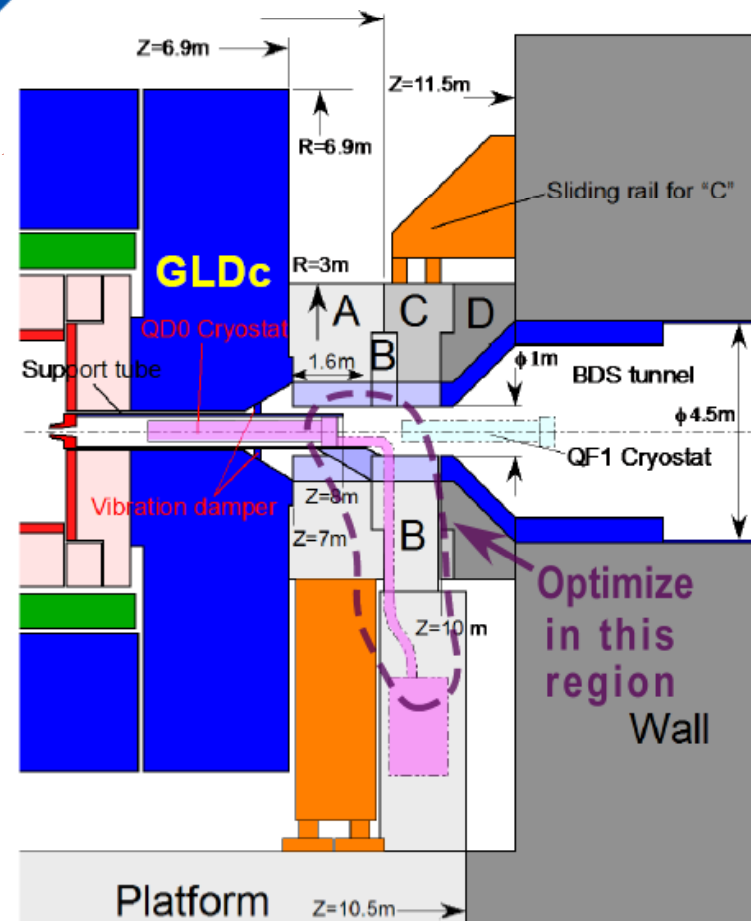
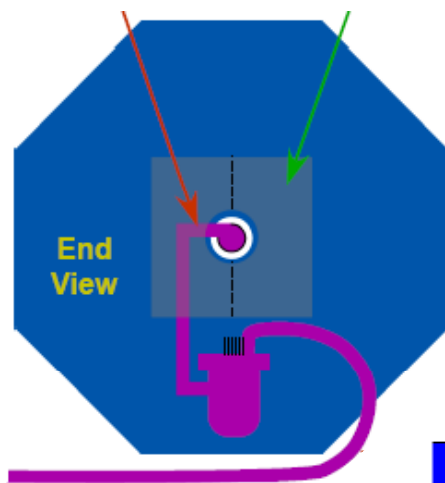
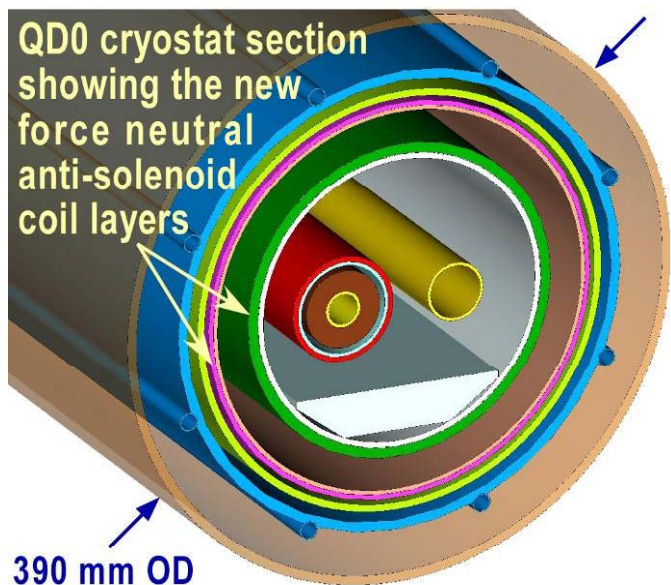
Post-IRENG07 optimizations:



Cross-section optimized for FNAL geology, Tom Lackowski et al

The RDR 400t crane configuration is planned to be replaced by ~100t version

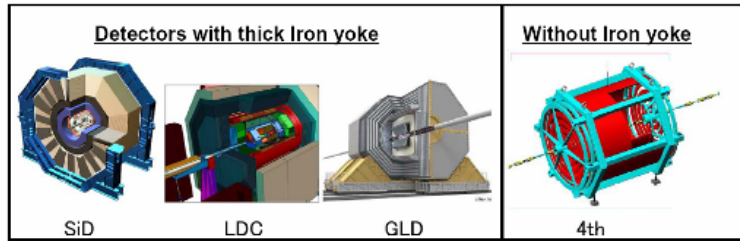
Cryo, shielding & QD0 design



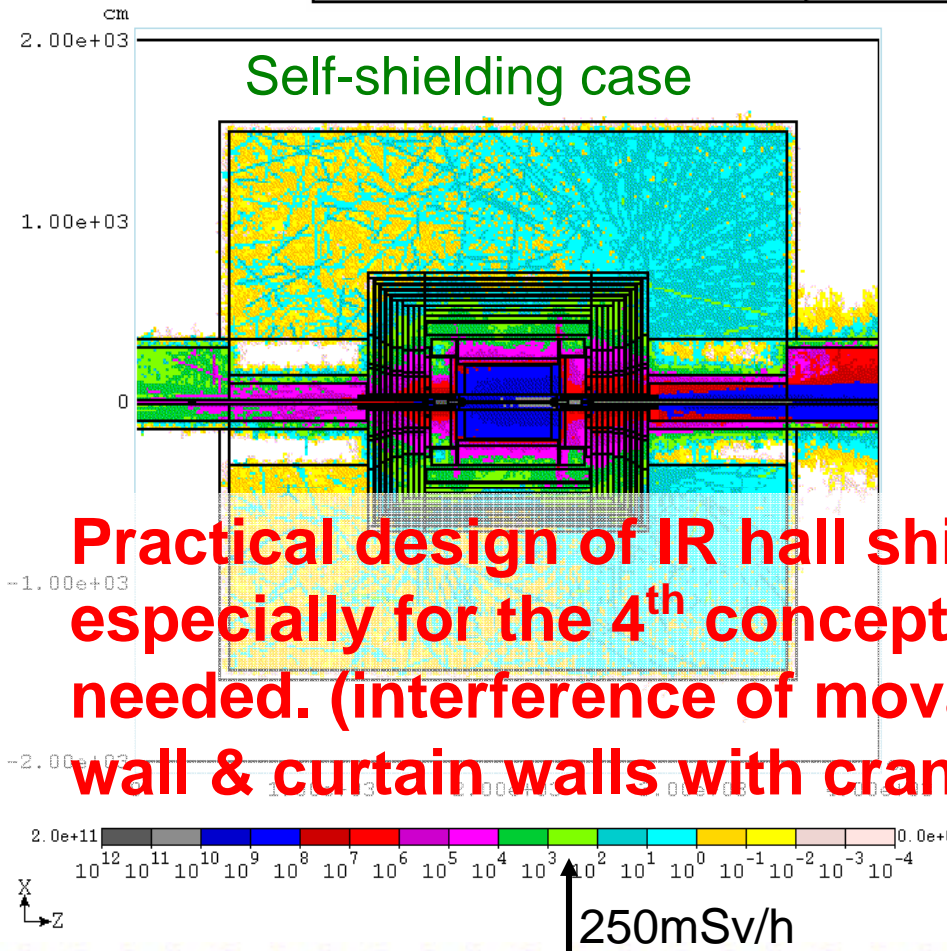
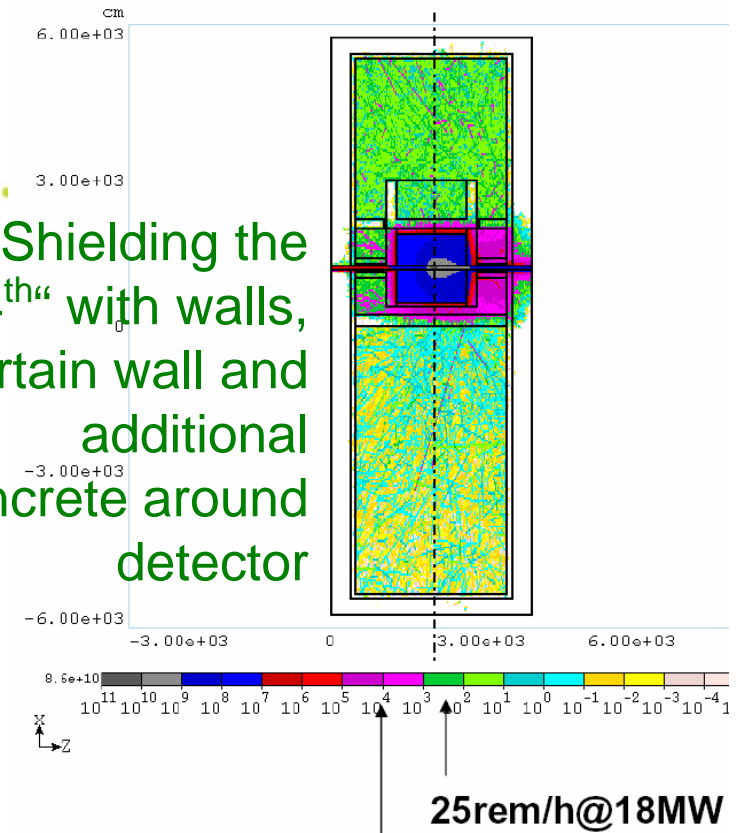
→ practical design of integr. cryo system is needed



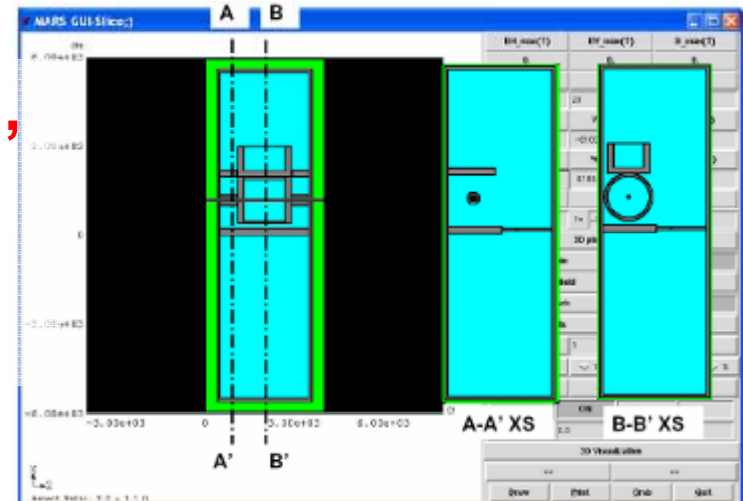
Shielding the IR hall



Shielding the "4th" with walls, curtain wall and additional concrete around detector

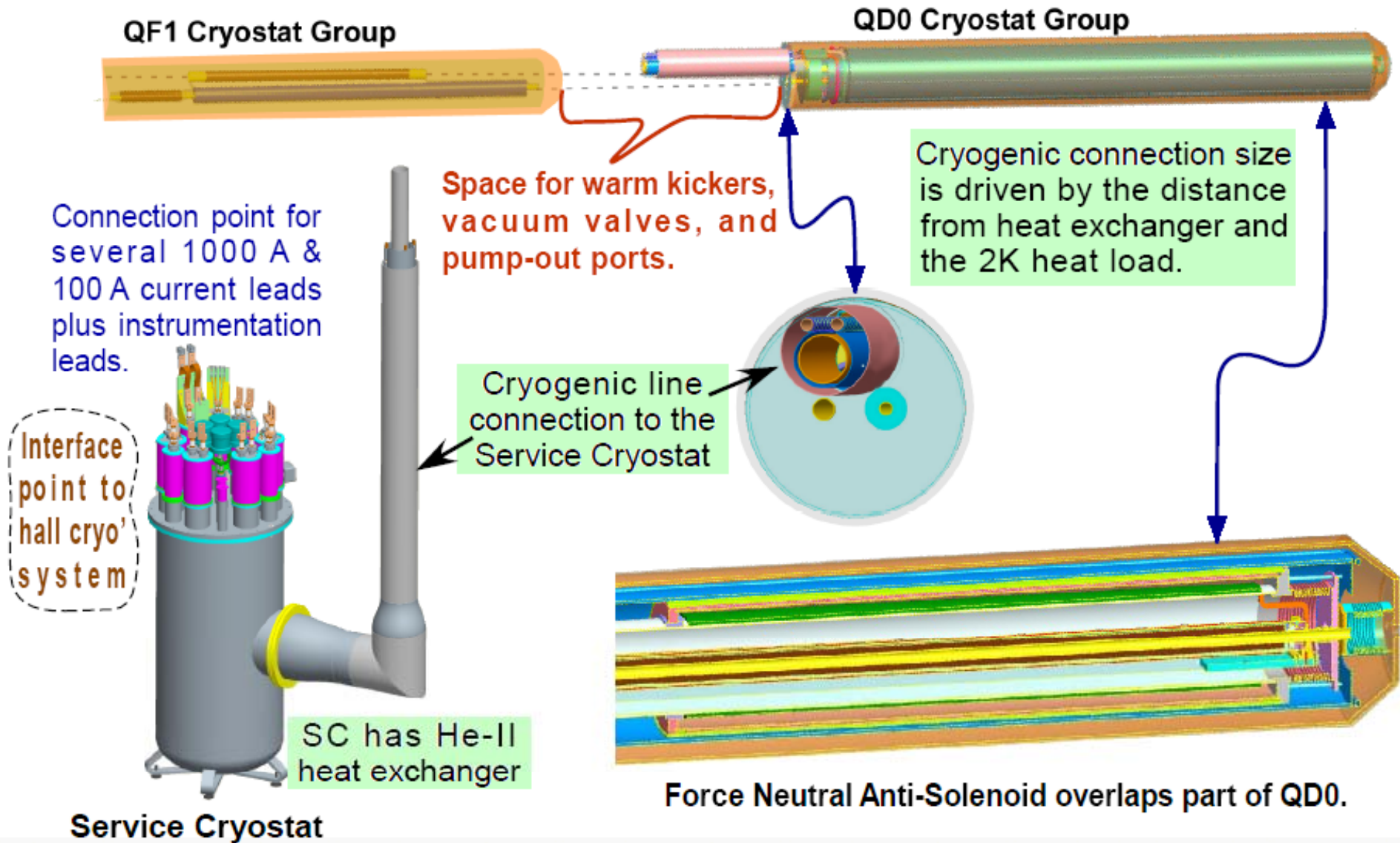


Practical design of IR hall shielding, especially for the 4th concept is needed. (interference of movable wall & curtain walls with cranes)





IR magnets and cryo connections



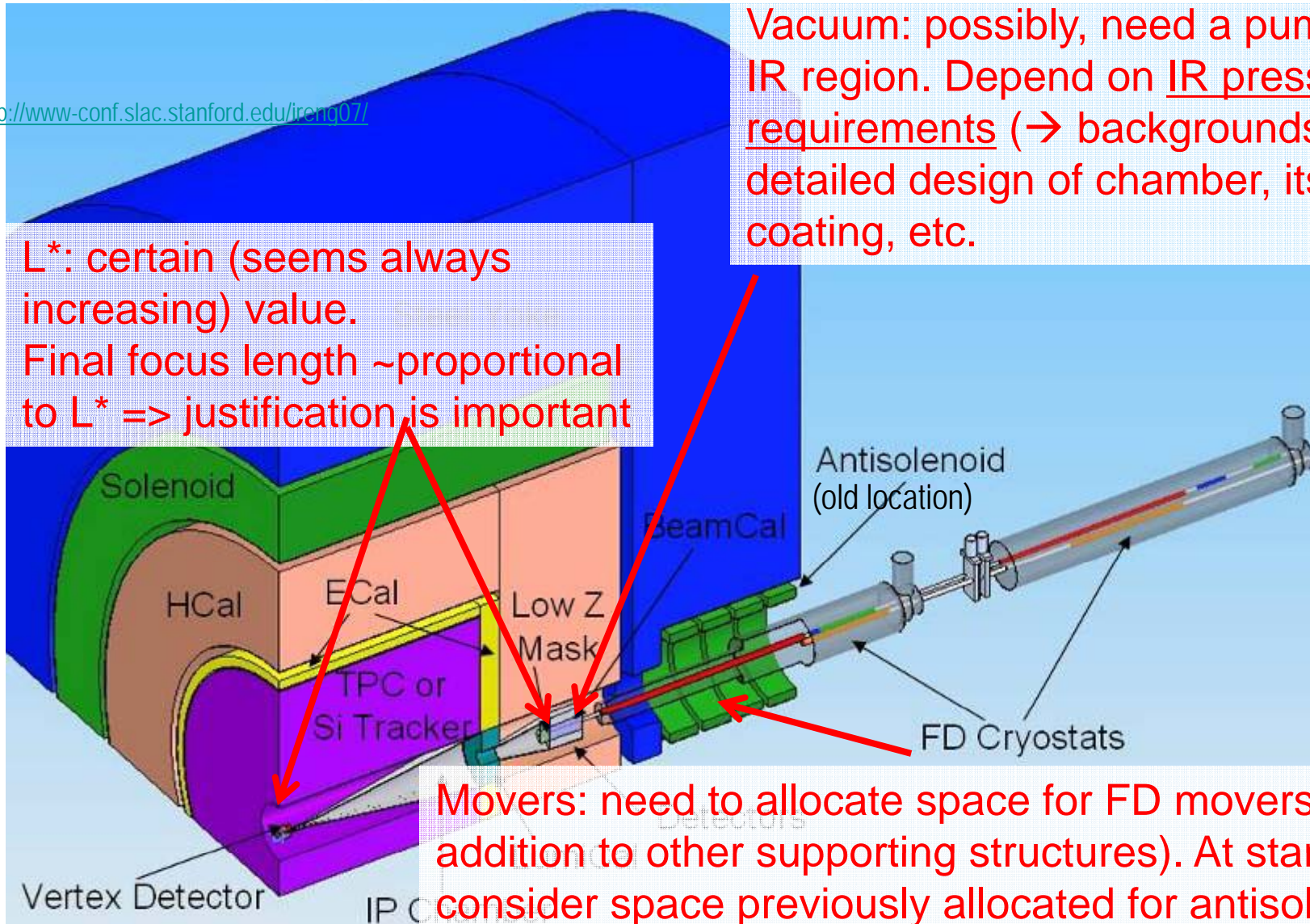


Vacuum, FD movers, L^* ...

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

L^* : certain (seems always increasing) value.
Final focus length ~proportional to L^* => justification is important

Vacuum: possibly, need a pump in IR region. Depend on IR pressure requirements (\rightarrow backgrounds) and detailed design of chamber, its coating, etc.



Movers: need to allocate space for FD movers (in addition to other supporting structures). At start, could consider space previously allocated for antisolenoid



Conclusions

- Interaction Region integration requires many design challenges to be solved
- IRENG07 workshop brought together many engineers with practical relevant experience
- Promising directions and ideas were outlined and are being checked in details now
- Clear connection between machine and detector is essential in EDR
- The synchronous pace of engineering of the detector and machine is very important