

# IRENG07 and LDC

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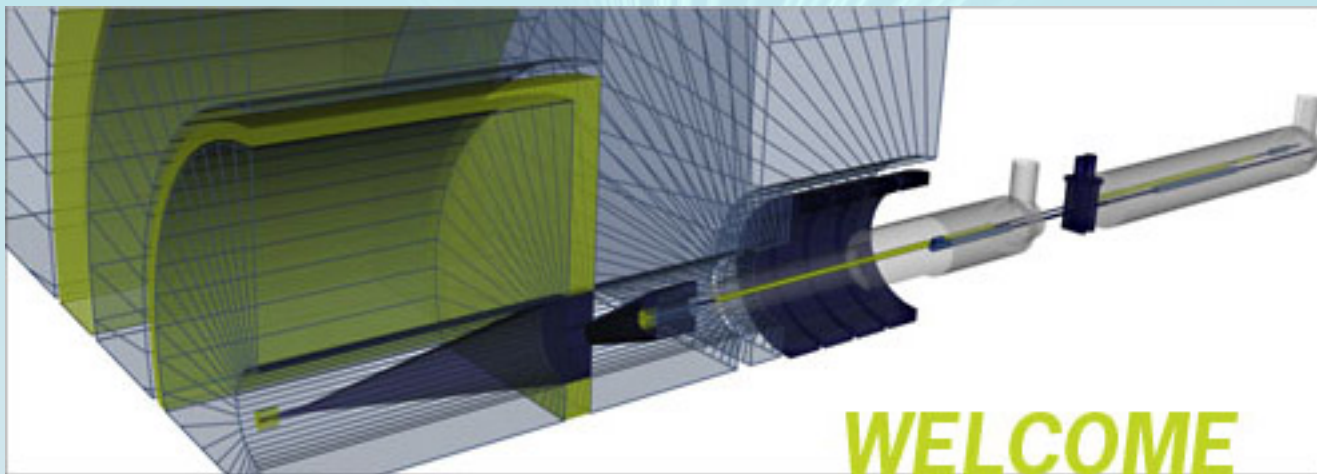
LDC General Phone Meeting  
29. August 2007

## ILC Interaction Region Engineering Design Workshop

September 17-21, 2007

Stanford Linear Accelerator Center

Menlo Park, California



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

# IRENG07 Goals

- 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. The tentative list of topics/sessions includes:
  - Accelerator physics & optics design and constraints on IR engineering
  - IR engineering design experiences from existing machines
  - Detector design for on-surface and underground assembly
  - Cryogenic system design
  - Alignment and vibration tolerances
  - IR hall design, cranes, shafts, service caverns, electronics huts, cables, etc.
  - Beamline and detector shielding
  - IR magnets design
  - IR integration: magnets, masks, LumiCal, BeamCal, vacuum, etc.
  - Masking and collimation
  - Push-pull system

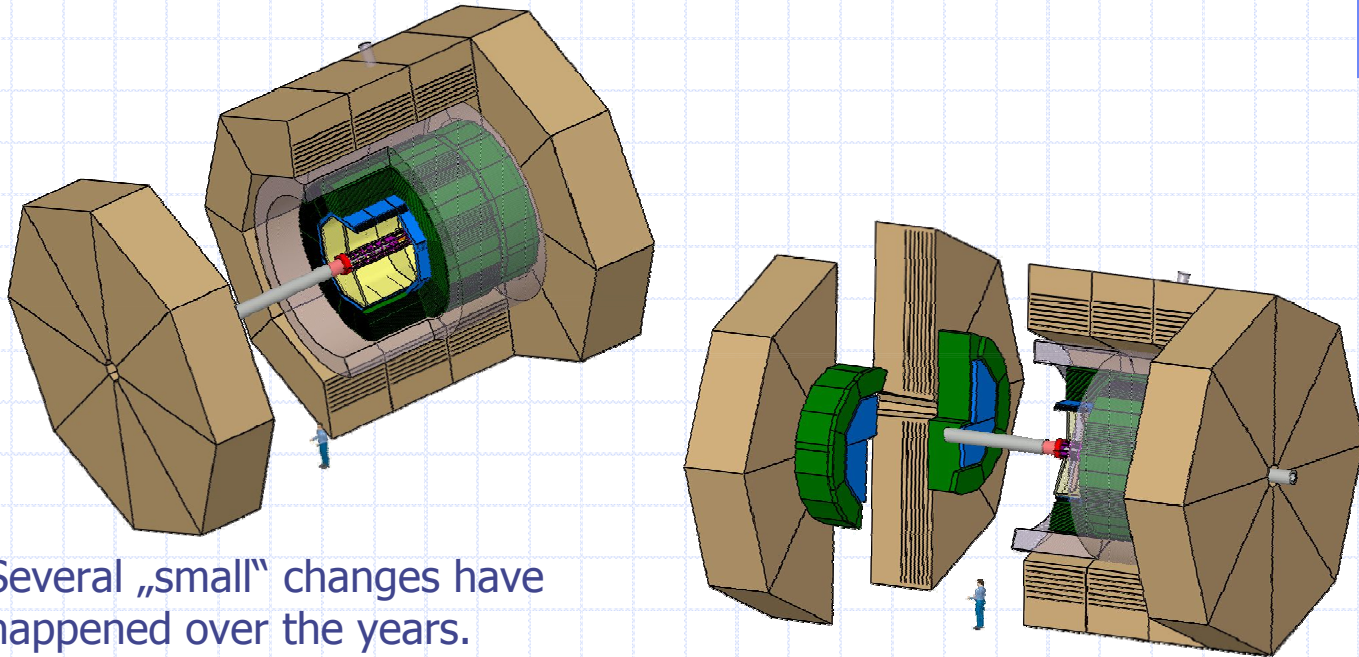
# IRENG07 Working Groups

- IRENG07 is planned to be a working meeting. Working groups have been formed and started already in July to prepare the workshop with weekly phone meetings
- WGs:
  - WG-A: Overall detector design, assembly, moving, shielding
  - WG-B: IR magnets design and cryo system design
  - WG-C: Conventional construction of IR hall and external systems
  - WG-D: Accelerator and particle physics requirements
- I will concentrate on some personally selected LDC relevant discussions in the phone conferences until today

## Now

N. Meyners

H. Videau, C. Clerc, M. Anduze, LLR; M. Jore, LAL; K. Sinram, DESY;  
started to work on the Engineering Model (all part time)



Several „small“ changes have happened over the years.  
Several question came up.  
Several items are under discussion.

(See Videau's talk: "Toward an LDC engineering model" LDC meeting, Paris May 4; 2007)

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## General Design

N. Meyners

End Cap HCAL made of magnetic iron to serve as field forming nose

(to improve the field quality in the central tracker)

→ Shorter Detector

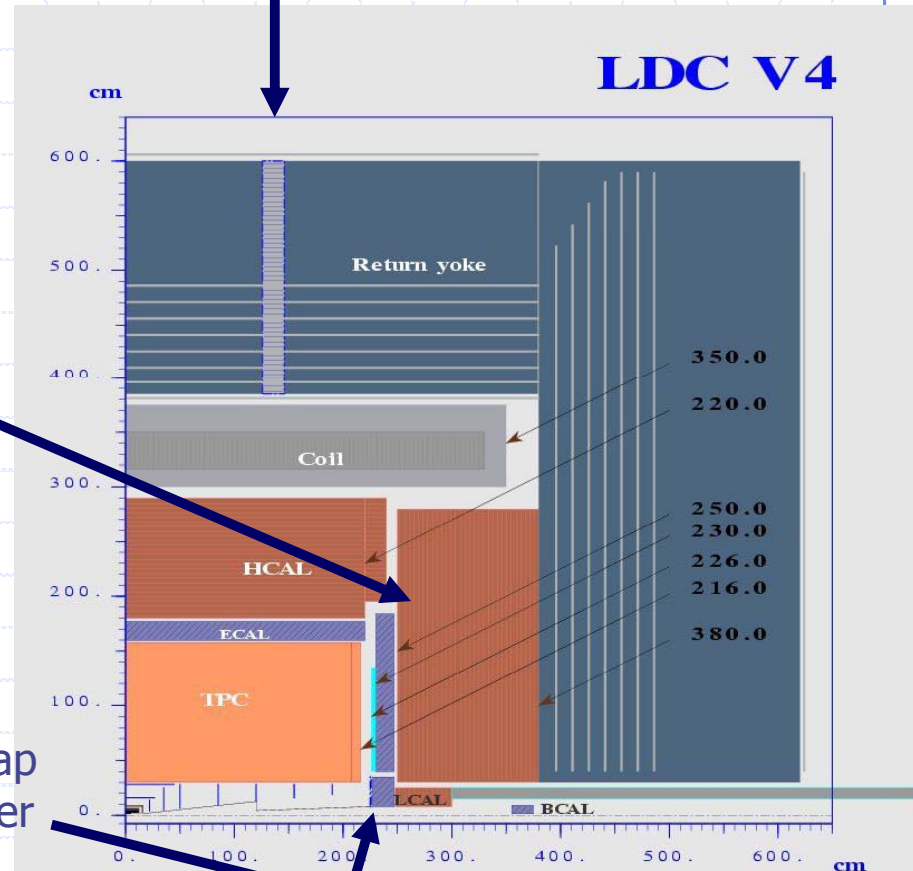
→ High force Q: Fixture?

LumiCAL enlarged to overlap with the end cap calorimeter

Q: Support?

Q: Access to Vertex detector?

Central Barrel split in three rings for CMS style surface assembly

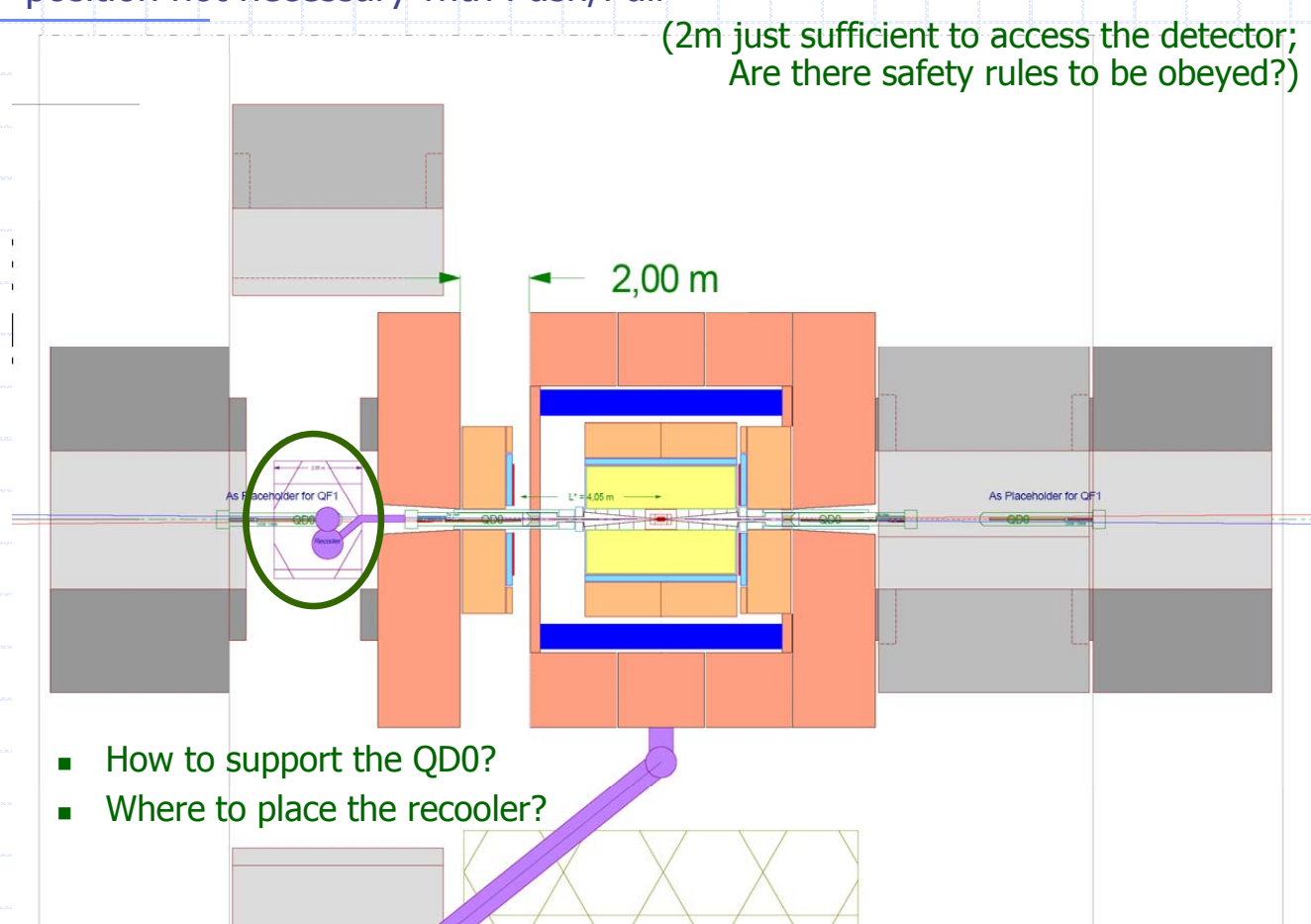


## Detector Opening (Beam Position)

N. Meyners

Splitting the end cap yoke in beam position not necessary with Push/Pull

(2m just sufficient to access the detector;  
Are there safety rules to be obeyed?)



- How to support the QD0?
- Where to place the recoiler?

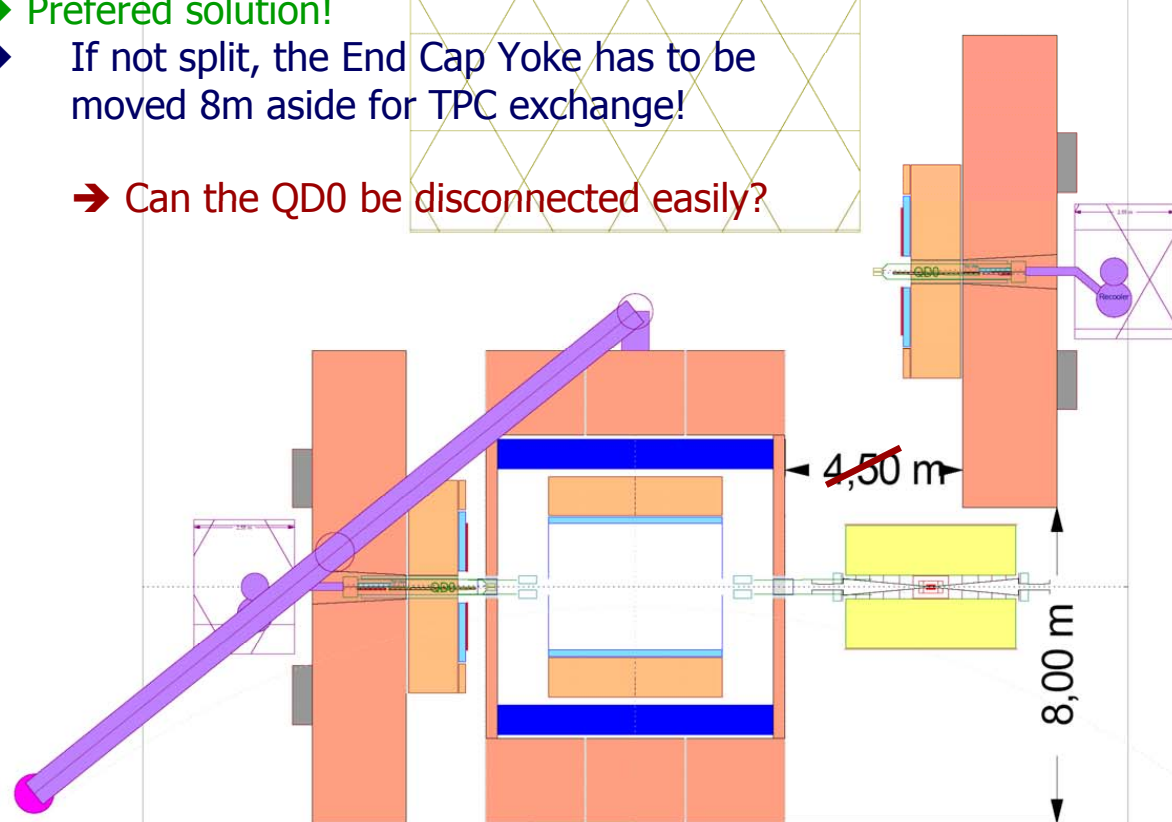
## Detector Opening (End Cap Yoke NOT split)

A full end cap yoke disk would be stiffer then two half!

→ Preferred solution!

→ If not split, the End Cap Yoke has to be moved 8m aside for TPC exchange!

→ Can the QD0 be disconnected easily?



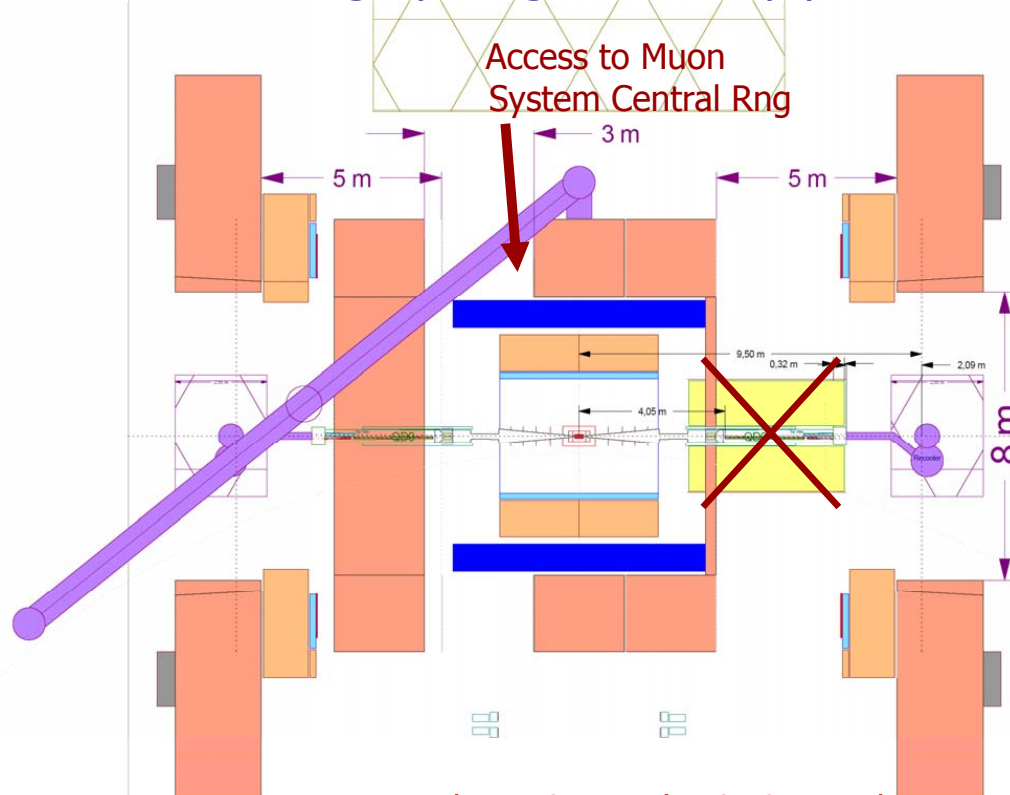
Is this possible with a platform?

N. Meyners



## Detector Opening/End Cap Yoke split

If disconnecting of the QD0s is too difficult or time consuming, splitting the end cap yoke could help!



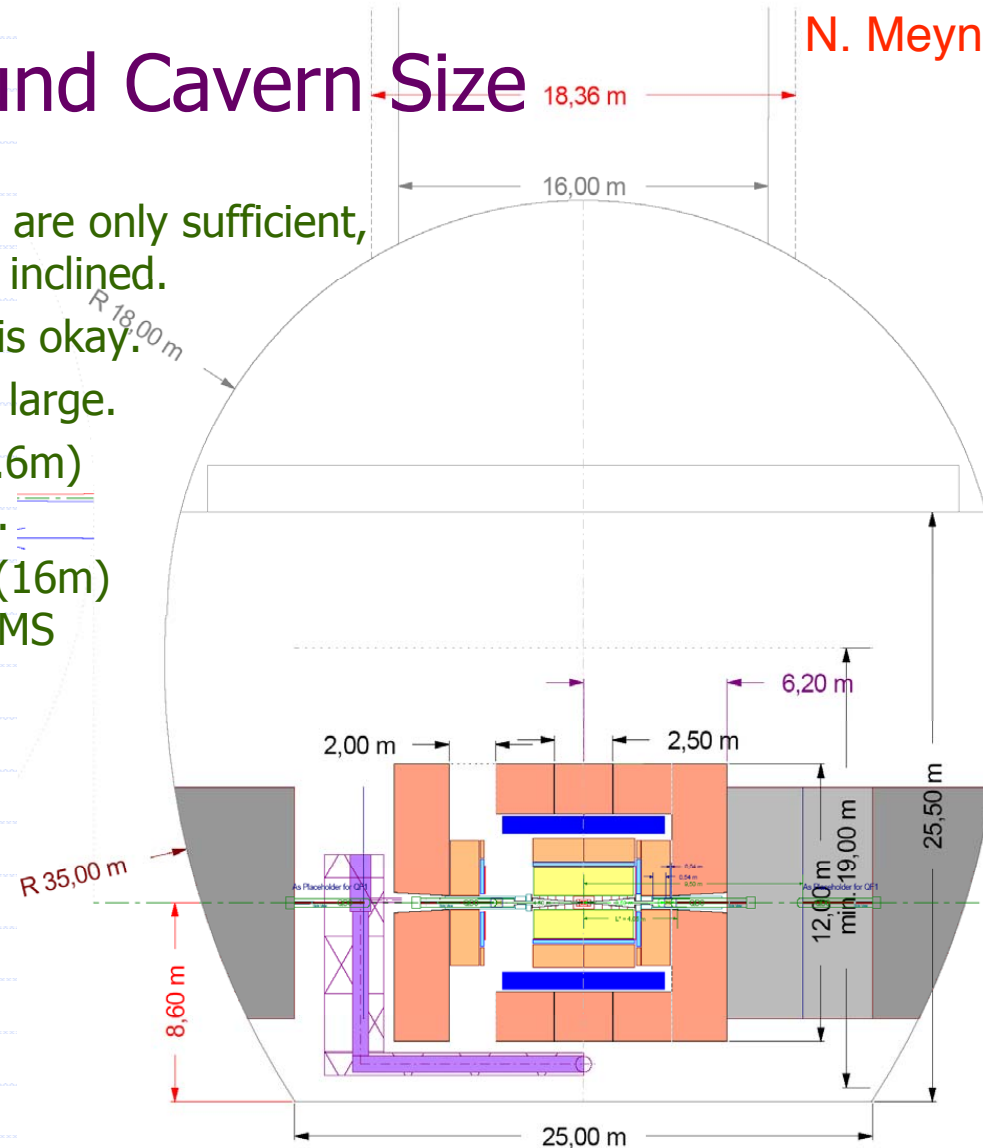
N. Meyners

Moving the TPC over the QD0 is at the moment not foreseen  
(Problem: LumiCal; Support of central beam pipe)

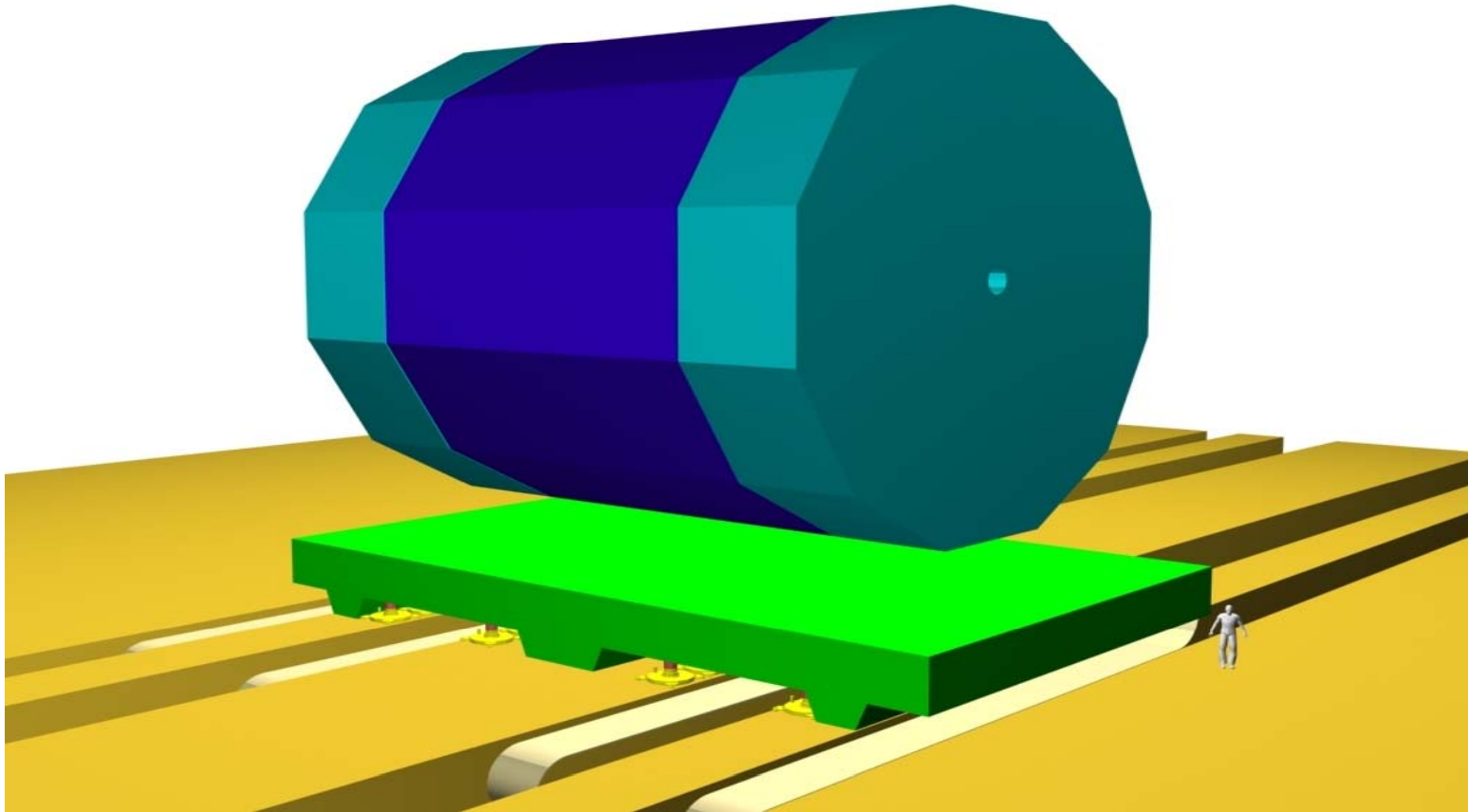
# Underground Cavern Size

N. Meyners

- 25m floor width are only sufficient, if the walls stay inclined.
- Length (120m) is okay.
- Height (39m) is large.
- Beam height (8.6m) is just sufficient.
- Shaft diameter (16m) is to small for CMS style surface assembly (min. 19.4m).



## Platform Views

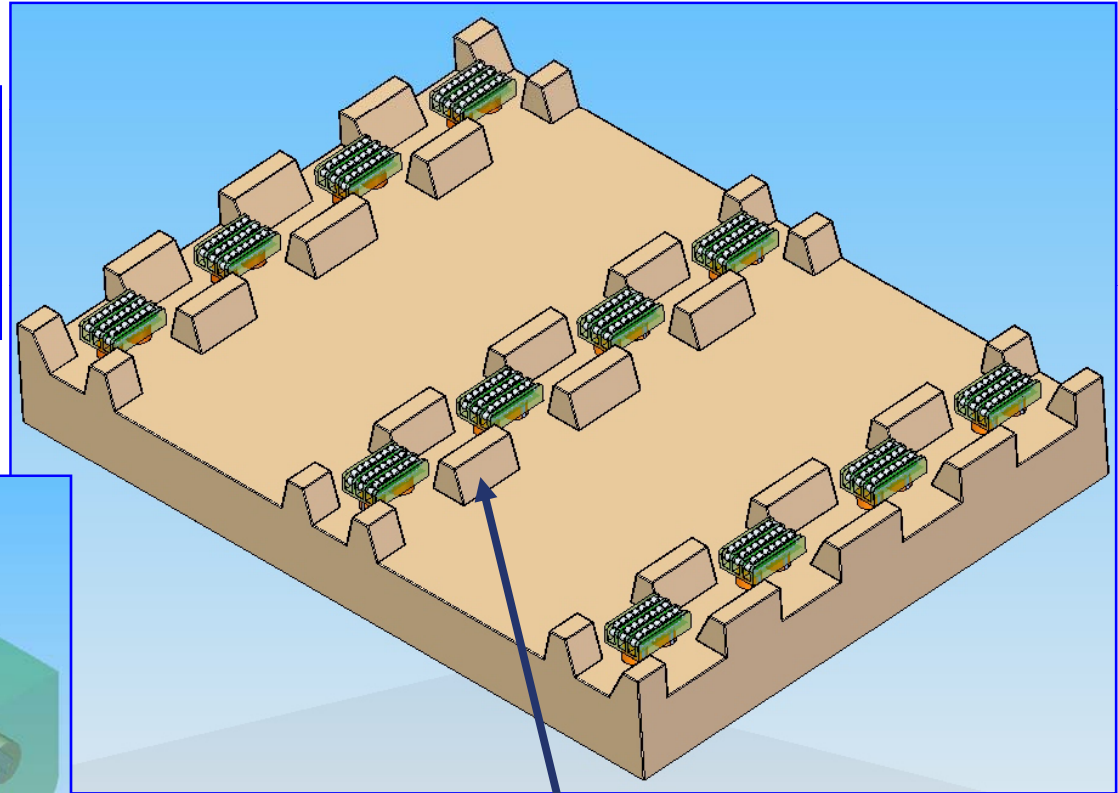
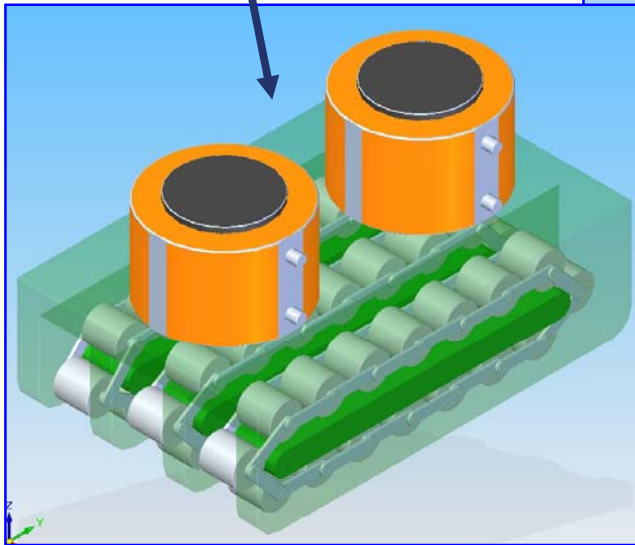


H. Gerwig - 12 July - IRENG07

21 x 12 x 2.25 m reinforced concrete

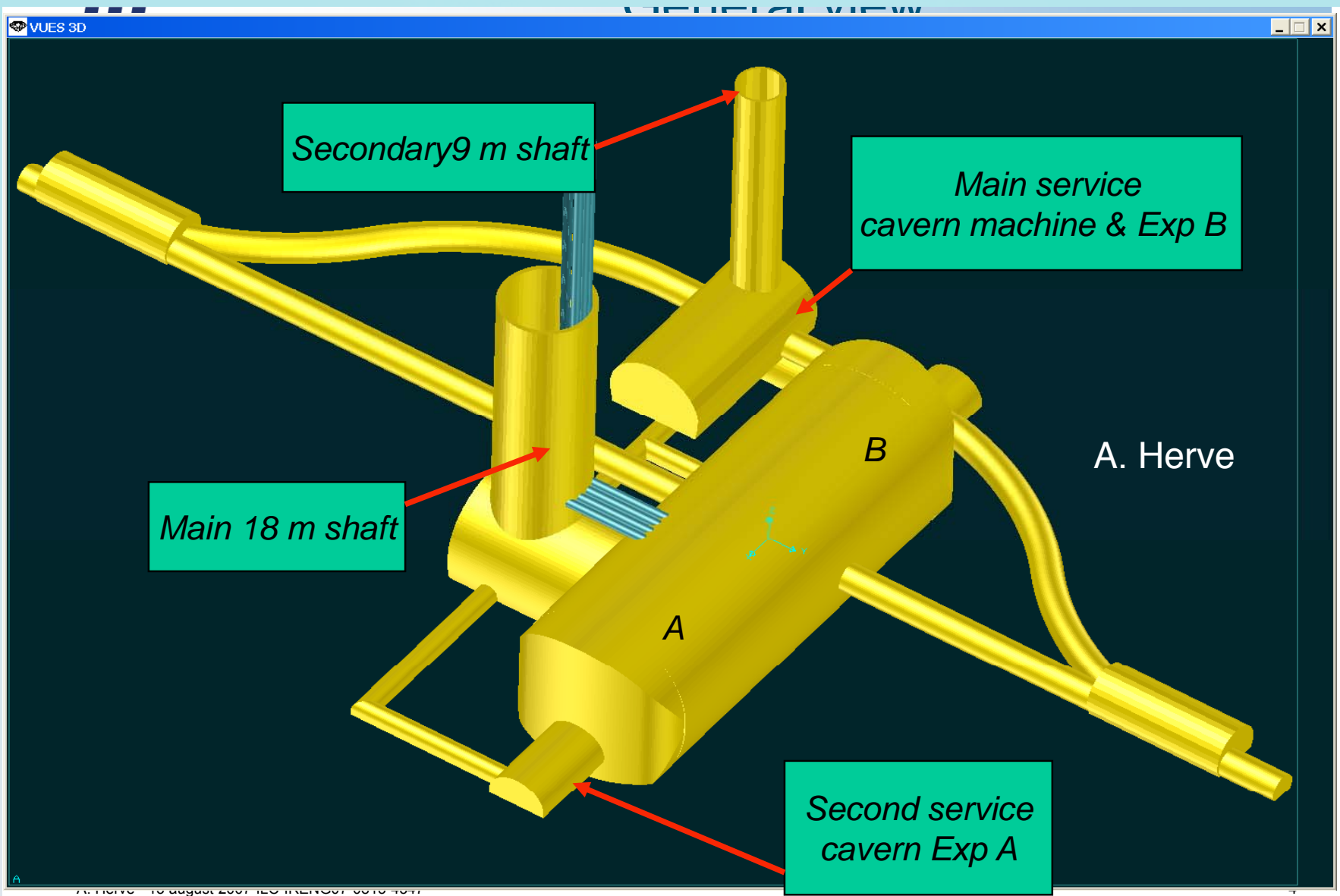
# Push-pull Platform Design Proposal

Uses 1.5kT roller module with 1kT hydraulic jacks. Design must be optimized to distribute load evenly over roller module.



Feet support platform when stationary.

# Proposal: Underground hall with only one big shaft



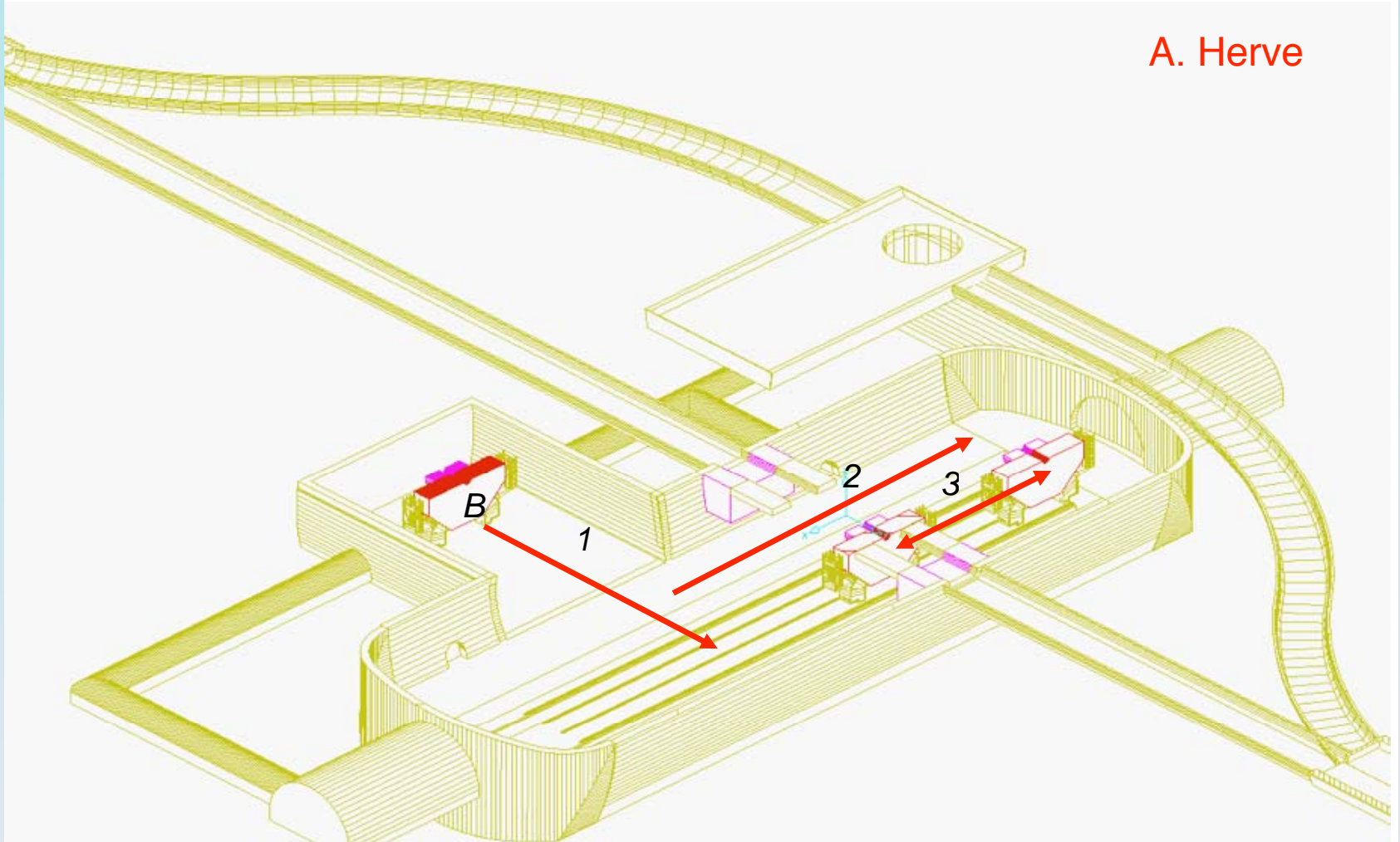


# Underground Hall with only one big shaft



## Movements of Experiment B

A. Herve

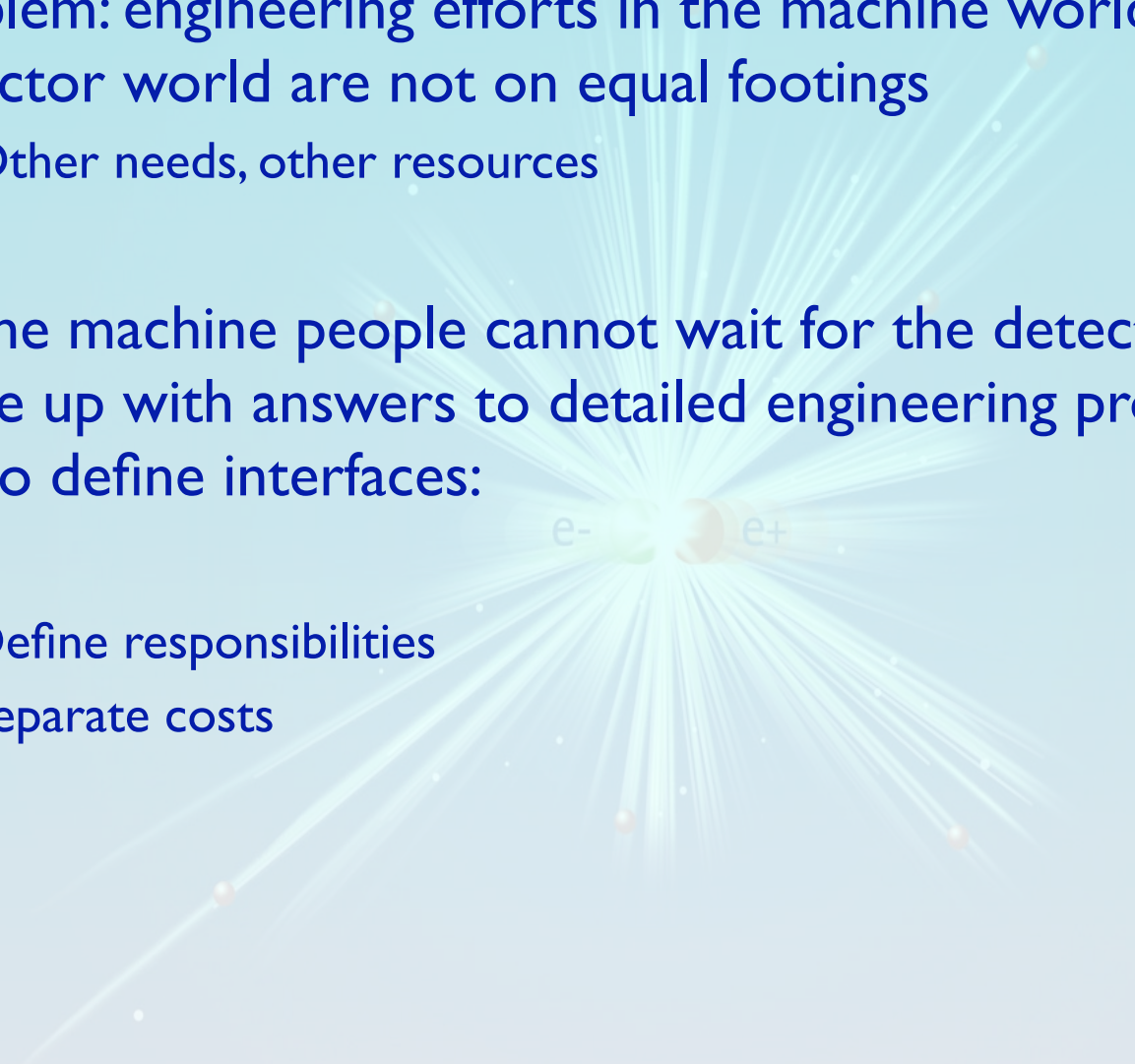


1. Self-shielding Detectors – how does affect conventional facilities?
2. Cooling by air systems
  - a. Temperature Requirements and tolerances
    - i. Detector
    - ii. Power supply rooms
    - iii. Computer and Control rooms
  - b. Air flow requirements and delta T
  - c. Humidity Requirements and tolerances
  - d. Heat loads to air – by area
  - e. Air exchange rates and purge requirements as it relates to heavier or lighter than air gas use. Hazardous or flammable gas.
3. Cooling by water systems
  - a. System types, ICW, warm LCW, cooled LCW, chilled LCW, chilled water (CHW)
  - b. Temperature requirements and tolerances
  - c. Water flow requirements and delta T
  - d. Heat loads to water – by system and area
4. Cryogenic use as it relates to conventional mechanical, electrical, and space requirements
5. Electrical Power Requirements (in watts)
  - a. Experimental Systems power requirements includes detectors, electronic, control rooms, etc.
  - b. Power Supplies
  - c. Primary and “out of beam” detectors
  - d. Grounding (isolation of grounding systems)
6. Fire Protection/Life Safety Systems
  - a. Use of suppression gases, where, required volumes
  - b. Sprinkler systems
  - c. Fire detection – spot type, VESDA, line type heat detection

CFS- People want us to answer that ASAP!

# Defining Interfaces

- Problem: engineering efforts in the machine world and in the detector world are not on equal footings
  - Other needs, other resources
- As the machine people cannot wait for the detector people to come up with answers to detailed engineering problems, they try to define interfaces:
  - Define responsibilities
  - Separate costs



# Interface Document

Interface parameters.

Created July 16, 2007.

Modified July 16, 2007

**Interface parameters, constraints, preferences, responsibilities, as well as questions and possible solutions. DRAFT.**

- Speed of push-pull operation and responsibility
- Alignment parameters
- Stability parameters
- Assembly of detector
- Segmentation of detector
- Radiation and shielding
- Vacuum requirements
- Magnetic field outside the detector
- Opening of the detector on the beamline
- Cryogenic system of the FD
- Support of forward instrumentation
- Detector calibration
- Splitting of beamline
- Safety



## ILC Detector Strategy Questions

### Deep Caverns

This is politically incorrect - so please do not pay any attention to this slide.

- Is it only politics that we are limited to deep sites?
- A first look at radiation indicates that a slightly buried linac - ie the top of the housing at grade, with the housing then buried under the excavated soil, is adequate for normal beam loss and accident scenarios.
  - This would require a very flat site.
  - This might save money.
  - Such a site is not on the approved list.
  - This might permit a shallow hall.

M. Breidenbach



# Basic assumptions questioned

## Seismicity

- We do not have a site yet. What if ILC winds up in Japan? Or California?

## Cavern Shape and Configuration

- How much of thinking of the underground shape of the cavern is based on CERN geology?
- Would larger cranes cost less in other rock?
- Are two shafts required for safety? Could the secondary escapeway be into a beamline?
- Could the shafts (if there are two) be over the garage position? Is the major reason for offsetting the shaft safety?

## Platforms and Push-Pull

- Platforms seem to make the interface issues easier, but they increase the depth of the hall below beamline. Are there technical risks that are increased by the platform approach - assuming that cable plants and other services are small.
- As the time required to effect a detector interchange increases, the frequency of interchange will decrease to maximize luminosity. When do the sociological issues become problematic? Does a slow interchange push towards an eventual one detector outcome?
- What are the fundamental limits for interchange time?
  - Is it obvious that a detector solenoid must be run down?

## Summary

- These are a few questions that have been worrying us.
- There will be more.
- These seem to affect fundamental strategy for the IR. At this time, should we be making decisions or developing options?

M. Breidenbach

# Conclusion

- The IRENG07 Working Groups are already in full swing
- Lively phone meetings are taking place weekly
  - if you want to join: be prepared for up to 4h long discussions
- LDC will be represented at the IRENG07 Workshop at SLAC by DESY, LAL and LLR colleagues
- This will be a very interesting meeting with potential impact on the ILC EDR phase
  - Side remark: LDC and GLD already ceased to exist in the lingo of our North American colleagues. We are always announced as GLDC.....