Update on MDI Issues for LDC

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ACFA Workshop

Beijing

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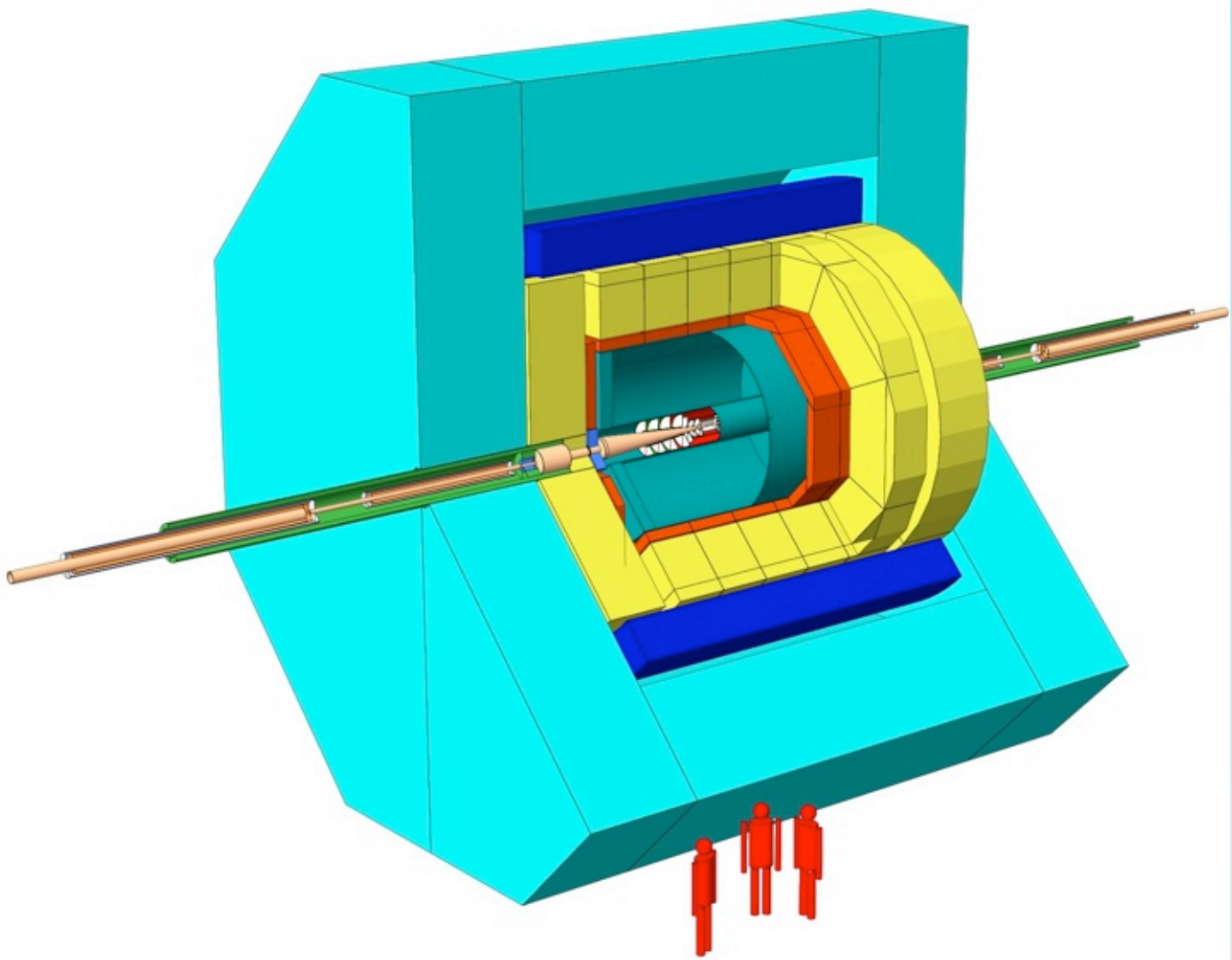
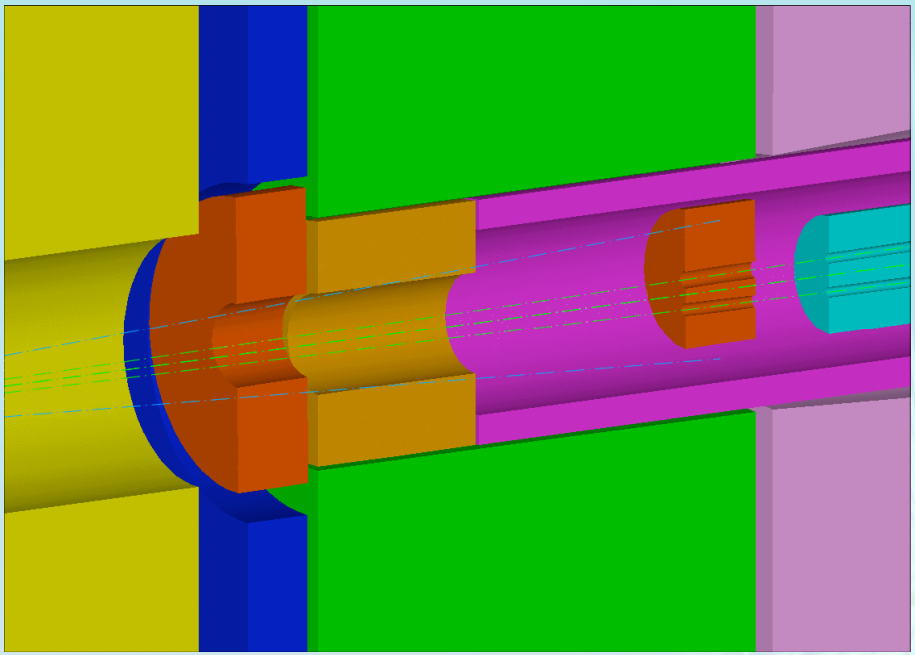
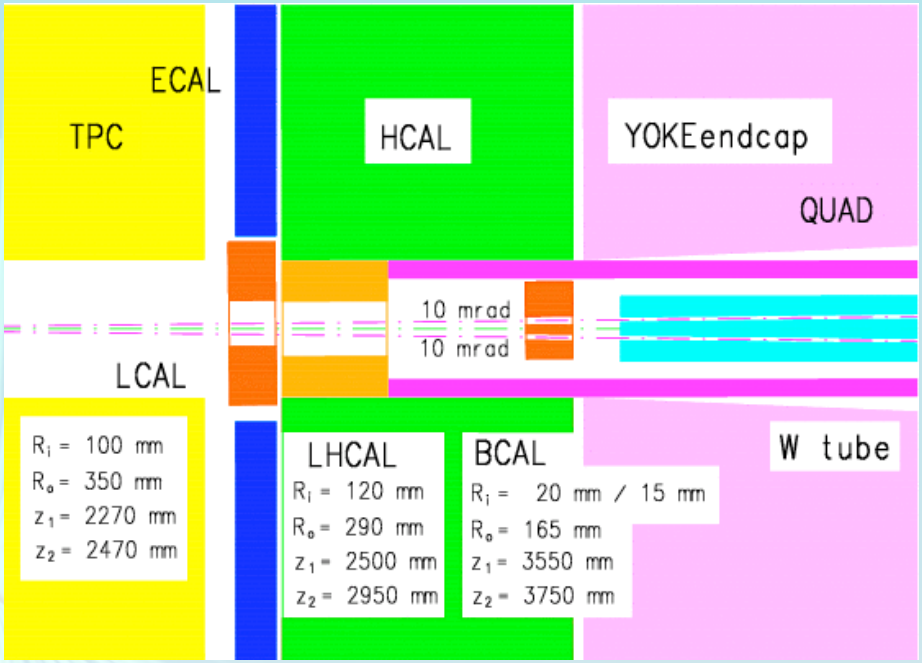
The Large Detector Concept



Size: ~12m x 12m x 12m (not that large)

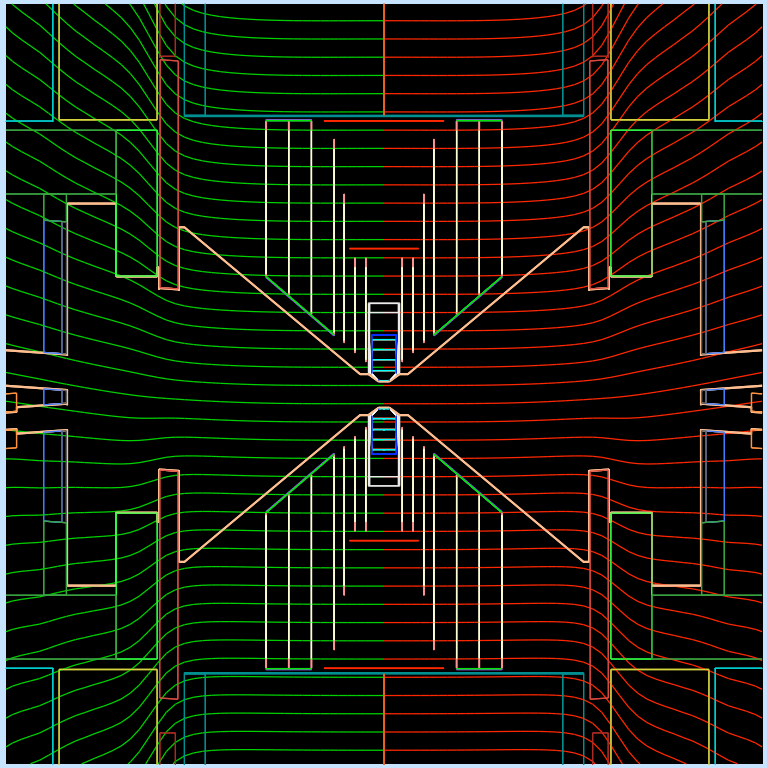
LDC Forward Region



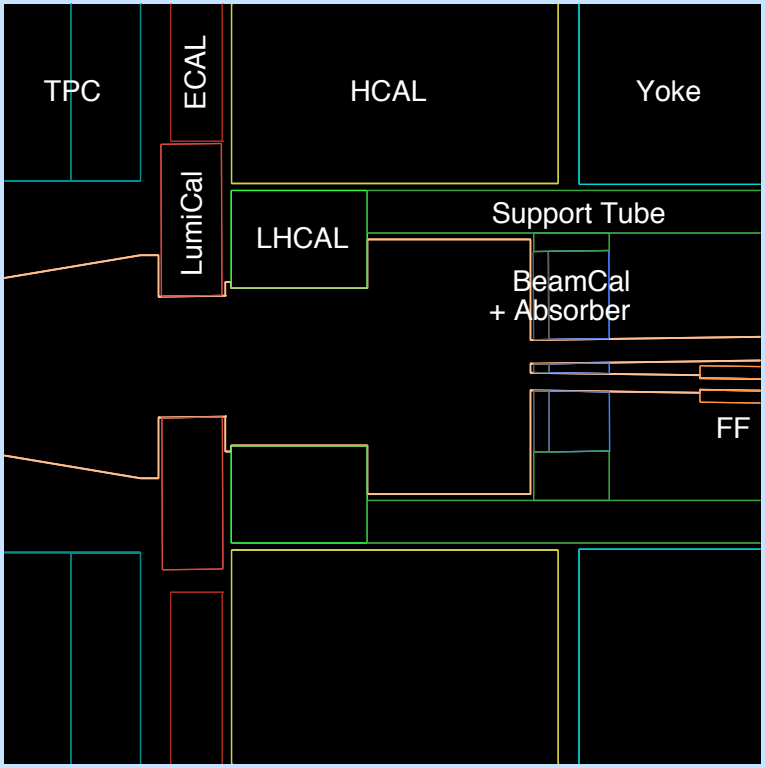


- L*=4.05 m
- 14 mrad crossing angle
  - 2 and 20 mrad exist as alternative
- Tungsten absorber around final focus quadrupoles
- LumiCal: precision luminosity measurement via Bhabha scattering
- BeamCal: pair signal measurement, hermeticity to <5 mrad
- Calorimeters centred on outgoing beam
- LowZ absorber

LDC 14 mrad Interaction Region



14 mrad crossing angle
with anti-DID field (1:10)



Forward region design
(compressed view 1:2)

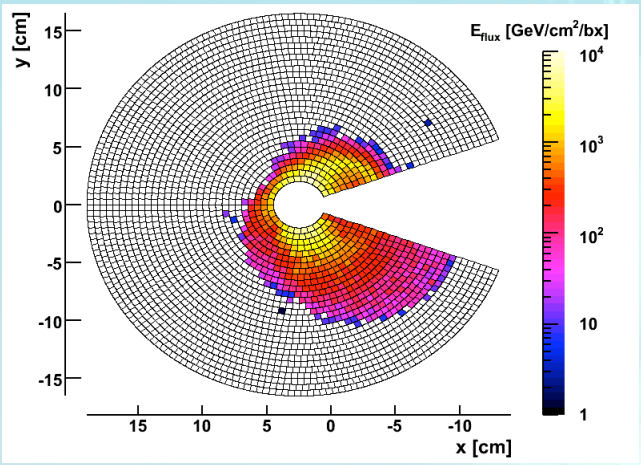
A. Vogel

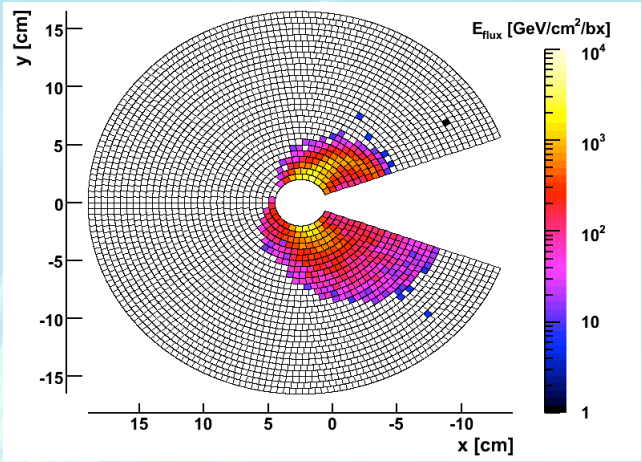
Beamstrahlung Pairs on the BeamCal

LowP

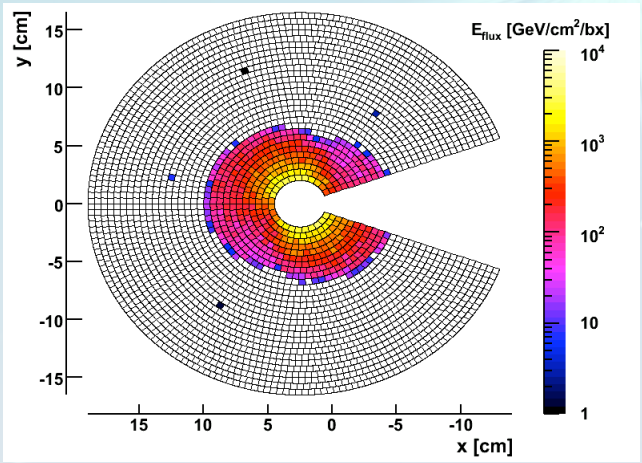
Nominal

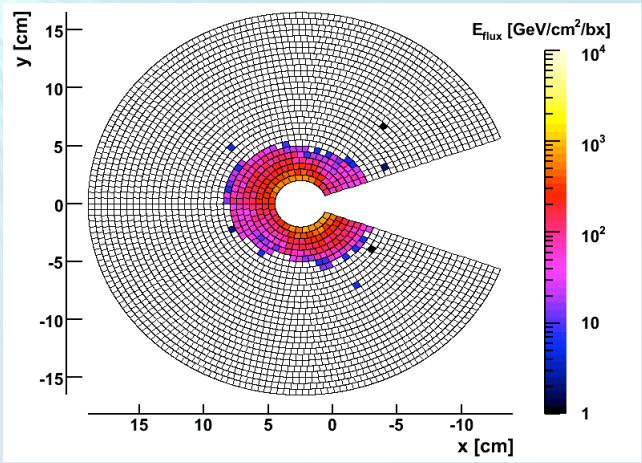
DID





Anti DID



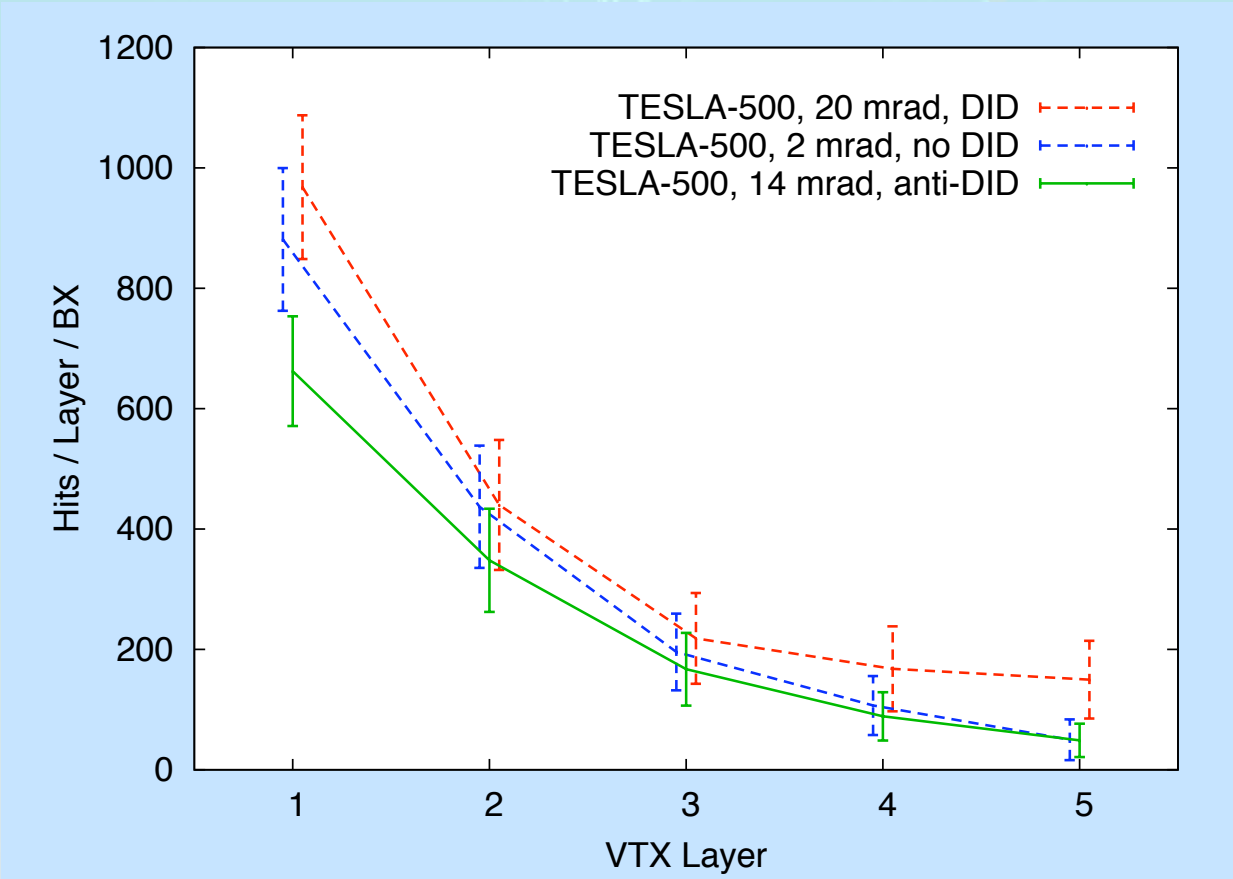


C. Grah

Larger blind area compared to 20 mrad (30° => 40°)

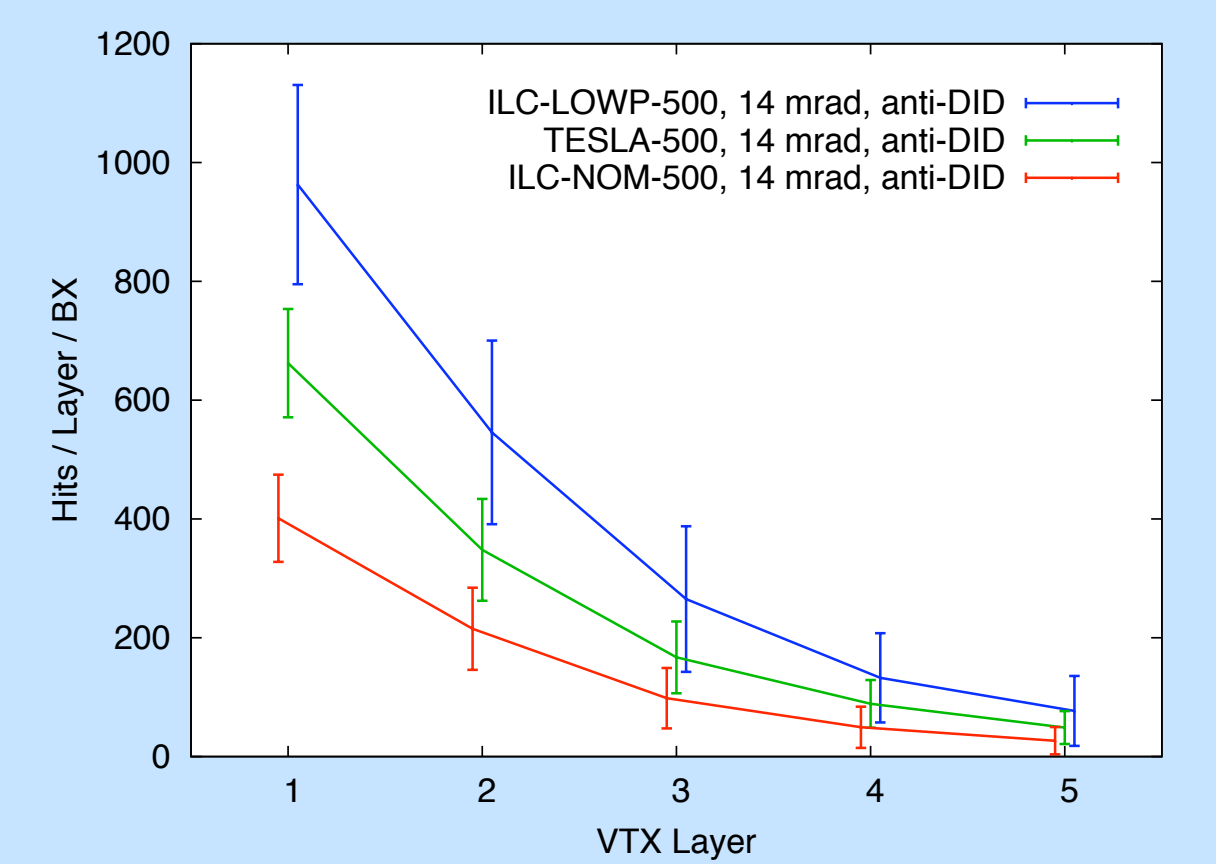
VTX Hits

Pair background simulated with GUINEA-PIG and MOKKA



A. Vogel

VTX Hits



A. Vogel

Neutrons in the VTX

Neutrons passing any VTX layer (with double counting)

- 1.7 ± 2.9 per BX for ILC-NOM-500
- 8.6 ± 10.4 per BX for ILC-LOWP-500

Normalisation per unit area (total surface is $2.8 \cdot 10^3\,\mathrm{cm}^2$)

Normalisation per nominal run time with $\int \mathcal{L}\,dt = 500\,\mathrm{fb}^{-1}$

- $3.9 \cdot 10^{11}$ BX in total for ILC-NOM-500
- $2.0 \cdot 10^{11}$ BX in total for ILC-LOWP-500

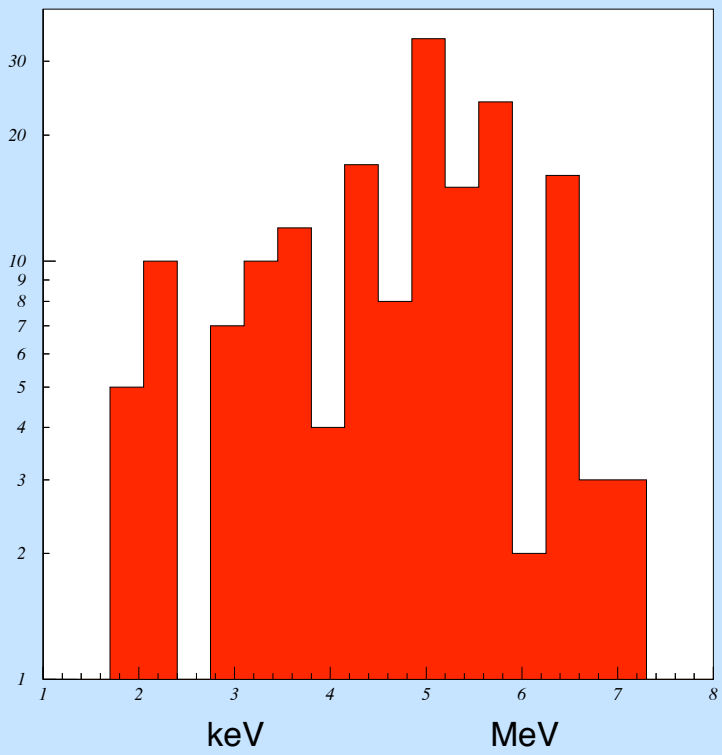
Neutron fluence (no NIEL scaling applied yet)

- $(2.3 \pm 4.0) \cdot 10^8$ neutrons / cm^2 for ILC-NOM-500
- $(6.1 \pm 7.4) \cdot 10^8$ neutrons / cm^2 for ILC-LOWP-500

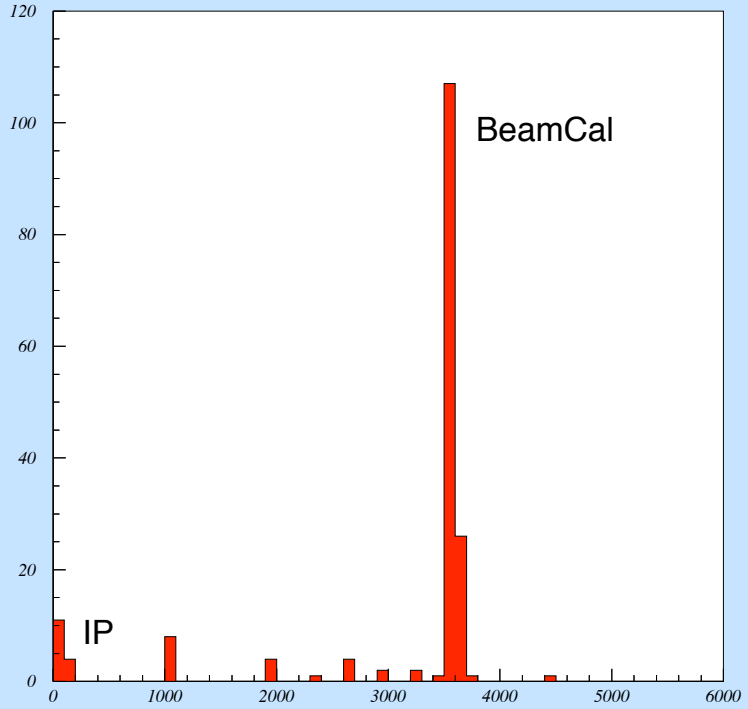
A. Vogel

Neutrons in the VTX

Statistics for neutrons are rather low …



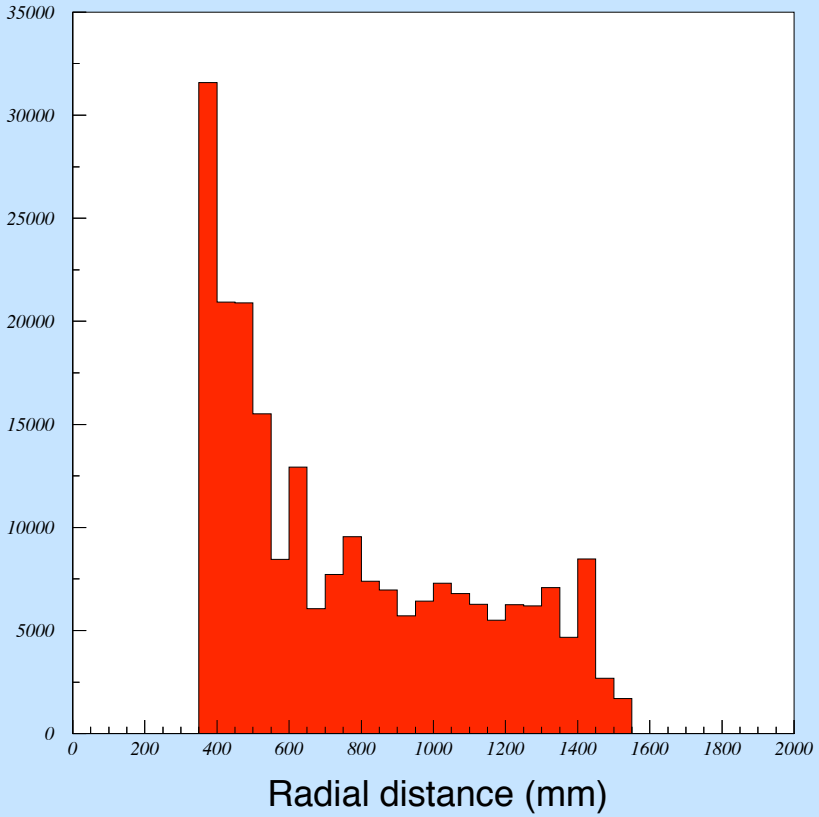
Energy spectrum



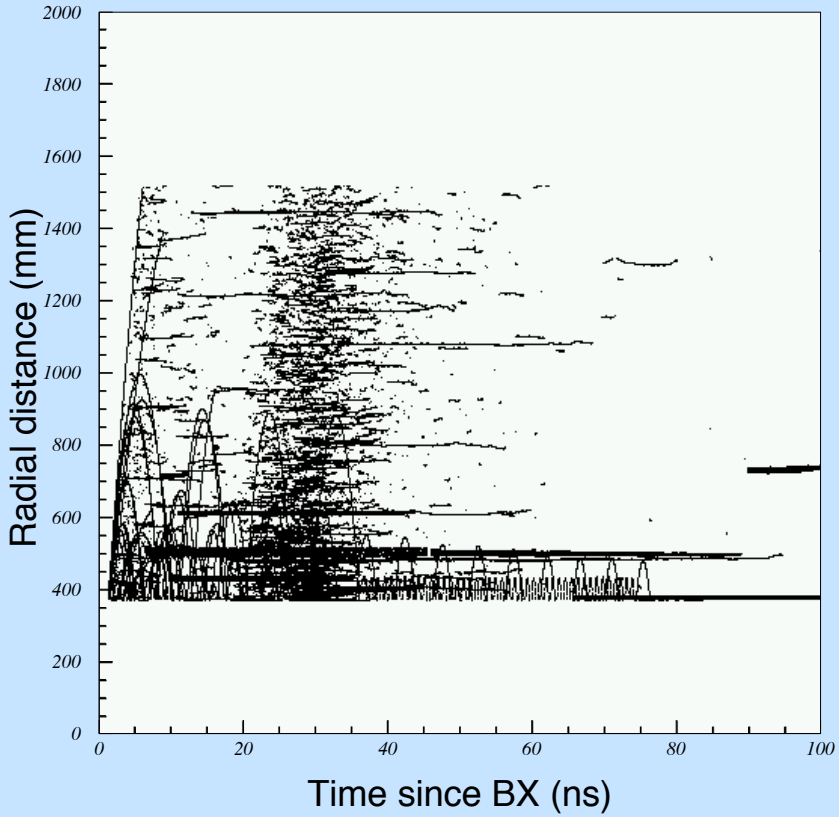
Origins of particles

A. Vogel

Mokka hits in the TPC (overlay of 100 BX)



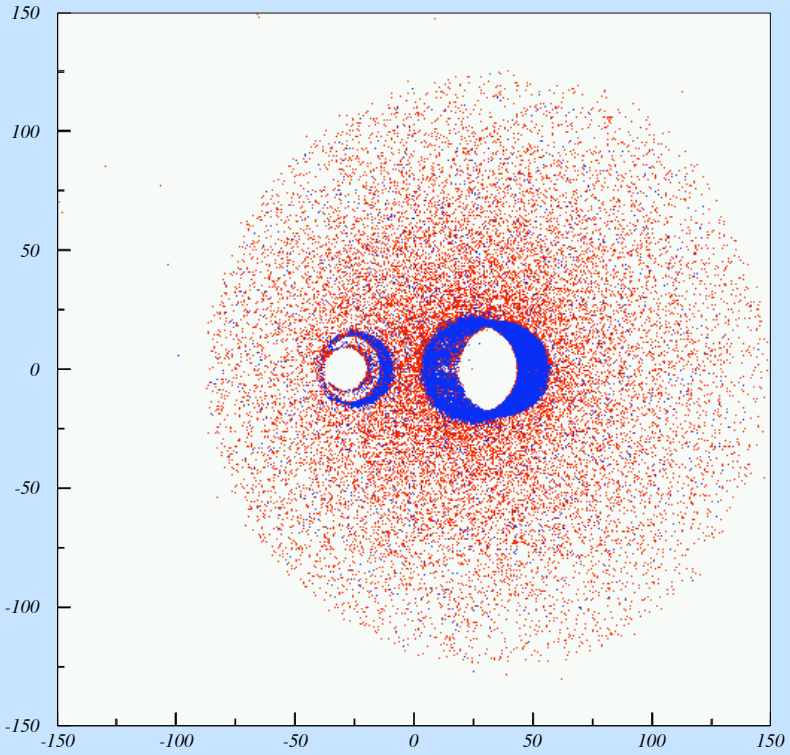
Radial distribution

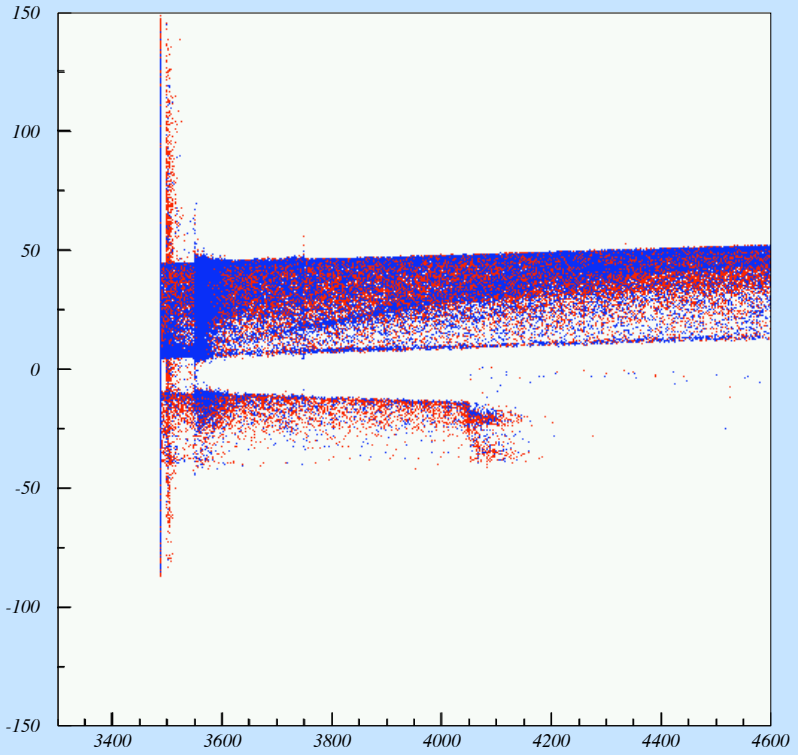


Time structure

A. Vogel

Backscattering Sources

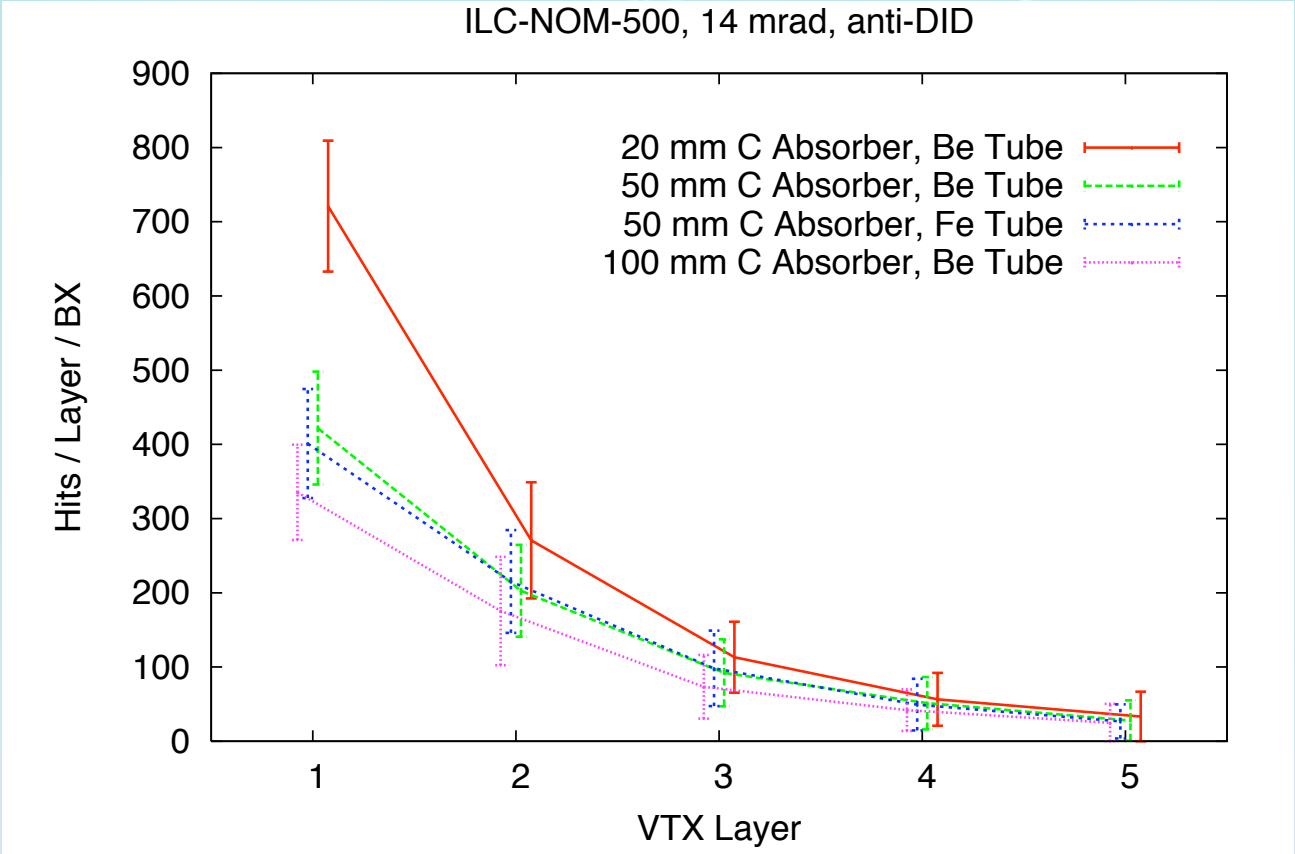




Origins of backscattered electrons and positrons which enter the inner parts of the detector

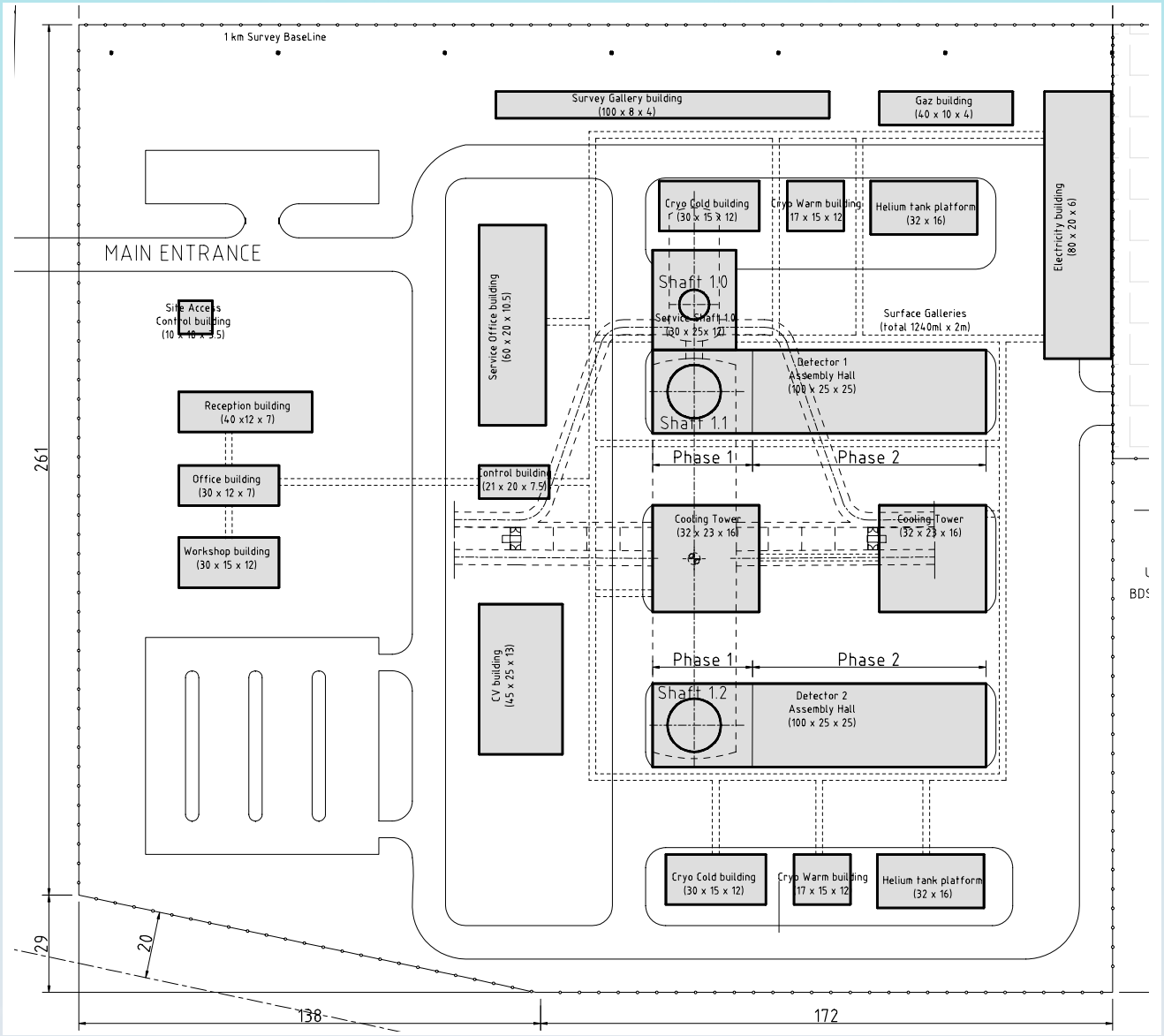
A. Vogel

LowZ Absorber Studies

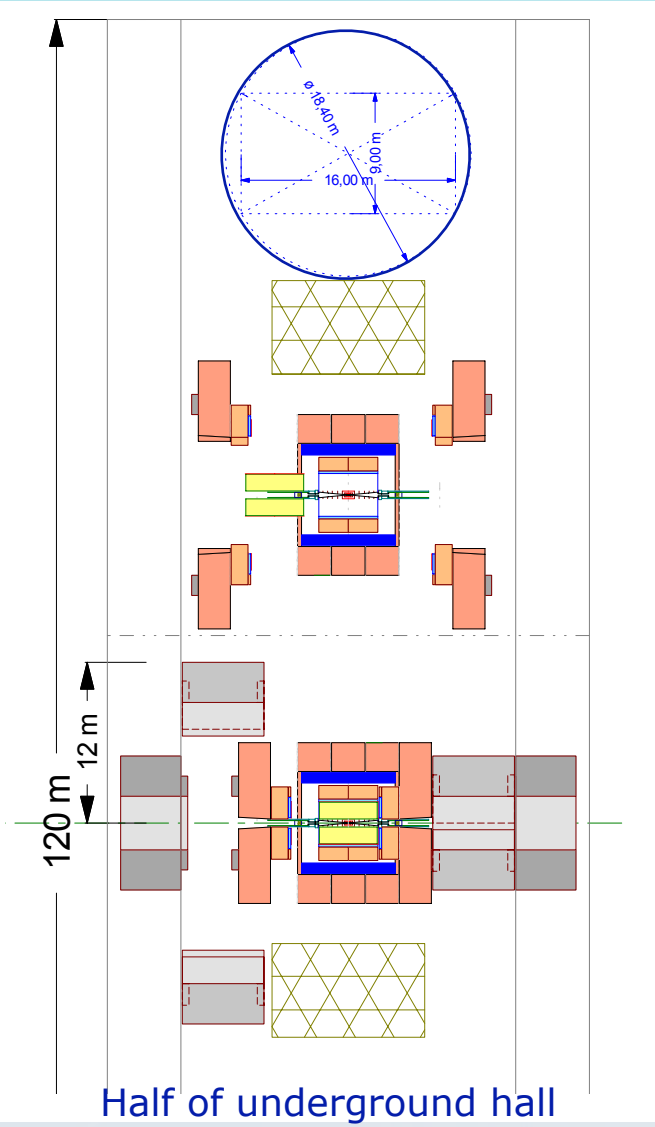


Varying LowZ absorber in front of BeamCal

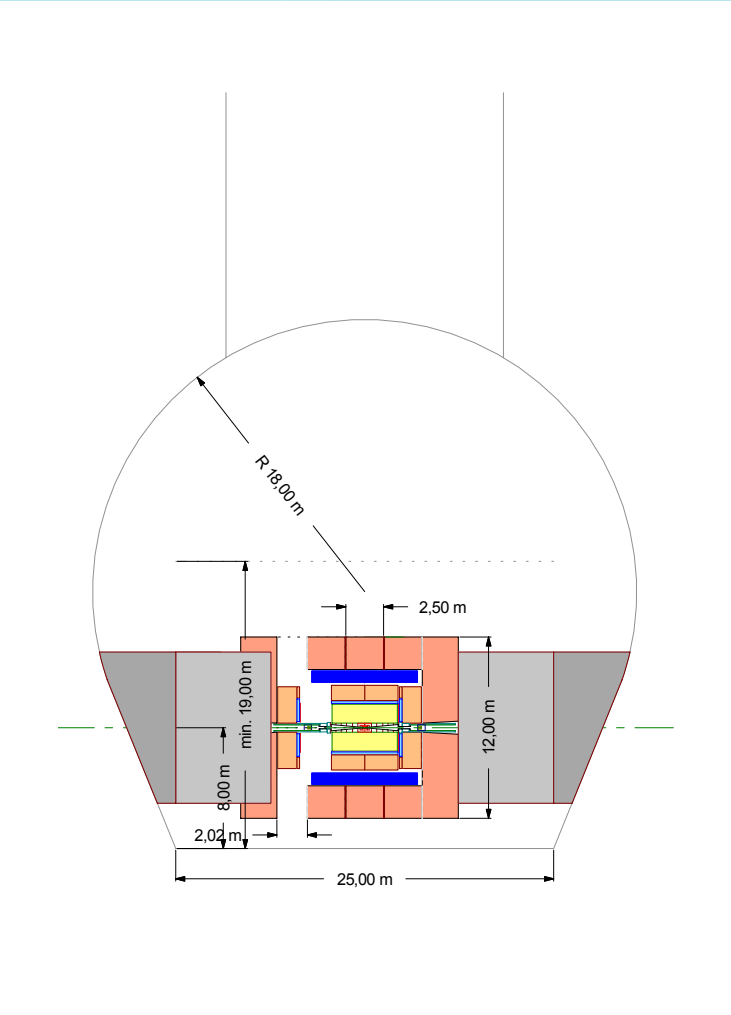
IR Installations



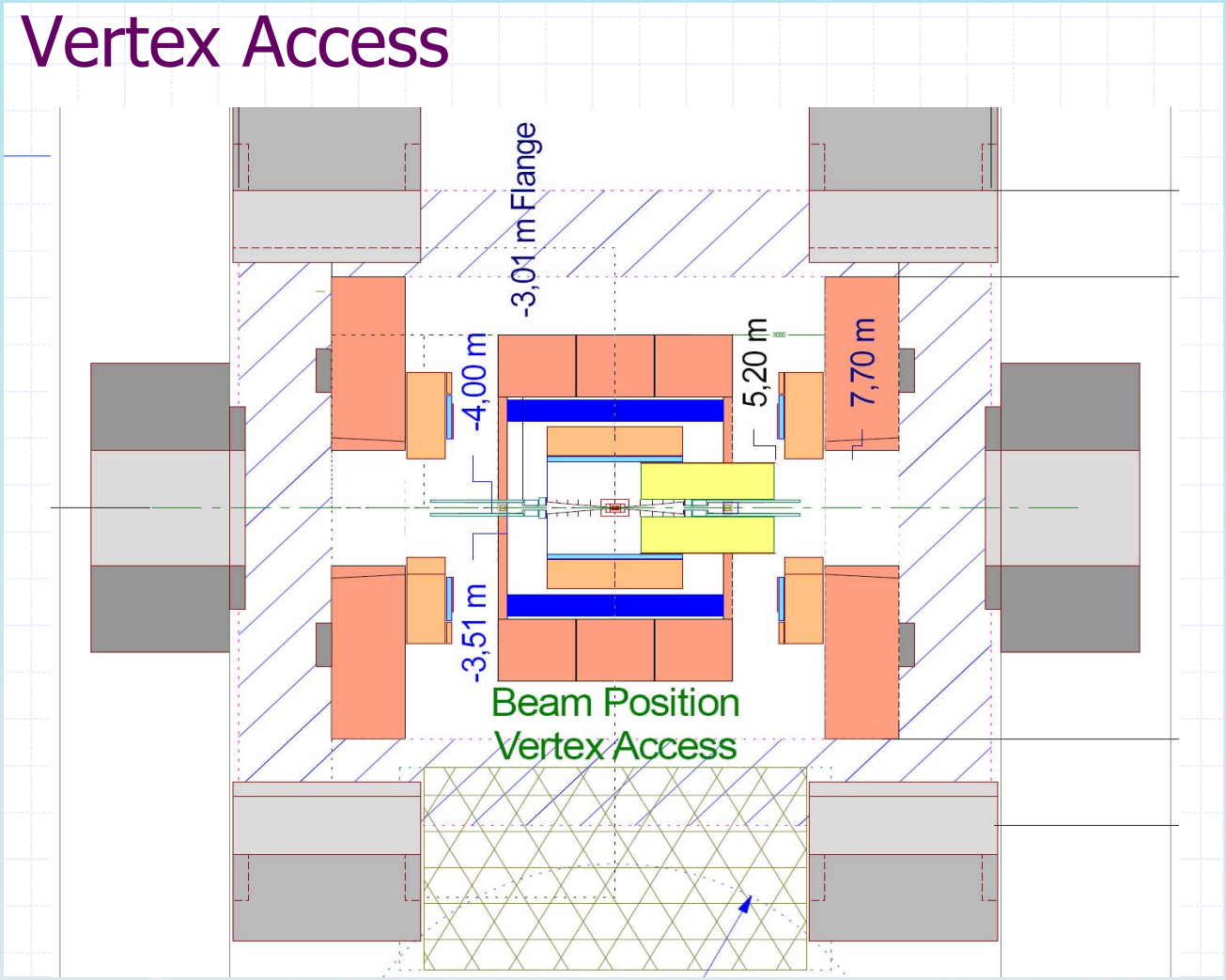
LDC in Underground Hall



Half of underground hall

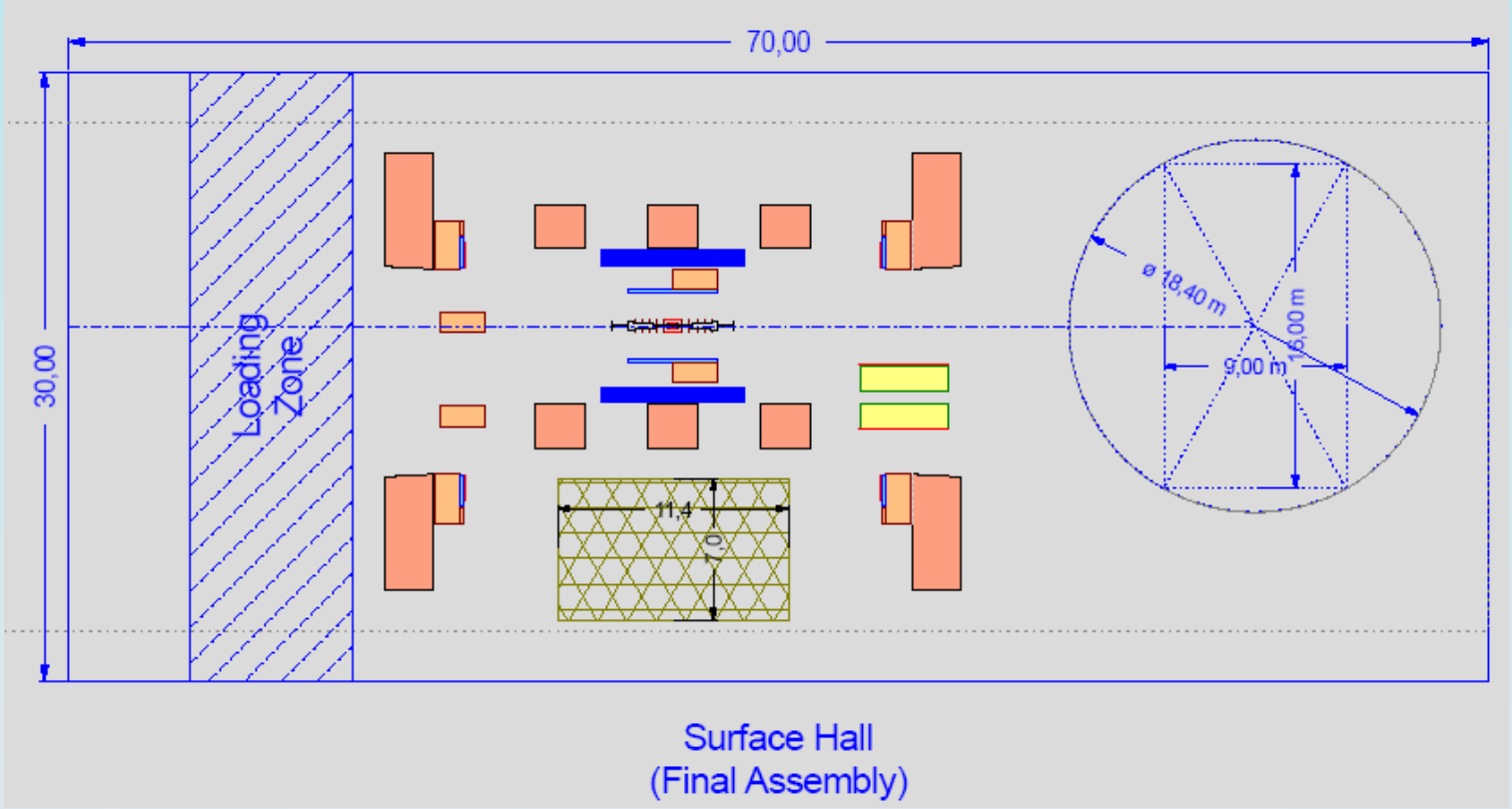


Vertex Access



Surface Hall Size

50m (later 70m) x 30m; 2 x 80t crane; hook 19m above floor.
(For the costing MDI panel has chosen 100m x 25m.)



From the Official LDC Statement on Push-Pull

- We have identified a number of areas of serious concern which need significant study and engineering work to understand their impact on the design of LDC (...)
- These areas include the design and size of the cavern, the mechanical overall design of the detector, its scheme to open and move around in the cavern, and designs of most different sub-systems, all of which will be affected (...)
- We are in particular not convinced that a fast switchover between detectors is possible without loosing significant time for re-calibration of the detectors
- Many of these problems can probably be solved by a dedicated engineering effort, and if enough resources and money are spent on their solution. At this stage however we feel that we do not understand the tradeoffs between decreasing costs by eliminating one beamline, and increasing costs and risks by additional complexities for the detectors
- A possible push-pull scenario will present a significant challenge to the community to operate it in a way that both detectors are treated on an equal footing
- (...) the LDC group is very concerned that no fast and irreversible decision is taken in favour of a push-pull scenario, in the absence of any serious study and information on the additional costs and risks such a solution implies
- We do not fundamentally oppose a push-pull decision, but insist that a decision at this time can only be preliminary, and has to include a non push-pull solution as backup

My Very Personal Remarks

- The LDC community is (still) unhappy with the push-pull decision
- We have to do a major job to convince our colleagues
- The rationale is clear: better one beamline than no beamline, but transferring this to our colleagues is not easy

- The central discussion: tradeoffs of cost and risks between the machine and the detectors will be with us for some time

Summary

- 14 mrad crossing angle is the ILC baseline now
- LDC forward region has been adopted to that by modifying the existing 20 mrad design
  - thanks to Adrian Vogel and Ringo Schmidt
- First background studies have been performed
  - No surprises
  - Optimisations yet to be done
- CFS issues for LDC are under study
  - plans for surface and underground halls seem ok
- Push-pull still is a headache