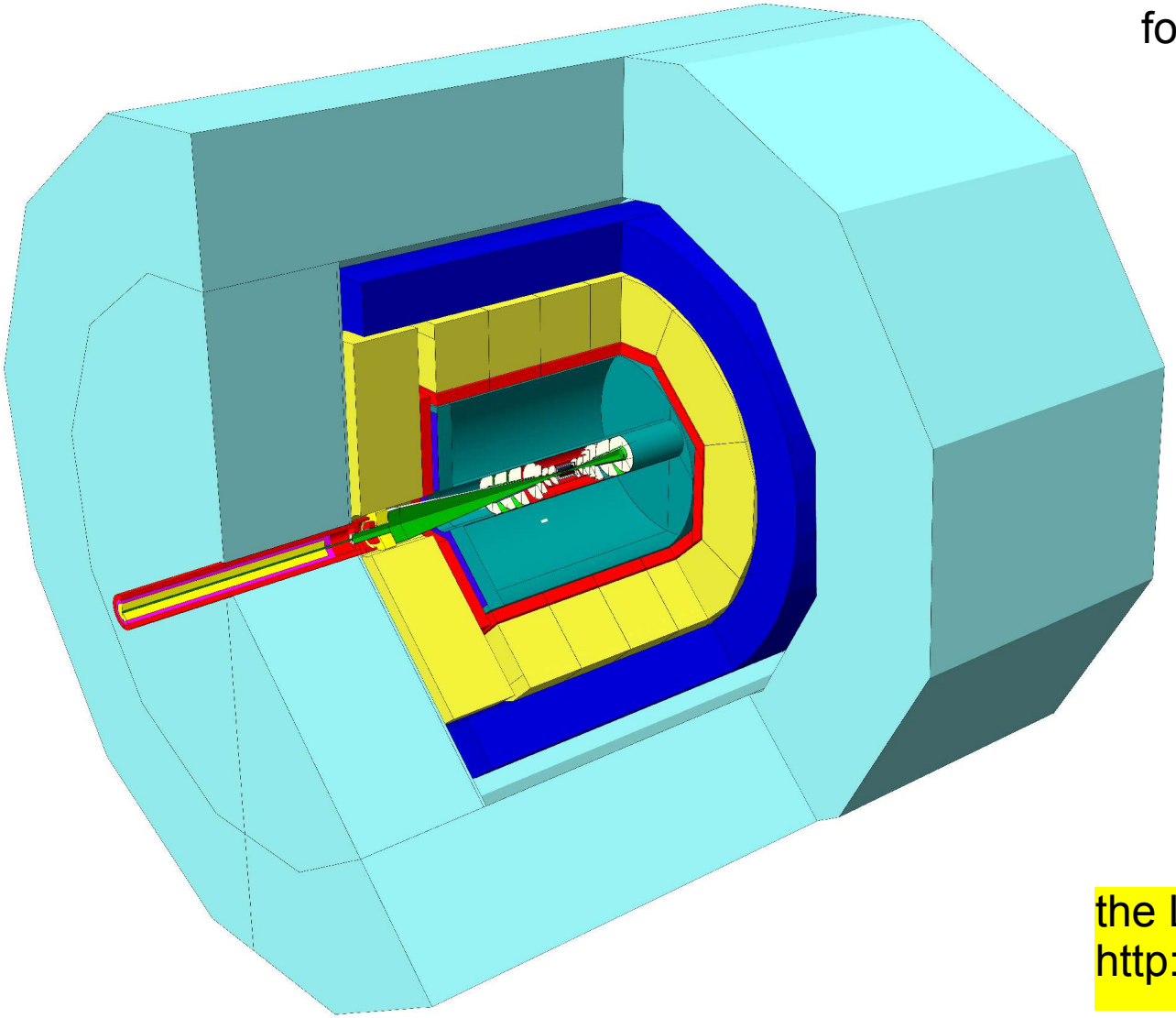
The LDC Outline Document

Ties Behnke, DESY
for the LDC concept

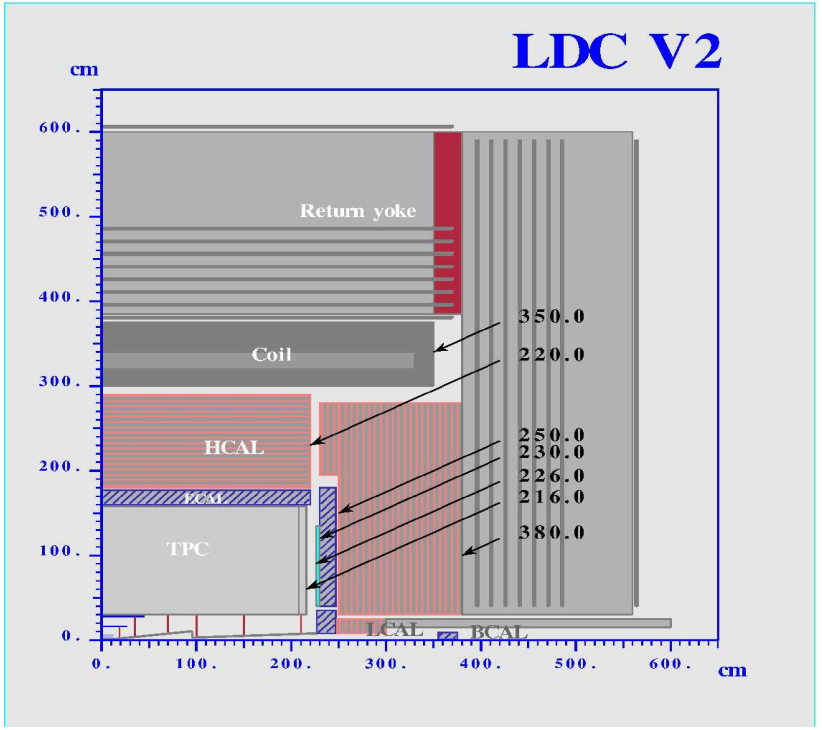


the LDC on the WEB:
http://www.ilcldc.org

The LDC detector

Basic concept:

- optimised for particle flow
- optimised for stable, robust and precision tracking
- do not forget the costing in the optimisation



LDC V2 is
optimised version of previous detector

Mostly fairly minor modifications

Modifications

Tracking detectors shrunk a bit:

Outer Radius of TPC: 158cm
Lenght of TPC: 216cm

extra space has been added
to the calorimeters to increase
thickness and reduce leackage

Coil has been shortened:

Outer Radius: 375cm
Length: 350cm

saves money,
but field quality deteriotes some

Forward region has been redesigned

better coverage
easier access
allow for 2 and 20 mrad designs

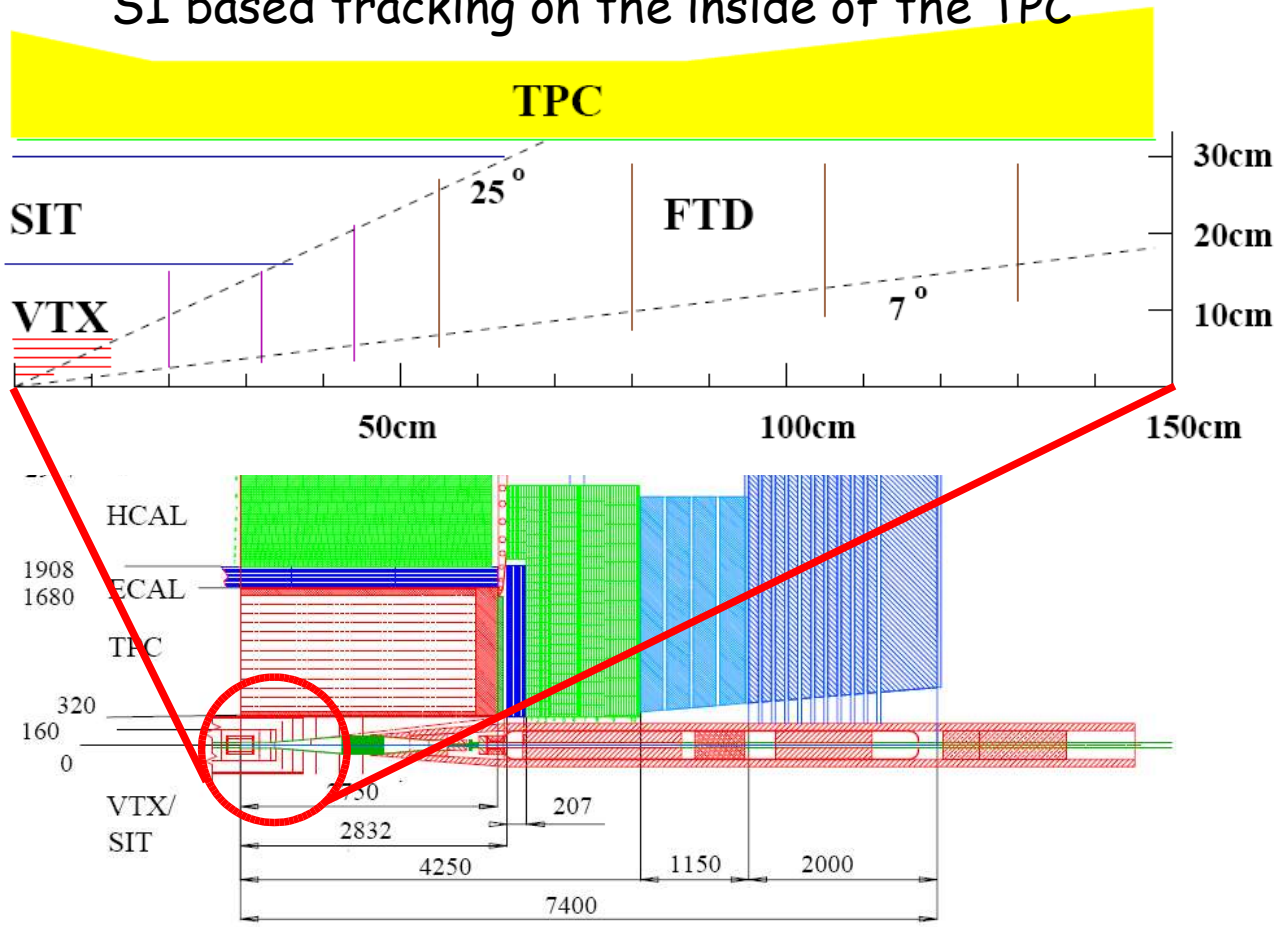
The Tracking System

fundamental concept:

best efficiency and robustness through combination of

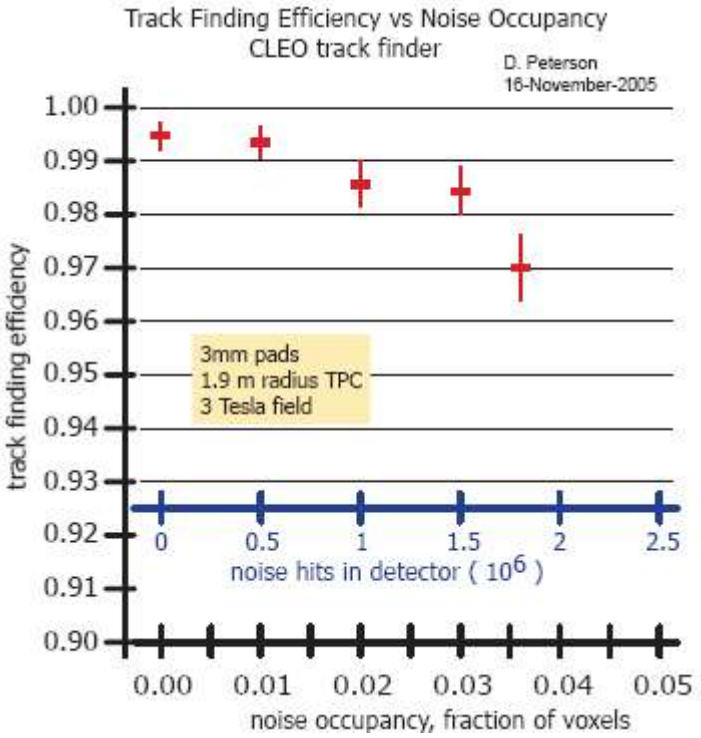
TPC central tracker

SI based tracking on the inside of the TPC



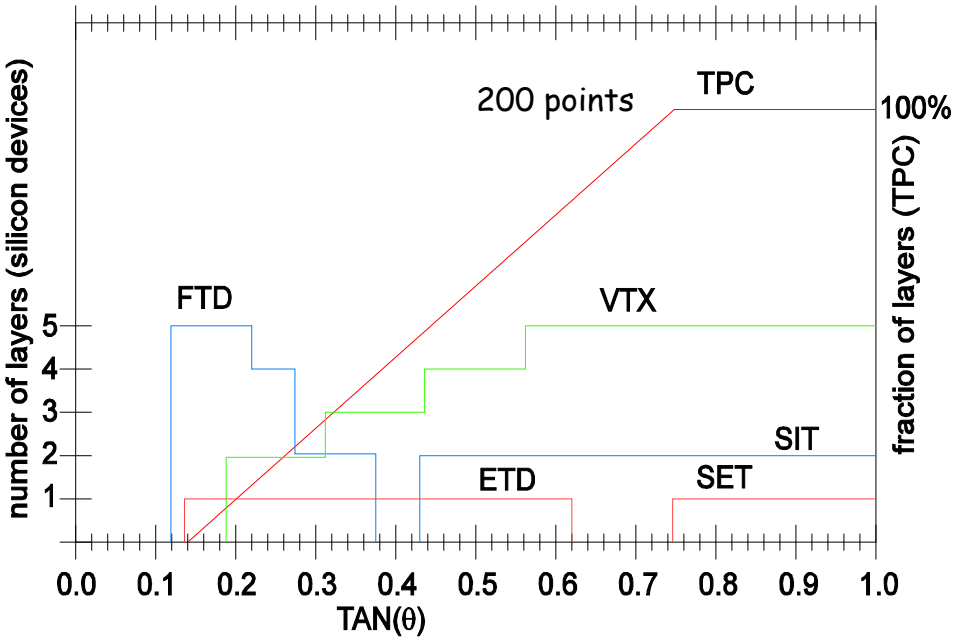
Tracking in LDC

Highly efficient tracking through



robustness of the TPC against background (D. Peterson)

- many (200) 3D points in TPC
- up to 8 additional high precision points in SI



Number of reconstructed points

The Vertex Detector

conceptual design remains unchanged

five layers, no endcaps, equal spacing,
inner radius 1.55cm
outer radius 6.00cm

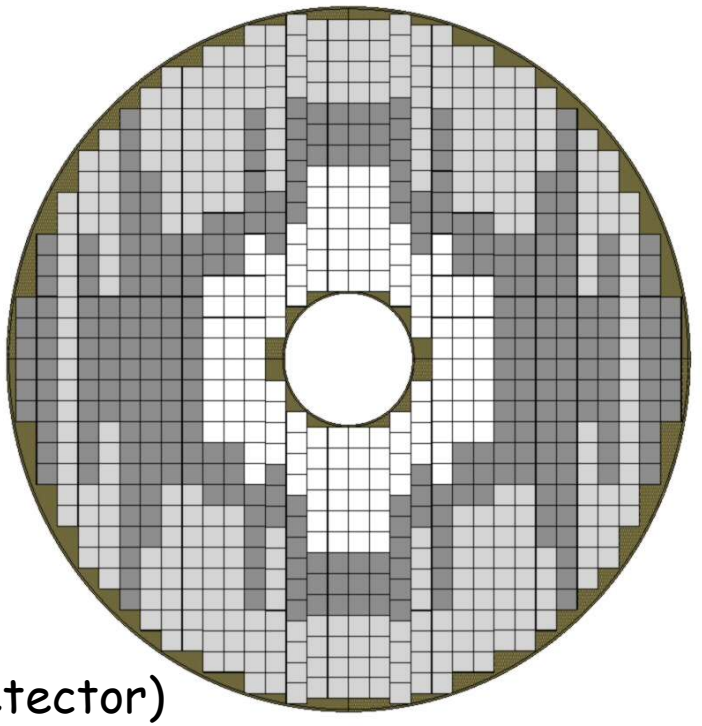
No decision on any technology at the moment
CCD – MAPS – CMOS - .. are all considered

External Tracking Detectors

- precise space point behind the TPC endplate:
  - improve angle measurement
  - help to „understand" material in the TPC endcap

- SI detector outside the TPC barrel
  - either as standalone „tracker"
  - or as highly granular first layer of the ECAL

Exact role of external Silicon needs to be defined



tiling structure of a SI disks for the ETD (endcap tracking detector)

Calorimeters

Design and layout of calorimeters driven by particle flow

stress granularity over energy resolution

small transverse cell sizes (5x5 mm2 in ECAL, 3x3 cm2 in HCAL, 1x1cm2 digital HCAL)

many longitudinal samplings

ECAL: SI-W calorimeter
HCAL: Fe-Scintillator calorimeter
or Fe-RPC digital calorimeter

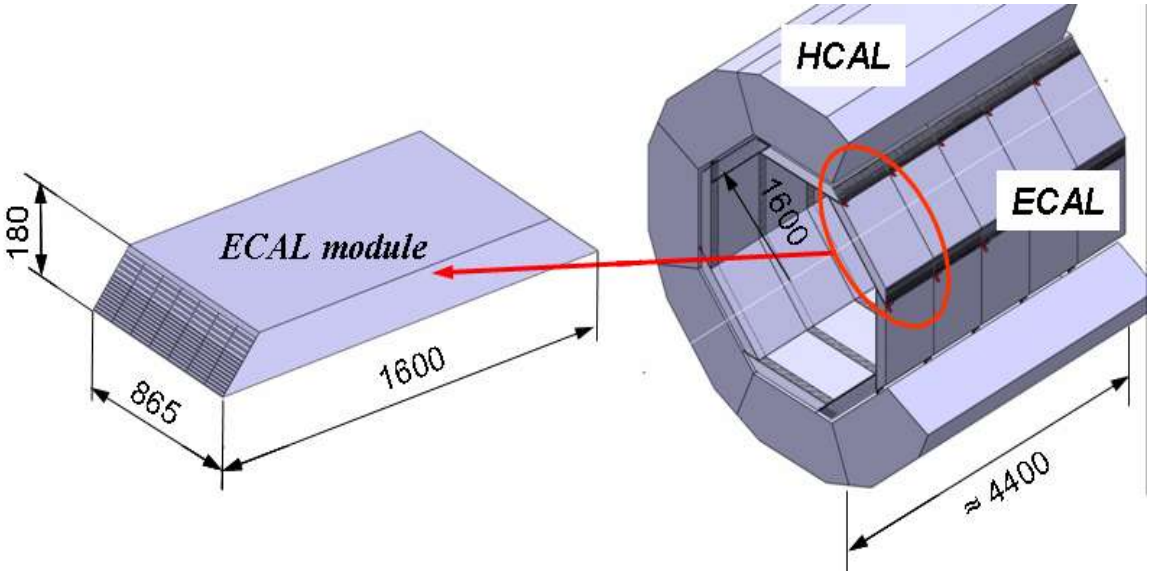
detailed technical studies are done in the context of the R&D groups (CALICE and others)

ECAL

SI-W calorimeter

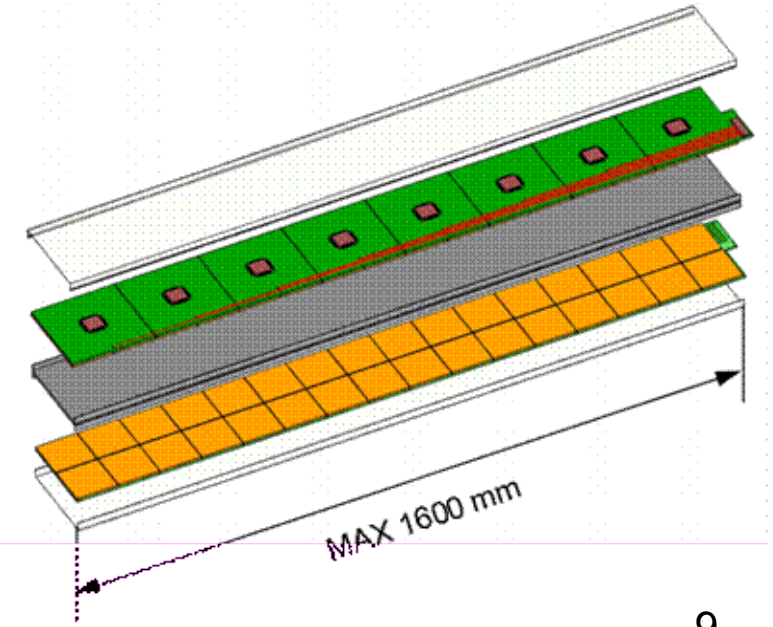
basic ECAL structure
remains unchanged

but many changes in detail



smaller cell size
different readout scheme
(electronics integrated in readout board)
(very challenging, heat dissipation?)

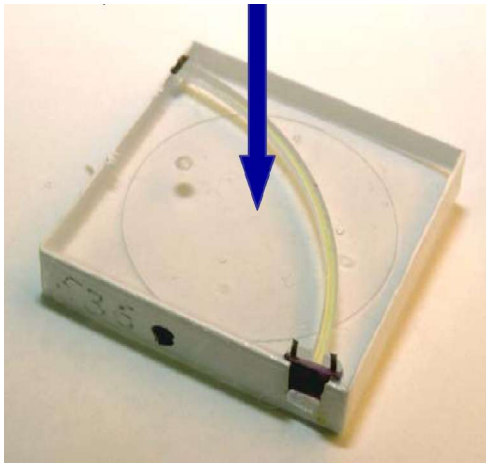
Beam test under way (CALICE)

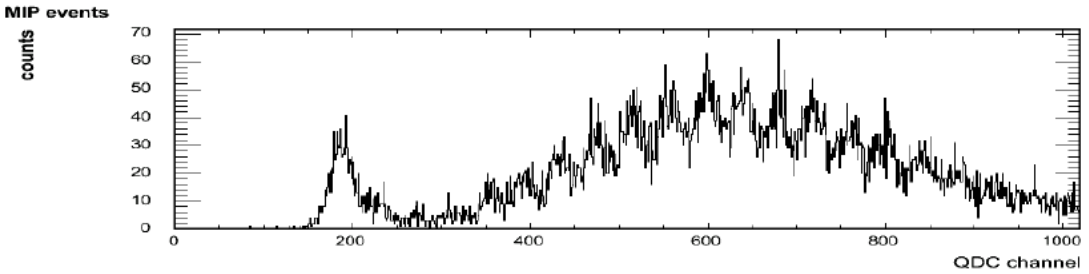


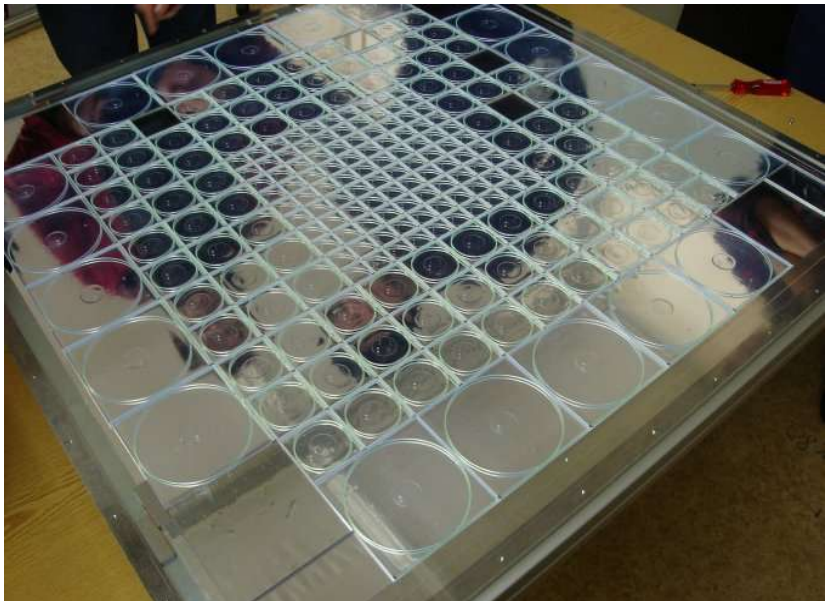
HCAL

Explore two options:

- Fe-Scintillator calorimeter (analogue version)
- Fe-RPC calorimeter (digital version)







analogue version:
based on SIPM readout

test beam being
prepared (CALICE)

RPC based version under
development

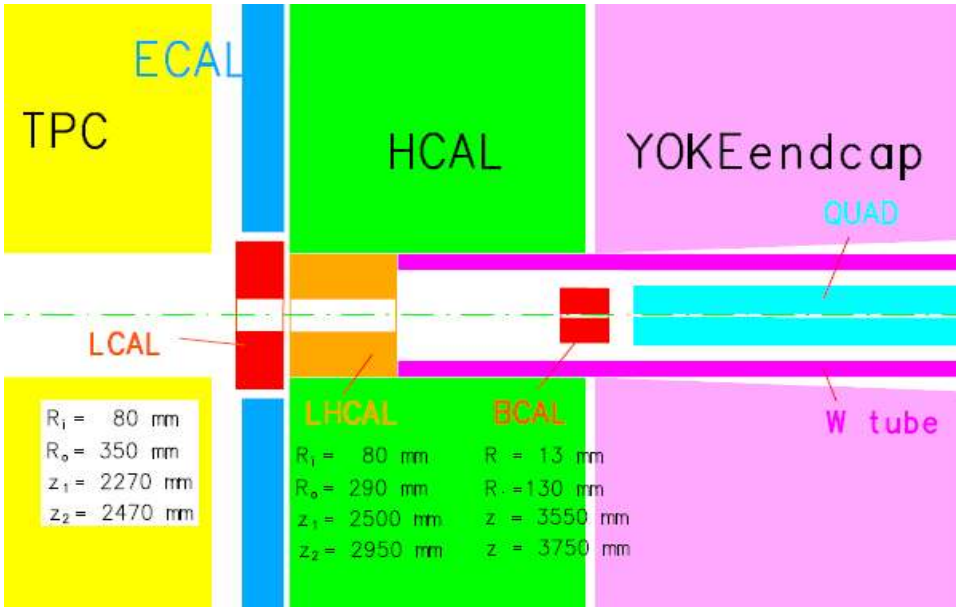
Forward Region

forward region has been redesigned:

design with 2mrad crossing angle

adopted to new overall LDC dimensions

LCAL now in line with ECAL EC
new small calo added to add particle
ID functionality to LCAL
overall concept now allows easier access



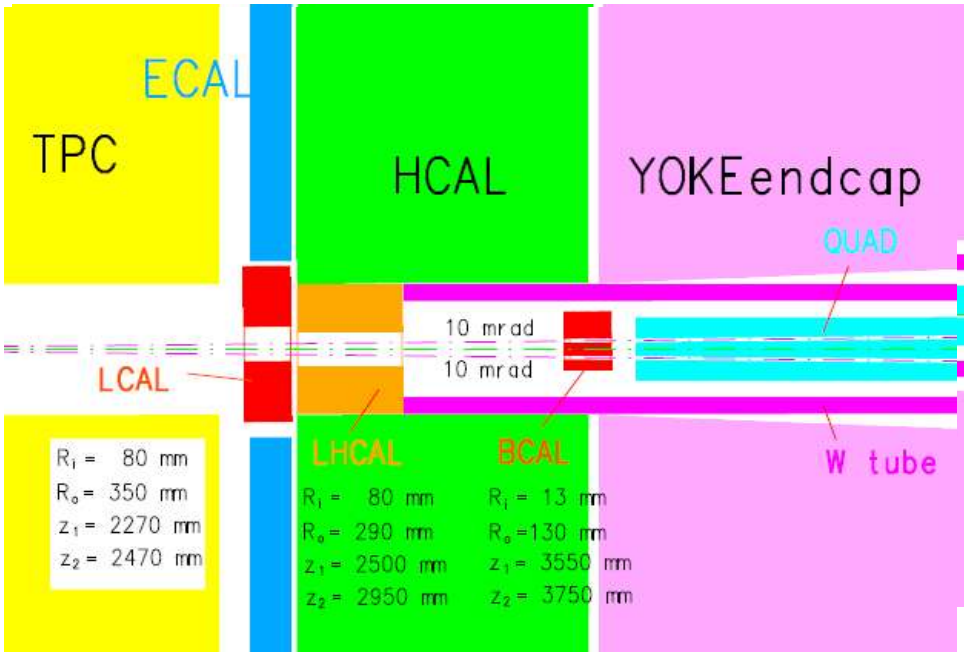
Forward Region

forward region has been slightly redesigned:

design with 20mrad crossing angle

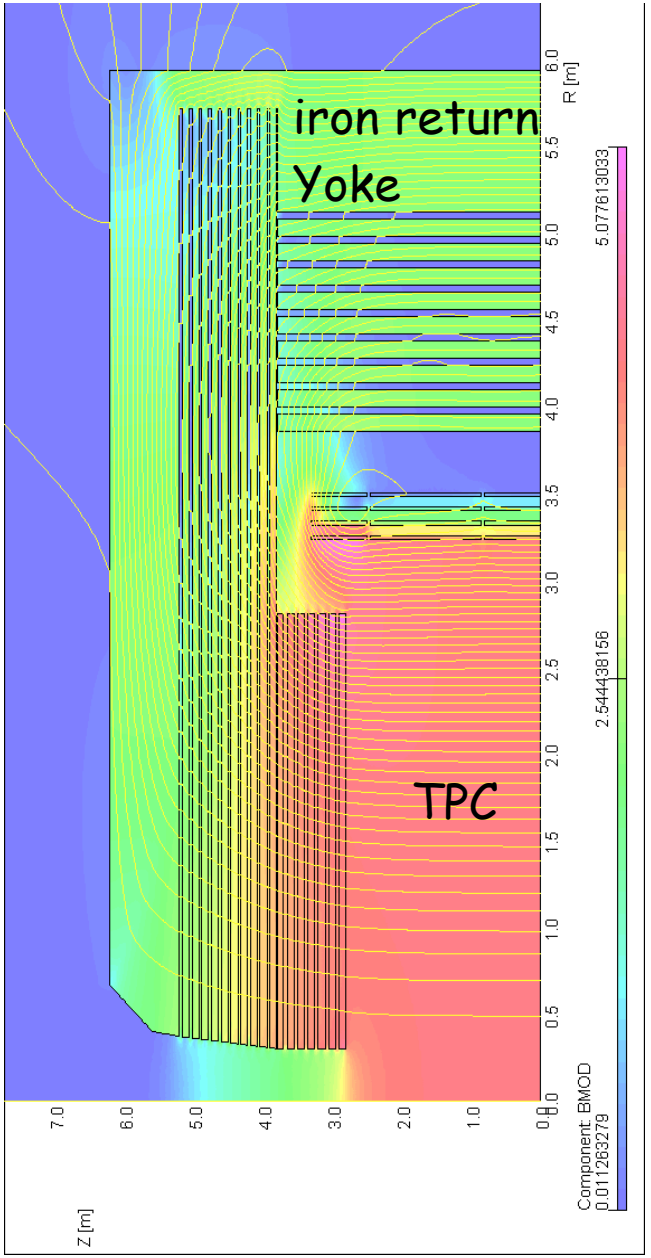
adopted to new overall LDC dimensions

LCAL now in line with ECAL EC
new small calo added to add particle ID functionality to LCAL
overall concept now allows easier access



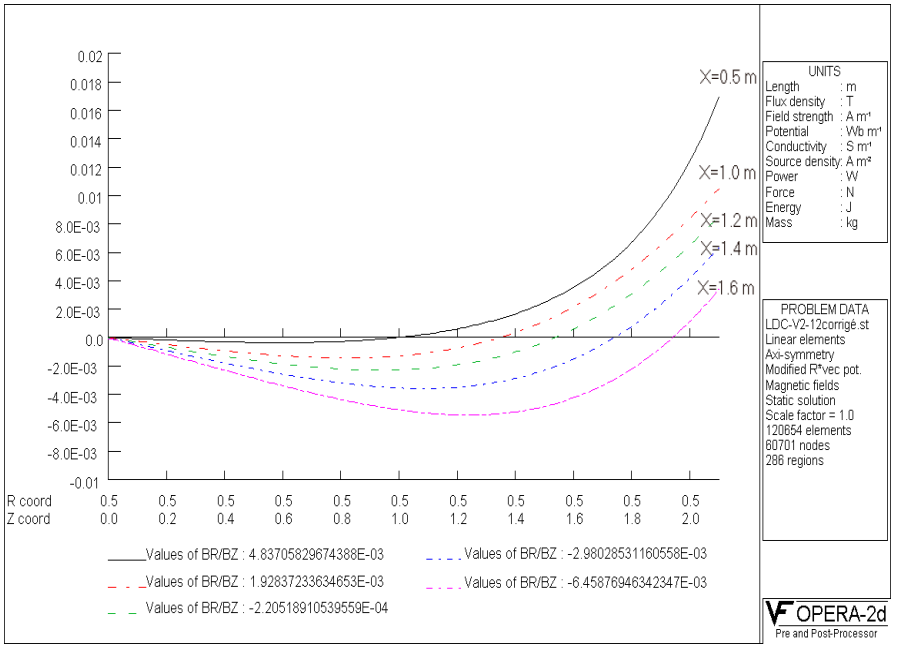
Warning: backgrounds for this new configuration are under evaluation

Magnet



based on the CMS design, but shortened

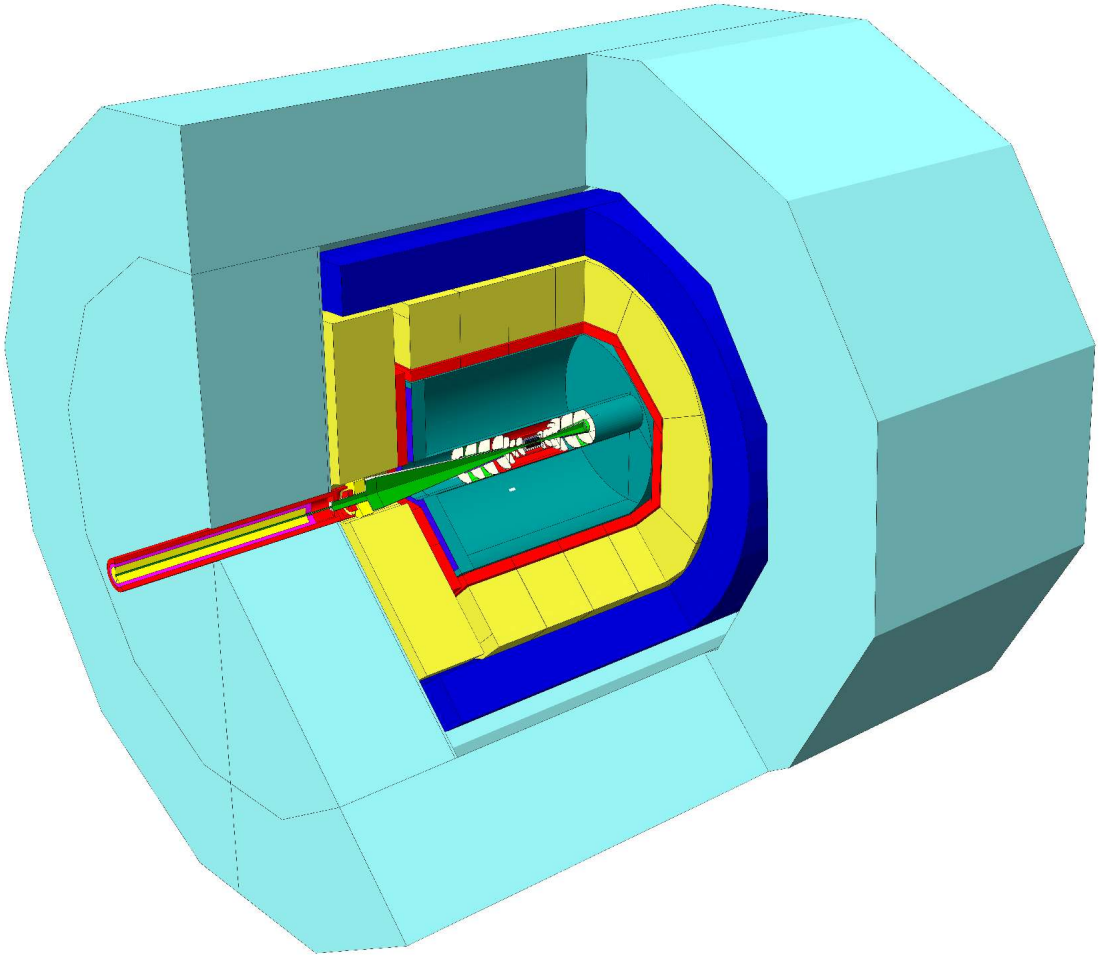
field homogeneity is achieved through corrector coils



max ∫Br/Bz<7mm

But full evaluatin of limit is needed

Muon System

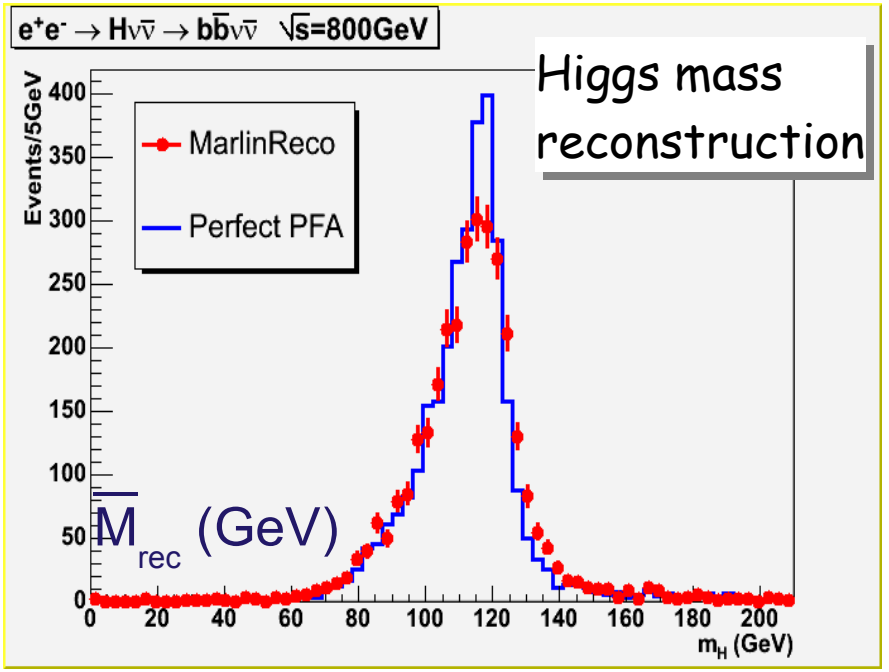


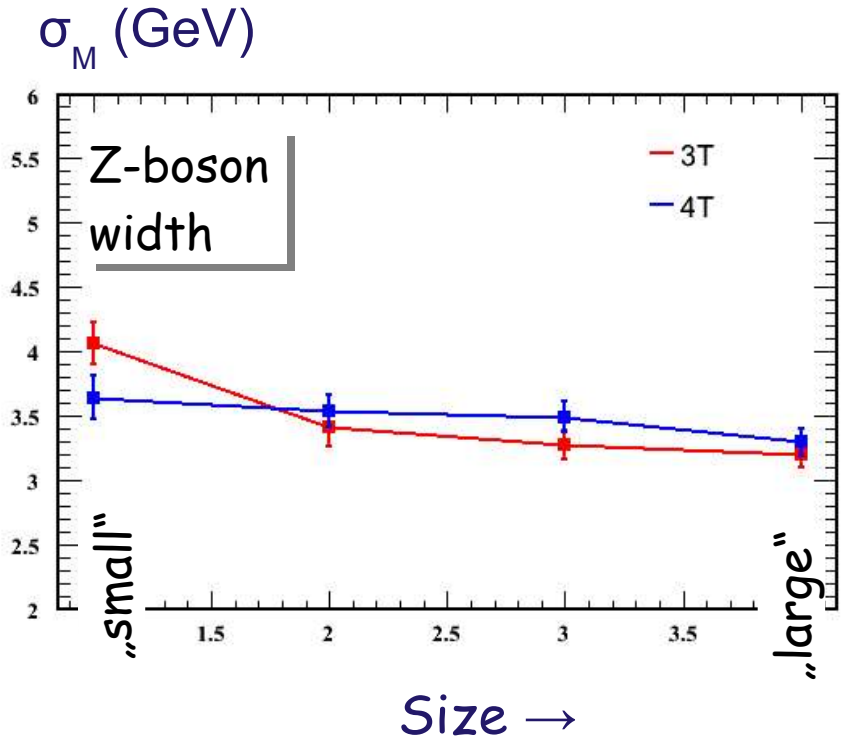
Muon system:
instrumented Yoke

instrumented with large area cheap chambers, e.g. RPC chambers

Performance and Optimization

Particle Flow algorithms are under development



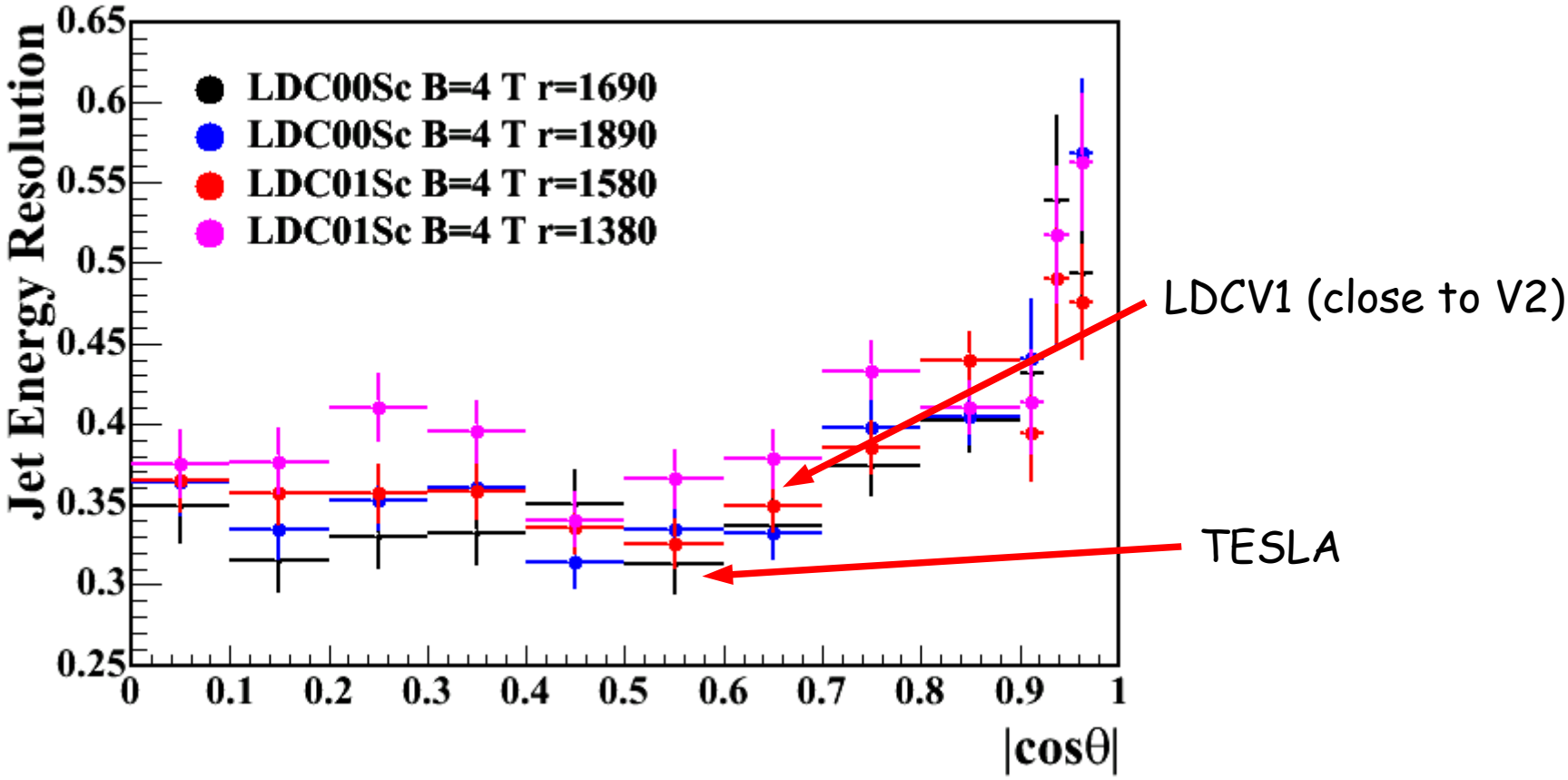


dependence of Z width on the B-field and on the size of the detector

but tools are still not good enough to draw real conclusions

Performance continued

Particle Flow performance as a function of cos(theta)



M.Thompson, Pandora PFA

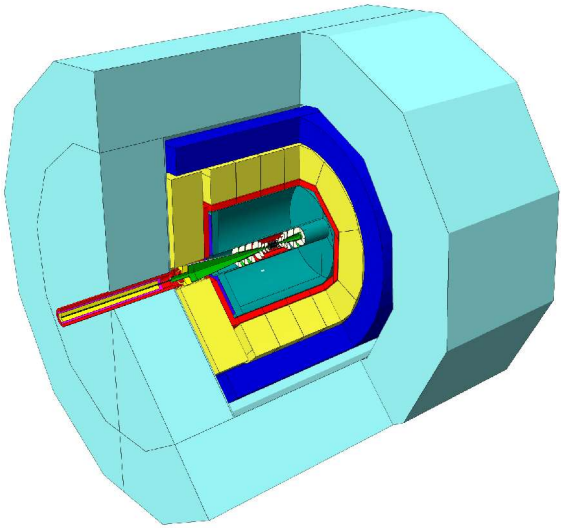
The LDC DOD

Large Detector Concept
Outline Document

Draft Version 1.2, March 7, 2006

Prepared by the LDC group for the Reference Design Report of the International Linear Collider.

This version for internal review only, not for public distribution!



First version is available on the WEB
(but not really fininshed)

http://www.ilcldc.org
-> documents -> outline document

The LDC DOD

The LDC DOD in a prelimiary form has been released just before LCWS2006

many thanks to the many people who helped to make this possible

BUT

the document is far from being finished,
we expect the next few (weeks/ months) to continue to work and to update the document

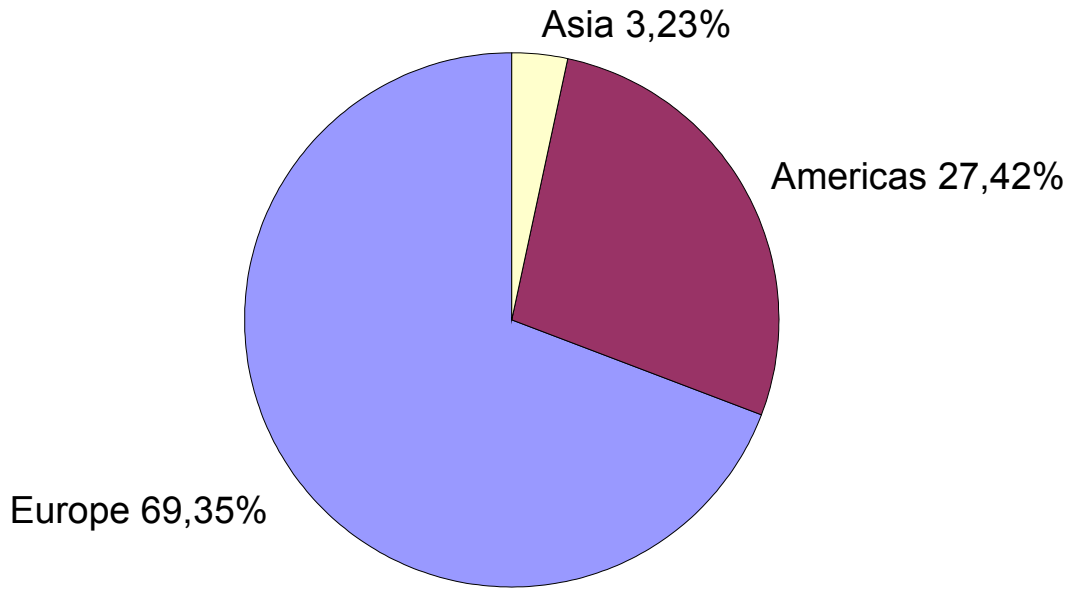
particularly in the area of performance studies

The LDC group

The LDC concept group:

148 people have currently signed up to LDC

Most of them are included in the authors list for the DOD



European dominate at least by numbers, but healthy American members. Asia is weak in LDC

(if you do not want to be included, use the ilcldc to sign off from the document)

The LDC DOD

Was for LDC a second iteration started from the TESLA detector

this is good, because it forced us to re-think the situation, and to re-evaluate many options taken at the time of the TESLA TDR

For a more in depth evaluation, we need the results from the R&D collaborations, which are not yet there.

Therefore the LDC DOD could by construction only be a rather intermediate document, reflecting a snapshot of a long development, which will continue to happen for the next few years.

Costing LDC

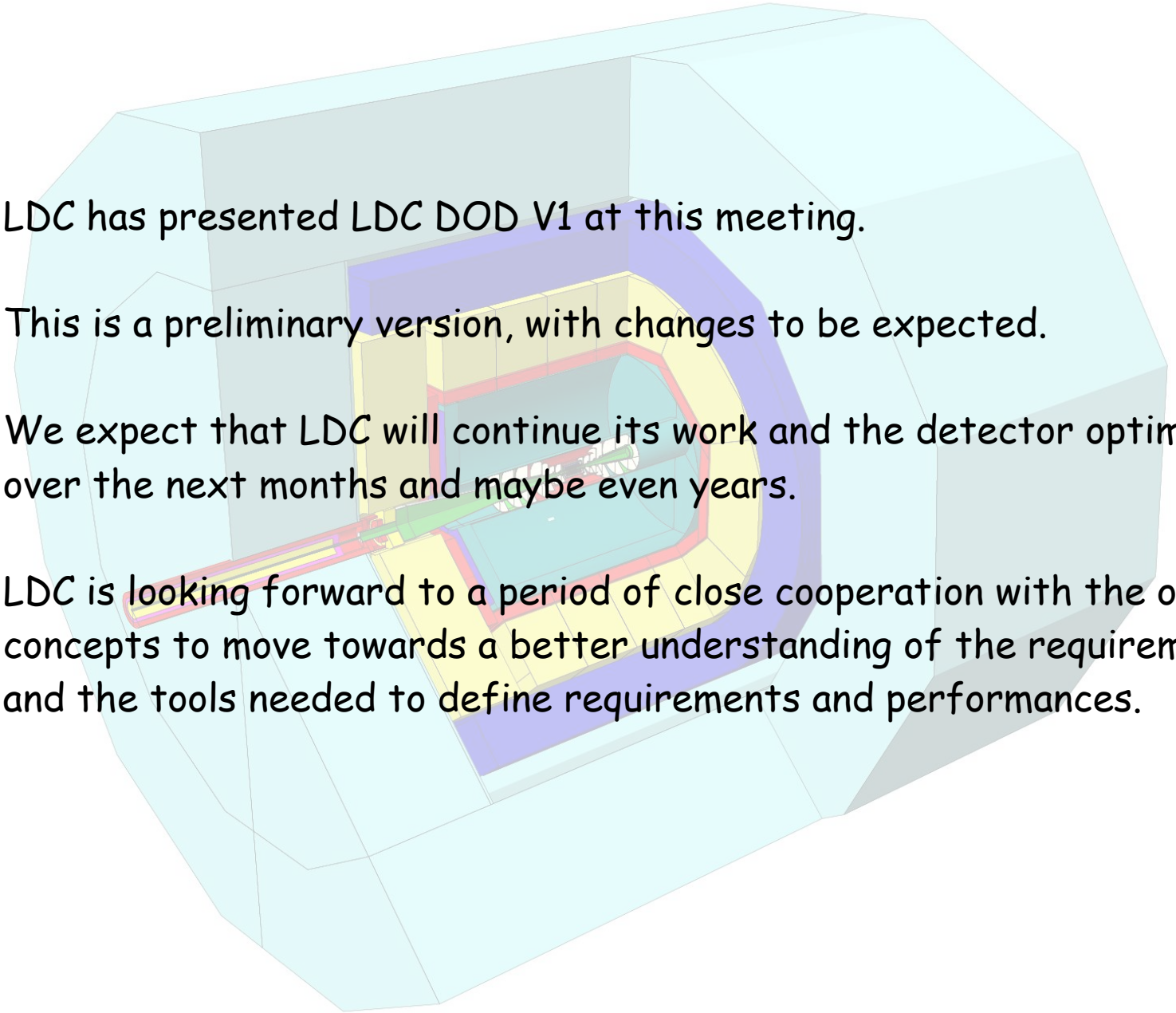
At the moment:

The LDC DOD does not contain any costs.

We have not yet sufficiently understood the costing nor the costing systematics to make a realistic cost estimate.

We will work with the other concepts, the R&D groups, and the WWS to rectify this situation.

Summary and Conclusion



LDC has presented LDC DOD V1 at this meeting.

This is a preliminary version, with changes to be expected.

We expect that LDC will continue its work and the detector optimization over the next months and maybe even years.

LDC is looking forward to a period of close cooperation with the other concepts to move towards a better understanding of the requirements and the tools needed to define requirements and performances.