From the Tesla TDR to the LDC baseline

How to answer some of the global questions
of the LDC sketch document?

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There has already be quite some interesting
discussions in the LDC concept group about these questions

SiD LDC GLD

How does LDC stay between SiD and GLD
with quite some overlap

LDC / SiD : TPC + ~ size + ~ field

LDC / GLD : Si_W calorimeter + ~ size + ~ field
but for recent evolution

With the type of R_M we can reach,
the bargain is only between distance and cell size

Is it then the TPC which determines the size?

What is the TPC argument: redundancy in 3d

you can look

Pattern efficiency in general
but specifically for V^0, kinks and backscattering

Low level of fakes at high energy

dE/dx for electrons

What are the drawbacks?

the distortions and their stability

the capability to reach the momentum resolution

problem of length (radius),
point resolution?
alignment
distortions

A smaller, shorter TPC makes it easier but for the BR^2

Can a thin Si detector help?
what does it do for backscattering?

If we achieve a better granularity for ECAL, say 5x5 mm2, we may go for a smaller TPC.

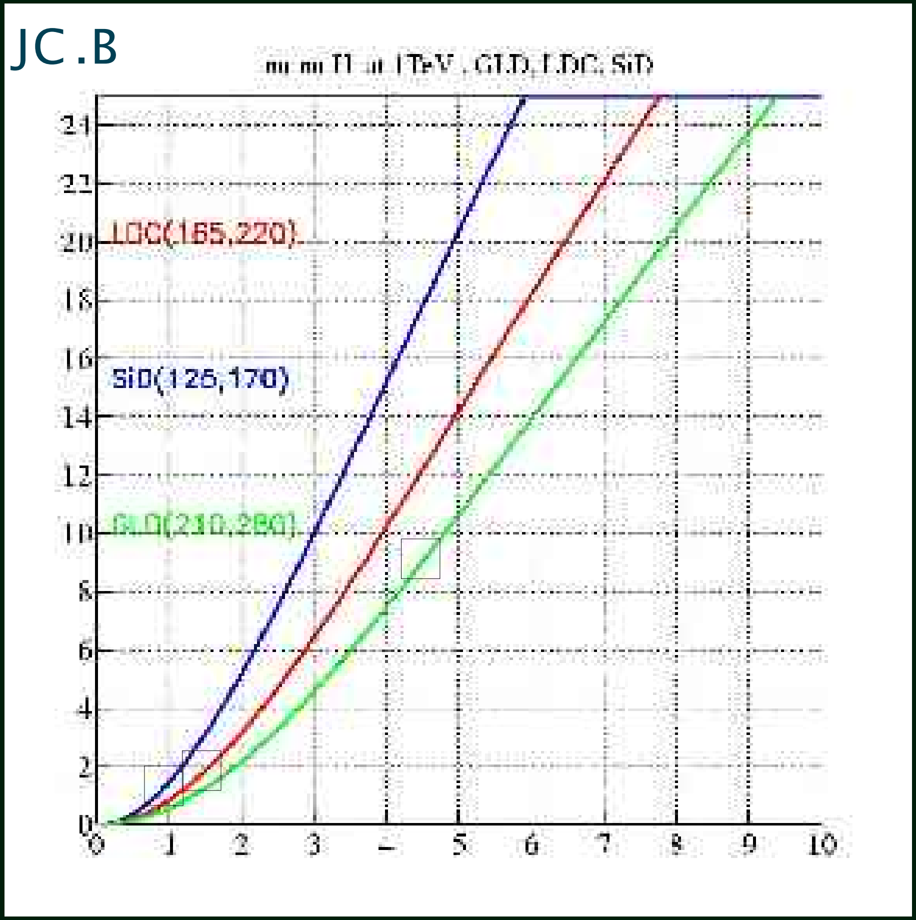
What about the field quality required?
In the Tesla TDR with a 9.25 m coil
and extra windings
and a 5 m TPC the worst displacement is 1.5 mm
with a 7m coil and the same windings for a 5m TPC we go to 21mm. (F. Kircher)

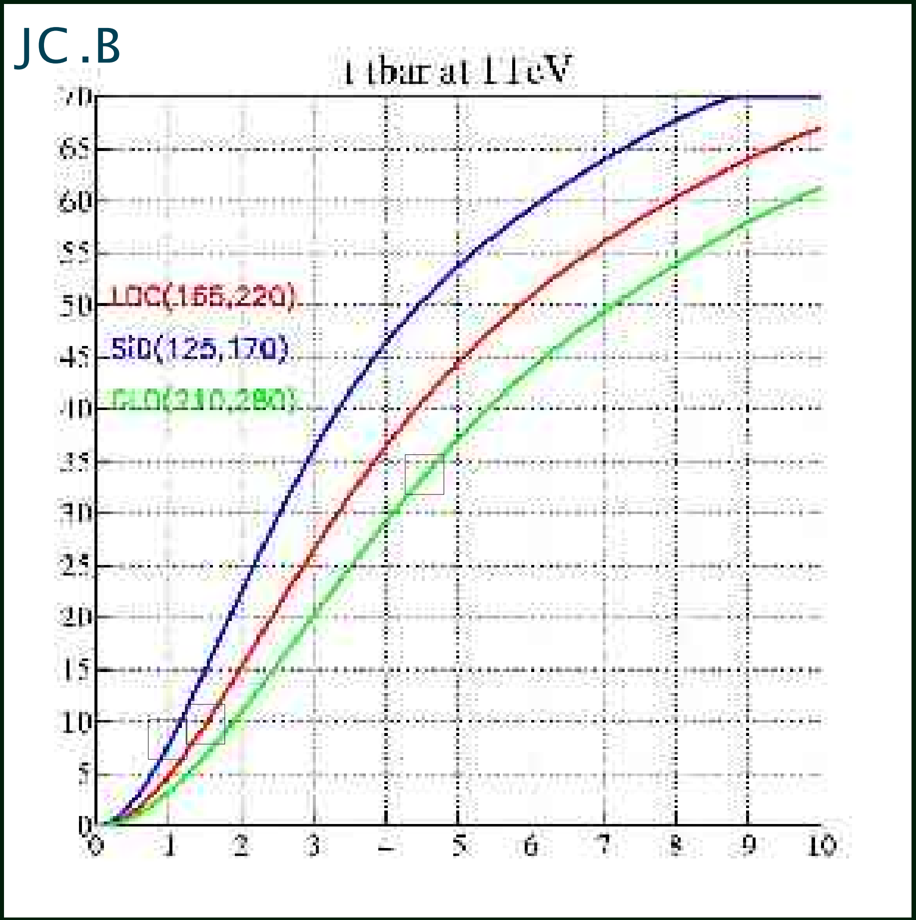
$$\int_0^{2.5} \frac{B_r}{B_z} dz$$

My guess is that for a 4m TPC and optimised windings the displacement will be < 10mm.
Good enough?

That was discussed yesterday. It could be accepted.
Check the real value and the inhomogeneity in the Z=0 plane

Fraction of the total event photon energy closer to a charged track than the abcissa



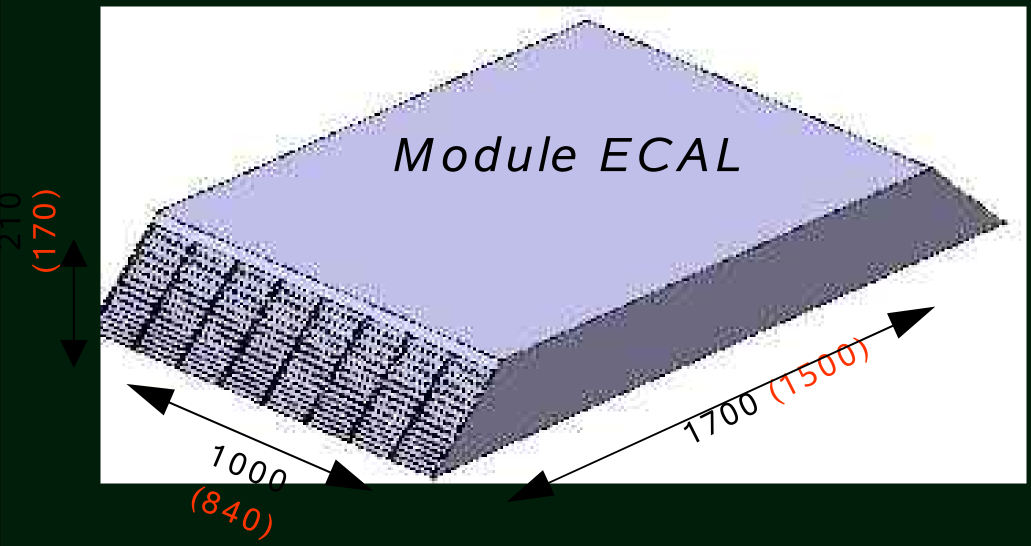


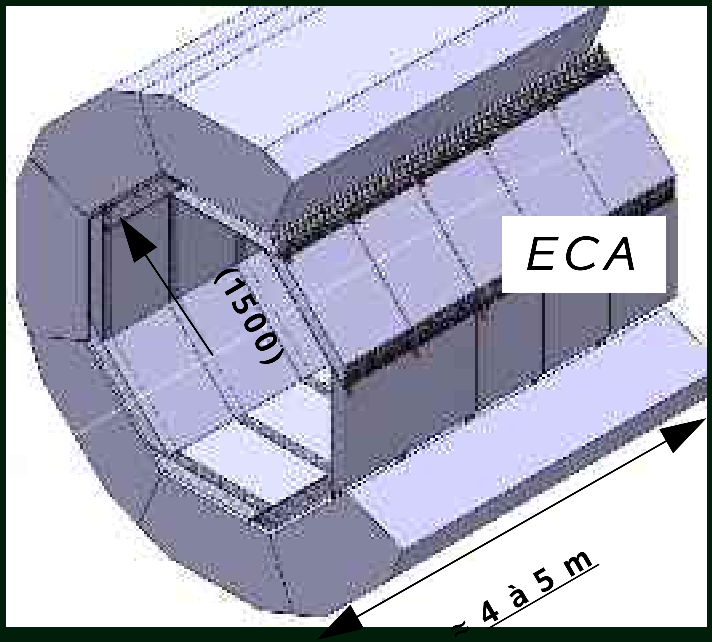
Energy fraction

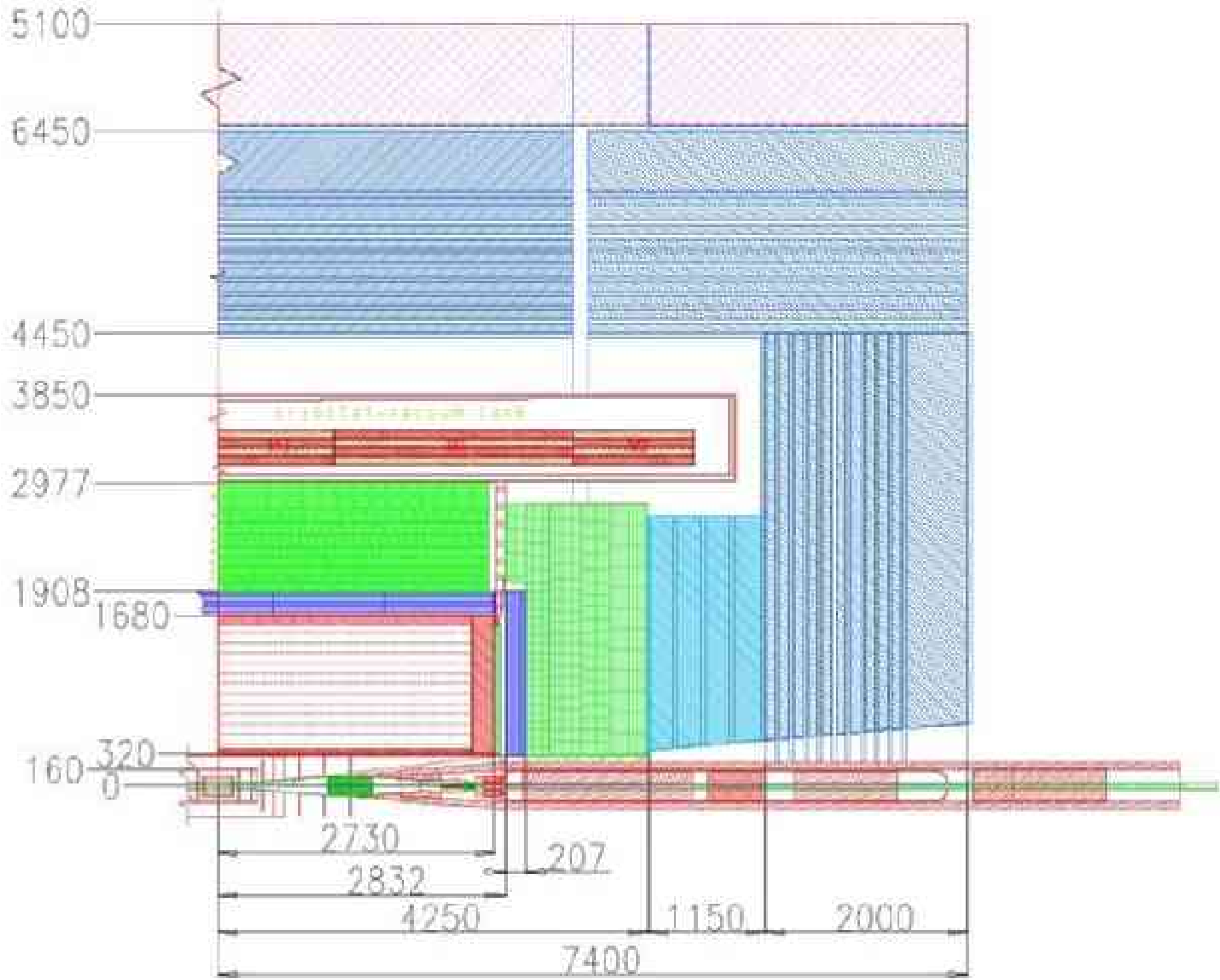
Distance in cm

What drives the choice of 4m?
- Si forward chambers (thin) relieve the need for a very long TPC.
- The technology we explore for the ECAL derives the length of the ECAL from the wafer length!

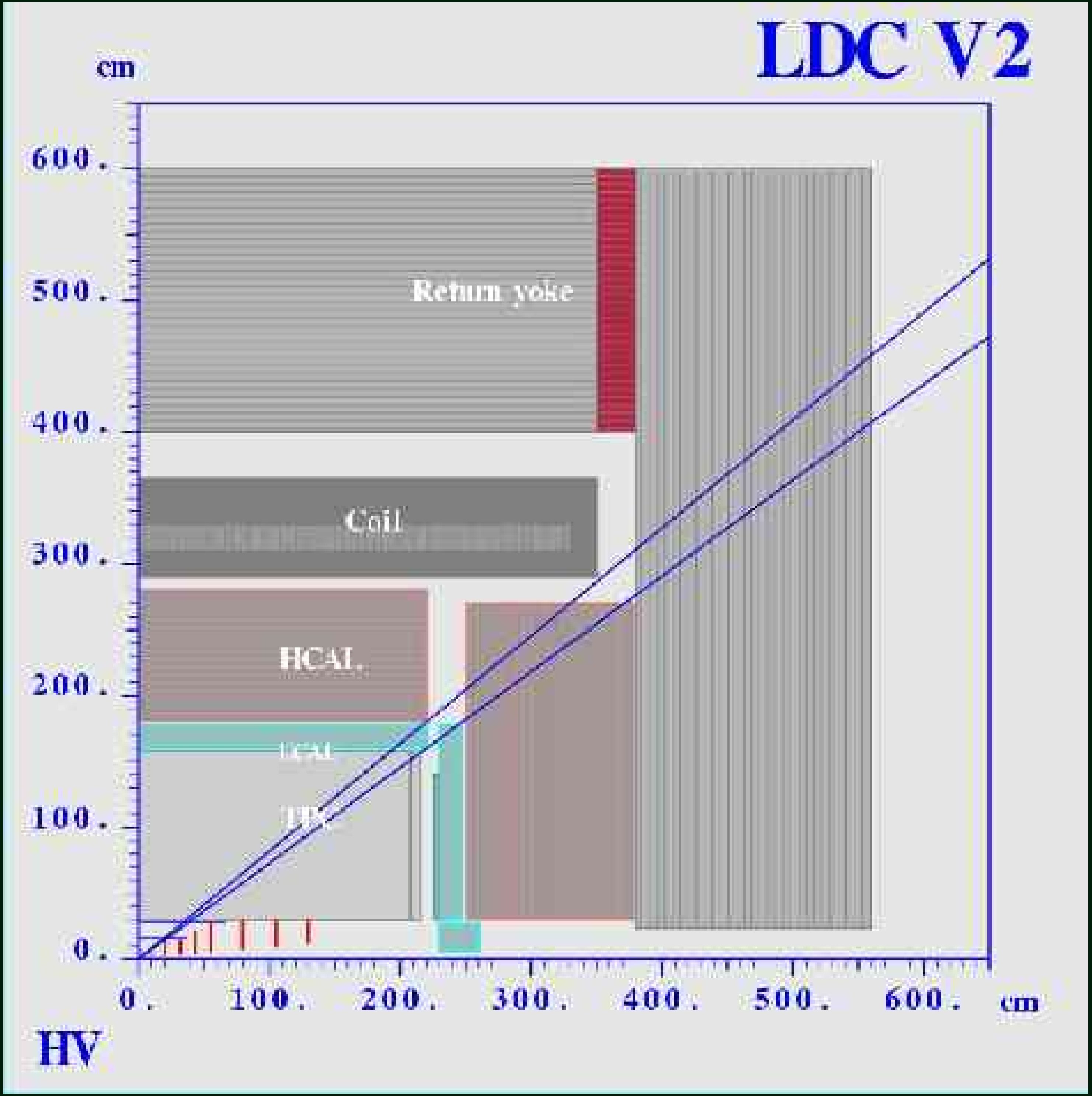
~ 7x5x13 cm   450 cm






5100
6450
4450
3850
2977
1908
1680
320
160
0
2730
2832
207
4250
1150
2000
7400

We can try this configuration implemented in Mokka in a scalable form under the name of LDC_1



The values used for the drawing are

Coil cryostat'

inner radius	290.
outer radius	365.
half length	350.

TPC

inner radius	30.
outer radius	158.
half length	208.
end plate th	8.

Forward chambers

inner radius	30.
outer radius	140.
forward face	226.
backward	230.

ECAL barrel

inner radius	160.
outer radius	177.
half length	220.

HCAL barrel

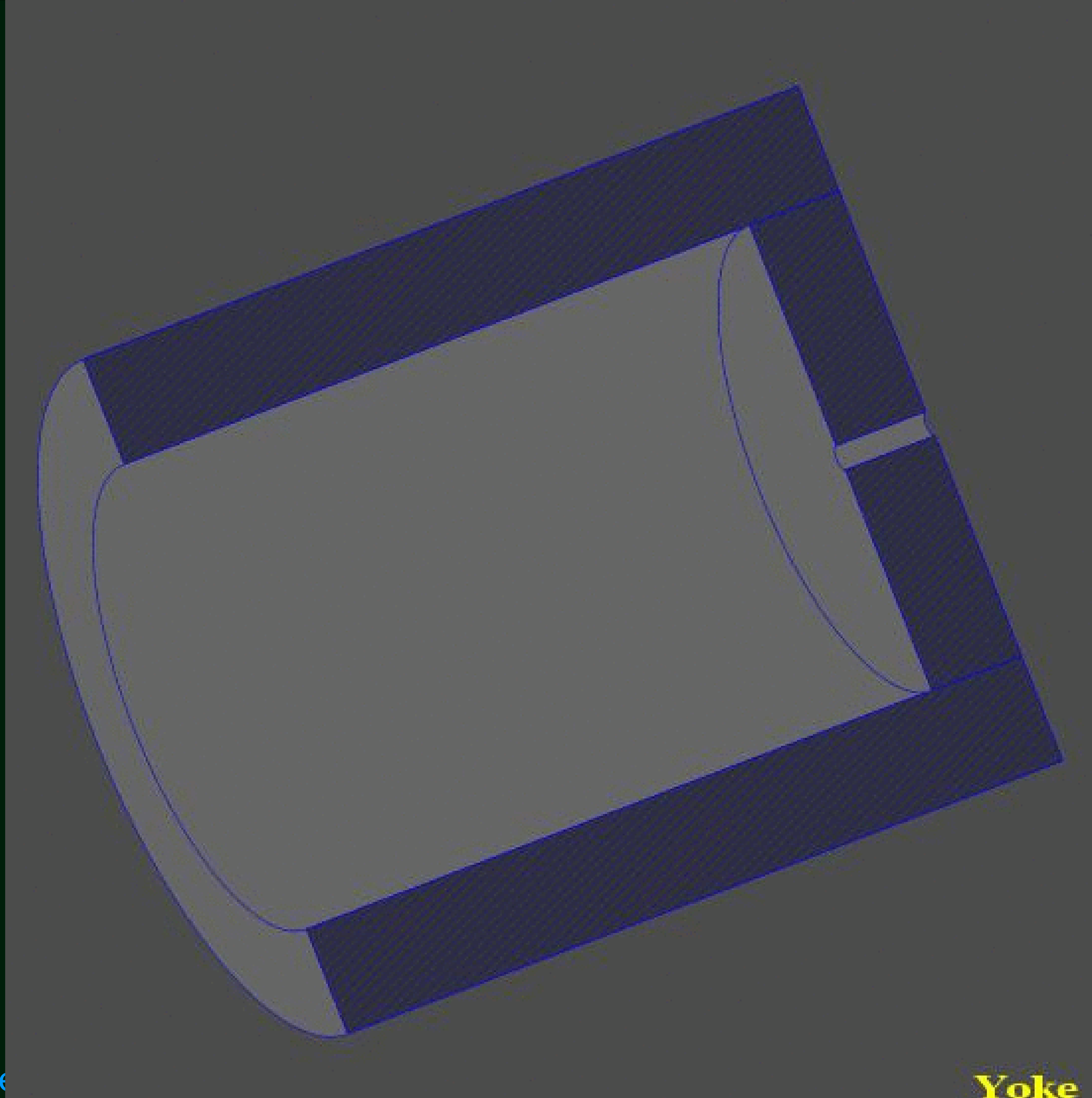
inner radius	180.
outer radius	280.
half length	220.

ECAL end caps

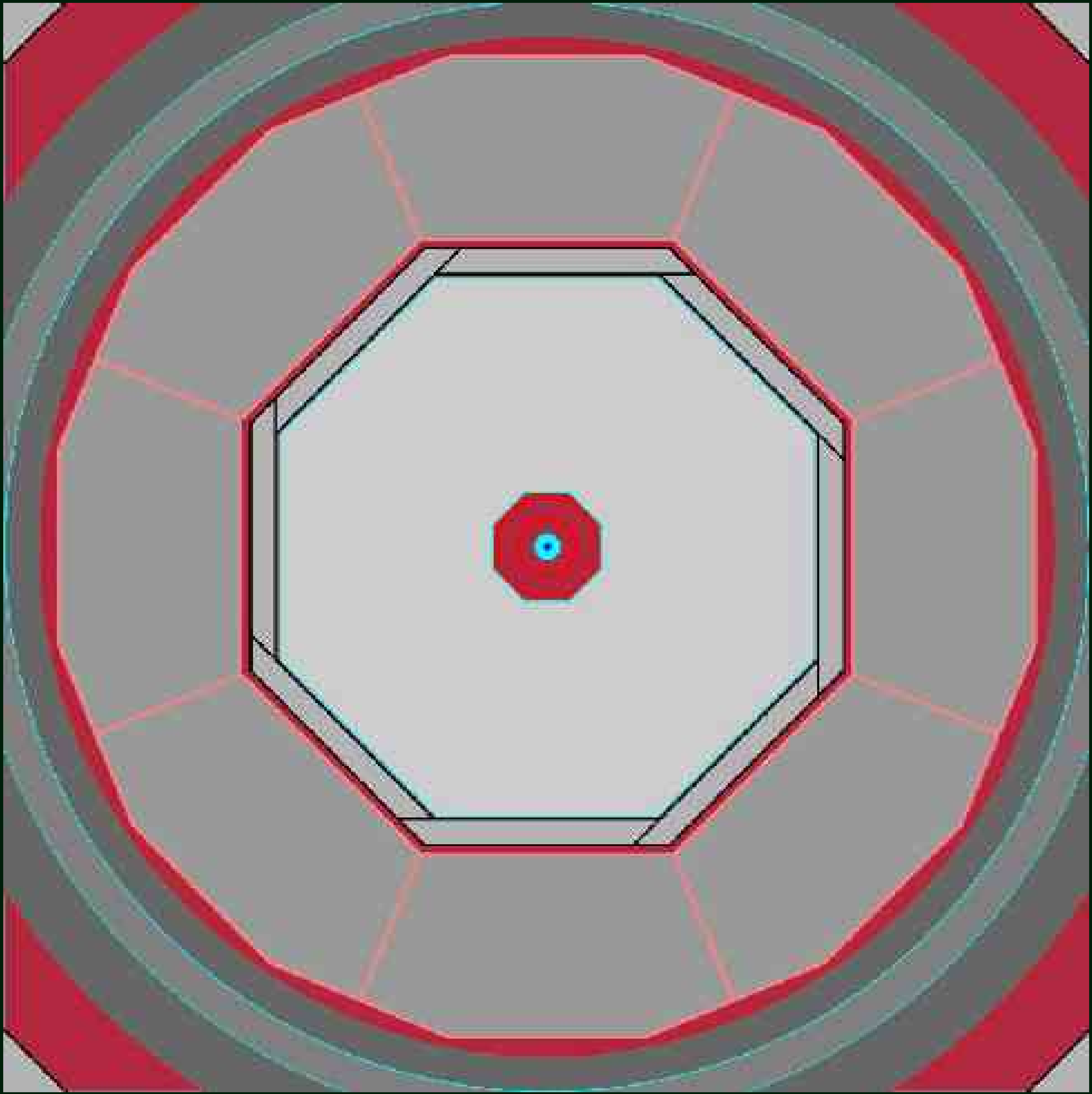
inner radius	30.
outer radius	178.
forward face	230.
backward	247.

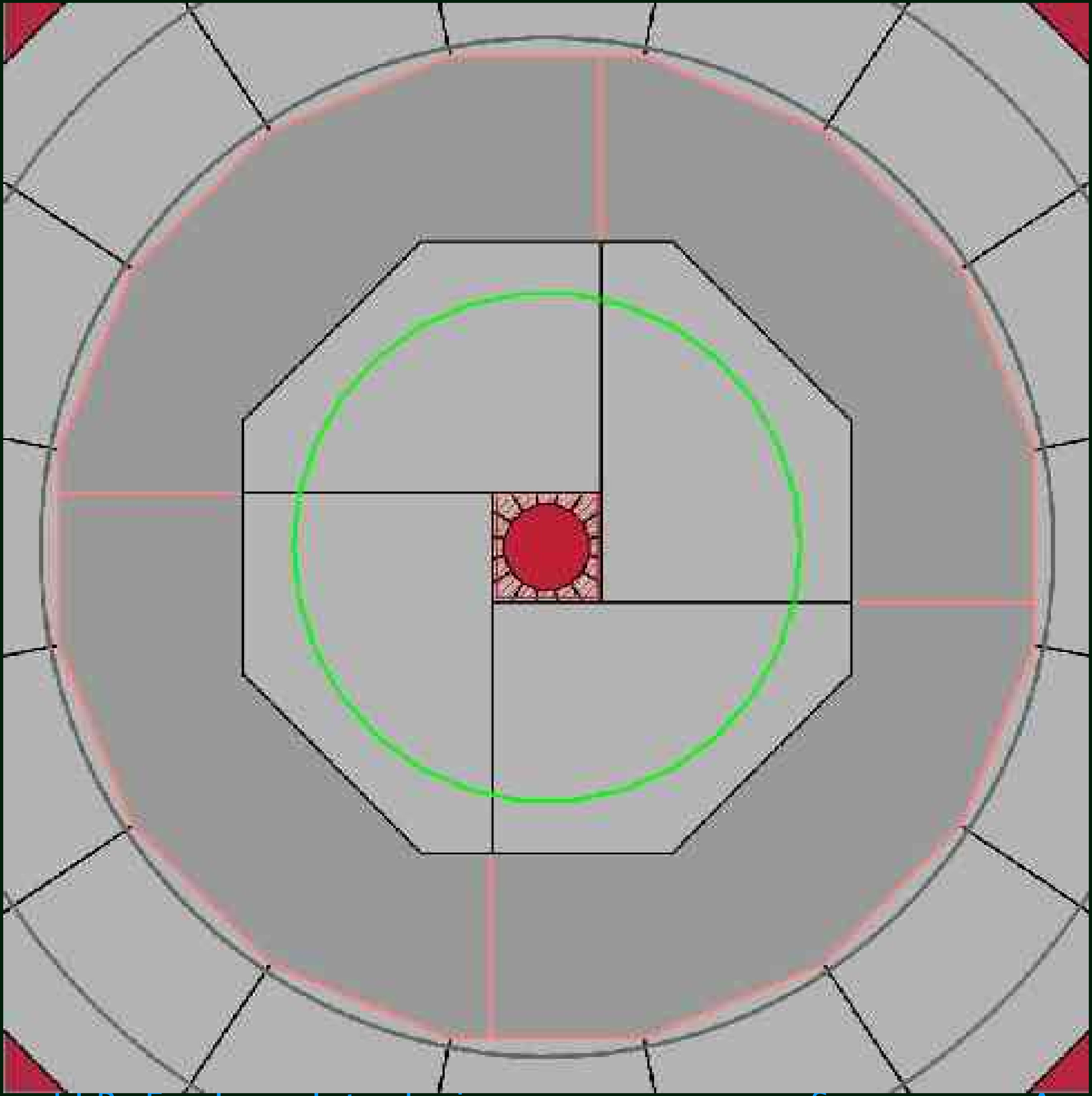
HCAL end caps

inner radius	30.
outer radius	270.
forward face	250.
backward	380.


Yoke

Octagonal TPC.
~ Agreed yesterday.





Challenges:
TPC end plates thickness <8cm
Forward chambers th. <4cm

The ECAL is meant to have 20 layers of 2.1 mm of W followed by 10 layers of 4.2.
We consider a granularity of ≤7x7 mm2
and 3x3 in the first 8 layers. The physics need is under investigation.

The HCAL is not defined here except that it is 1m deep for the barrel, 1.3 in the end caps.
The choice between iron, tungsten or a mixture is to be made.

We need to finalise a baseline detector.
(not the final one!)
This means to have defined the overall shape and the borders in such a way that each subdetector can be essentially optimised independently.

To achieve this we need to identify quickly (if not now) the people who will bring some answers to the most important questions from the sketch document and those which have been forgotten.

We could also dedicate some time here to detailed discussion of some of these issues. (being done)

In particular

what is the role of SIT? how is it fulfilled?

What do we expect from the FCH
behind the TPC? track recognition, precision?

Field quality for the TPC
do we need anything special
for alignment and calibration?

A realistic drawing of the TPC

Performances of the forward disks

Calorimetry

W/Pb changes the ECAL thickness by ~ 4cm
Choice from mechanics and price!

Choice on granularity from technology
and the cooling problem.
Impact on DAQ limited.

HCAL,
aside analogue/digital
gas/dense medium
nature of the radiator, depth
performance, cost, mechanics

We should try to get most of it done
at about the time of Vienna.

We may have to organise ourselves
slightly more than we are