

Mechanical studies for a TPC at the ILC

I-DEAS for the ILD-TPC

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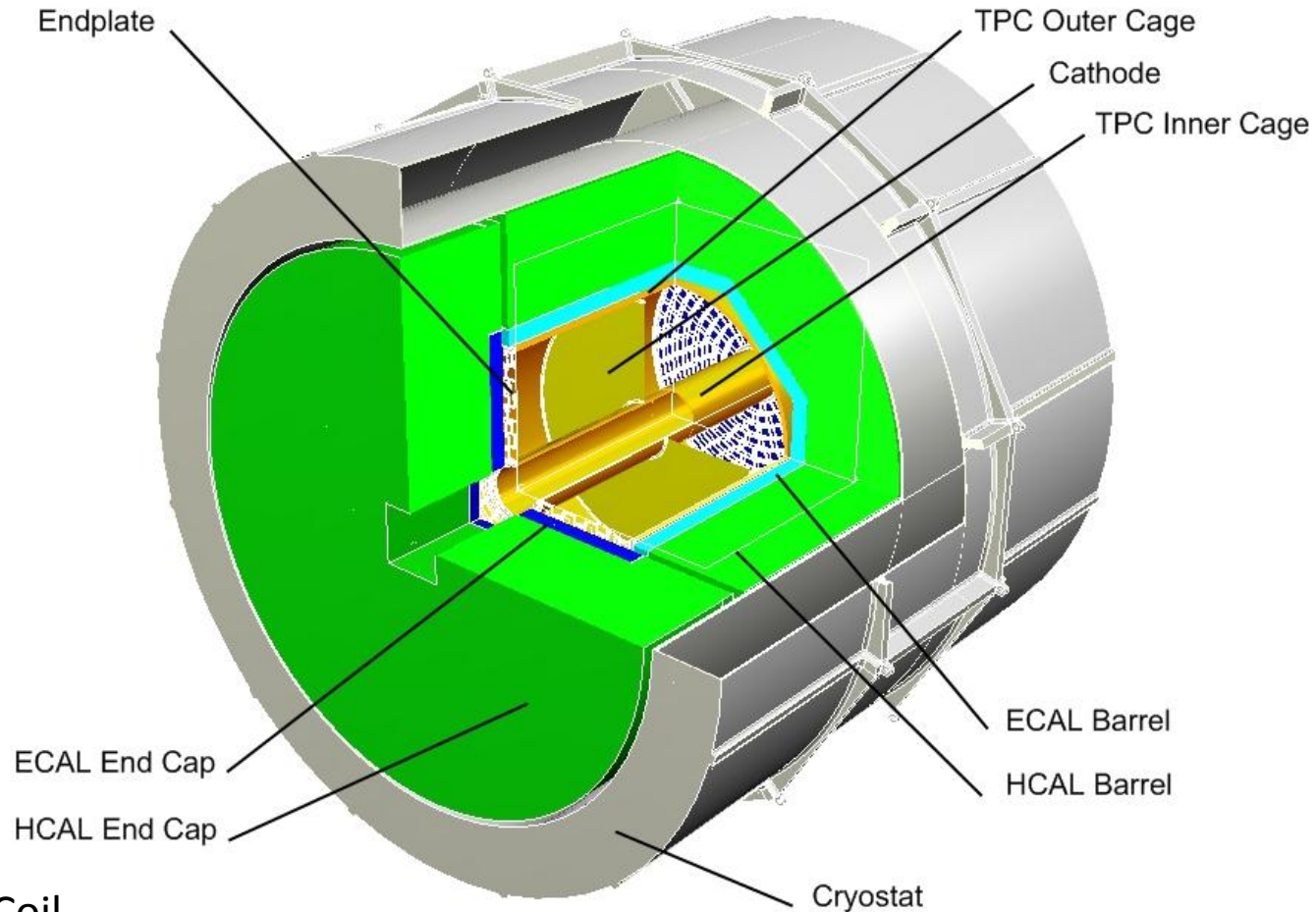
Advanced European Infrastructures
for Detectors at Accelerators

6/7/2012

The mechanical model

Detector components
inside the magnet

- VTX
- Silicon
- TPC
- Calorimeters

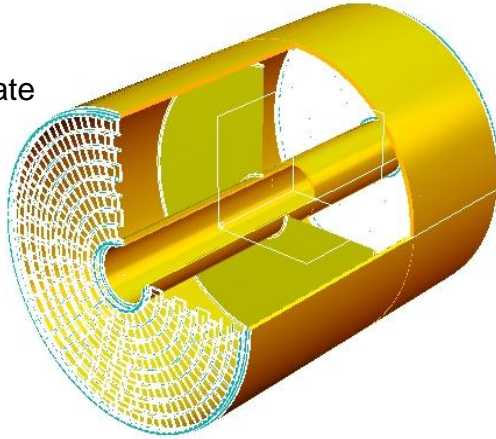


Current model:

- TPC supported from Coil
- Inner detectors supported from TPC

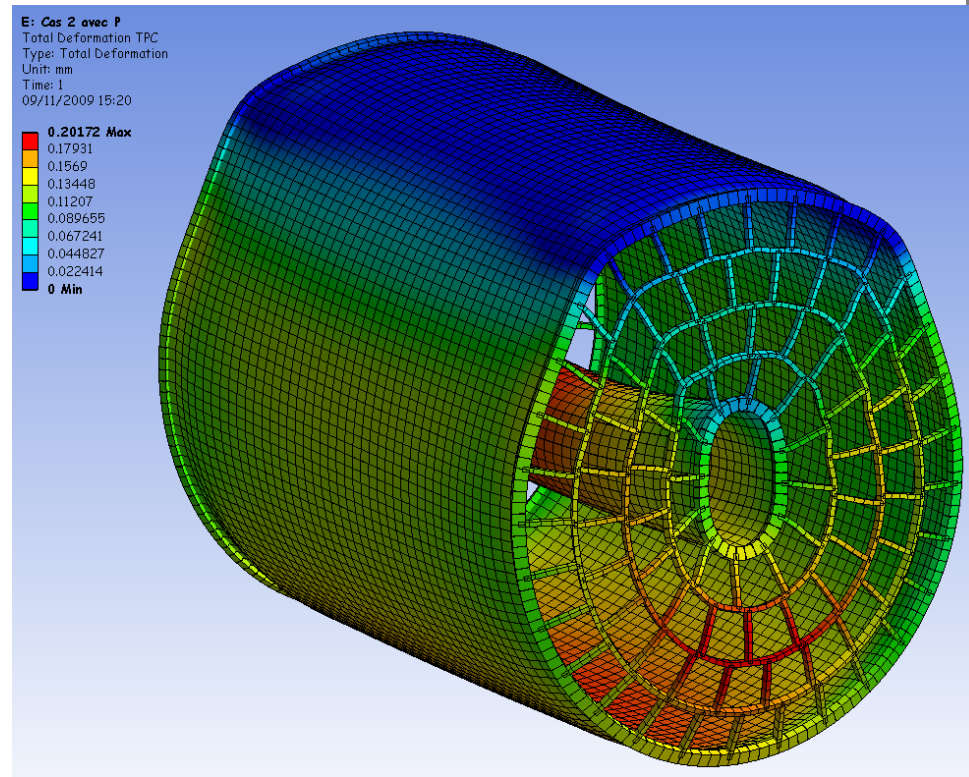
Design studies: mechanical properties

Light weight Endplate
by D.Peterson

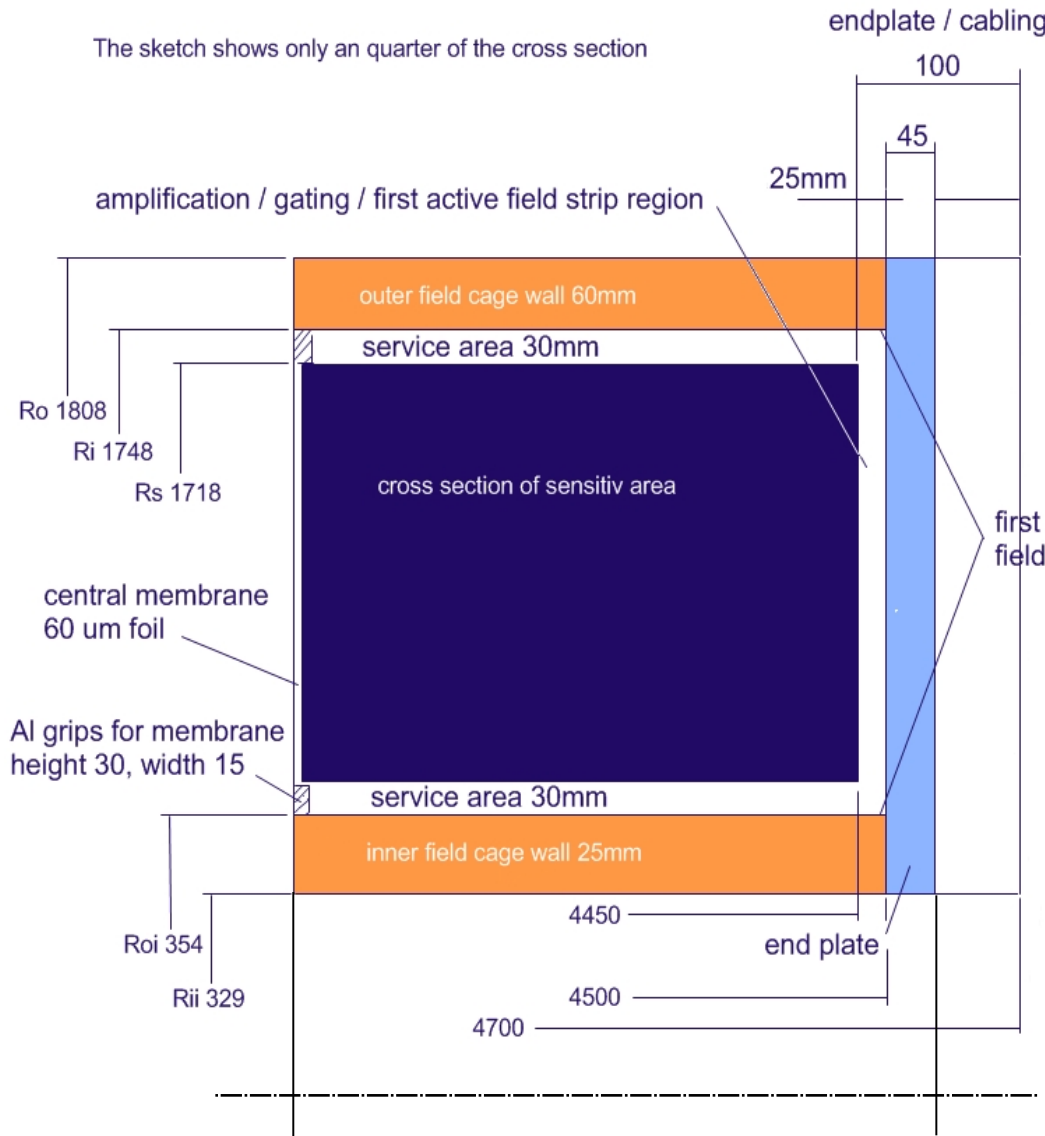


FEM Calculations by CEA Saclay:
Deflection $O(150 \mu\text{m})$ @ 3 mbar

We still do not have a very good
understanding of the beaviour of
the system.



Details of TPC design

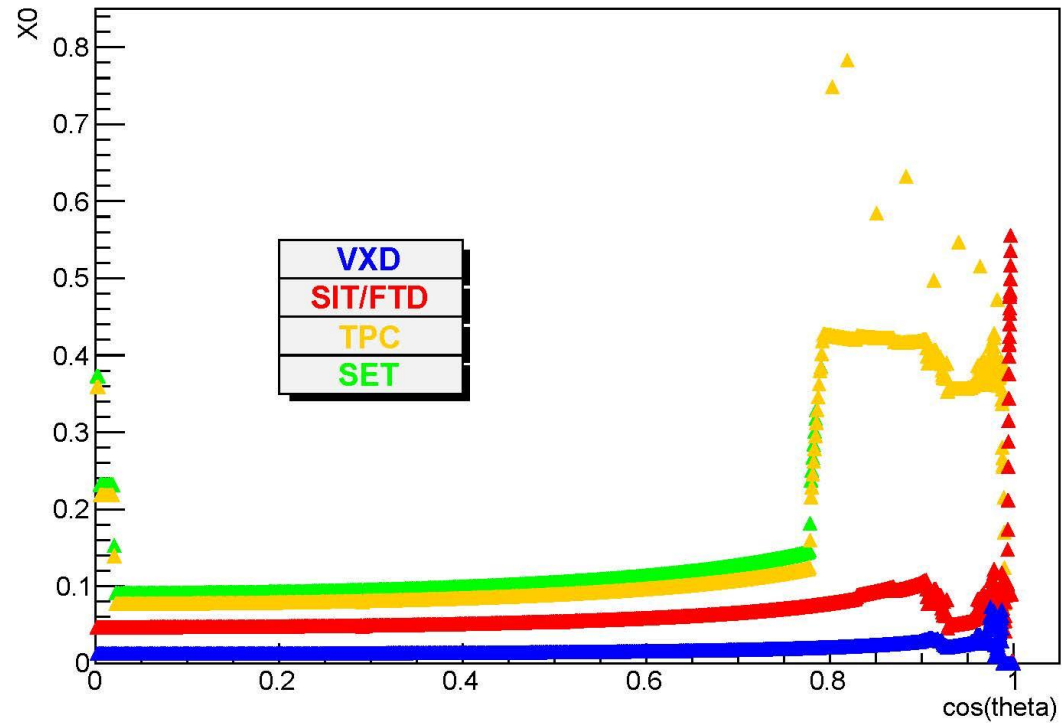


Infrastructure (Cables,
Gaslines, Cooling, Alignment)
C.Clerc

Boudaries for a design have
been
defined

Material distribution

Material budget for ILD_O1_v03



40% X_0 spike in the middle of the detector:

Caused by the cathode support

Support Rings

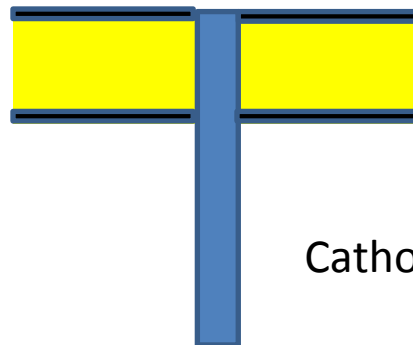
Current model:
Massive Carbon-fiber support ring

Proposed alternative model

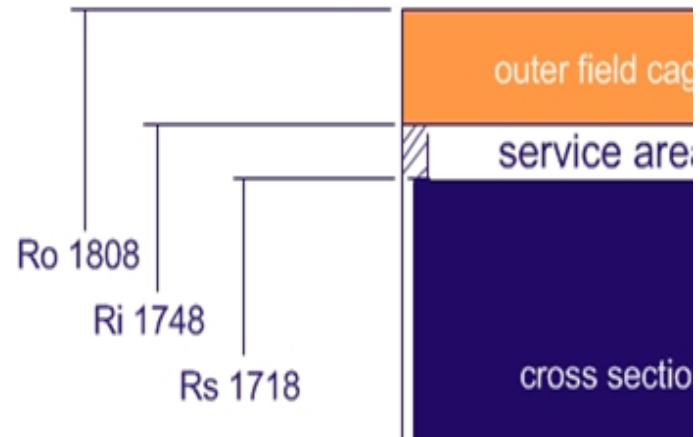
Support ring from composite materials:

1mm Carbon (0.35%)
28mm Carbon Foam (0.5%)
1 mm Carbon (0.35%)

About 2% X0 (instead of 40%)
for two rings



Support rings
carbon – foam - carbon



Cathode design and support

Typical cathode design:

Tensioned foil (mylar, CFC, ...) supported by inner and outer ring



Design goals and problems:

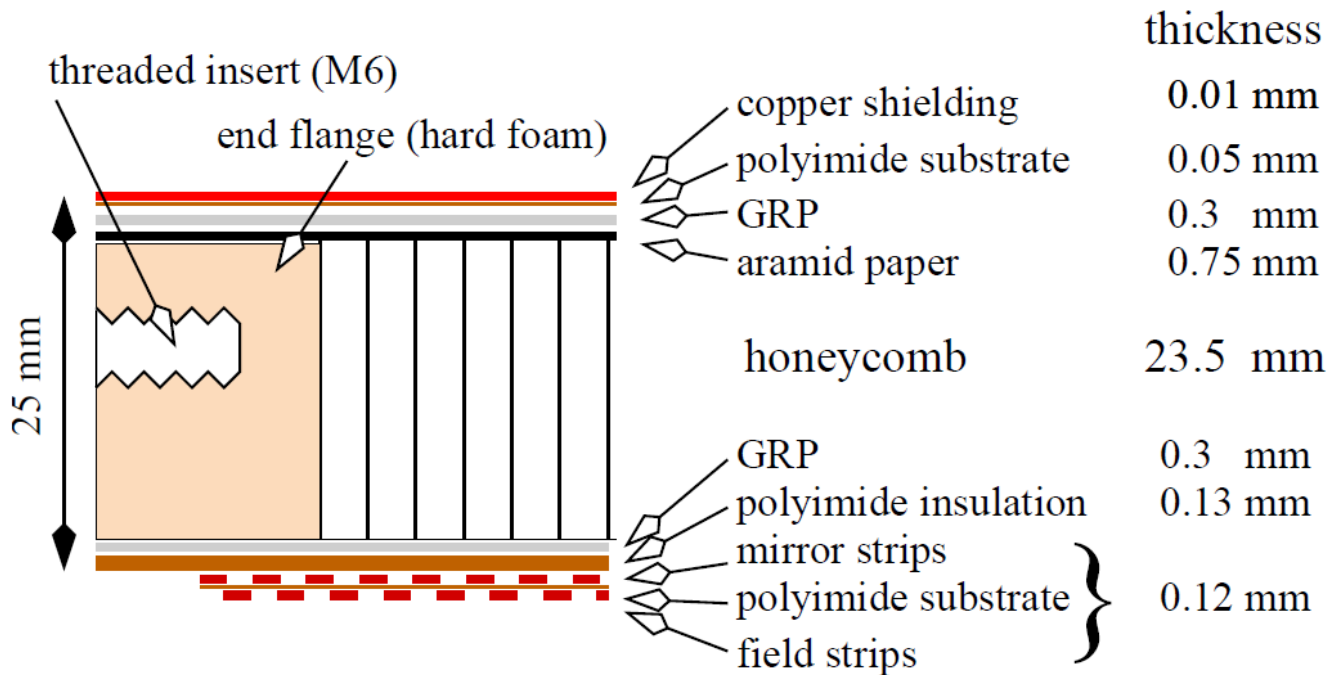
- Light weight, thin
- Mechanically stable and robust (inaccessible)
- Supply of HV non trivial
- Studies in laboratory support this design: load is about 2kg/10cm outer radius
- HV supply through special HV cable, OF about 14mm for 100 kV

STAR TPC

6/7/2012

Field Cage Design

Wallstructure Large Prototype TPC: HV stable up to 30 kV
 → extrapolate to ILD-TPC (O(100 kV))



Estimate: Outer field cage 60mm, inner field cage 30mm