TPC Central Electrode

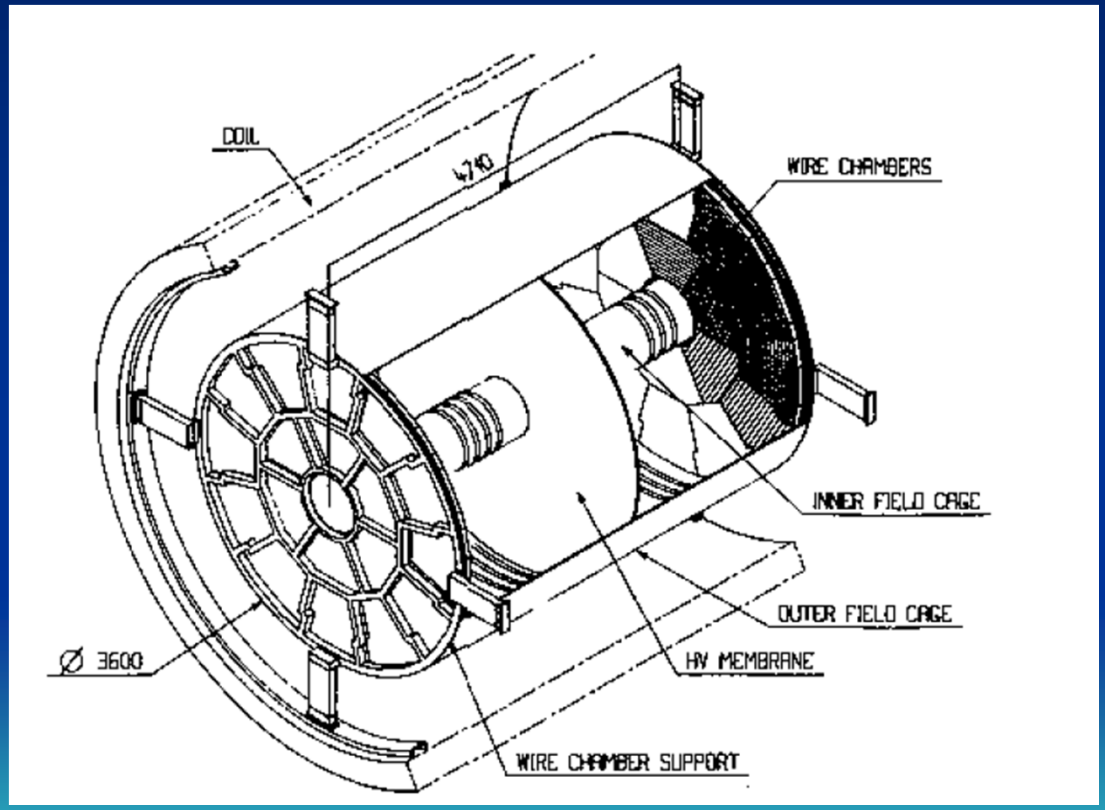
Aleph info from the Aleph Handbook, mechanical details

Star info from an overall review about 10y ago, not many details

Alice info from a distortion review 1y ago, some details

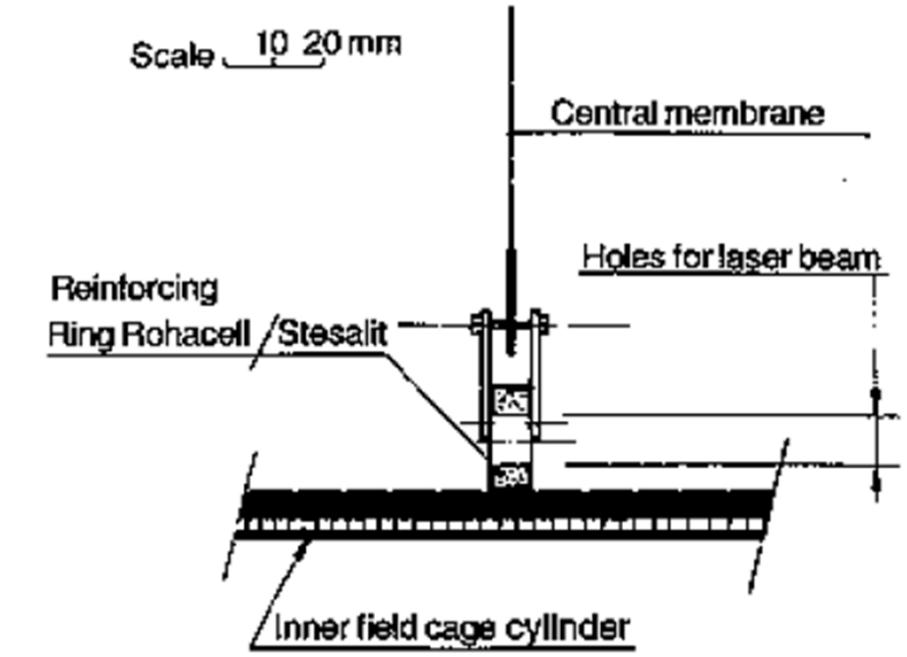
TPC Central Membrane
Aleph

…from the Aleph Handbook:



TPC Central Membrane

Aleph



ig. V.7 Positioning of the central membrane on the inner field cage cylinder.

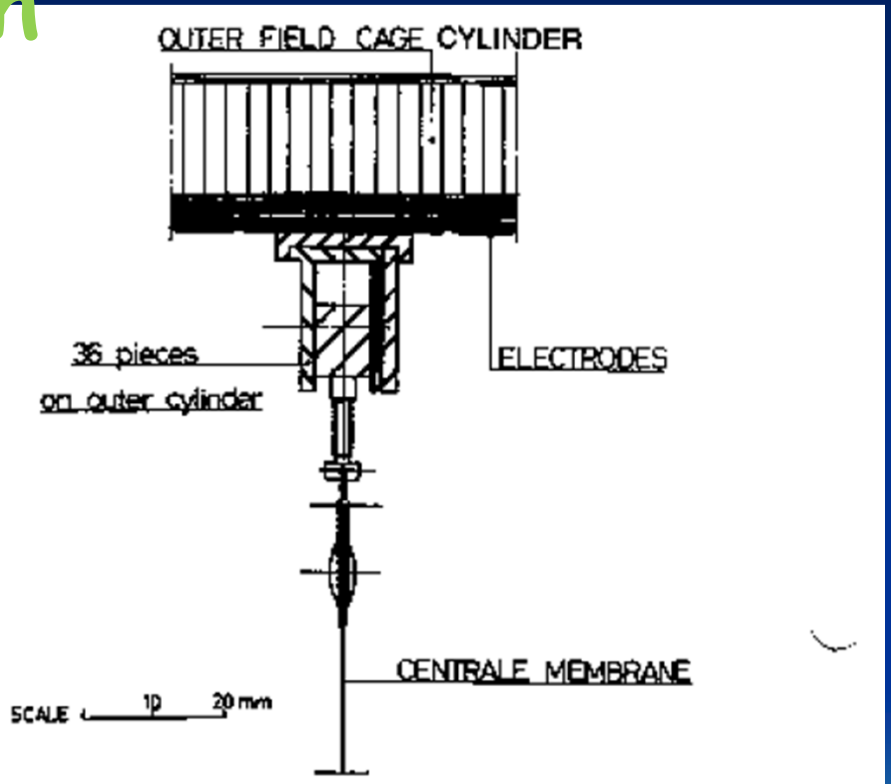


Fig. V. 11 Attachment of the central membrane to the outer field cage cylinder.

TPC Central Membrane
Aleph

3.7 Resistor chains

The electrical layout of the resistor chain is shown in Figs. V.8 and V.9. Note that the inner and outer electrodes are connected in series using 1 MΩ

the electrode structure is continued using a flexible printed circuit. In this way the resistors are shielded inside the cover. The high-voltage cable is brought in through the resistor-chain covers on one side of the outer field cage cylinder. In order to cope with

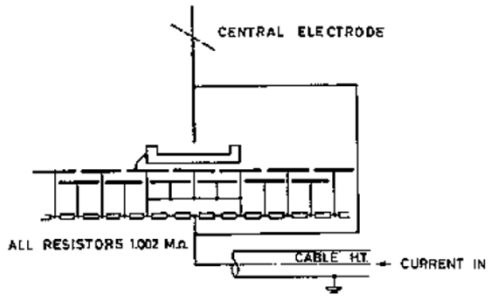


Fig. V.8 Electrical connection of the central membrane to the outer field cage cylinder.

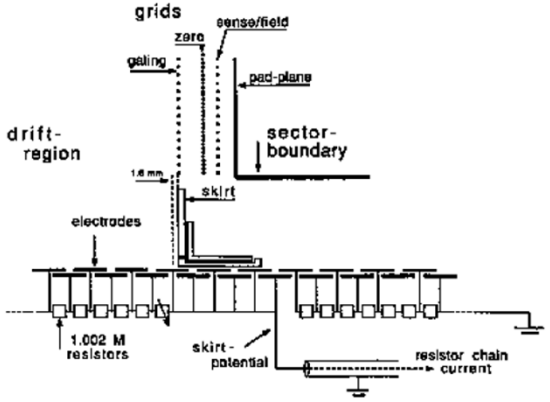


Fig. V.9 Schema showing the electrostatic boundary conditions at the edge of the TPC.

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TPC Central Membrane
Aleph

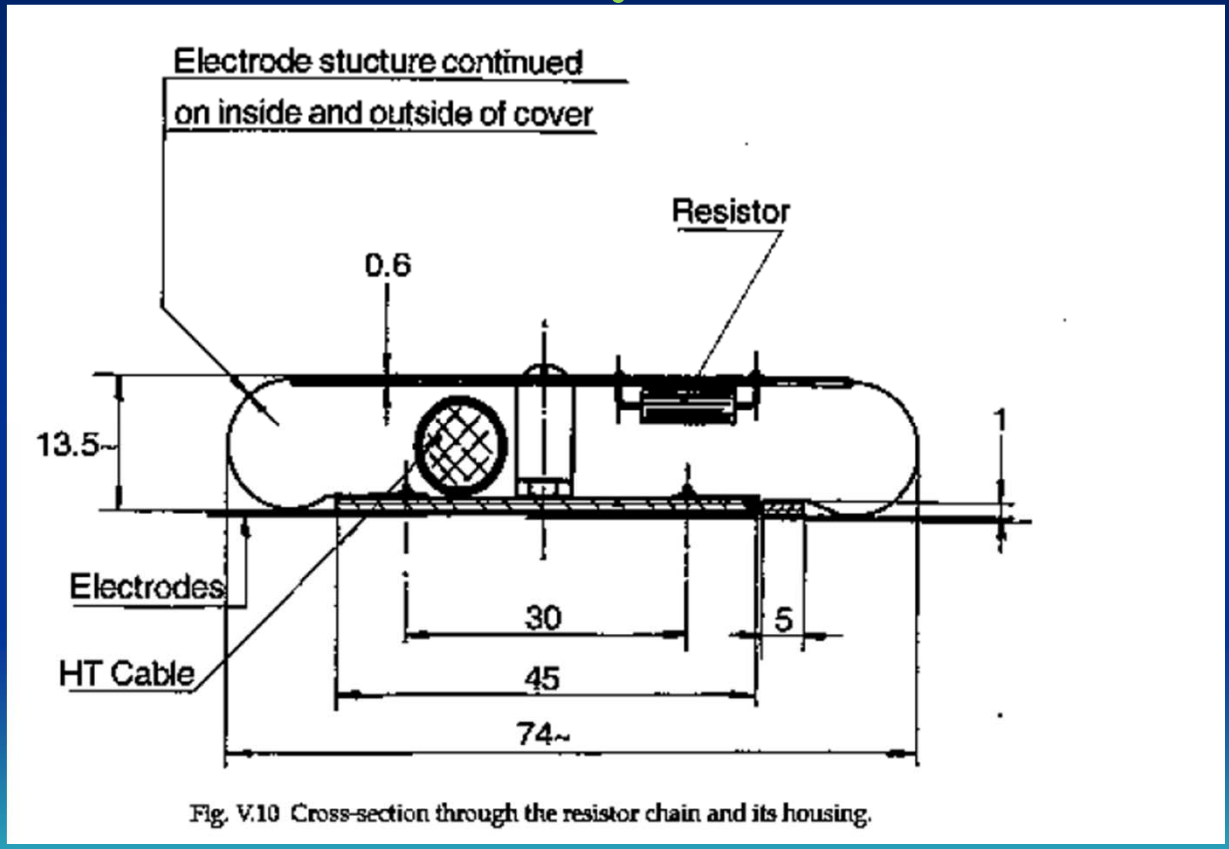


Fig. V.10 Cross-section through the resistor chain and its housing.

TPC Central Membrane

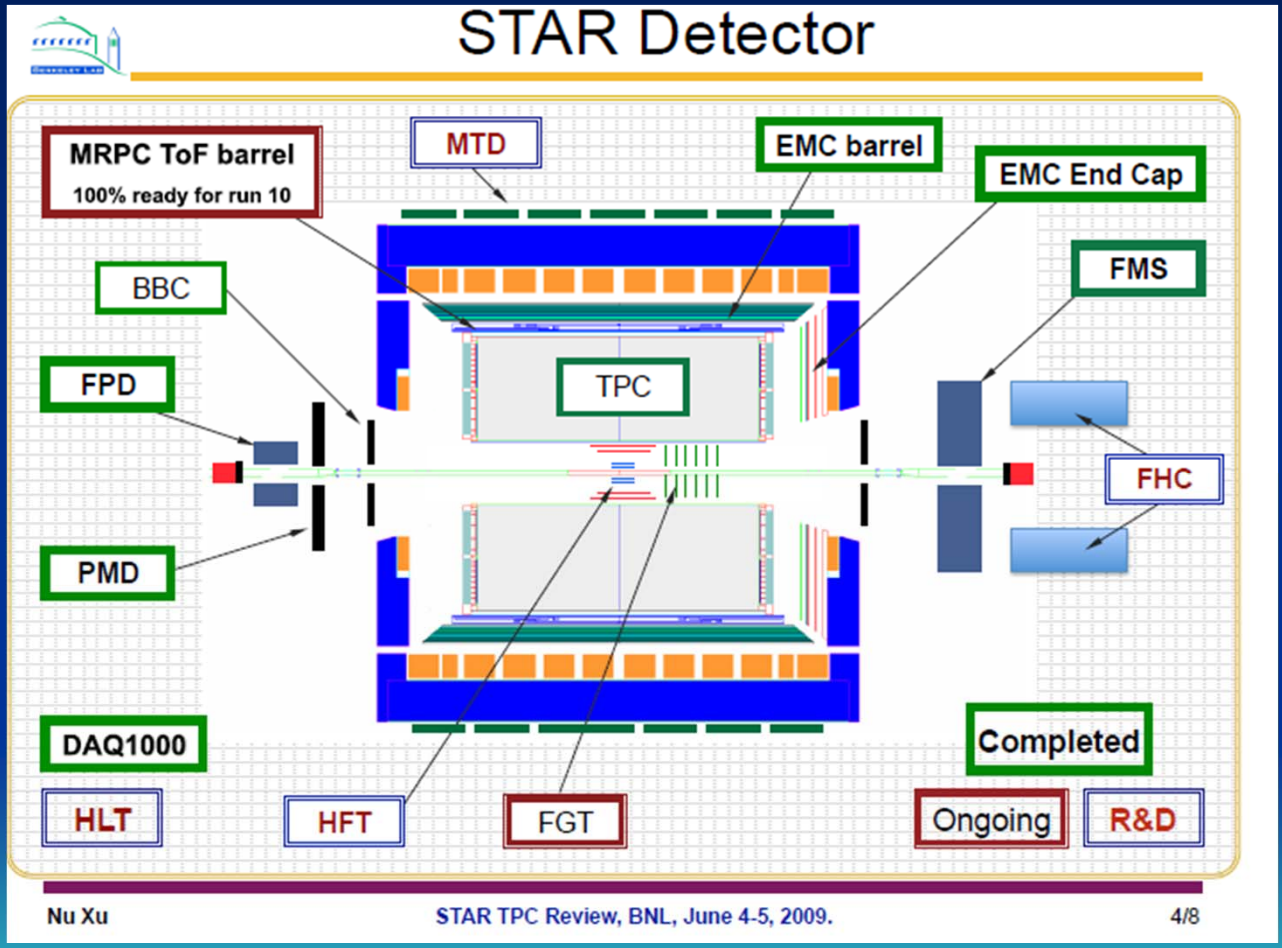
Aleph

3.8 Central membrane

The central membrane is made from 25 μm Mylar coated on both sides with a conducting graphite paint. The Mylar sheet is reinforced at its outer and inner periphery by two rings of 0.3 mm thick Mylar. The whole sheet is stretched and its tension is supported by a 10 × 8 mm^2 Al ring. The structure resembles a bicycle wheel in its function, with the Mylar sheet taking the place of the spokes and the outer Al being the rim. The membrane is supported by a shallow U-section Al ring, glued onto the outer field cage; it is attached to this ring by means of clips, as shown in Fig. V.11.

TPC Central Membrane

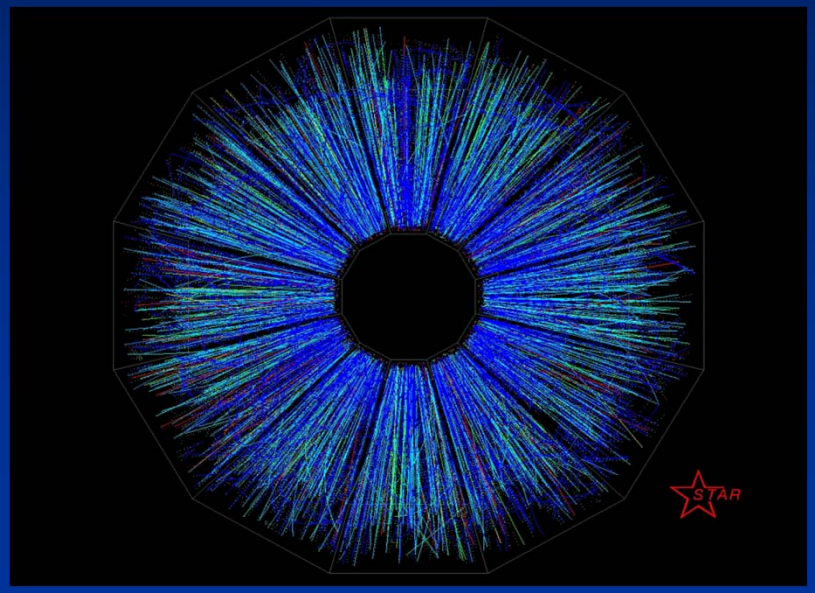
Star

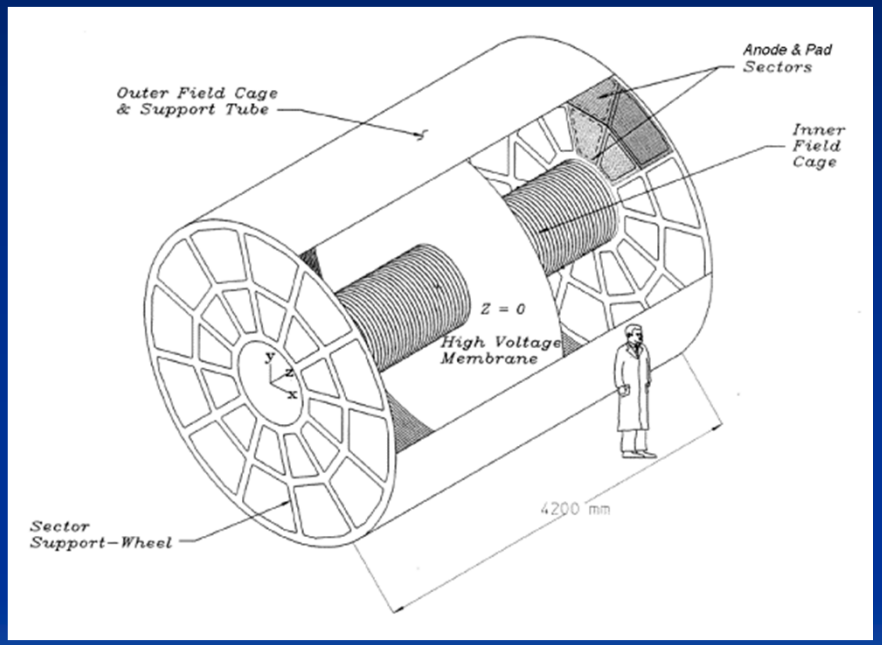


TPC Central Membrane

Star

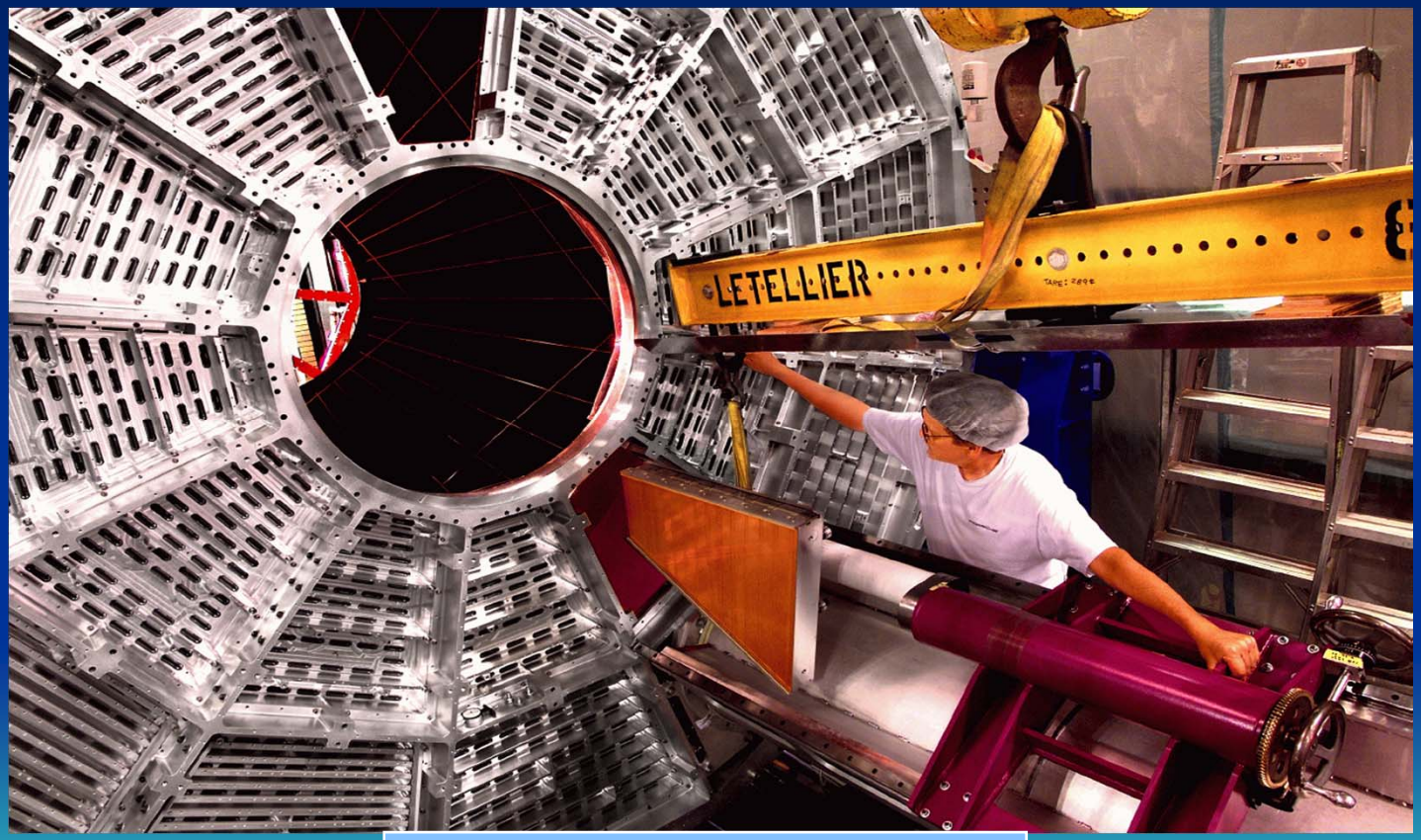
A.Lebedev, BNL, June 4, 2008





TPC Central Membrane
Star

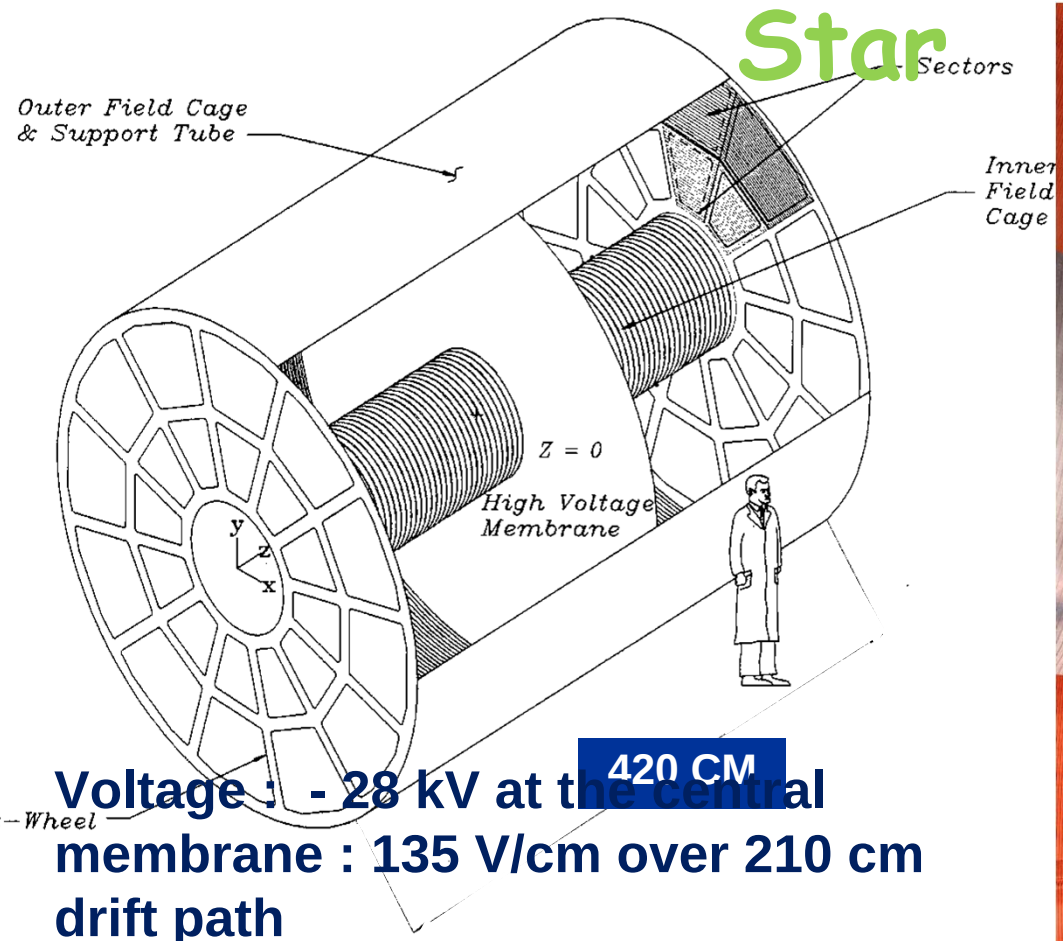
Sector Repair is possible but not a trivial task

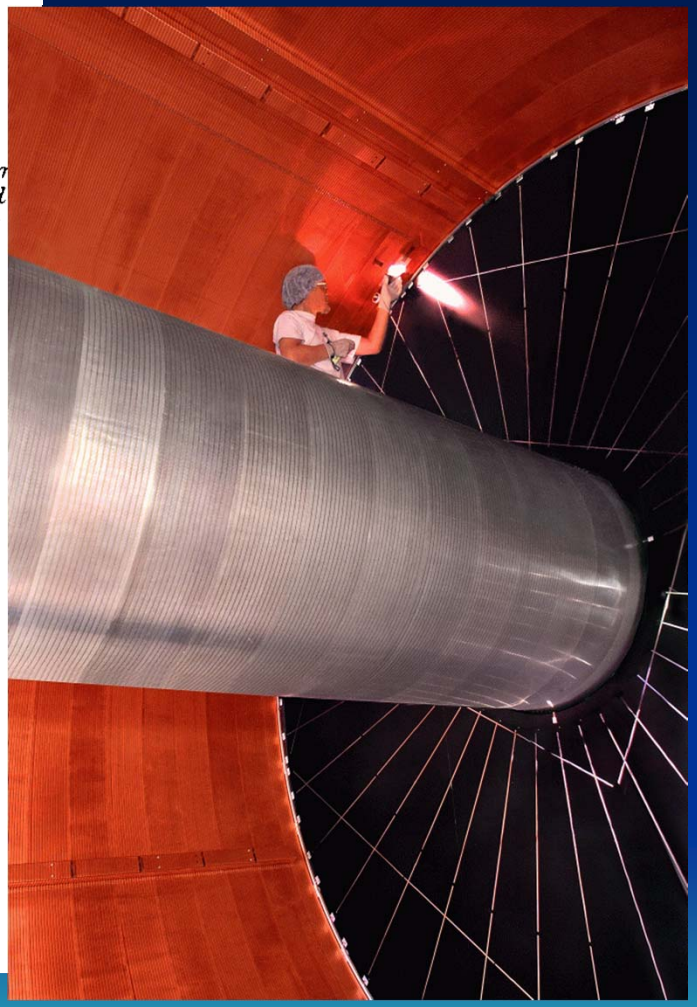


Sector Installation & Tooling

TPC Central Membrane

Star





Voltage : - 28 kV at the central membrane : 135 V/cm over 210 cm drift path

TPC Central Membrane

Star

Inner field cage, single gap fluctuating resistance

- The problem: A short developed in the inner field cage that unlike others could not be found and removed. Solution was to lock down the short and increase neighbor resistors to restore undistorted drift field. Later developed reduced resistance with humidity dependence. It was assumed that epoxy used was bad and bridged a gap.

Resistor chain cover

Inner field cage outside of drift volume

TPC Central Membrane
Star

- The problem: A short developed in the inner field cage that unlike others could n[illegible] removed. So[illegible] down the sho[illegible] neighbor resi[illegible] undistorted d[illegible] developed re[illegible] with humidity[illegible] was assumed[illegible] was bad and

This is why it is important to design, if possible, so that we can enter in order to fix damage. This feature was used extensively for the Aleph TPC

Resistor chain cover

Inner field cage outside of drift volume

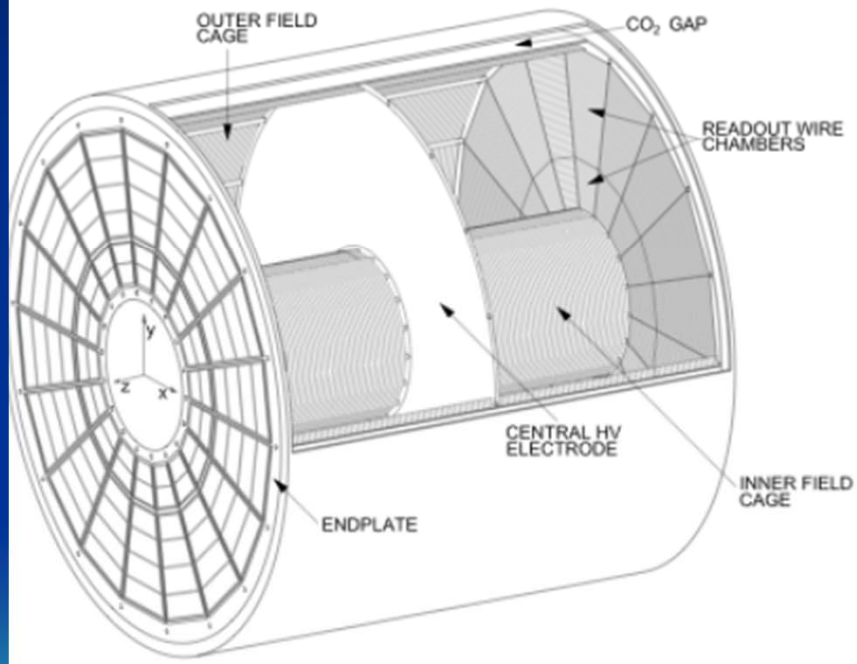
TPC Central Membrane

Alice

TPC Central Membrane

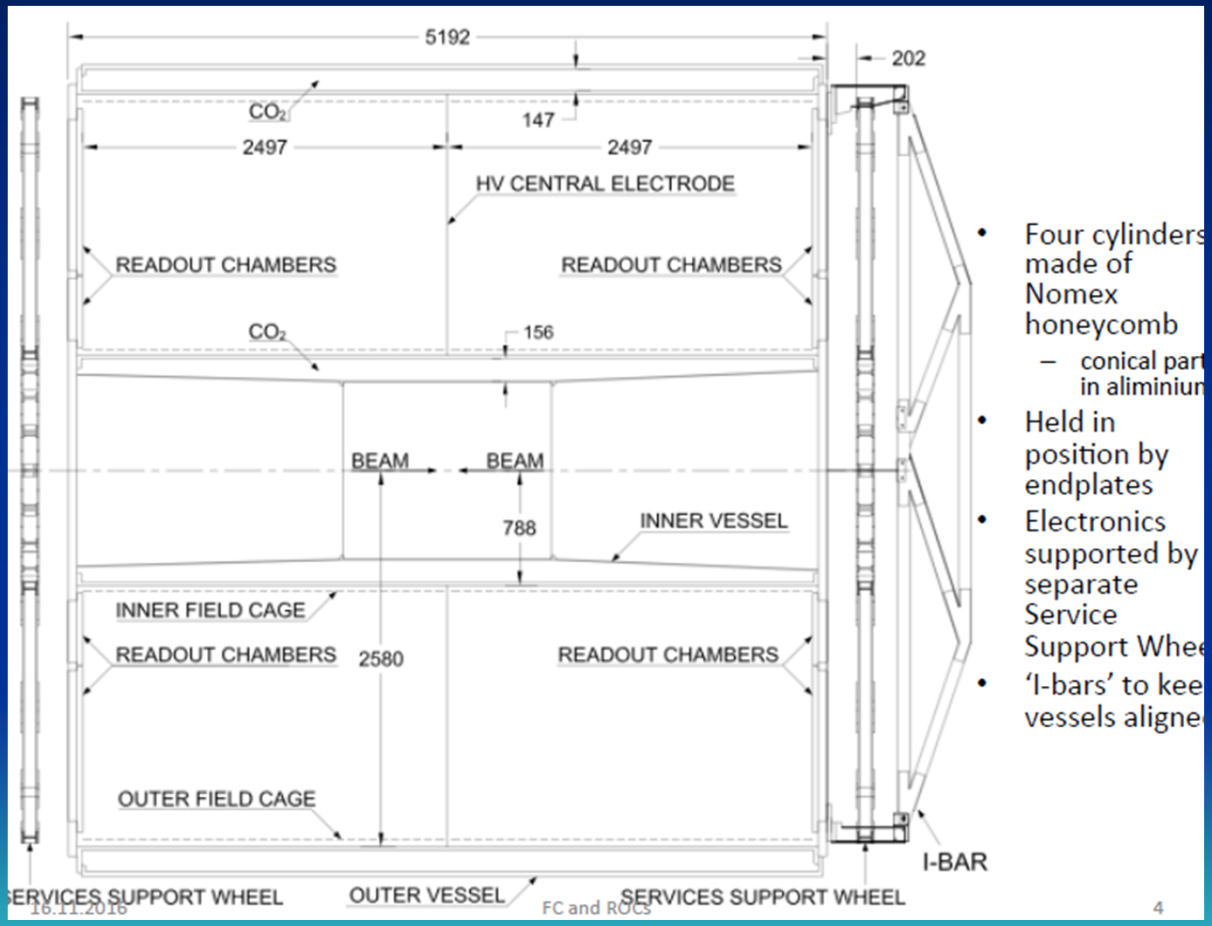
Alice

The ALICE TPC



- 5 m x 5 m
- ≈90 m^3
- 100 kV in CE
  - 400 V/cm
  - ≈100 μs
- 2x2x18 chambers: IROC and OROC
- Gain 3000-6000
- 557568 readout pads

TPC Central Membrane
Alice



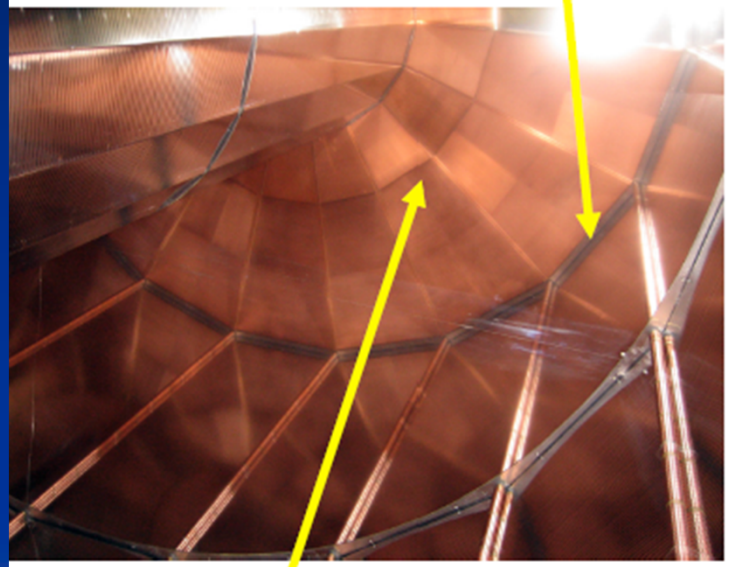
- Four cylinders made of Nomex honeycomb
  - conical part in aliminiu
- Held in position by endplates
- Electronics supported by separate Service Support Whee
- 'I-bars' to kee vessels aligne

TPC Central Membrane
Alice

Strips and voltage divider

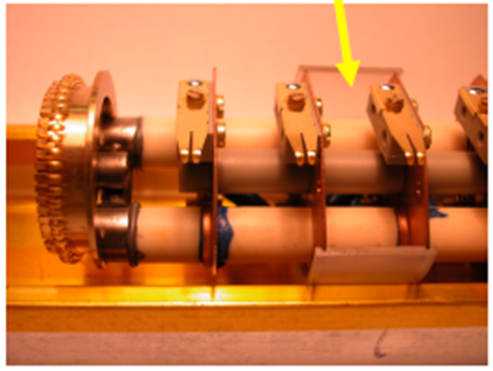
5 m x 5 m, ~90 m^3

skirt



Central Electrode (aluminised mylar, 100 kV) reflects the image of the Readout Chambers (IROCs, OROCs)

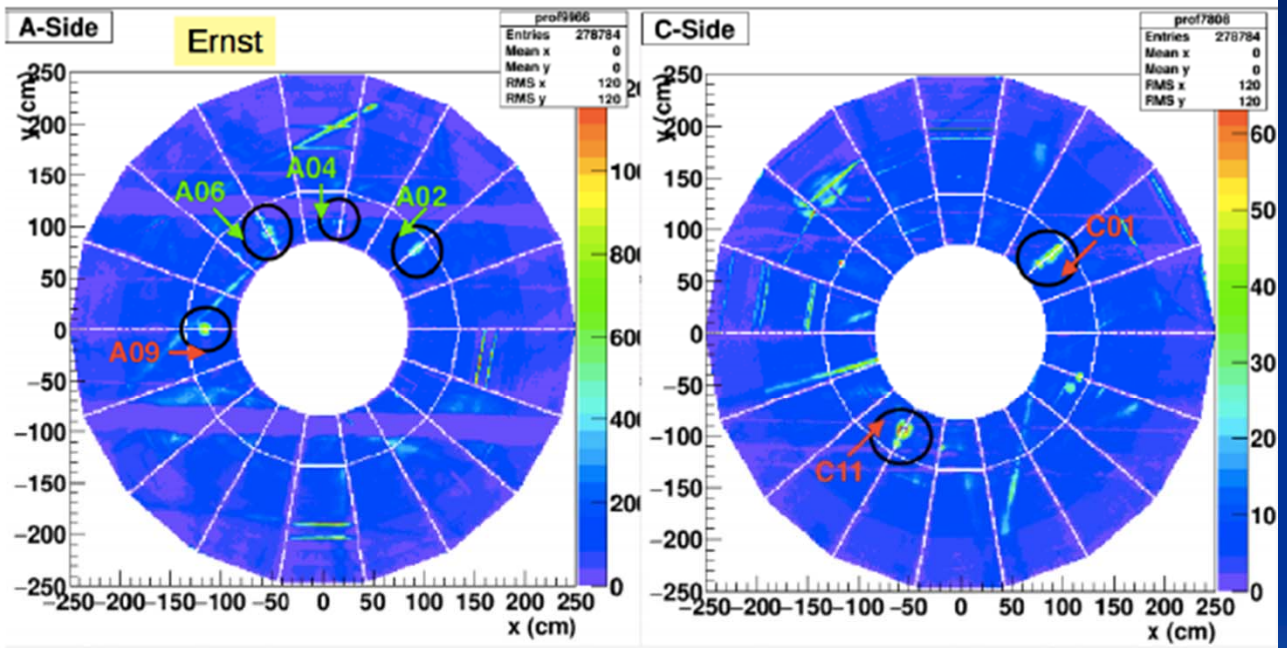
- 400 V/cm drift field defined by suspended strips held by rods
- Rods used also to:
  - circulate the gas through small holes
  - introduce laser tracks
  - house water cooled, removable resistor chains for voltage degrading



TPC Central Membrane

Alice

Central Electrode



- Distortion hot spots occur always at the same side of the ROC (C-Side is mirrored)
- Individual chambers could be associated to a specific batch during chamber production

The CE is composed of 3 Al-mylar foils glued together and stretched