



TPC Issues for the LDC

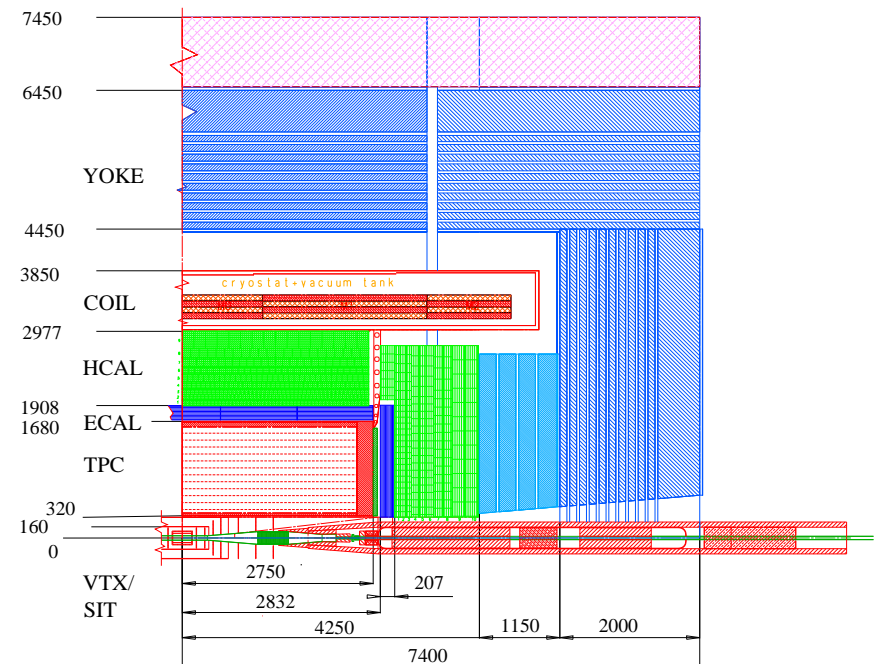
Steve Aplin, DESY
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Outline

- Radial Dimensions
- Length
- Readout
- Field Cage
- Software

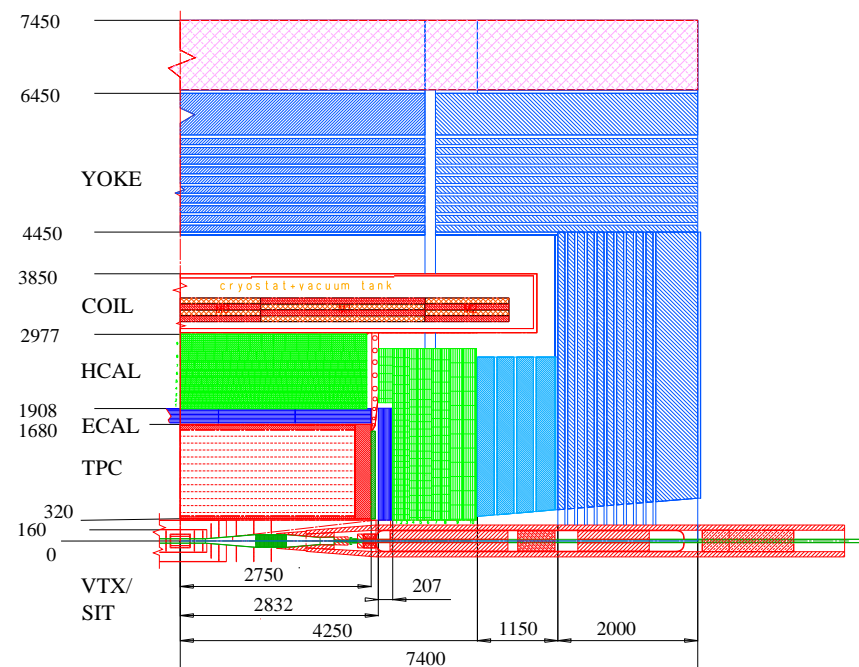
Radial Dimentions

- Inner radius constraint 38cm (Mechanical issue from Mask, modified for ILC?)
- Outer radius constraint 167cm (CALO must fit inside the Coil)
- Leverarm (tracking)
- Number of Pads (dE/dx)

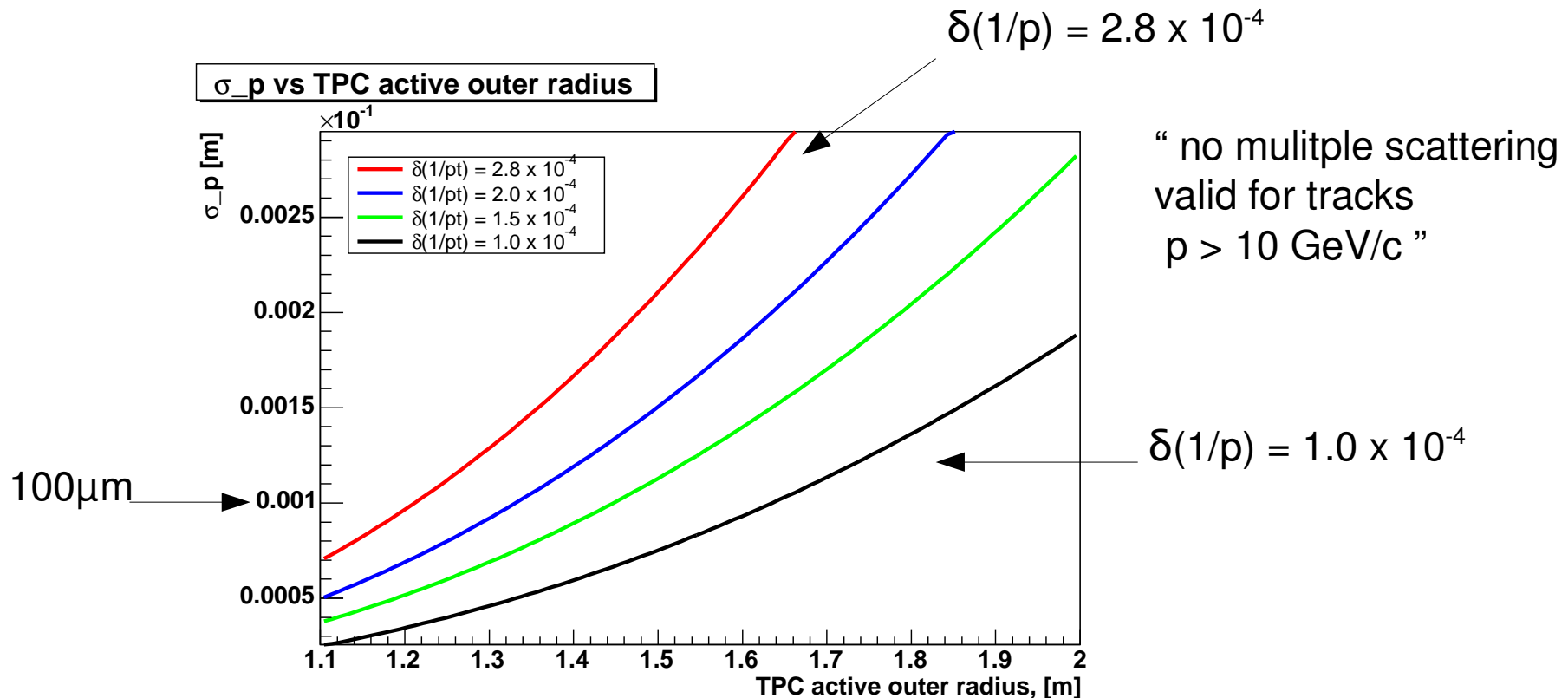


Length

- Separation between charged and neutral clusters in the ECAL reduced in the forward region due to the orientation of B field
- Maximum drift length
- Drift field
- Forward tracking



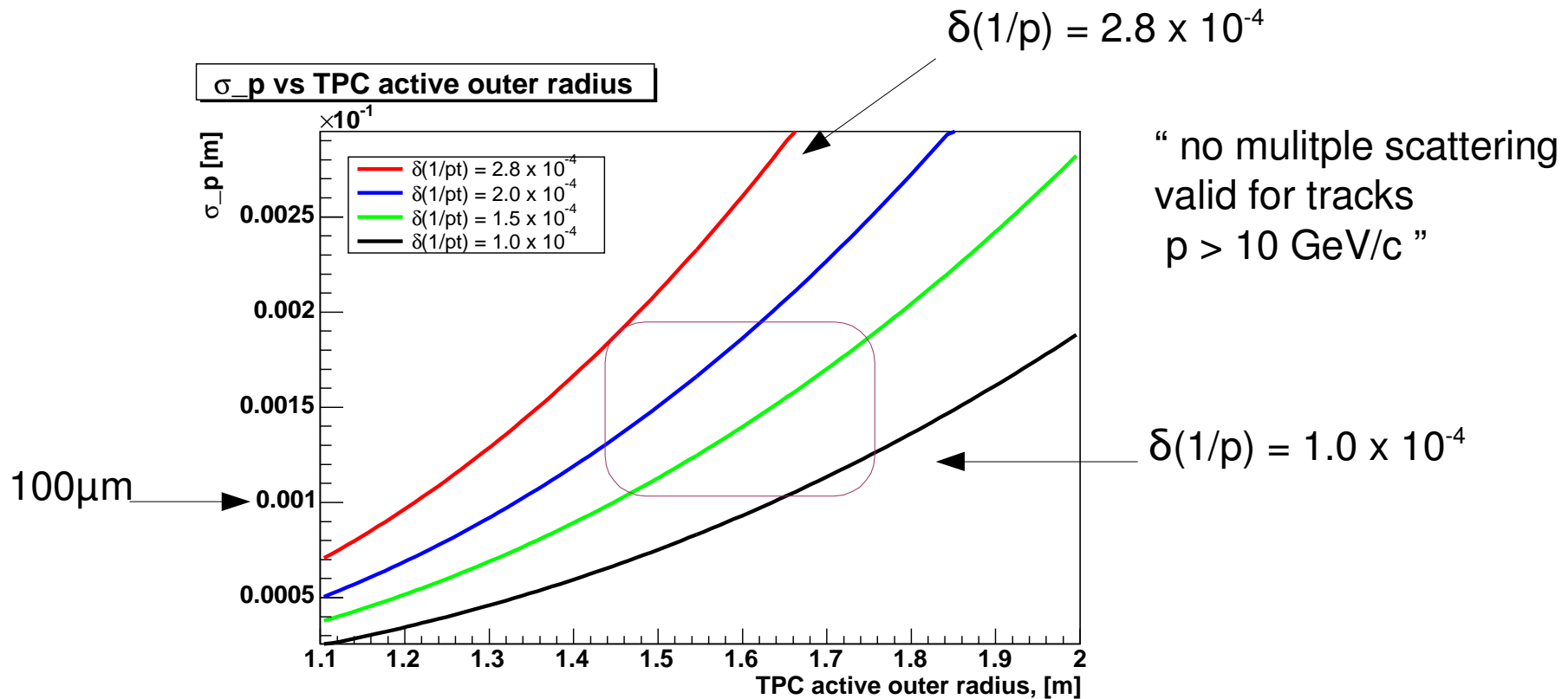
Momentum Resolution



Calculation made using the Gluckstern Formula:

$$\frac{1}{\delta p} \propto \frac{\sigma}{BL^2}$$

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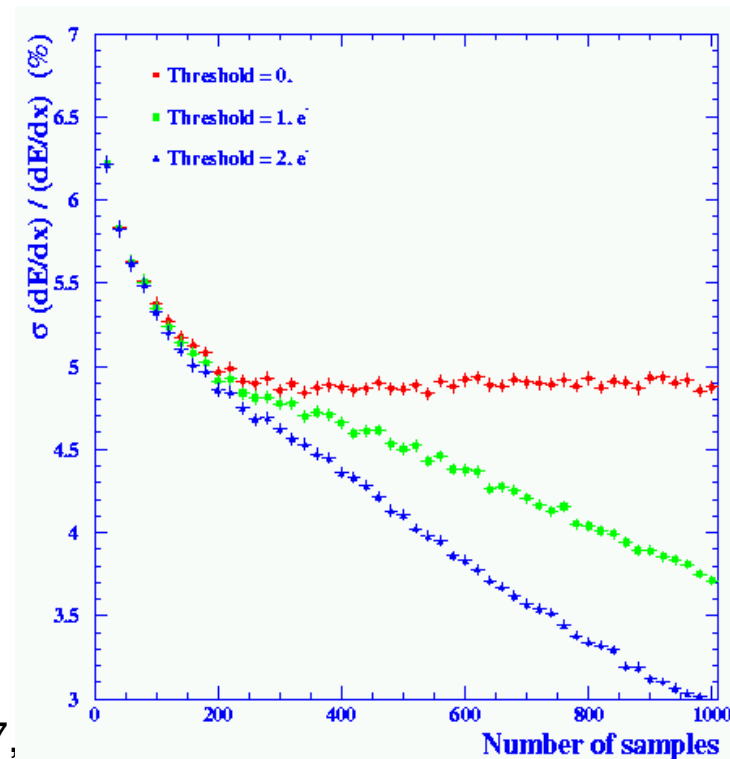
Tracking in Jets

- Efficiency of the order of 99%
- Purity, the ghost rate should be kept to a minimum
- Both of these depend of the double track seperation and reconstruction algorithms implemented

dE/dx

- Previous detectors have achieved a dE/dx resolution parameterised as $5.5\% \times L - 0.36$
- Toy Monte Carlo by Hauschild and Gruwé suggest that using 240, 5mm pads in a TDR like TPC could deliver $\sim 4.1\%$

[ref LC-DET-2001-043]



Readout

- Readout should perform signal processing on-board
- End-plate is largely dependent on readout
- End-plate should be modular to allow ease of access
- Mechanical integrity vs low material budget $\ll 30\%$ radiation length
- Boundaries should not point to the interaction region?
- Utilise experience from LEP, STAR or ALICE

Field Cage

- Must be able to withstand 100kV
- Low material budget $< 3\%$ rad length
- Experience taken from LEP, STAR and ALICE
- Homogenous
- Mechanical stability, self supporting structure
- Mechanical investigation starting

Software

- Simulation on going at Aachen and DESY
- This should give a better understanding of the point resolution and the behaviour of GEMs
- Simulation of the field cage has been done at Aachen and St Petersburg
- Development in reconstruction software on going. Performance studies exist for TDR detector but need to be redone within the context of the concept study
 - e.g. LC-DET Haushild and LC-DET Behnke et. al.

Summary

- Key issues before we can answer questions in the LDC sketch document:
 - In R&D to determine the expected point resolution and double point separation
 - In simulation to understand the results provided by R&D
 - In reconstruction algorithms, both tracking and PFlow, to determine the impact of the performance and material effects
 - In engineering, both in mechanics and electronics, to develop realistic numbers for the material budget
 - Investigation into systematics, B field, alignment, etc.