



Simulations & Scaling of the Performance of the ILD Tracking System

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Outline

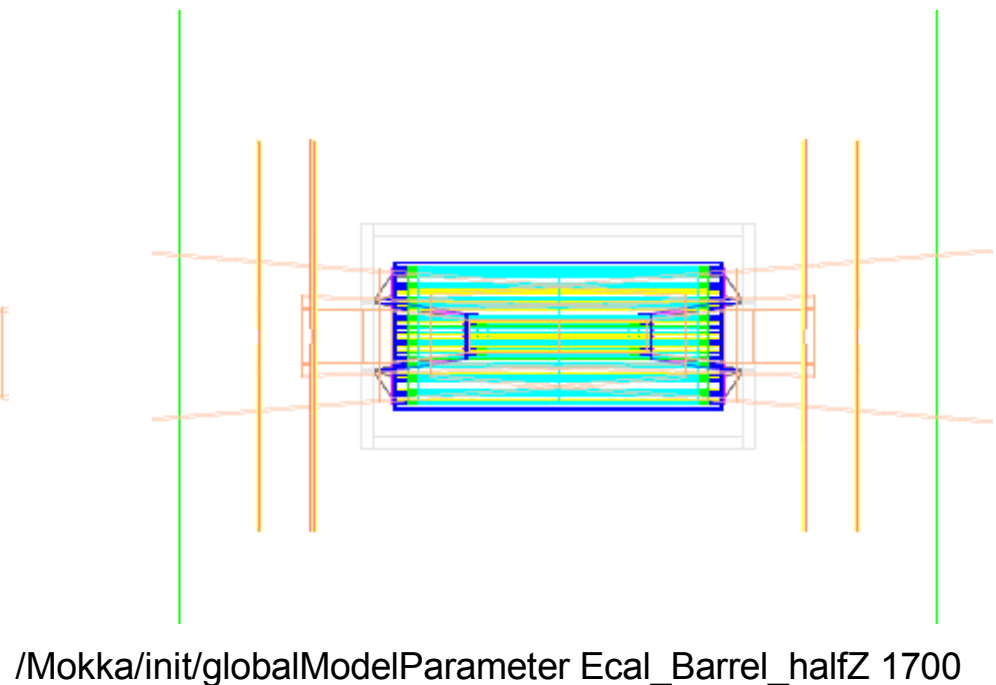
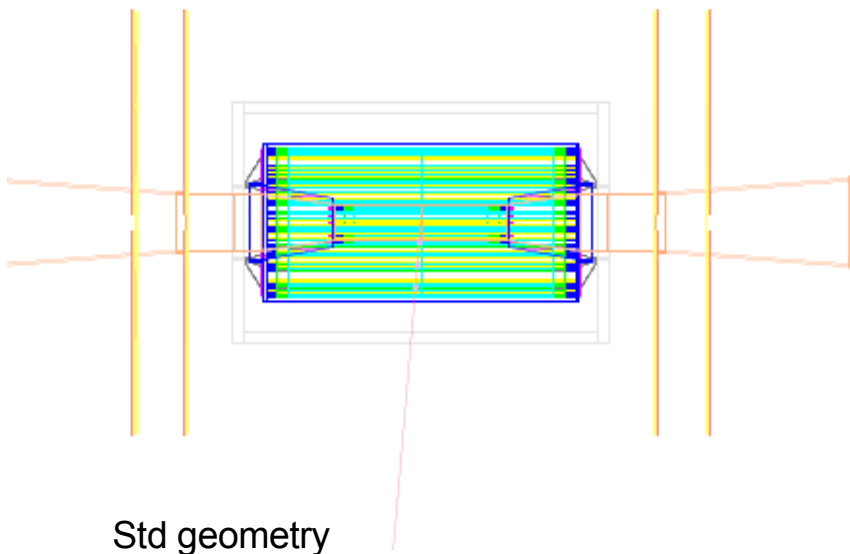
- Full simulation studies – Radial scaling of the detector
 - Single muon tracks
 - IP & momentum resolution
 - 6 fermions @ $\sqrt{s} = 500$ GeV
 - Tracking efficiency
- Fast simulation studies – keeping aspect ratio constant
 - IP & momentum resolution vs momentum
- Examined configurations

Magnetic Field (T)

TPC R_{out} 1.4m	3.5	4.0	4.5	5.0
TPC R_{out} 1.6m	3.5	4.0	4.5	5.0

Full Simulation – Why only radial scaling

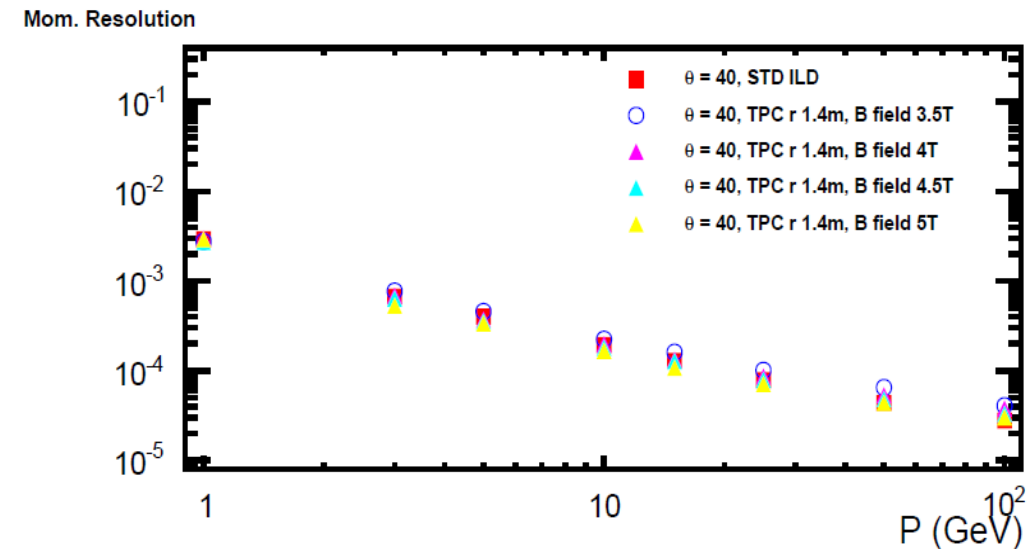
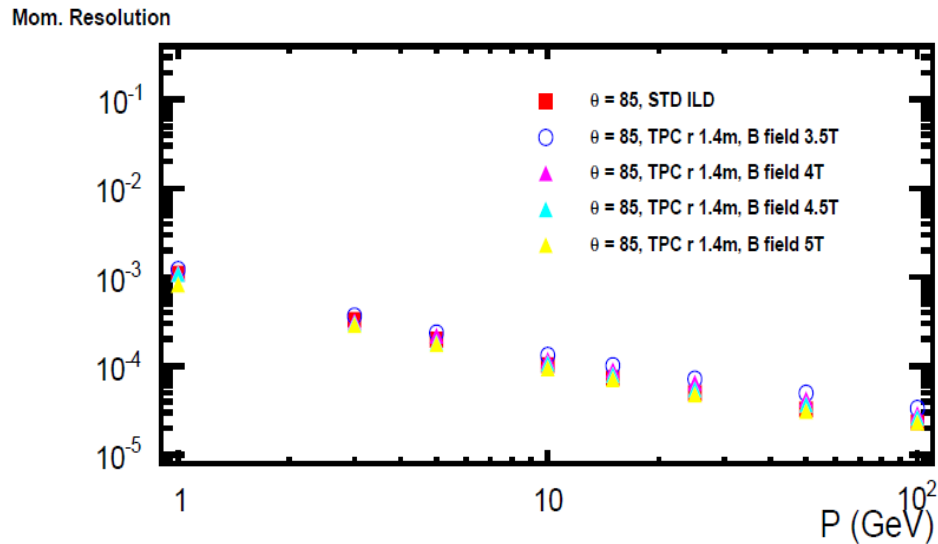
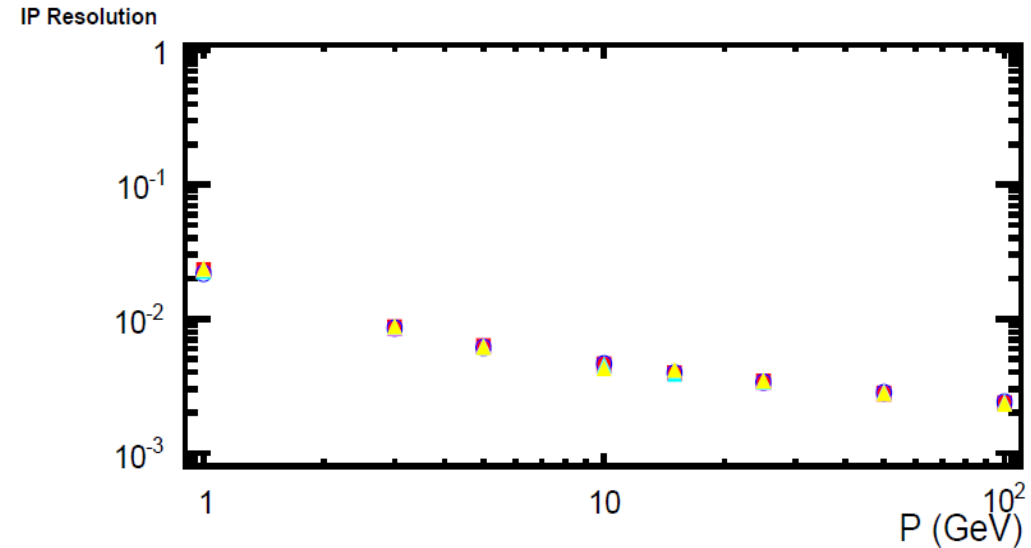
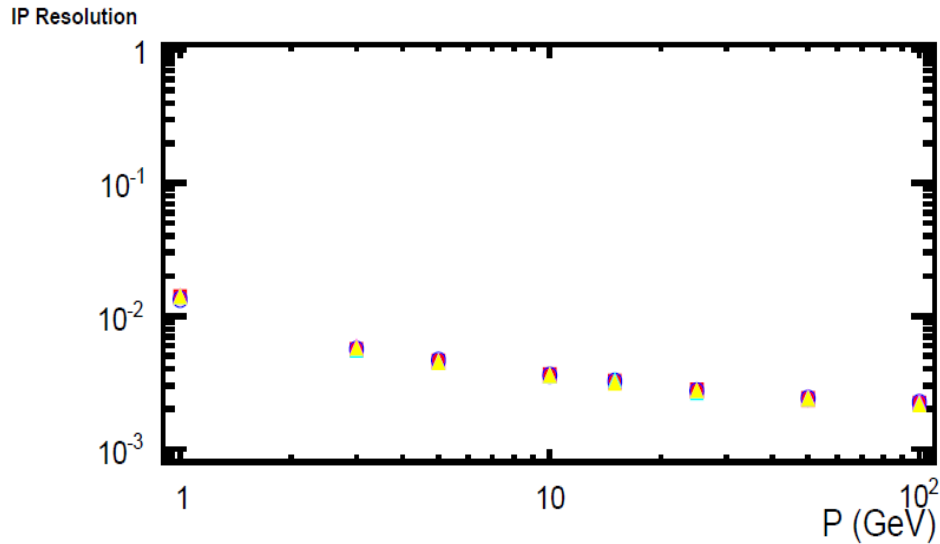
- Geometry overlap when we shrink the ECAL - TPC along the z axis
 - Beam tube with VXD etc...



Full Sim. - Single Muon Tracks

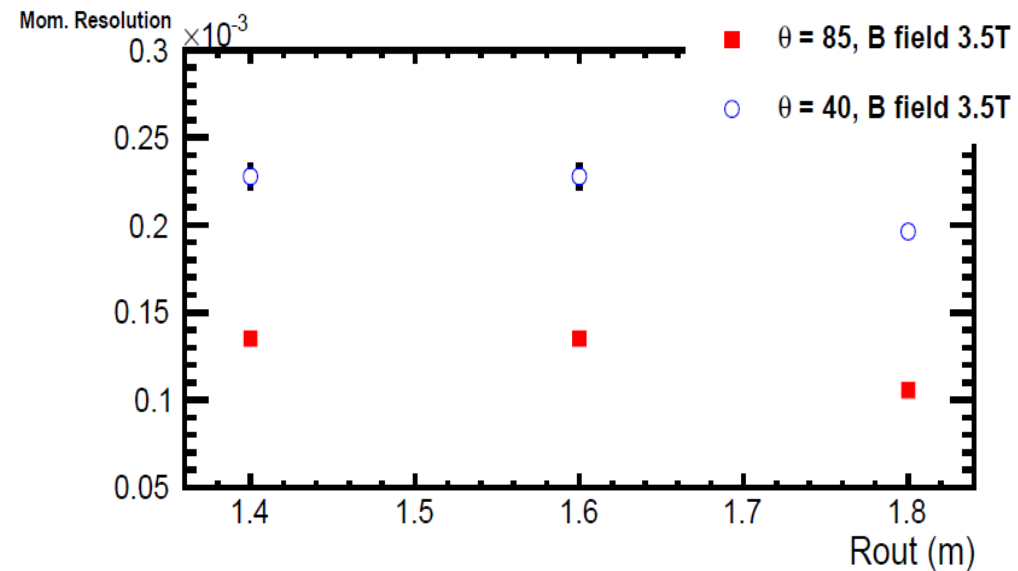
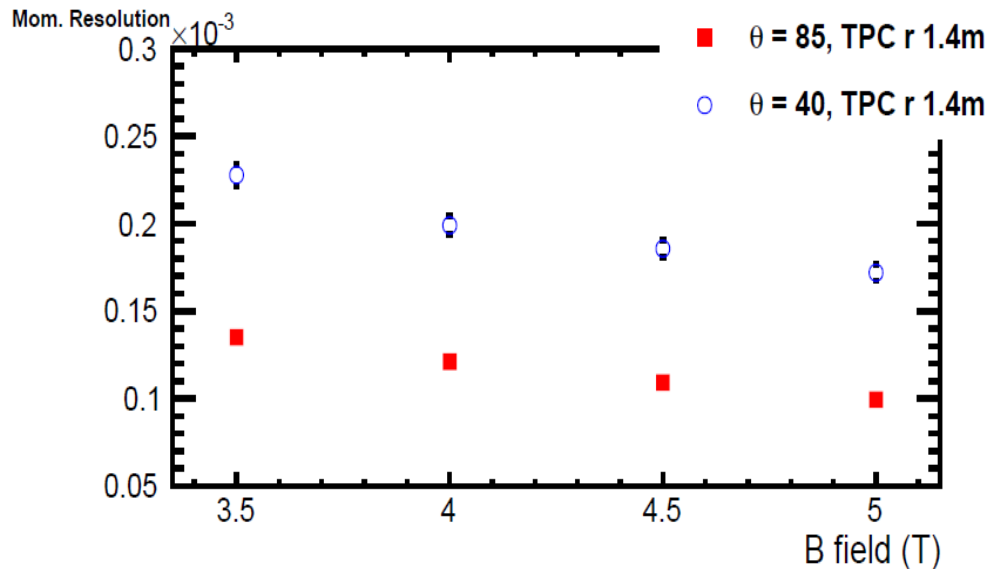
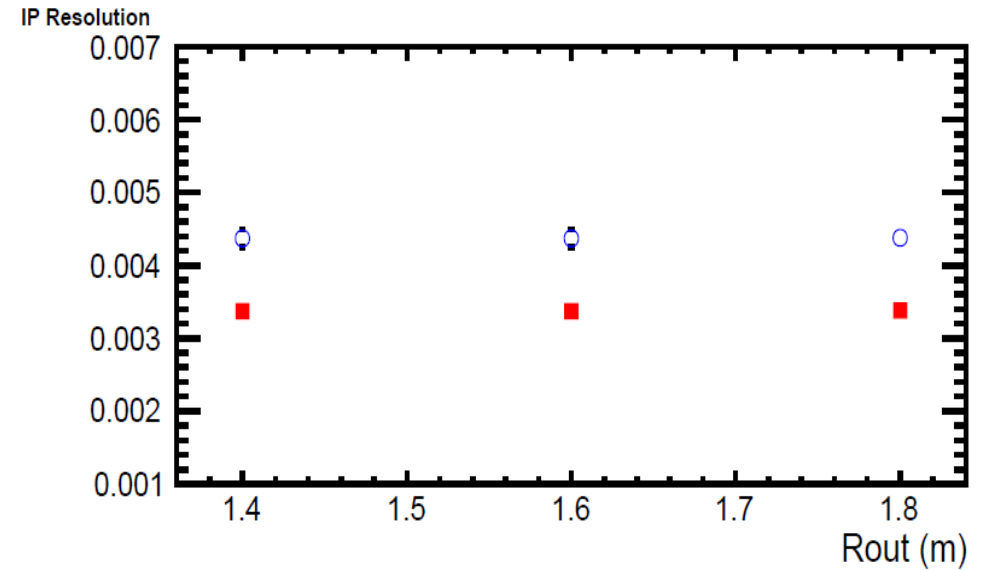
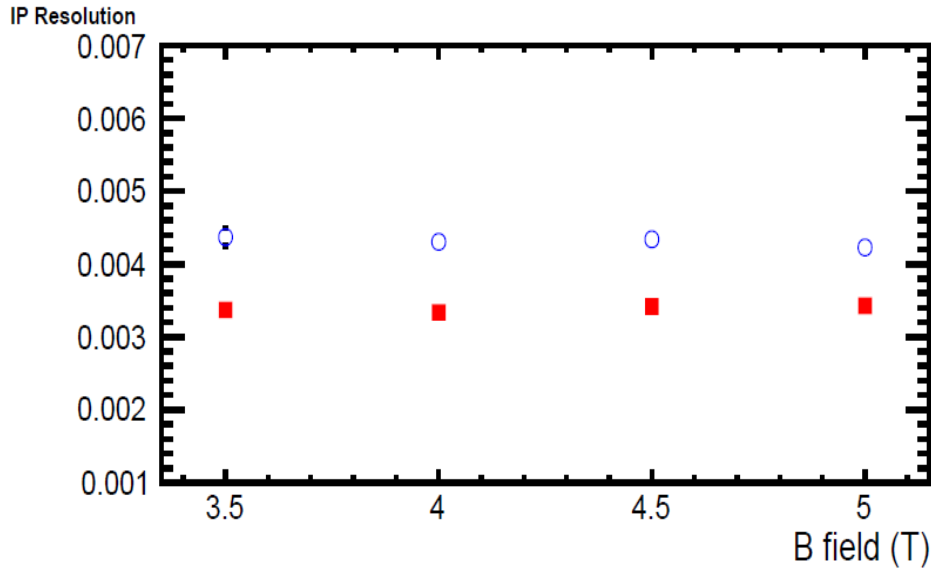
$\theta = 85^\circ$

$\theta = 40^\circ$



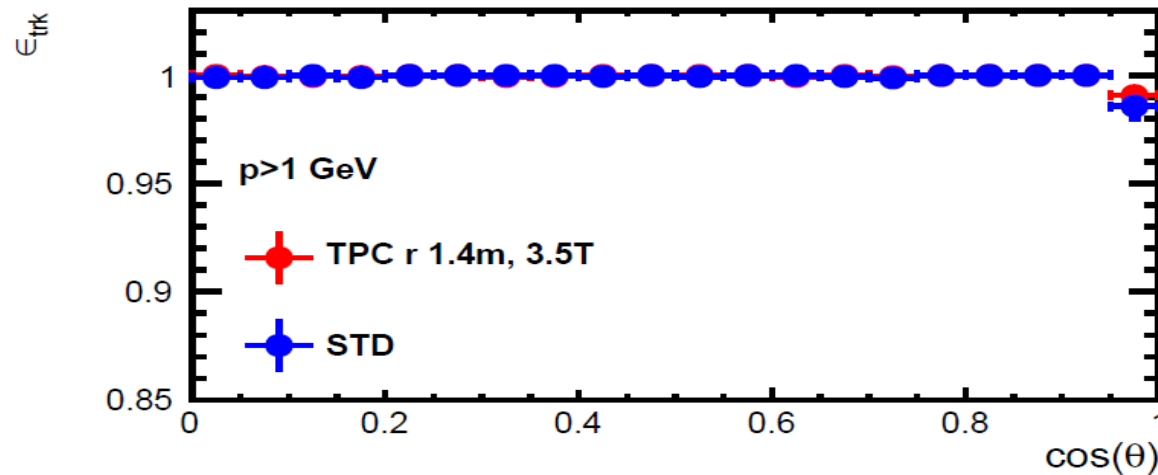
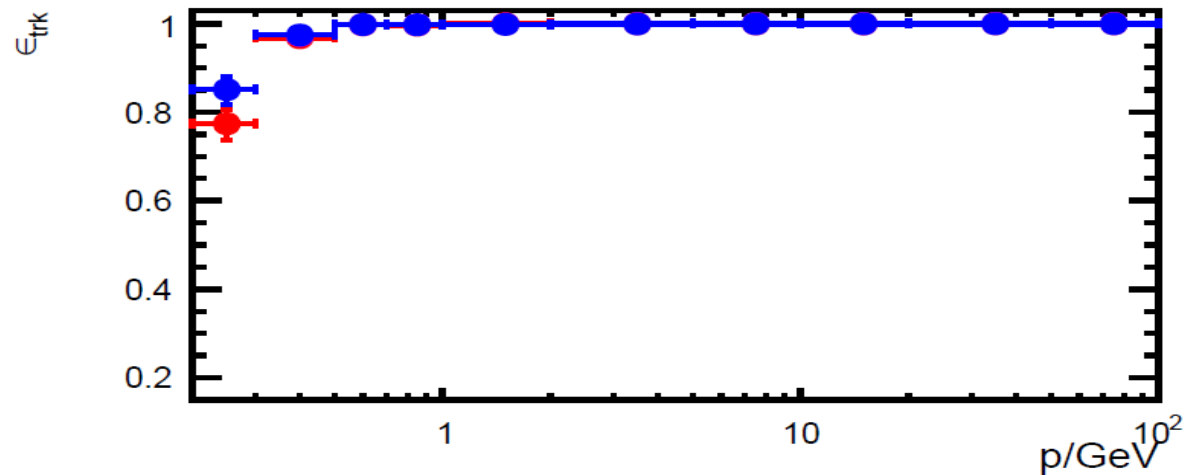
Full Sim. - Performance vs B field – TPC radius

- 10 GeV muon tracks

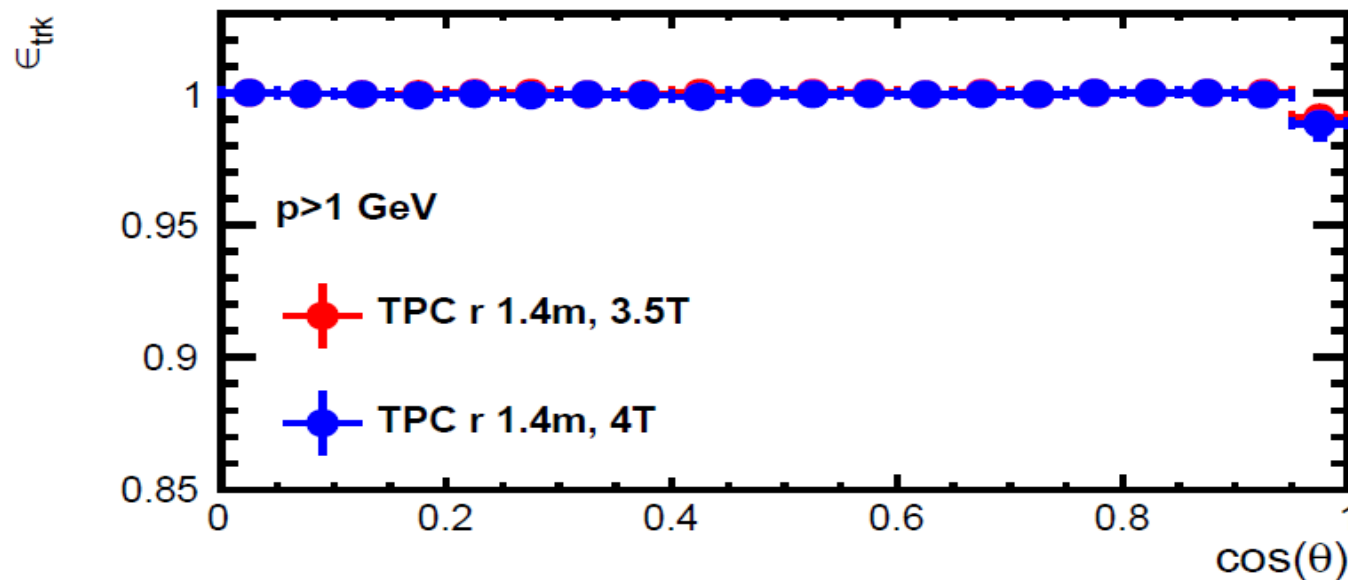
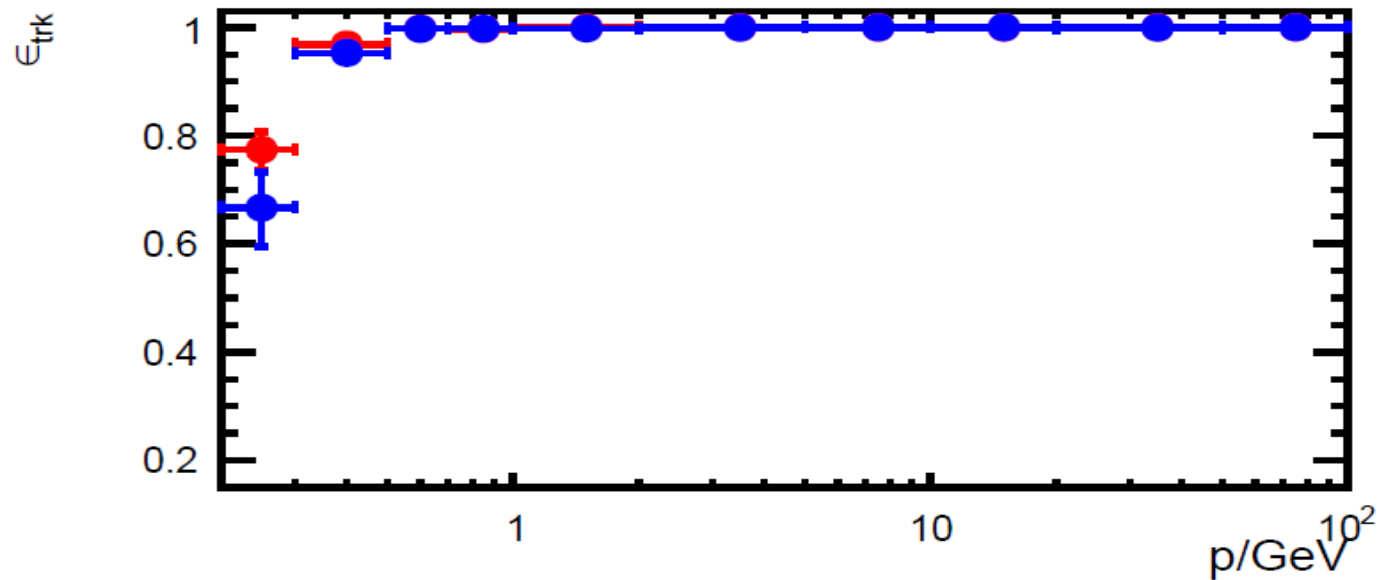


Track Finding Efficiency – Radius Effect

- 6 fermions @ $\sqrt{s} = 500$ GeV – no pair bkg overlaid
- Definition of tracking efficiency same as DBD

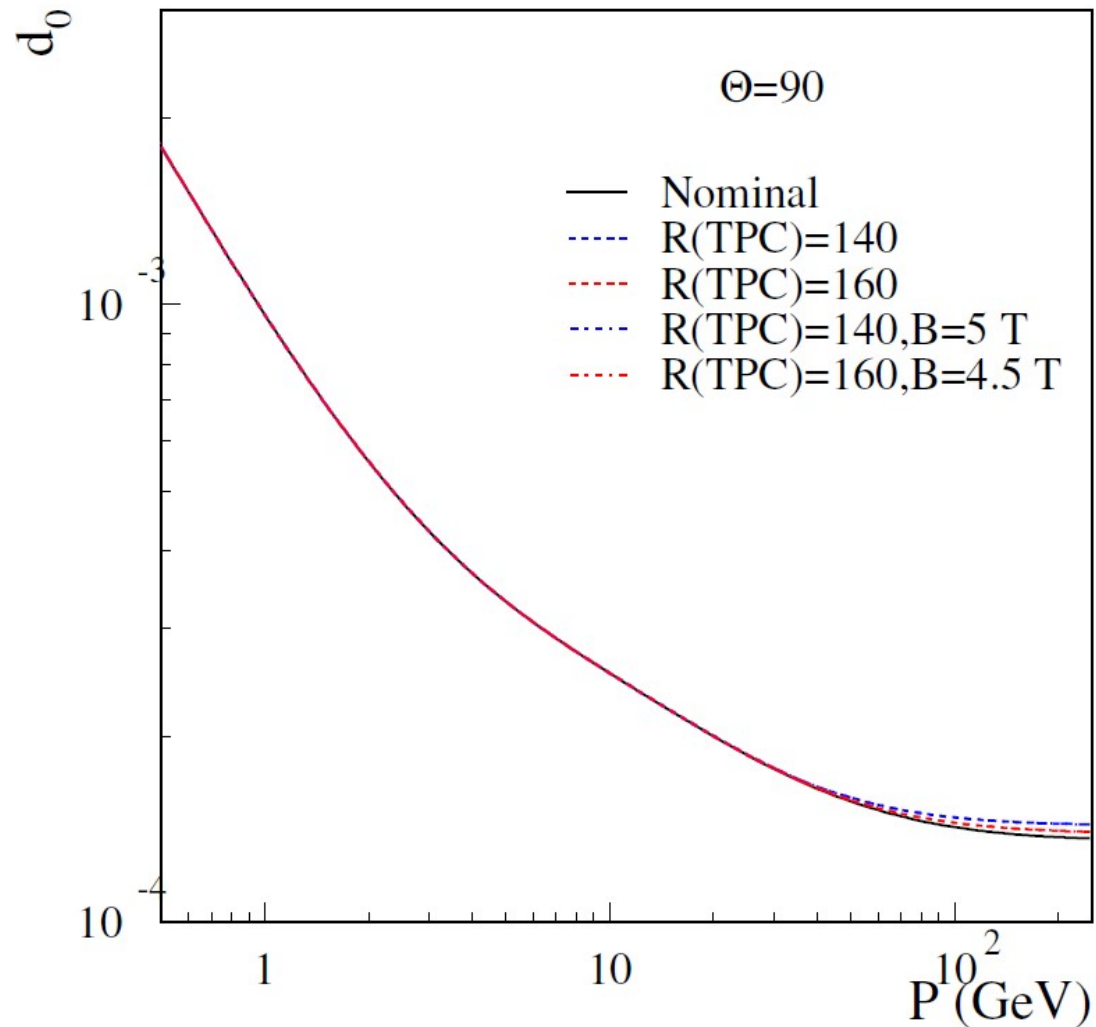


Track Finding Efficiency – B Field Effect



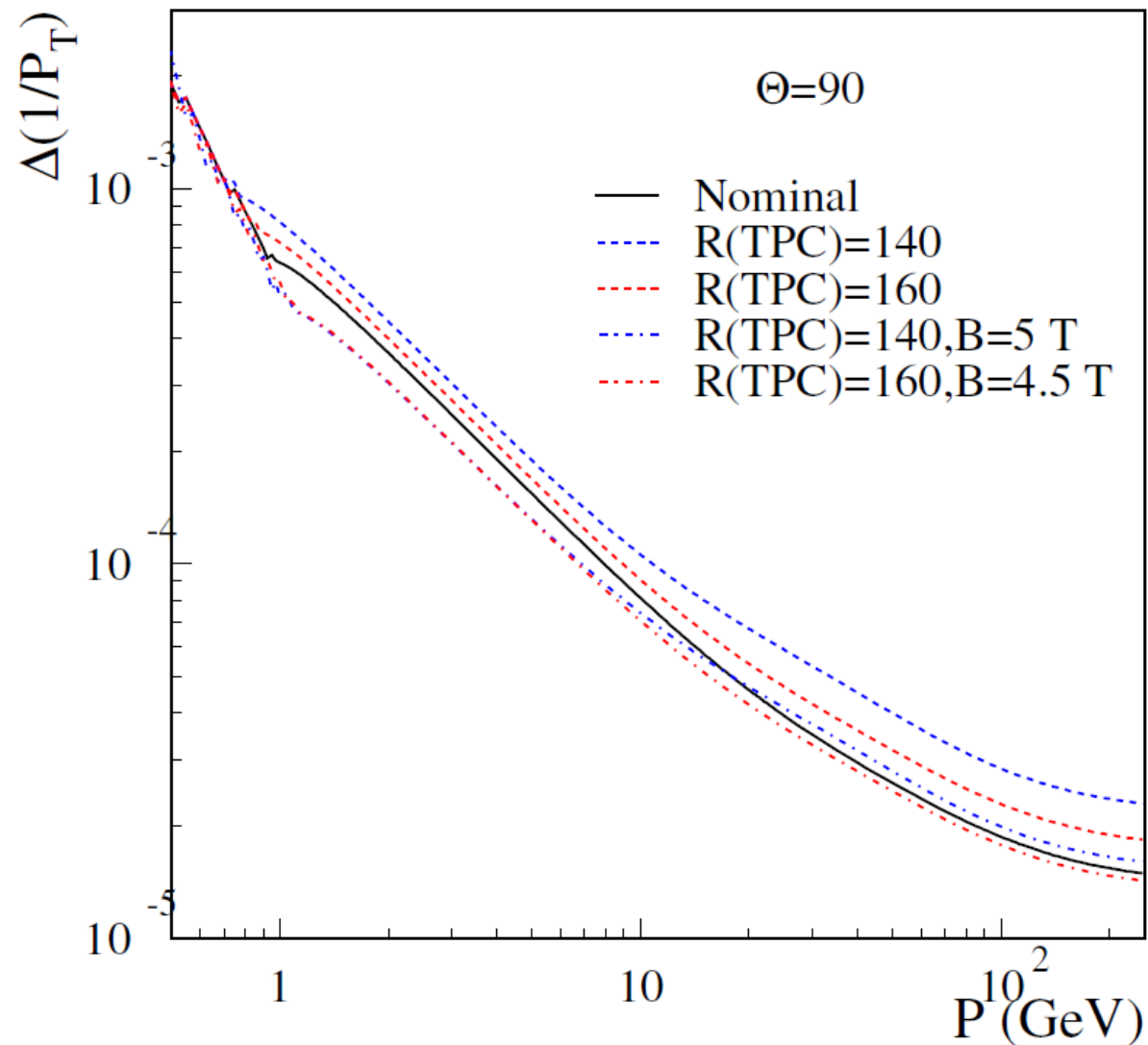
Fast sim. - IP resolution

- Plots from Mikael Berggren



Fast sim. - P resolution

- Plots from Mikael Berggren



Summary

- The IP resolution depends on the VXD
 - Scaling of the TPC radius has negligible effect on IP resolution
- Momentum resolution degrades by $\sim 10 - 20\%$ going from 1.8m to 1.4m TPC radius
 - Can be restored with a higher magnetic field
 - It might come with a cost at tracking efficiency