

Some numbers on resolution

(a reminder)

Some numbers on resolution (1)

- $p \cos \lambda = 0.3 B R$ B [Tesla], R [m], p [GeV]
- Sagitta $s \approx L^2 / 8R$ $L \approx$ pathlength
- $B=4T, p=100\text{GeV}, L=1.2\text{m} \Rightarrow R=83.3\text{m}$
- $\Rightarrow s=2.16 \text{ mm}$

Some numbers on resolution (2)

- $B=4\text{T}, p=100\text{GeV}, L=1.2\text{m} \Rightarrow R=83.3\text{m}$
- $\Rightarrow s=2.16\text{ mm}$
- TPC alone (pad readout ~ 200 points):
 $\Delta 1/p = \Delta p/p^2 \sim 10^{-4}\text{ GeV}^{-1} \Rightarrow \Delta p/p = 10^{-4} p$
- $P = 100\text{ GeV}: \Delta p/p = 10^{-2} = \Delta s/s$
- $\Delta s = 10^{-2} s \Rightarrow \Delta s = 22\text{ }\mu\text{m} \text{ !!!}$

Full ILD tracking

- $B=4\text{T}$, $p=100\text{GeV}$, $L=1.8\text{m}$ \Rightarrow $R=83.3\text{m}$
- \Rightarrow $s=4.86\text{ mm}$
- Full tracking:
 $\Delta 1/p = \Delta p/p^2 \sim 2 \times 10^{-5} \text{ GeV}^{-1}$
 $\Rightarrow \Delta p/p = 2 \times 10^{-5} p$
- $P = 100 \text{ GeV}$: $\Delta p/p = 2 \times 10^{-3} = \Delta s/s$
- $\Delta s = 2 \times 10^{-3} s \Rightarrow \Delta s = 10 \mu\text{m} !!!$

Lesson to take

- Residual systematics internal to TPC has to be well below 22 μm
- Overall positioning TPC w.r.t. Rest of tracking detectors has to be well within 10 μm