Silicon Internal & External Tracker

Simulation Studies for LCTPC & Hardware Prospects – Update

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DESY

Concerns/opinions expressed during previous LCTPC WP meeting

> During the last WP meeting:

> Some people expressed clear preference on the pixel option (small coverage area, excellent resolution)

> While others were concerned on the realignment required after every single move of the TPC with the small coverage area of the pixel option

> Comment: Taking data with magnet on and off should be done without realigning the system → puts low limit on coverage area at the exit of the TPC

> Received additional feedback after the meeting

Feedback after meeting – Ron Settles

> In order to avoid realignment after each single movement of the TPC using a small Si tracker → fix sensors on field cage or magnet wall

  - Have 2-3 systems at specific values

> Problematic approach because:

> High instrumentation cost

> System is less flexible

> Si tracker should be part of the test beam infrastructure so we can't glue it on the field cage

  - Handling of field cage would be even more complicated

> Field cage moves (a few mm) when inserted in the magnet –> risk of damaging the sensors

Feedback after meeting – Claus Kleinwort

> Pattern recognition and track fitting in a system of 2+2 layers with the geometry of the current infrastructure gets quite complicated

> Up to now, we have been using the hit positions on the Si layers from simulation, fitting a helix and looking at the momentum resolution

> But how easy is it to actually find the correct hit positions on the Si layers and reconstruct a track in data?

  - Noise, combinatorics, extrapolation to the other side of the detector,...

> Proposes 3 planes on each side

  - For pixels. Similar cost by slightly adjusting the coverage area (2x2 cm2 front, 4x8 cm2 back)

  - For strips (1d)? How many layers would we need? Cost not so much of an issue here

Feedback after meeting – Claus Kleinwort (2)

> Need to proceed with some more realistic simulation and reconstruction

> Ongoing work on moving the simulation within DD4Hep in order to describe the system and have a reconstruction chain for the Silicon tracker

- Clusters → Hits → Pattern recognition → Track fitting
- Separate simulation for the two different systems (pixels, strips)

DESY