Tracking Software Status for a TPC at FCCee

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DESY.

Overview

❖ Track reconstruction in silicon tracking detectors with Conformal Tracking

❖ Track reconstruction in TPC with Clupatra Tracking

❖ Track merging of subdetector tracks required

❖ FullLDCTracking incorporates track merging …

   … but it is tailored to the ILD

   ❖ e.g. subdetector names are often hardcoded

❖ C Event Display is not reliably showing hits of tracks

CellIDEncodings: Current Situation

- Each sensor cell has a unique CellID (64 bits, partially split into 2x32 bits in LCIO for storage, always uint64_t in EDM4hep)
- For tracking: only 32 bits to enumerate the sensor, leaving 32 bits for strips / pixels on each sensor (convention from LC)
- CellIDEncoding can be used to split these into several smaller pieces
  - for ILD: **system:5,side:-2,layer:9,module:8,sensor:8**
  - for CLD: **system:5,side:-2,layer:6,module:11,sensor:8**

- Important assumption: **Only one convention for complete tracker!**
  - For now use ILD convention (need enough layer bits for TPC!)

CellIDEncodings: Food for Thought

❖ Now is a good time to potentially rethink some of the LC conventions

❖ Do we need / want CellIDEncodings that are the same for all subdetectors?

    ❖ Just define `system:5,side:-2` and leave the distribution of remaining bits for layer, module, sensor to each subdetector?

❖ Are we happy with 32 bits up to the sensor, or do we need more? How many bits can we take from the 32 that are currently reserved for on-sensor ids?

The usual caveats apply:

❖ Available person power to actually act on any potential decision

k4DetPerformance

❖ Framework designed to study tracking performance within full simulation environments

   ❖ Requires complete simulation and reconstruction setup

   ❖ Matches reconstructed tracks to simulated particles

   ❖ Various plotting options: superimpose plots and ratios for comparative analyses

❖ Initially developed for CLD at FCCee by Gaelle Sadowski

❖ Now integrated into Key4HEP

❖ Leonhard Reichenbach, Gaelle and me are looking into extending its applicability to other detectors

https://github.com/key4hep/k4DetPerformance