CDC Update

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11 May 2015

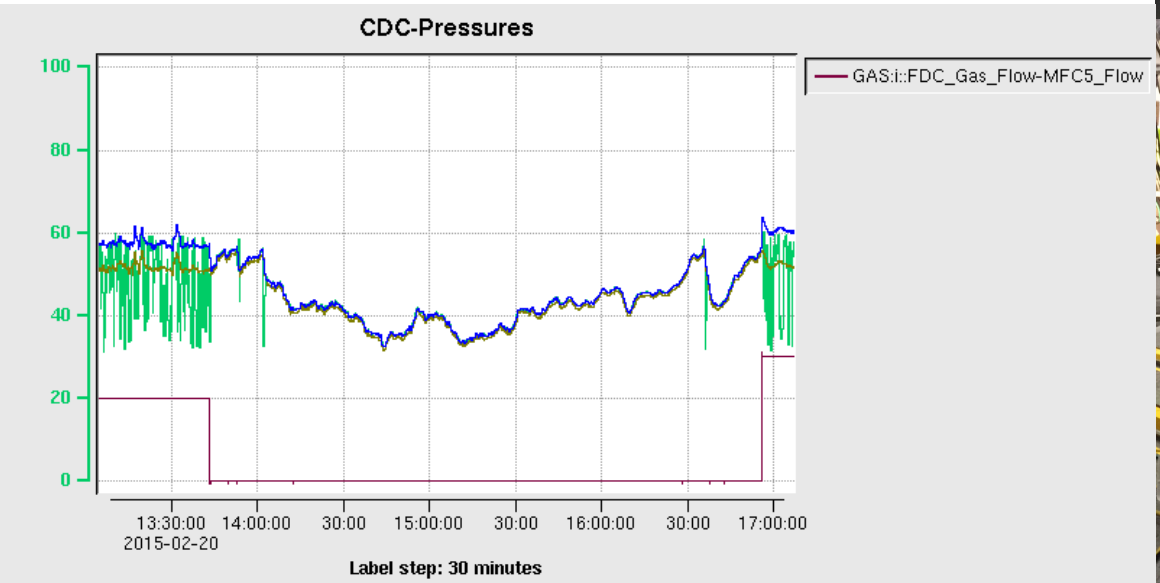
GlueX Collaboration Meeting

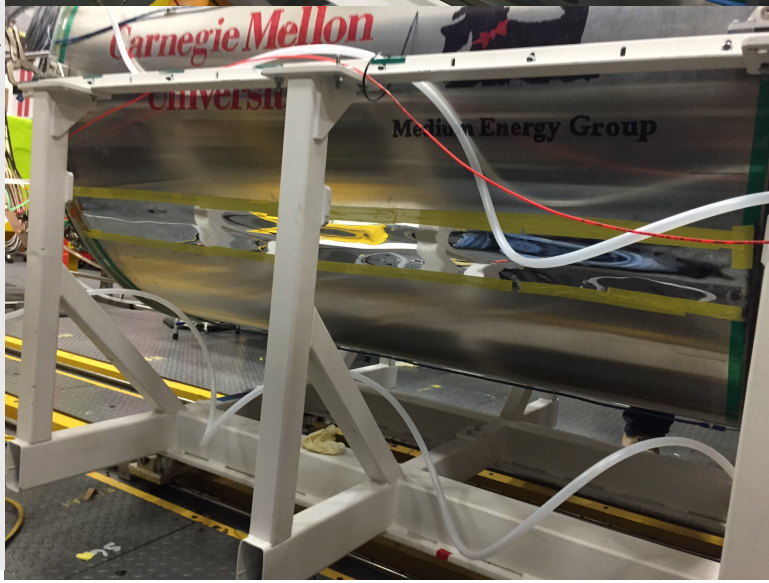
Overview

- Gas leak repair
- Noise filtering
- Gas mix
- Efficiency
- Alignment

Gas Leak Repair

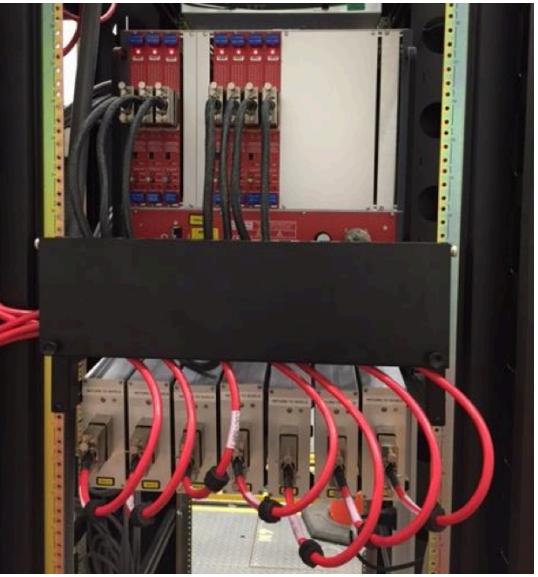
- Gas Leak repair in March went well. CDC gas tightness has improved dramatically.
- Thanks to the engineering team for a quick and effective solution!





Noise Reduction

- From last meting -- Rerouting the HV wires did not fix the problem with CDC noise (things were worse).
- Filter boxes were assembled by CAEN for each HV connector on the CDC and the FDC (installed in mid-April).
- The filter boxes are functioning very well and reduce the noise considerably. Noise levels now ~5 mV rms.
- Lower thresholds = higher efficiency!



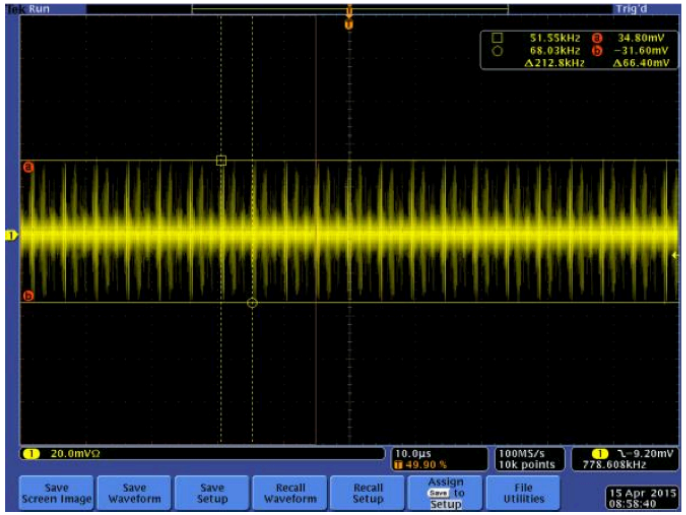


Fig.2 – CDC C5, Ch24, no filter

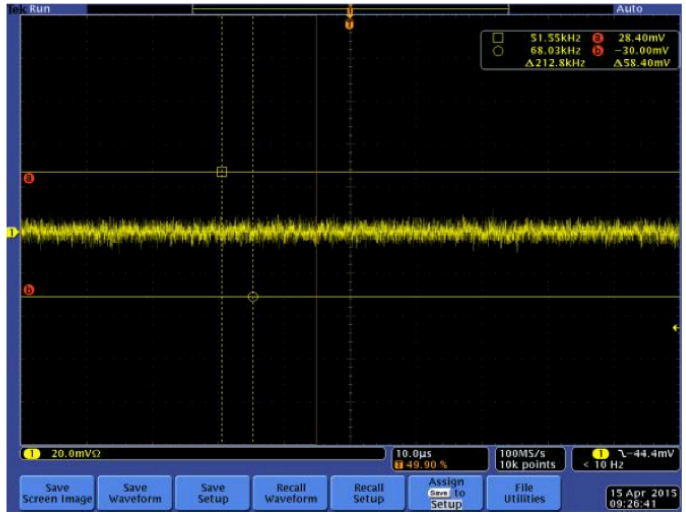
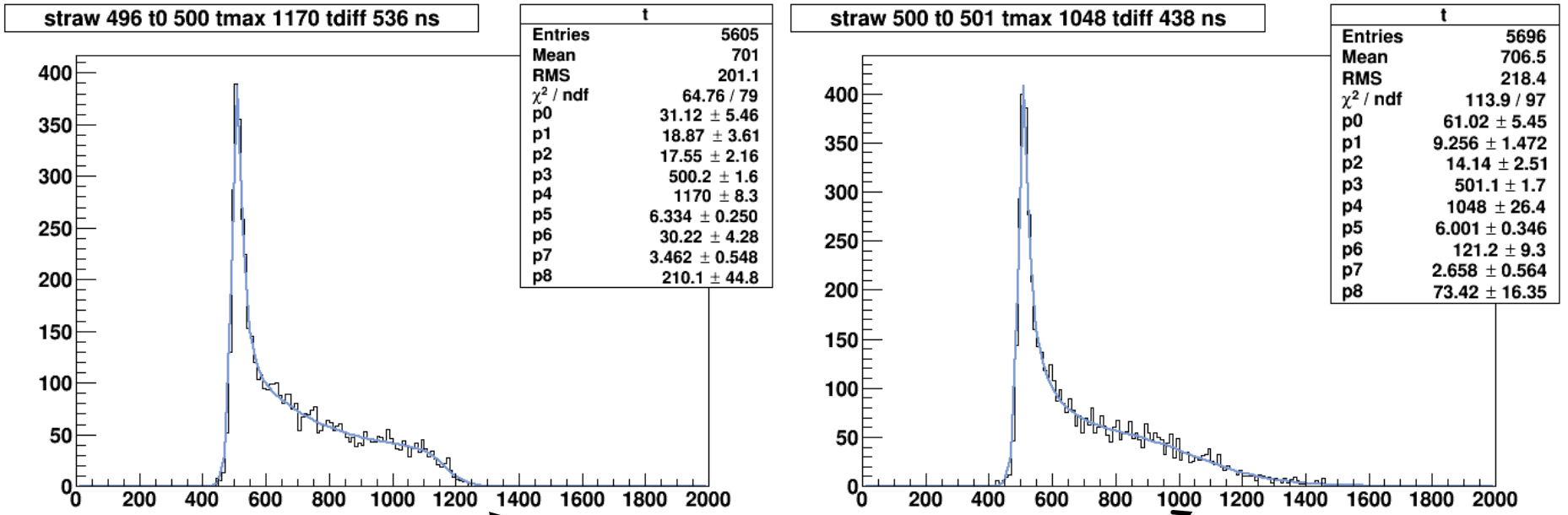


Fig.3 – CDC C5, Ch24, with filter

Drift Time Distribution

- Some (most) straws exhibit unexpected timing behavior at large drift times.



Per Straw Efficiency

First set of results are for Run 2931 (800A).
Second set is for

Method:

1. Get all time based tracks (for a single mass hypothesis)

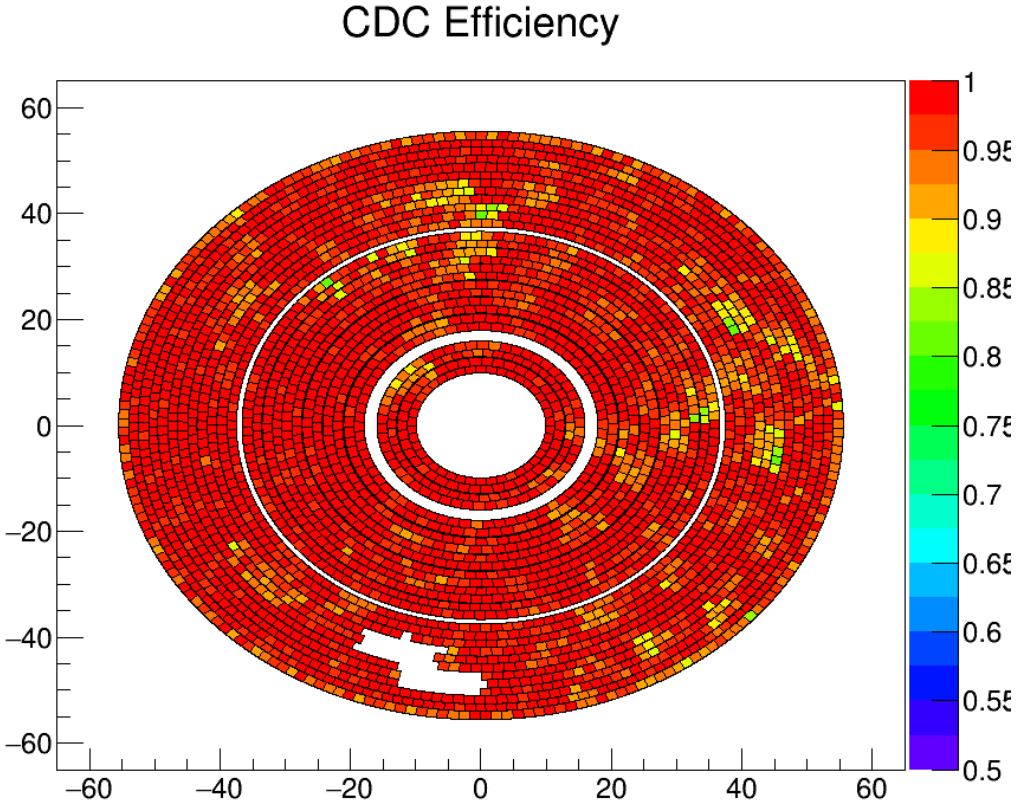
2. Cuts:
   - Tracking FOM > 0.01
   - 0.3 < |P| < 6.0 GeV/c
   - Has SC Match
   - 62 < Vertex Z < 68 cm
   - Vertex r < 1 cm
   - Must have at least 15 hits in the CDC
   - Must hit one of the two innermost rings, and one of the two outermost rings.

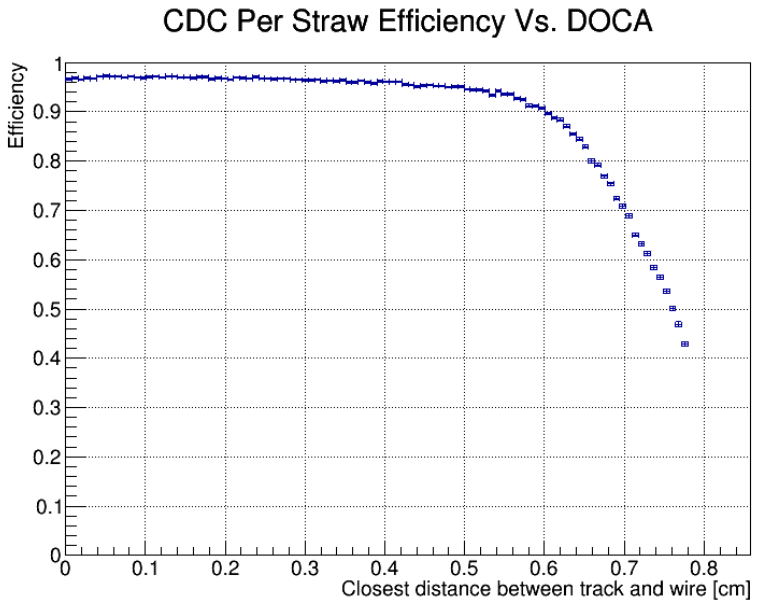
3. Find DOCA of the track to the wire. If less than 0.78 cm we expect a hit.

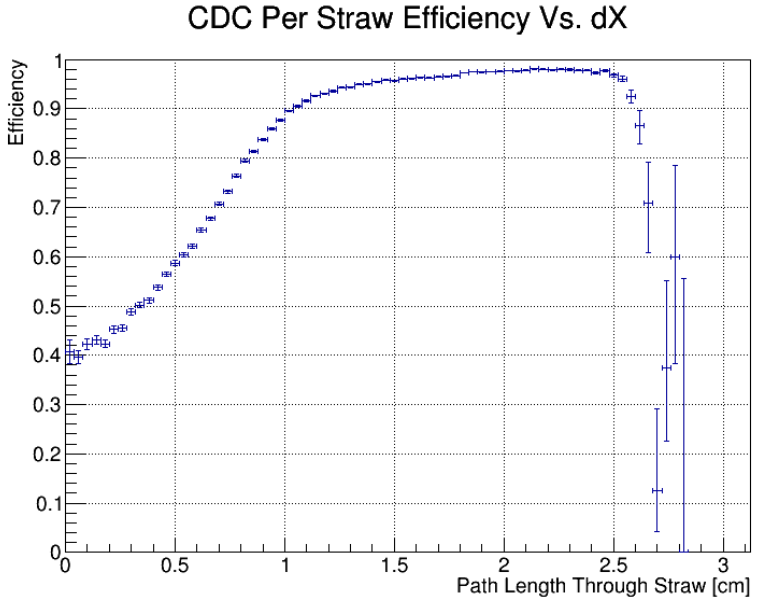
4. Search through CDC hits to see if there was a hit on the expected wire.

5. Divide to get per straw efficiency.

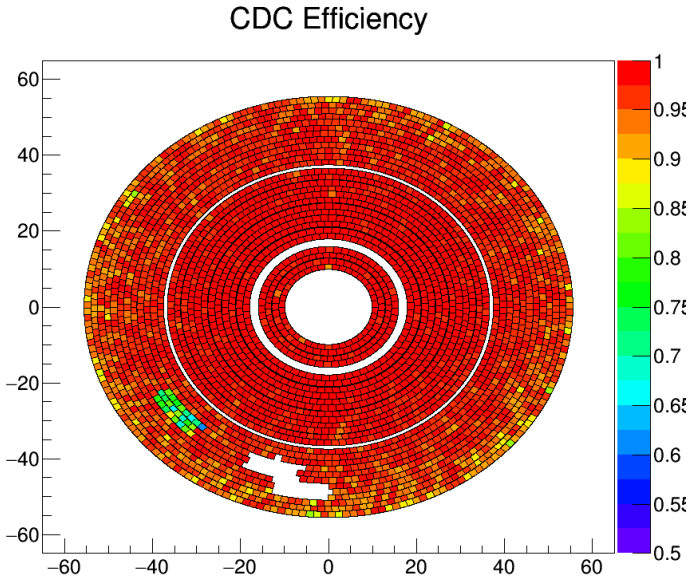
Run 2931 Per-straw Efficiency

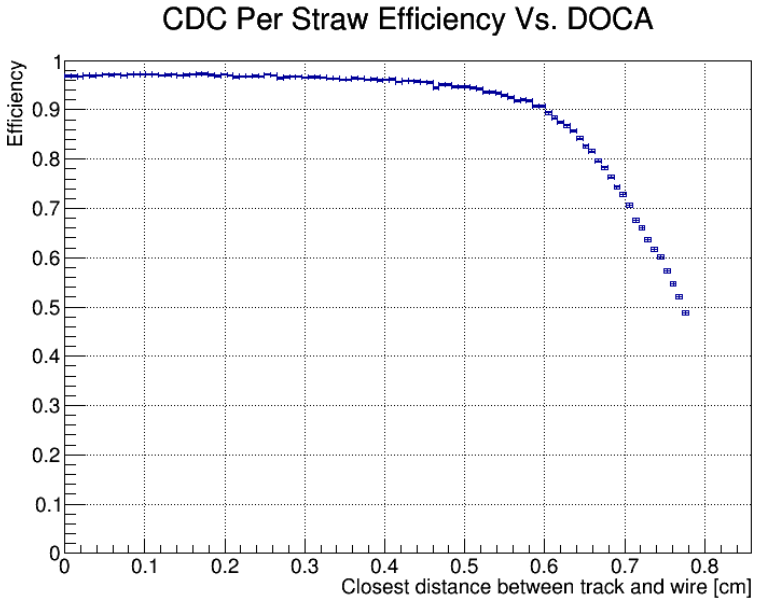


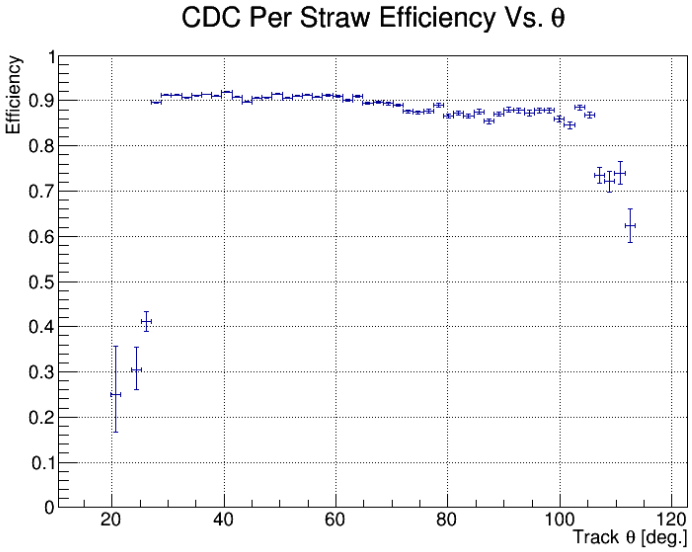


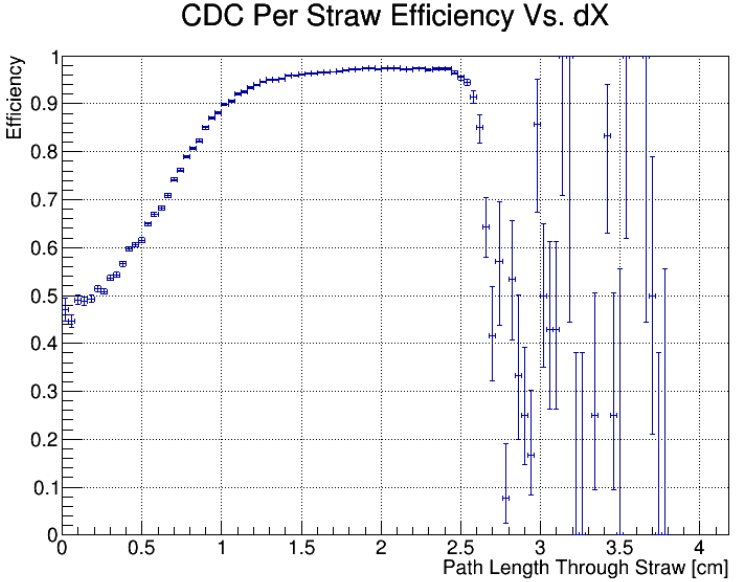


Run 3079 Per-straw Efficiency



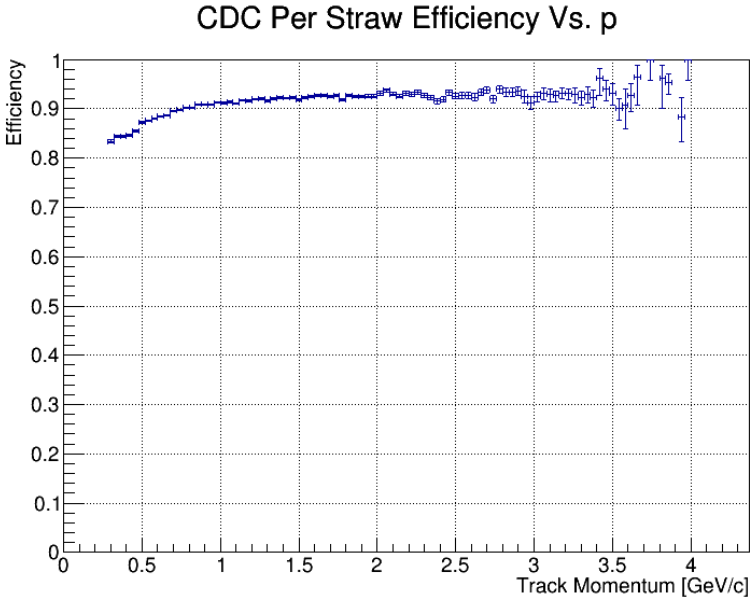


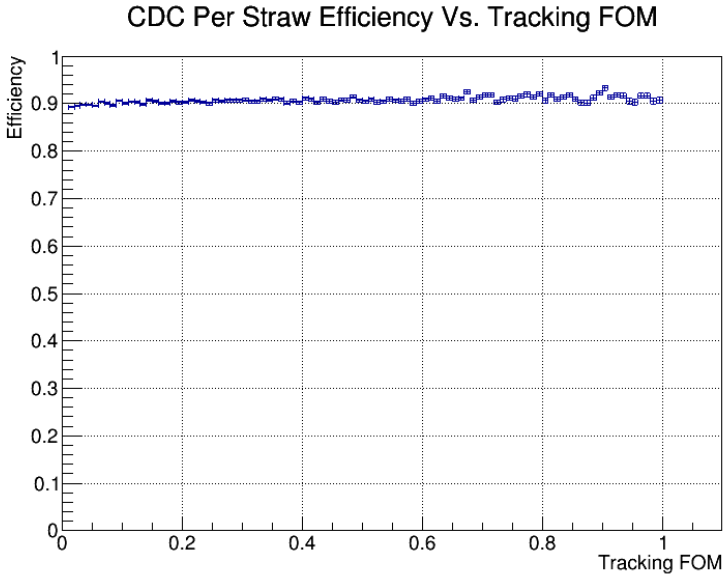


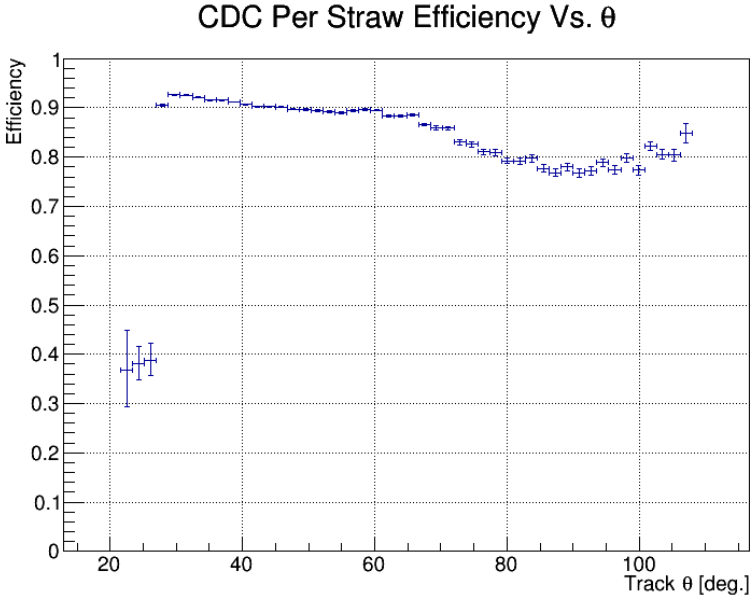


Per-straw Efficiency

Ongoing work to study how these efficiencies look with simulated data

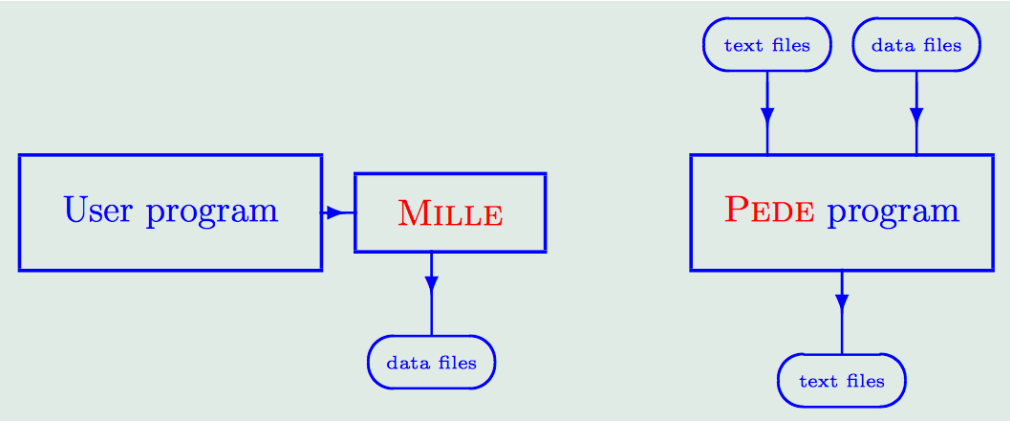






Alignment

- Simon has a first pass at the straw offsets in the CCDB.
- Constants determined using extended Kalman filter.
- Tested with simulated data, works well with axial straws, stereo are more challenging.
- Running over real data improves tracking FOM.
- One drawback is the method is not easily parallelized within the sim-recon framework.
- A cross check with another method is useful.
- Investigating using Millepede for GlueX data.



Millepede 2009, V. Blobel, Contribution to the 3rd LHC Detector Alignment Workshop, June 15 - 16 2009, CERN

Overview

- Overall performance has improved from the fall to the spring thanks to improvements in noise levels.
- CDC gas mixture measured, but not yet understood.
- Work ongoing to calibrate time-distance tables and set the energy scale for dE/dx.
- New FPGA algorithms in the works.
- Alignment using Kalman filter tested and applied. Millepede integration in the works.
- Early tracking efficiency studies ongoing.

Quenchtions?

Backup Slides

Run 2209 -> 1200A field