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Bundesministerium
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und Forschung

CA Track Finder for FTS

I.Kisel, M.Pugach, I.Zivko, M.Zyzak

FIAS, Frankfurt am Main
GSI, Darmstadt

PANDA Collaboration meeting
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Outline

- Introduction
- Kalman filter track fit for Cellular Automaton Track Finder
- Combinatorial Part of the algorithm
- Results & Summary

Cellular Automaton Track Finder

- * **Input/Initialisation** (MC-info, hits, magnetic field, detector geometry etc.)

- * **Track-segment construction**

- ✧ **Singlets**

- ✧ **Doublets**

- ✧ **Triplets**

- ✧ **...**

- ✧ **N-plets**

- * **Estimation of Track Parameters**

- ✧ **Kalman Filter**

- ✧ **Extrapolation (to station position)**

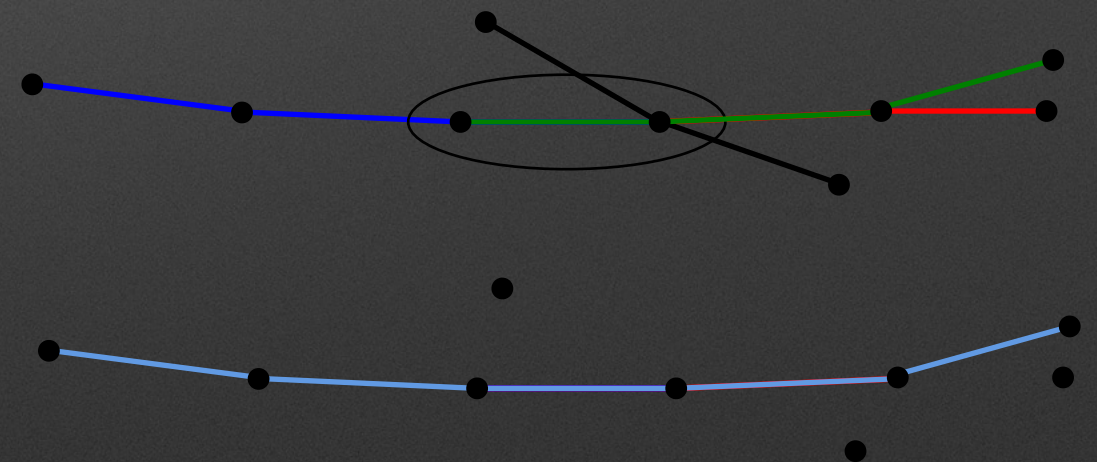
- ✧ **Update (using hit-measurement information)**

- * **Evolution**

- ✧ **Neighbour Search**

- ✧ **Track Construction**

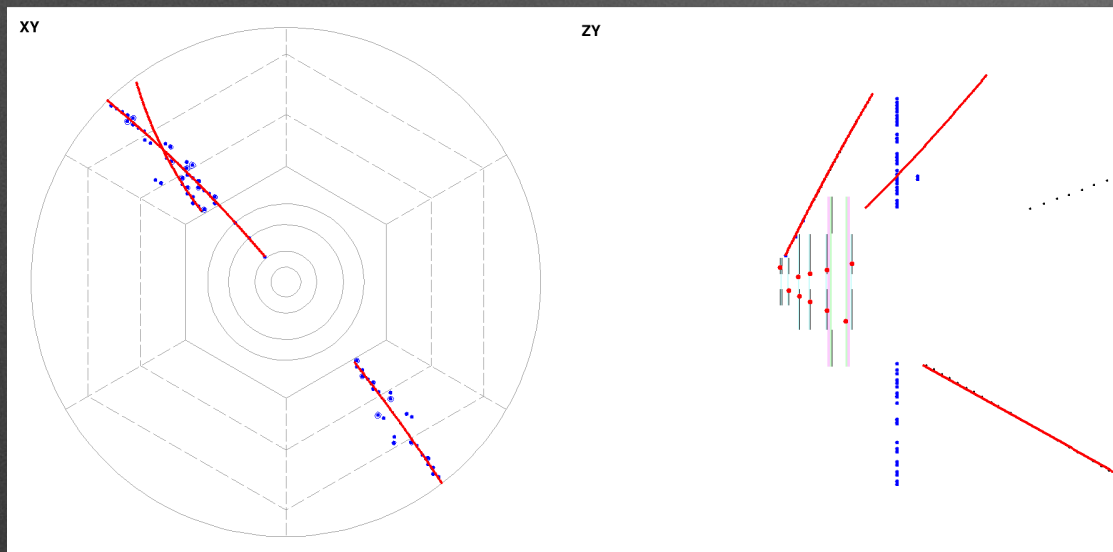
- * **Performance evaluation**



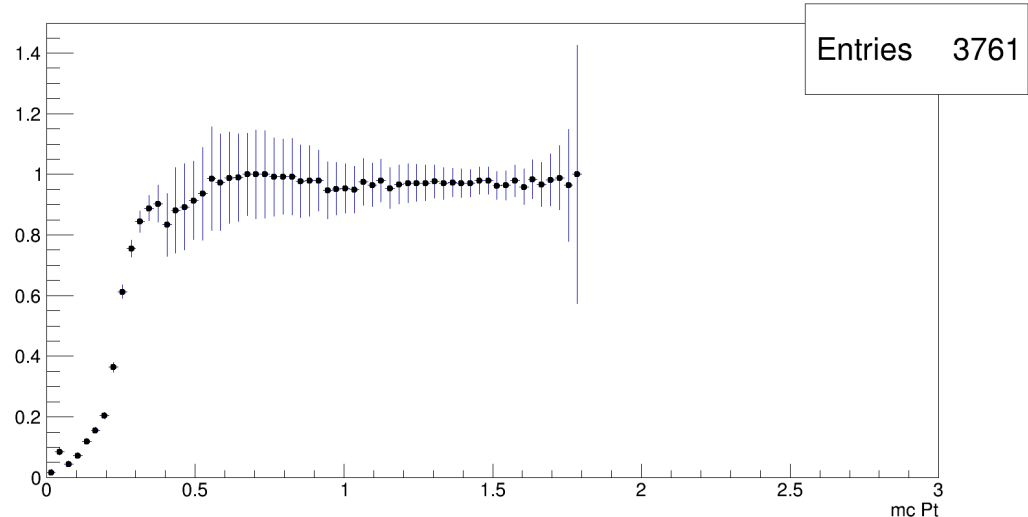
CA Track Finder STT->FTS

- With improved track fit the CA method was further developed.
- FTS measurements are similar to STT -> STT CA track finder has been applied to FTS.

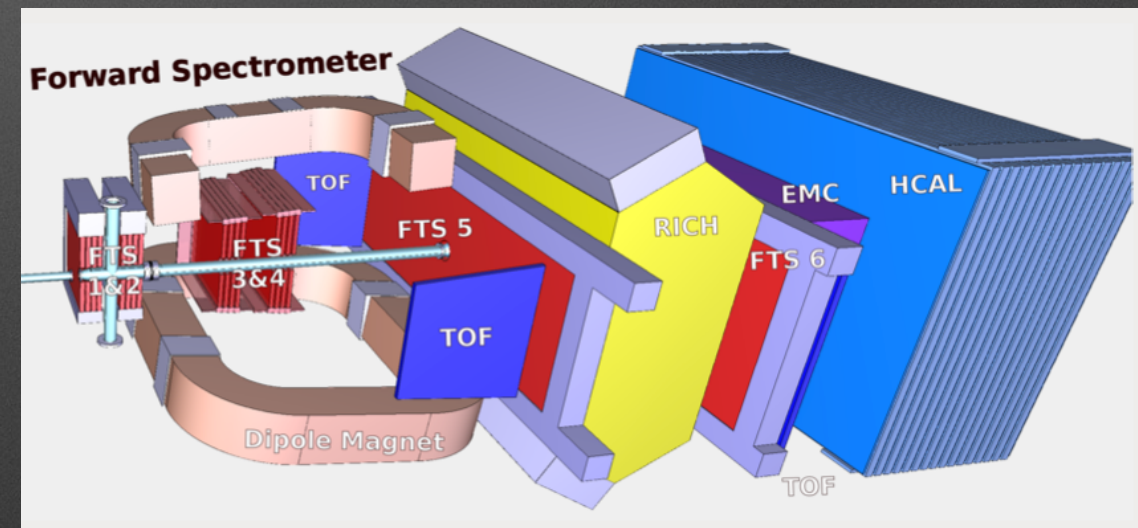
Barrel part



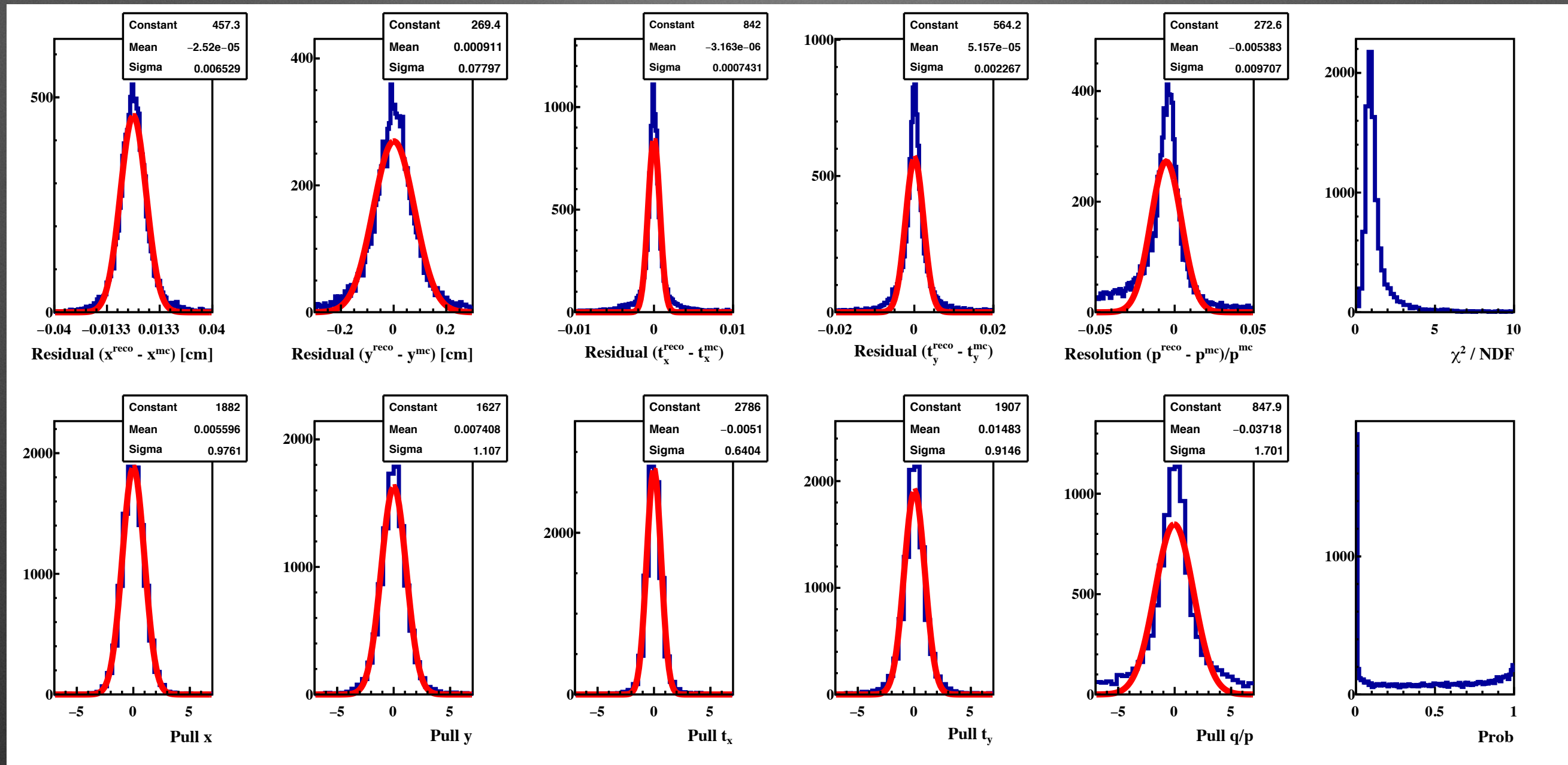
Barrel tracking efficiency vs pt



Forward part

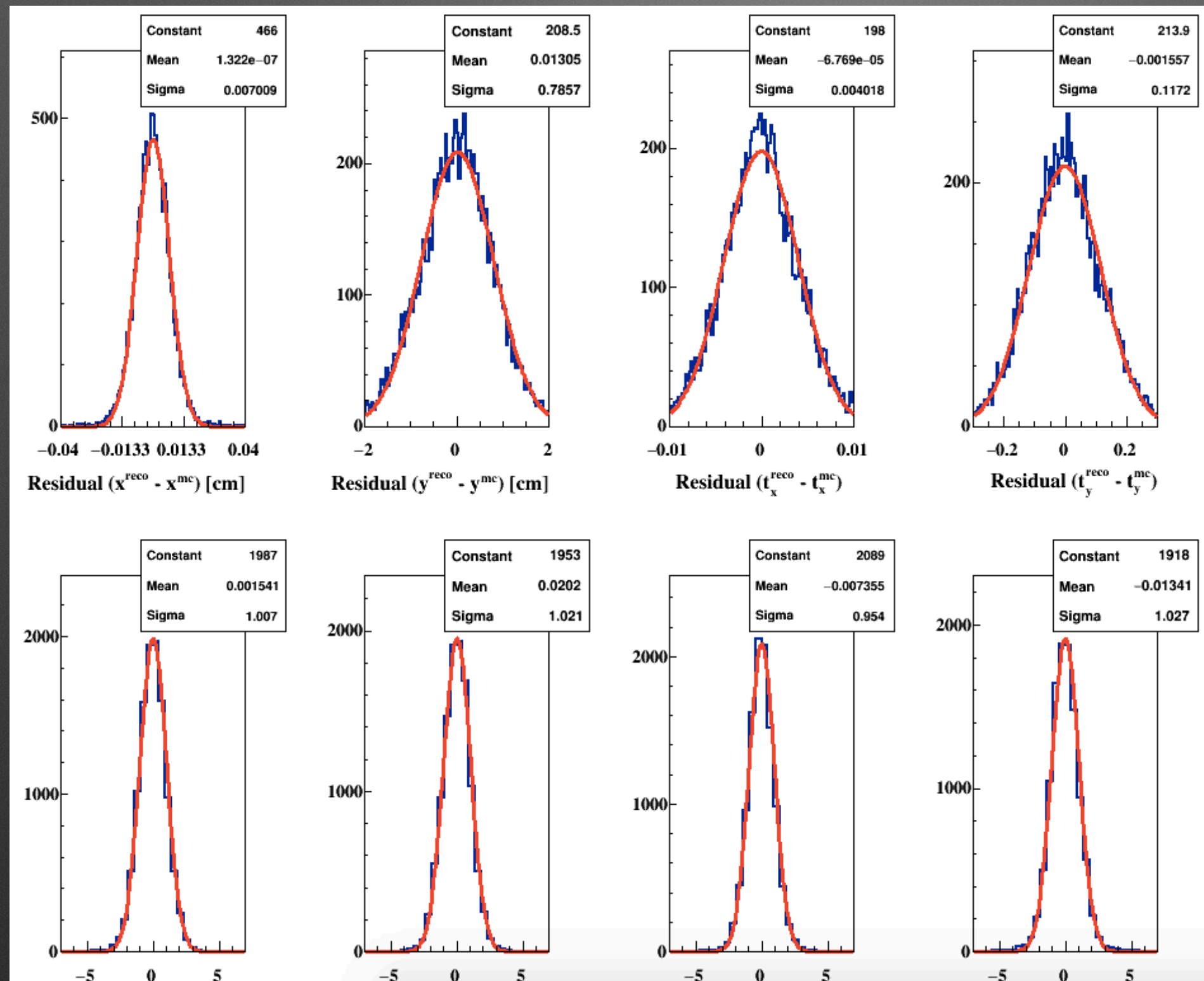


Residuals & Pulls for FTS Track Finder (PandaRoot)



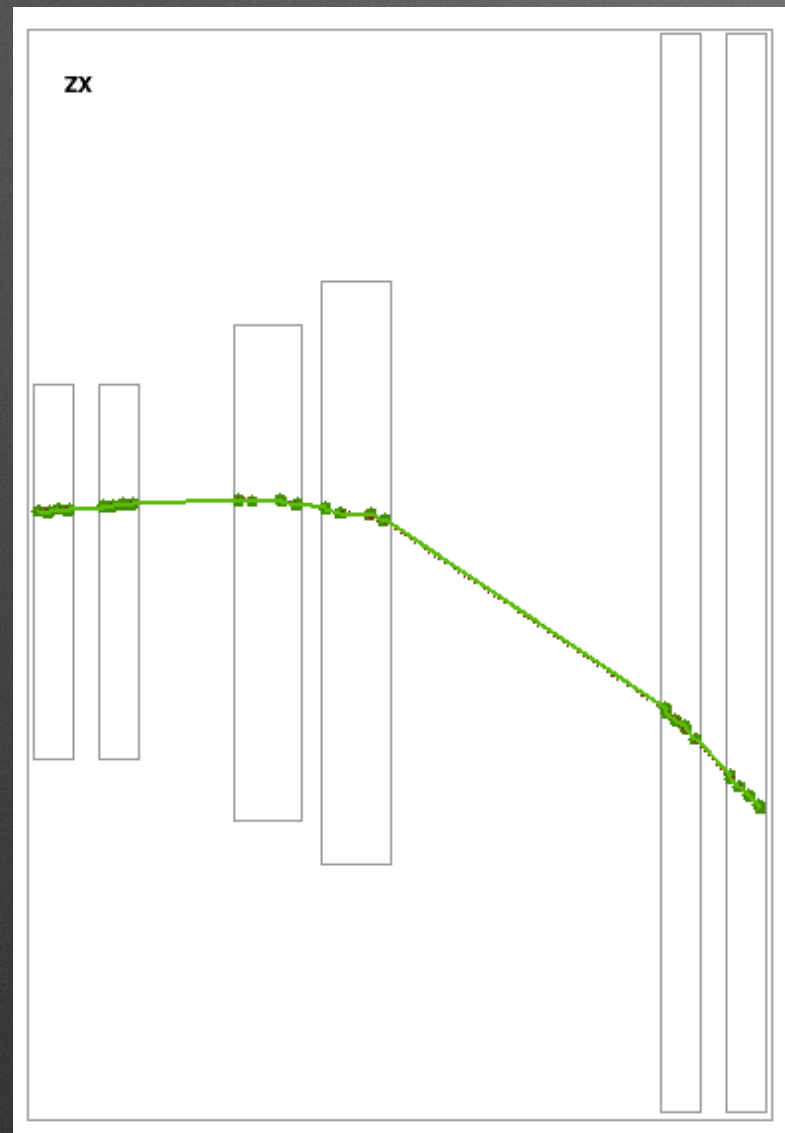
- Correct pulls and χ^2 distribution.
- Pulls are not ideal and peak at 0 in prob due to the approximate material budget.

Residuals & Pulls for FTS CA Track Finder (segments)



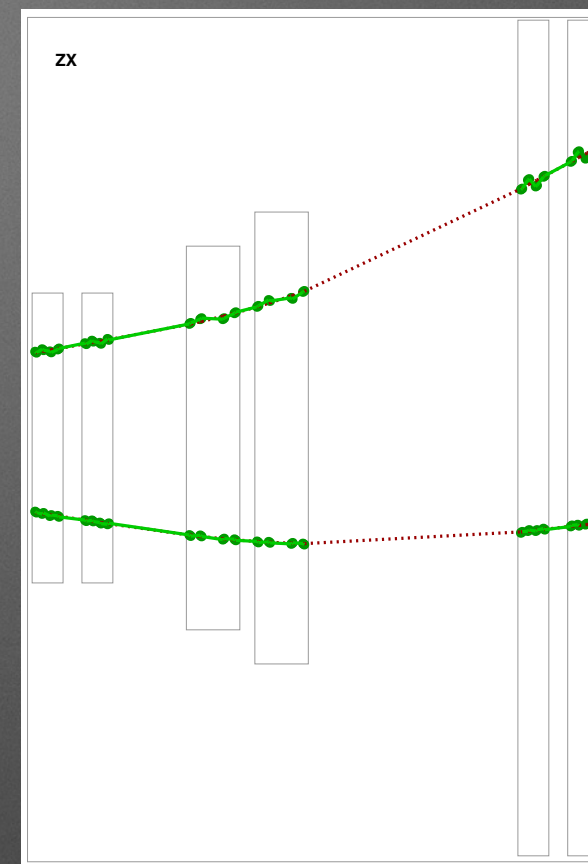
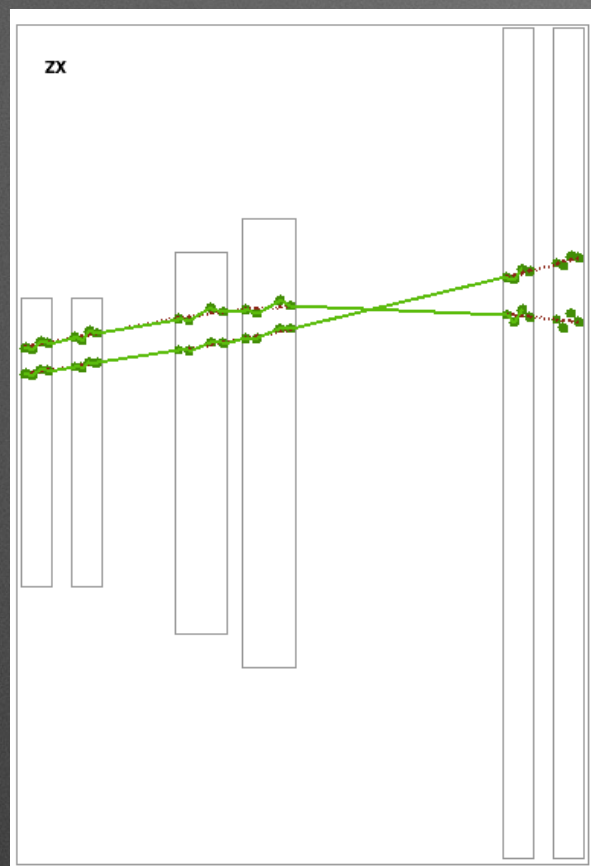
Correct parameters
allow to combine
segments further

Status for CA Track Finder



- Applied to FTS:
 - STT CA Track Finder in conjunction with KF for the forward track-model.

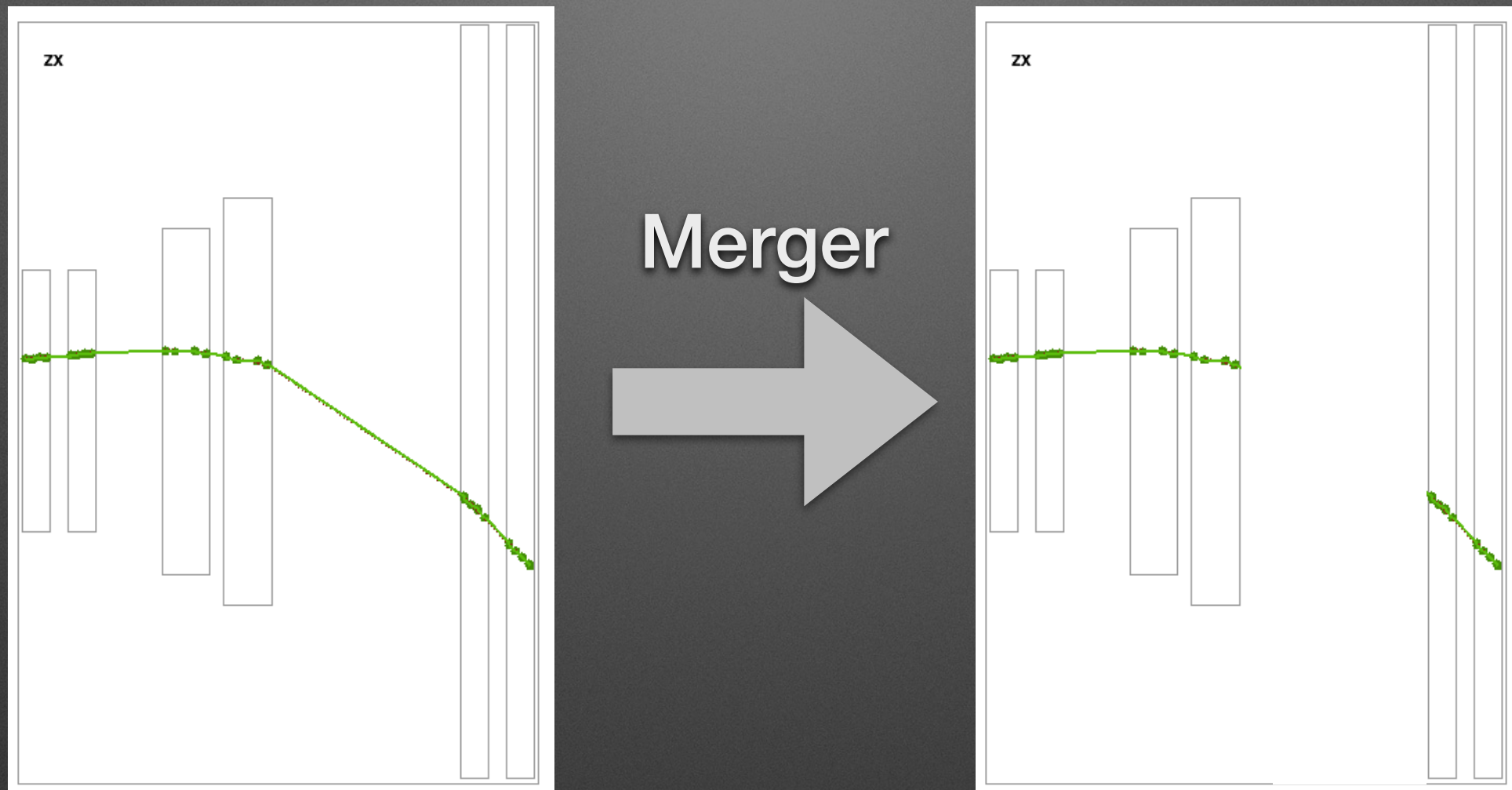
Efficiencies



| | EFFICIENCY, % | GHOST, % | CLONE, % | TRACKS/EV |
|--------|---------------|----------|----------|-----------|
| Tracks | 97.5 | 0.4 | 80.2 | 1 |

1000 events generated
by PndDpmDirect

Track Merger



Track Merger is implemented to merge splitted tracks and track clones

Summary & Plans

- Kalman filter based track fitter is implemented for the inhomogeneous magnetic field and shows correct results.
- STT CA Track finder for the forward part is at the final stage of optimisation.
 - Singlet initialisation by hit on neighbour station.
 - Different criteria to combine segments with/without of magnetic field
 - Precise material map
 - Cut-optimisation

Back Up

Package architecture

- Interfaces for CA track finder + QA within PandaRoot
- Event Display for debugging purposes and visualisation
- Vectorised code:
 - Suitable for fast analysis of big data streams

