Imperial College
London

Tracker Software Update

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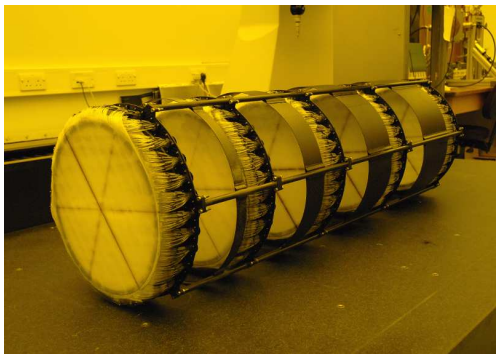
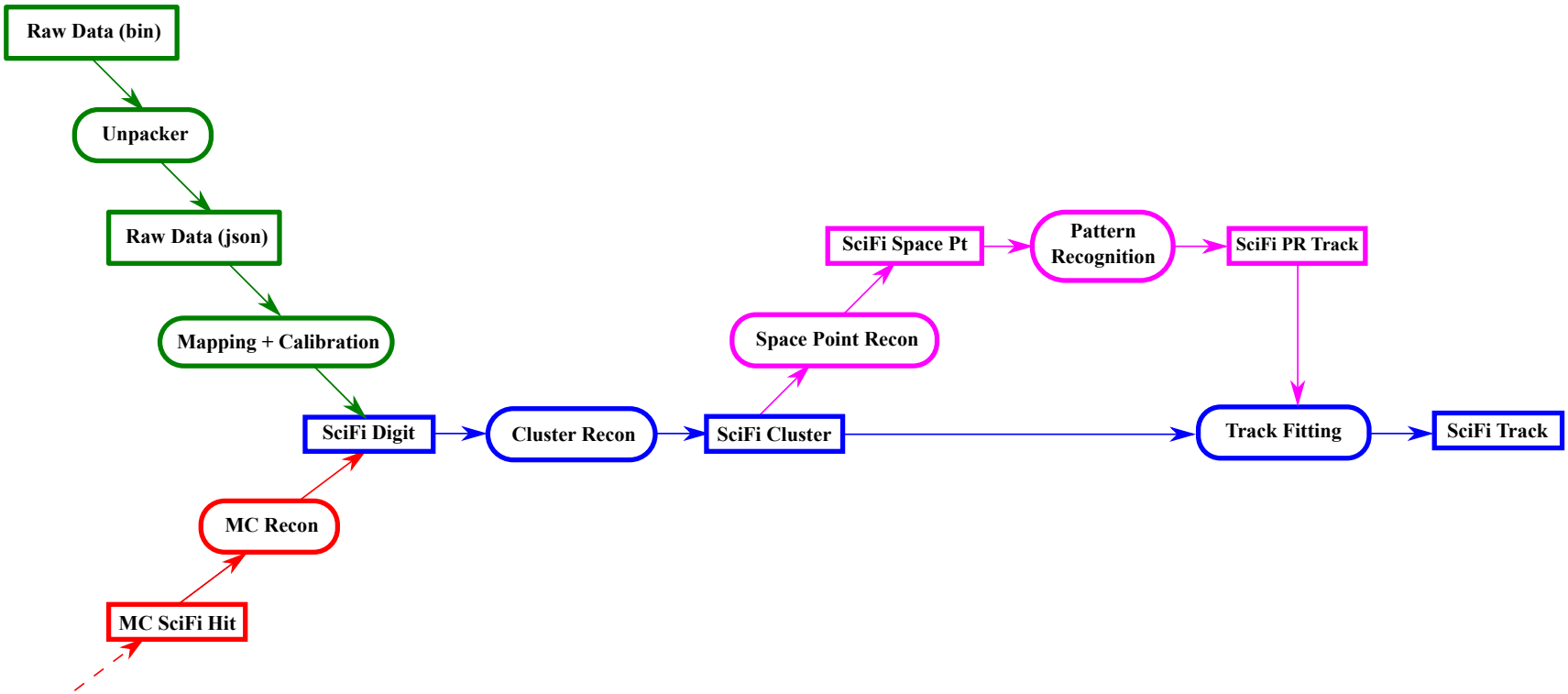
Overview

- Current Status
- Workflow
- Single Station Test
- Monte Carlo
- Pattern Recognition
- Full Track Fit



Reminder: Tracker software work flow

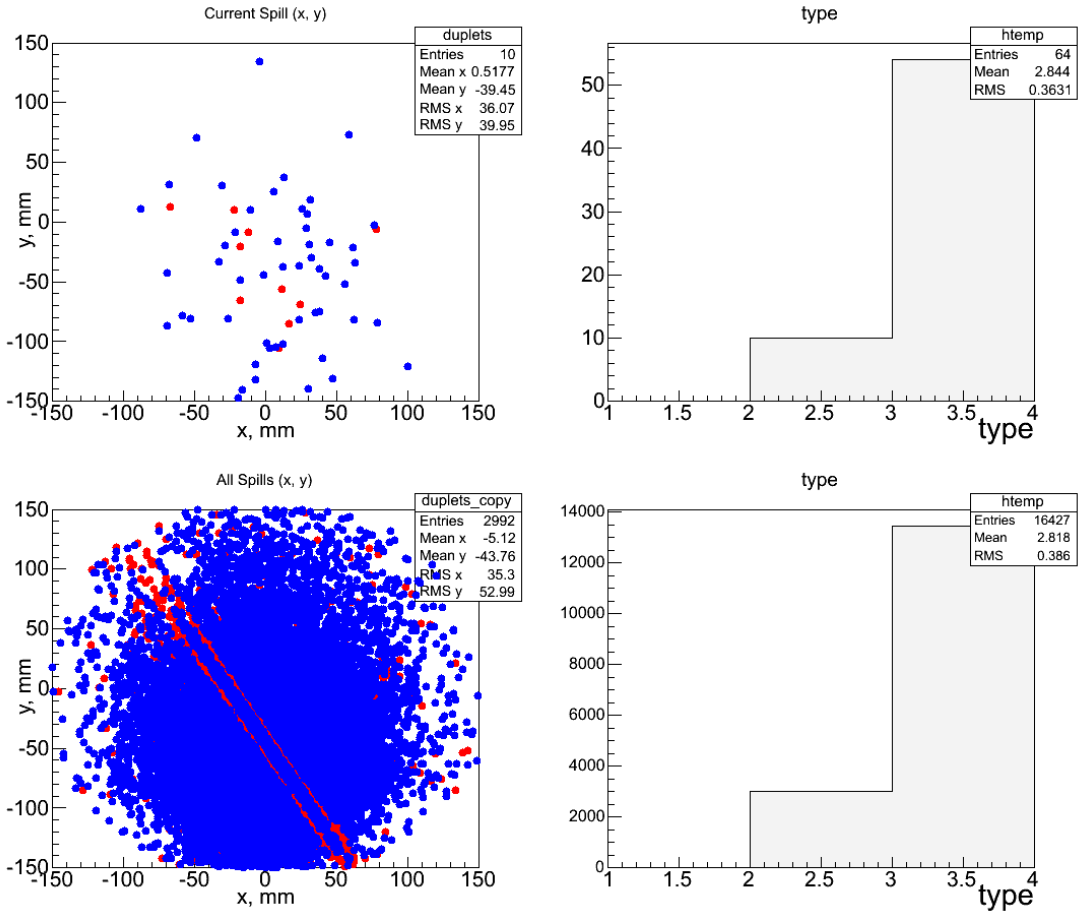
Rectangles - data units, Lozenges - processes



Current Status

- MC is much improved but issues remain
- Config DB - need to write code to start using this
- Reconstruction up to spacepoints demonstrably working reliably (MC, cosmics, single station test)
- Online Monitoring also working well up to spacepoints
- Pattern Recognition working for straight, to be optimised
- Pattern Recognition for helical has produced helices but code is not yet reliable
- Full Kalman track fit making steady progress
- Unit tests starting to catch up with code again
- Documentation - good from an algebra / equipment point of view, code implementation not done
- New team members: Savannah Thais and Natalie Harrison from UChicago, Chris Heidt drafted in from Riverside

Single Station Test



Plots by E. Santos.

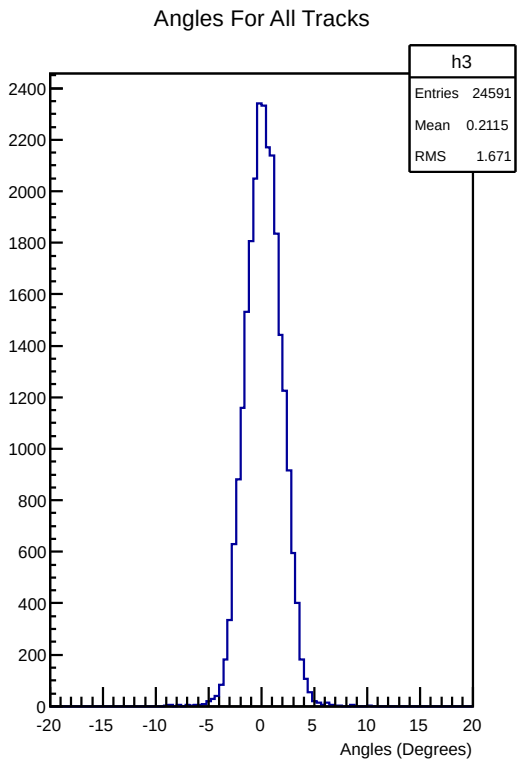
- Able to perform real time reconstruction of spacepoints
- Duplets are Red, Triplets are Blue
- Red lines are dead channels in the electronics
- **See D. Adey talk on single station test and E. Santos talk in Analysis session**

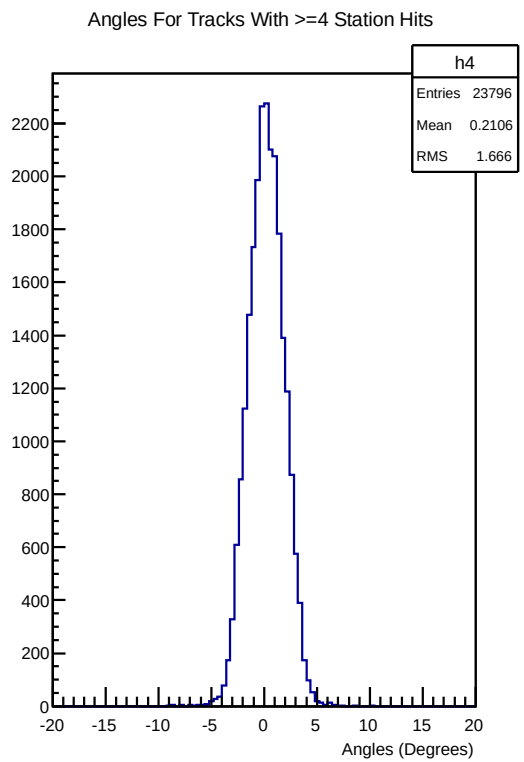
Monte Carlo

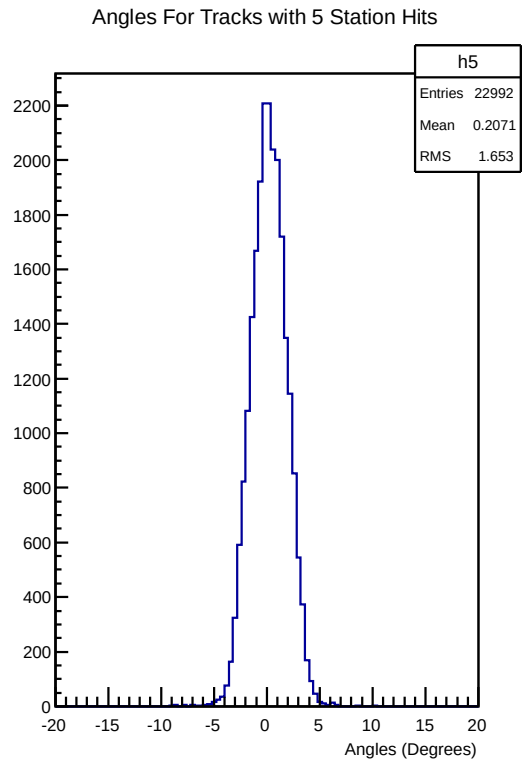
- C. Heidt making good progress
- Solved why were not seeing Hits (fibre length parameter was set wrong)
- Can now reconstruct straight tracks direct from the MC
- Analysis also to being performed by new UChicago students
- **See talk by C. Heidt**

Pattern Recogniton: Angle Analysis

Work by Savannah Thais.

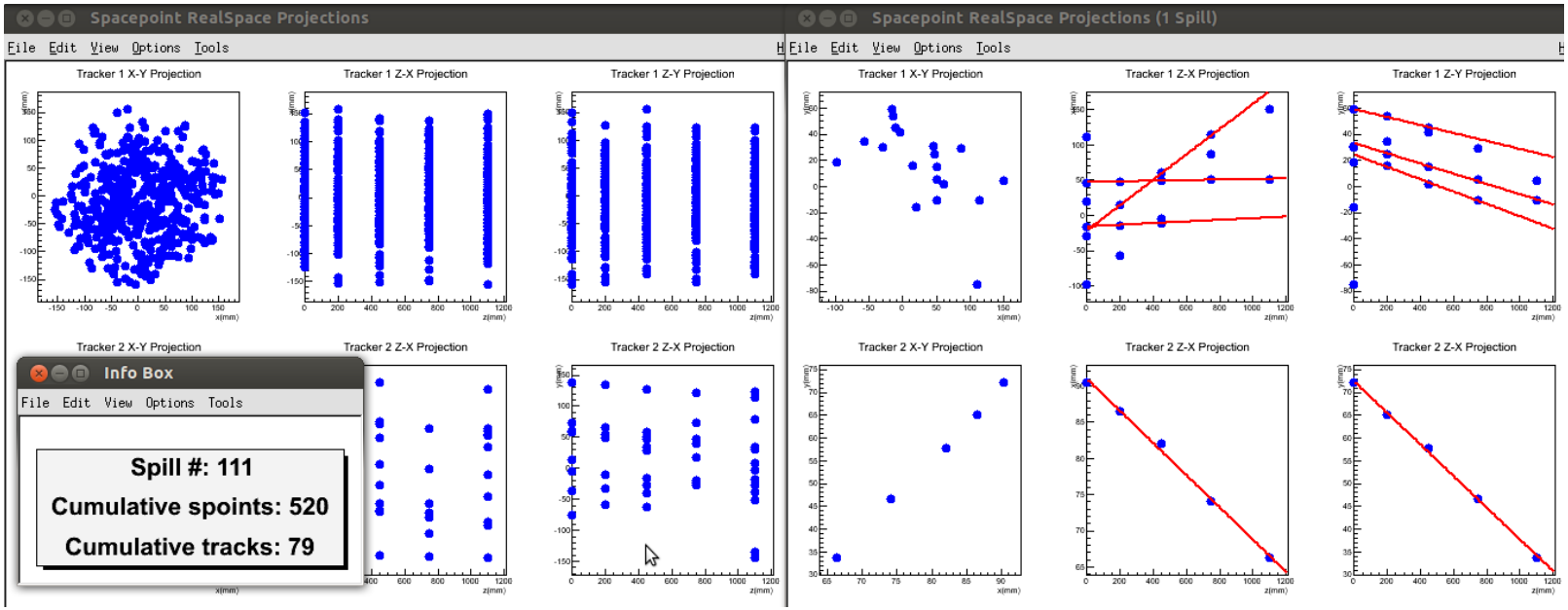




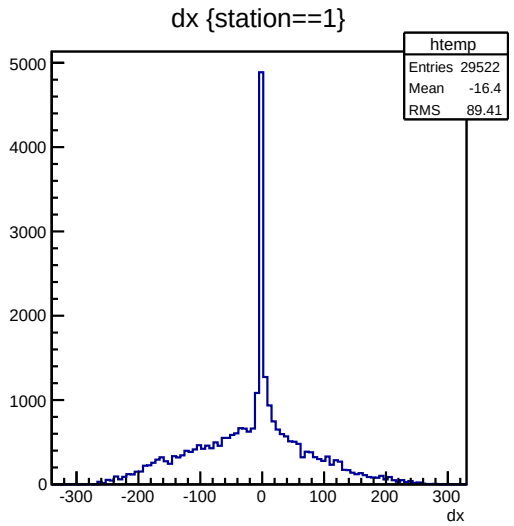


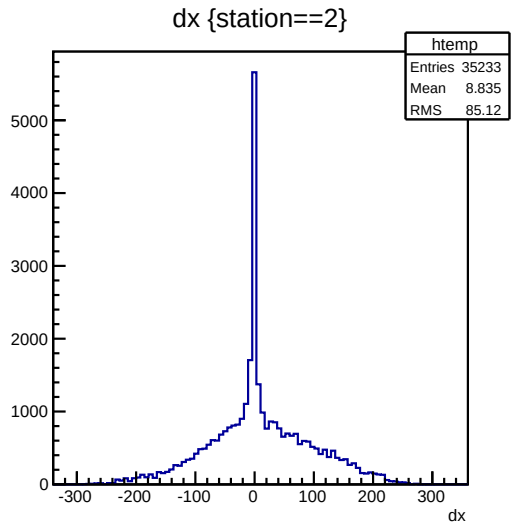
Pattern Recognition: Reducer for Visualisation

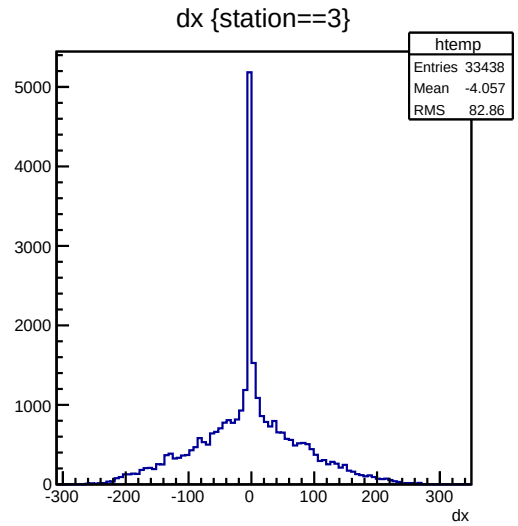
- Reducer to visualise tracks and spacepoints online or offline
- Current spill and cumulative output
- Both trackers, displayed separately
- X-Y, Z-X, Z-Y projections

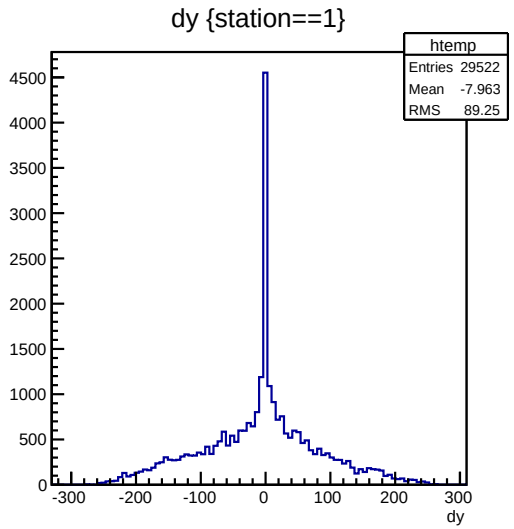


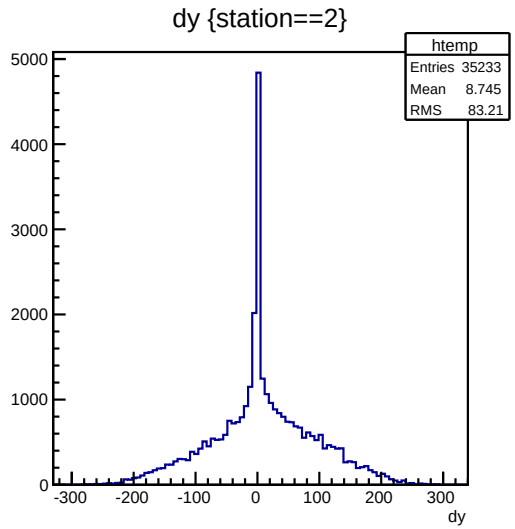
Pattern Recognition: Residuals All Trial Lines

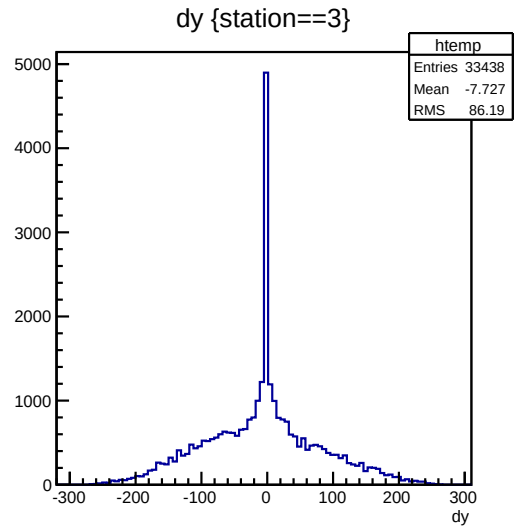






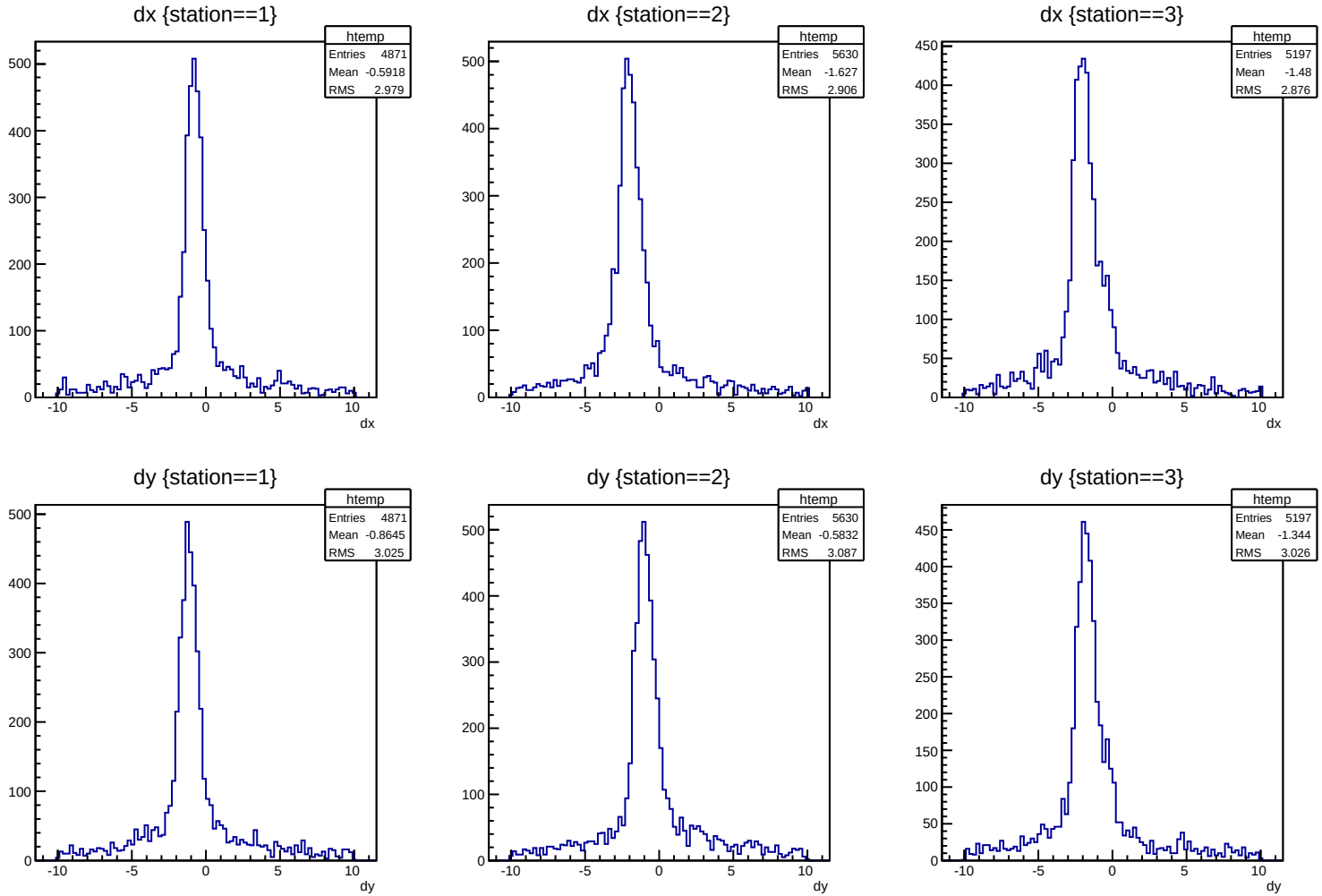




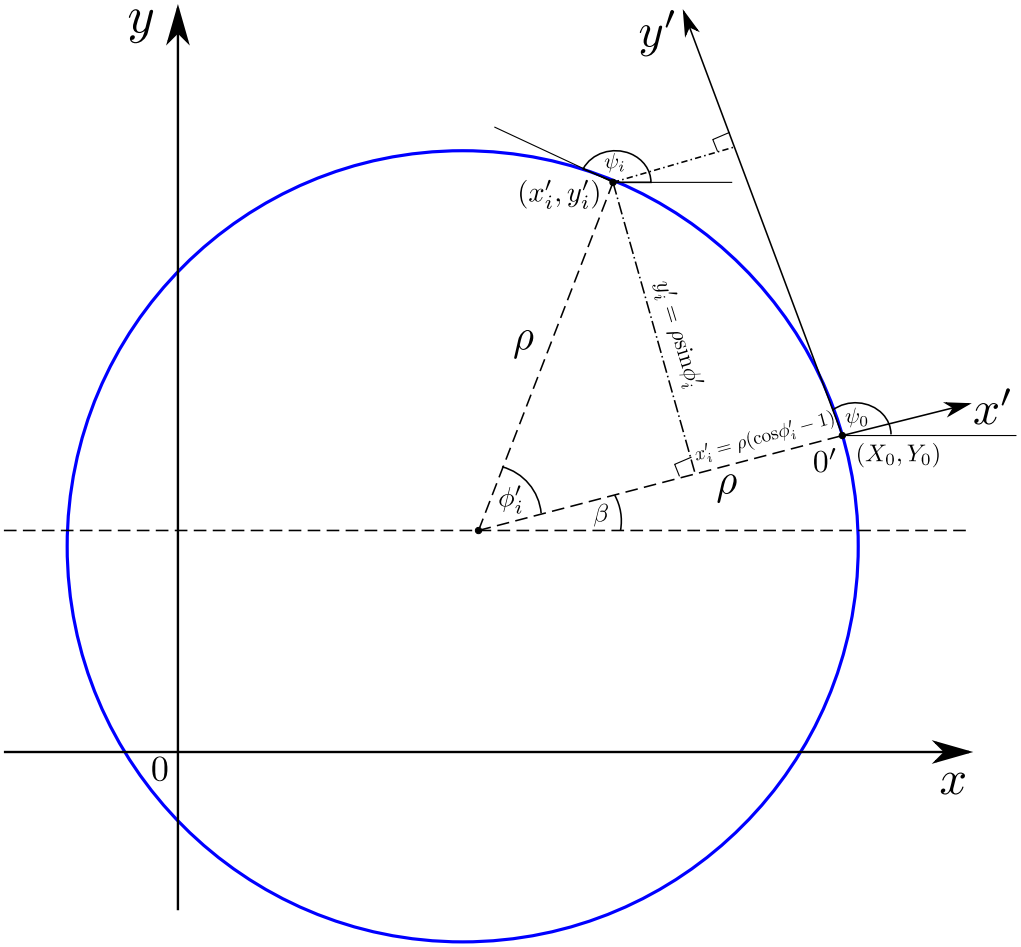


Pattern Recognition: Residuals Good Trial Lines

Cuts: $\delta x < 10mm$ AND $\delta y < 10mm$



Pattern Recogniton: Helix Parameterisation



$$x = X_0 + x' \cos\beta - y' \sin\beta$$

$$y = Y_0 + x' \sin\beta + y' \cos\beta$$

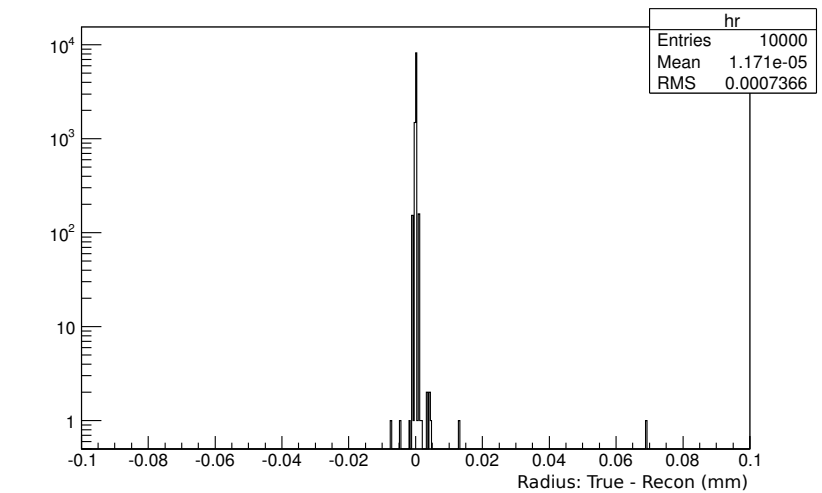
$$z = Z_0 + z'$$

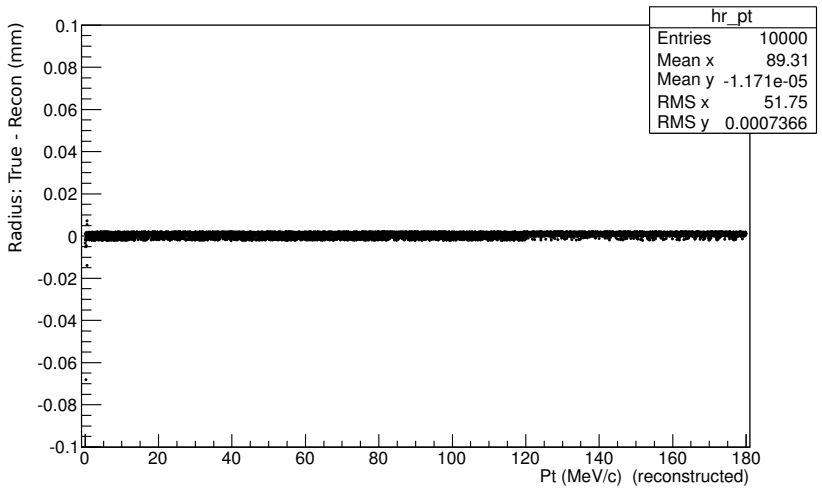
$$x' = \rho(\cos\phi - 1)$$

$$y' = \rho \sin\phi$$

$$z' = \rho\phi \tan\lambda$$

Pattern Recognition: Helices





- Work by S. Blot and N. Harrison
- Need to resolve issues with singularities in helix parameterisation
- Code bugs still be solved
- Need further checking against MC
- Unit tests being written
- Plots shown here represent reconstruction based on perfect mathematical helices

Full Track Fit

- Use Kalman filter, picking up spacepoints and suggested track parameters from Pattern Recognition;
- Finds the optimum state at each measuring site including measurement and system errors;
- Measurement sites defined to be each individual channel hit (instead of the reconstructed spacepoints);
- Flexible, can be used in difference scenarios (solenoidal, quadrupole or no field) and integrate different detectors;
- Reconstruction of straight tracks shows that fitted position agrees very well with measurement (better than the simple χ^2 fit);
- The goodness of the momentum reconstruction hasn't been assessed as it requires helical Pattern Recognition;
- Energy Loss to be included in the Kalman fit too.