TPC Reconstruction

Jonathan M. Paley

MIPP Collaboration Meeting
07/22/05

Indiana University

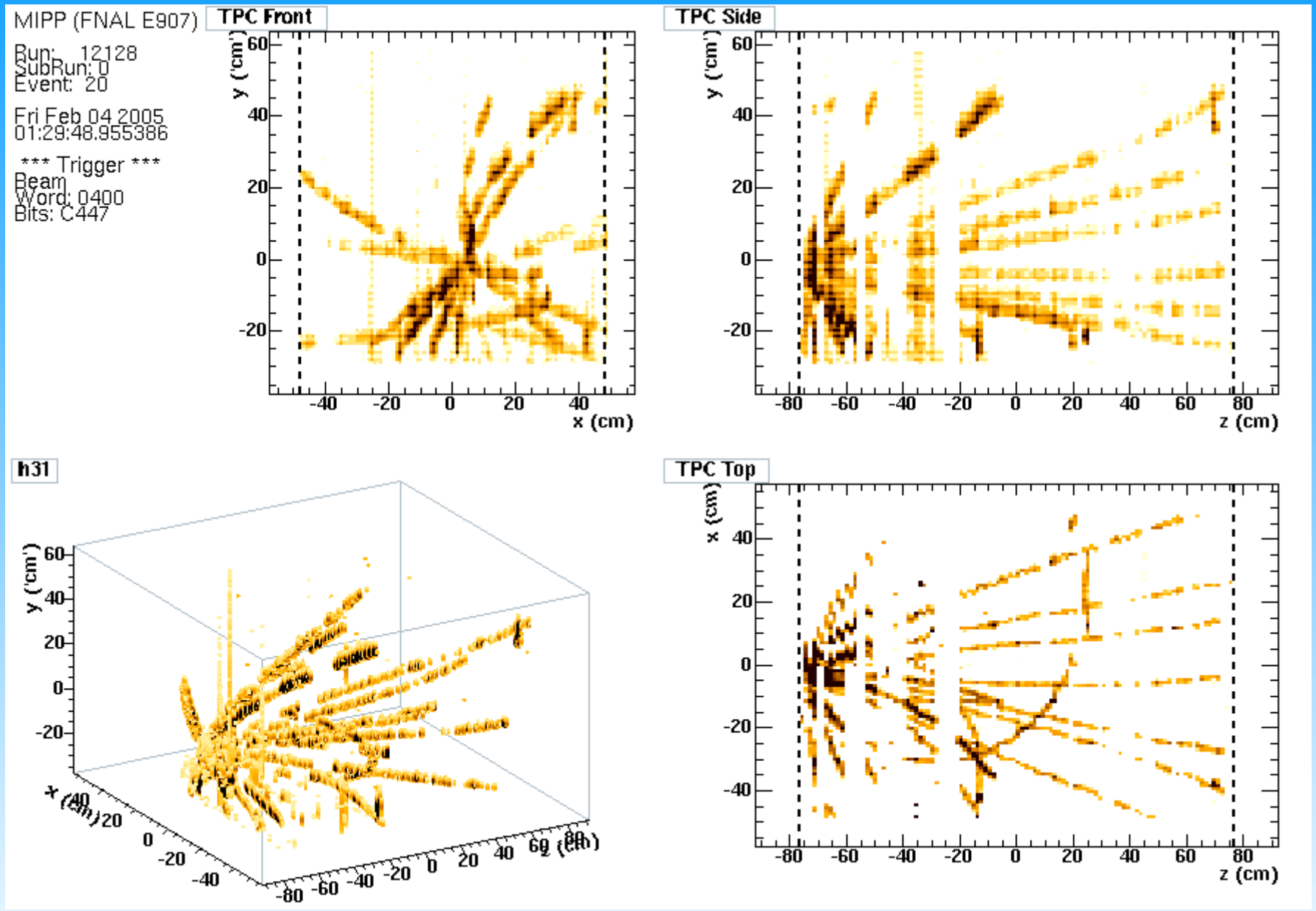
TPC Reconstruction Task List:

1. Hit finding, fitting (David)
2. **Track and vertex finding, fitting (Jon)**
3. Distortion corrections (Ron, Mike)
4. Gain (Jenn, Mike)
5. **Drift velocity calibration (Jon)**
6. Geometry (Peter)

General Scheme for TPC Track Reconstruction:

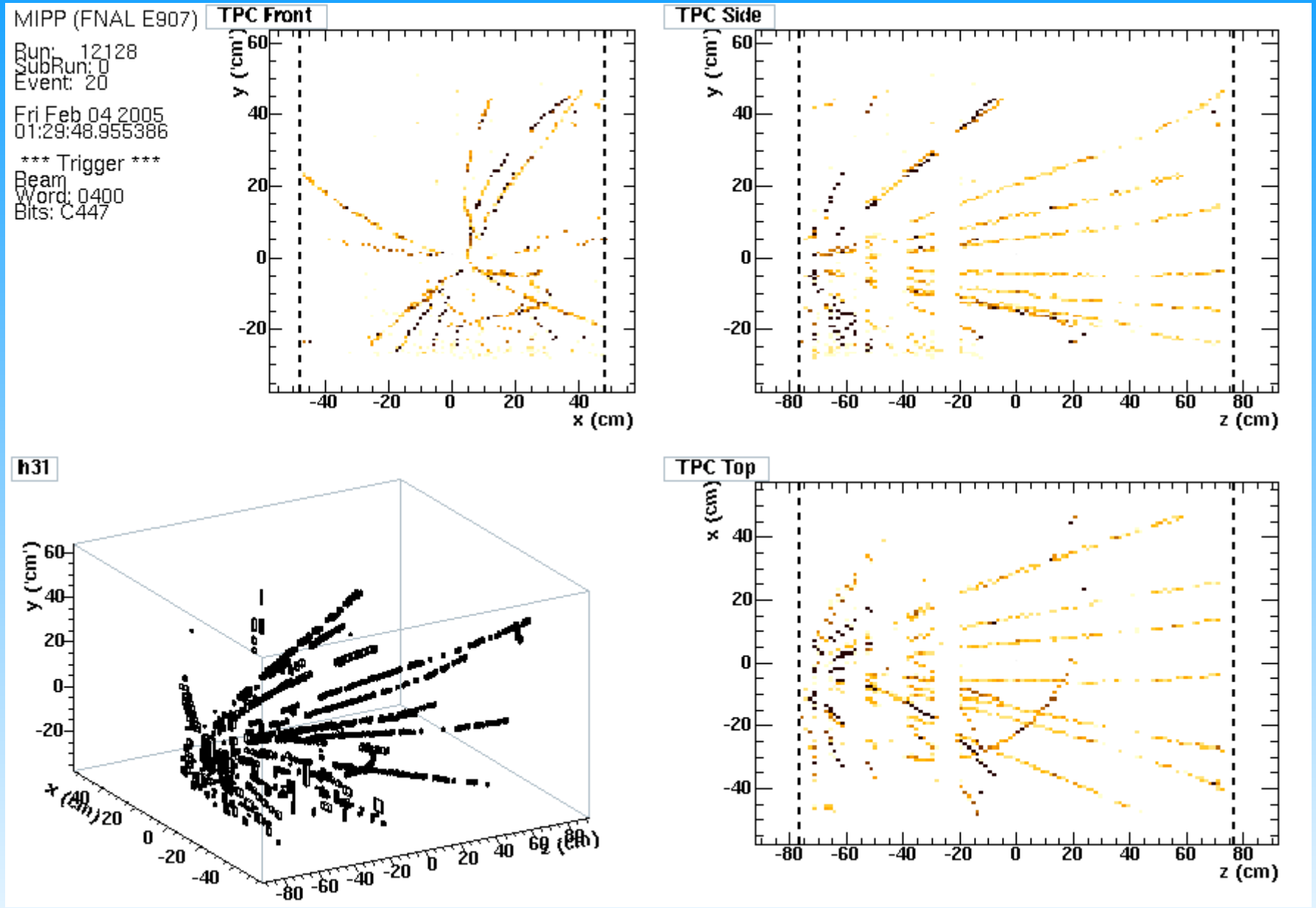
(Raw Digits)->(2DClusters)->(Hits)->(Tracks)->(Vertices)

TPC Track/Vertex Reconstruction



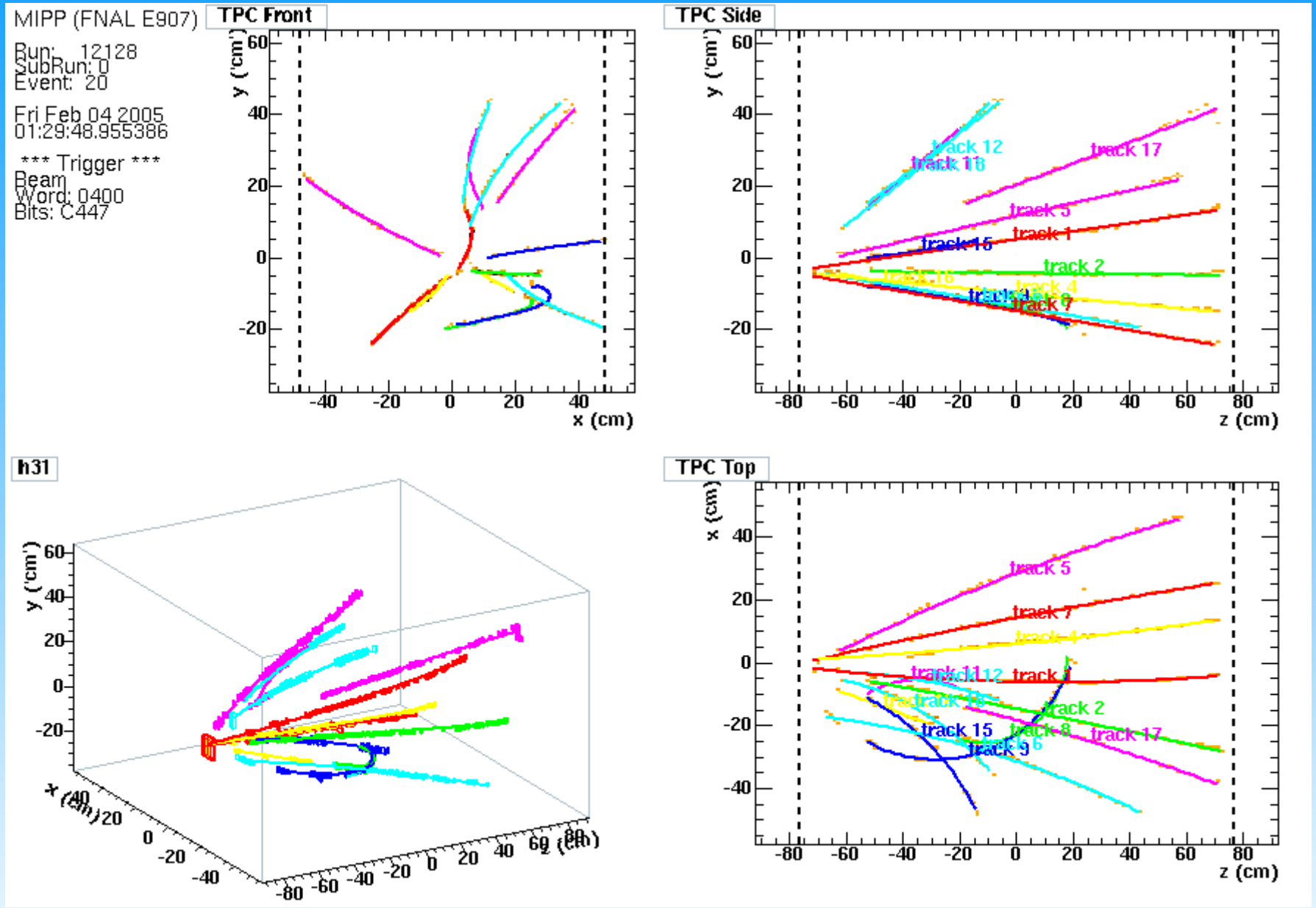
Start with raw digits...

TPC Track/Vertex Reconstruction



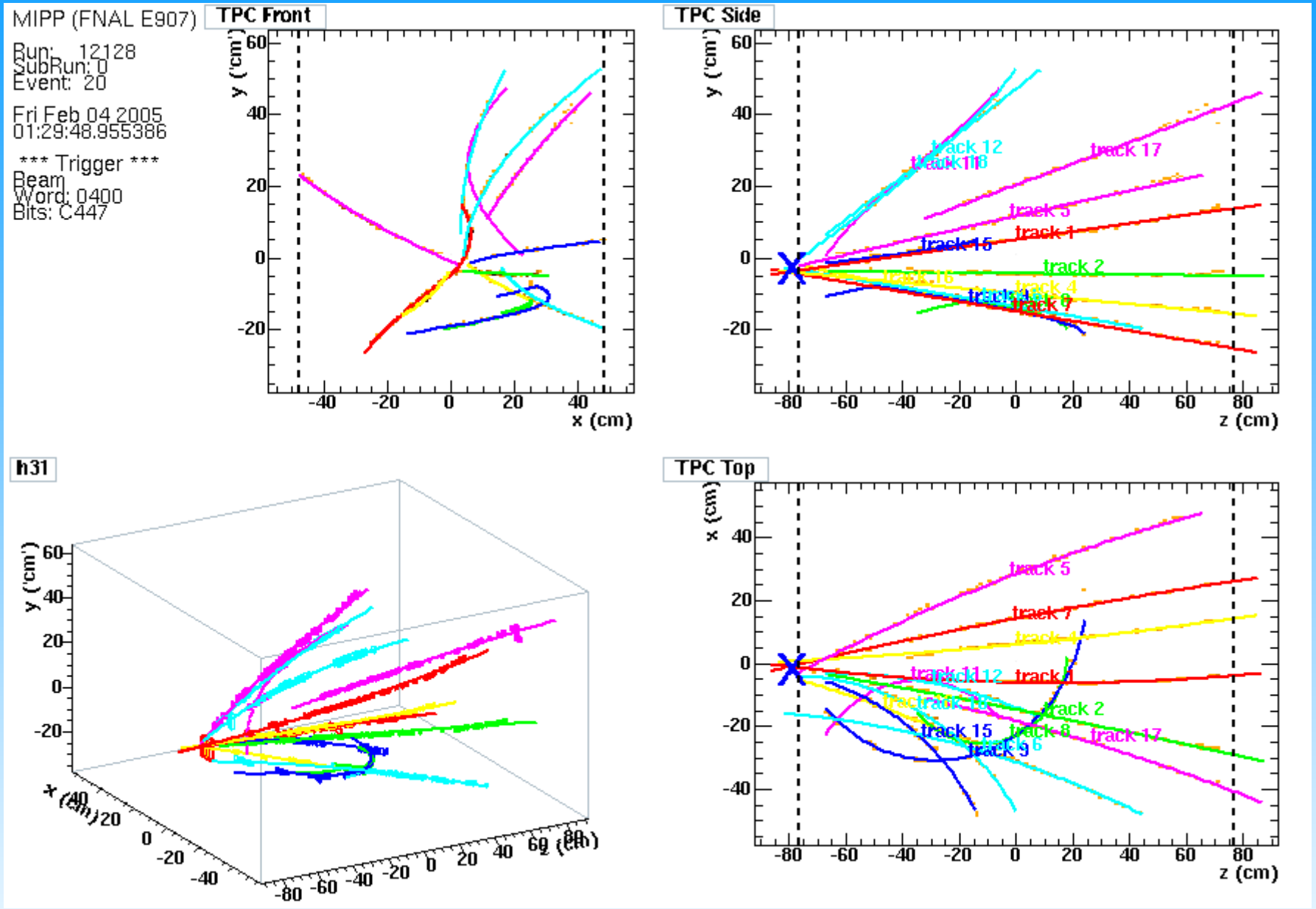
Next, reconstruct clusters and hits...

TPC Track/Vertex Reconstruction



Then track finding and helix fitting...

TPC Track/Vertex Reconstruction



And end with vertex finding and fitting.

TPC Track/Vertex Reconstruction

Track fitting is in excellent shape.

Areas that need work:

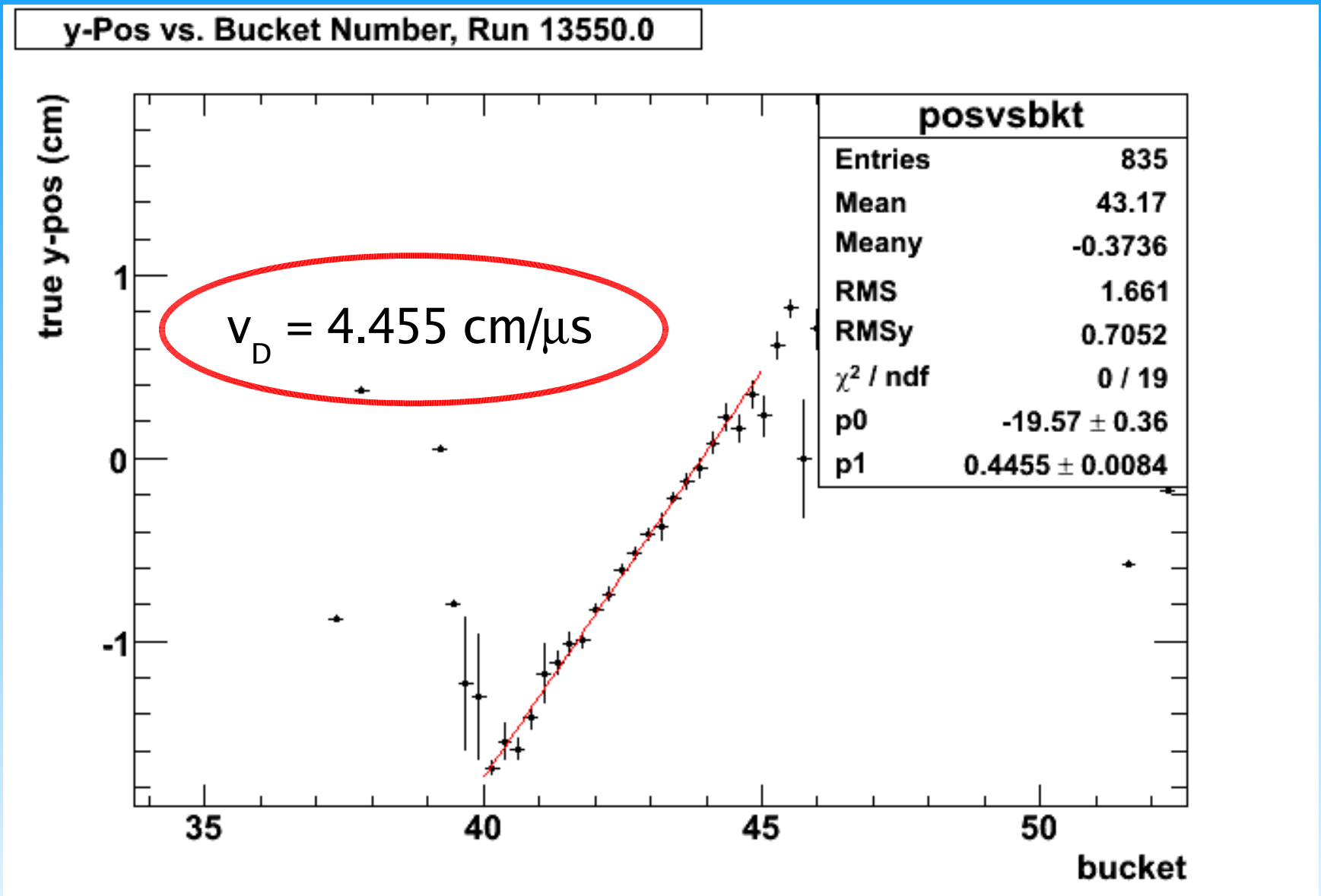
- **Distortion corrections** - our highly non-uniform B-field creates very large distortions that make global tracking extremely difficult.
- Track finding - the current algorithm is not designed to pick up high p_T tracks.
- Hit finding/fitting – the current algorithm can not separate overlapping hits, has poor resolution in both position and dE

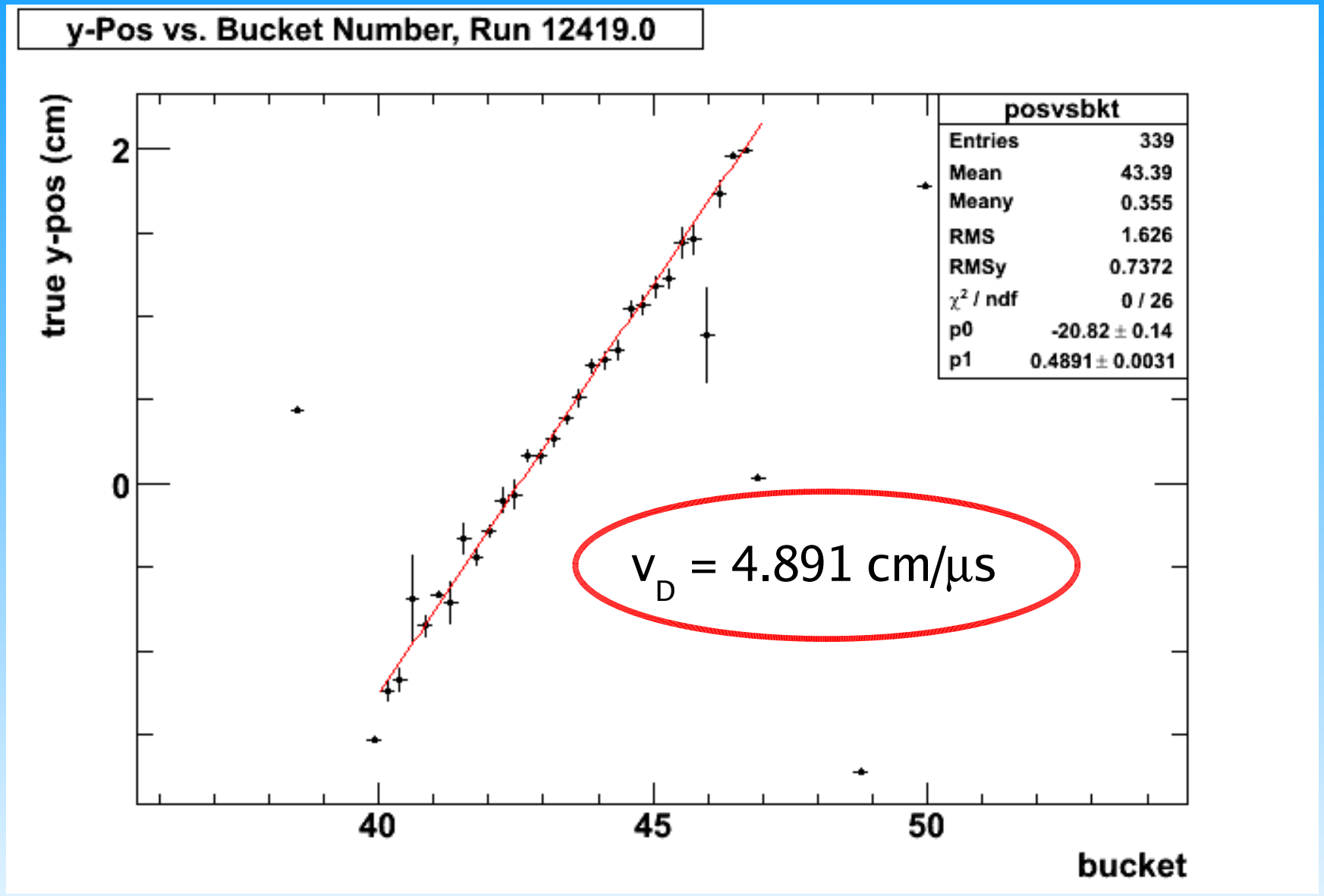
TPC Drift Velocity Calibration

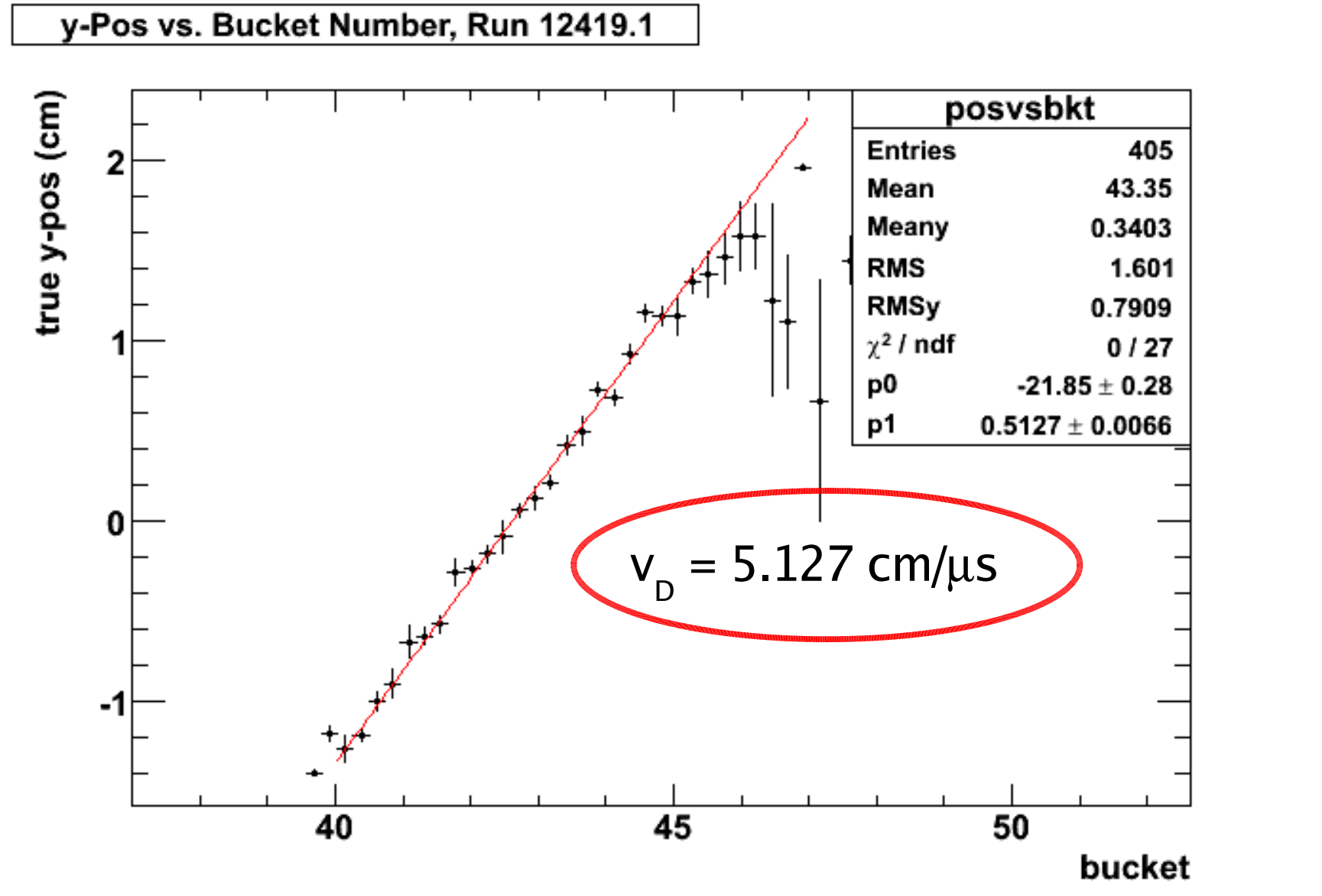
Algorithm:

- Use y-position of reconstructed BCLines to center of TPC as the “true” y-position.

- Use beam tracks in the TPC to compare time bucket to true y-position.


y-Pos vs. Bucket Number, Run 13550.0
true y-pos (cm)
1
0
-1
35
40
45
50
bucket
v_D = 4.455 cm/μs
posvsbkt
Entries 835
Mean 43.17
Meany -0.3736
RMS 1.661
RMSy 0.7052
χ^2 / ndf 0 / 19
p0 -19.57 ± 0.36
p1 0.4455 ± 0.0084


y-Pos vs. Bucket Number, Run 12419.0
true y-pos (cm)
2
0
40
45
50
bucket
posvsbkt
Entries 339
Mean 43.39
Meany 0.355
RMS 1.626
RMSy 0.7372
χ² / ndf 0 / 26
p0 -20.82 ± 0.14
p1 0.4891 ± 0.0031
v_D = 4.891 cm/μs


y-Pos vs. Bucket Number, Run 12419.1
true y-pos (cm)
bucket
posvsbkt
Entries 405
Mean 43.35
Meany 0.3403
RMS 1.601
RMSy 0.7909
χ² / ndf 0 / 27
p0 -21.85 ± 0.28
p1 0.5127 ± 0.0066
v_D = 5.127 cm/μs

Summary

- Track helix-fits are well under-control.
- Calibration needs work...
- Tasks have been assigned to try to tackle all the issues, *however we need help with Monte Carlo!*