SVT Hit Timing II

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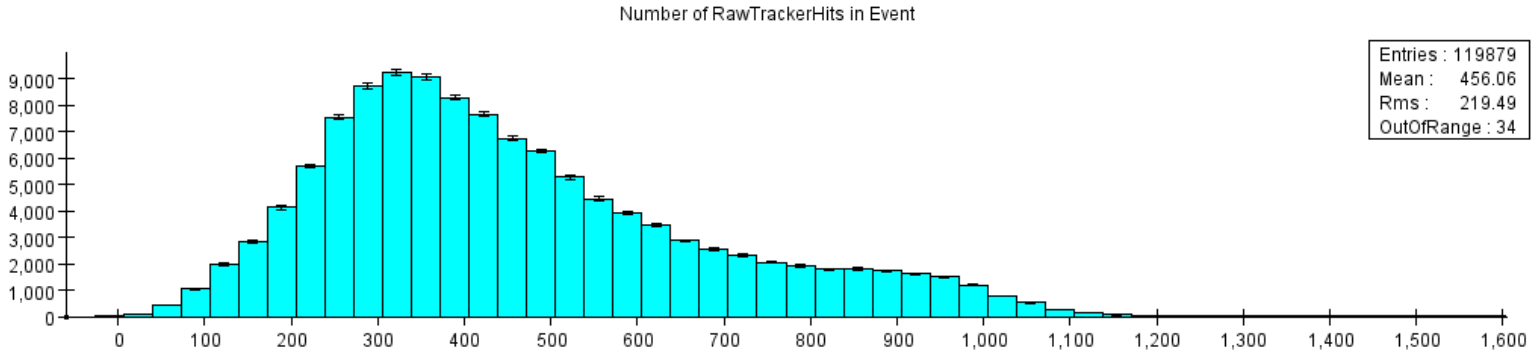
Reconstruction / Calibration Meeting

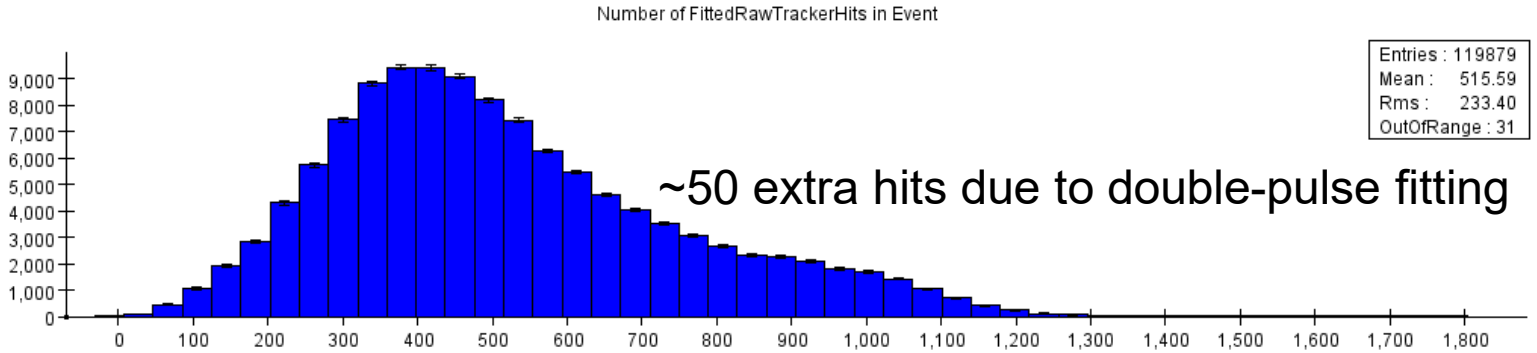
May 25, 2021

SVT Hit times

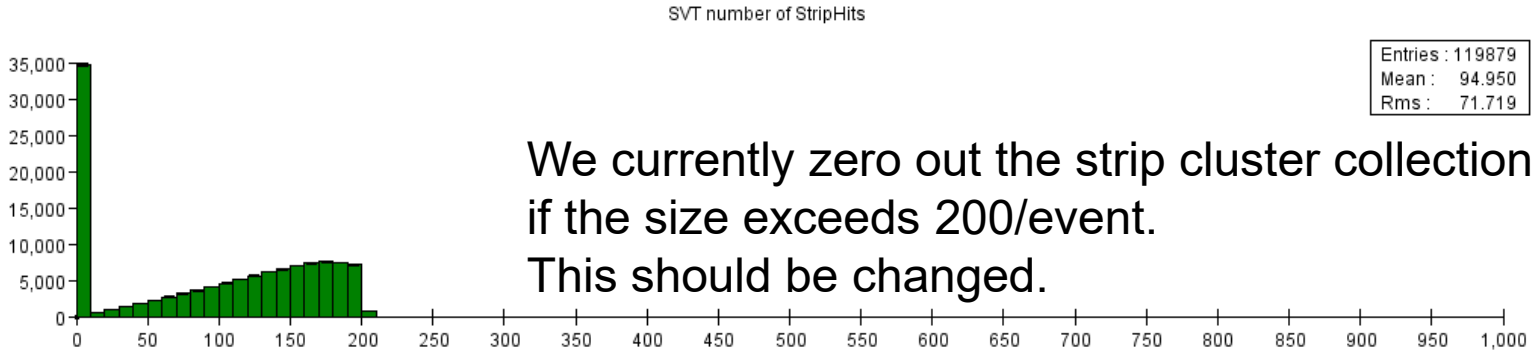
- We use hit times to:
  - associate neighboring strips into 1D hits
  - associate axial and stereo hits into 3D hits
    - only needed for SeedTracker pattern-recognition
  - use track time in track-finding pattern recognition
  - compare track time to cluster time
  - compare track time to other tracks/clusters
- I wanted to check this…
  - Look at strip cluster hits in tracking
  - Analyze run 10515, which has high occupancy

1D Strip Cluster Hits



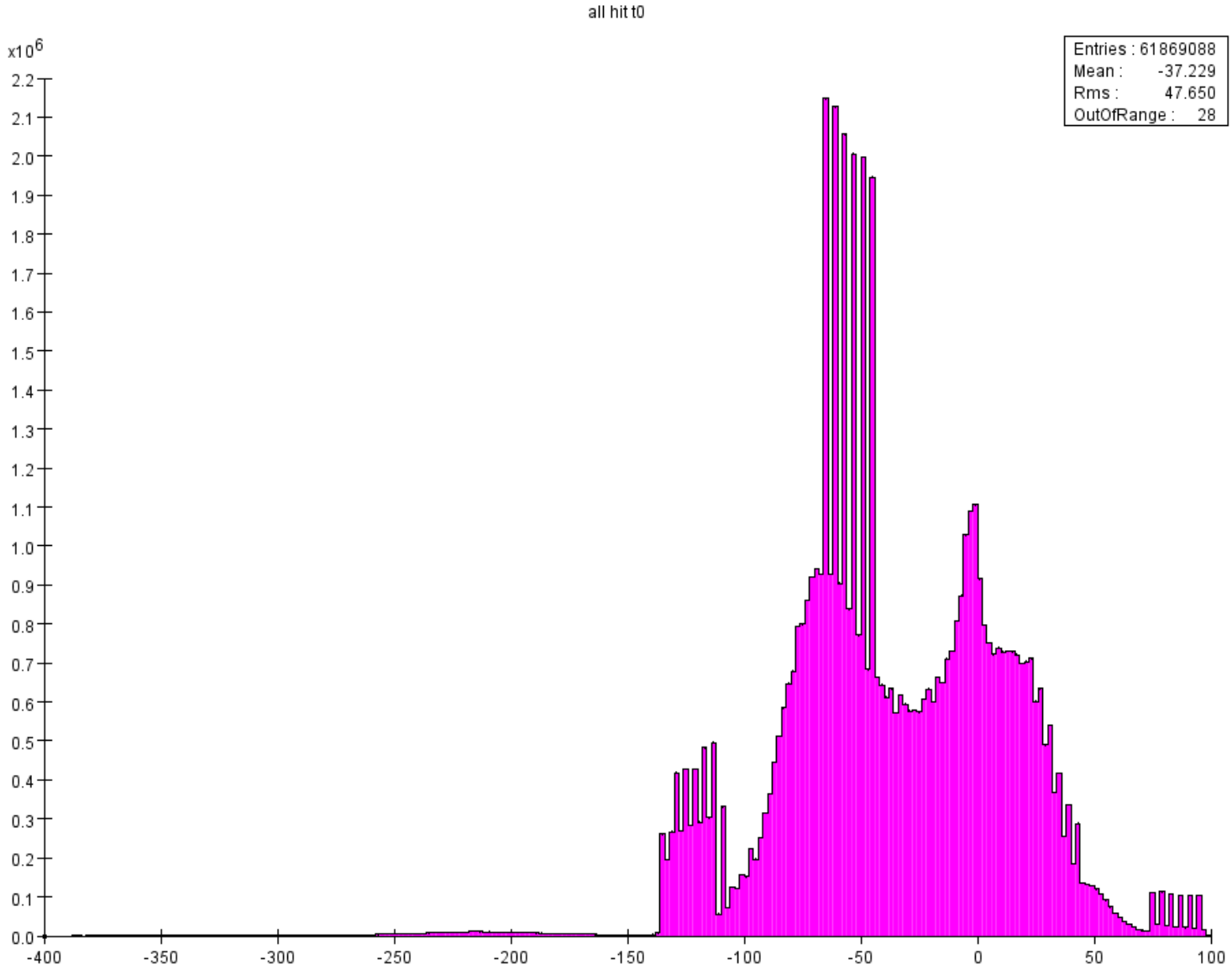


~50 extra hits due to double-pulse fitting



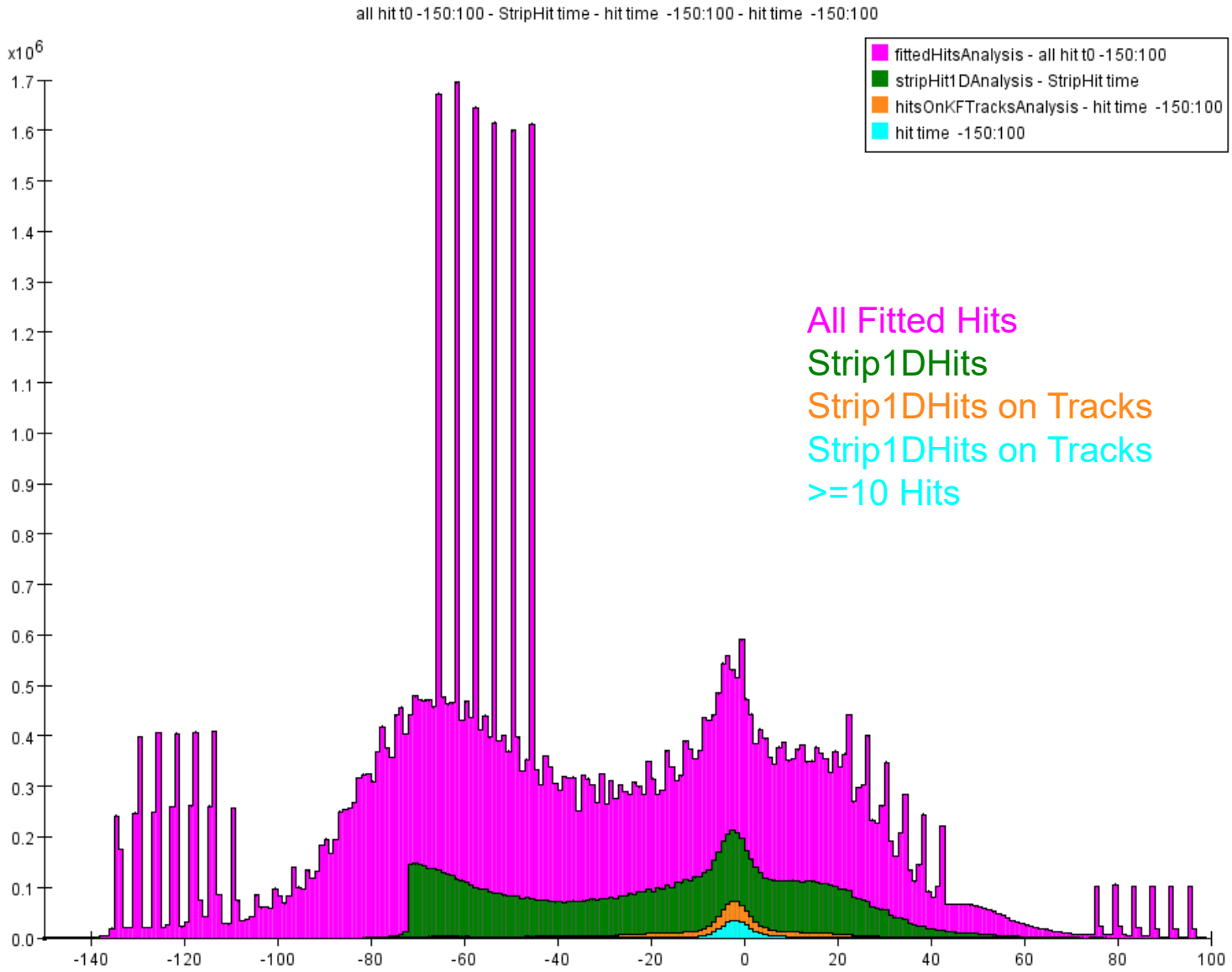
We currently zero out the strip cluster collection if the size exceeds 200/event.
This should be changed.

All Fitted Hits t0

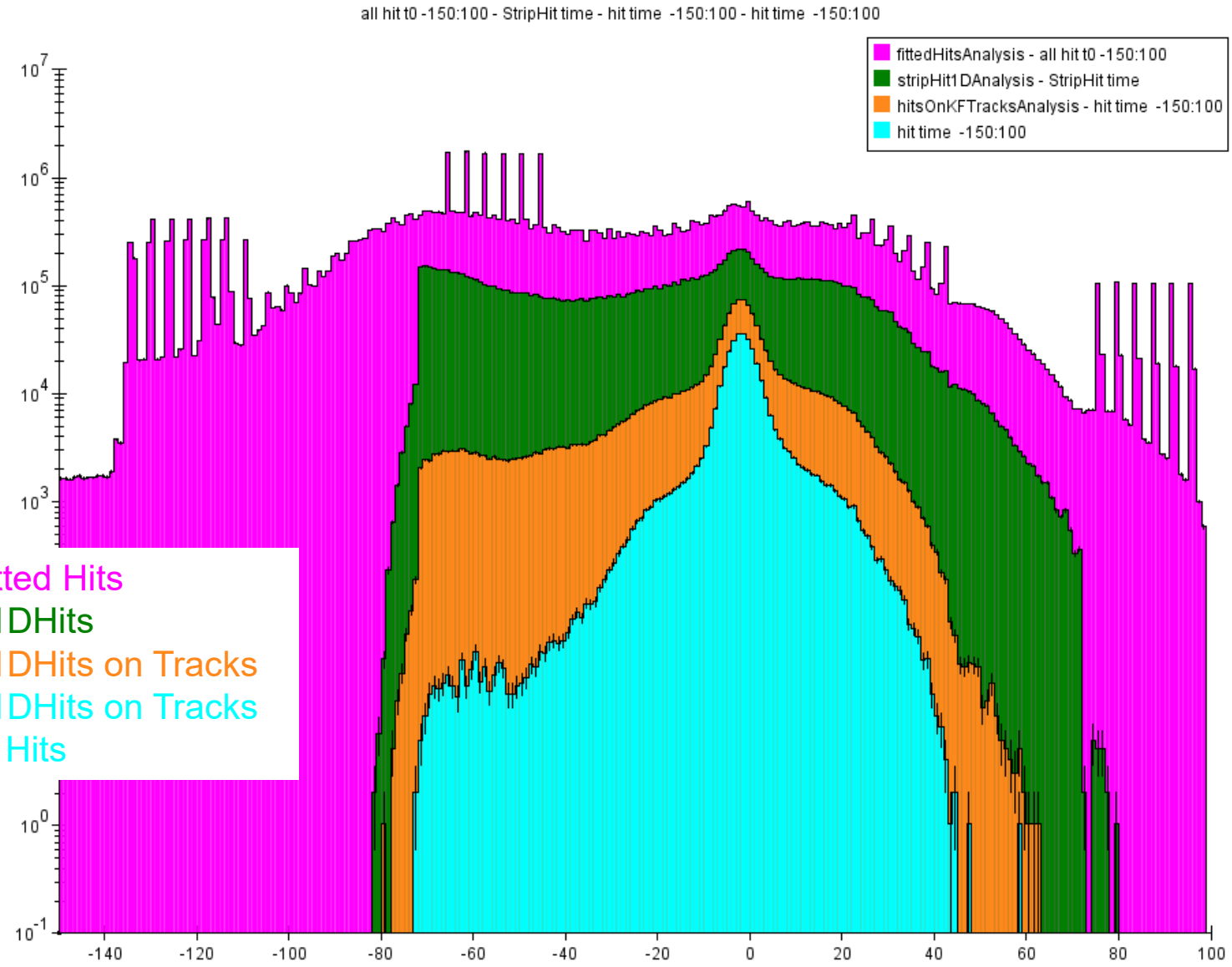


All Fitted Hits t0

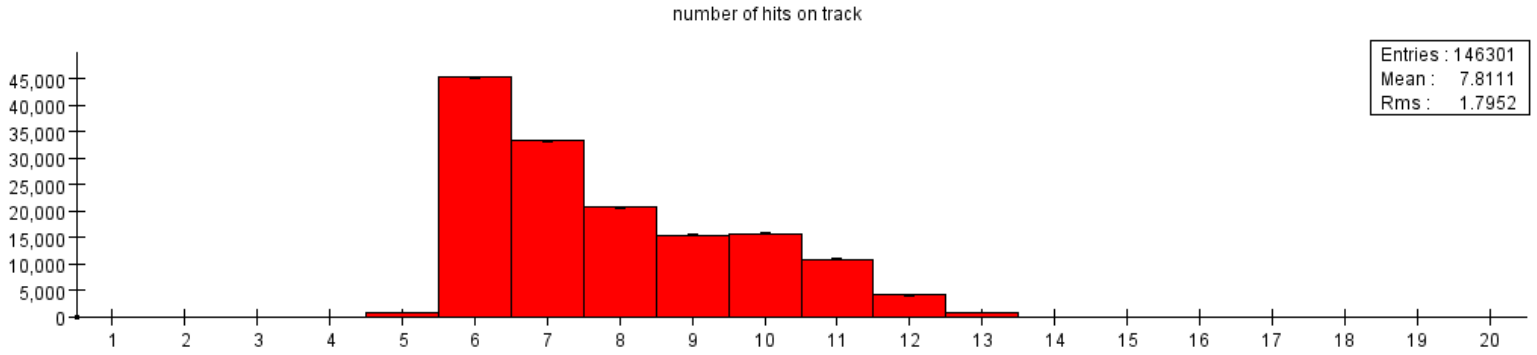
Hit t0

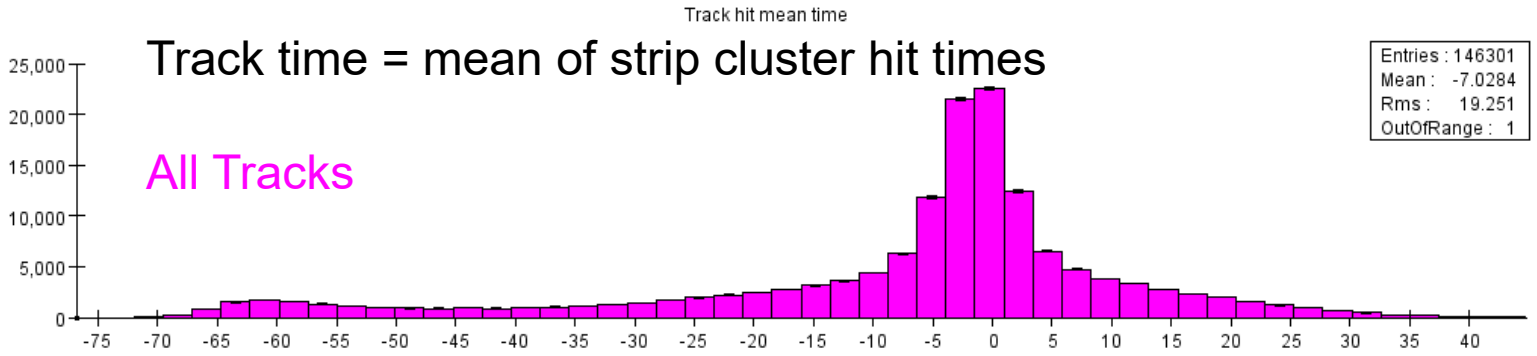

all hit t0 -150:100 - StripHit time - hit time -150:100 - hit time -150:100
x10^6
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-140
-120
-100
-80
-60
-40
-20
0
20
40
60
80
100
fittedHitsAnalysis - all hit t0 -150:100
stripHit1DAnalysis - StripHit time
hitsOnKFTracksAnalysis - hit time -150:100
hit time -150:100
All Fitted Hits
Strip1DHits
Strip1DHits on Tracks
Strip1DHits on Tracks
>=10 Hits

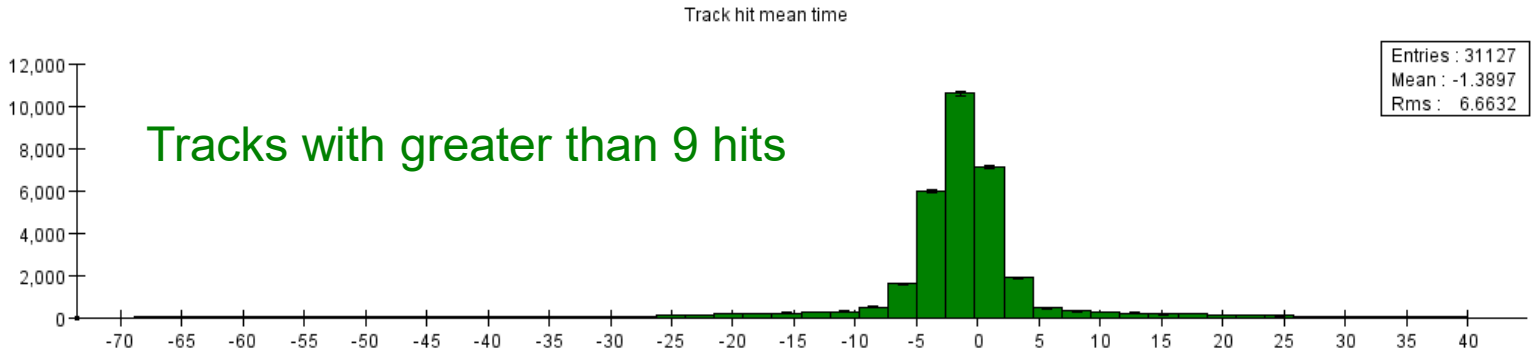
Hit t0


all hit t0 -150:100 - StripHit time - hit time -150:100 - hit time -150:100
fittedHitsAnalysis - all hit t0 -150:100
stripHit1DAnalysis - StripHit time
hitsOnKFTracksAnalysis - hit time -150:100
hit time -150:100
All Fitted Hits
Strip1DHits
Strip1DHits on Tracks
Strip1DHits on Tracks >=10 Hits

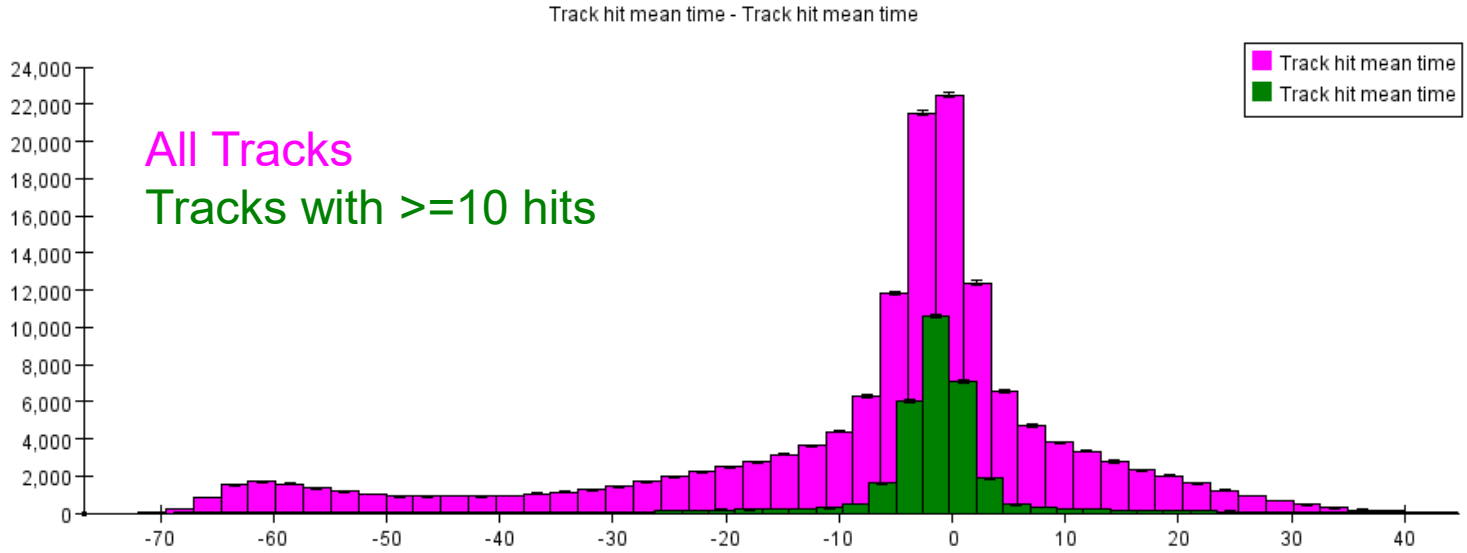
Kalman Track Hit Analysis

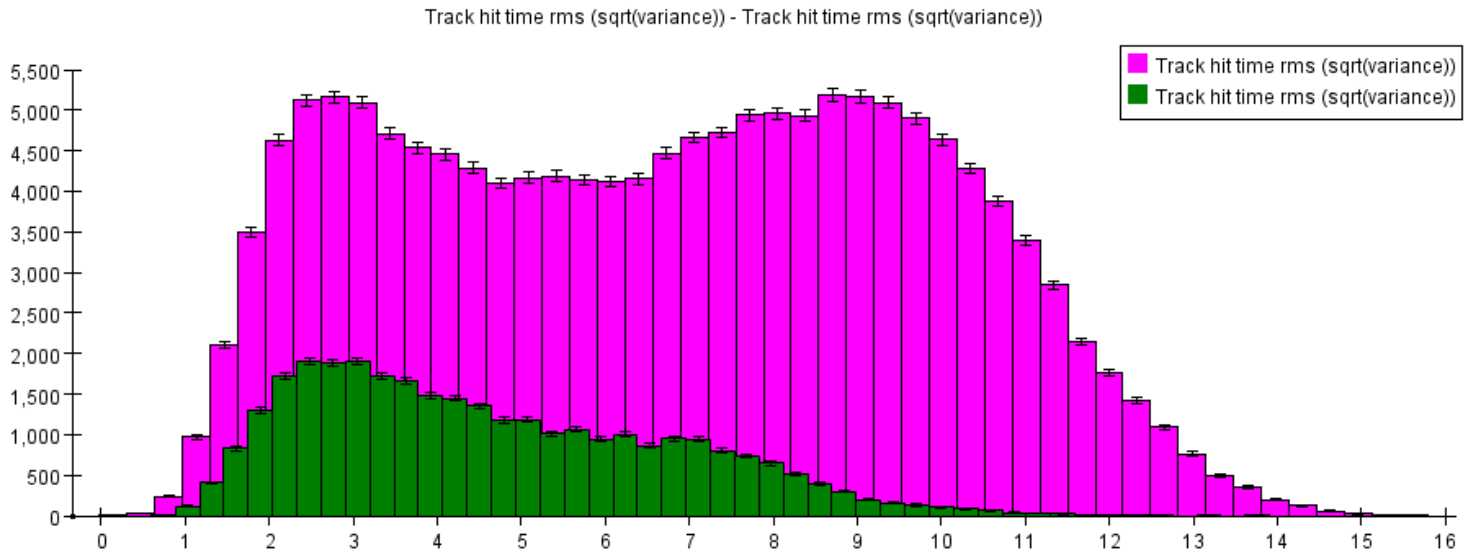




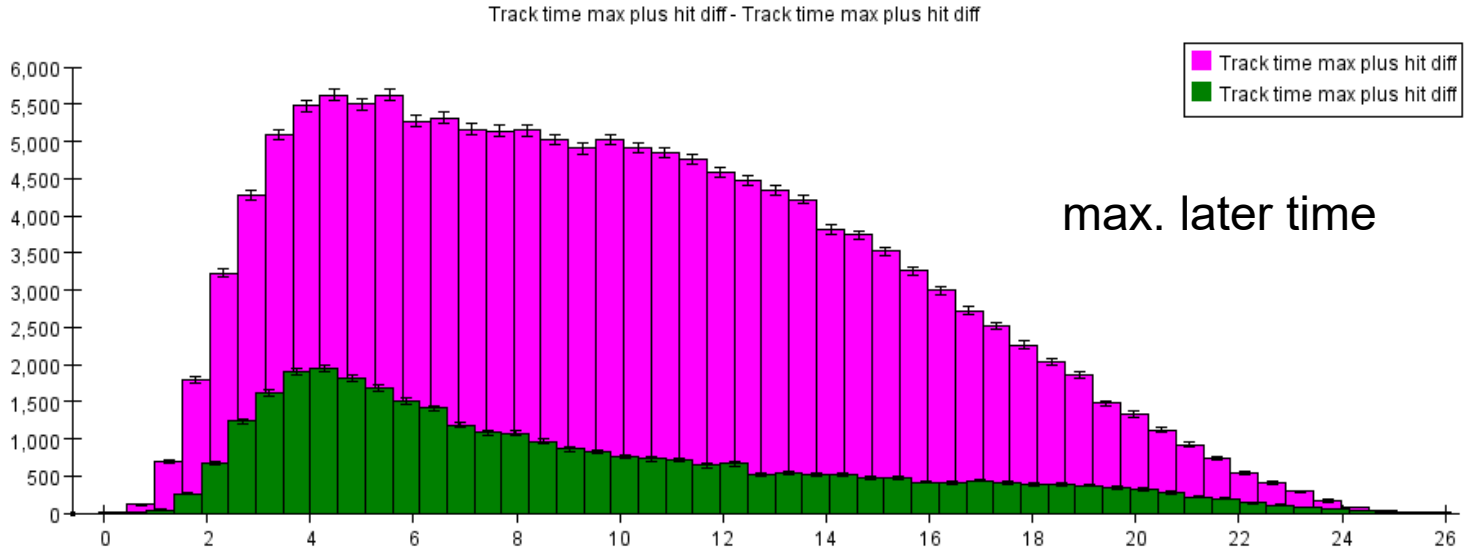


Track Time and RMS

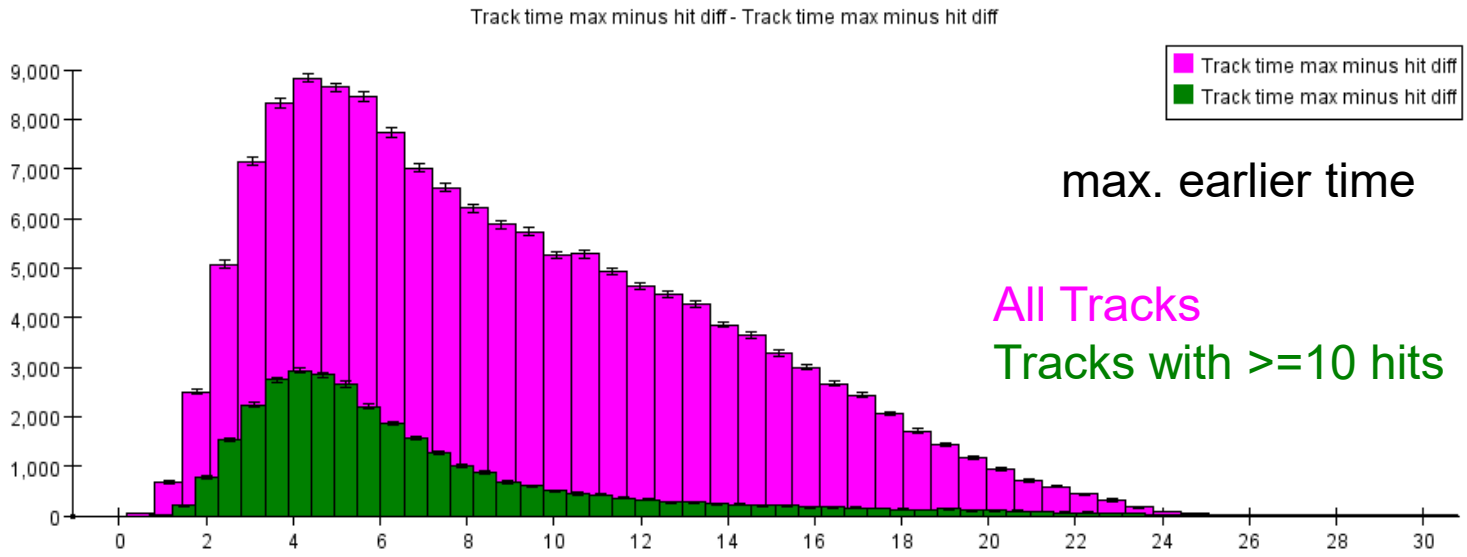




Track Time maximum times +/-



max. later time

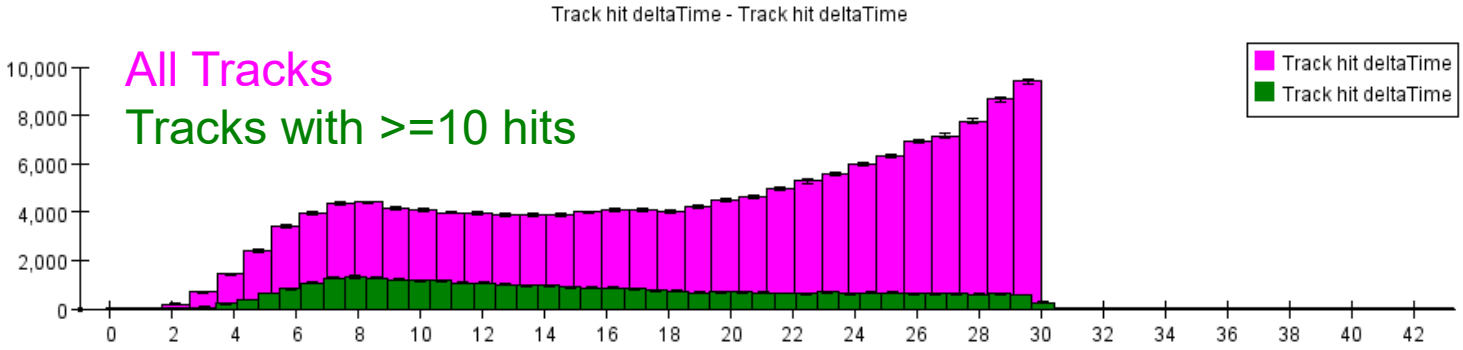


max. earlier time

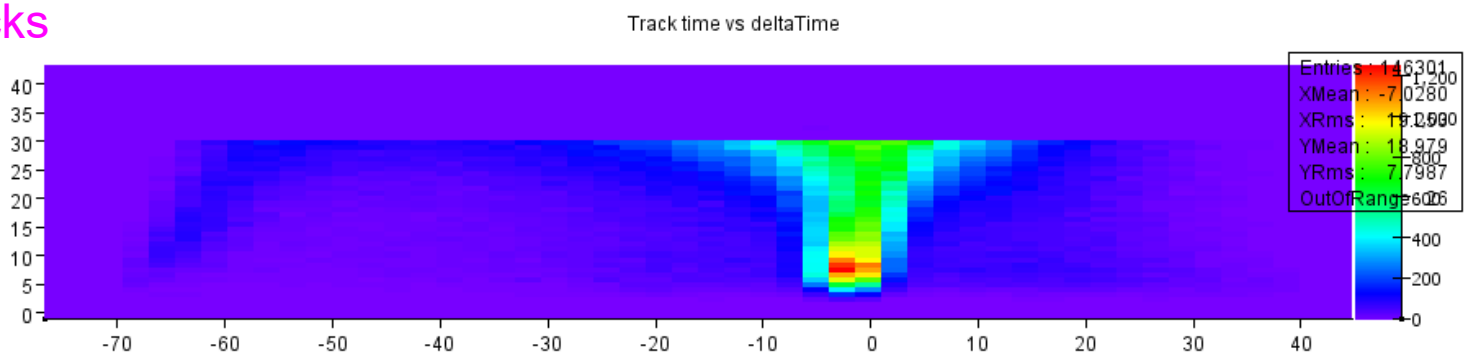
All Tracks

Tracks with >=10 hits

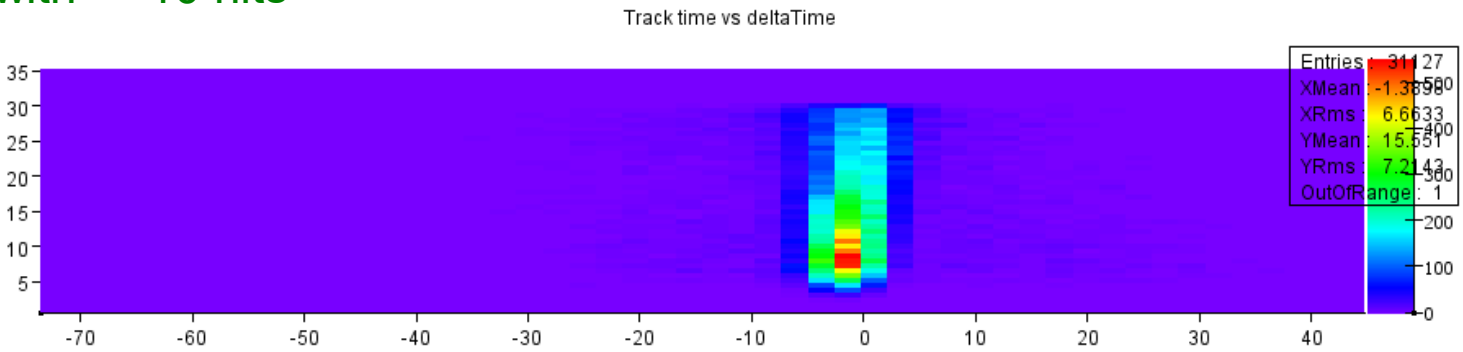
Track Time vs Delta Time



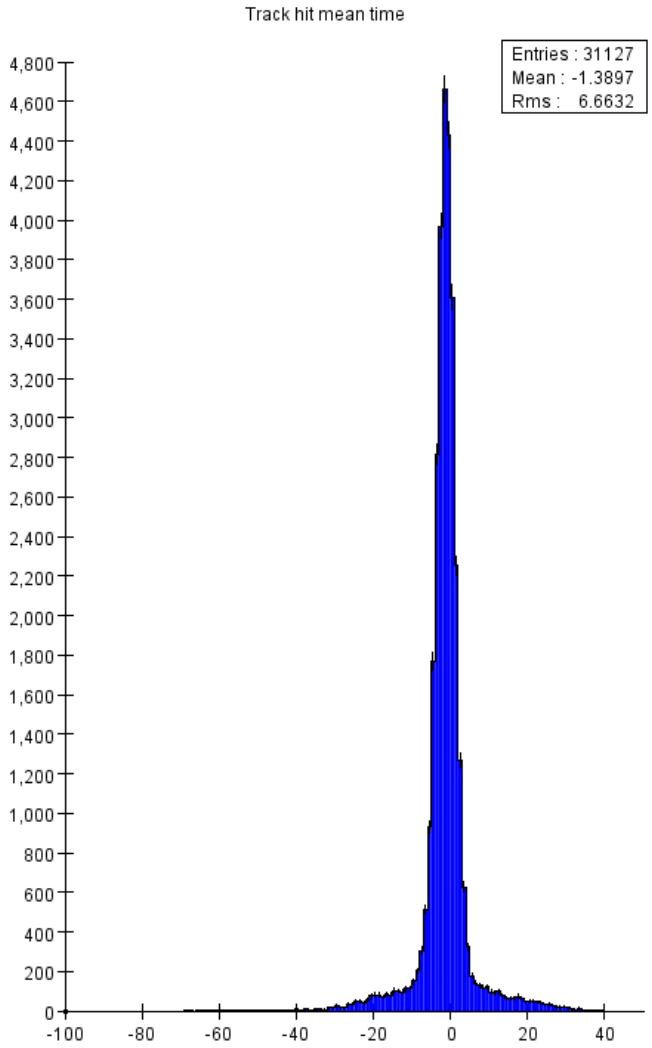
All Tracks

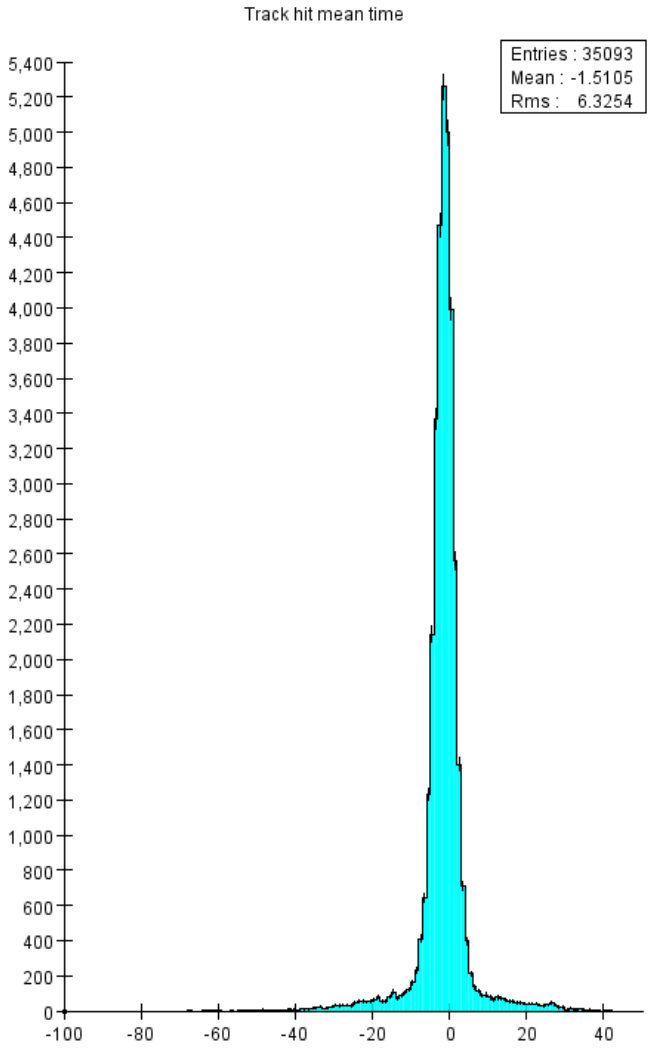


Tracks with >=10 hits

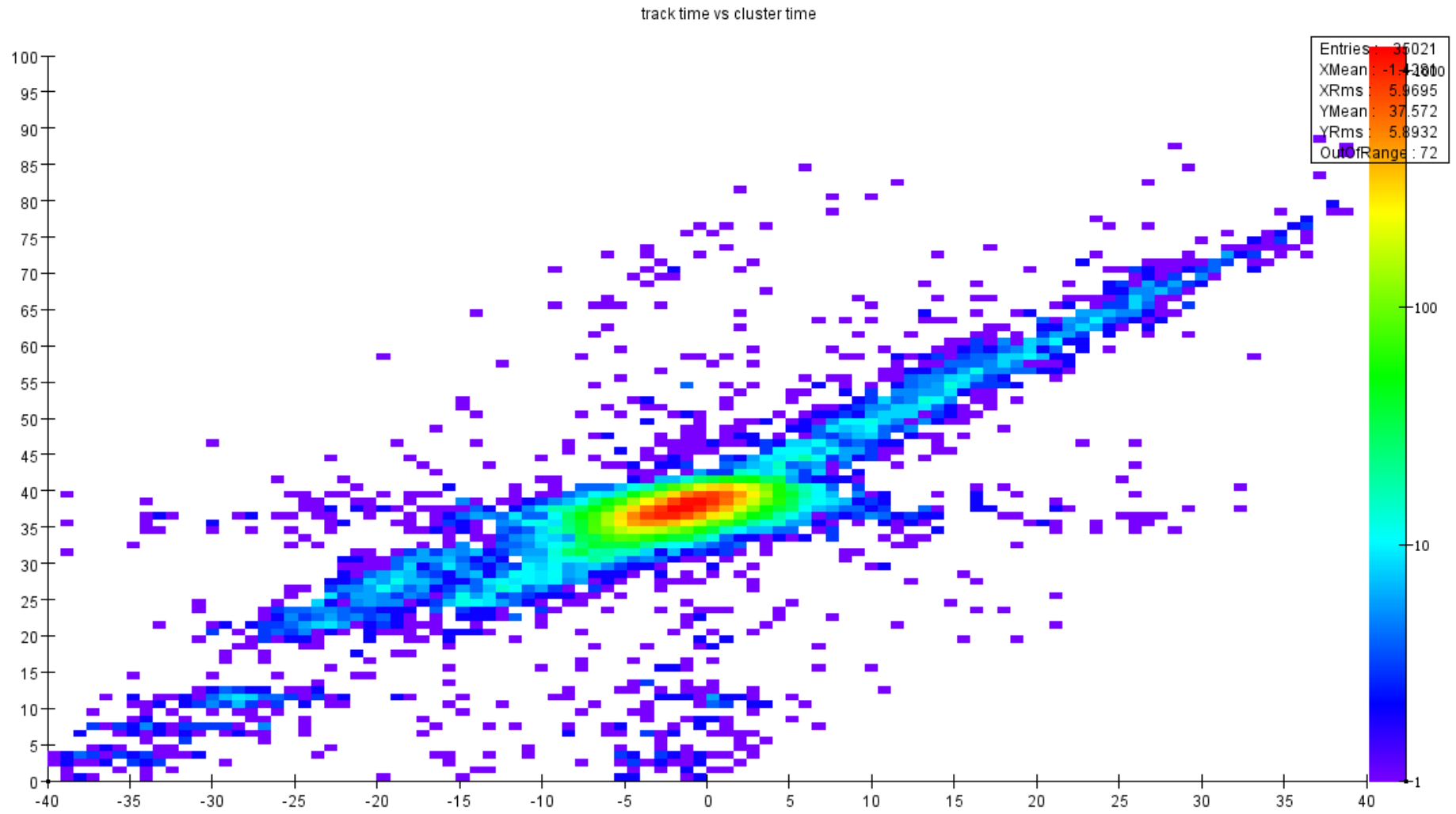


Tracks with >= 10 Hits & with Clusters

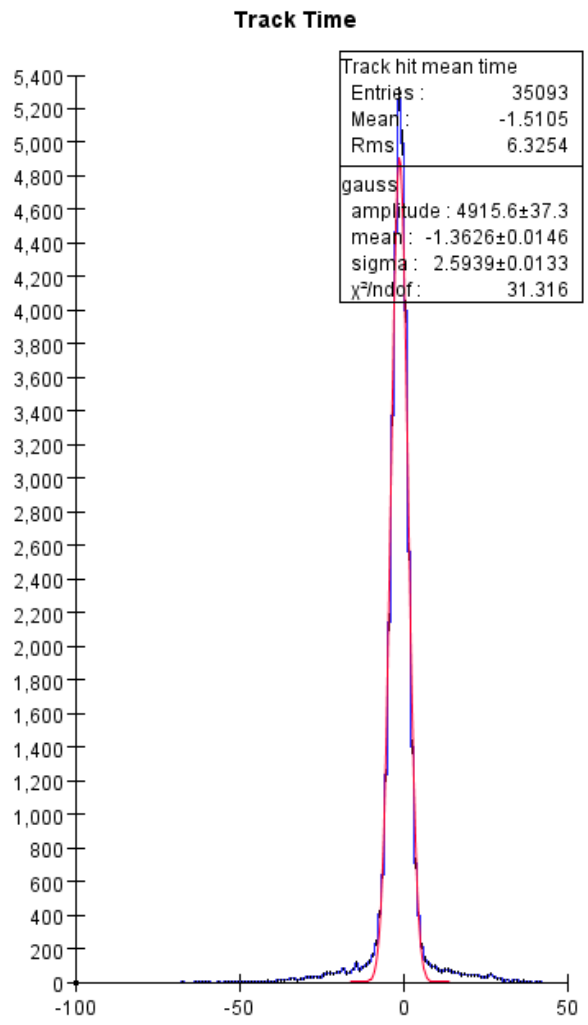


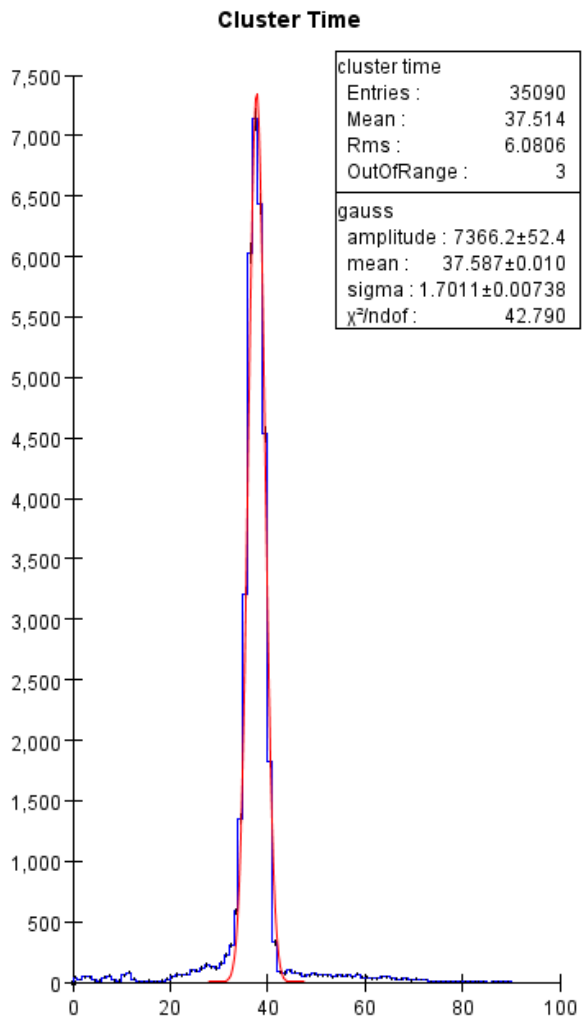


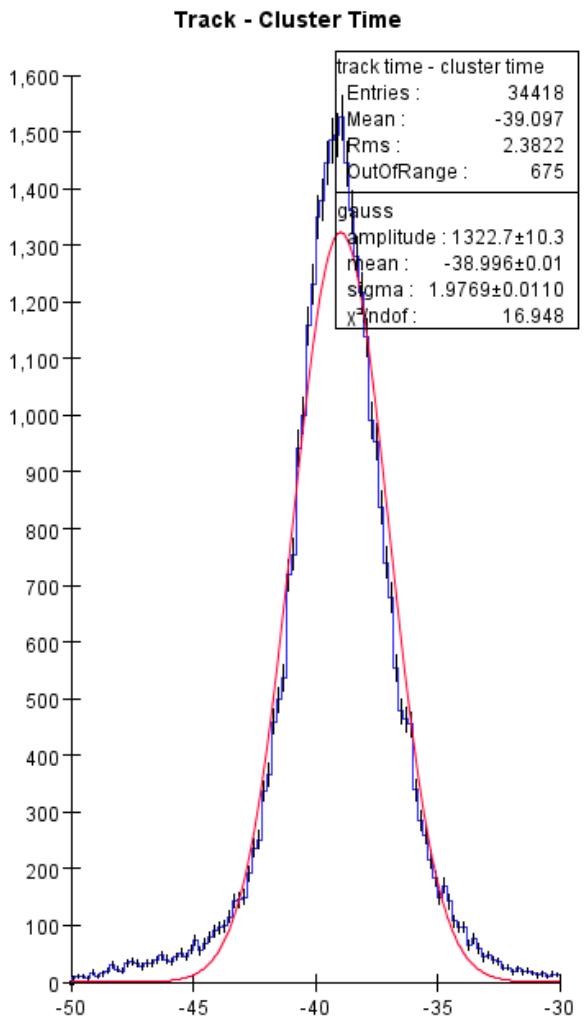
Times for Tracks with Ecal Clusters



Times for Tracks with Ecal Clusters







Proposals

- For RawTrackerHits fitted with two pulses, drop fit with t0 farther from zero
- Tighten hit time window when adding a hit to the KF track (currently at 30ns)
- Study t0 fit uncertainties from migrad as another metric of goodness
- Think about dropping hits/clusters way out of time.
- Publish a set of “physics quality cuts” to identify tracks which do/don’t or would/wouldn’t make it into an analysis.
  - Use these to fine-tune cuts