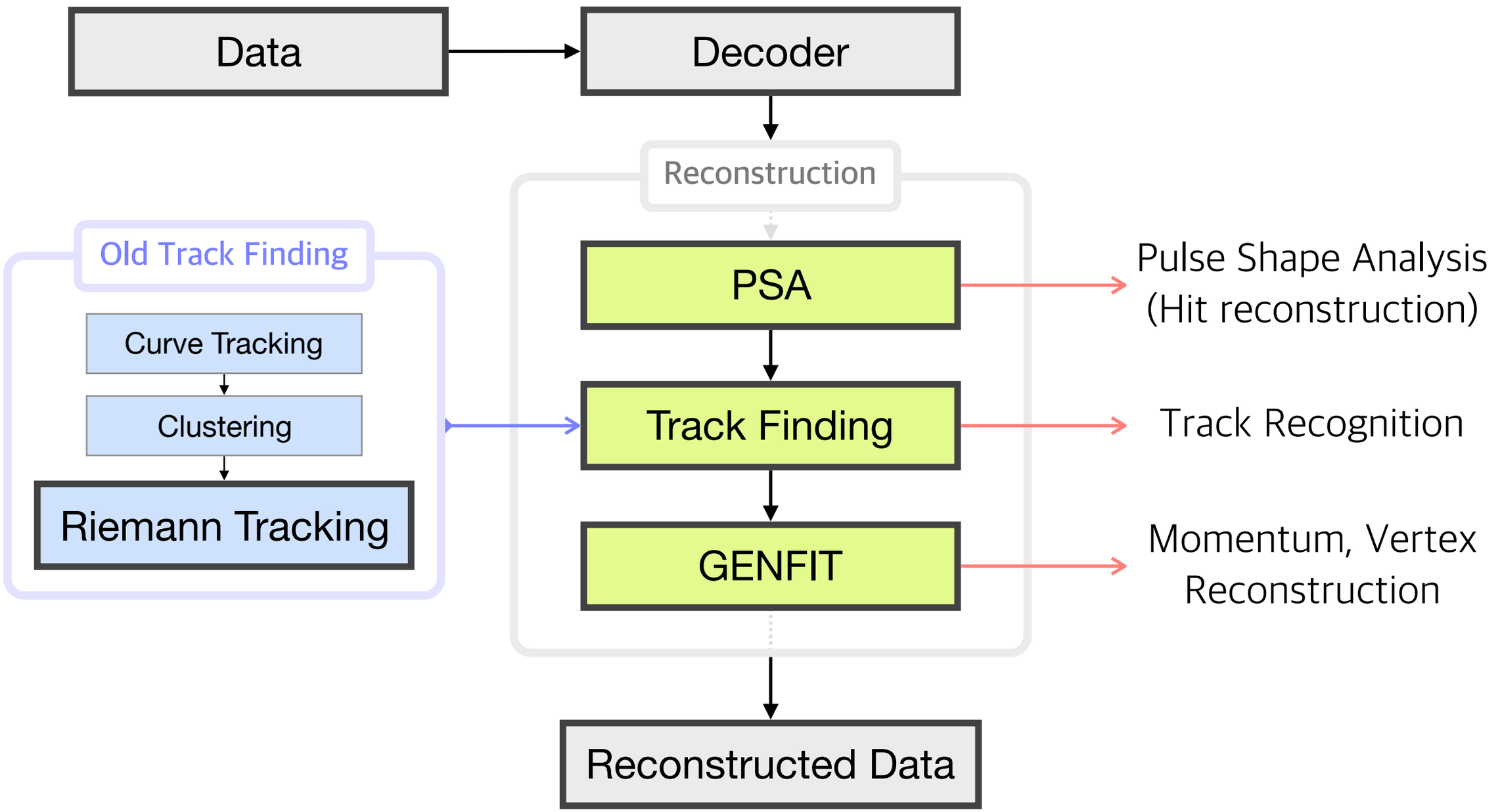
TPC Software

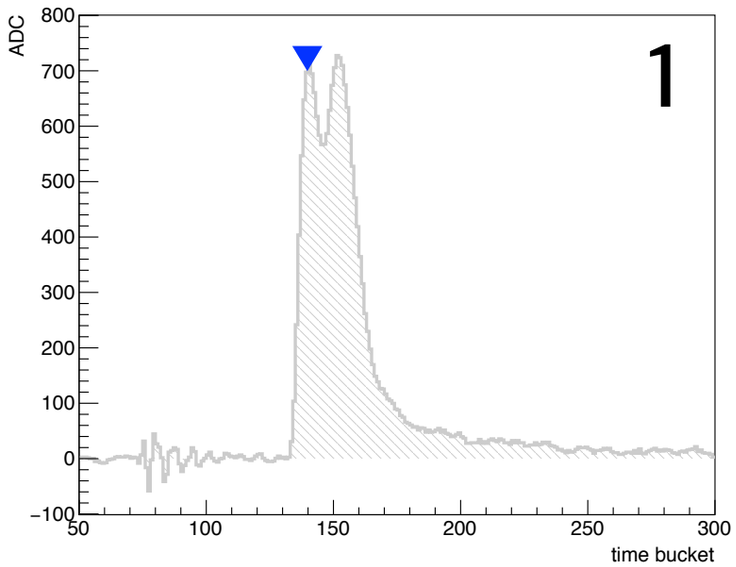
이정우, 장진희

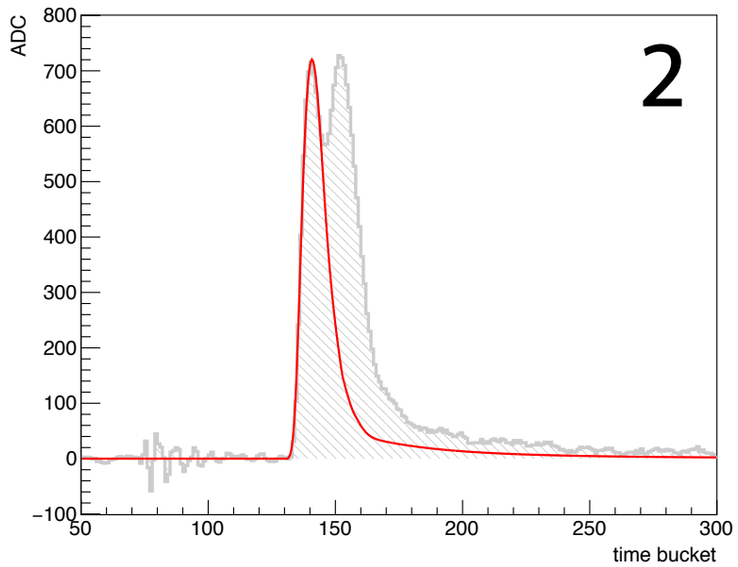
Software Frame

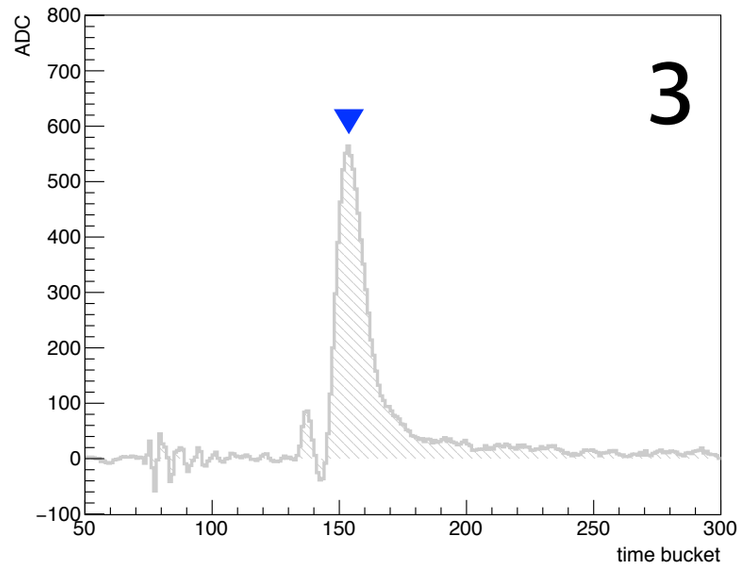


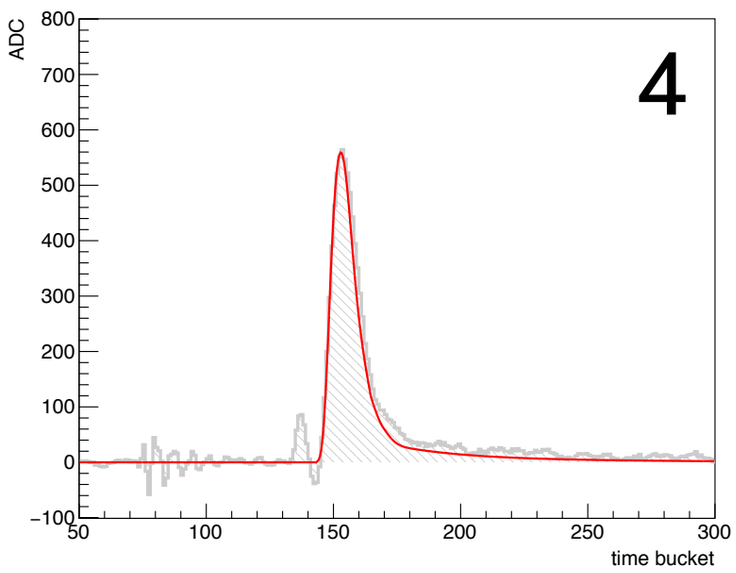
Pulse Shape Analysis

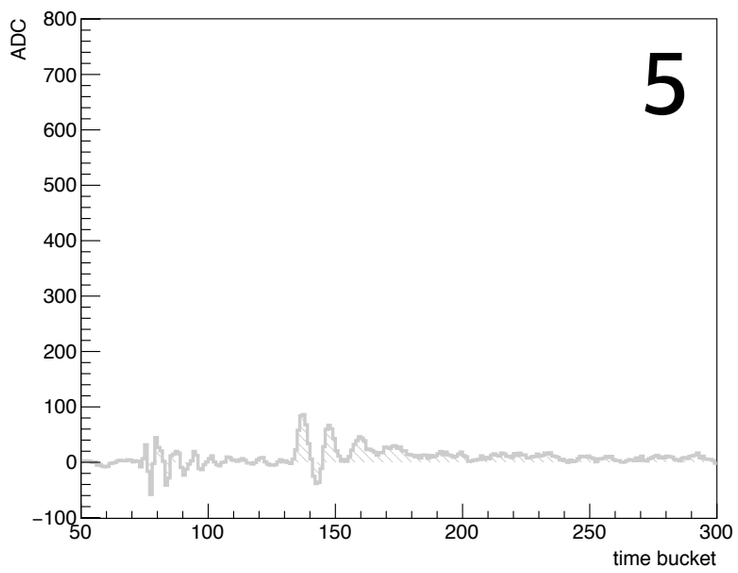
*Fit with reference pulse

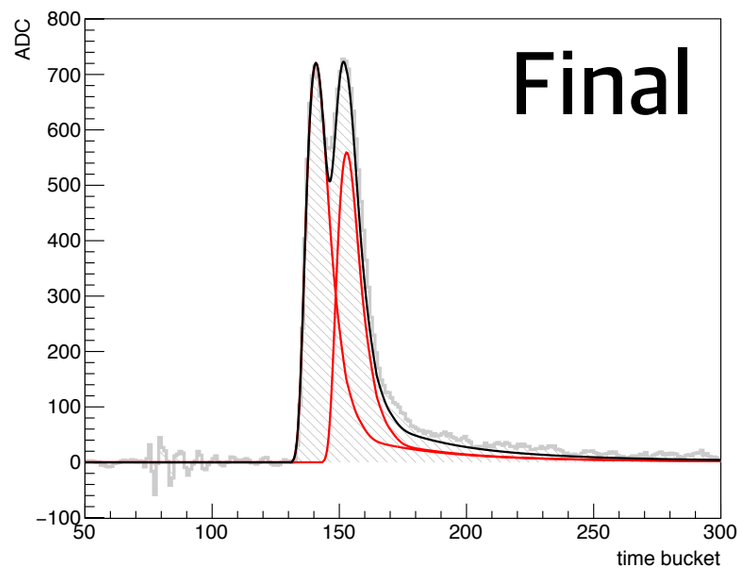






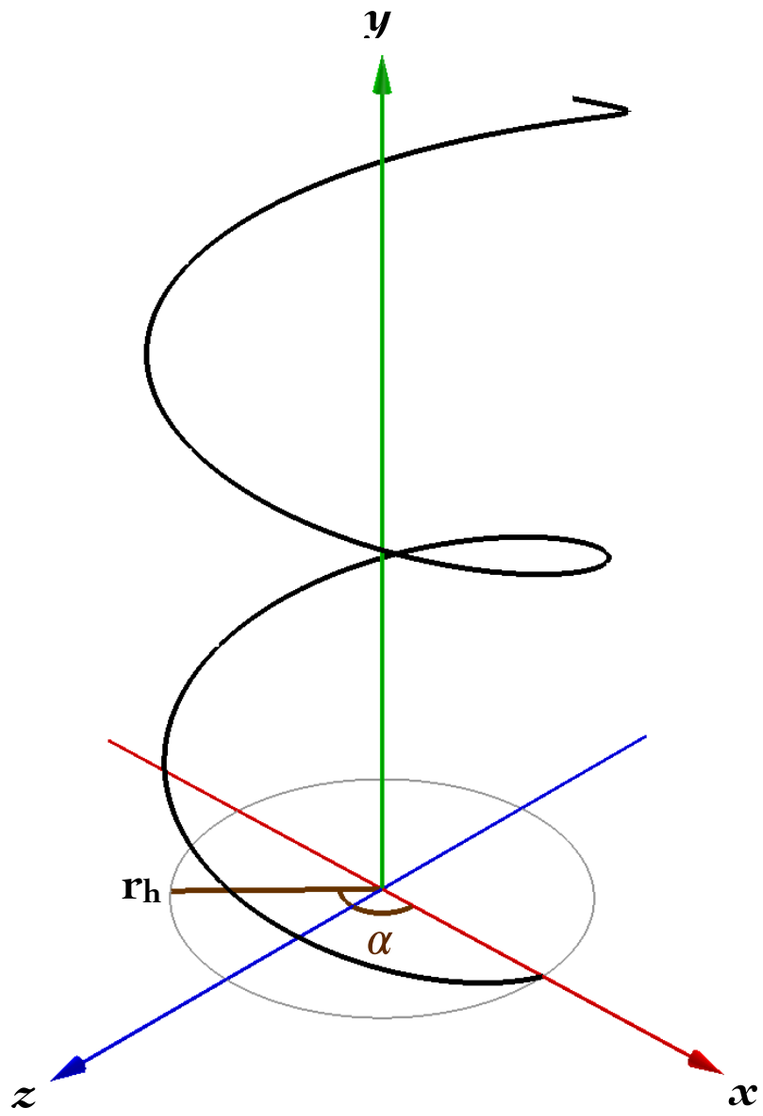




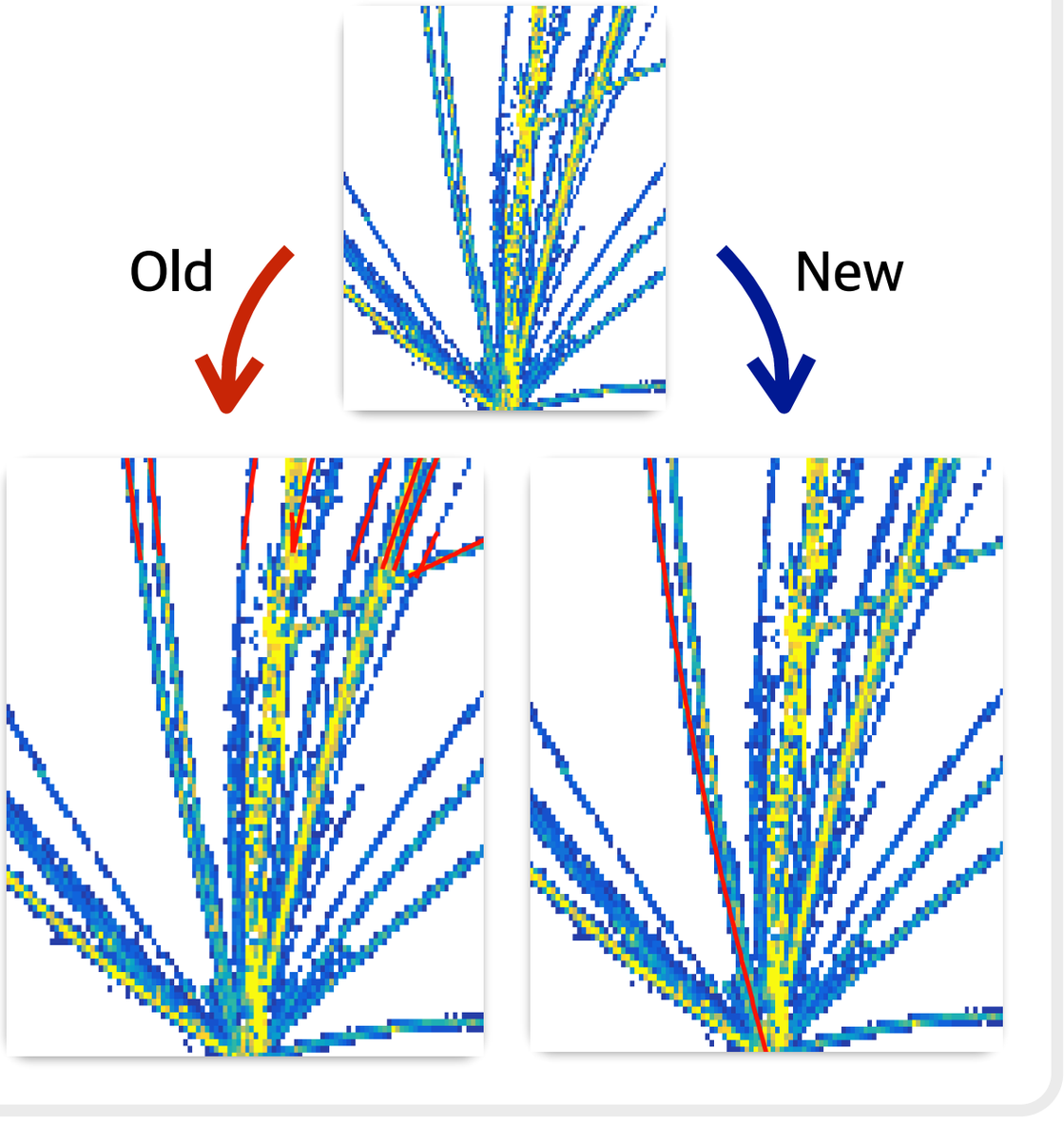


Track Finding

- **Problems we had**
  - Clustering for Riemann tracking
  - Broken tracks
  - Unidentified circling tracks
  - Too many parameters
- **New features**
  - Full control of the code
  - Build full track one by one instead of building track simultaneously
  - Use hits instead of hit-clusters for track finding
  - Self-updated parameters: Riemann fit parameters, proximity cut.

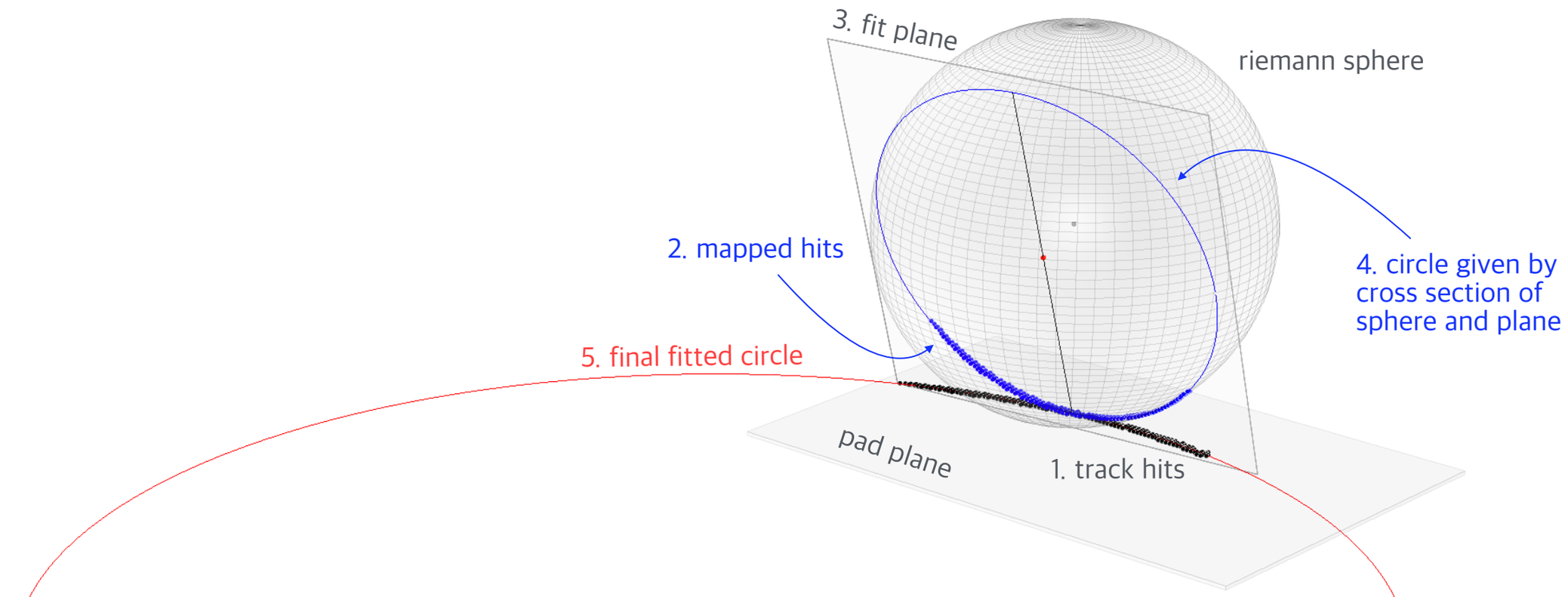


Event Map



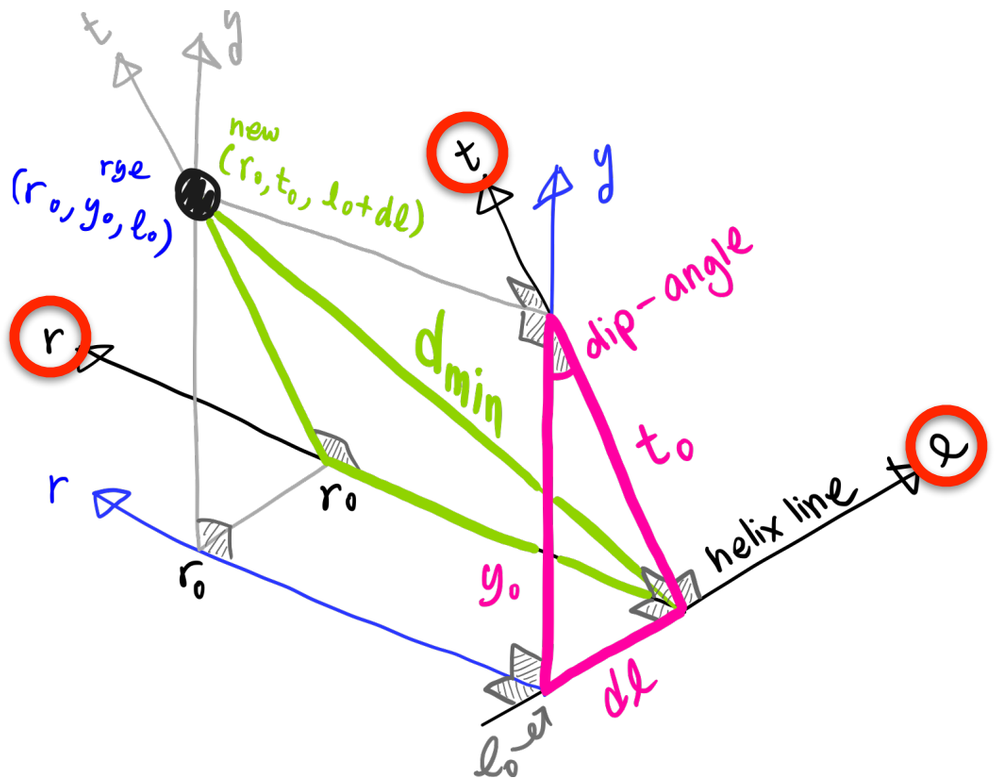
- One to one 2D mapping from pad(row, layer) to pad hits.
- This enables one to build one full track before another track is built.
- New possibility of finding hits and continue building track from extrapolated position using event map.
- Used hits are left in the event map so other tracks also have chance to check the correlation.

Improvement of Riemann Fit



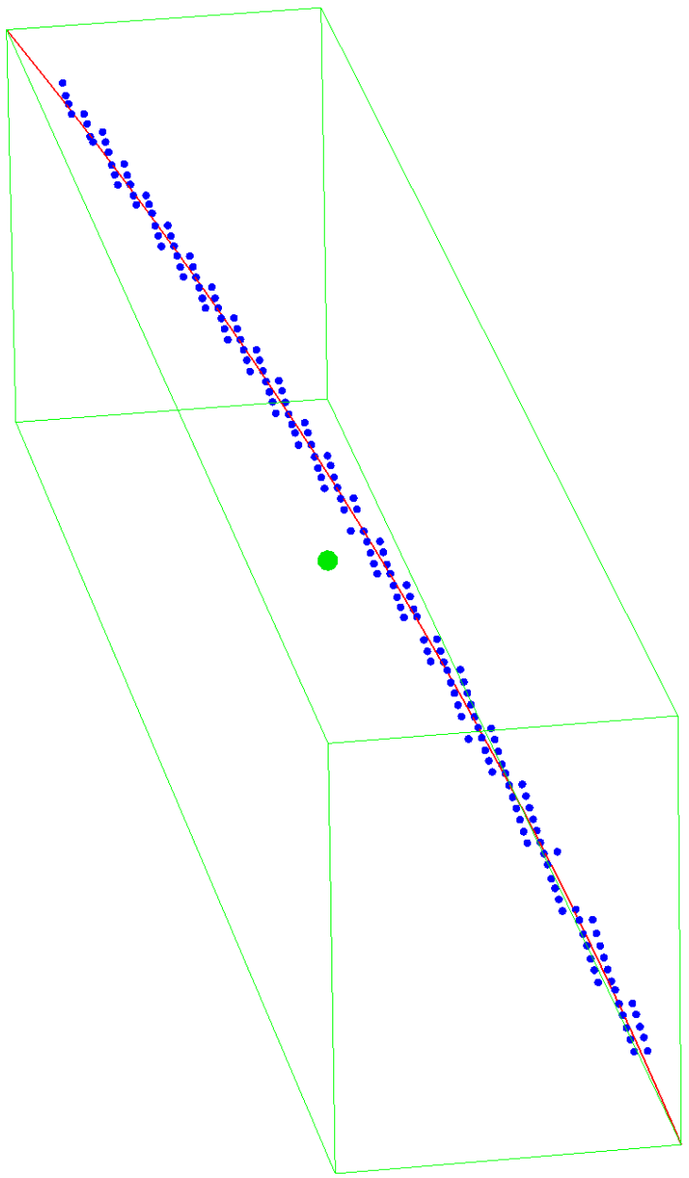
- Fit quality also depend on Riemann sphere center position and radius.
- Center position is choosen from the centroid of the track hits.
  - This also take advantage of determining straight line before the calculation falls into singularity.
- Radius is calculated from the sigma of track hit distribution.

Hit-Track Correlation

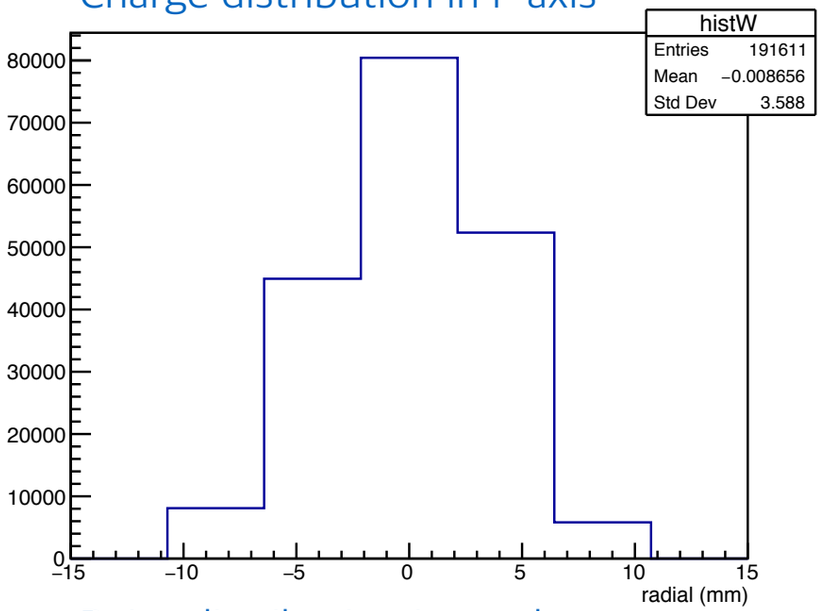


- Correlation used in track finding
  1. Distance in radial direction(width, electron diffusion direction, r-axis)
  2. distance in axis, normal to radial and helix direction vector(track height, t-axis).

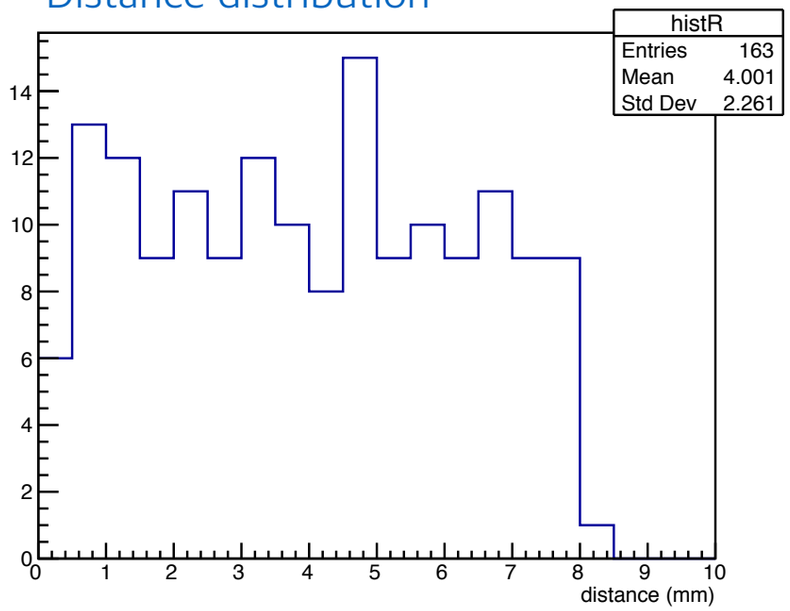
Hit-Track Correlation



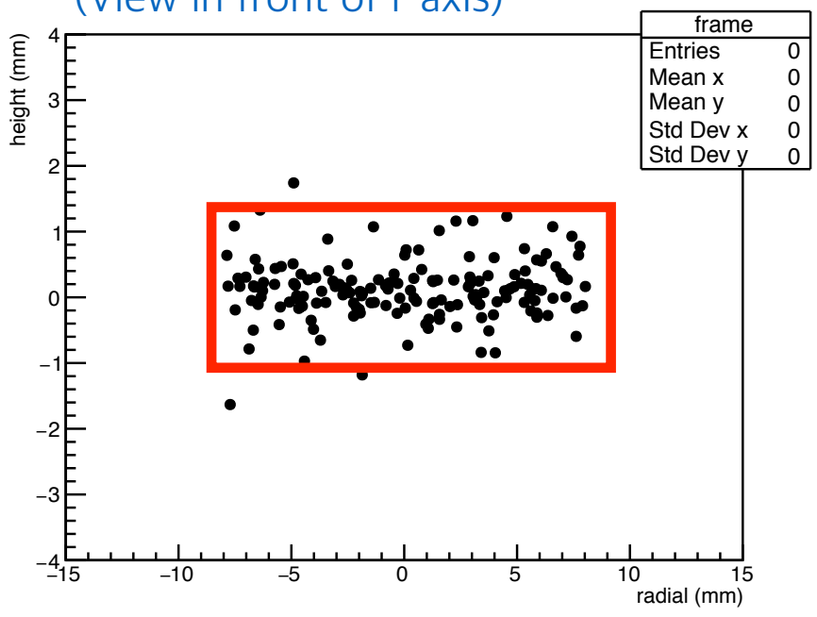
Charge distribution in r-axis



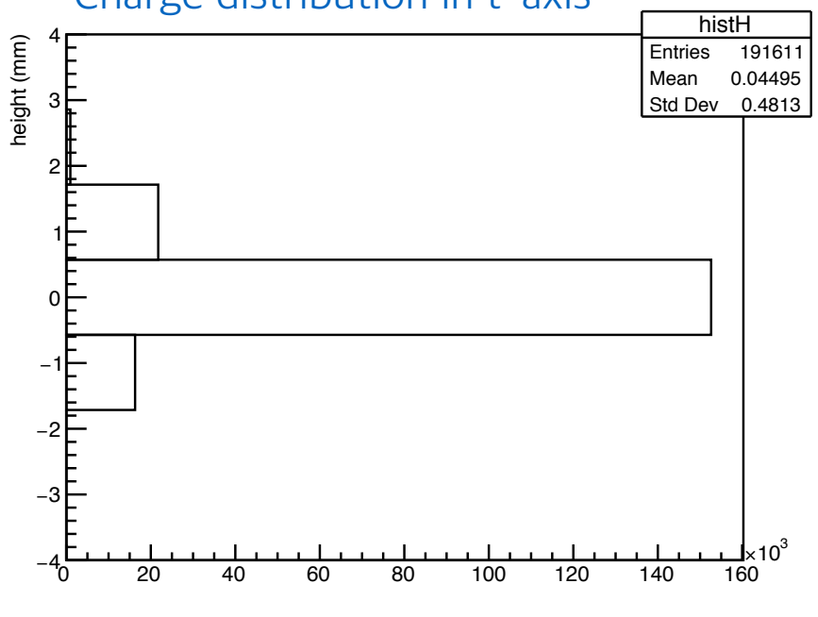
Distance distribution



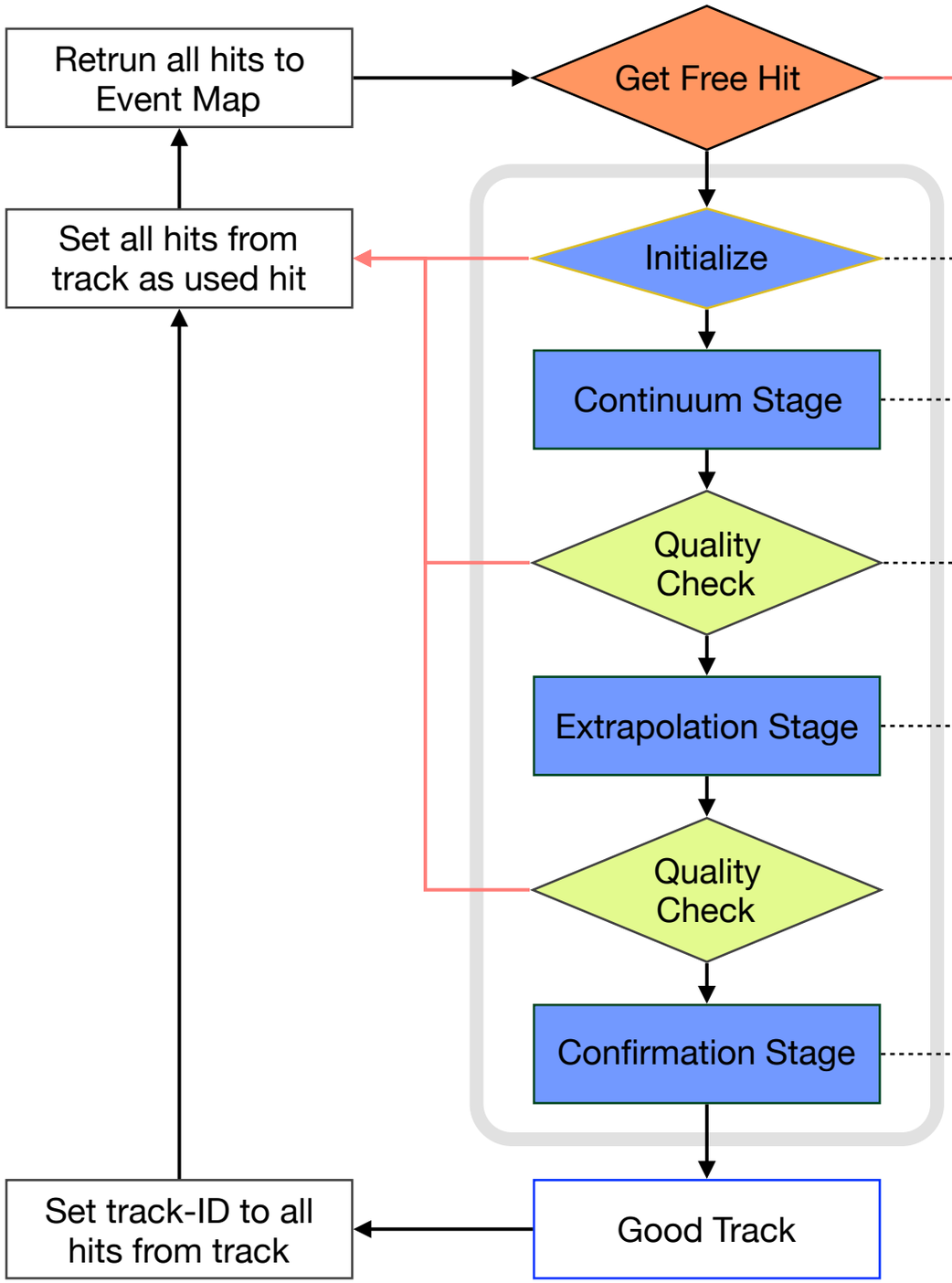
Point distribution in rt-plane
(View in front of l-axis)



Charge distribution in t-axis



Track Finding Algorithm



Try initialization(build track) by adding only the neighboring pad hits.
Pass to next stage if hit distribution is big enough to fit as helix.

Build track by adding only the neighboring pad hits.
Helix fitting is done to see the mathching quality of with the track.

Check quality(continuity, length) of the track.

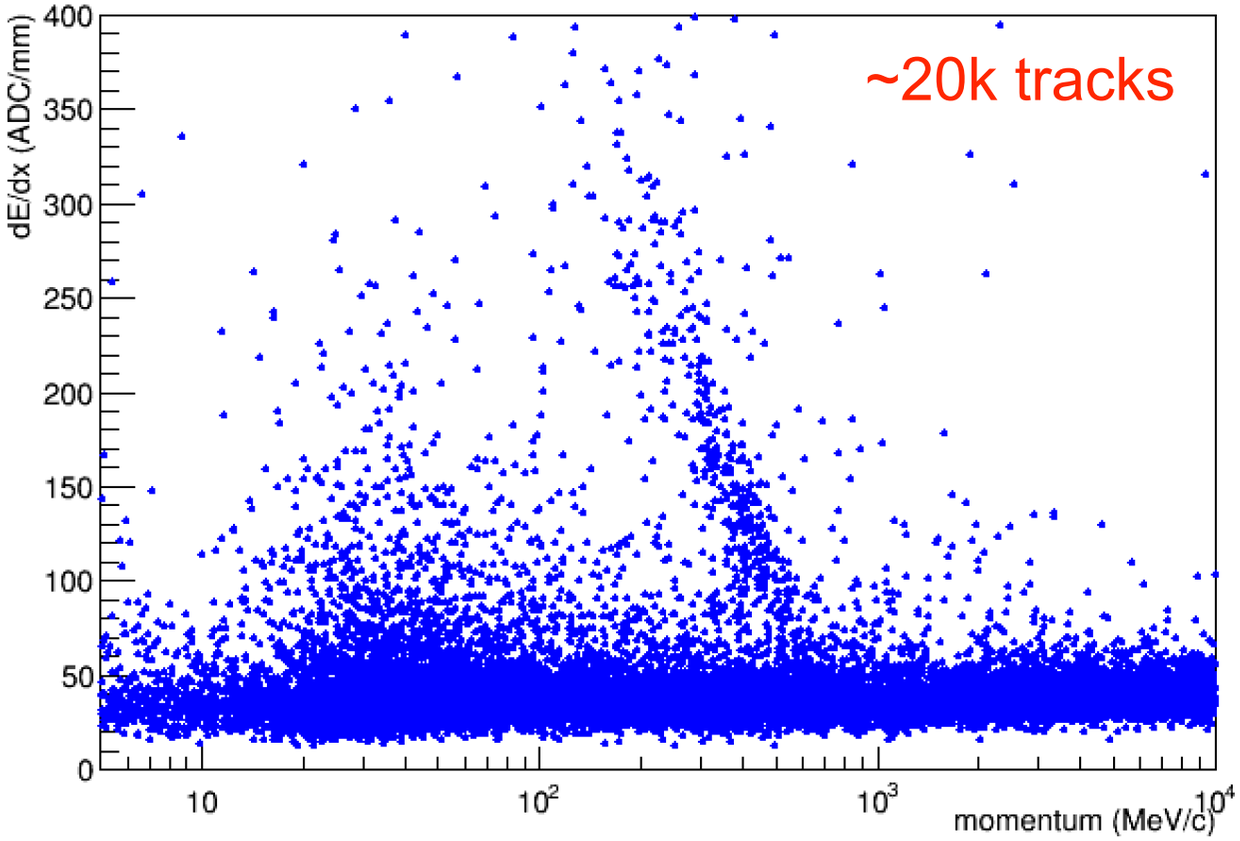
Same as continuum stage, but hits are gethered by extrapolating track until the track reaches end of TPC.

Same as extrapolation stage, but find or remove hits due to with stable fitting of the track.

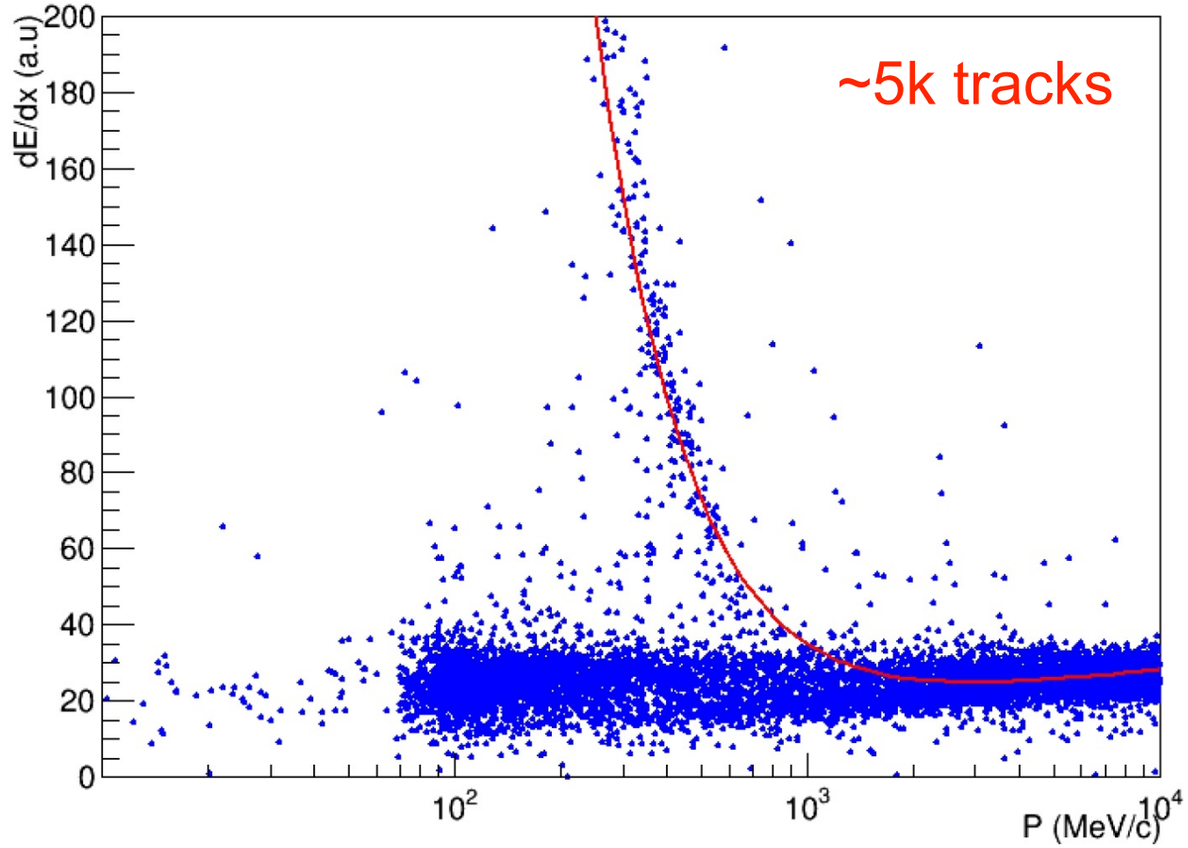
- **Free hit** : Hit that was never used to build track.
- **Used hit** : Hit that was used to build once or more.

Cosmic Comparison

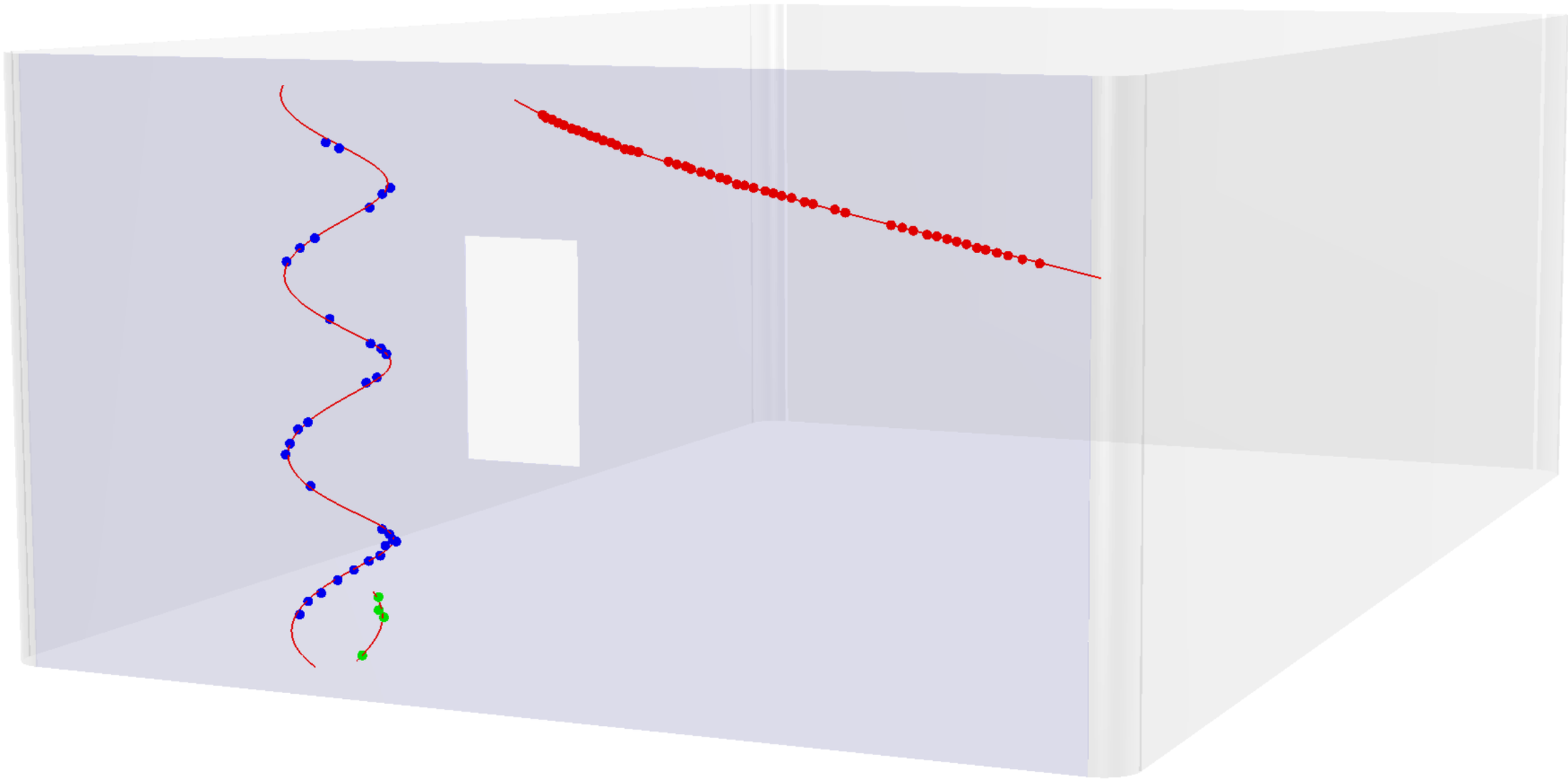
New Code



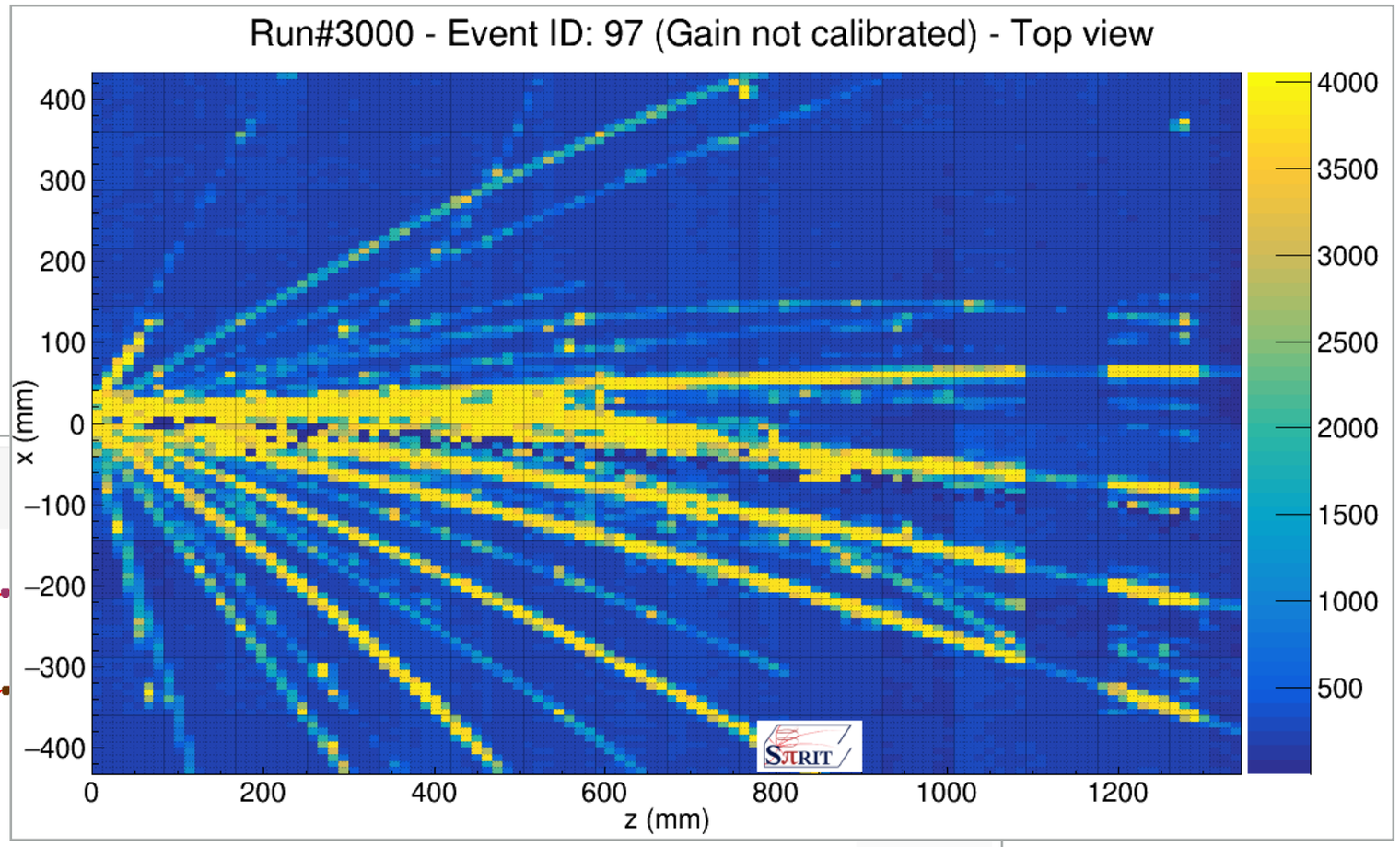
Old Code

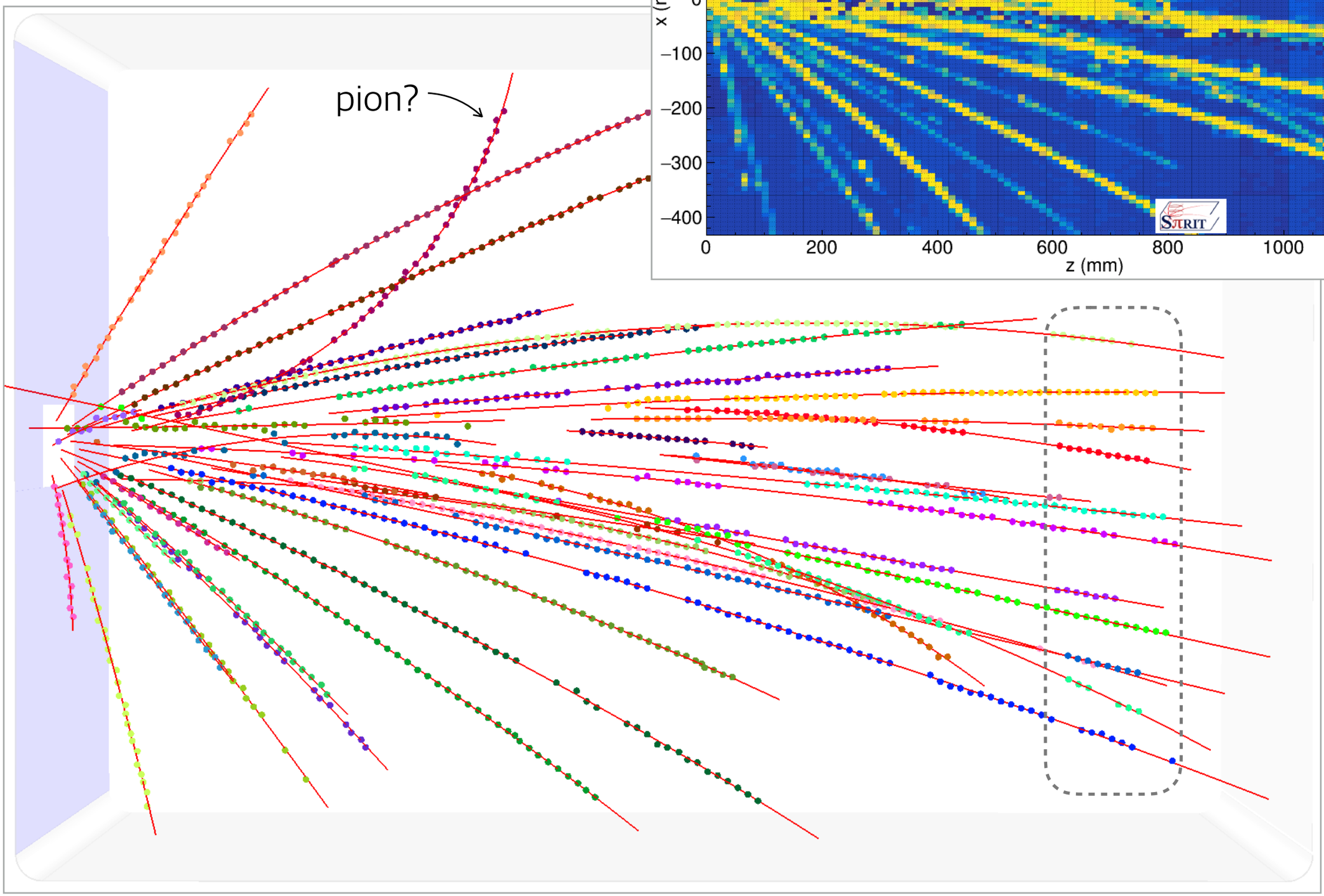


Cosmics



Physical Run





Summary

- Reconstruction: PSA, Track Finding, GENFIT
- Implementation from SpiRIT Software to LAMPS Software?