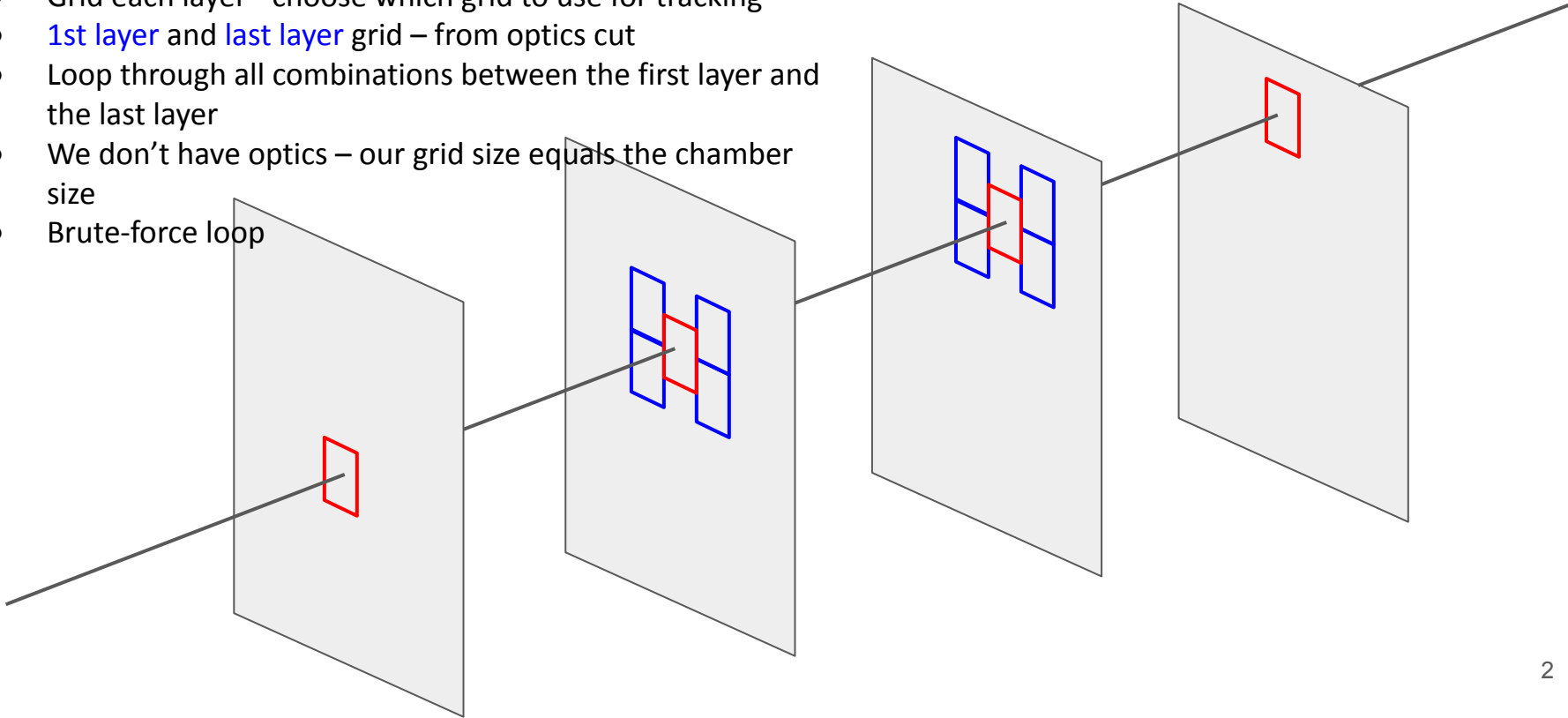


Tracking

Tracking Algorithm

- Grid each layer - choose which grid to use for tracking
- 1st layer and last layer grid – from optics cut
- Loop through all combinations between the first layer and the last layer
- We don't have optics – our grid size equals the chamber size
- Brute-force loop



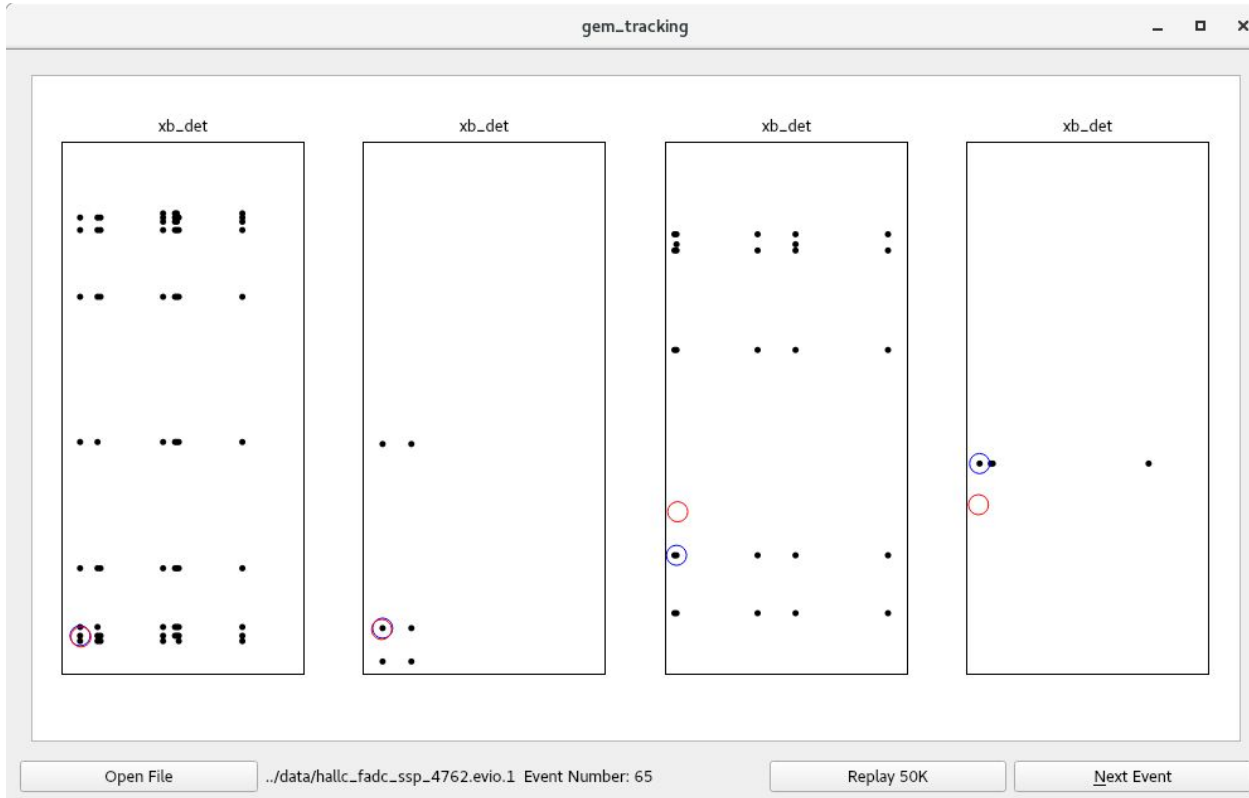
Tracking Algorithm Bias

- We have 4 layers in total – minimum hits on track – 3 or 4
- **Chi2 cut** is the only criteria at present
- Tracking result shows that: **3-hits** configuration always generate **smaller chi2** than **4-hits** configuration – causing a tracking algorithm bias
 - Possible cause - X-Y offset not corrected rightly?
 - Choose 4-hits tracks for calibration study - **you can require 4 hits minimum in the config file**
- So current algorithm will artificially favor **4-hits** configuration tracks – if a 4-hits track found within the required **chi2 cut**, algorithm will stop searching for **3-hits** track candidates (**although maybe better to keep both**)

Running Speed

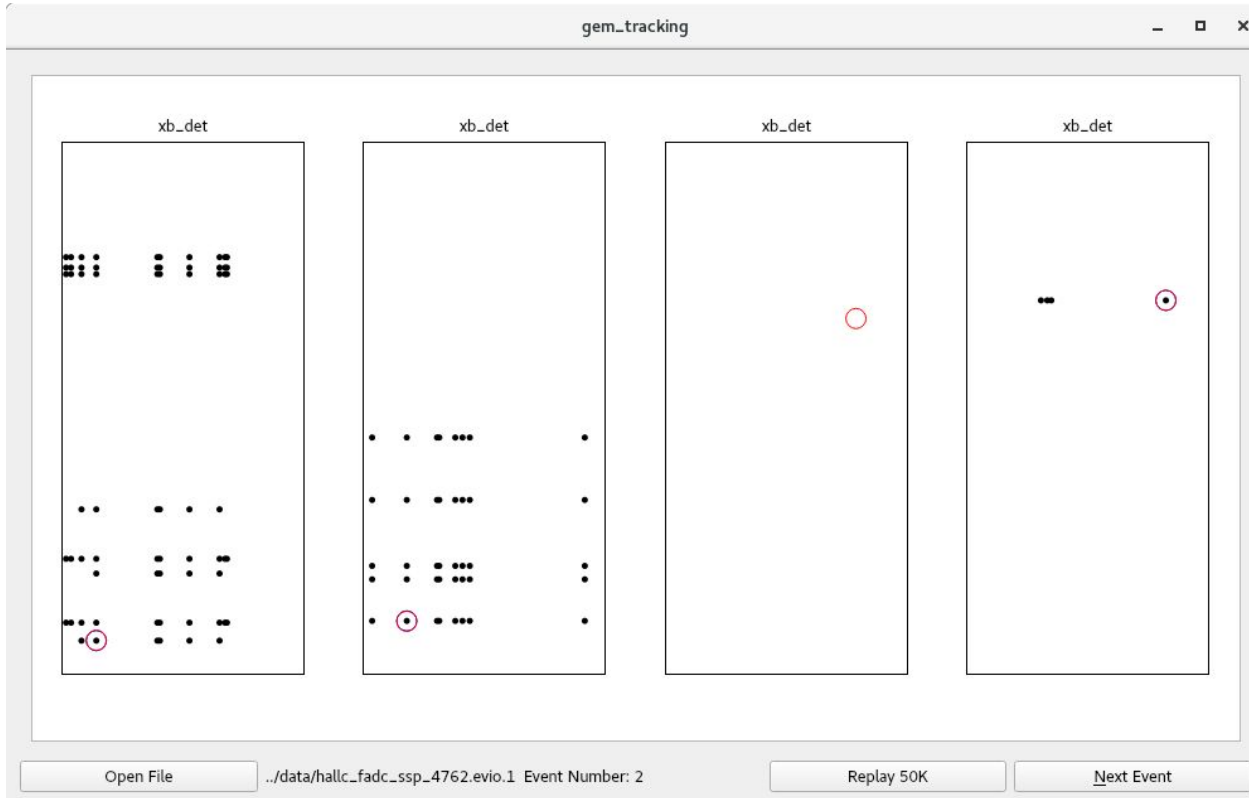
- 70 μA run (**highest beam current**):
 - 50K events - 1629.25 seconds
 - 100K events - 2837.1 seconds
 - You can make it faster by reducing the grid size
- 5 μA run
 - 1M events - 370 seconds
- **Previous code** on 5 μA run - small angle
 - 100 events - average 4 seconds - 25 Hz

Tracking tool



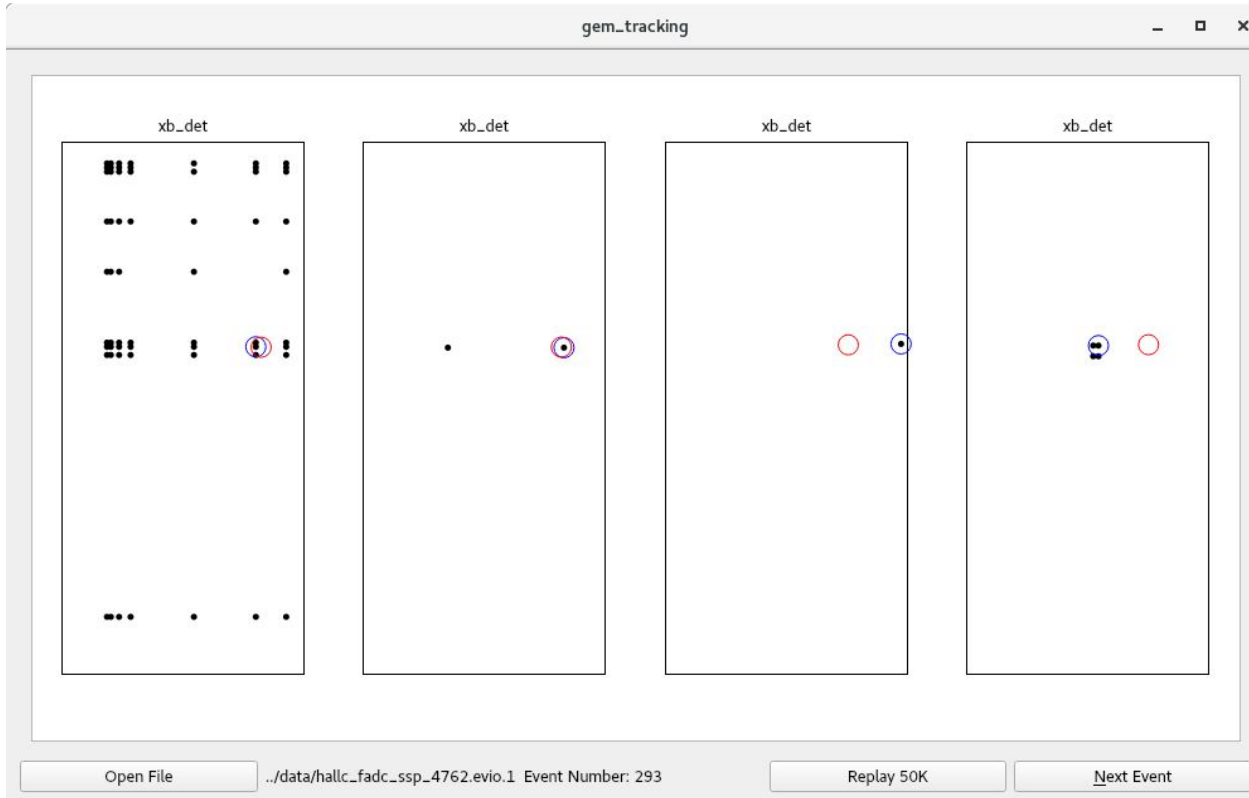
- **Red circle:** track projected position
- **Blue circle:** detector reconstructed hits used for best track fitting
- Black dots: all detector reconstructed hits

Tracking tool



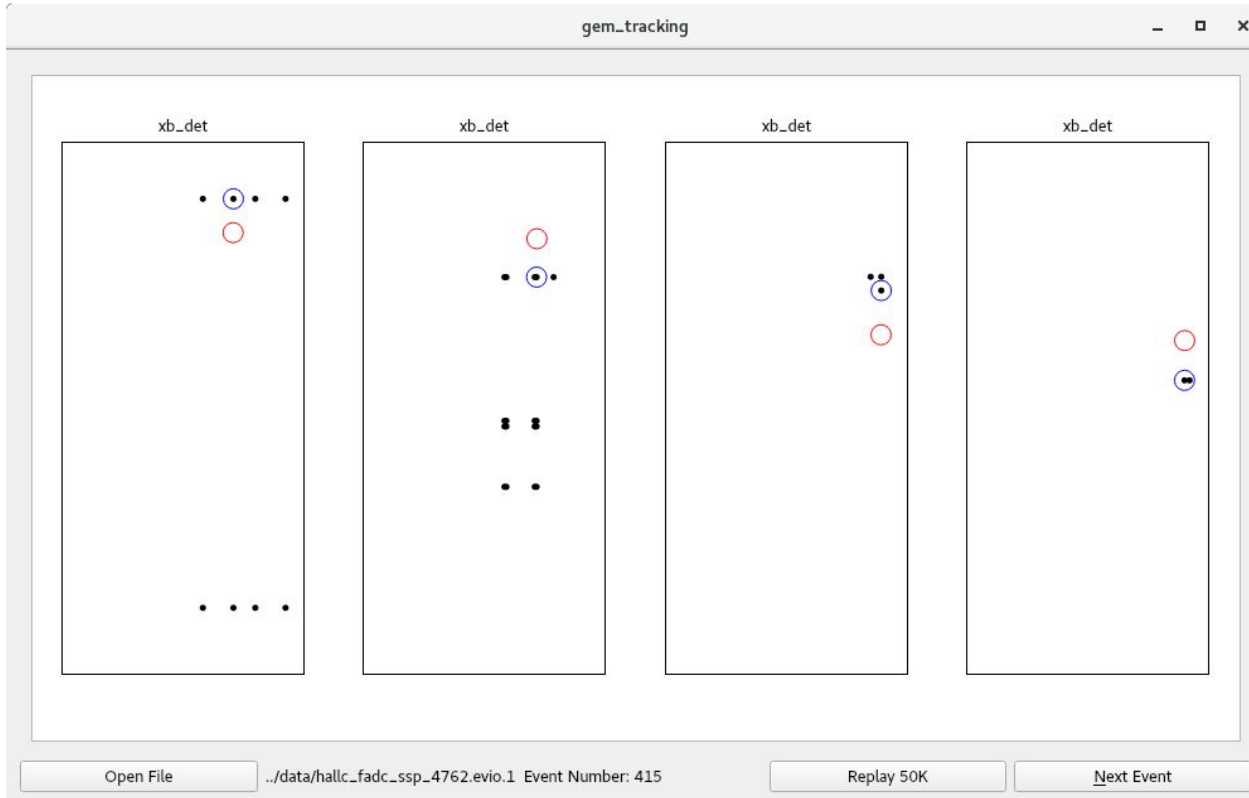
- **Red circle:** track projected position
- **Blue circle:** detector reconstructed hits used for best track fitting
- **Black dots:** all detector reconstructed hits

Tracking tool



- **Red circle:** track projected position
- **Blue circle:** detector reconstructed hits used for best track fitting
- **Black dots:** all detector reconstructed hits

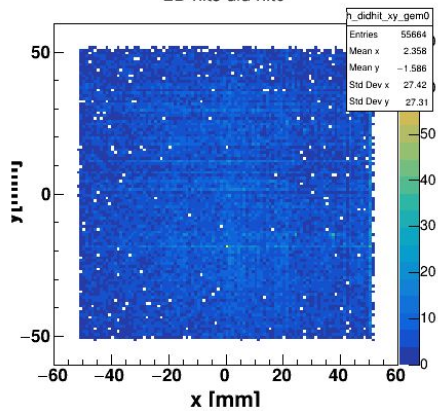
Tracking tool



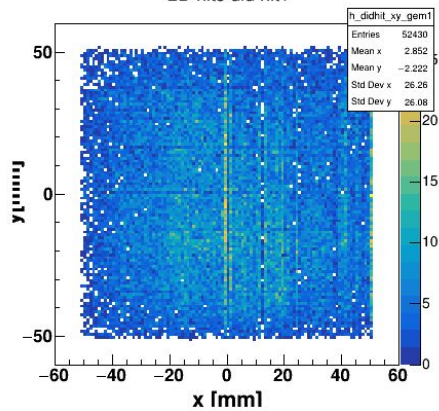
- **Red circle:** track projected position
- **Blue circle:** detector reconstructed hits used for best track fitting
- **Black dots:** all detector reconstructed hits

Tracking result 4680

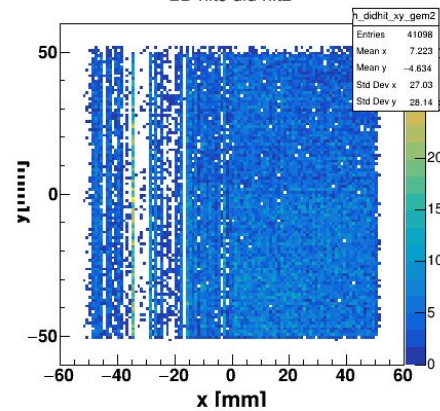
2D hits did hit0



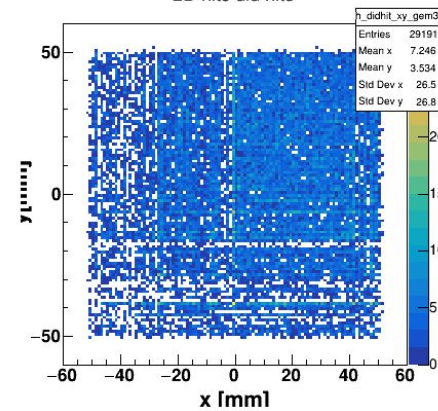
2D hits did hit1



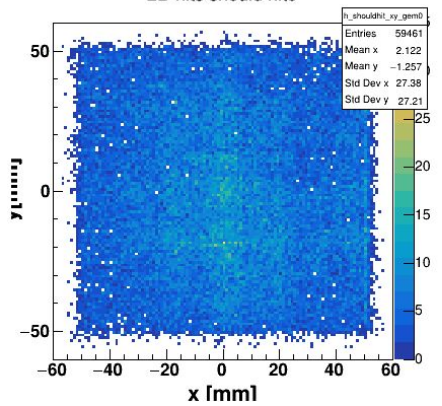
2D hits did hit2



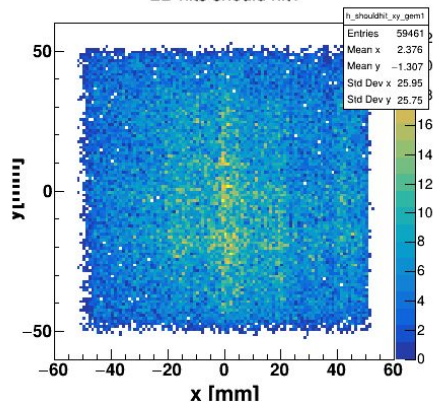
2D hits did hit3



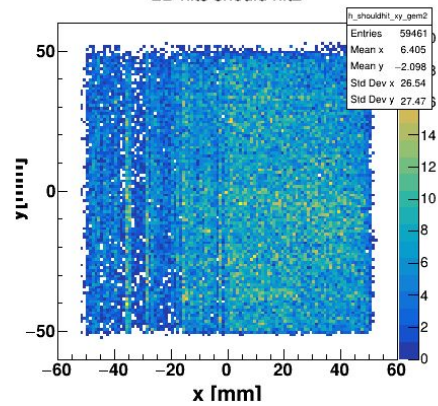
2D hits should hit0



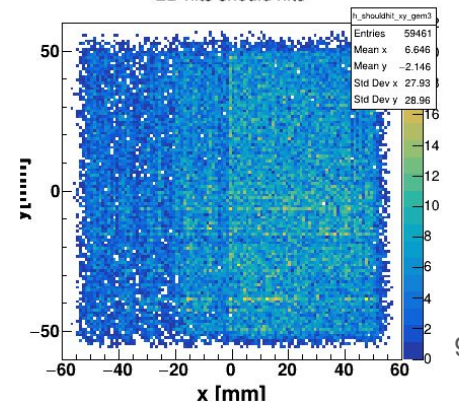
2D hits should hit1



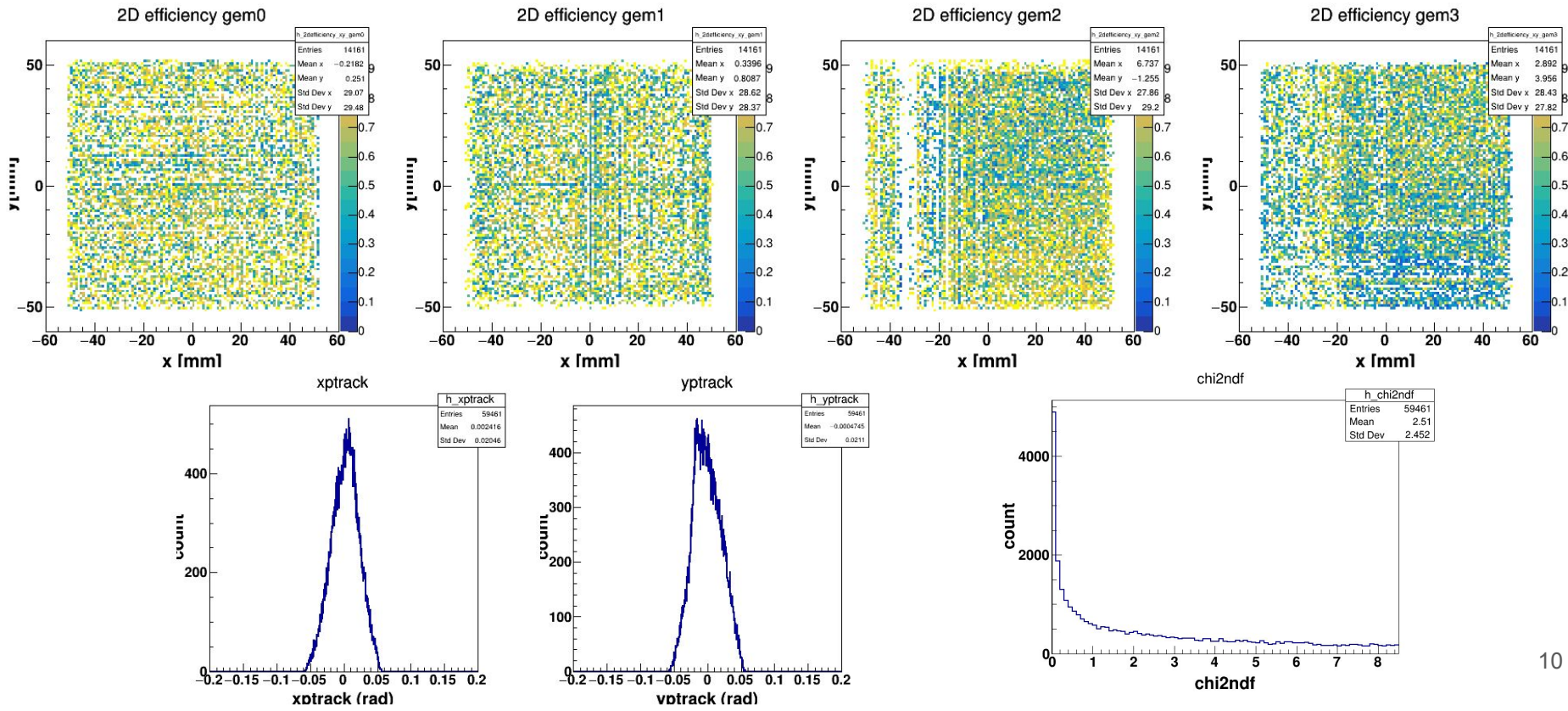
2D hits should hit2



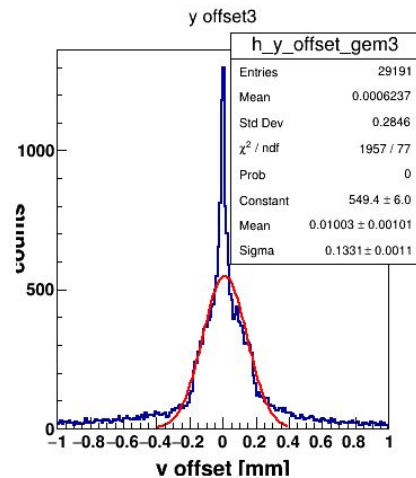
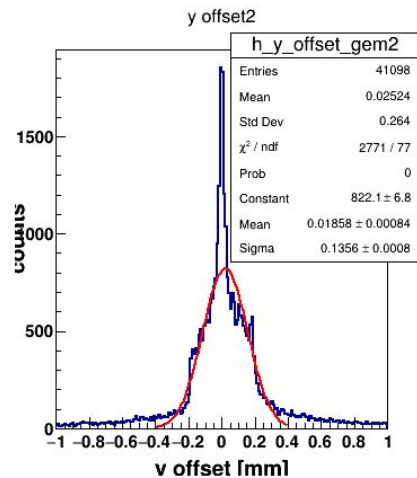
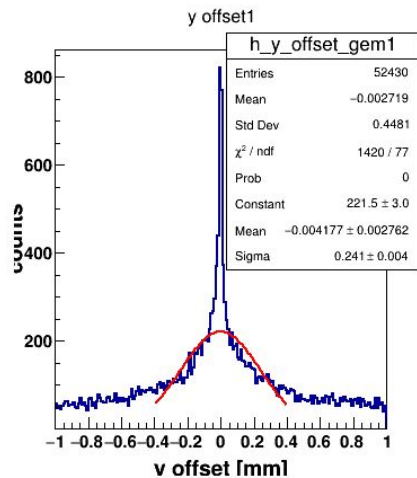
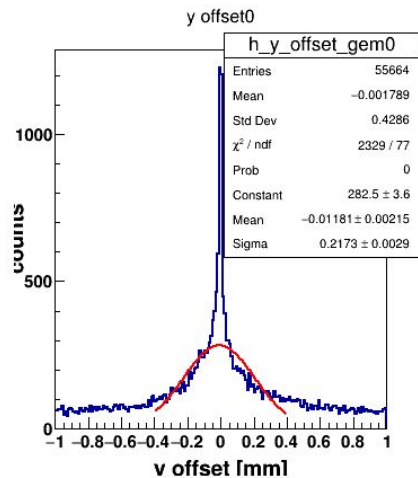
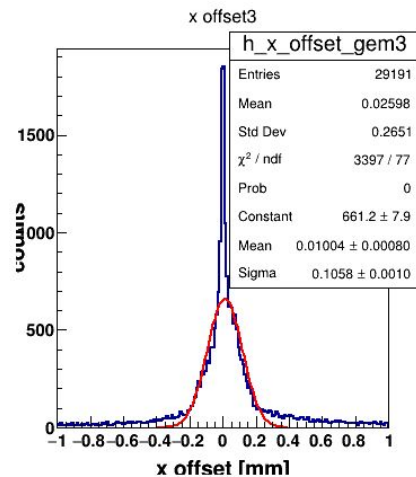
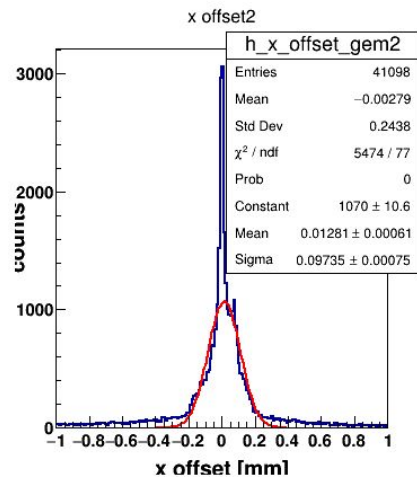
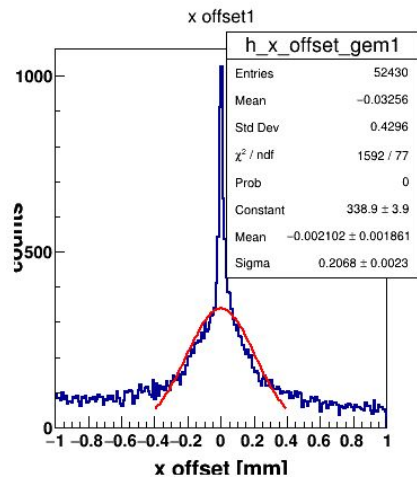
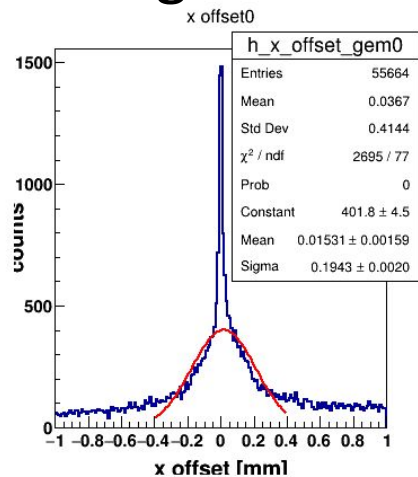
2D hits should hit3



Tracking Result 4680



Tracking Result 4680



Summary

- Speed is improved by around 100
- I think the current tracking is good enough for our beam test purpose
 - Help calorimeters to select desired events
- Major optimization work is completed, future minor optimization will still be needed (highly), but shouldn't affect too much on event selection purpose
 - Implement APV-wise zero suppression threshold – to recover hits on the low-gain APV
 - Refined offset, tilting angle study
 -