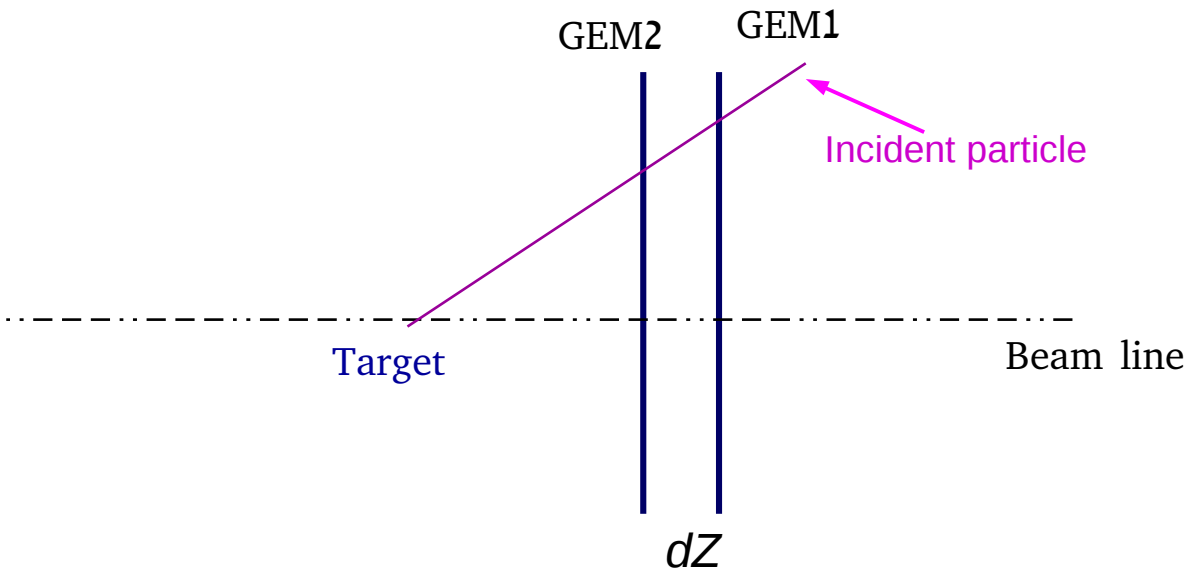
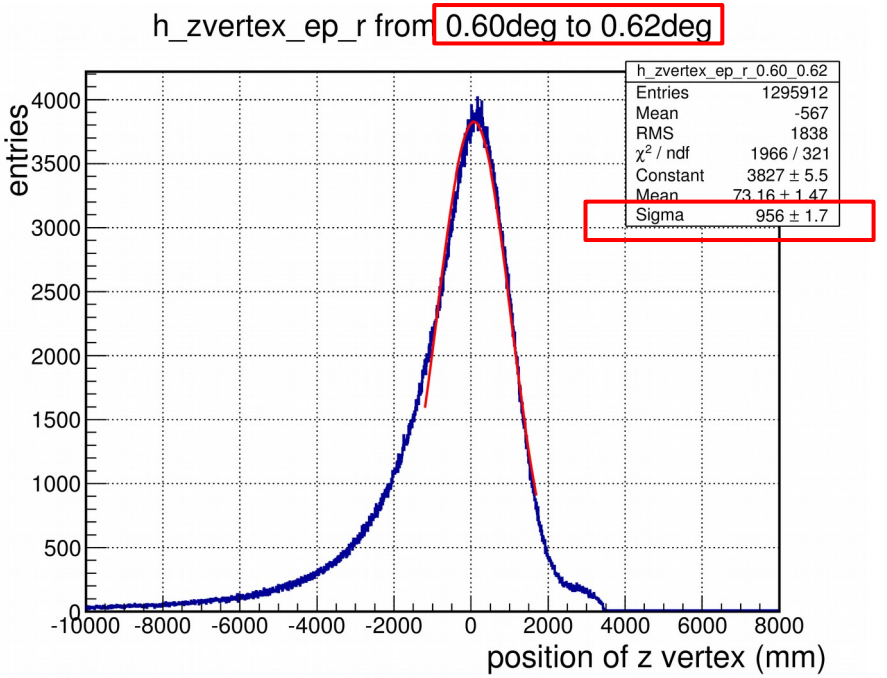
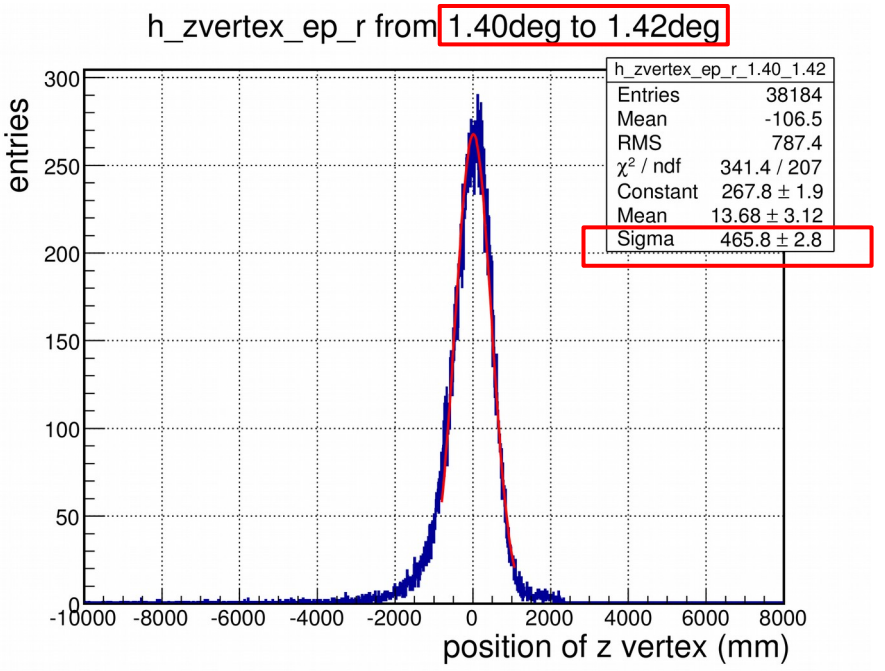
GEM Update

Using overlap GEM clusters to reconstruct Target Z



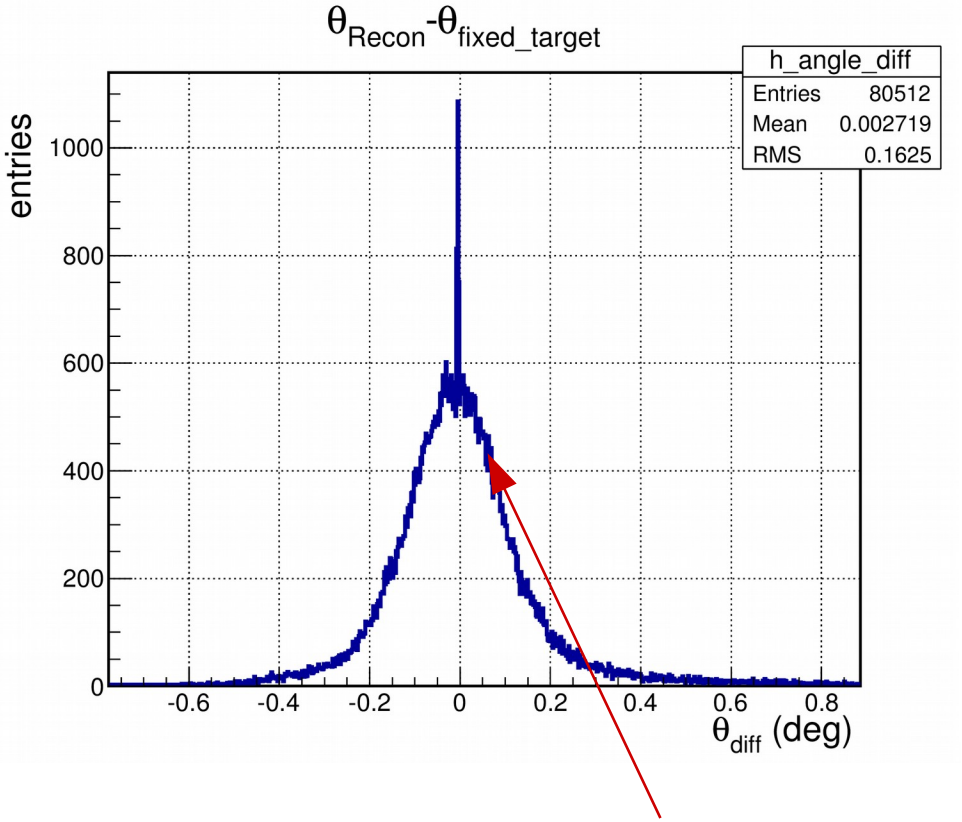


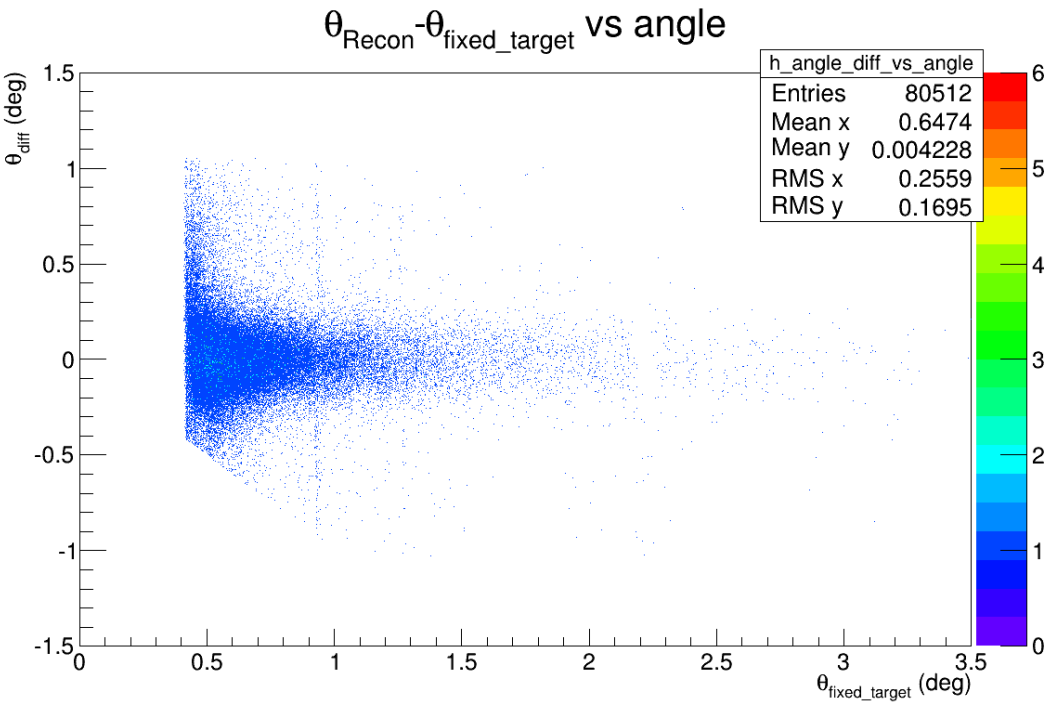


- To check the source of background in e-p yield
- To check the bump of e-p yield in lower scattering bin

- Using GEM overlap area e-p events
- Using two GEM clusters to find Z position

Difference between reconstructed angle and fixed target angle



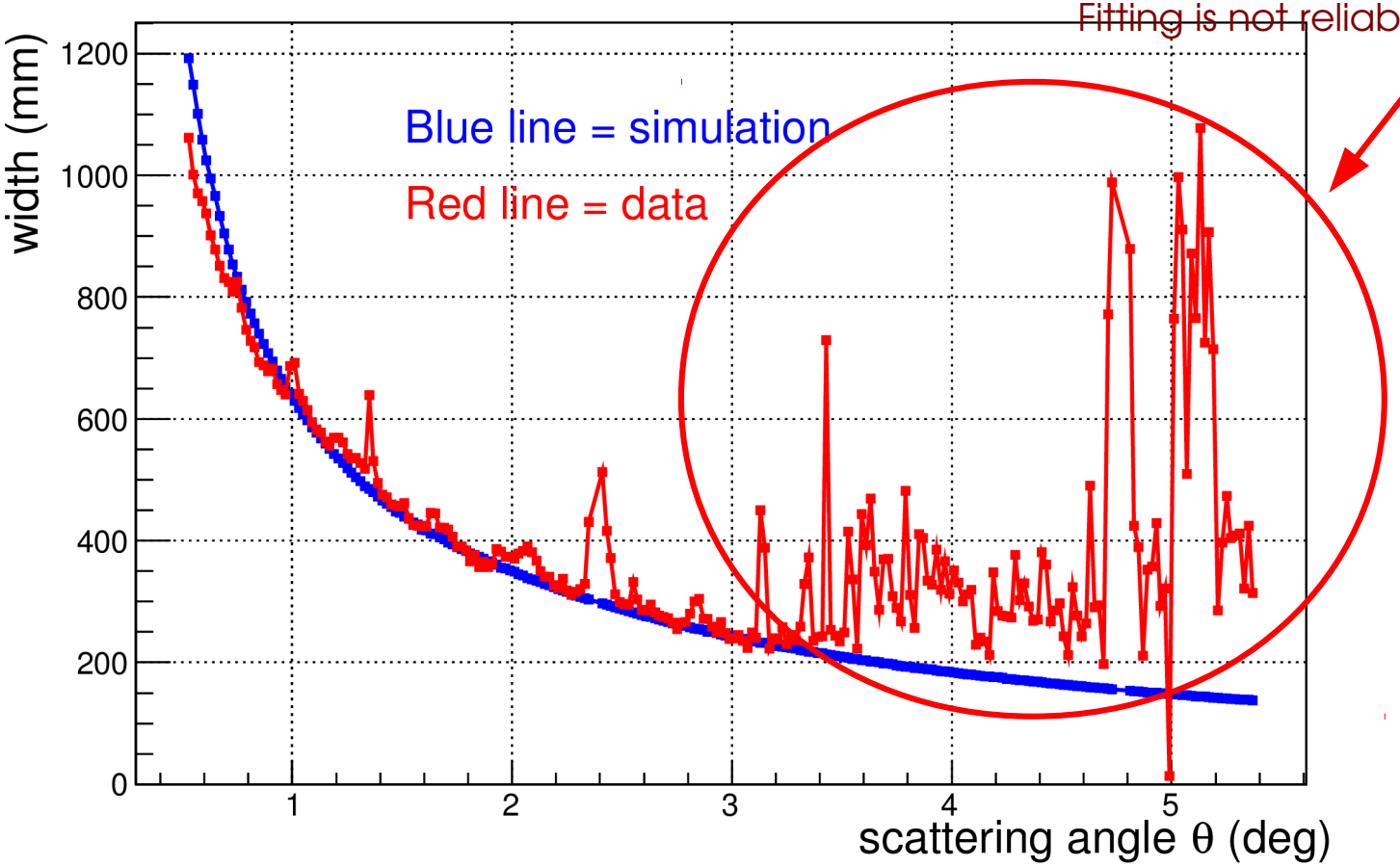


This sharp peak is because:
Some times using overlap GEM clusters can reconstruct > 90 degree Scattering angle, which is clearly wrong, high likely due to bad matching.
For these situations, I use fix-target angle to replace reconstructed angle.

Reconstructed z vertex sigma in different angle bins

Combined 85 production runs

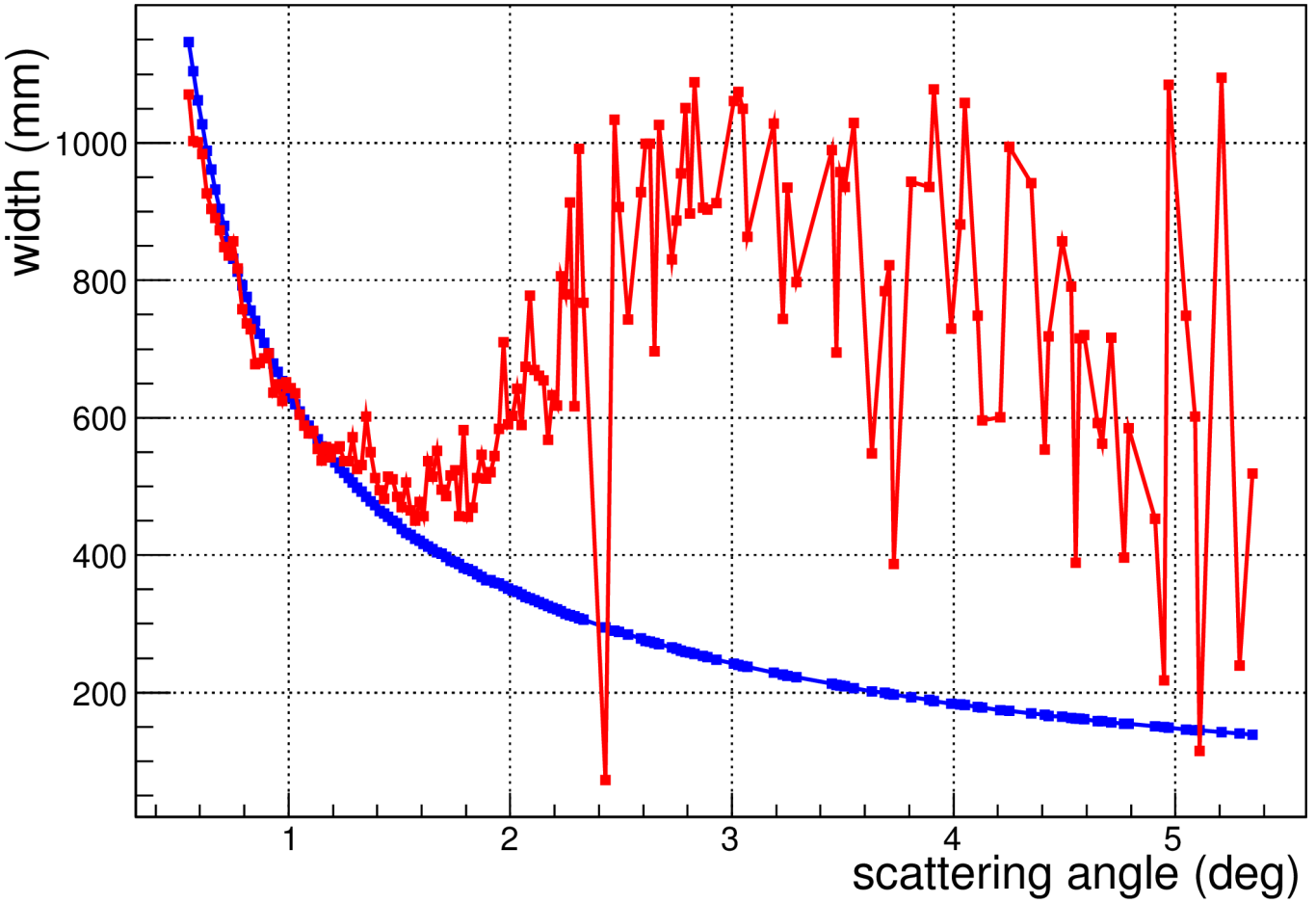
Very low statistic area
A few entries to several hundreds entries
Fitting is not reliable at all.



- **In simulation, suppose GEM native resolution = 70 microns**

Reconstructed z vertex sigma in different angle bins

^{12}C foil run



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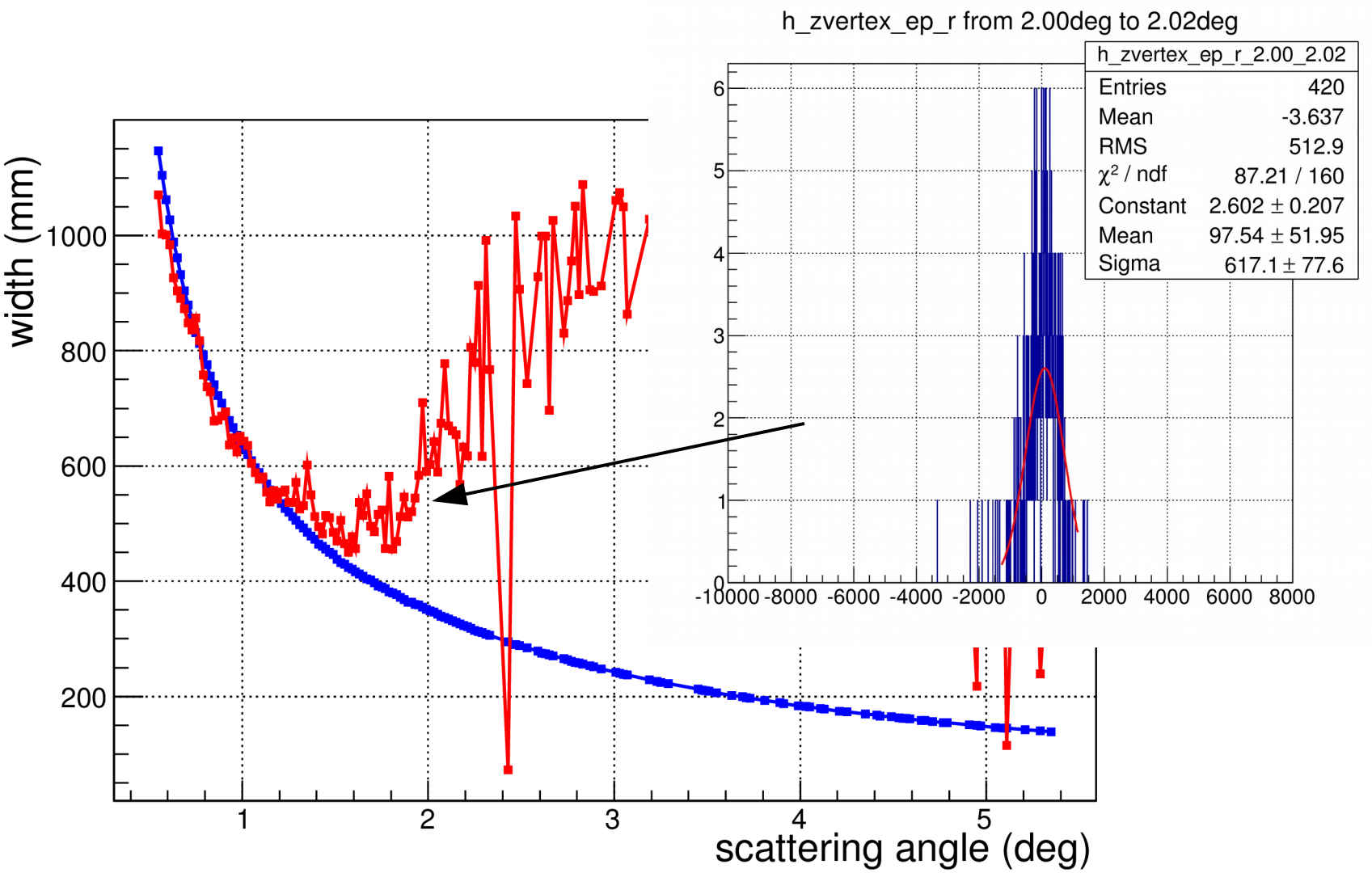

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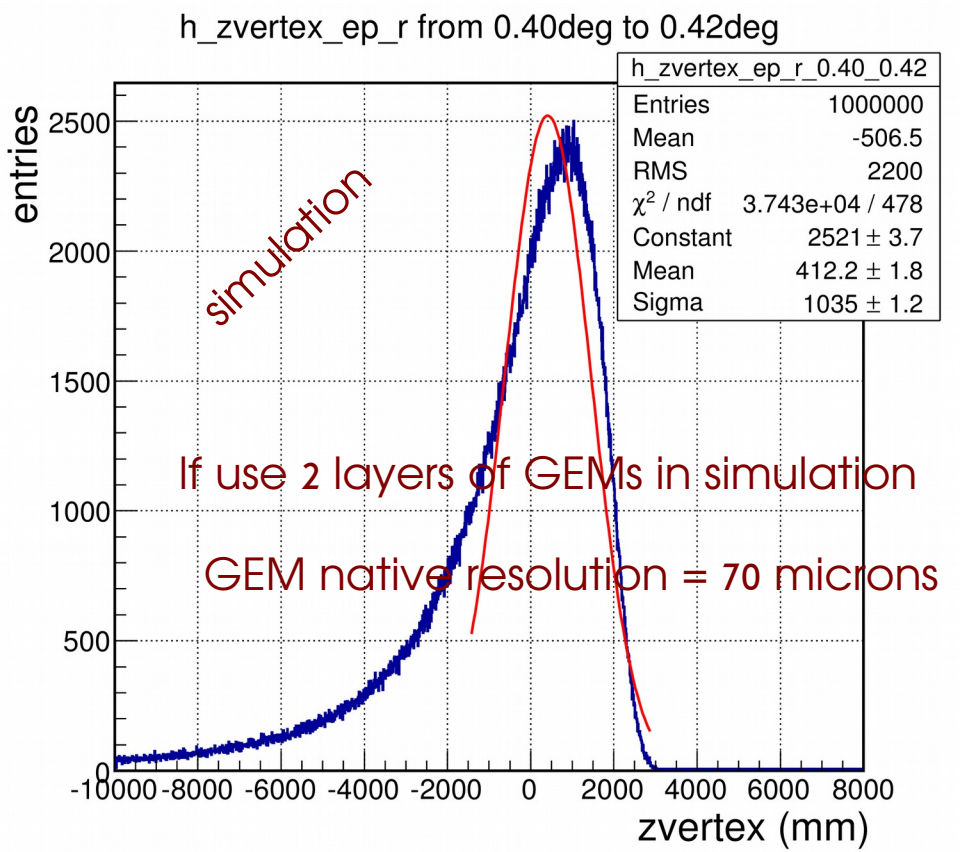
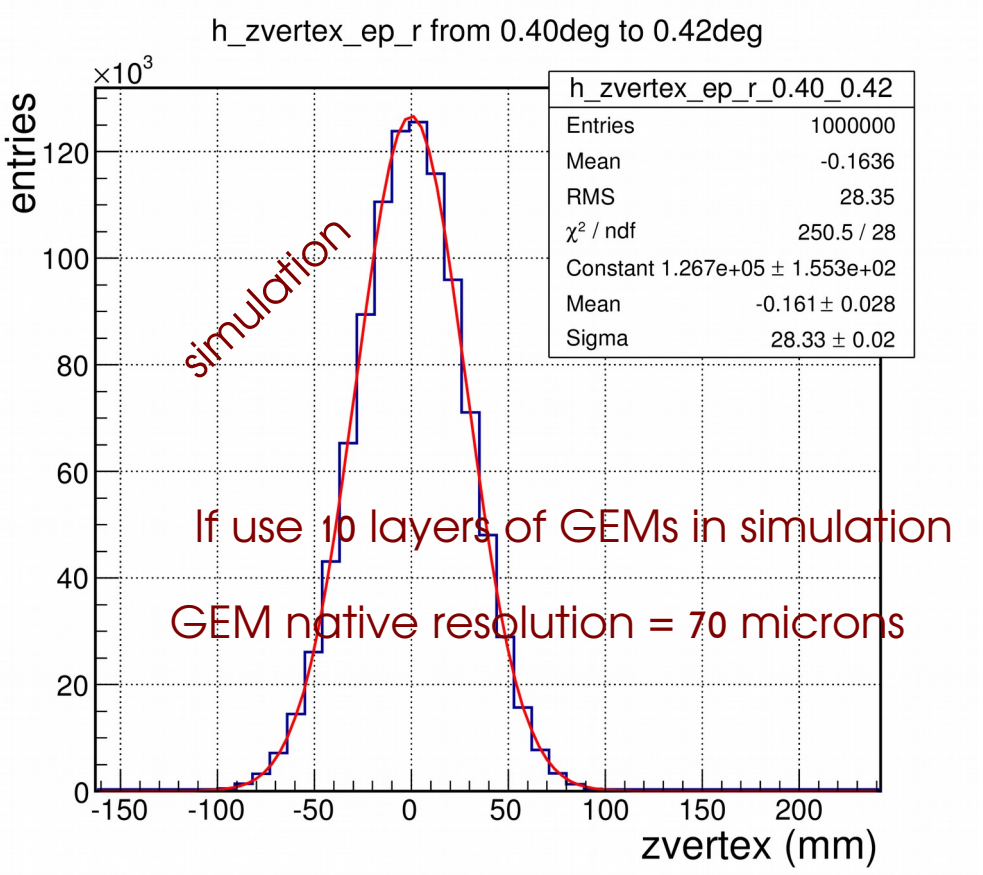
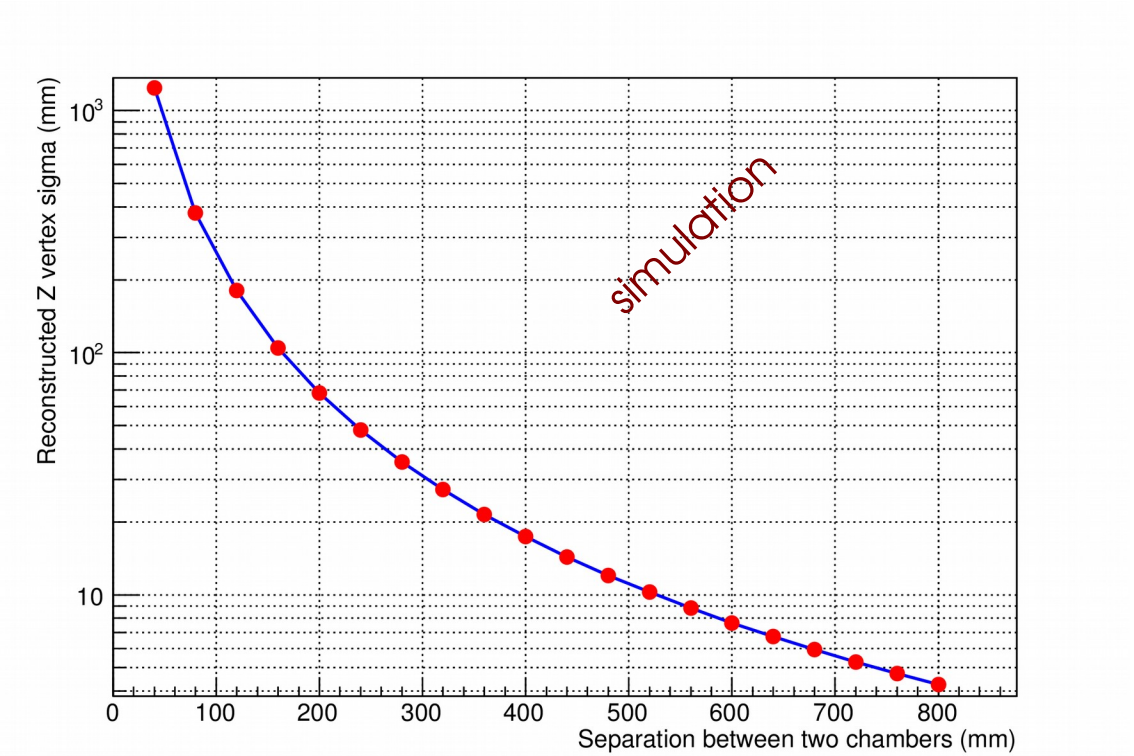
Reconstructed angle sigma in different angle bins





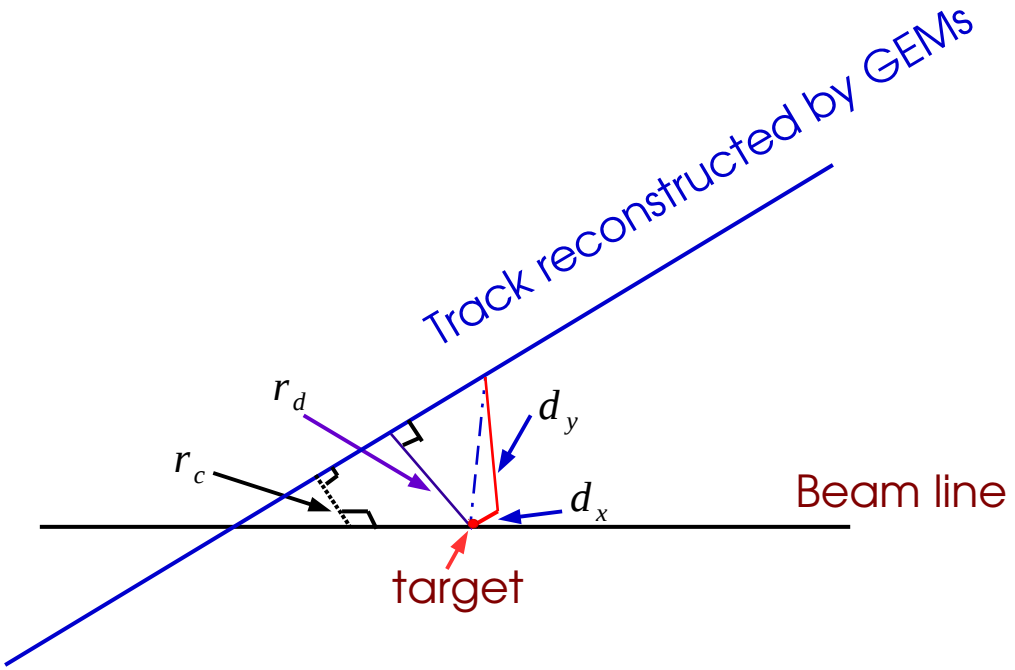
- Z vertex distribution have different sigma's in different scattering angle bin (refer to last page).
- Distance between each GEM layer = 40 mm.
- In simulation, angle was uniformly distributed between (0.4, → 0.42) degree. When use 2 layers of GEMs, the reconstructed z vertex has very wide distribution. If increase to 10 layers of GEMs, much narrower.

Or increase the distance between two chambers:



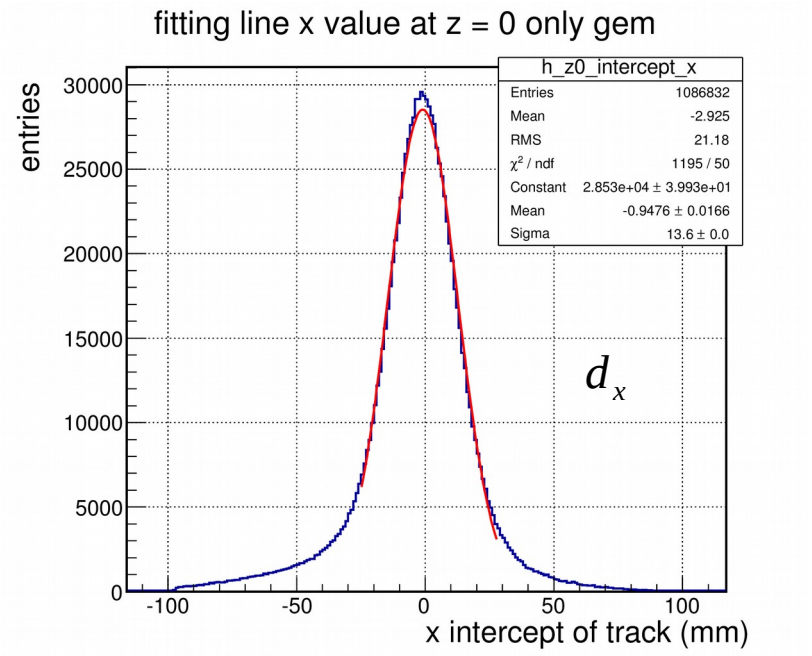
- Angle range : 0.4 – 0.42 deg (same as previous page)
- GEM native resolution = 70 microns

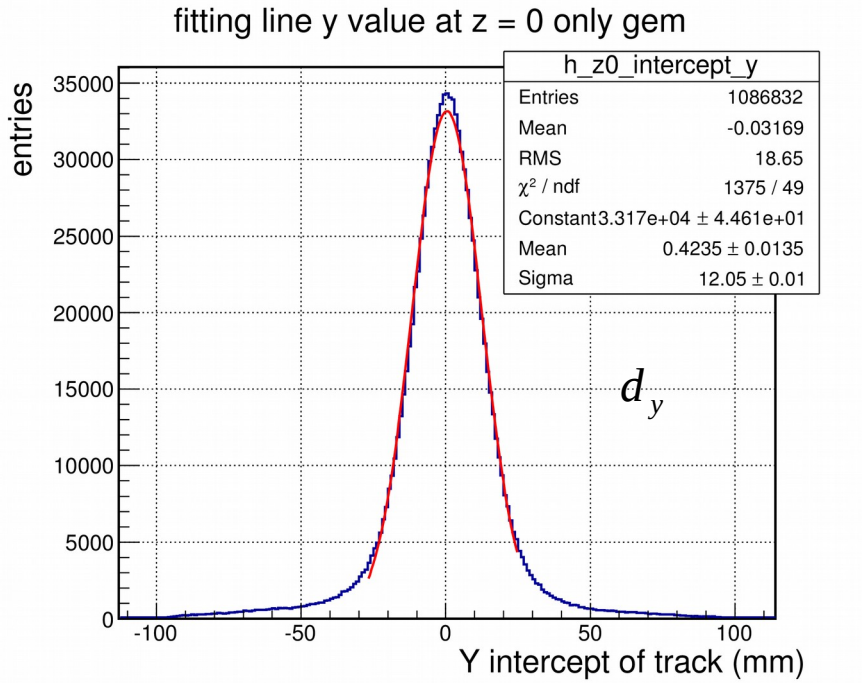
Tracks reconstructed by overlap GEMs

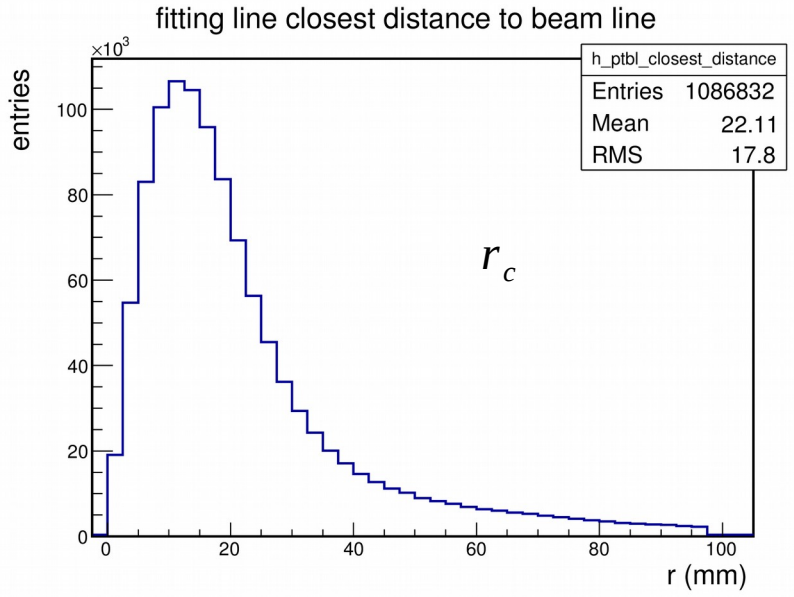


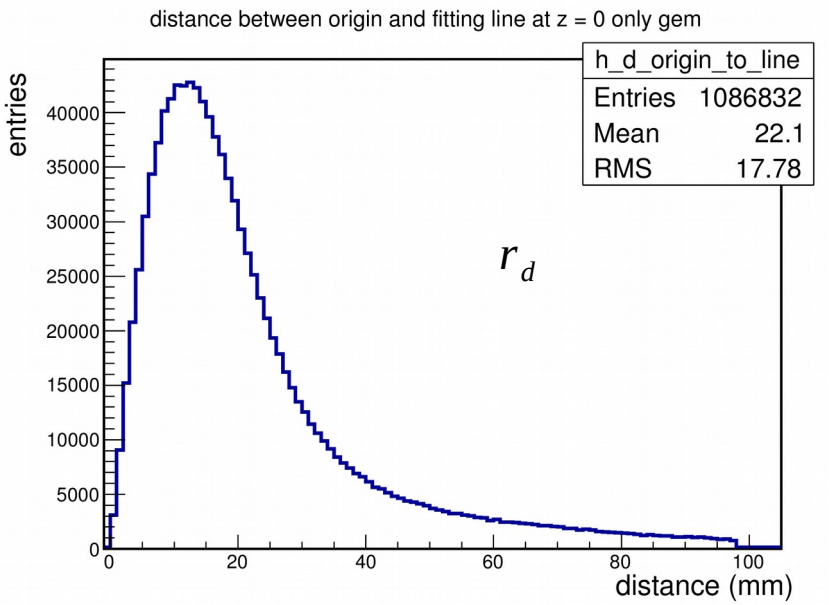
- r_c : the closest distance between beam line and track
- r_d : the distance from target to track
- d_x : X intercept of track at target (z=0)
- d_y : Y intercept of track at target (z=0)

Tracks reconstructed by overlap GEMs ^{12}C run







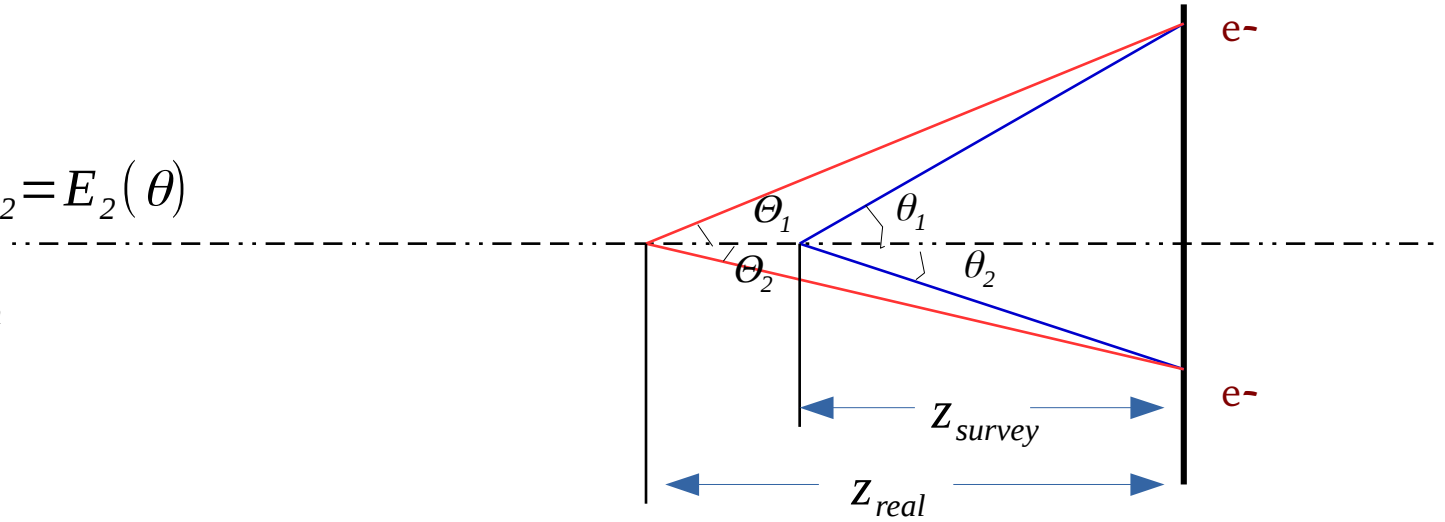


Using overlap area ee events to determine Z for each GEM

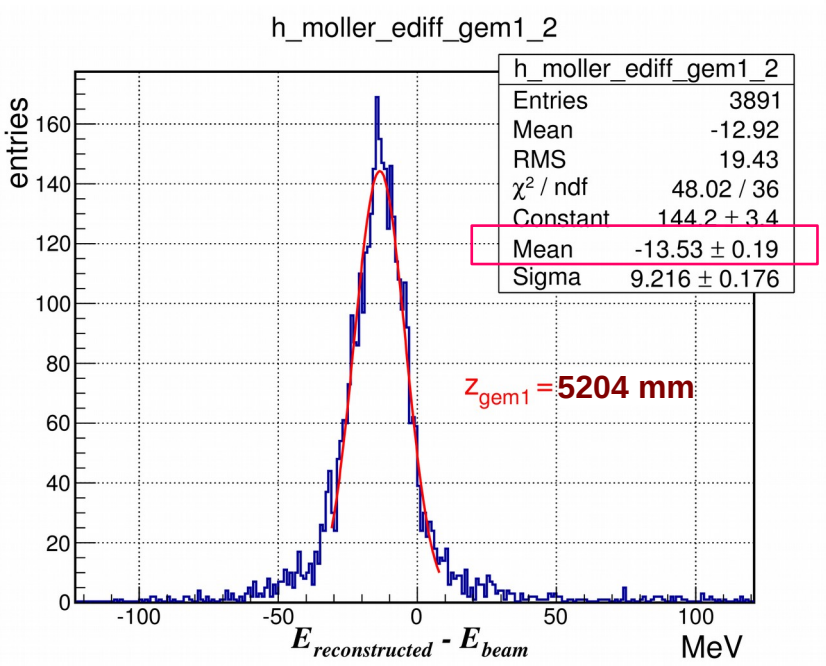
Moller events:

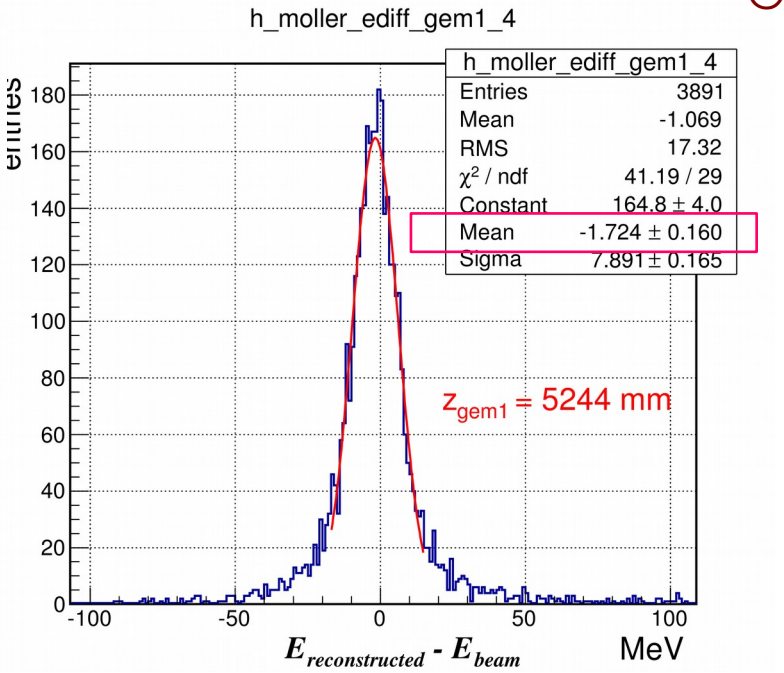
$$E_1 = E_1(\theta);\ E_2 = E_2(\theta)$$

$$E_1 + E_2 = E_{beam}$$

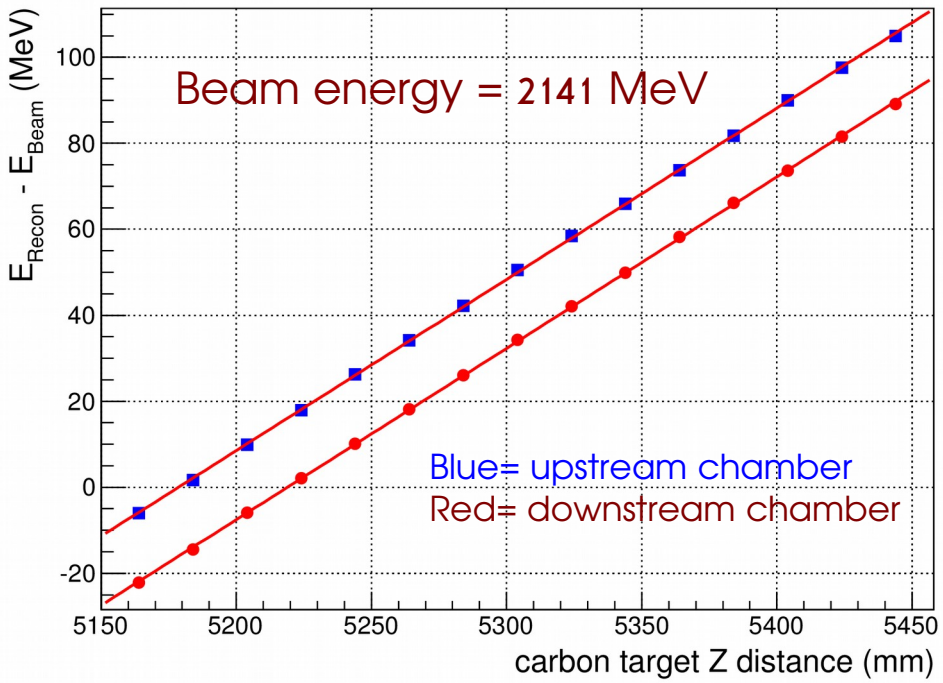


GEM

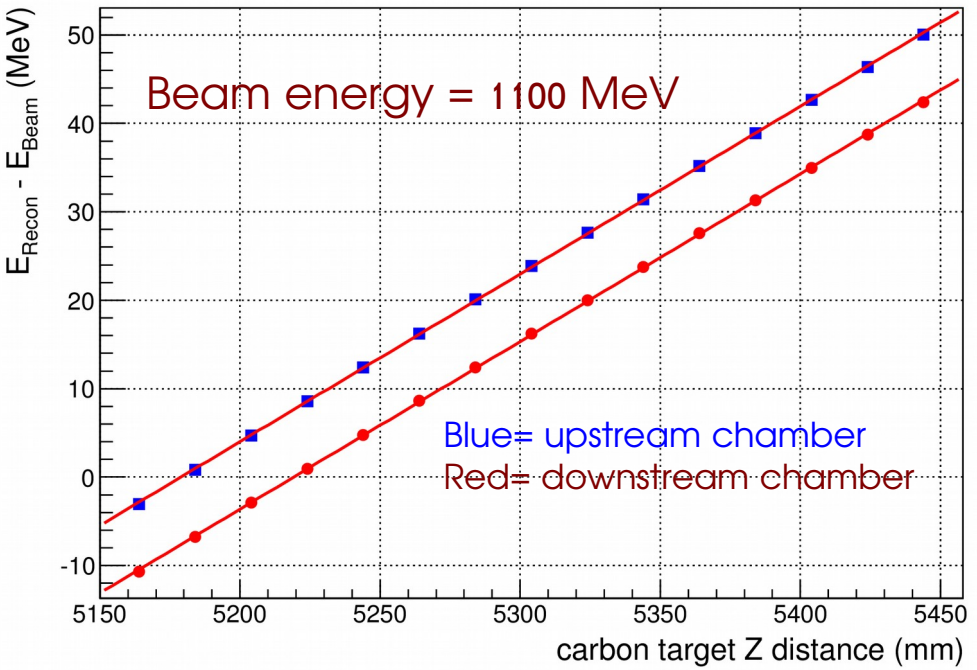




2.2 GeV Carbon run



1.1 GeV Carbon run



$z_{gem1} = 5178.58\,mm$

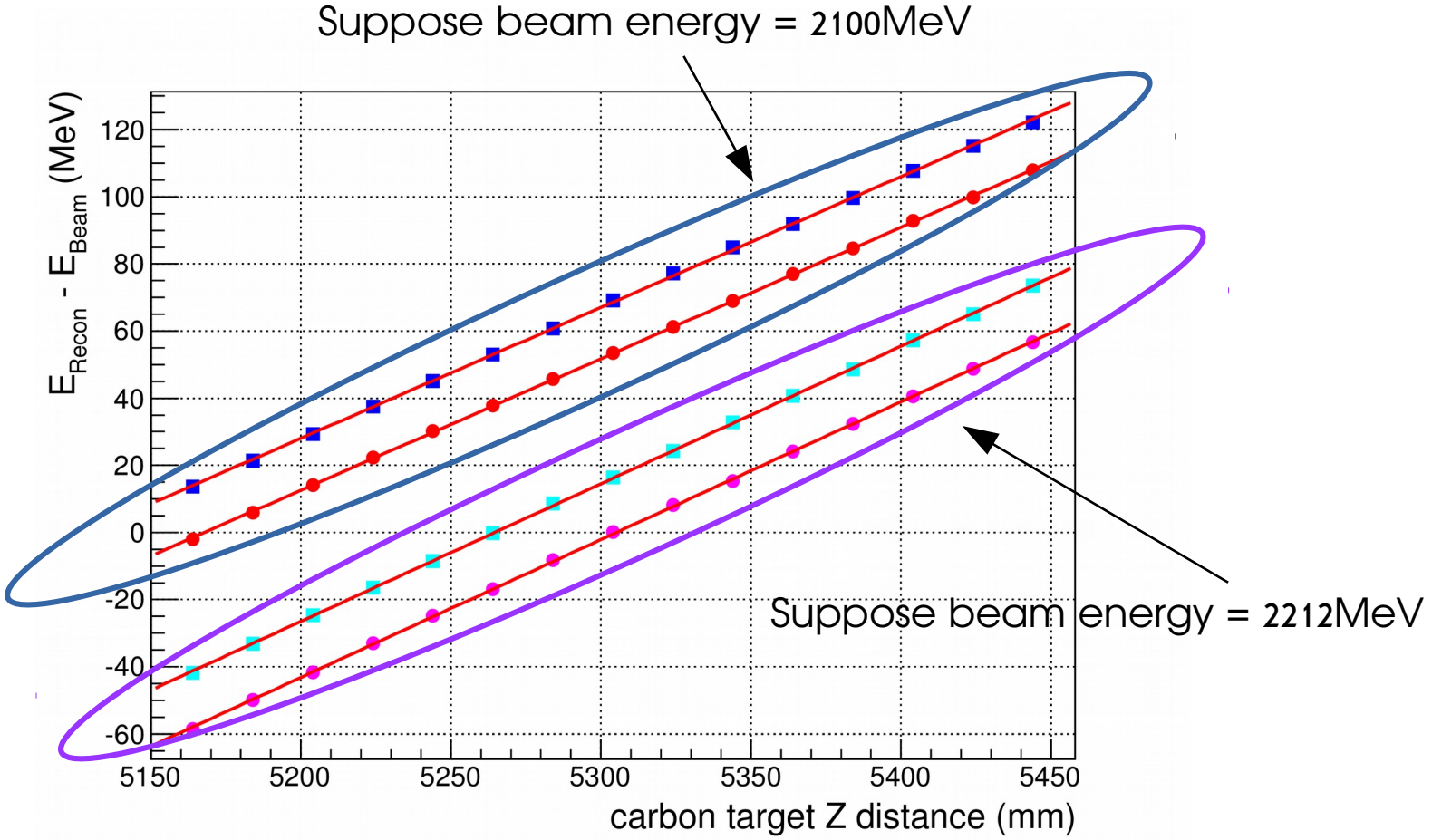
$z_{gem1} = 5218.89\,mm$

$z_{gem1} = 5178.88\,mm$

$z_{gem1} = 5219.14\,mm$

From survey: $z_{gem1} = 5264\,mm$

$z_{gem1} = 5304\,mm$



Adjust 1100MeV → 1136MeV to match survey data
Adjust 2147MeV → 2212MeV to match survey data.

Summary

- Reconstructed Z distance is ~80mm away from Survey data.
- If use different beam energy, will reconstruct different Z distance.
- We can adjust beam energy so that we can generate a Z distance that match Survey Data.
- Or we can adjust Survey data, keep beam energy.