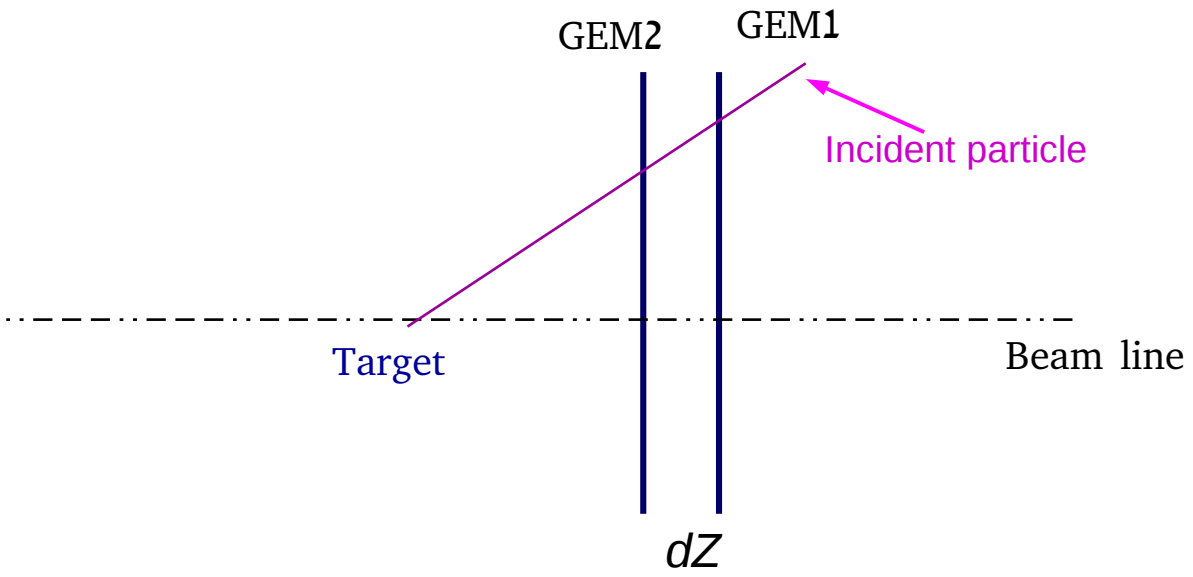
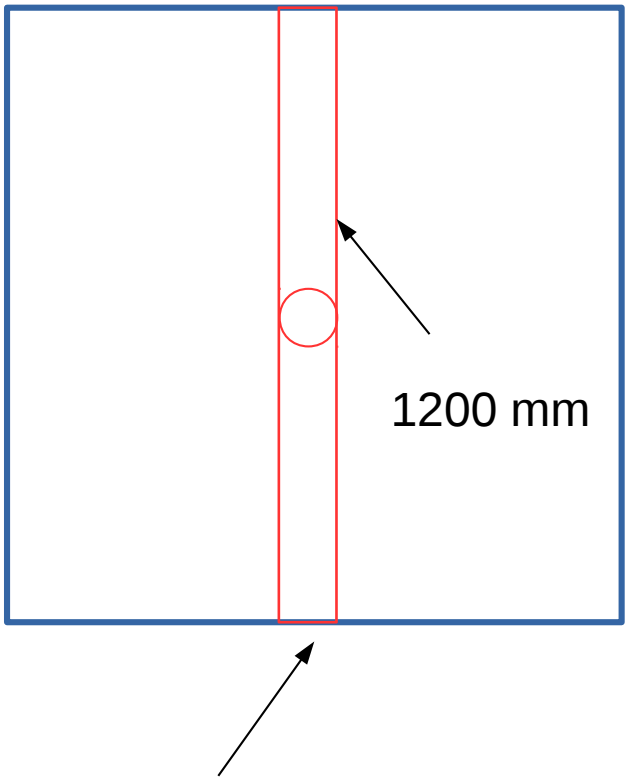
Using overlap GEM clusters to reconstruct Target Z

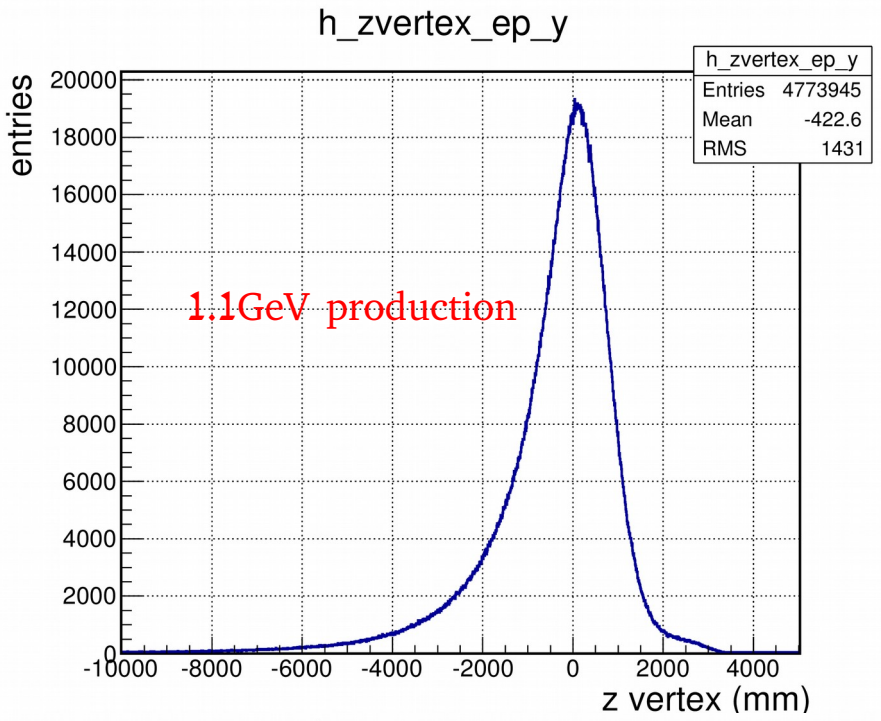


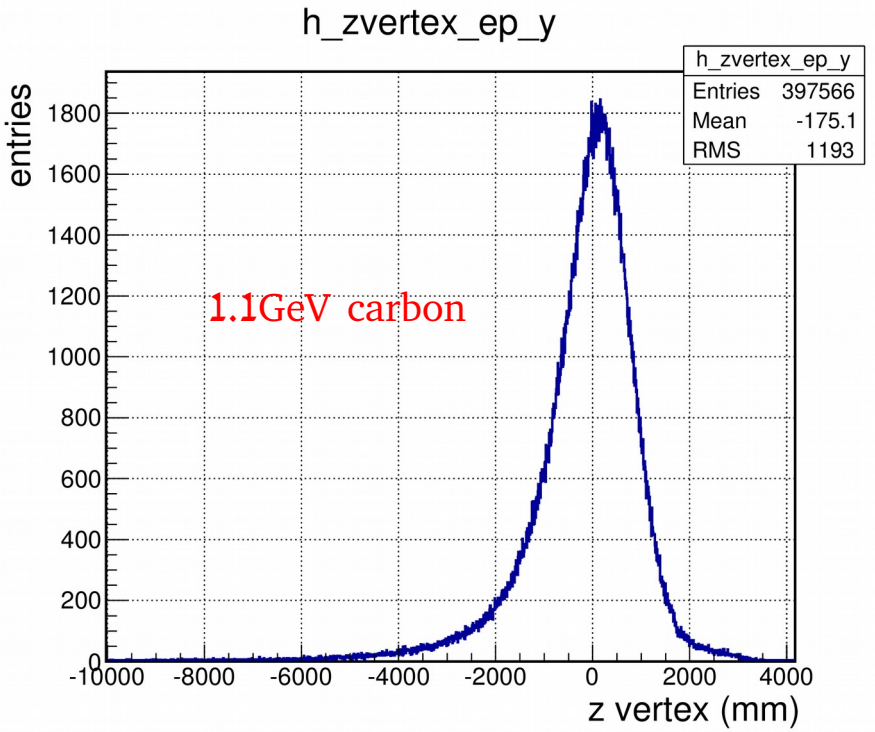


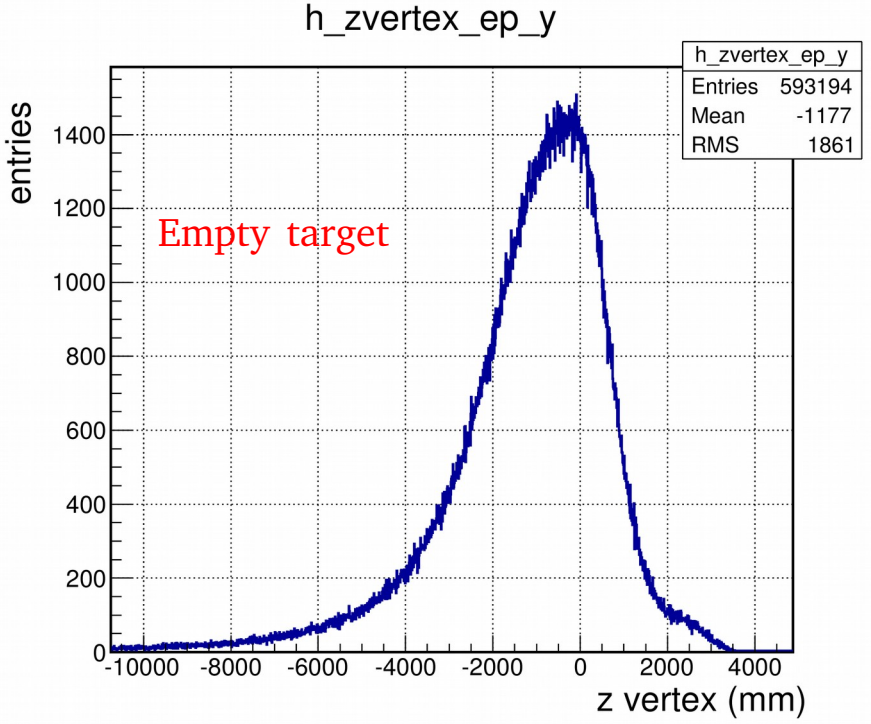
- To check the source of background in e-p yield
- To check the bump of e-p yield in lower scattering bin

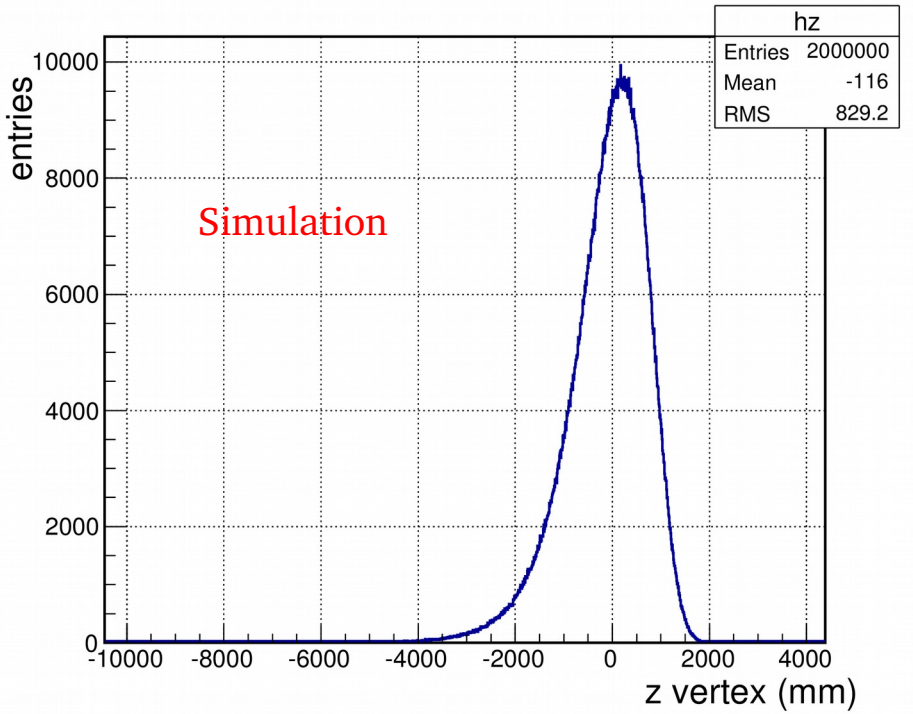
- Using GEM overlap area e-p events
- Using two GEM clusters to find Z position

Target Z

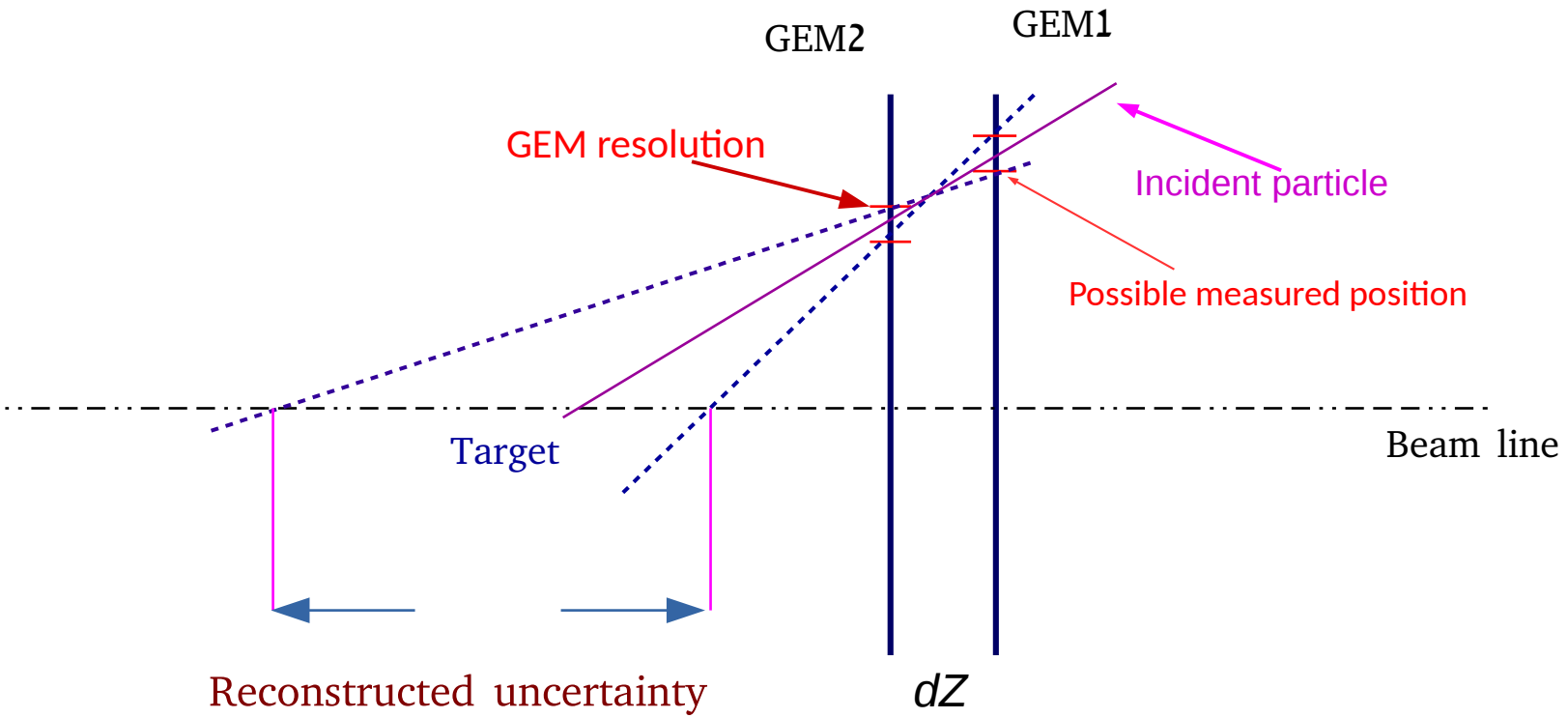

h_zvertex_ep_y
h_zvertex_ep_y
Entries 4773945
Mean -422.6
RMS 1431
1.1GeV production
entries
z vertex (mm)


h_zvertex_ep_y
h_zvertex_ep_y
Entries 397566
Mean -175.1
RMS 1193
1.1GeV carbon
entries
z vertex (mm)


h_zvertex_ep_y
h_zvertex_ep_y
Entries 593194
Mean -1177
RMS 1861
Empty target
entries
z vertex (mm)

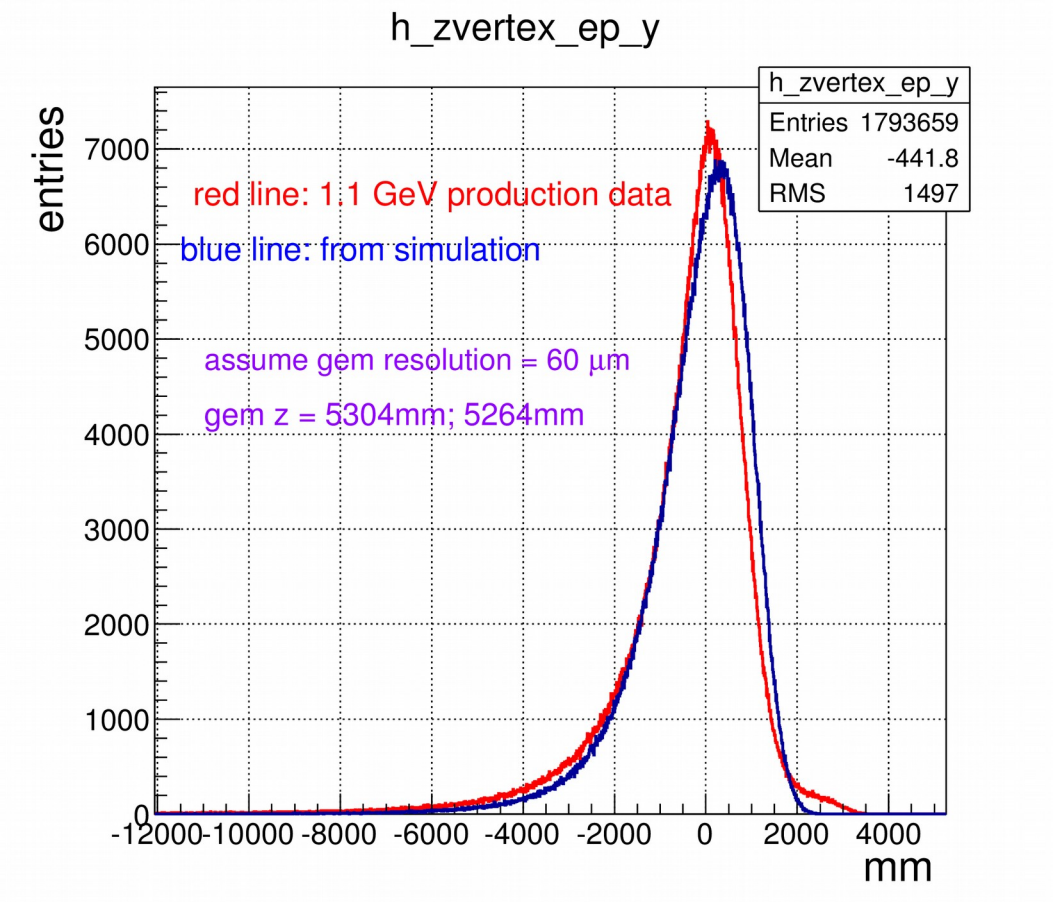

hz
Entries 2000000
Mean -116
RMS 829.2
Simulation
entries
z vertex (mm)

Z vertex simulation



- simulation assume GEM resolution = 60 microns
- This setup only take into account the effect from GEM position resolution
- Assume beam incident angle is between 0.5 ~ 0.8 deg

Z vertex reconstruction vs simulation



Scaled by beam charge

Background / data ratio:

$$\frac{\textit{integral of empty chamber}}{\textit{integral of production}} = 6.9\%$$

Cut from -2000:

$$\frac{\textit{integral of empty chamber}}{\textit{integral of production}} = 5.8\%$$

Data drop: 10.5%
Background drop: 24.5%

Cut from -1000:

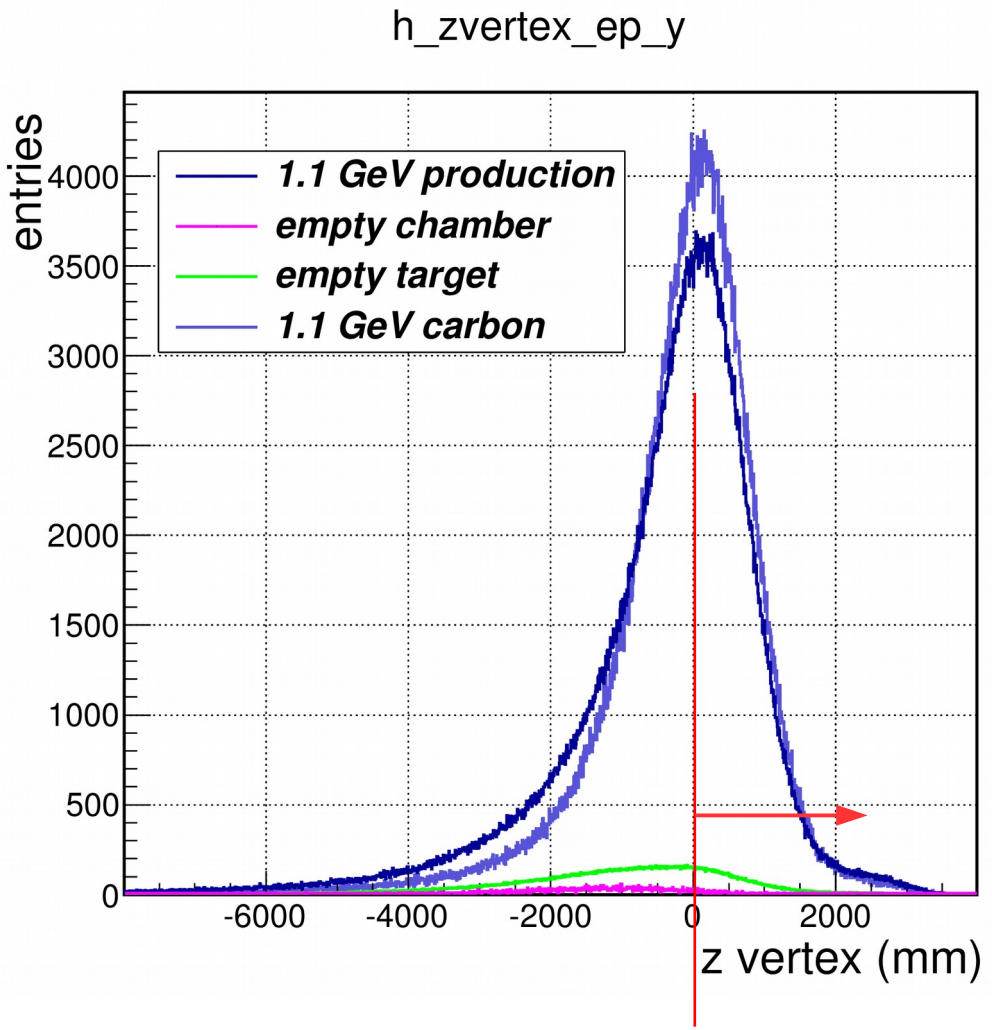
$$\frac{\textit{integral of empty chamber}}{\textit{integral of production}} = 4.9\%$$

Data drop: 23.4%
Background drop: 45.9%

Cut from 0:

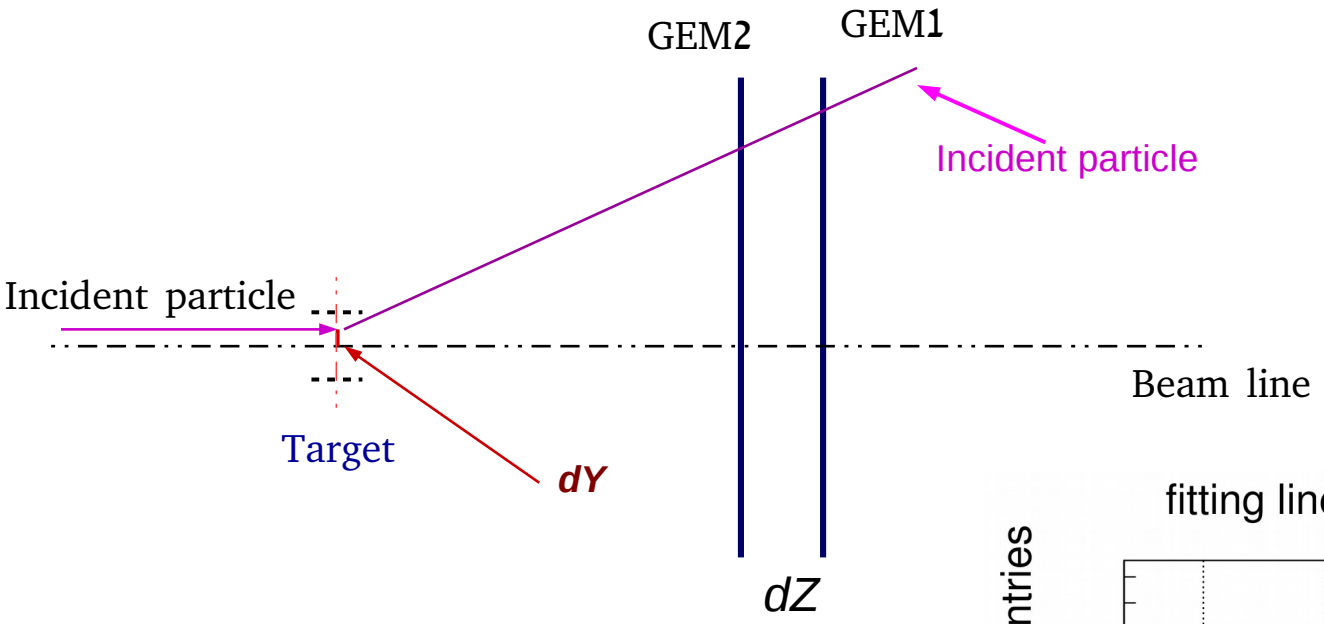
$$\frac{\textit{integral of empty chamber}}{\textit{integral of production}} = 4.1\%$$

Data drop: 55.1%
Background drop: 73.3%

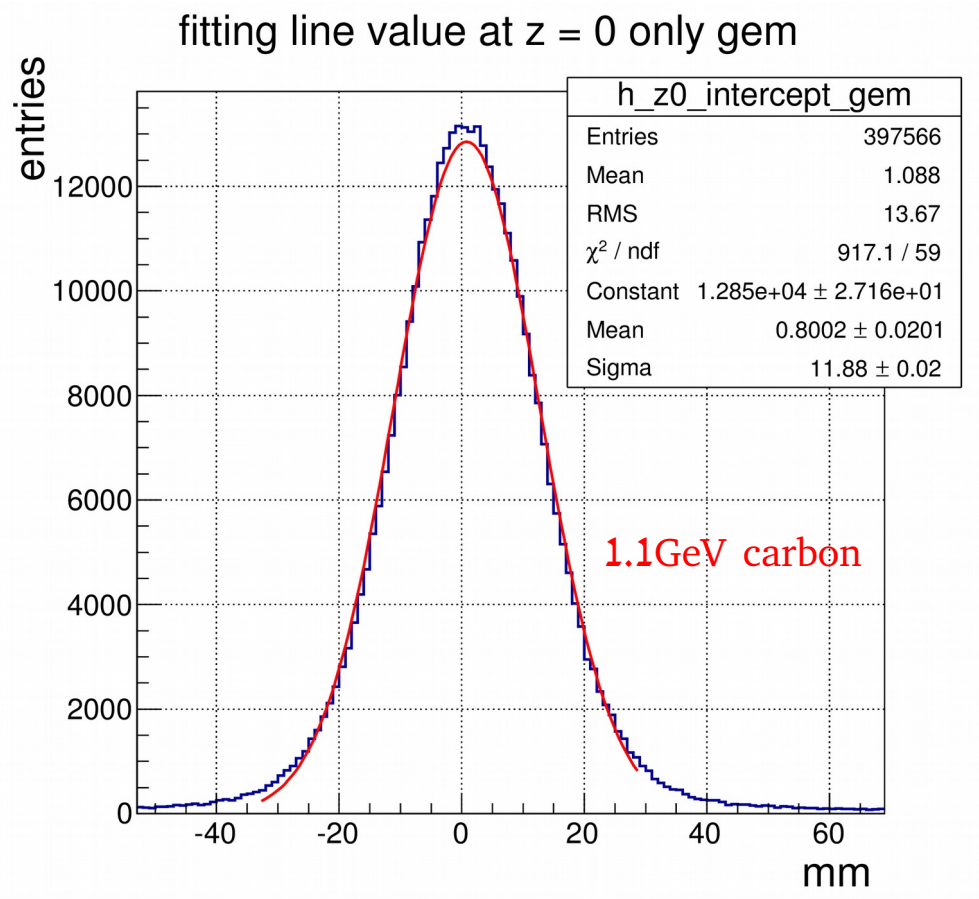


- Using GEM overlap area e-p events.
- Except carbon run, everything is scaled to equal beam charge.
- Carbon run was normalized to 1.1 GeV production run
- e-p scattering angle > 0.6 degree.

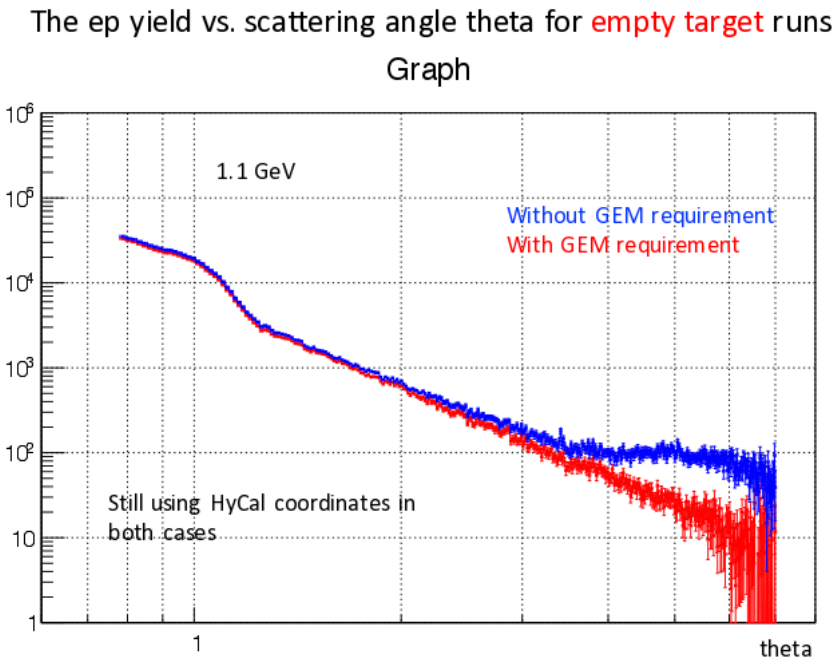
Target width



- Using GEM overlap area ep events
- Assume target is at 0

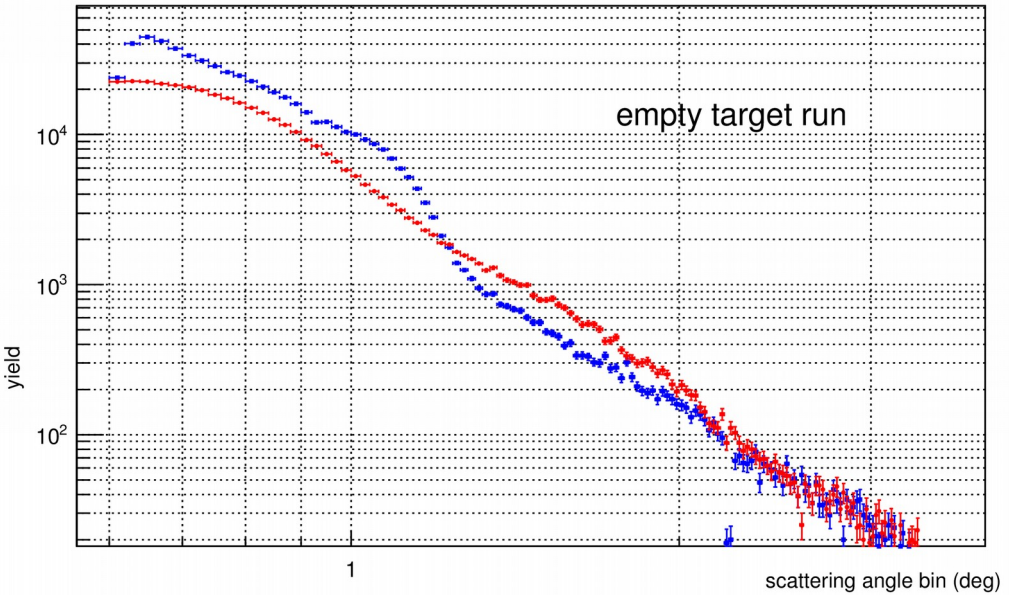


Overlapping area e-p yield

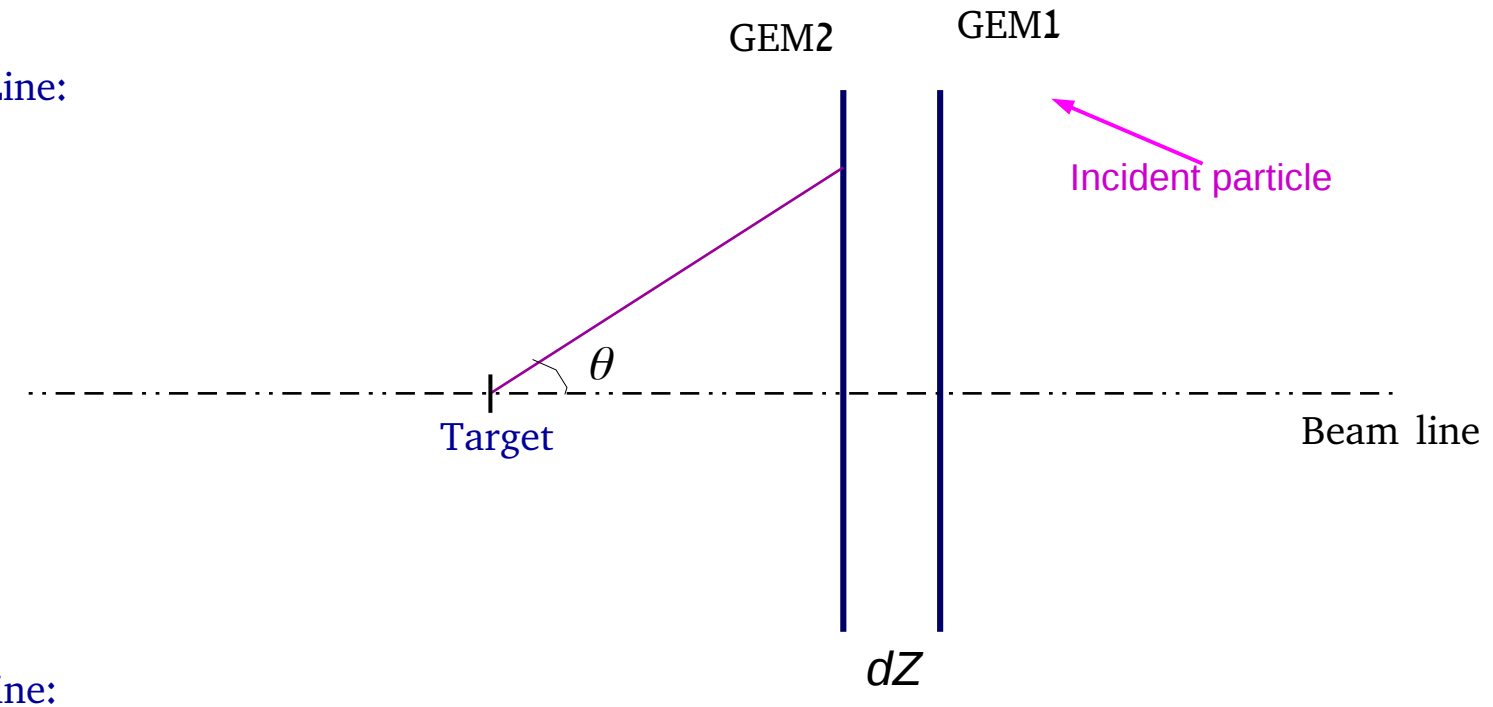


From weizhi

e-p yield in GEM overlap area



Blue Line:



Red Line: