simulation update

acceptance & yields

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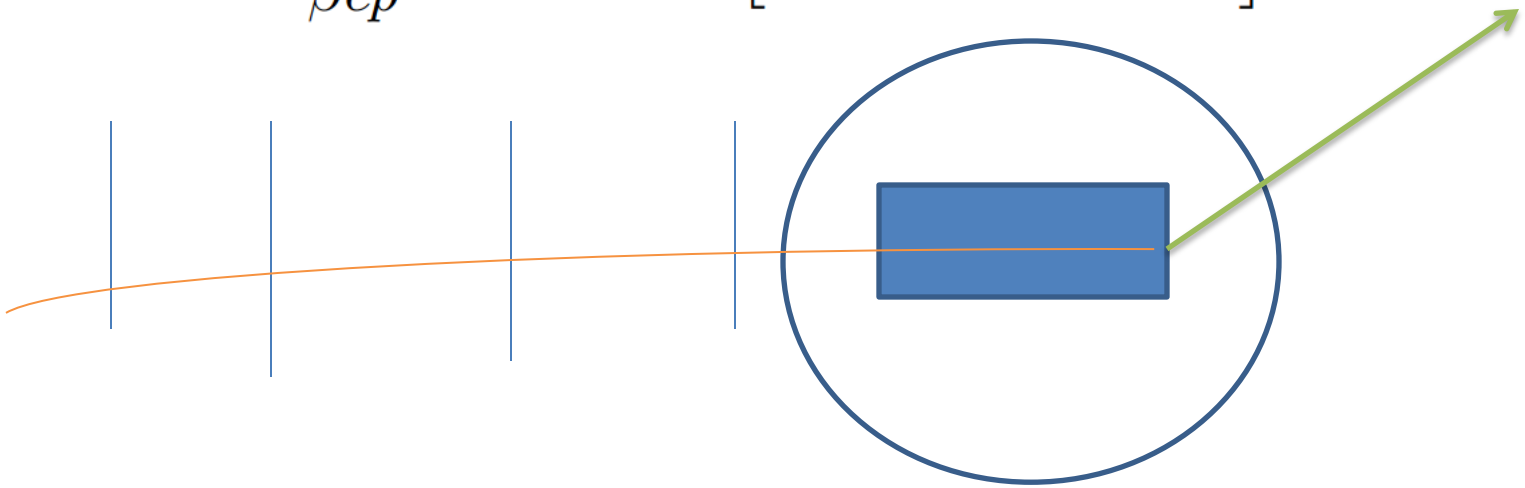
Multipole Scattering Effects – incoming beam

- Multipole Scattering

- A charged particle traversing a medium is deflected by many small-angle scatters, mostly due to Coulomb scattering

- Gaussian approximation for the central 98% of the projected angular
- distribution, with a width

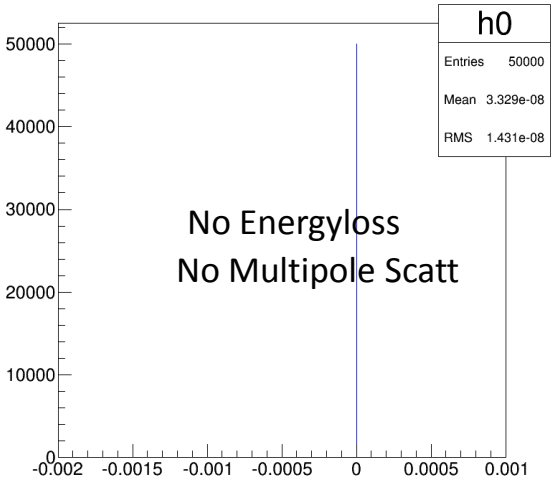
$$\theta_0 = \frac{13.6\ \mathrm{MeV}}{\beta cp}\, z\, \sqrt{x/X_0}\left[1 + 0.038 \ln(x/X_0)\right]$$

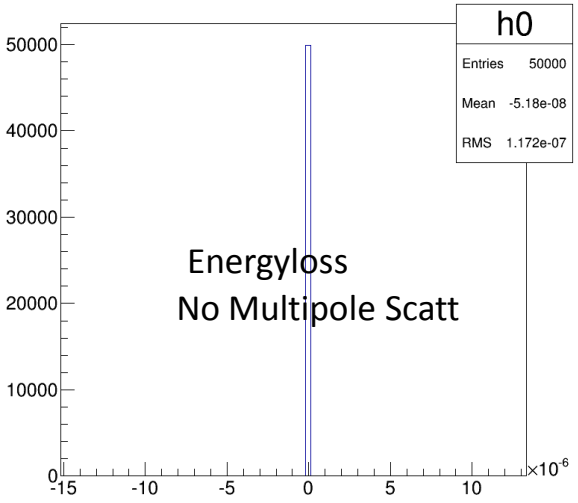


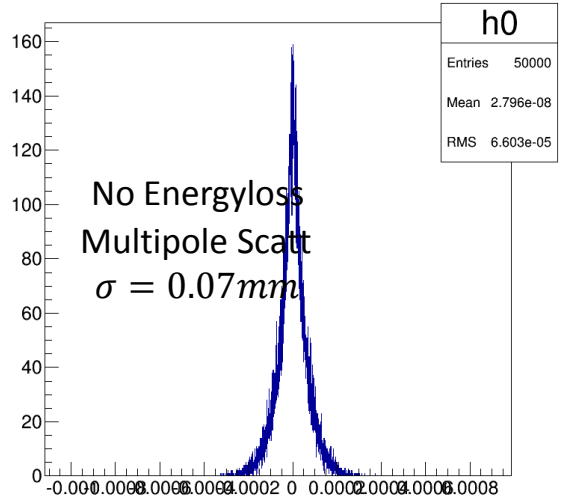
Simulate: Beam 2.2GeV, 2.5T, Trans, NH3 target,
(x, y, th, ph, bpm coords) distribution at downstream endcap

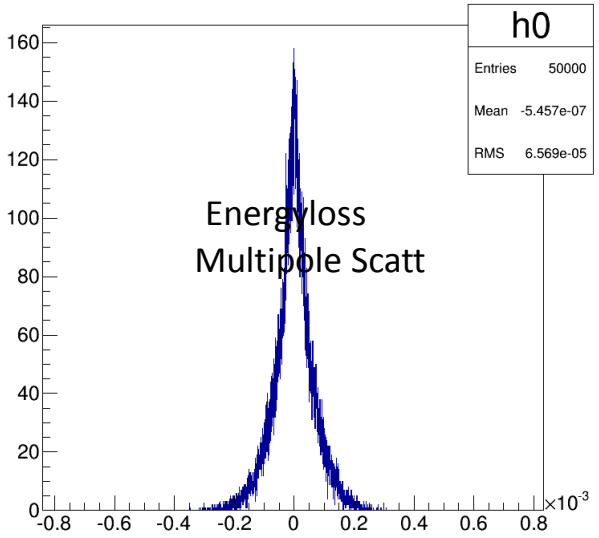
Multipole Scattering Effects – incoming beam

- X distribution in BPM coordinate (th = dx/dz, ph = dy/dz)









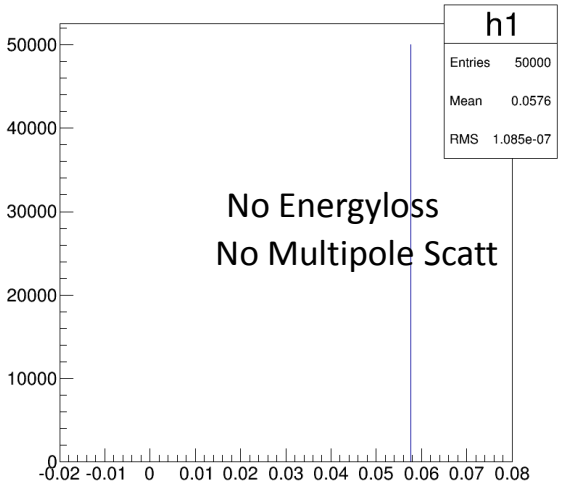
Settings:
Point beam
Beam 2.2GeV
HRS 1.7GeV
Production target

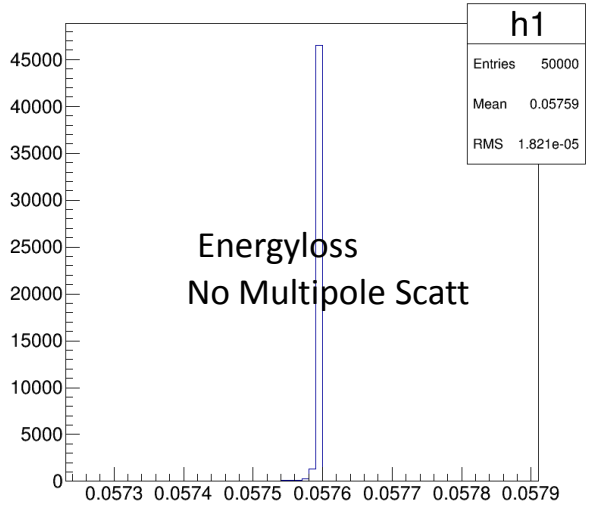
X distribution at cell downstream endcap

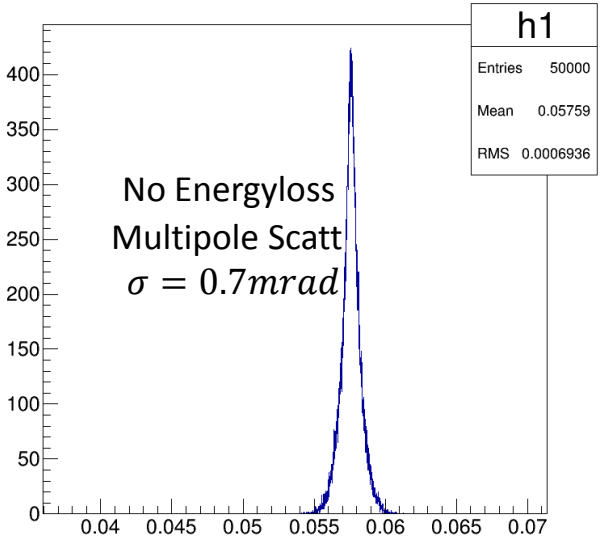
unit: m

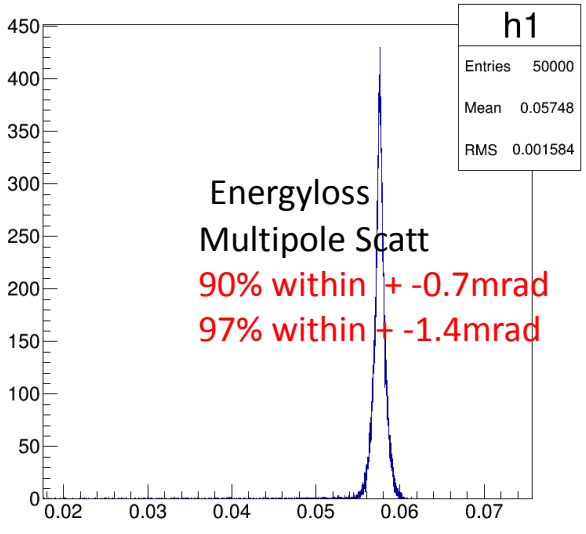
Multipole Scattering Effects – incoming beam

- theta distribution in BPM coordinate (th = dx/dz, ph = dy/dz)









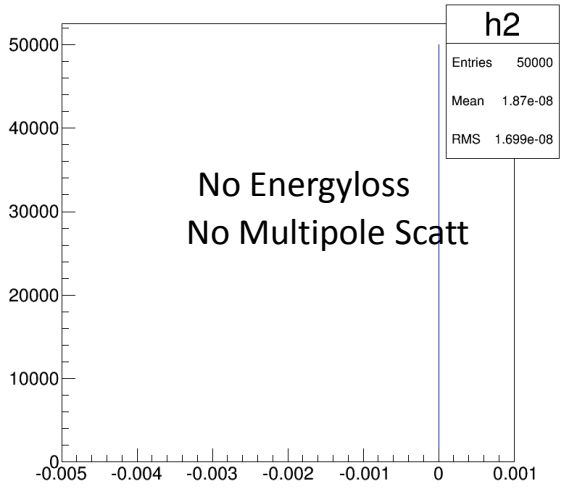
Settings:
Point beam
Beam 2.2GeV
HRS 1.7GeV
Production target

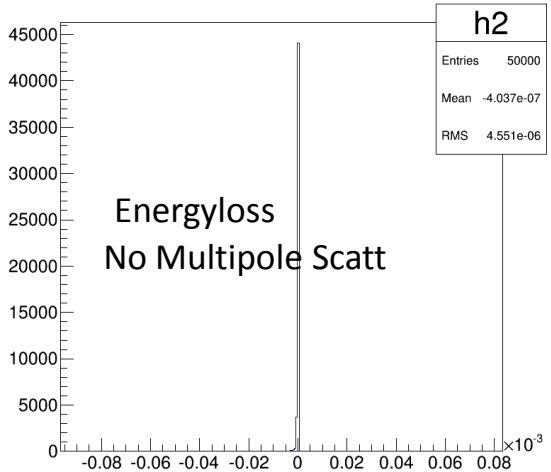
th distribution at cell downstream endcap

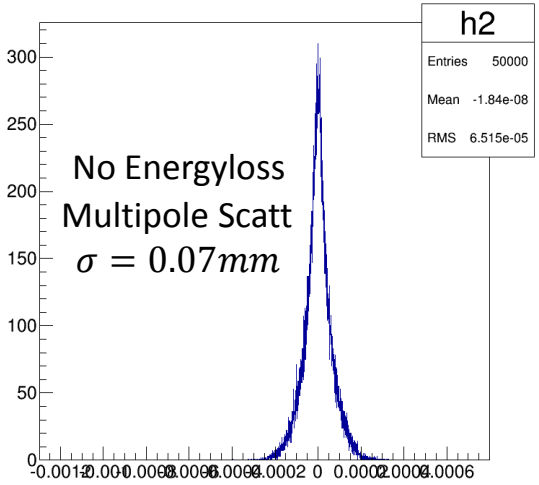
unit: rad

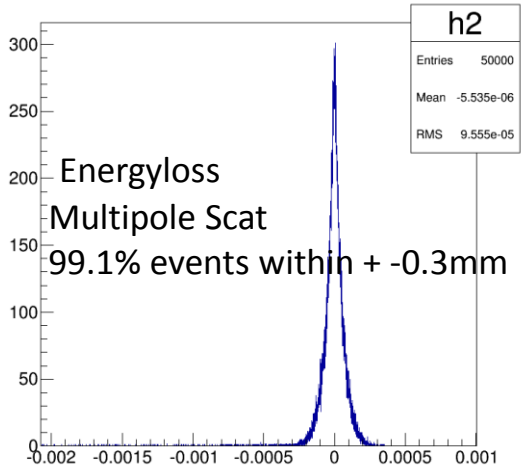
Multipole Scattering Effects – incoming beam

- y distribution in BPM coordinate (th = dx/dz, ph = dy/dz)









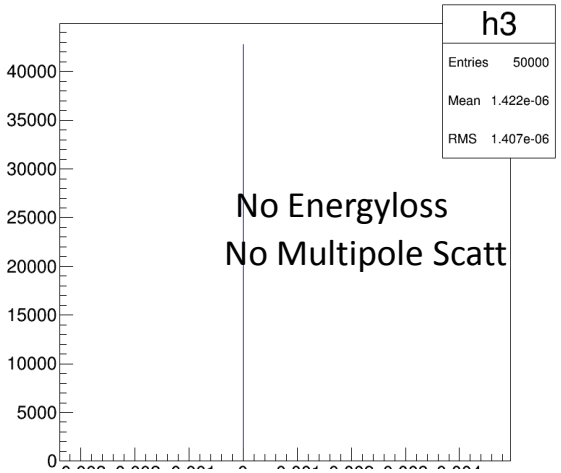
Settings:
Point beam
Beam 2.2GeV
HRS 1.7GeV
Production target

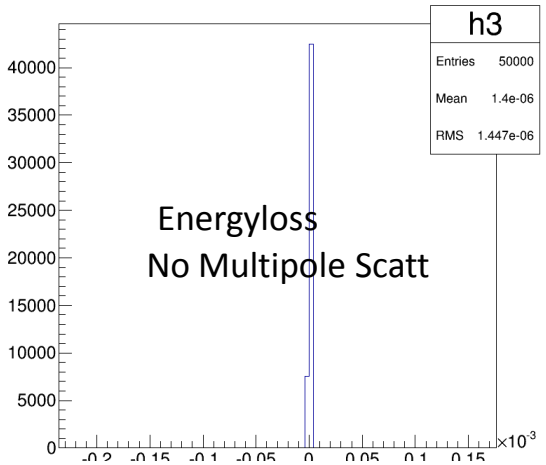
y distribution at cell downstream endcap

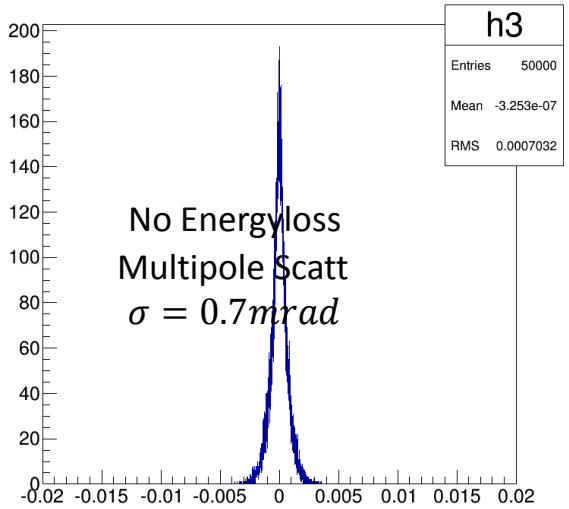
unit: m

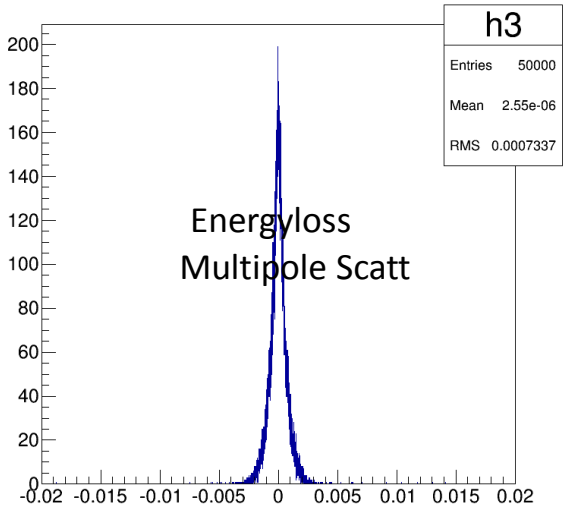
Multipole Scattering Effects – incoming beam

- phi distribution in BPM coordinate (th = dx/dz, ph = dy/dz)









Settings:
Point beam
Beam 2.2GeV
HRS 1.7GeV
Production target

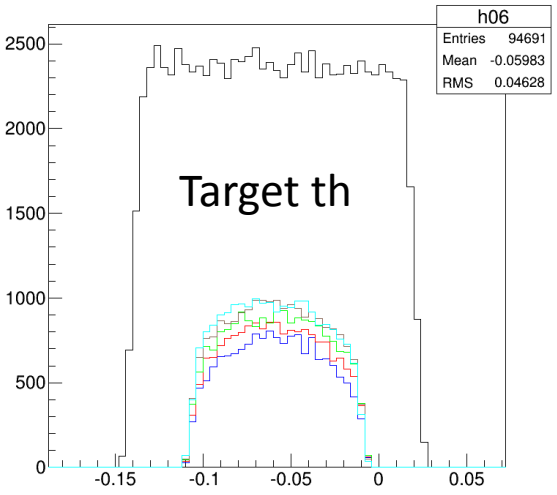
phi distribution at cell downstream endcap

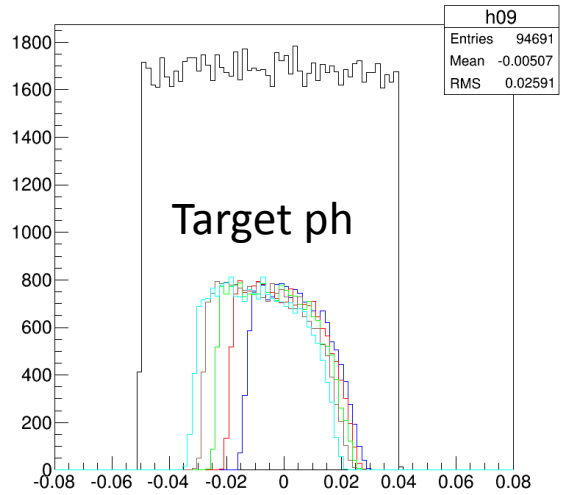
unit: rad

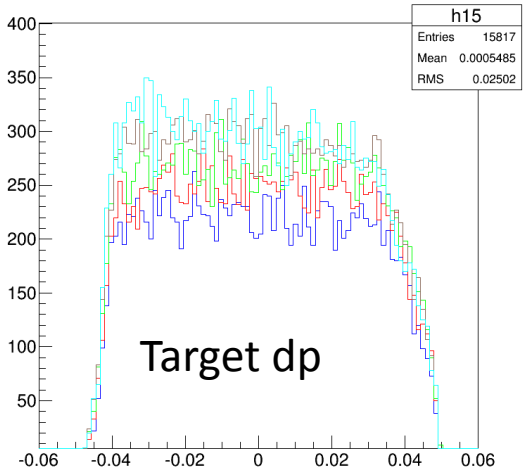
Last time

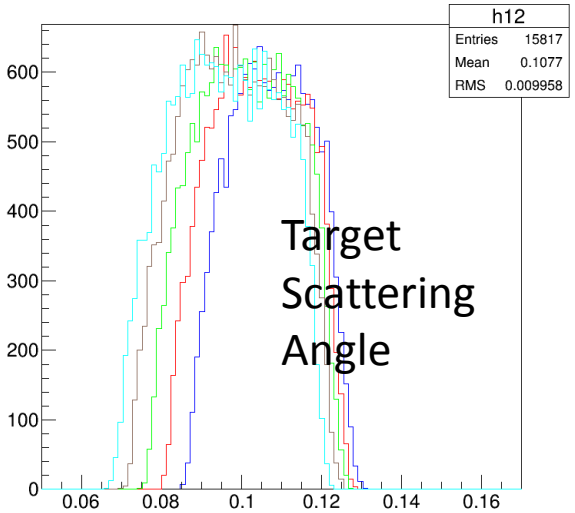
Acceptance & yields

- point beam in simulation: *Along bpm x*









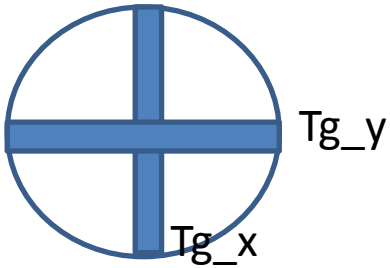
Settings:
Beam 2.2GeV
HRS 1.7GeV
Good septum
2.5T Trans
Production target

Point beam :
(-10, 0): Blue
(-5, 0):Red
(0, 0):Green
(5, 0): Brown
(10, 0): Cyan

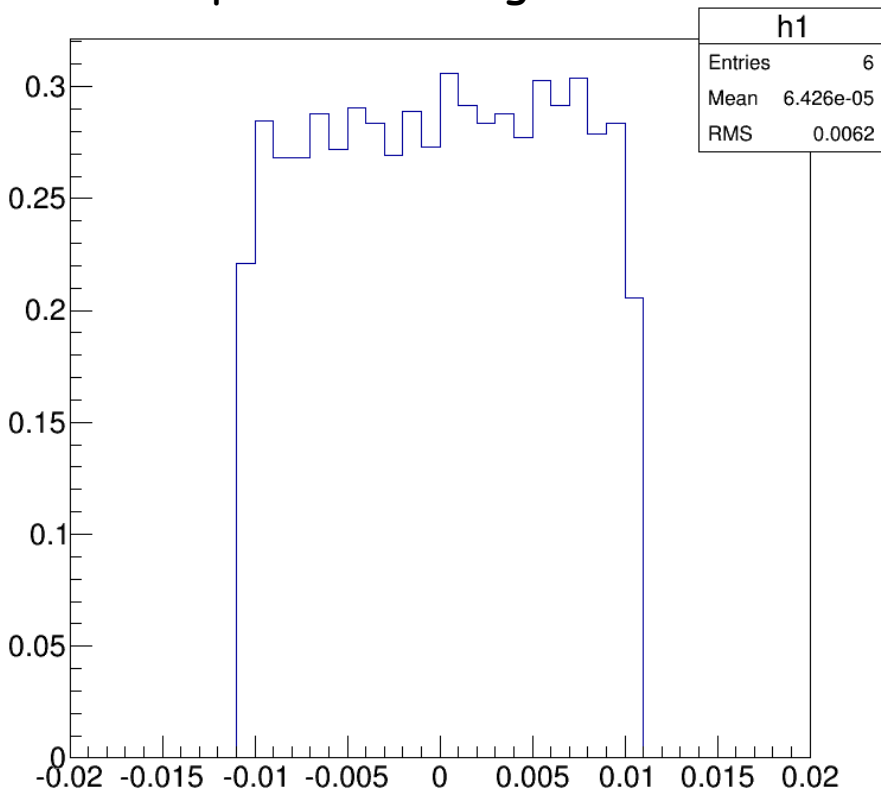
Angle unit: Rad

Beam Position dependent acceptance

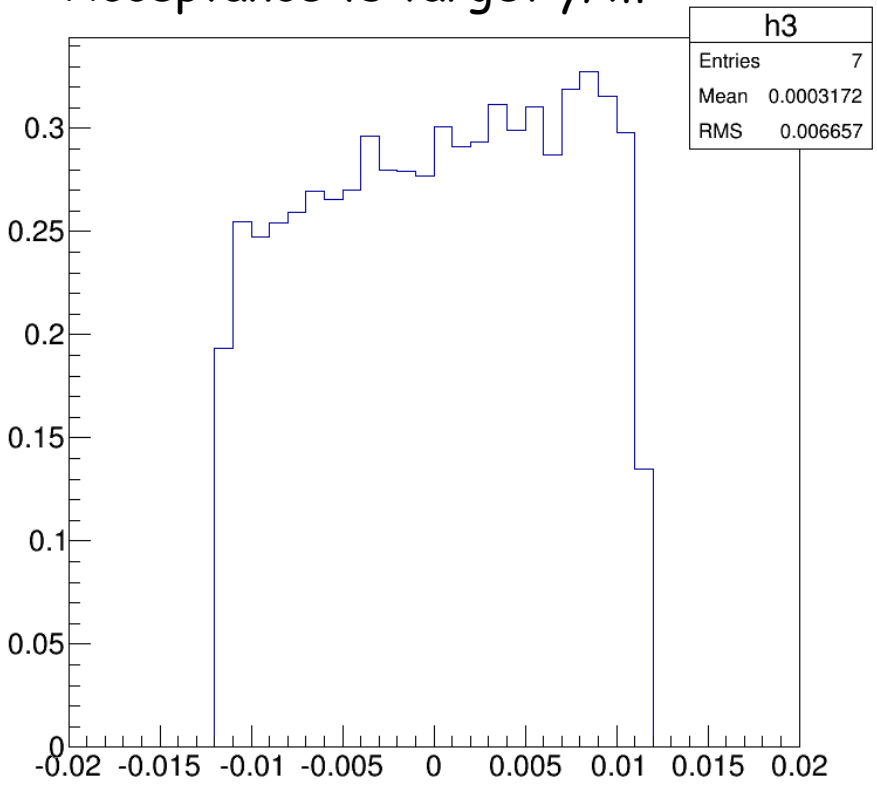
- Study acceptance versus beam pos (target plane)
  the stripe with with 1mm
  angle full coverage, 2.2 GeV, 2.5T, HRS 1.706GeV



Acceptance vs target x/m

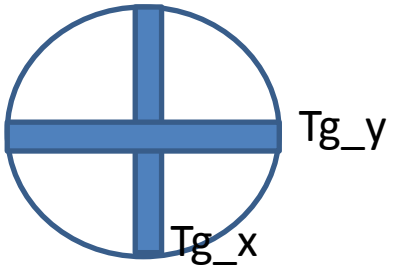


Acceptance vs target y/m

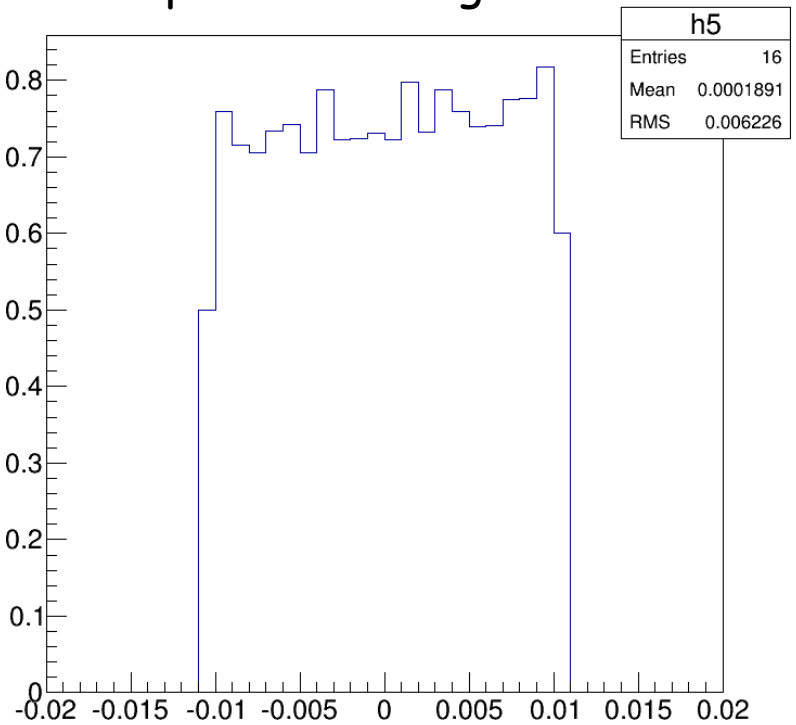


Beam Position dependent acceptance

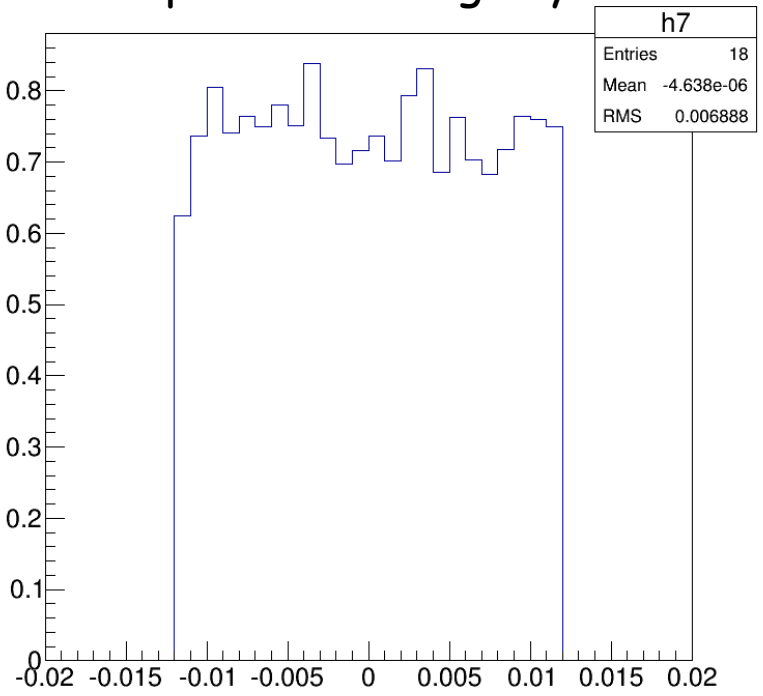
- Study acceptance versus beam pos (target plane)
  the stripe width was 1mm
  CUT angle: -0.015<tg_ph<0.005rad
  -0.08<tg_th<0.03rad



Acceptance vs target x/m

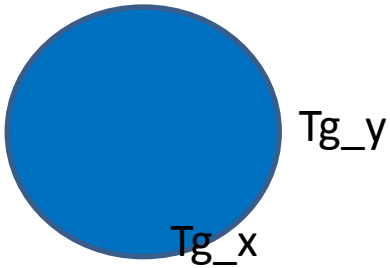


Acceptance vs target y/m

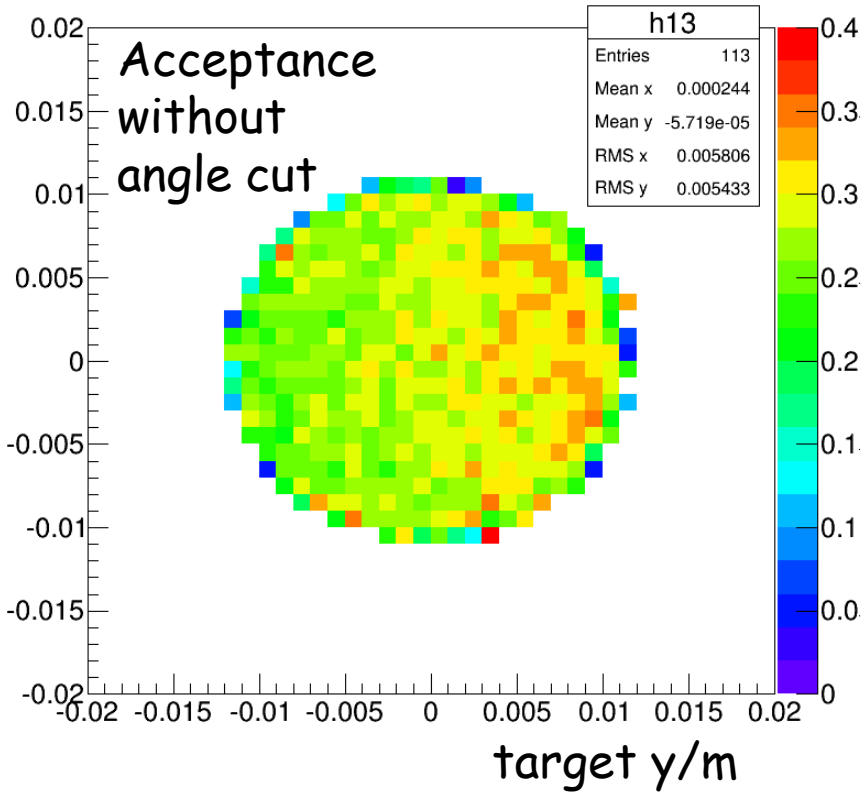


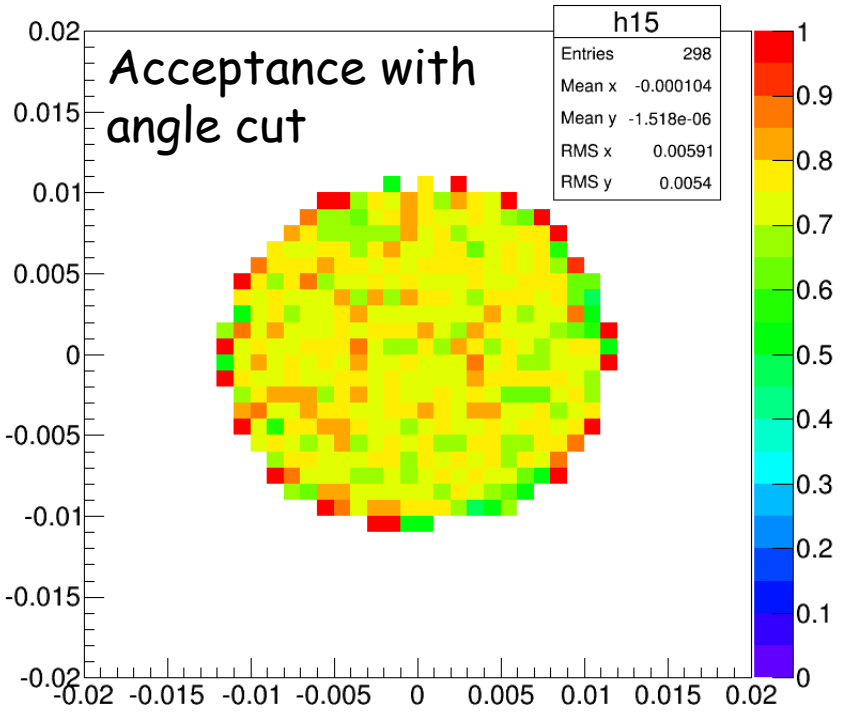
Beam Position dependent acceptance

- Study acceptance versus beam pos (target plane)
  CUT angle: -0.015<tg_ph<0.005rad
  -0.08<tg_th<-0.03rad



target x/m



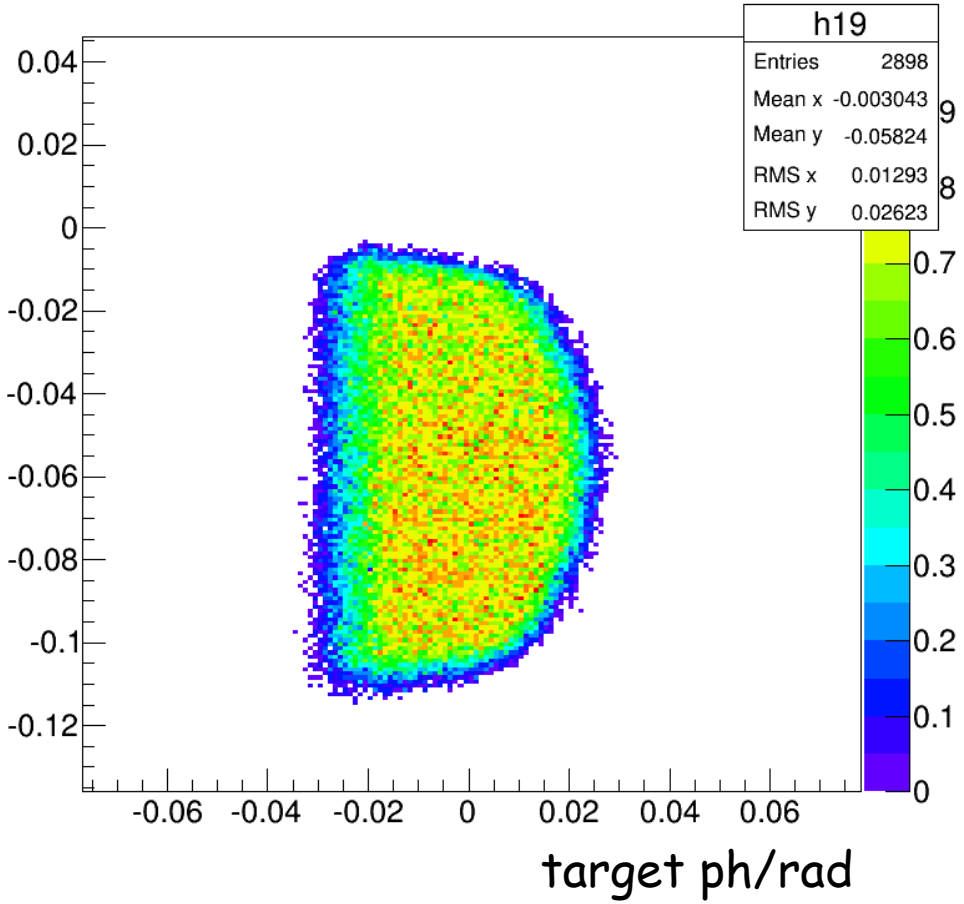


Beam Position dependent acceptance

- Study acceptance versus beam pos (target plane)

  angular acceptance

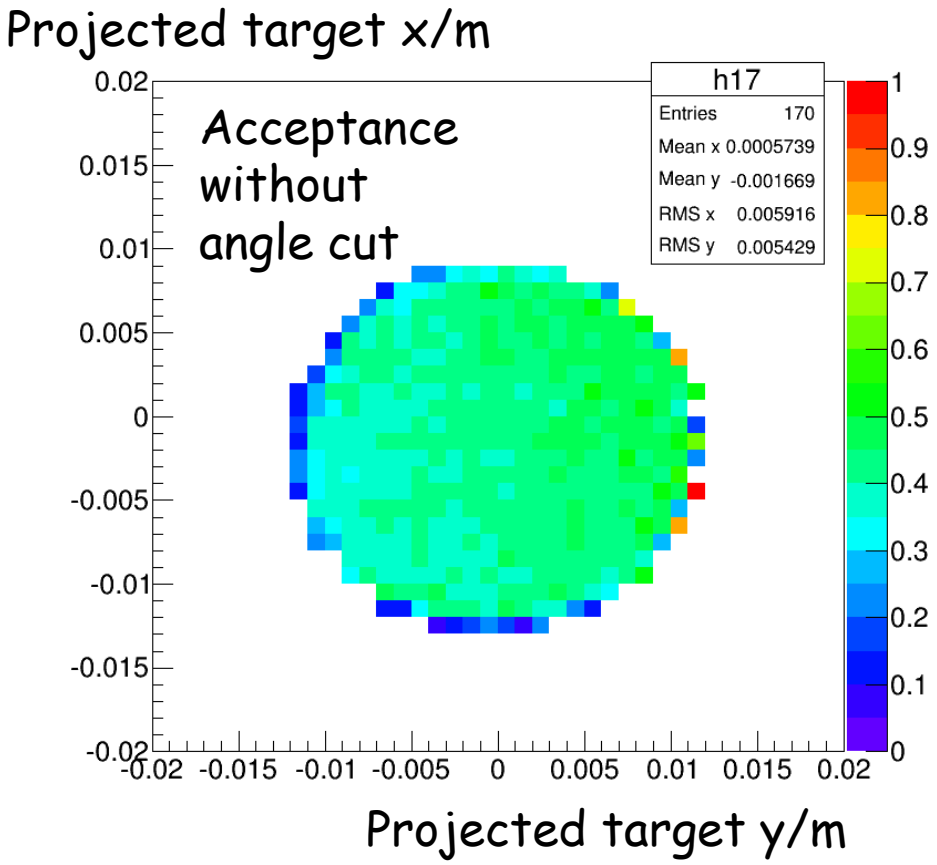
target th/rad

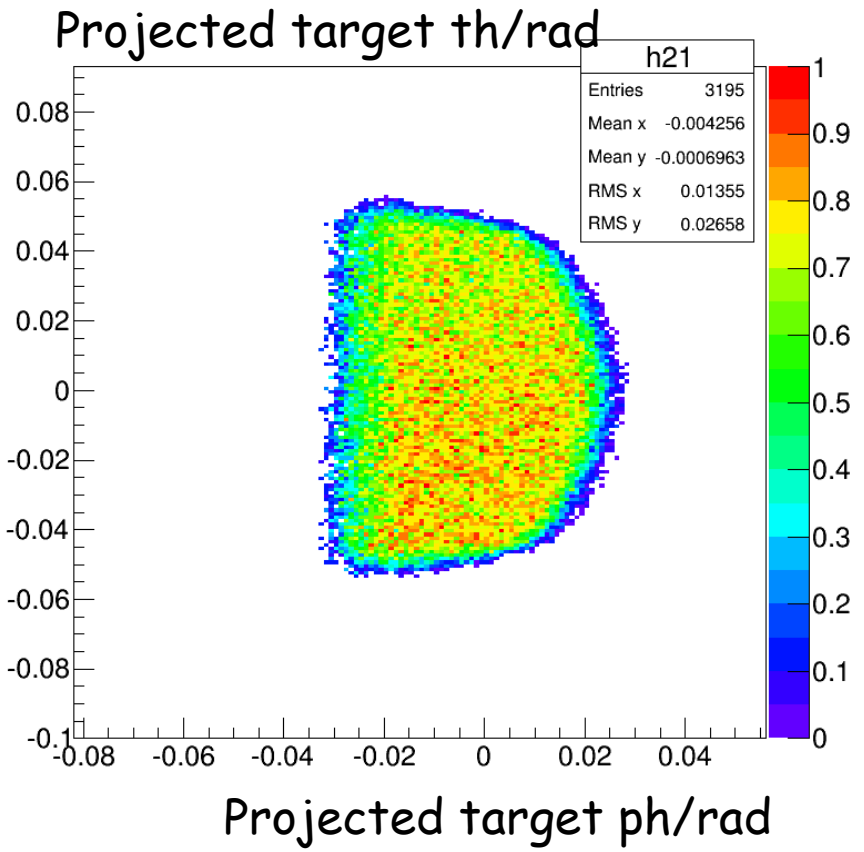


target ph/rad

Beam Position dependent acceptance

- Study acceptance versus beam pos (target plane)
- Project back to target plane from sieve pos, minimize target field effects.





Acceptance – energy loss and multipole scattering

- Energy loss (radiation) and multipole scattering affect the overall acceptance

To study the radiation effects on acceptance:

Overall acceptance ≈ pure geometry * (geometry | Multipole scattering) * (geometry | multipole scattering | energy loss)

A|B: means B under condition A

Eg: target x acceptance

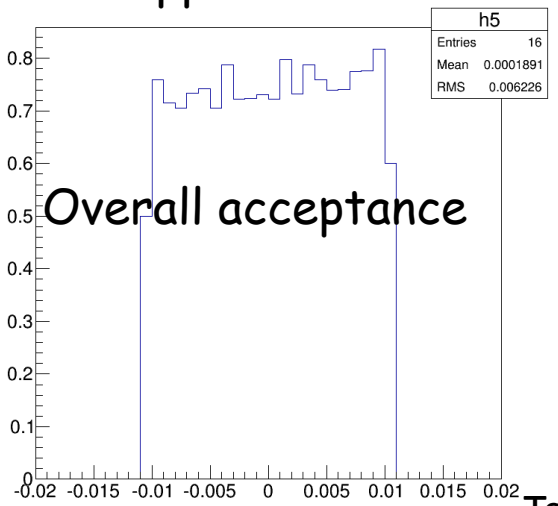
Geometry = $\frac{x\ pass}{x\ generate}$ (no multipole scatt & no energy loss)

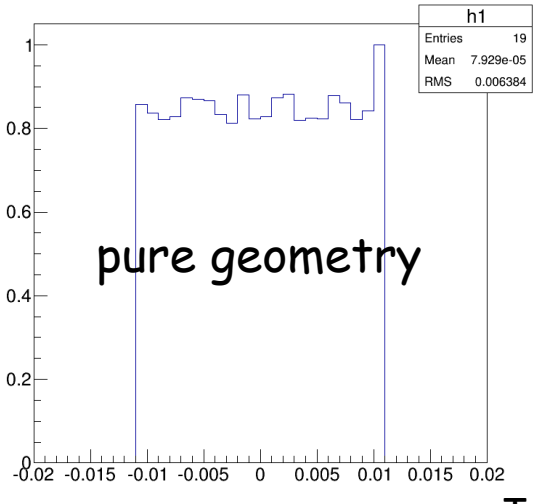
Geometry | Multipole scattering = $\frac{x\ pass\ (multipole\ satt, no\ enery\ loss)}{x\ pass\ (no\ multipole\ scatt, no\ energ\ loss)}$

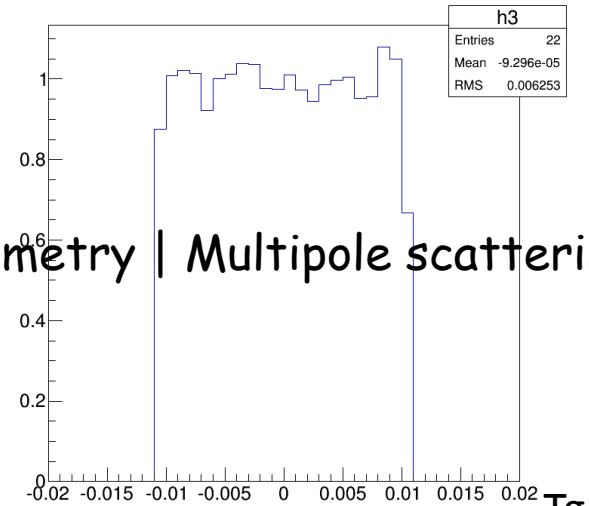
geometry | multipole scattering | energy loss = = $\frac{x\ pass\ (multipole\ scatt\ and\ energy\ loss)}{x\ pass\ (multipole\ scatt, no\ energy\ loss)}$

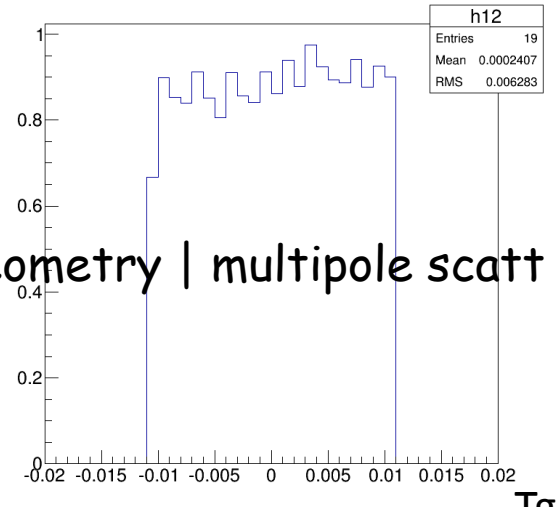
Acceptance – energy loss and multipole scattering

- Study acceptance versus beam pos x (target plane) , angle cut applied.









Summary

Any suggestions?