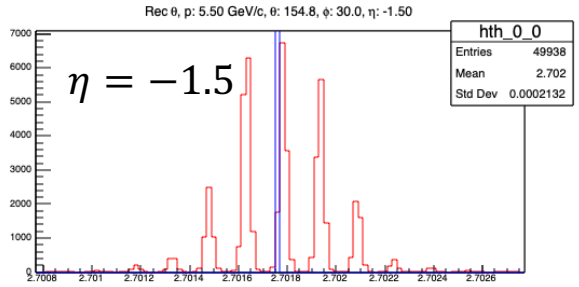
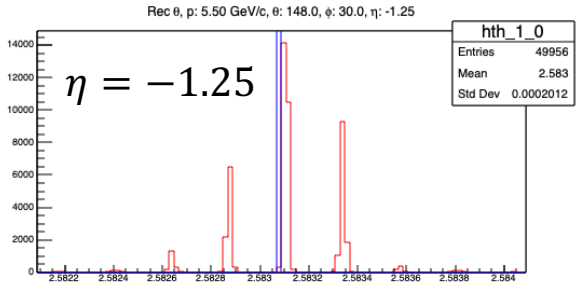
Detector Configuration and Data Set

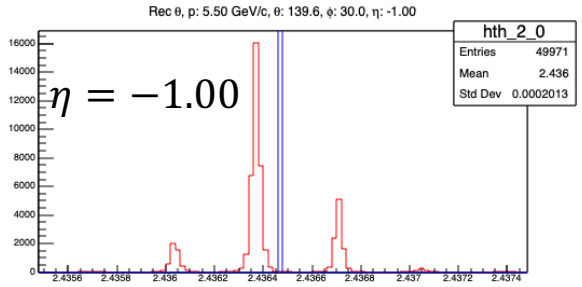
- Detector configuration: Bryce Canyon
- Particle Generation Details
  - Fixed kinematic settings: ϕ, θ, p
  - Shoot π^-
  - Repeat many times
  - Spread in distributions give parameter resolutions

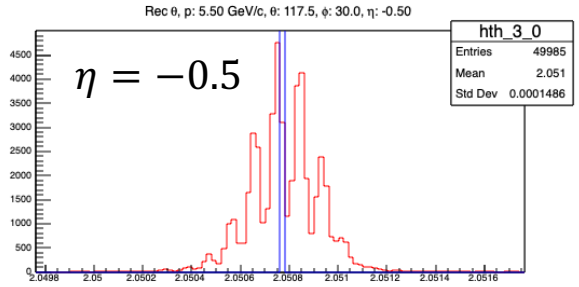
θ Distribution: My Sim ($\phi = 30^o, p = 5.5\ GeV/c, \theta = fixed$)

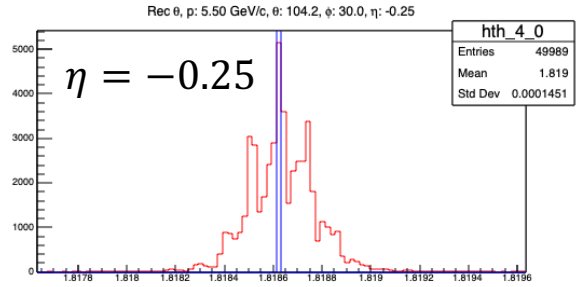
- θ_{mc}
- θ_{reco}

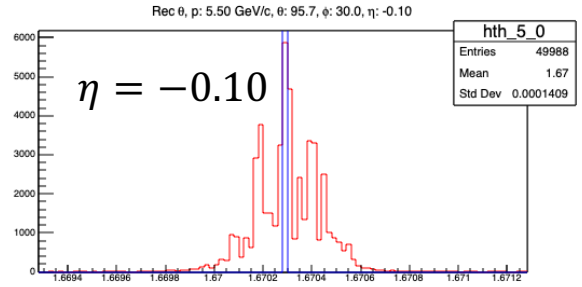


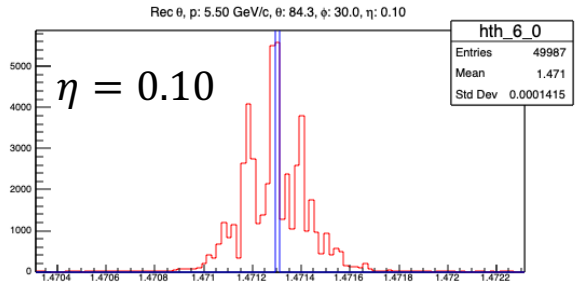


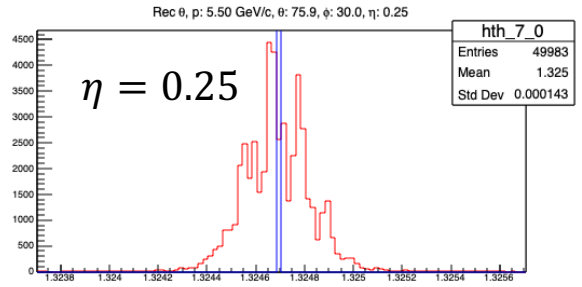


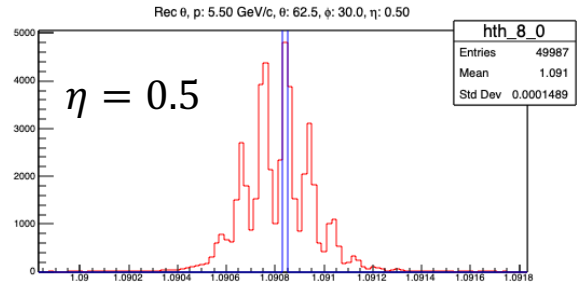


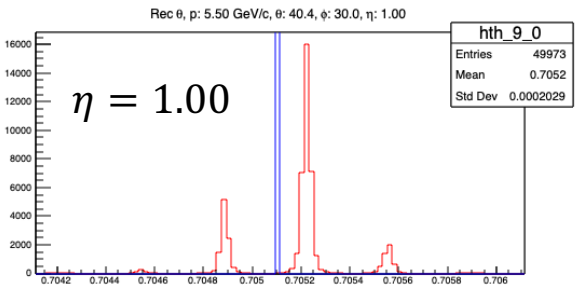


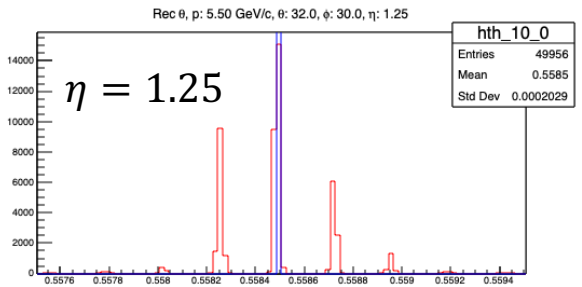


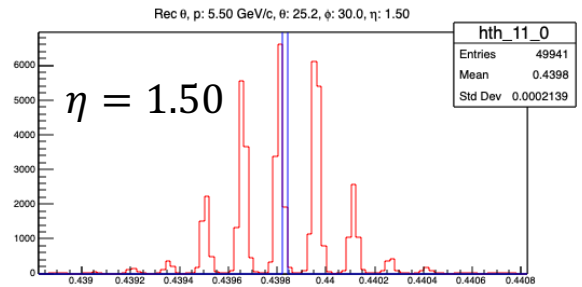




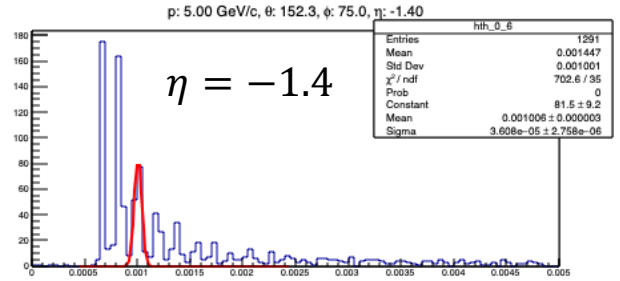


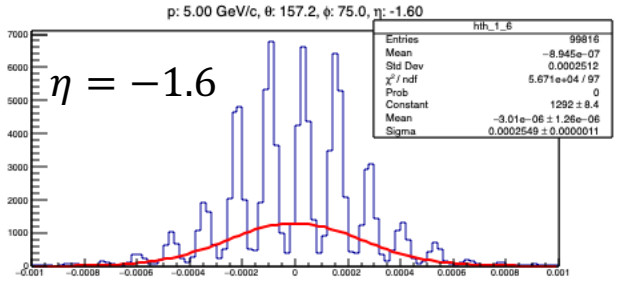


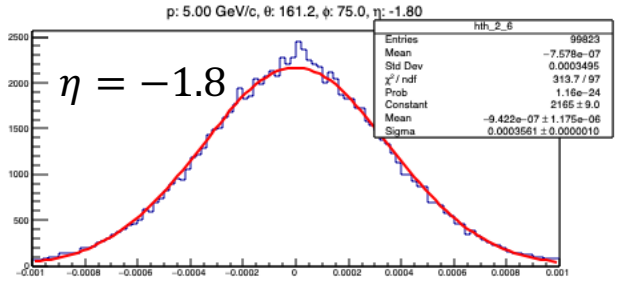


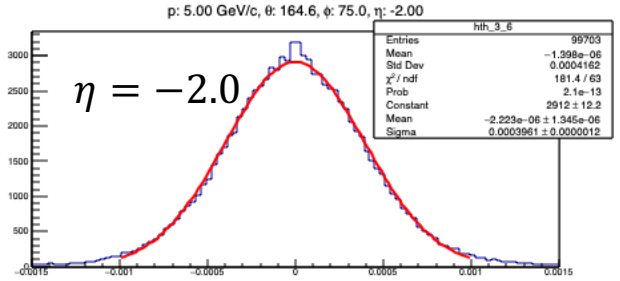


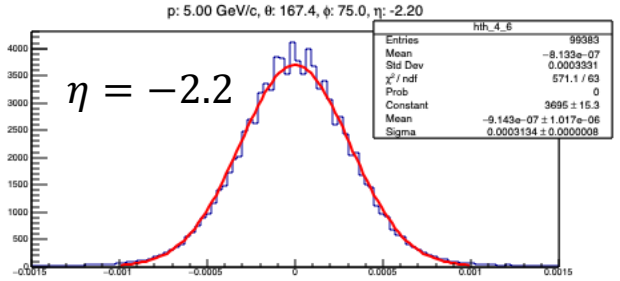
θ Distribution: My Sim ($\phi = 75^o, p = 5.0\ GeV/c, \theta = fixed$)

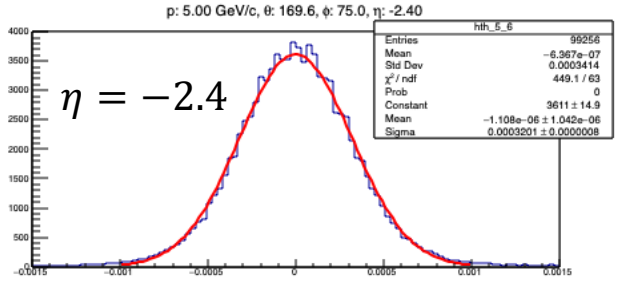


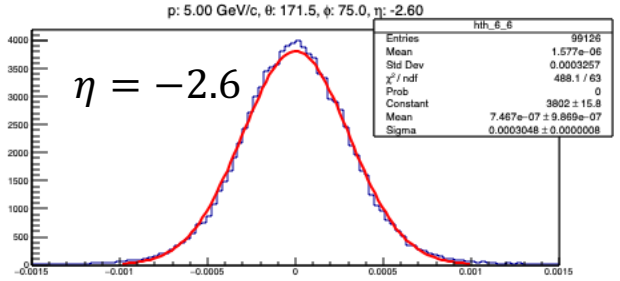


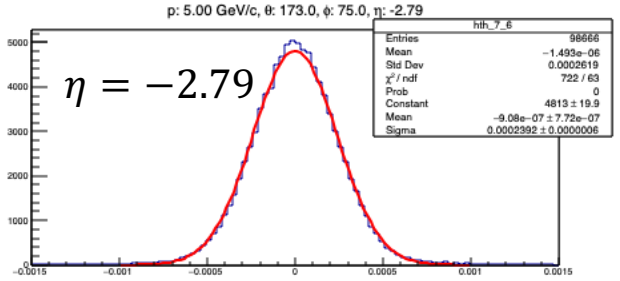


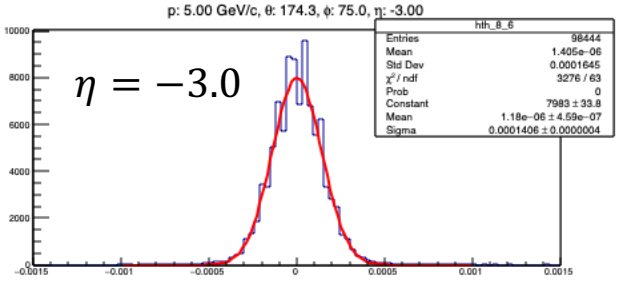


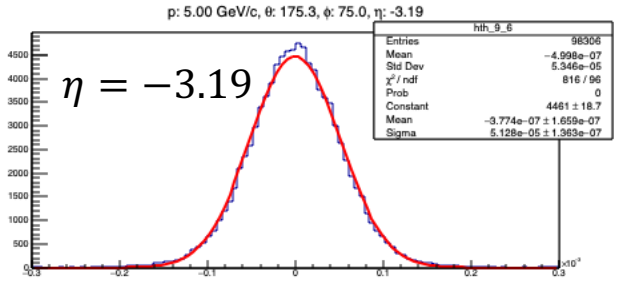


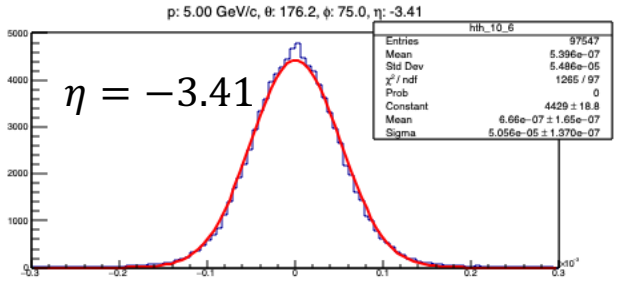


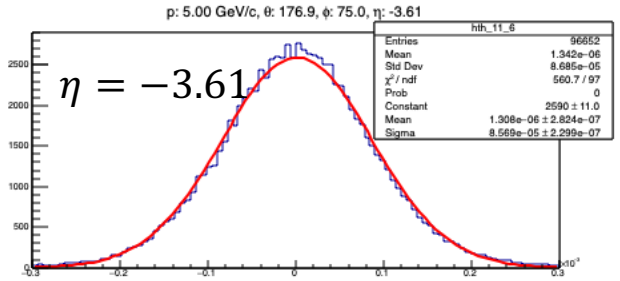








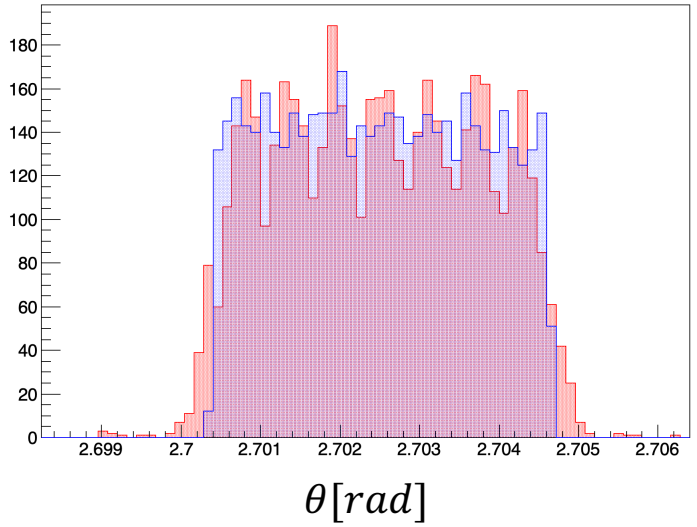




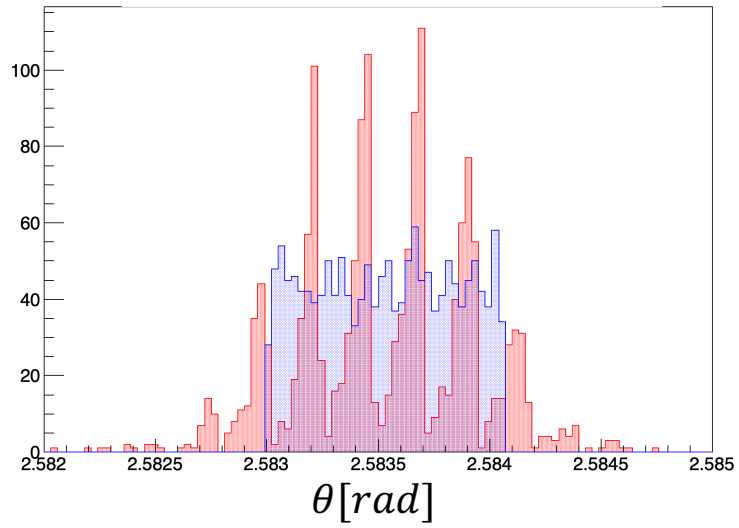
θ Distribution: 22.11.2 Sim ($0^o \leq \phi \leq 360^o$)

- Check 22.11.2 simulation files on S3 from Oct. simulation campaign
  - *eictest/EPIC/RECO/22.11.2/epic_brycecanyon/SINGLE/pi/xx/130to177deg*
- Structure is also present in narrow η region

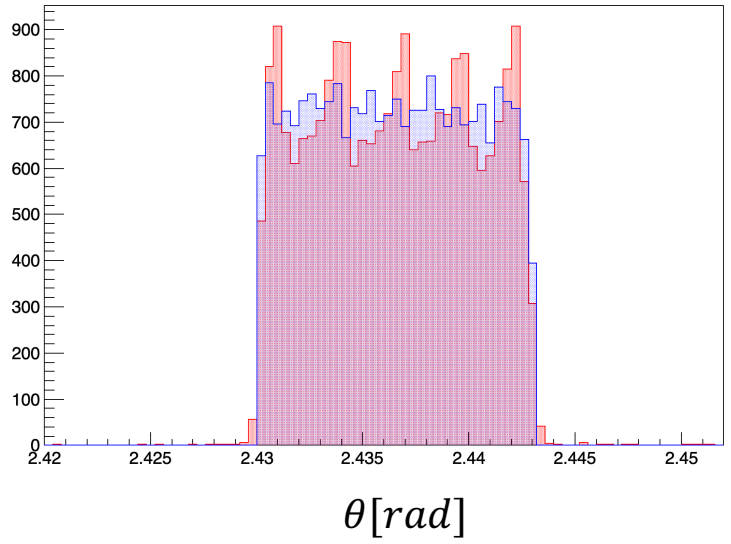
$-1.505 \leq \eta \leq -1.495$



$-1.251 \leq \eta \leq -1.249$



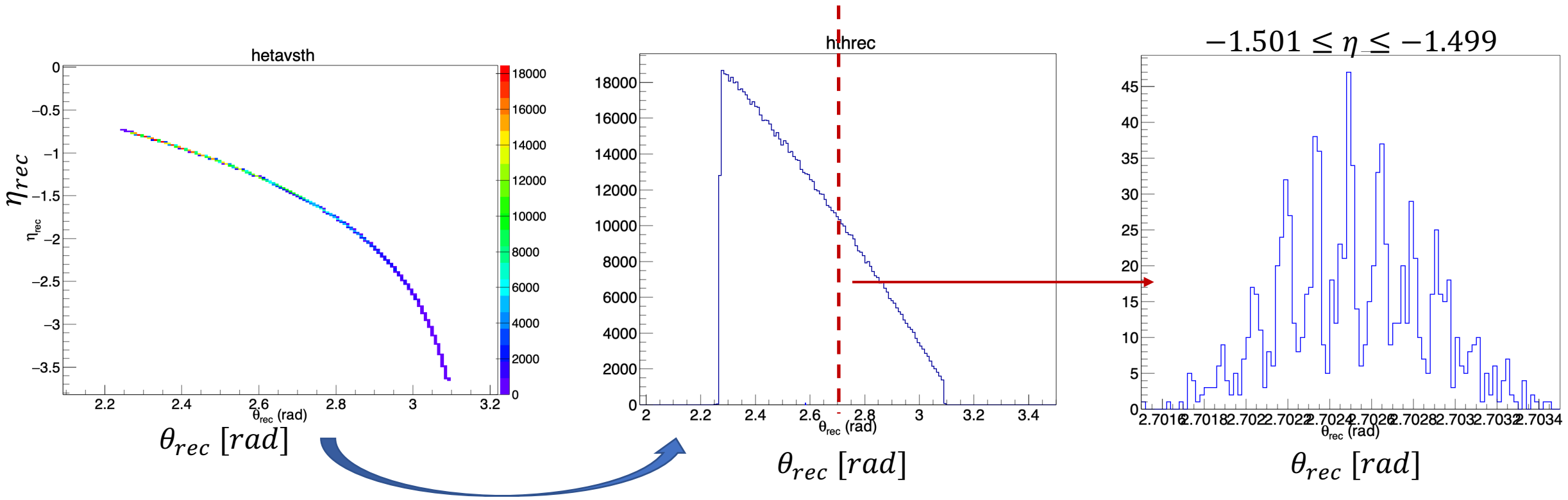
$-1.01 \leq \eta \leq -0.99$



- **MC**
- **Reconstructed**

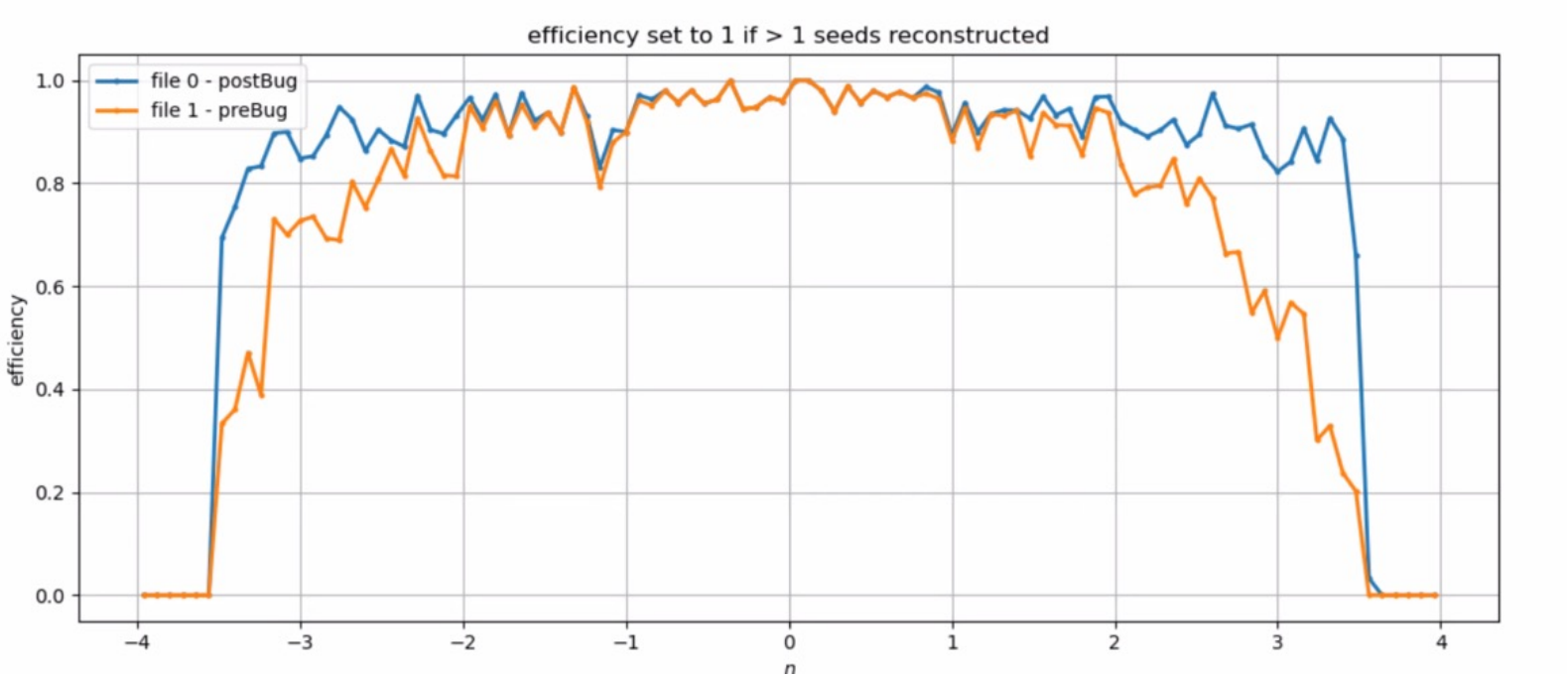
θ Distribution: Oct. Campaign Sim ($0^o \leq \phi \leq 360^o$)

- Data from Oct. simulation campaign S3 main
  - *eictest/EPIC/RECO/main/epic_brycecanyon/SINGLE/pi-/xx/130to177deg*
- Use macro from Shyam to verify structure
- Peak structure present at narrow η binning



η Distribution: Emma

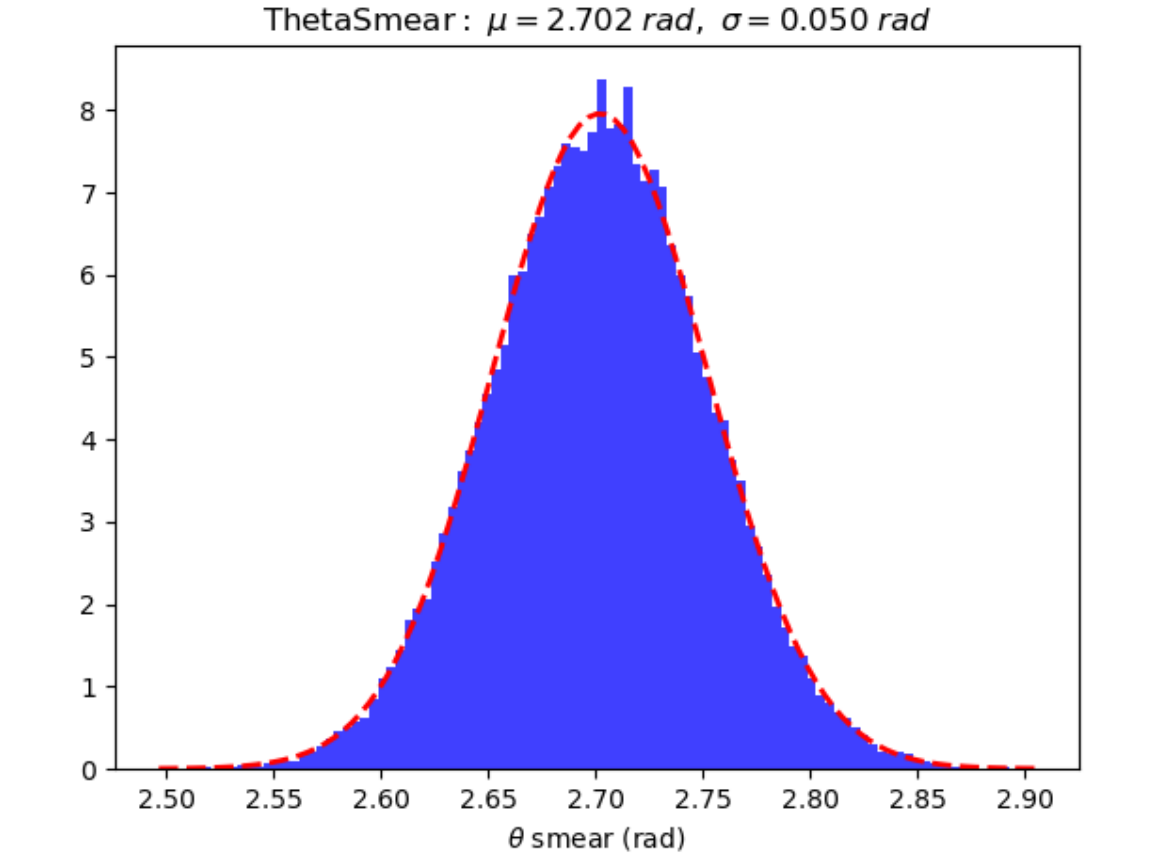
Tracking WG 3/23/22: Emma Yeats



- Could this effect also be causing the fluctuations seen in the seeding efficiency?
- Looks like Emma's η bin widths are ~0.1

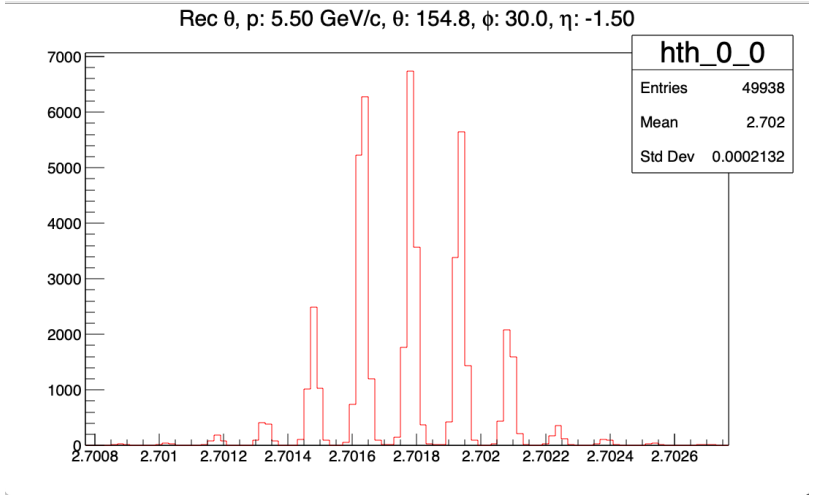
Introduce Angular Smearing

- Detector configuration: Bryce Canyon
- Particle Generation Details
  - Fixed kinematic settings: $\phi = 30^o, \theta = 154.8^o, p = 5.5\ GeV/c$
  - Shoot π^-
- Smear angular inputs used in truth seeding
  - Follow same approach used by Shyam for momentum smearing(PR 475)
- For reference Fun4All applies smearing of
  - 10% to momentum
  - 0.05 rad to θ and ϕ

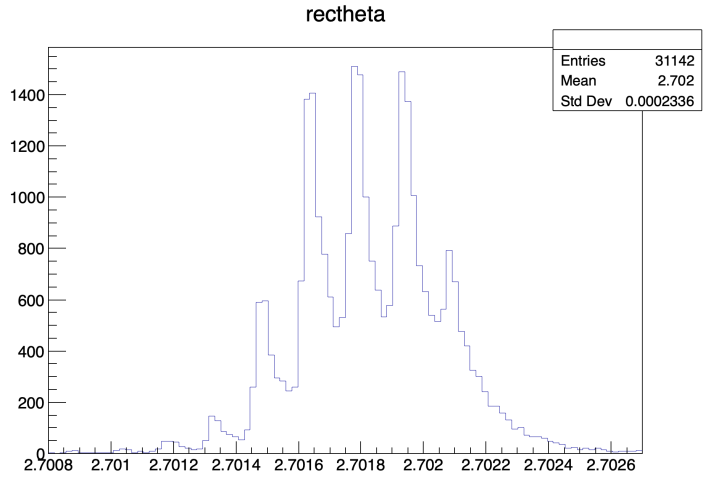


$\phi = 30^o, p = 5.5\ GeV/c, \theta = 154.8^o, \eta = -1.50$

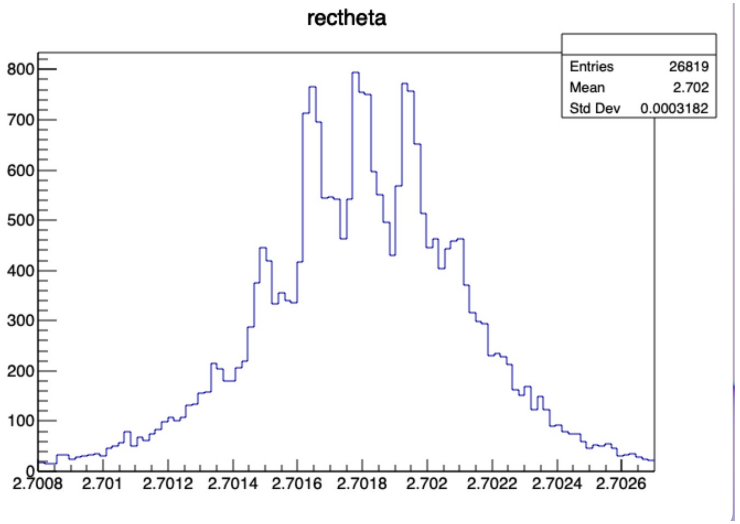
$\theta_{smear} = 0.0\ rad$
$\phi_{smear} = 0.0\ rad$



$\theta_{smear} = 0.05\ rad$
$\phi_{smear} = 0.0\ rad$



$\theta_{smear} = 0.05\ rad$
$\phi_{smear} = 0.05\ rad$



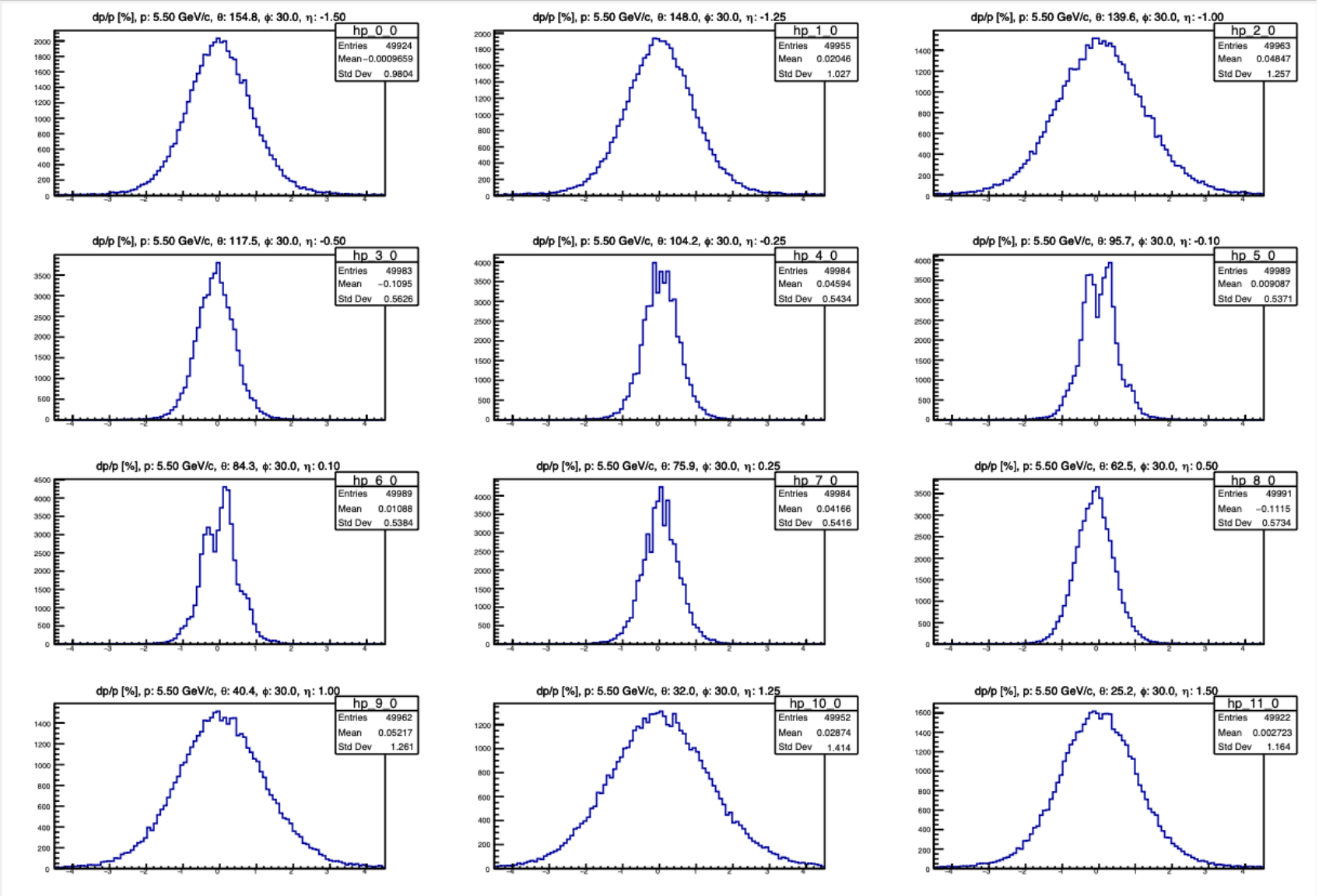
$\phi = 30^o, p = 5.5\ GeV/c, \theta = 154.8^o, \eta = -1.50$

Summary

- Peak structure seen in detector performance assessment
  - Present when looking at narrow pseudorapidity ranges ($\Delta\eta < 0.1$)
  - Seen in my local and official large production simulations (particle gun)
  - Structure is still present when smearing angular inputs to truth seeder
  - More investigation/suggestions needed
    - Approaching/surpassing resolution of ACTS material scan?

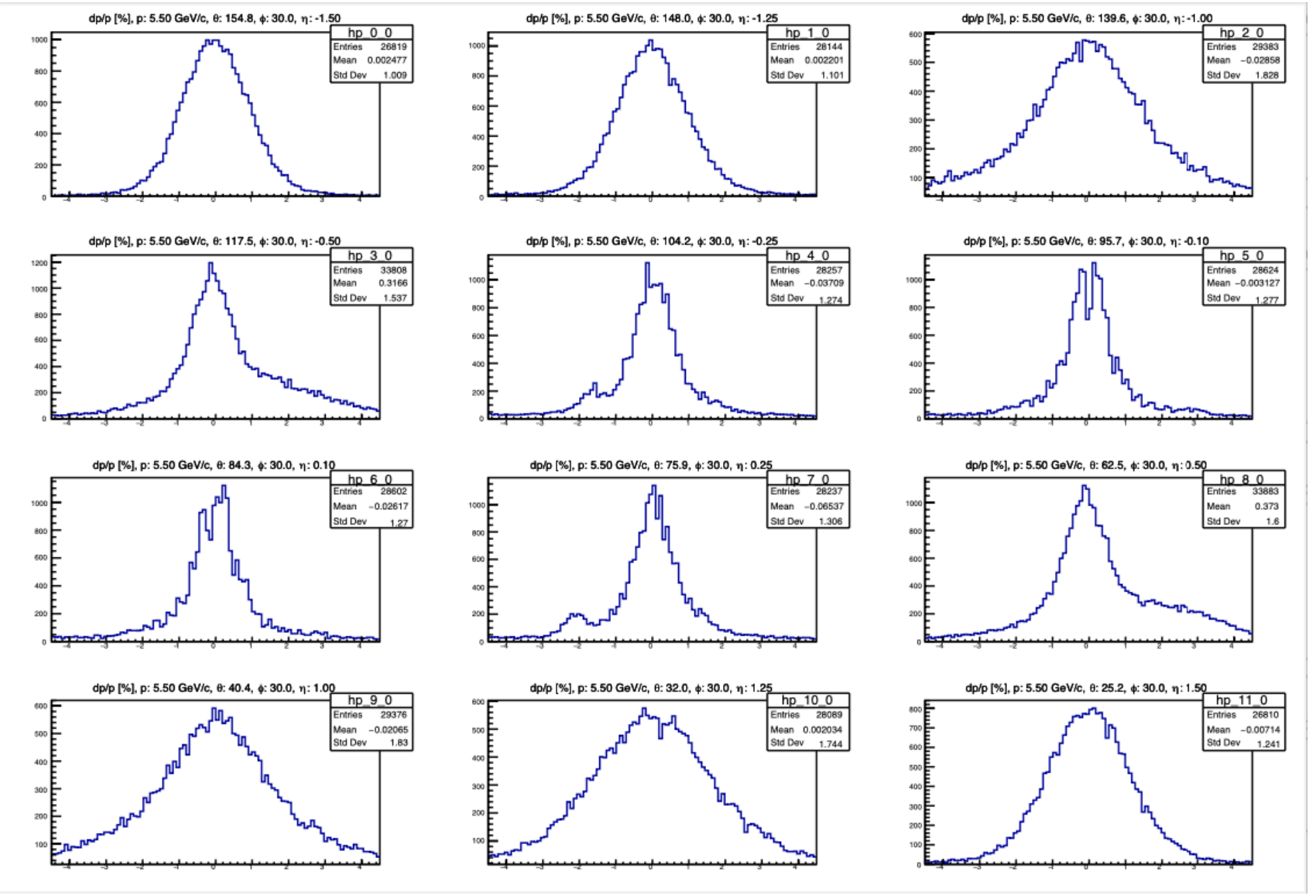
Momentum with No Angular Smearing

$\phi = 30^o, p = 5.5\ GeV/c, \theta = fixed$



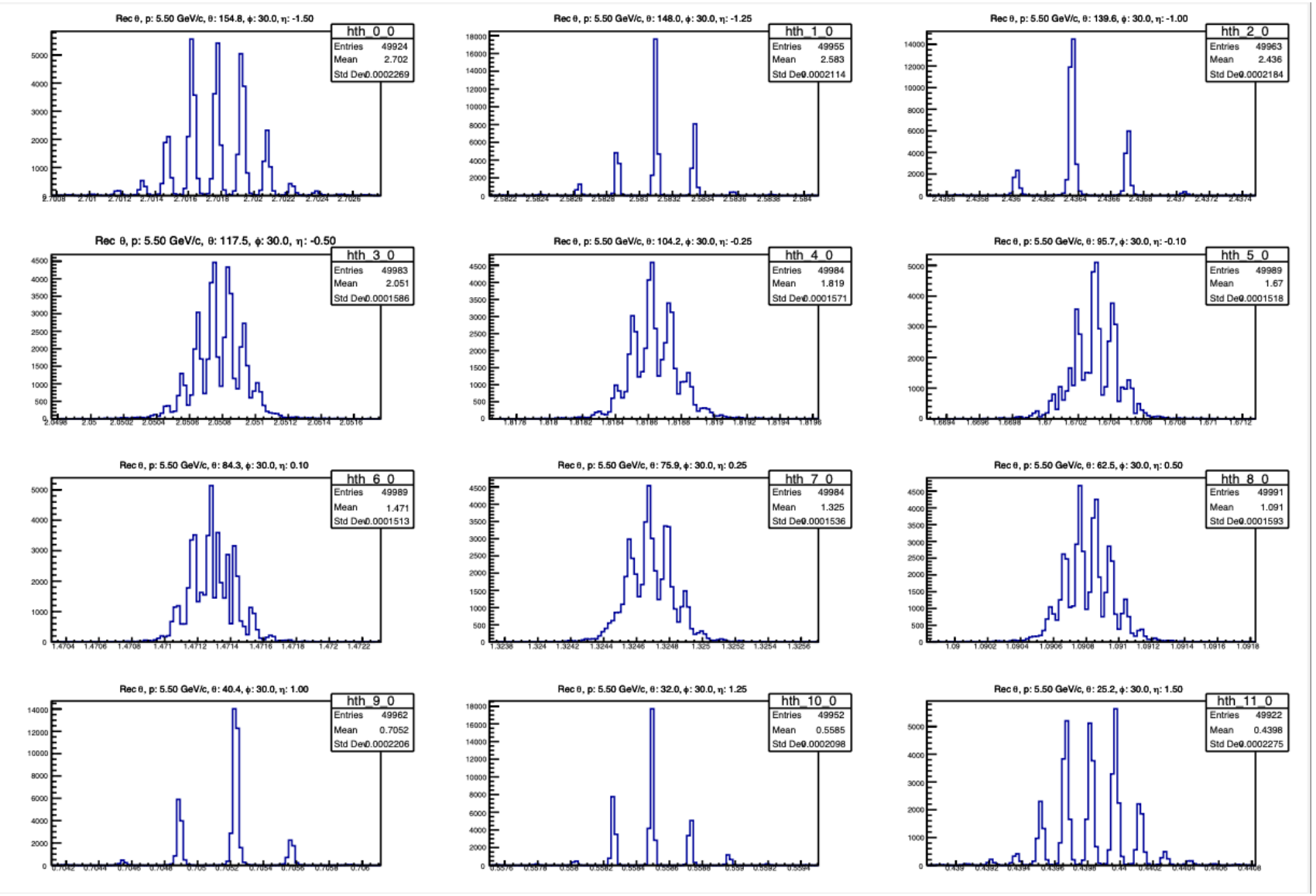
Momentum with Angular Smearing: 0.05 rad

$\phi = 30^o, p = 5.5\ GeV/c, \theta = fixed$



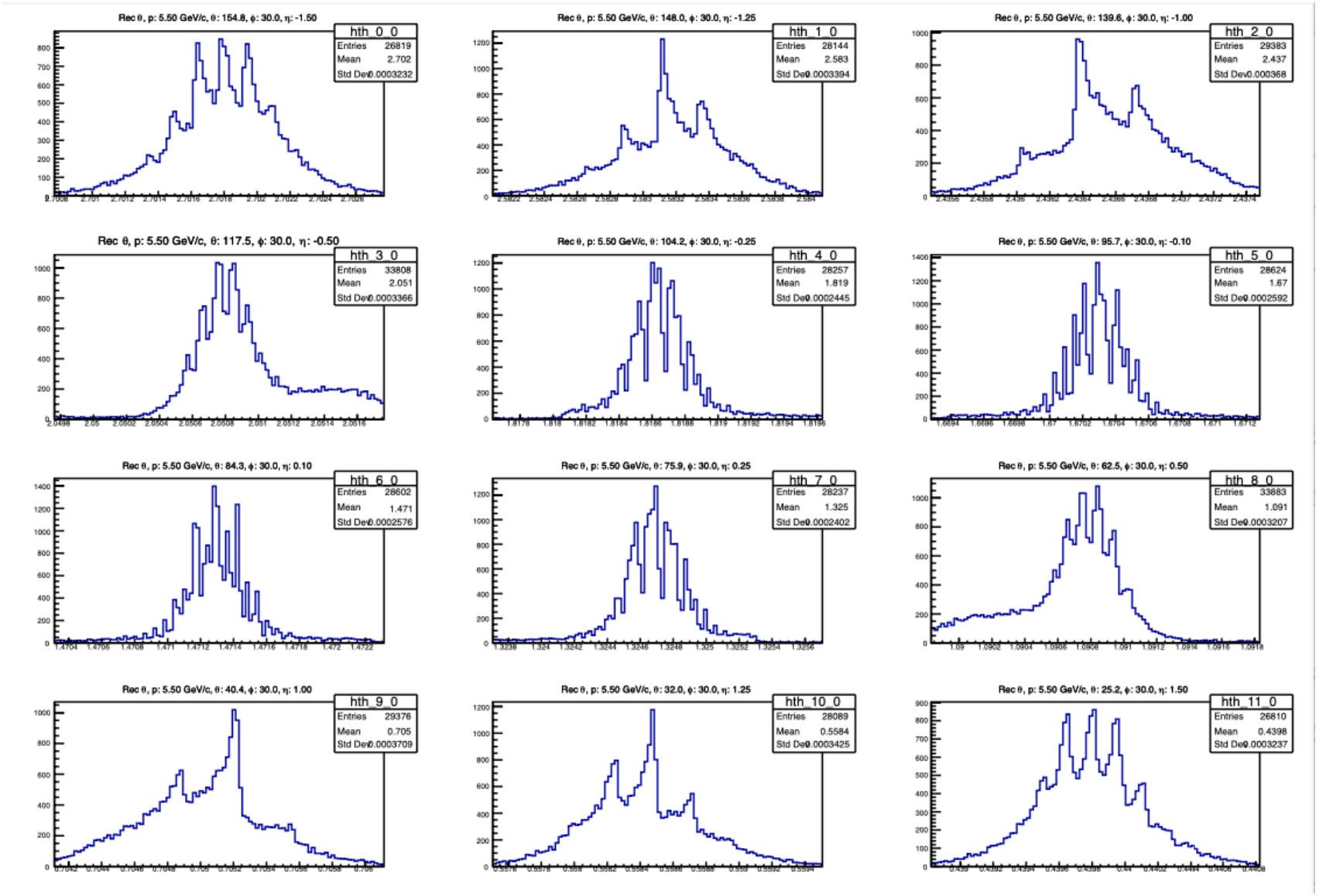
Theta with No Angular Smearing

$\phi = 30^o, p = 5.5\ GeV/c, \theta = fixed$



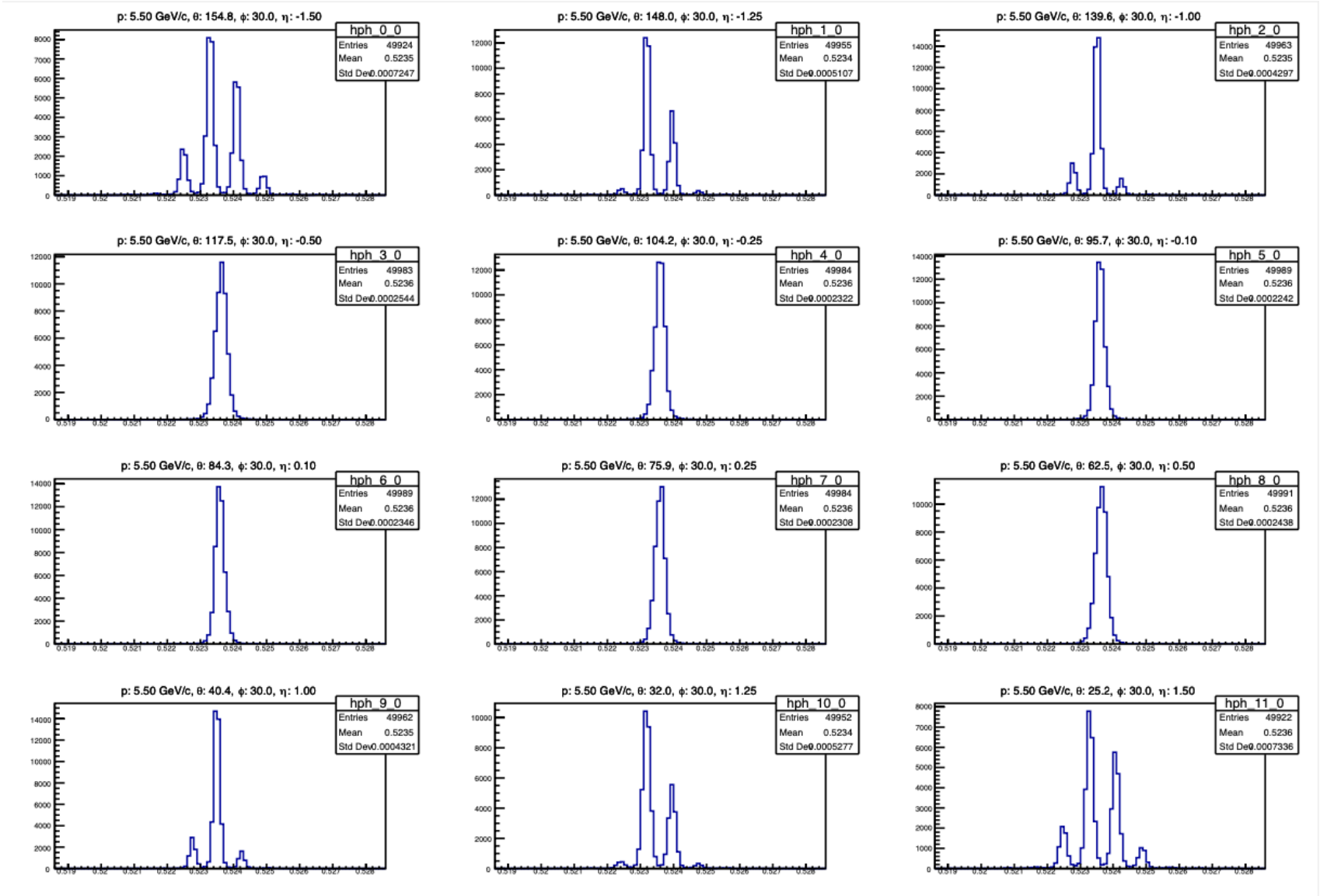
Theta with Angular Smearing: 0.05 rad

$\phi = 30^o, p = 5.5\ GeV/c, \theta = fixed$



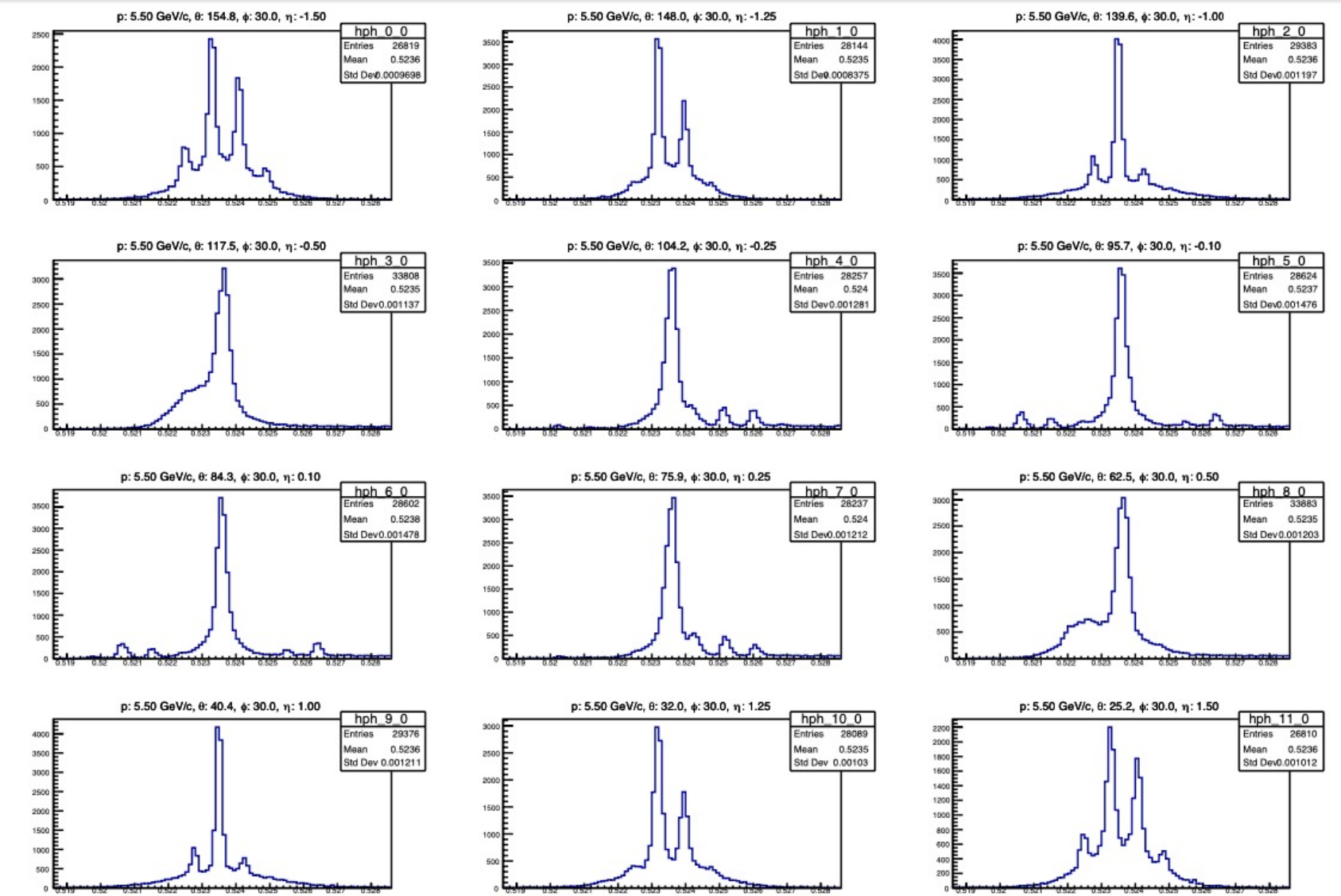
Phi with No Angular Smearing

$\phi = 30^o, p = 5.5\ GeV/c, \theta = fixed$



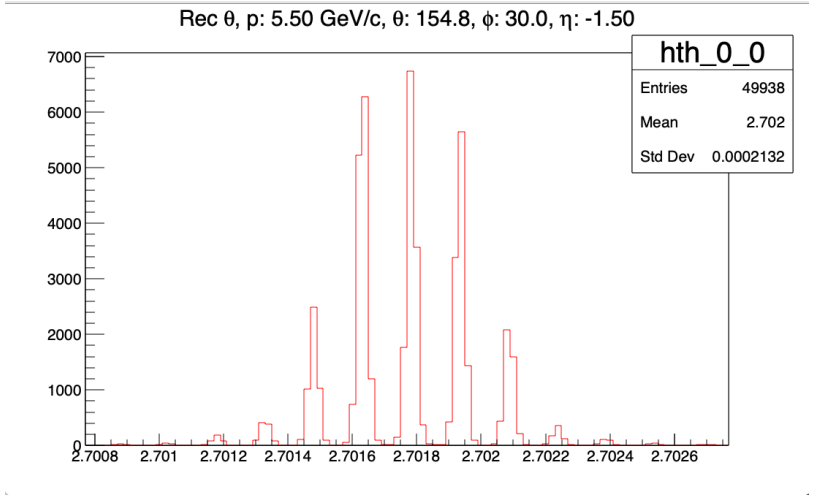
Phi with Angular Smearing: 0.05 rad

$\phi = 30^o, p = 5.5\ GeV/c, \theta = fixed$

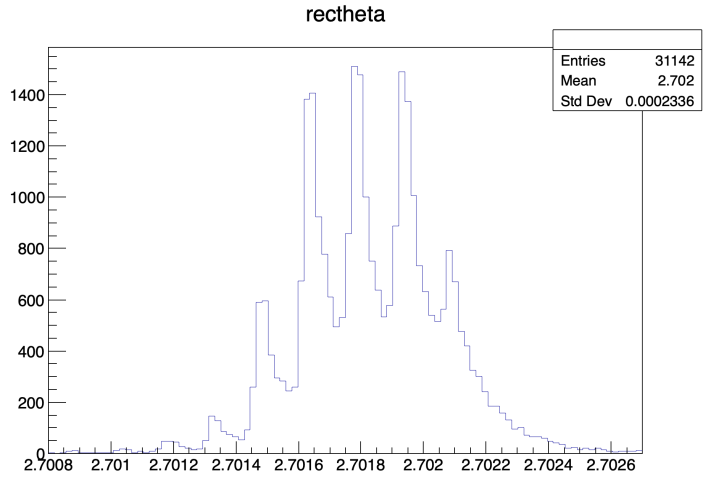


$\phi = 30^o, p = 5.5\ GeV/c, \theta = 154.8, \eta = -1.50$

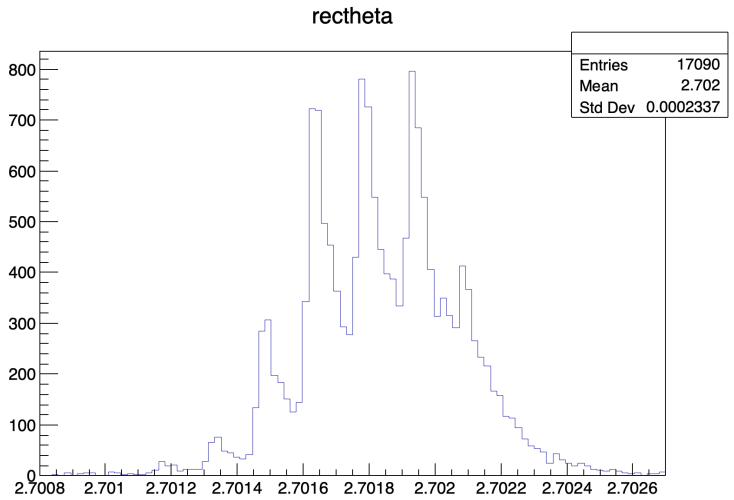
$\theta_{smear} = 0.0\ rad$



$\theta_{smear} = 0.05\ rad$



$\theta_{smear} = 0.1\ rad$



$\theta_{smear} = 0.3\ rad$