

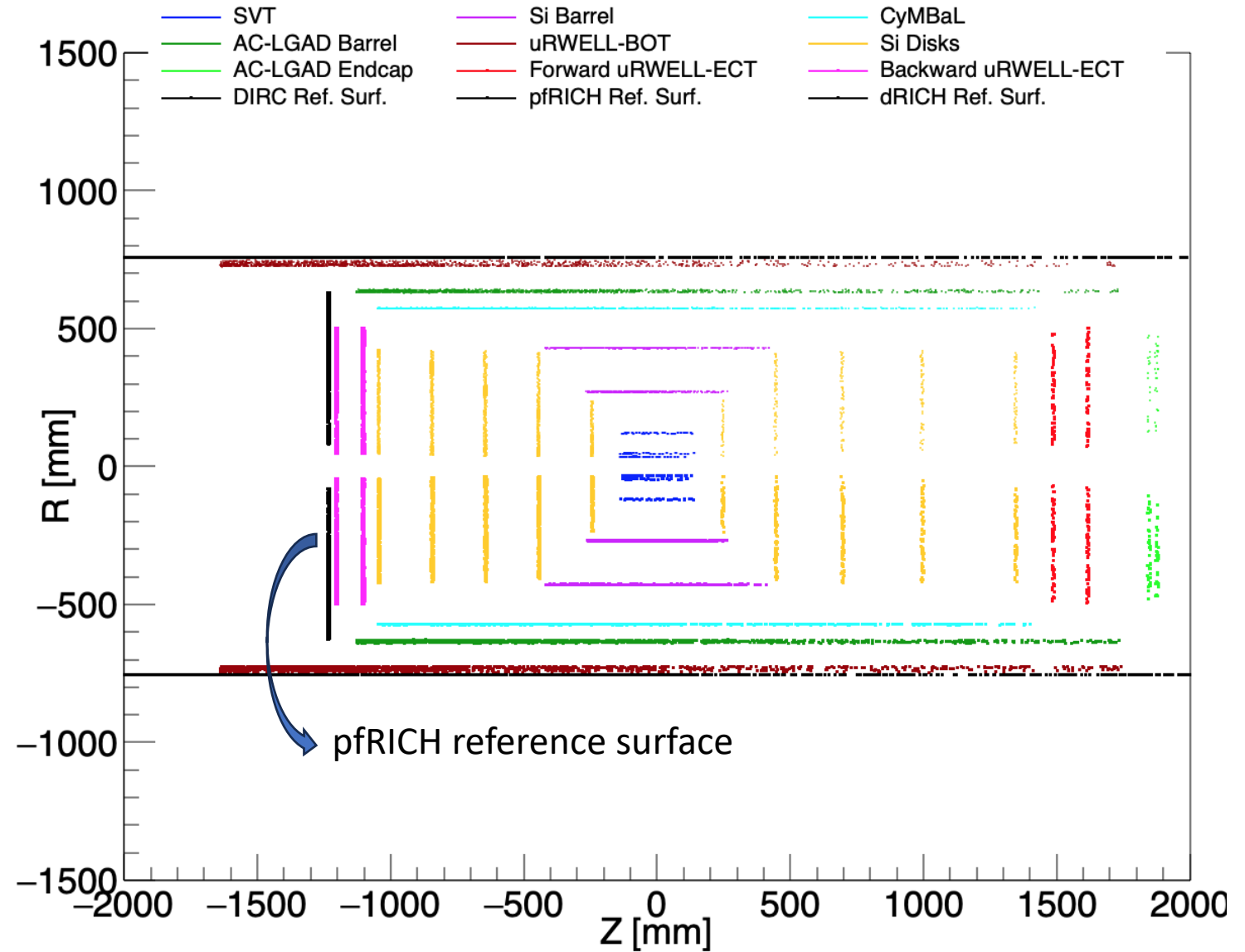
Angular Resolution at pfRICH

Matt Posik
Temple University

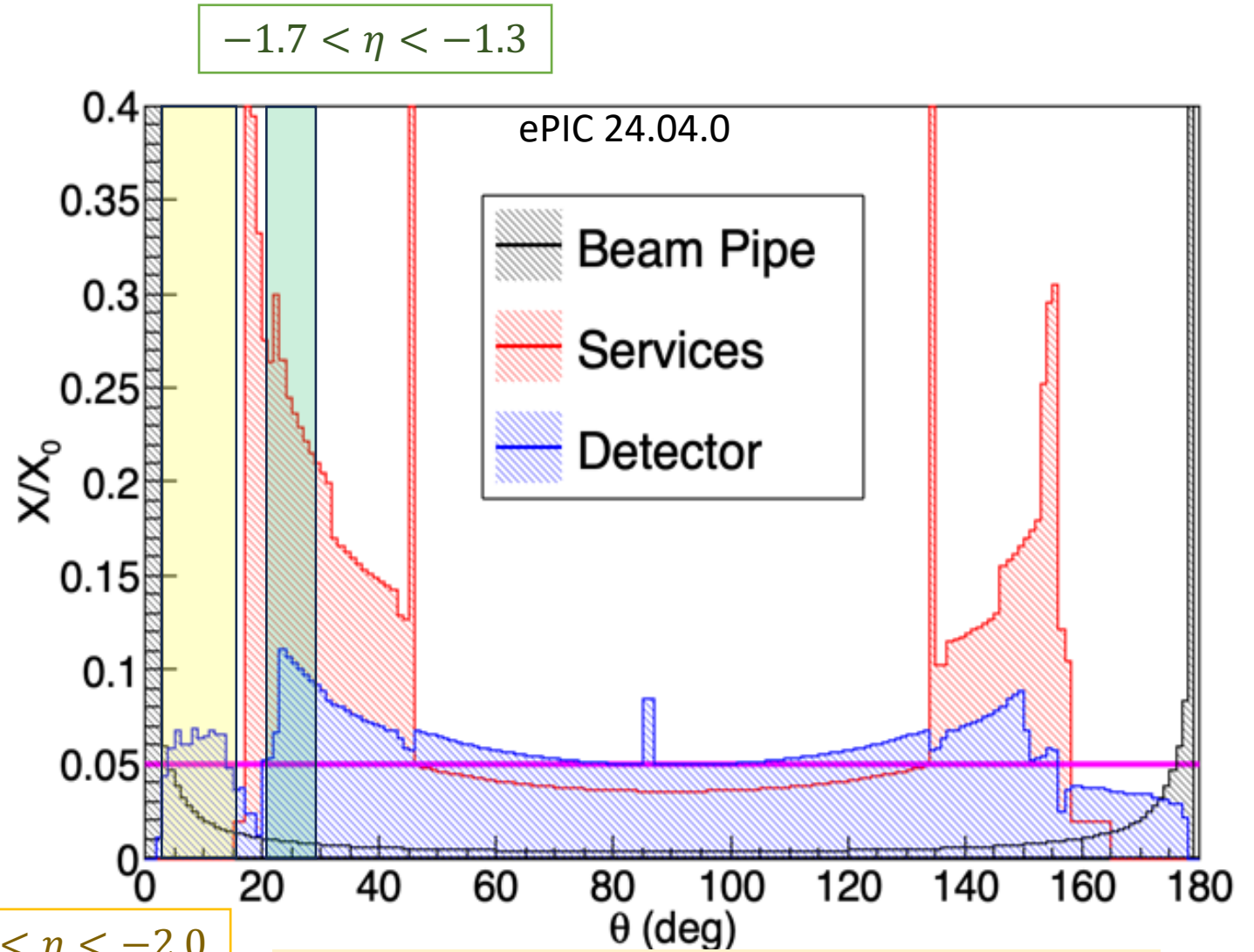
□ DD4hep Disk Reference Surface:

- Rmin = 8 cm
- Rmax = 63 cm
- Z = -123.5 cm
- Low mass X/X0 ~0.01%
- Outside tracking volume
- Used to register truth hit

- Angular resolutions assessed via difference between track propagated to pfRICH location and closest hit on dd4hep reference surface



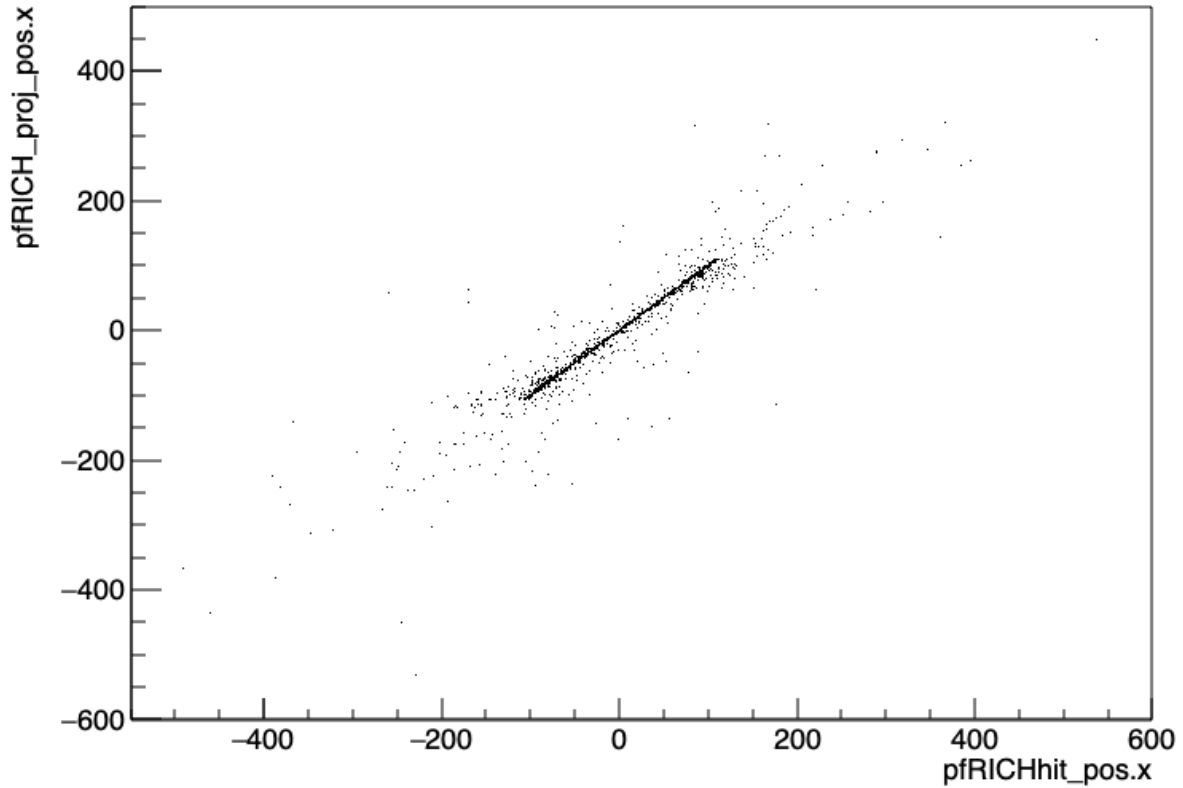
- ❑ Single particle: π^-
- ❑ Uniform ϕ : $0^\circ < \phi < 360^\circ$
- ❑ Narrow θ range: $\Delta\theta = 2^\circ$
- ❑ Lower edge θ values:
 - $152^\circ, 156^\circ, 164^\circ$
 - $168^\circ, 172^\circ, 175^\circ$
- ❑ Discrete momentum values:
 - $0.3, 0.5 \text{ GeV}, 1 \text{ GeV},$
 - $2 \text{ GeV}, 5 \text{ GeV}, 10 \text{ GeV}, 20 \text{ GeV}$



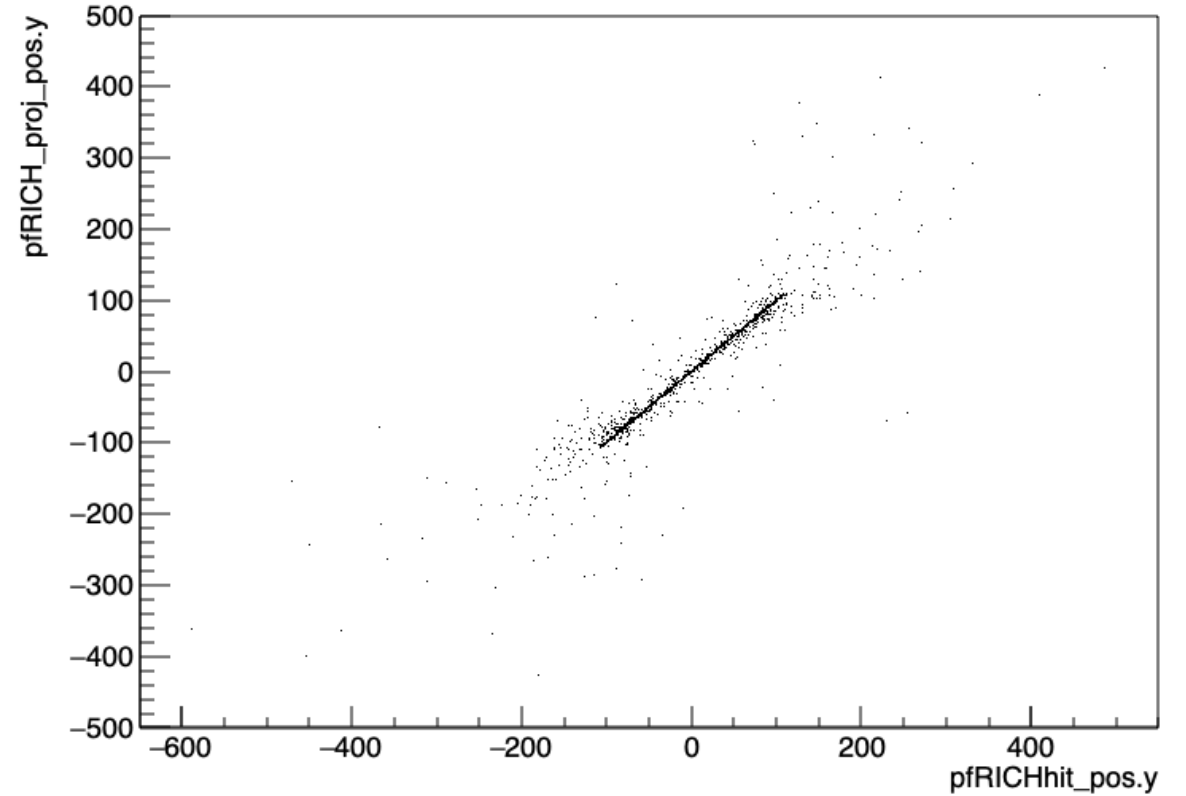
*Difference in θ definition between material plot and simulation gun

☐ Representative Example

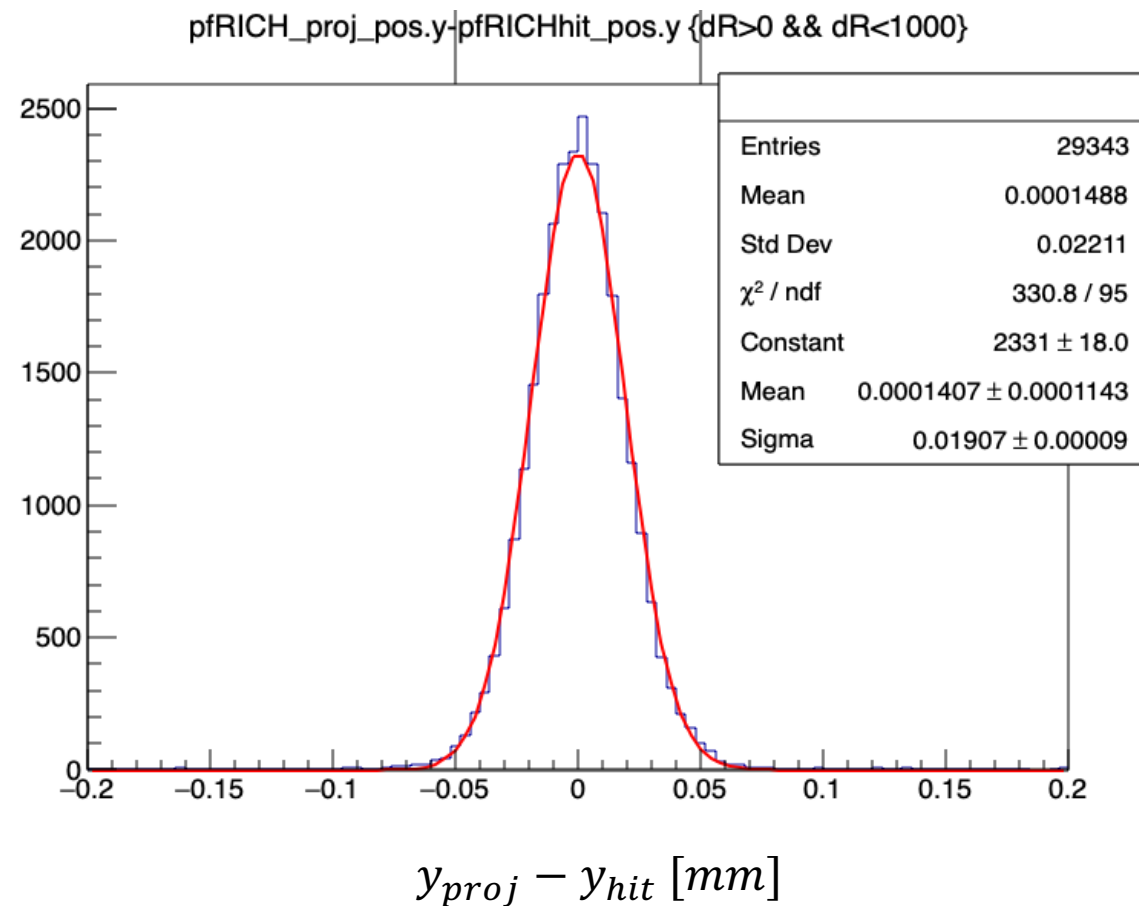
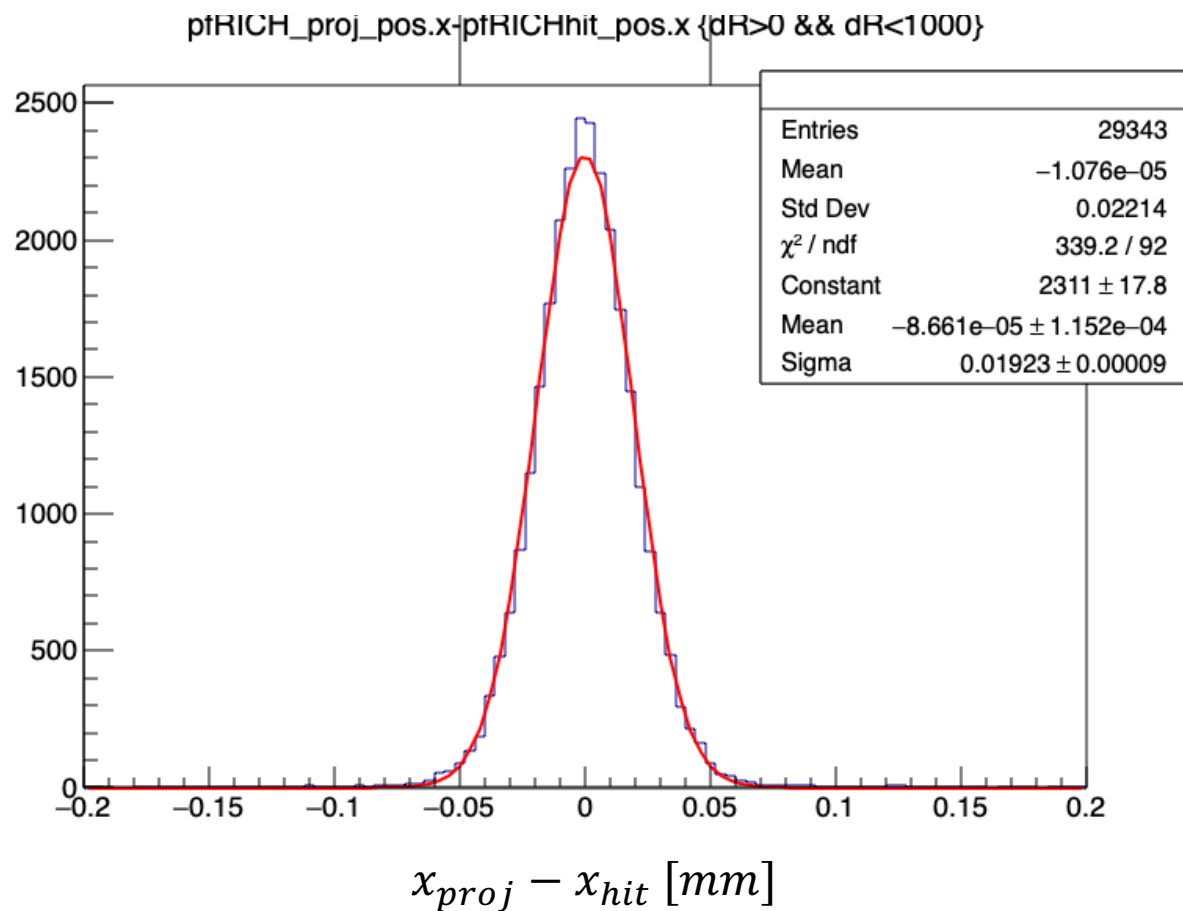
pfRICH_proj_pos.x:pfRICHhit_pos.x {dR>0 && dR<1000}



pfRICH_proj_pos.y:pfRICHhit_pos.y {dR>0 && dR<1000}

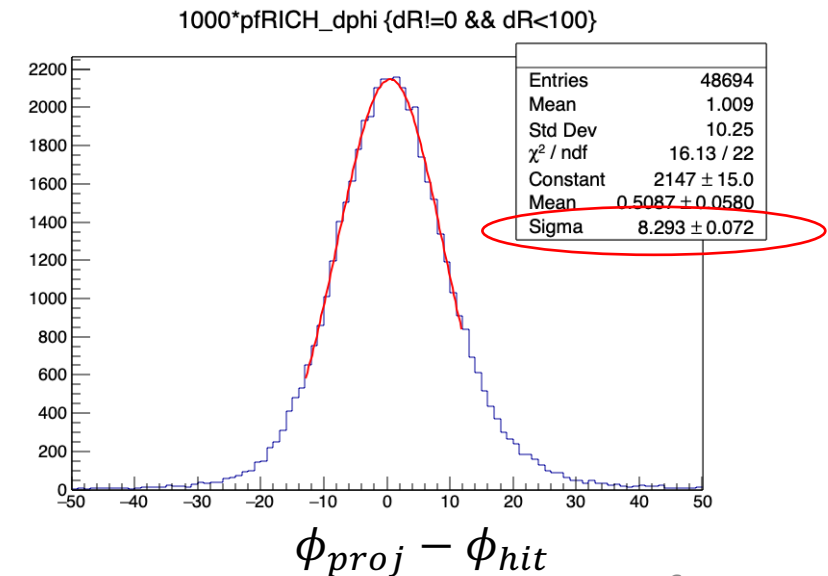
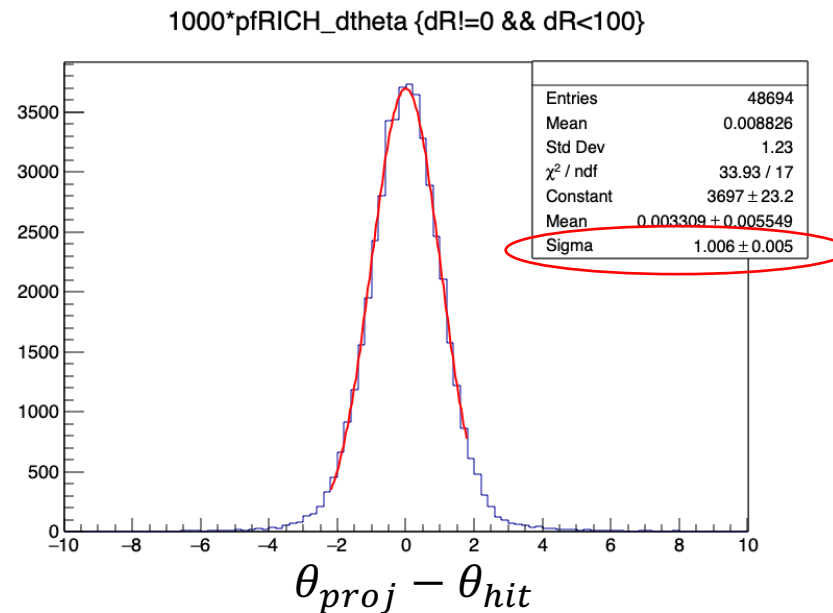
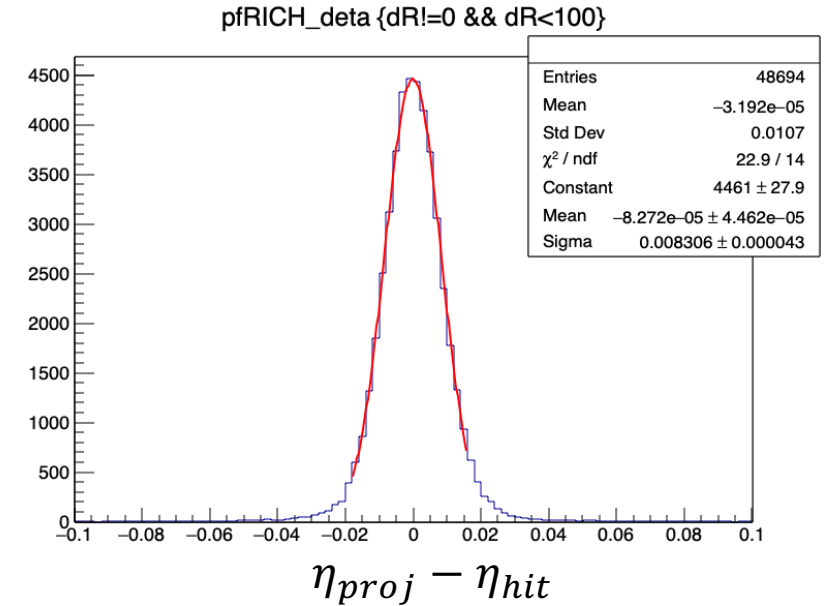
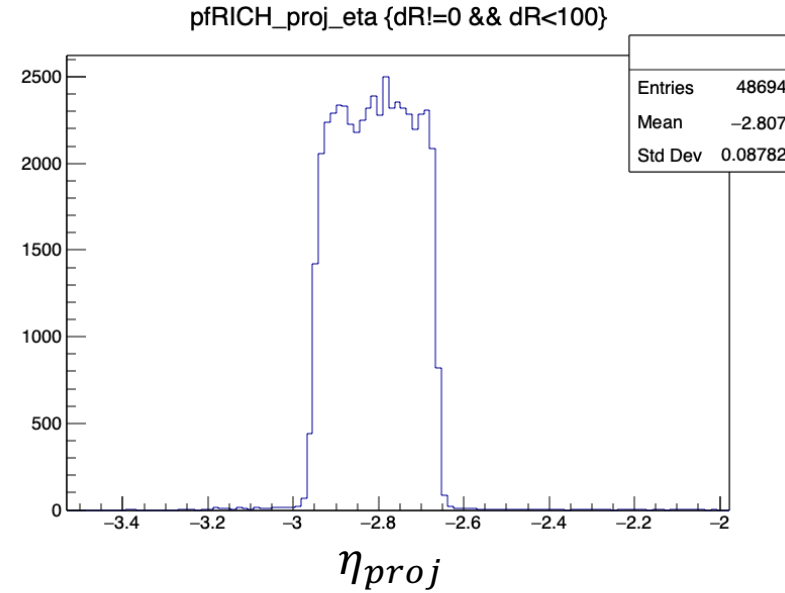


Representative Example



Representative example

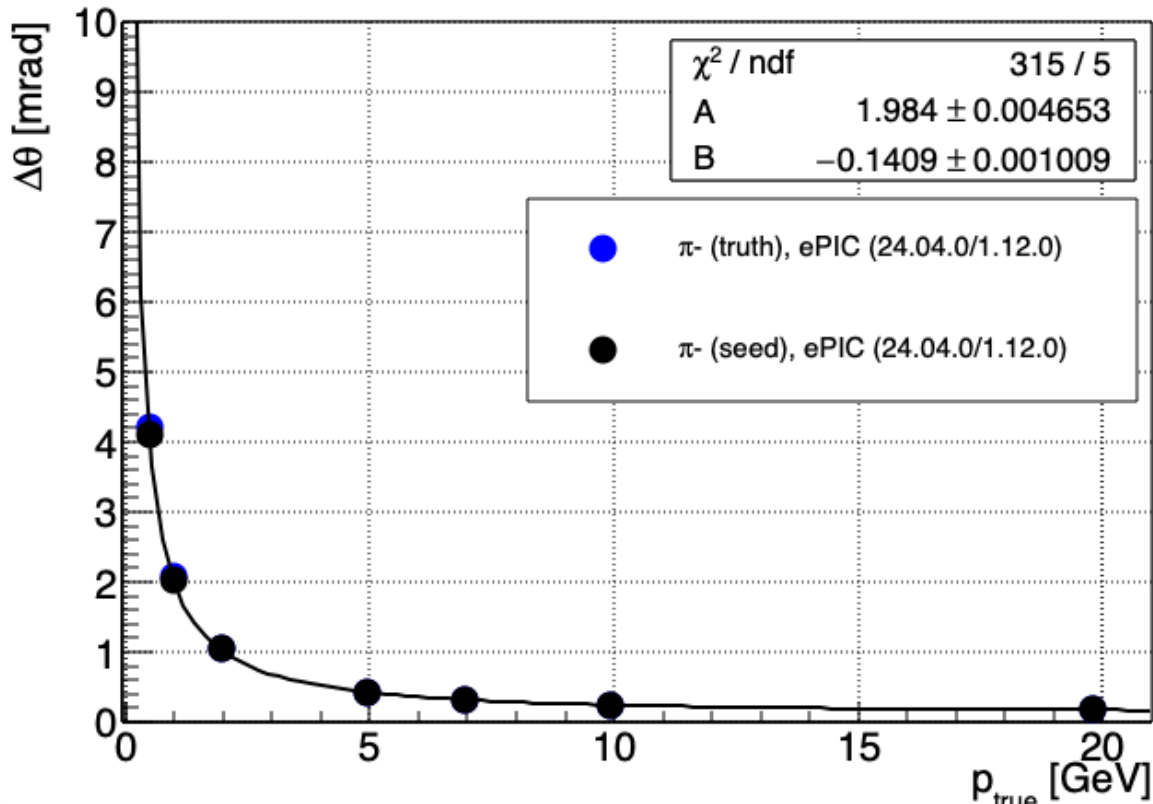
- $p = 2 \text{ GeV}$
- $172^\circ < \theta < 174^\circ$
- $\Delta\eta \sim 0.01$
- $\Delta\theta \sim 1.0 \text{ mrad}$
- $\Delta\phi \sim 8.3 \text{ mrad}$



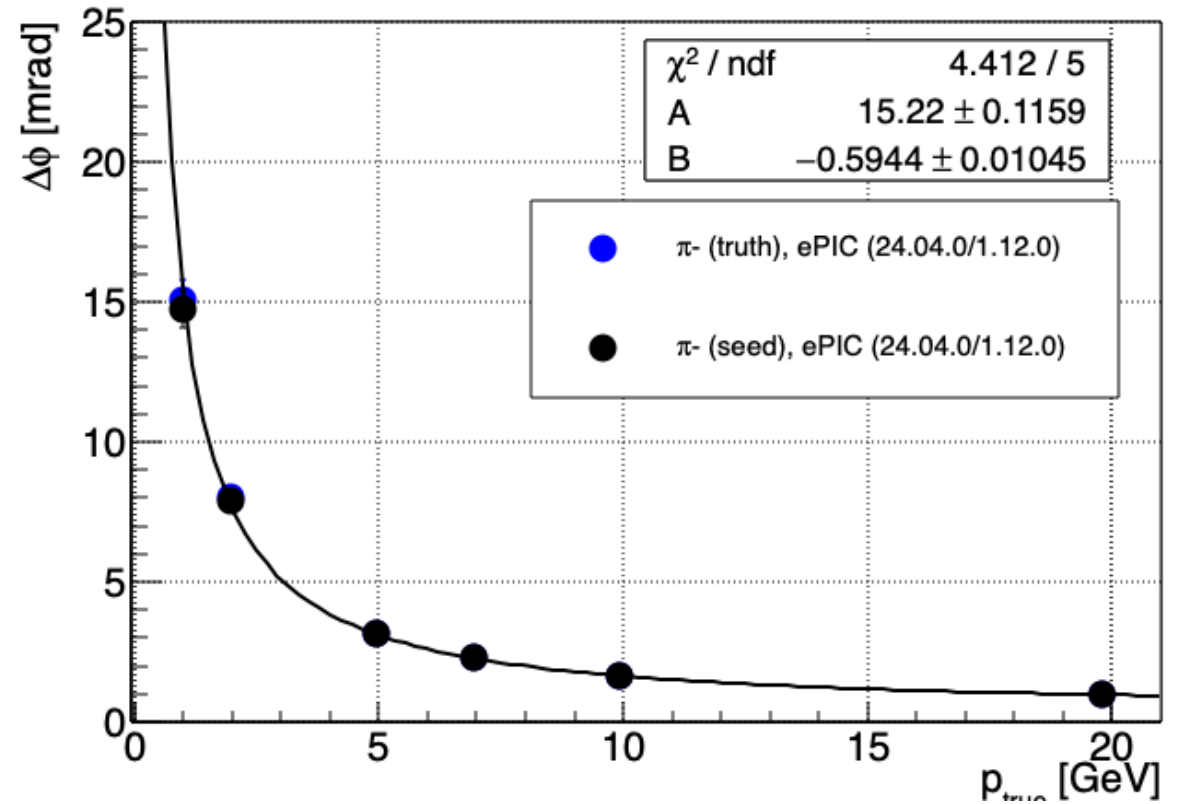
- ❑ Azimuthal resolution worst than polar angle resolution
 - Related to 2π azimuthal bin
- ❑ Other bins in backup

Fit Function: $\sqrt{\frac{A^2}{p[\text{GeV}]^2} + B^2}$

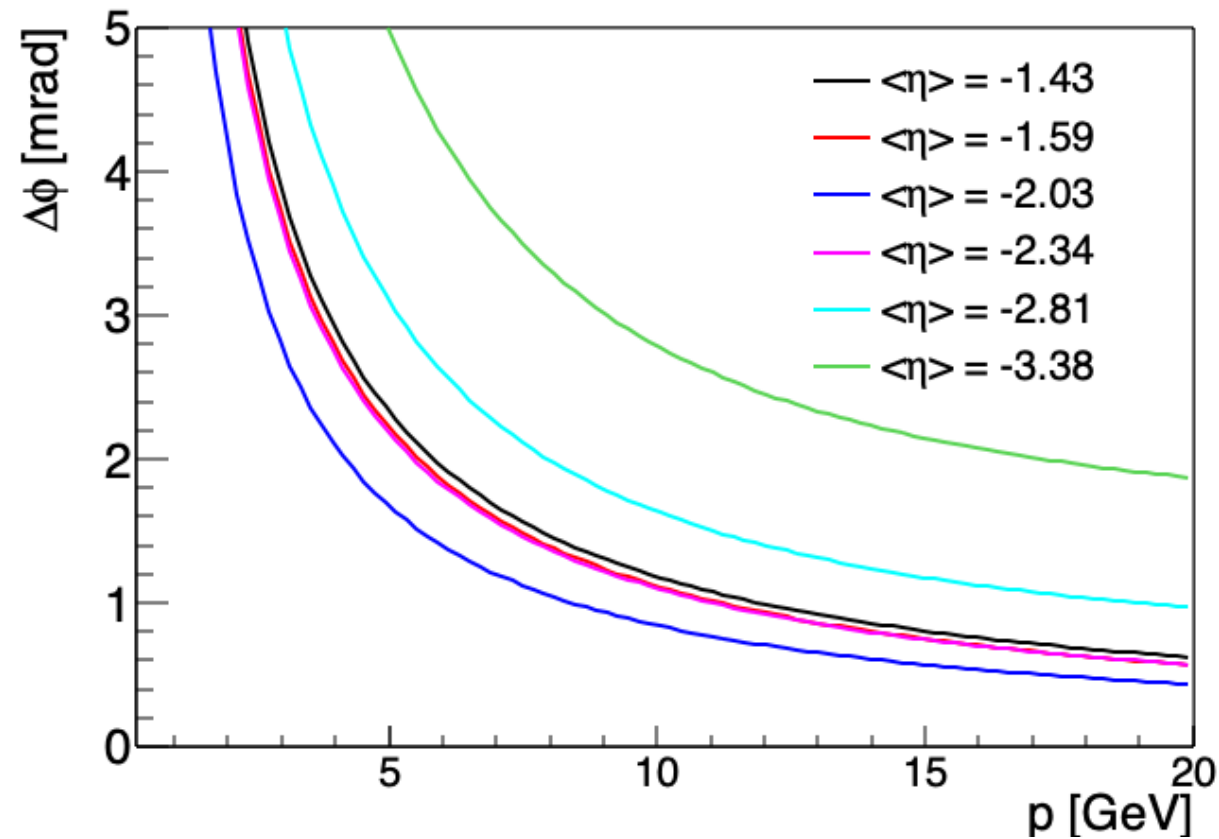
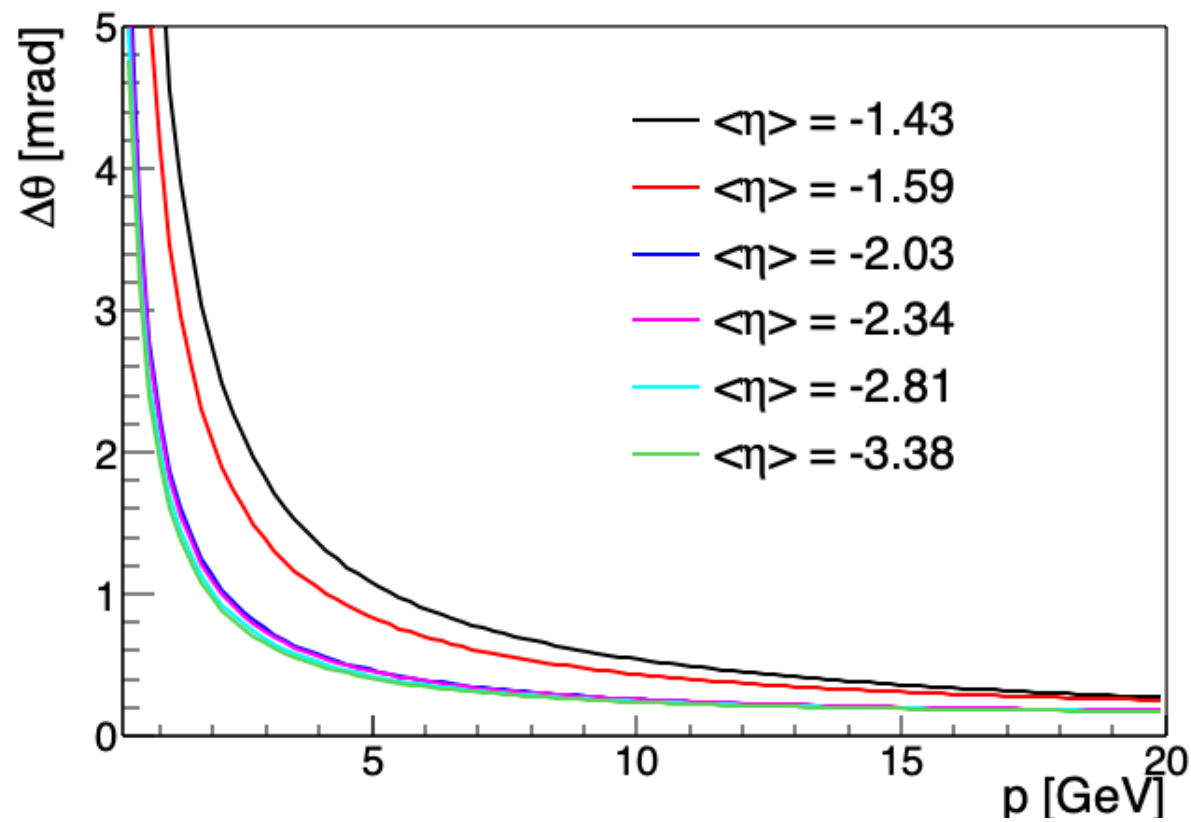
$172 < \theta < 174, \langle \eta \rangle = -2.80$



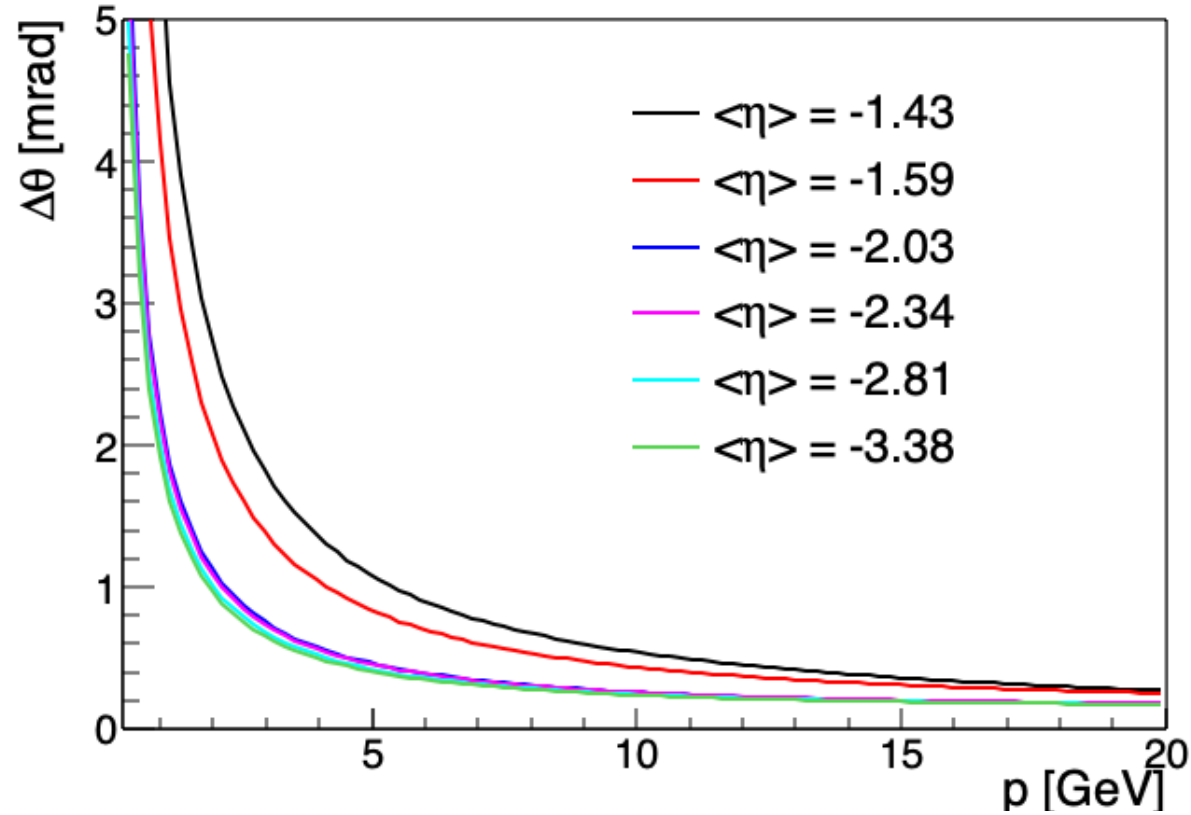
$172 < \theta < 174, \langle \eta \rangle = -2.80$



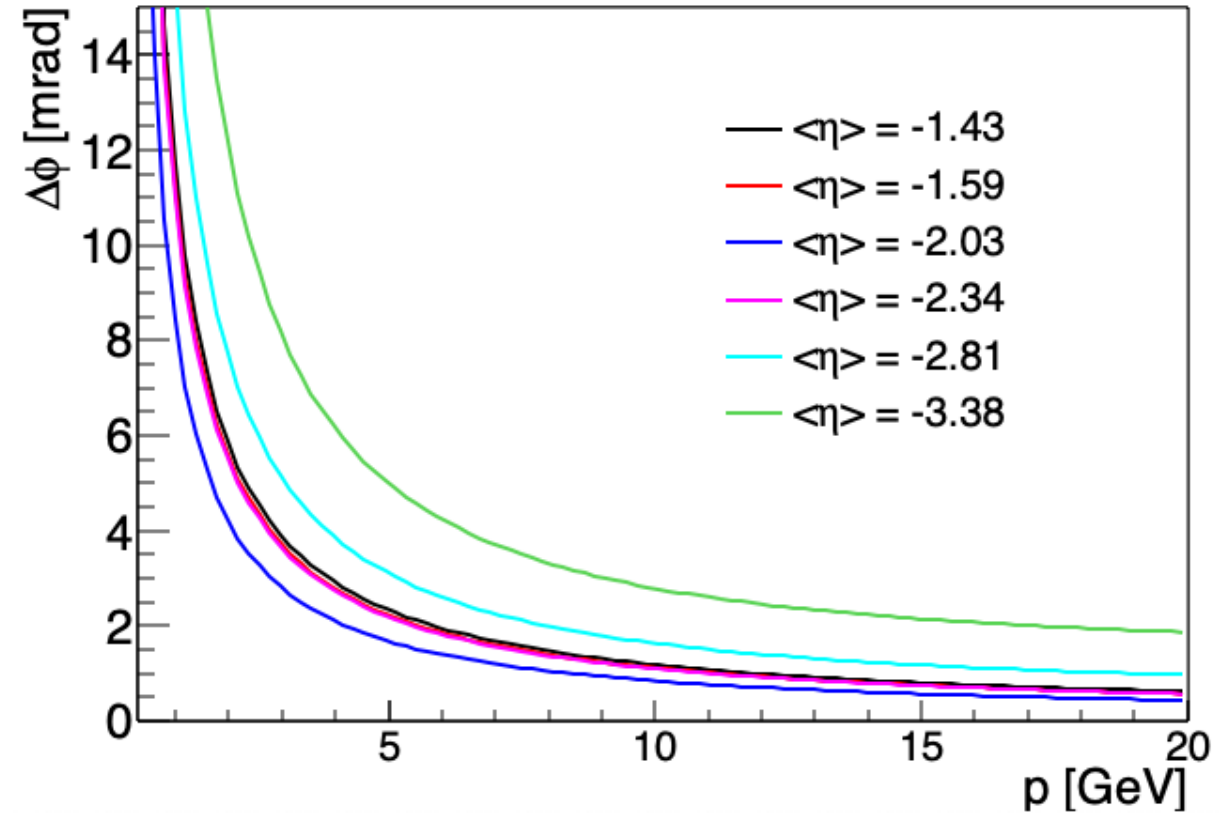
□ Parameterization Results Summary



□ Parameterization Results Summary

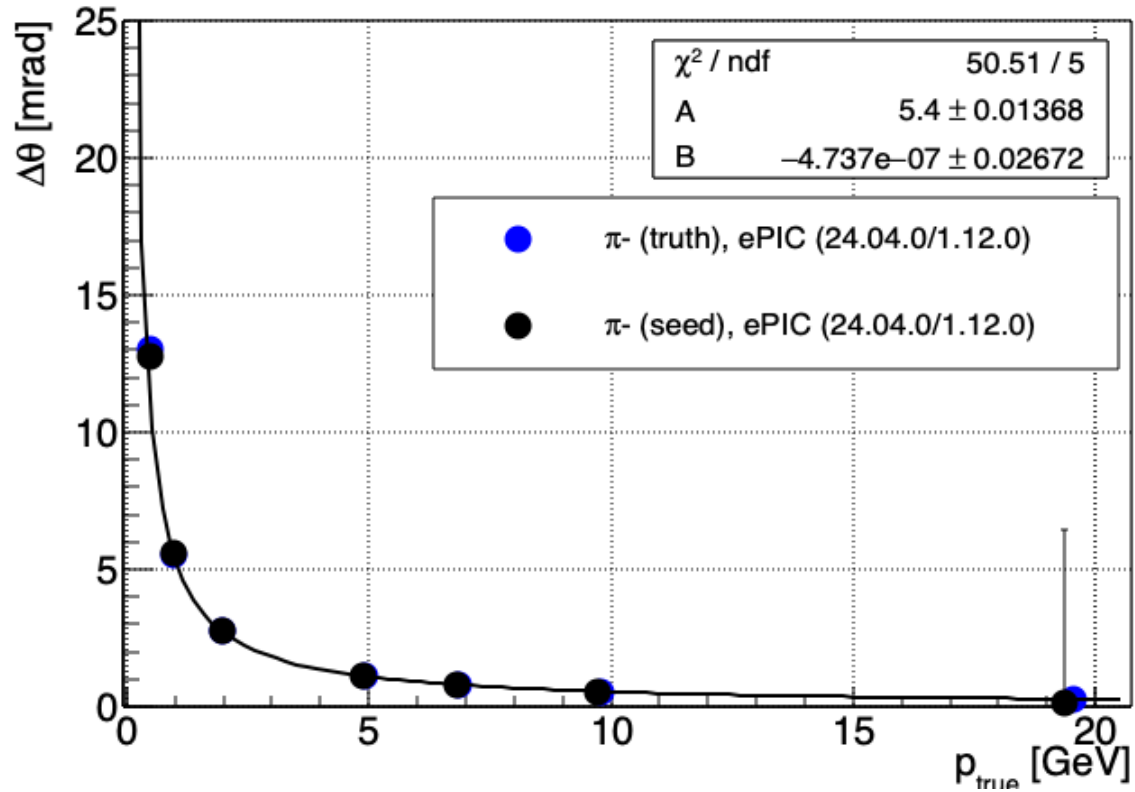


(extended vertical range)

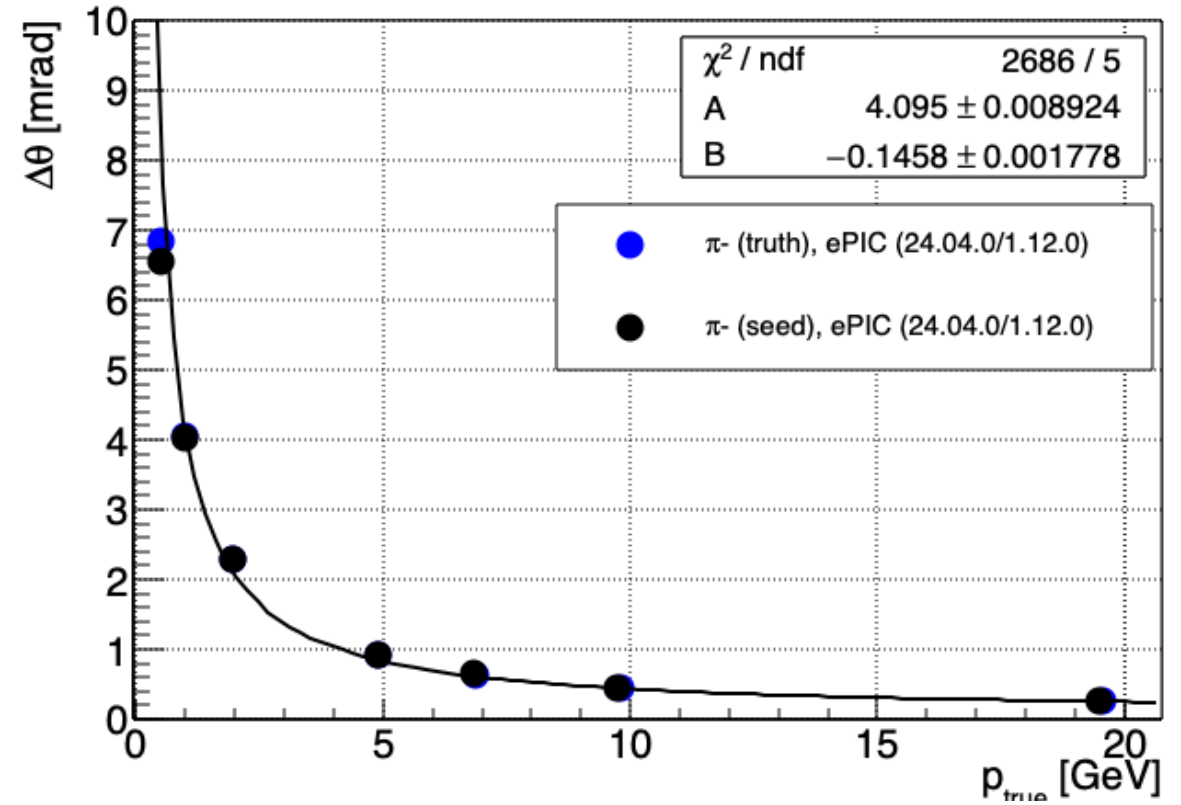


Fit Function: $\sqrt{\frac{A^2}{p[\text{GeV}]^2} + B^2}$

152 θ < 154, $\langle\eta\rangle = -1.43$

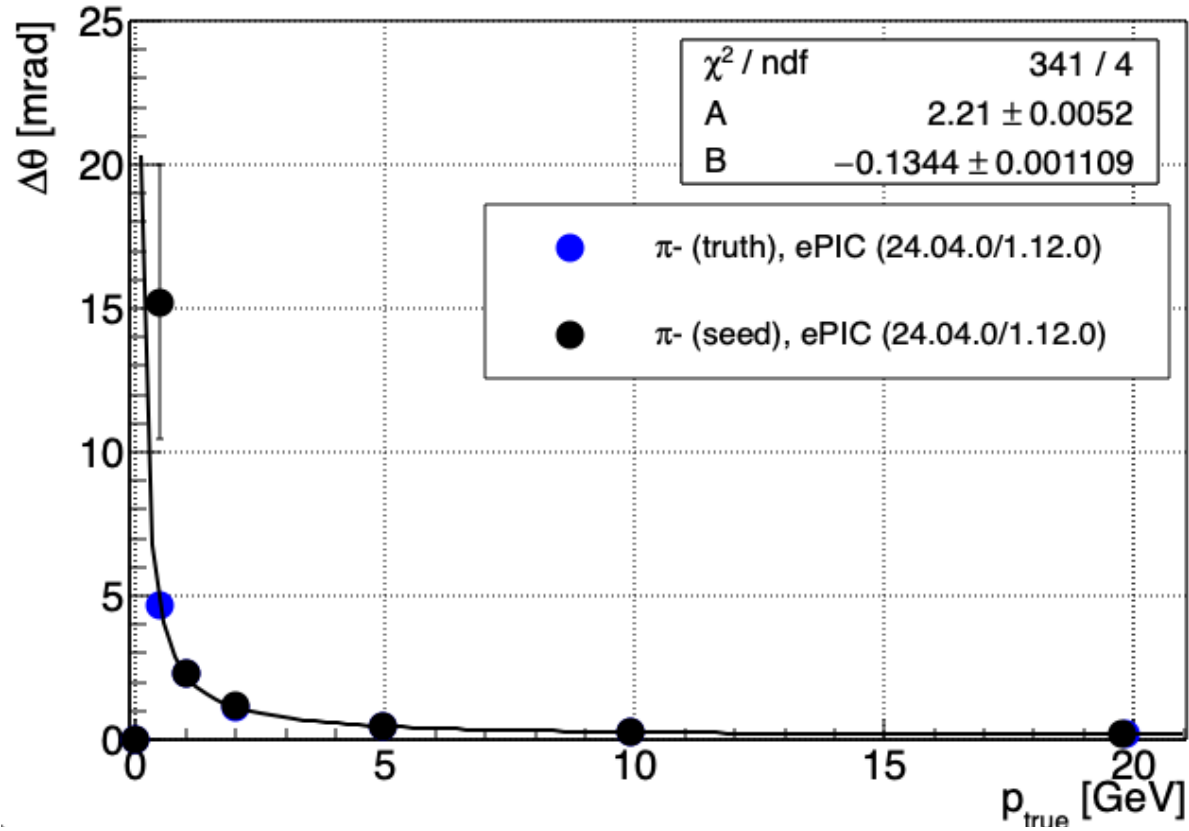


156 θ < 158, $\langle\eta\rangle = -1.59$

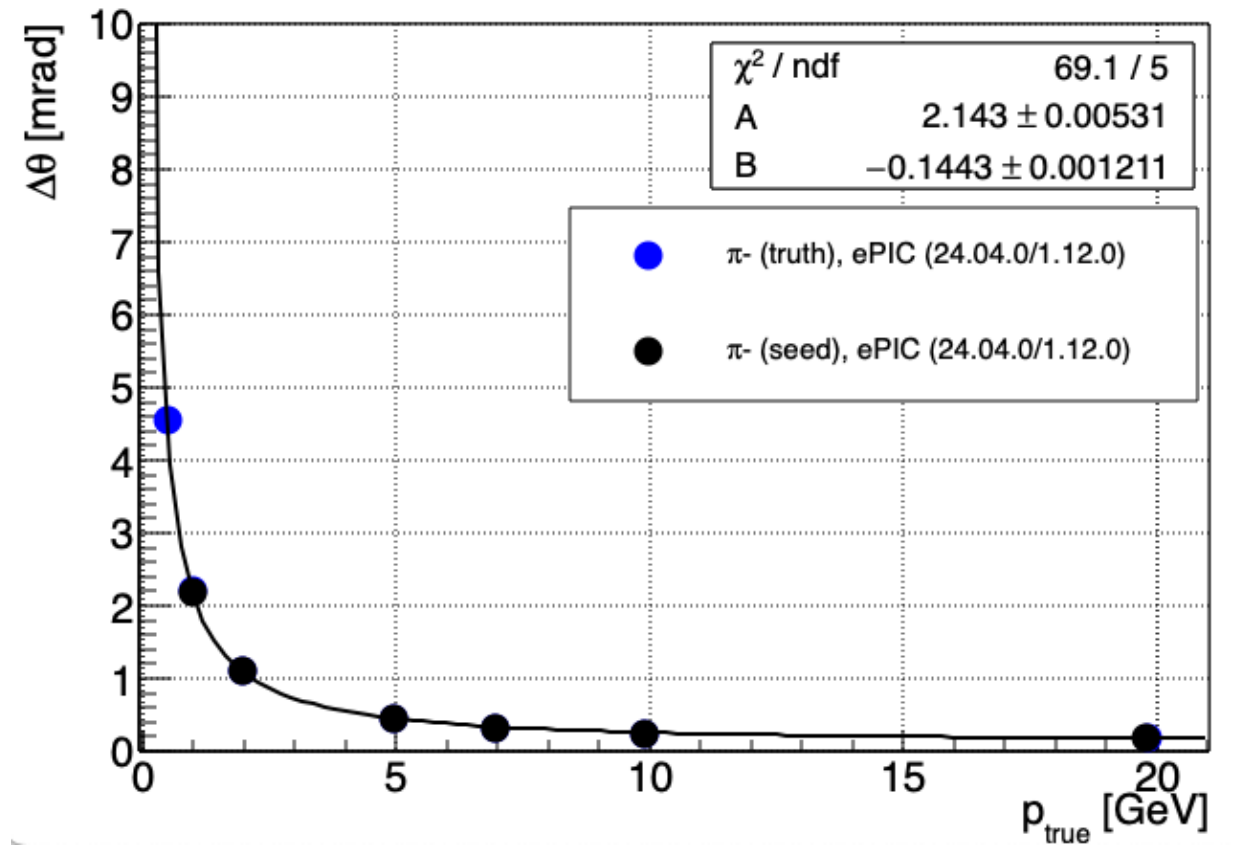


Fit Function: $\sqrt{\frac{A^2}{p[\text{GeV}]^2} + B^2}$

164 θ < 166, $\langle\eta\rangle = -2.03$

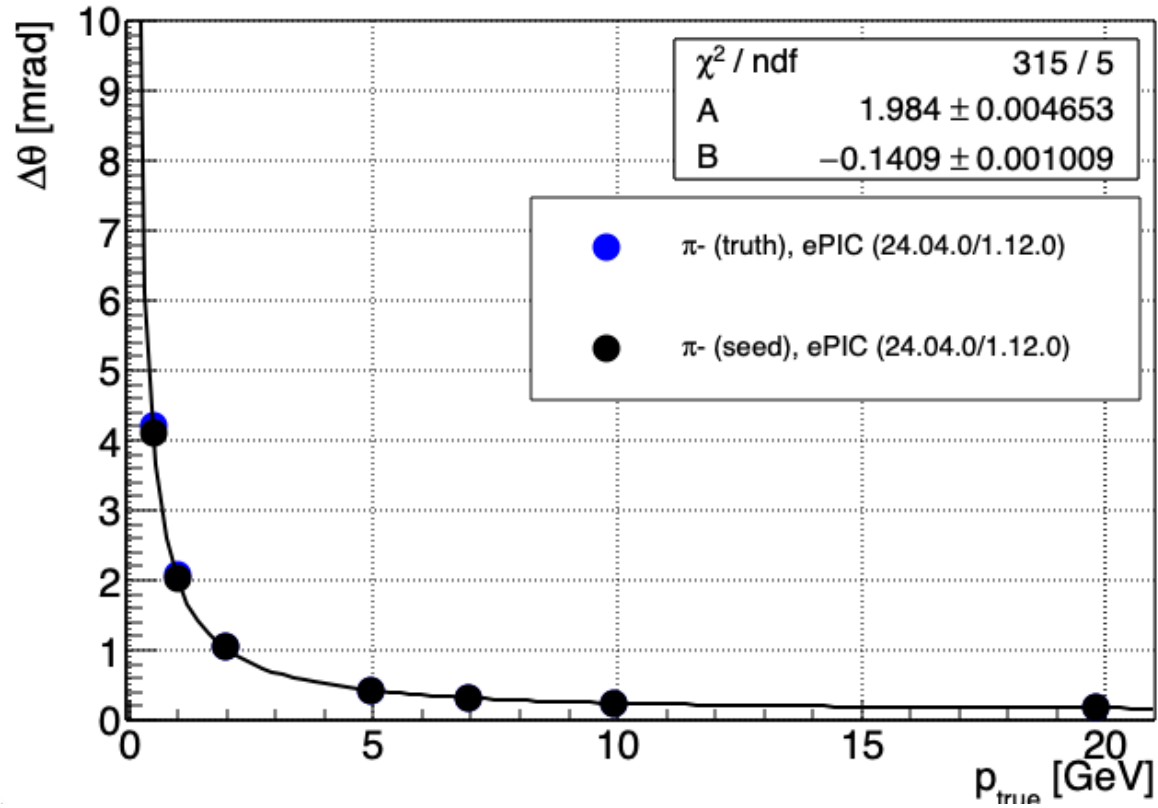


168 θ < 170, $\langle\eta\rangle = -2.34$

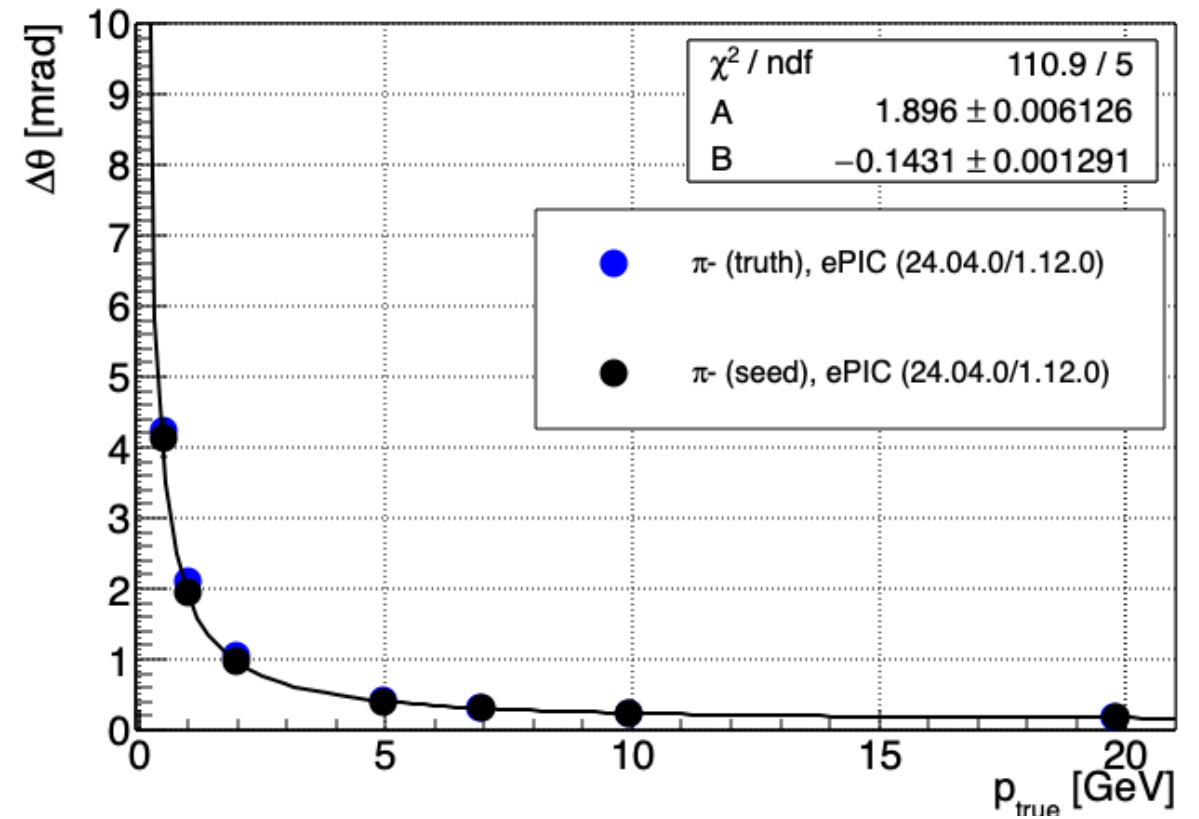


Fit Function: $\sqrt{\frac{A^2}{p[\text{GeV}]^2} + B^2}$

$172 < \theta < 174, \langle \eta \rangle = -2.80$

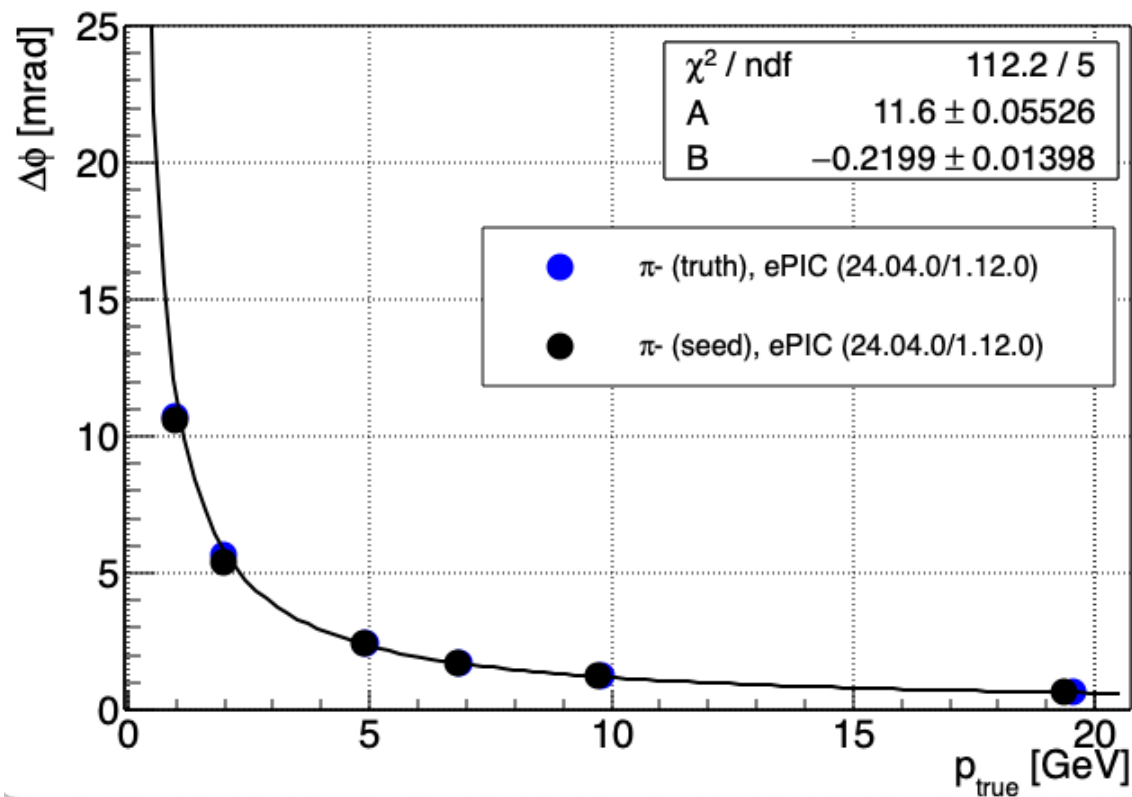


$175 < \theta < 177, \langle \eta \rangle = -3.39$

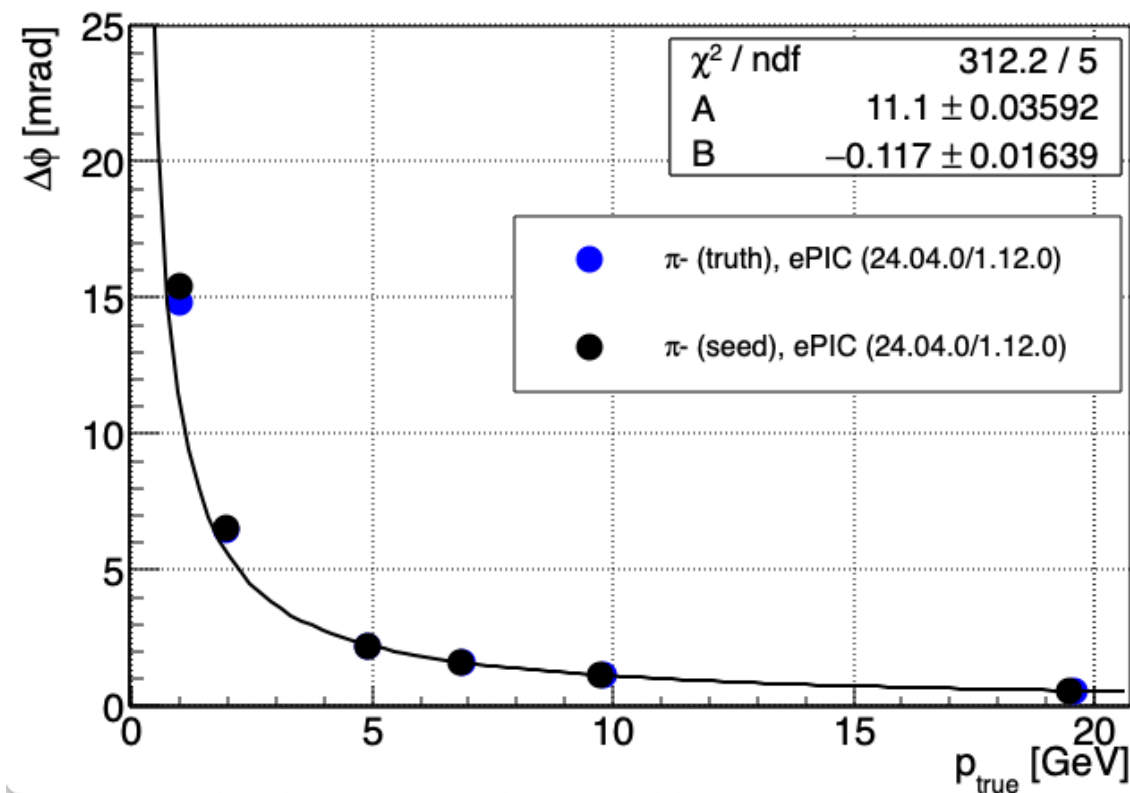


Fit Function: $\sqrt{\frac{A^2}{p[\text{GeV}]^2} + B^2}$

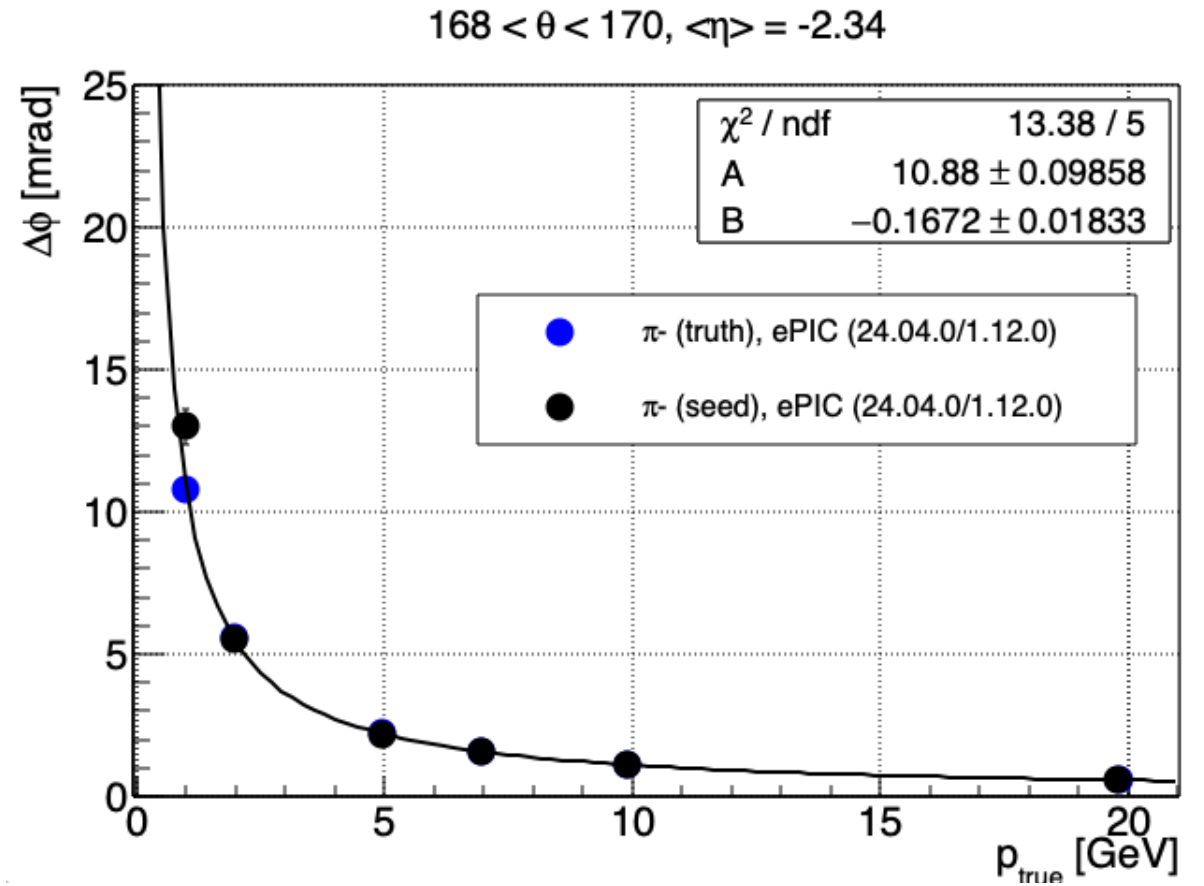
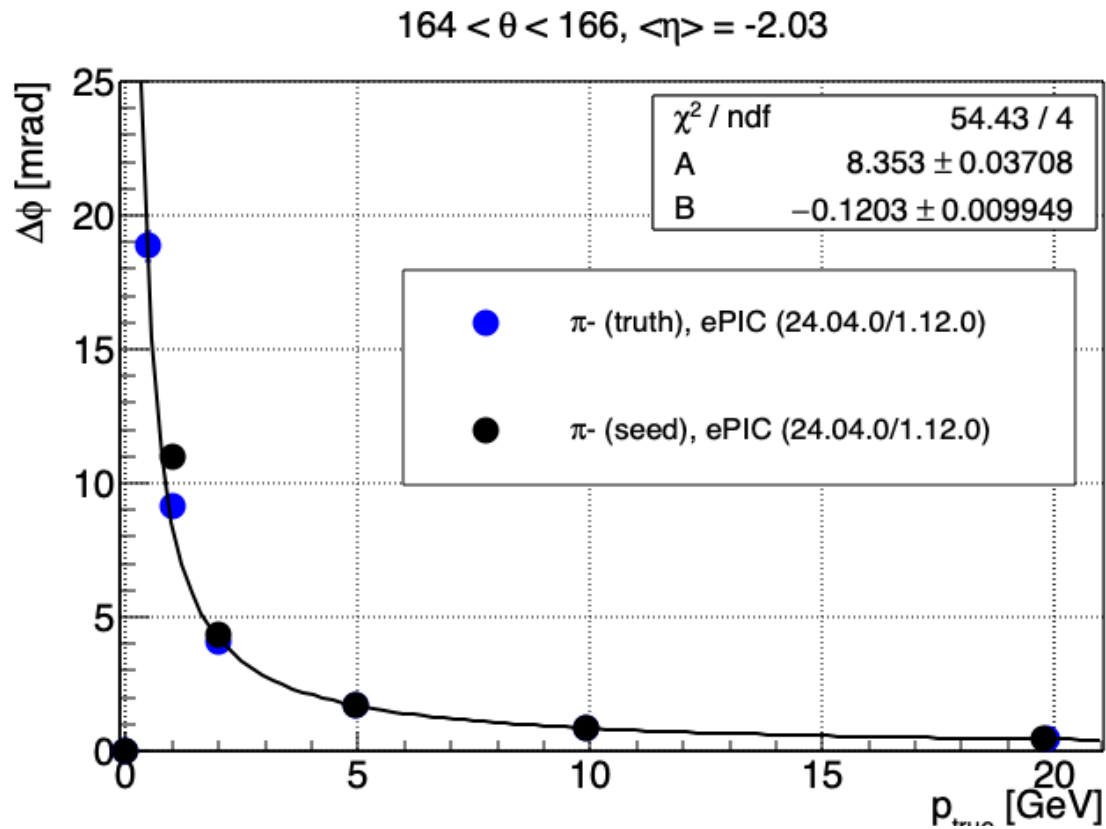
$152 < \theta < 154, \langle \eta \rangle = -1.43$



$156 < \theta < 158, \langle \eta \rangle = -1.59$

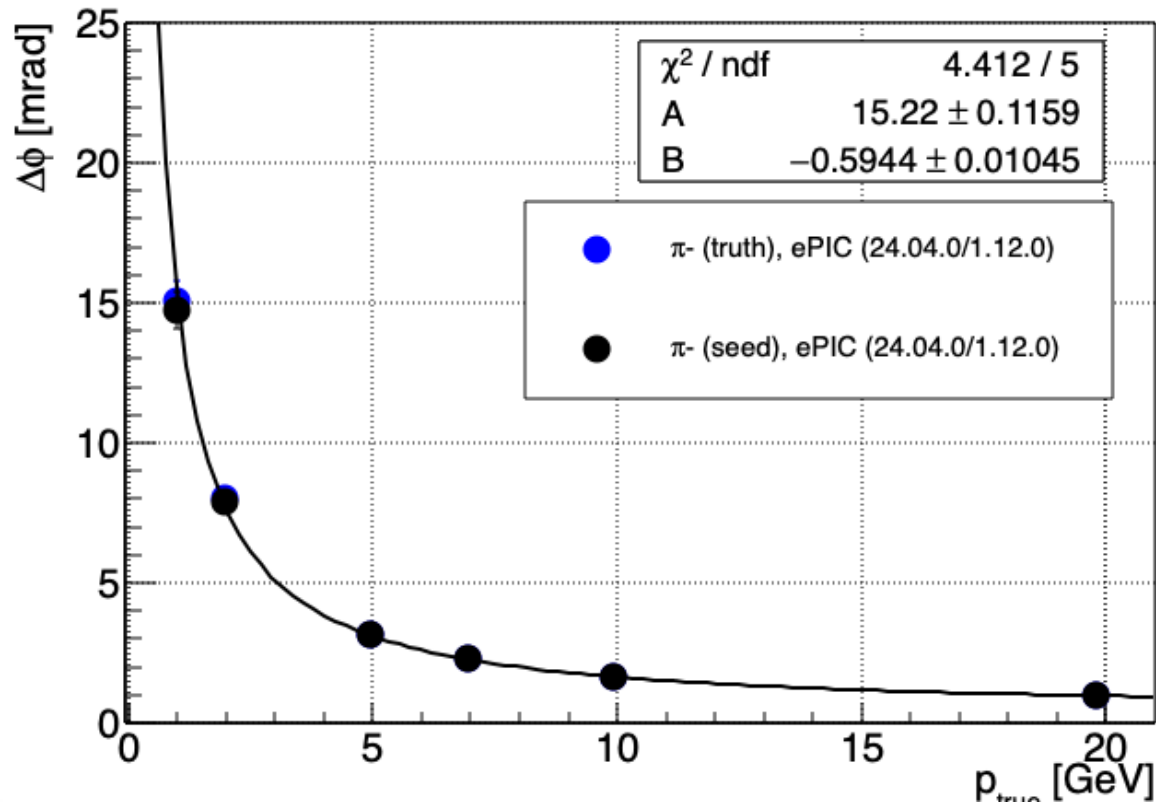


Fit Function: $\sqrt{\frac{A^2}{p[\text{GeV}]^2} + B^2}$



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