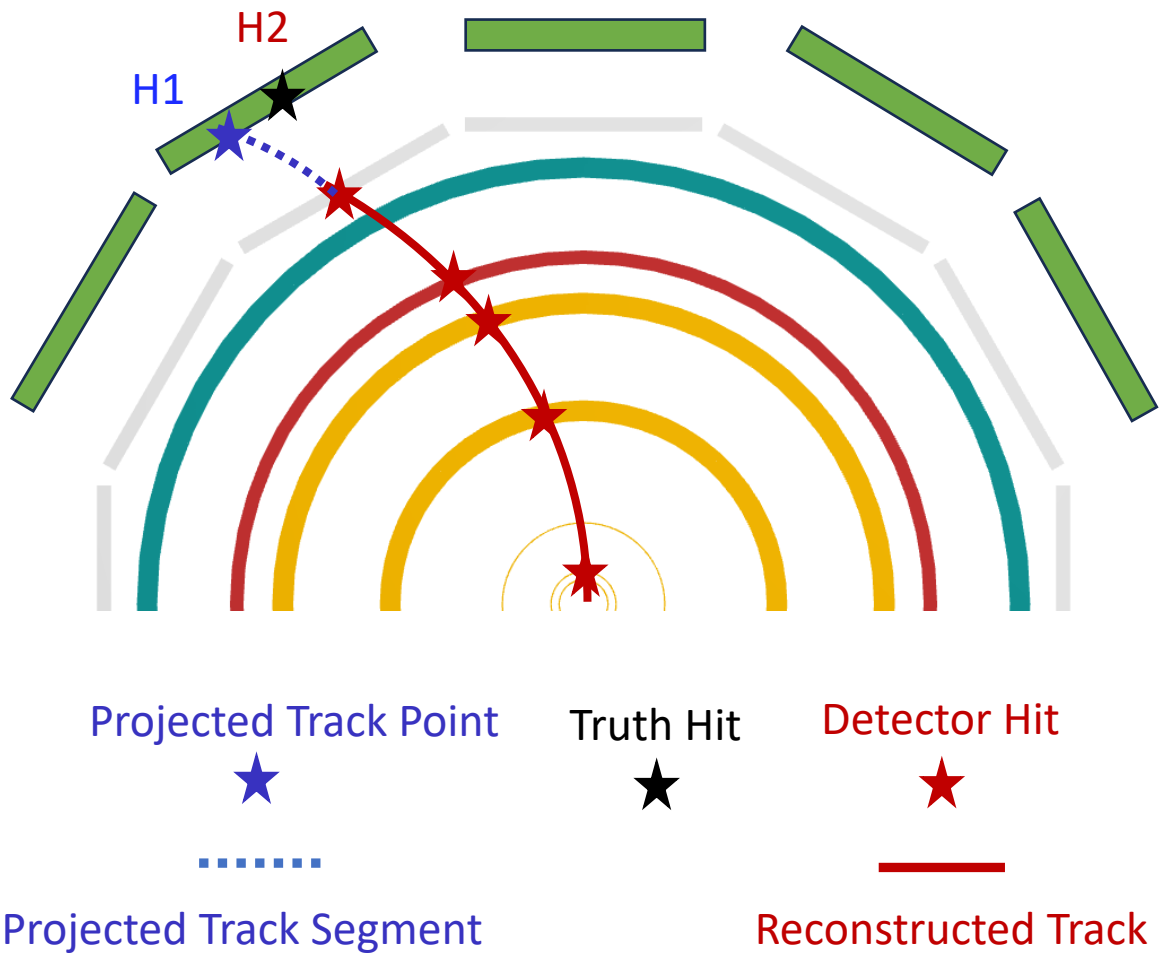
Angular Resolution Method 1

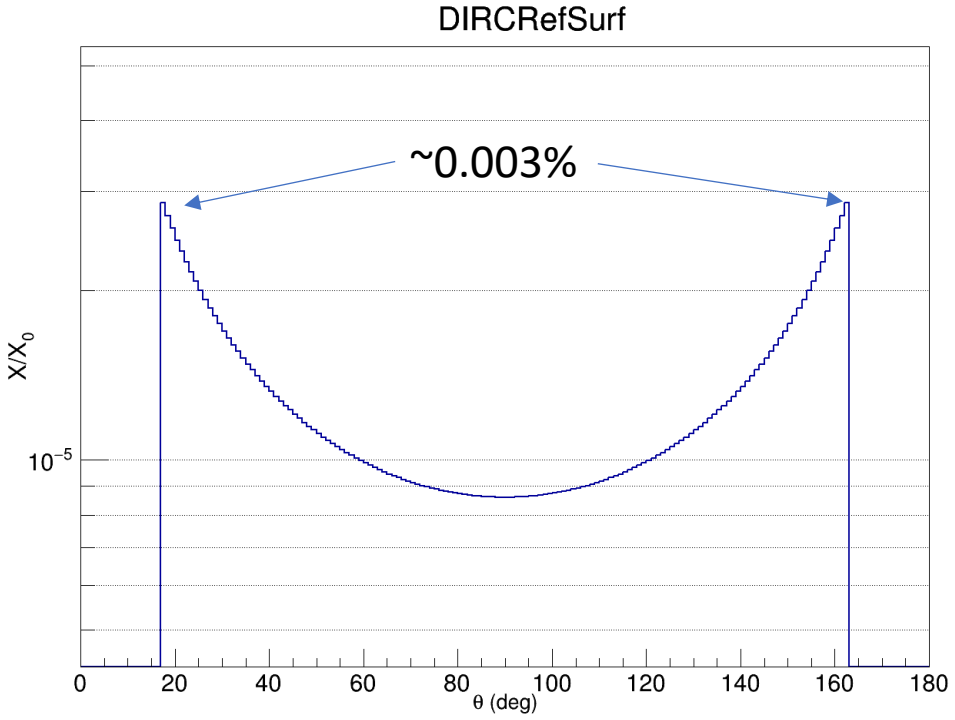
- Use projected position point vectors of projected track point (H1) and **nearest** DIRC hit (H2) to obtain angles:
  - Projected Point (x,y,z) hits → θ_{proj} , ϕ_{proj}
  - DIRC Point (x,y,z) hits → θ_{dirc} , ϕ_{dirc}
- Issue found in Method 1 presented at last Tracking WG meeting (11/9/2023)
  - Simulation hit generated in DIRC bar volume → sees that material
  - DIRC material is never passed to ACTS → propagated track never sees DIRC material

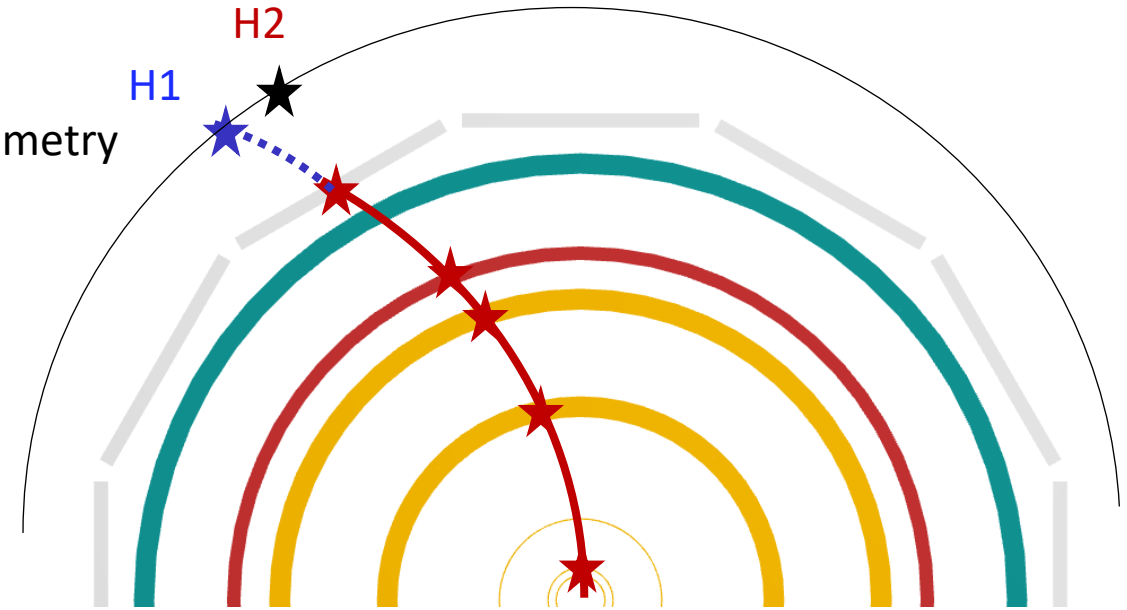
Simulation hit sees more material than propagated ACTS track



New Method 1

- Define low mass cylindrical tracking layer located at DIRC position (R = 72 cm)
- Propagate reconstructed track to this surface
  - Both hits see ~same material
  - Reference layer and ACTS propagation surface have same geometry





Projected Track Point

Reference (truth) Hit

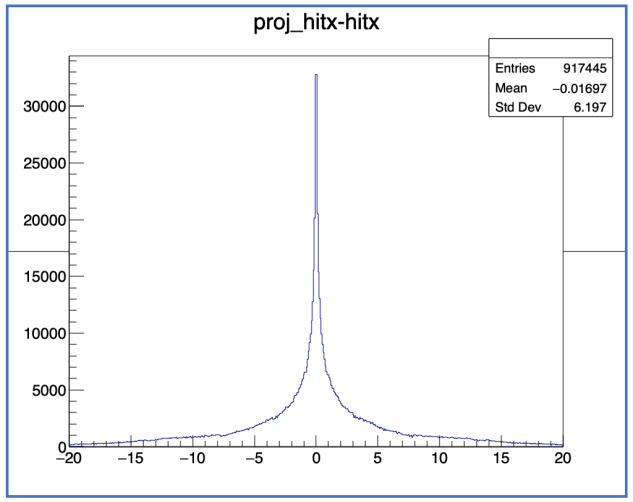
Detector Hit

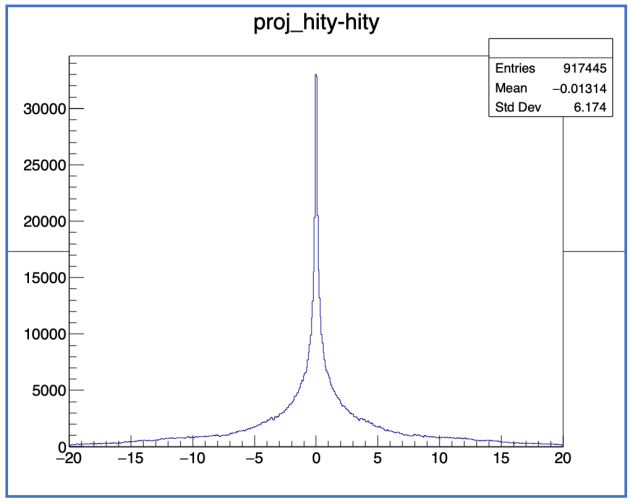
Projected Track Segment

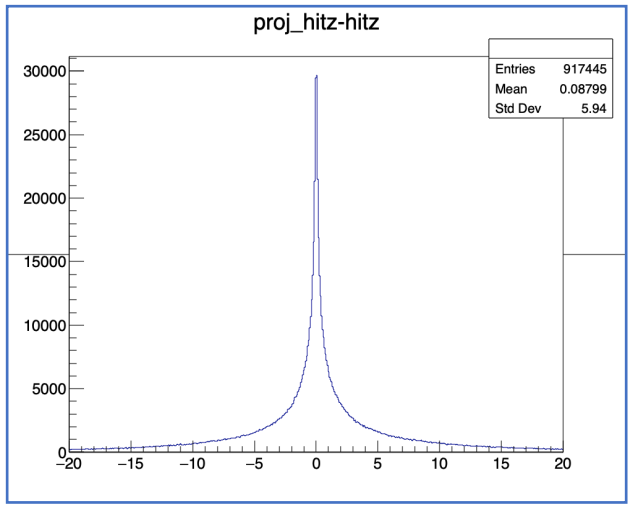
Reconstructed Track

Hit Differences

Previous Method 1 Approach

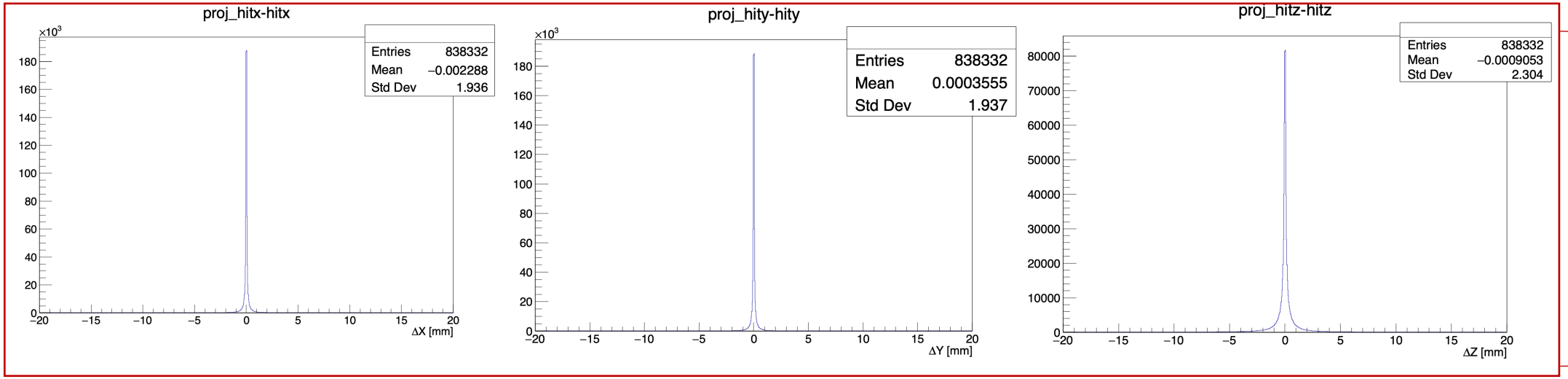






$std\ dev \sim 6\ mm$
Events ~900k

New Method 1 Approach

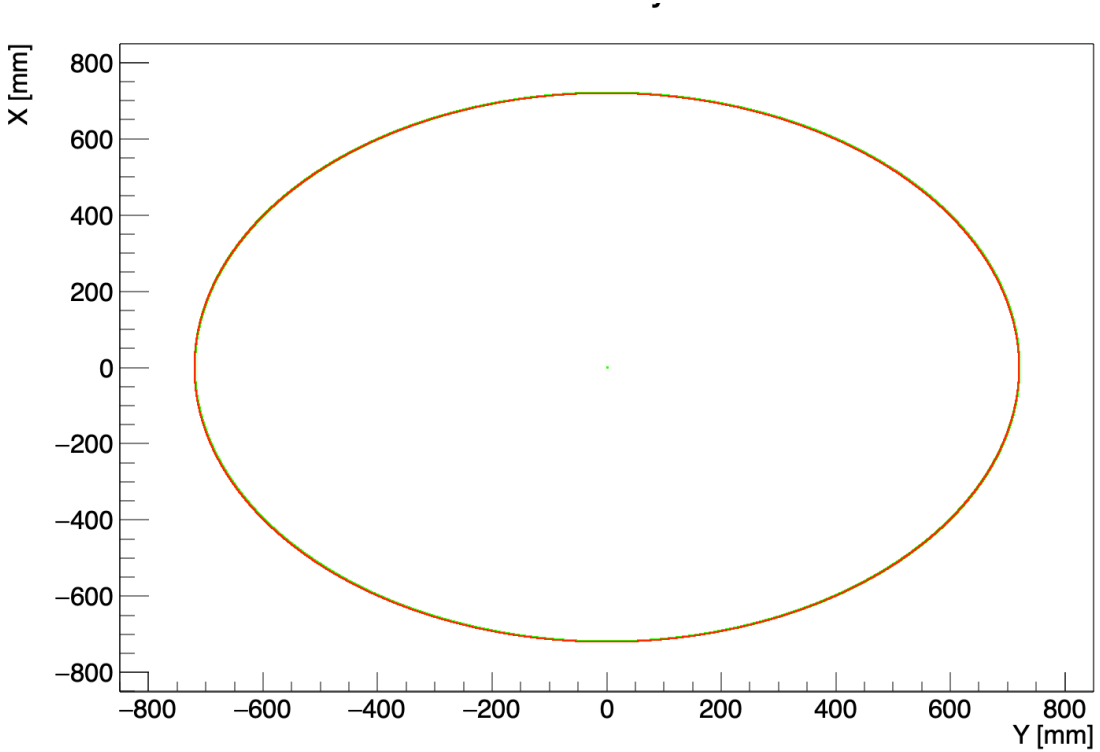


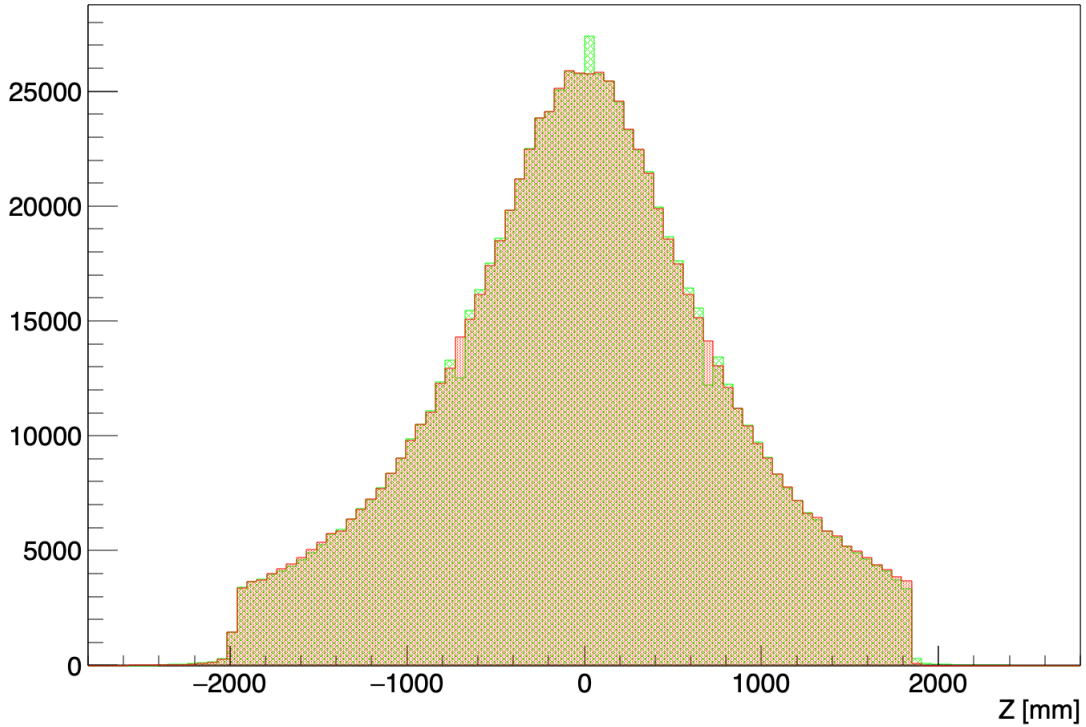
$std\ dev \sim 2\ mm$
Events ~800k

Surface Comparisons

- In revised method 1 both hit surfaces have the same geometry

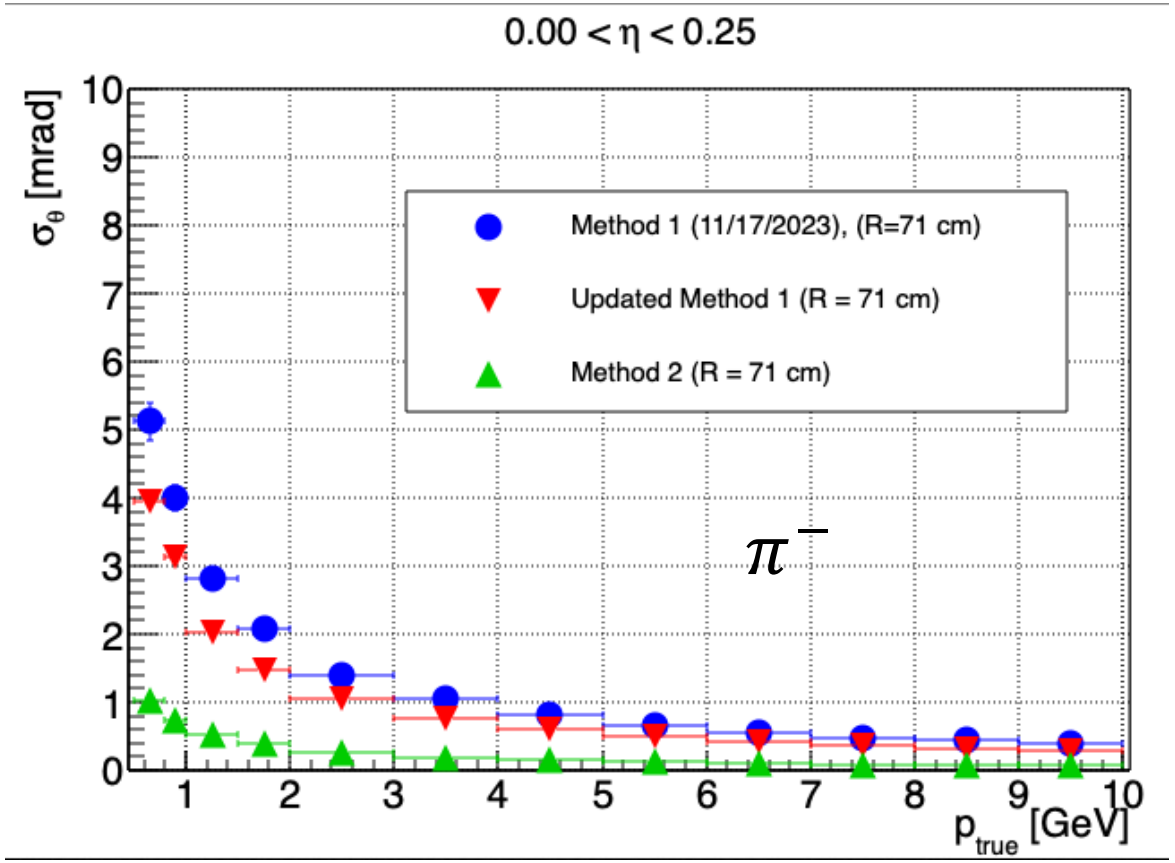
Simulation Hit Surface
Propagation Surface

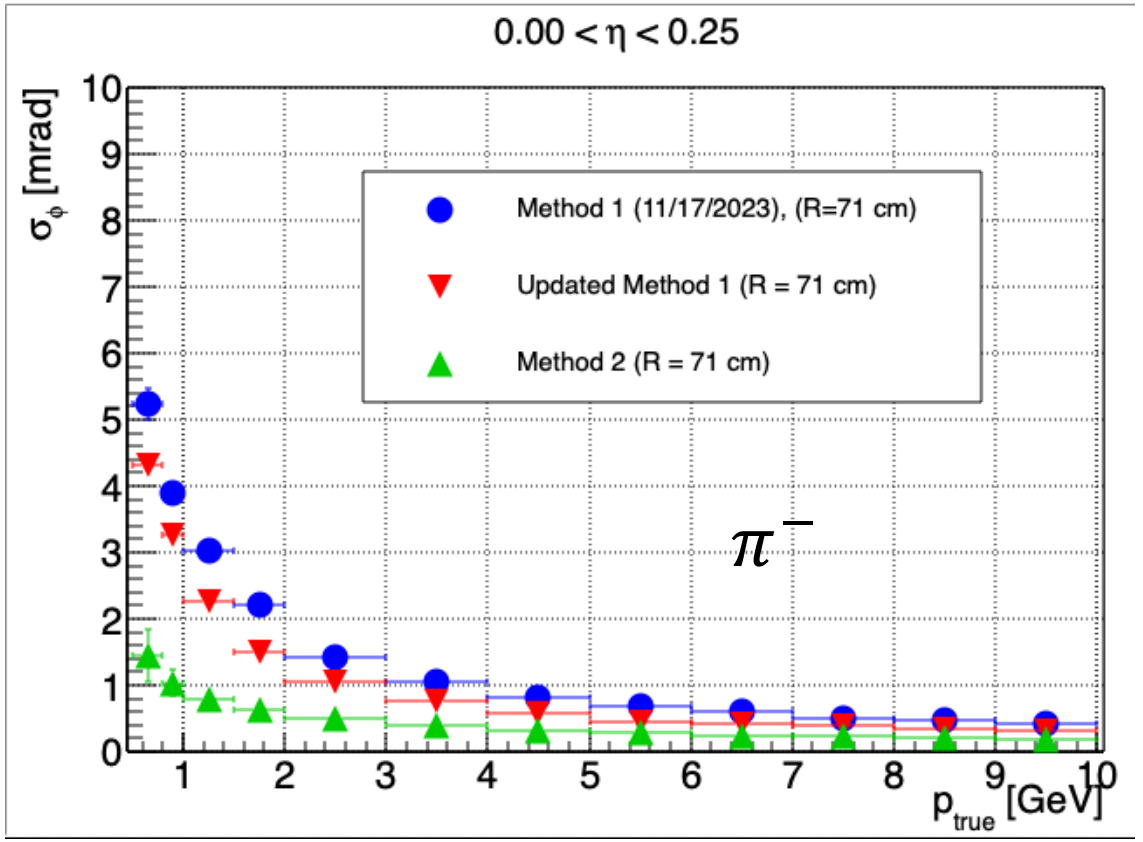




Comparisons: Pions $(0.00 < \eta < 0.25)$

- Revised Method 1 shows improvement in angular resolution, in particular at low momenta





Comparisons: Pions ($1.00 < \eta < 1.25$)

- Revised Method 1 shows improvement in angular resolution, in particular at low momenta