

$$\gamma + n \rightarrow \pi^{-} + p$$

Analysis Update

November 22, 2021

Phoebe Sharp

Skimming criteria for $\gamma + n \rightarrow \pi^- + p$

- Exactly 1 positively charged track
- Exactly 1 negatively charged track
- Exactly 0 neutral showers

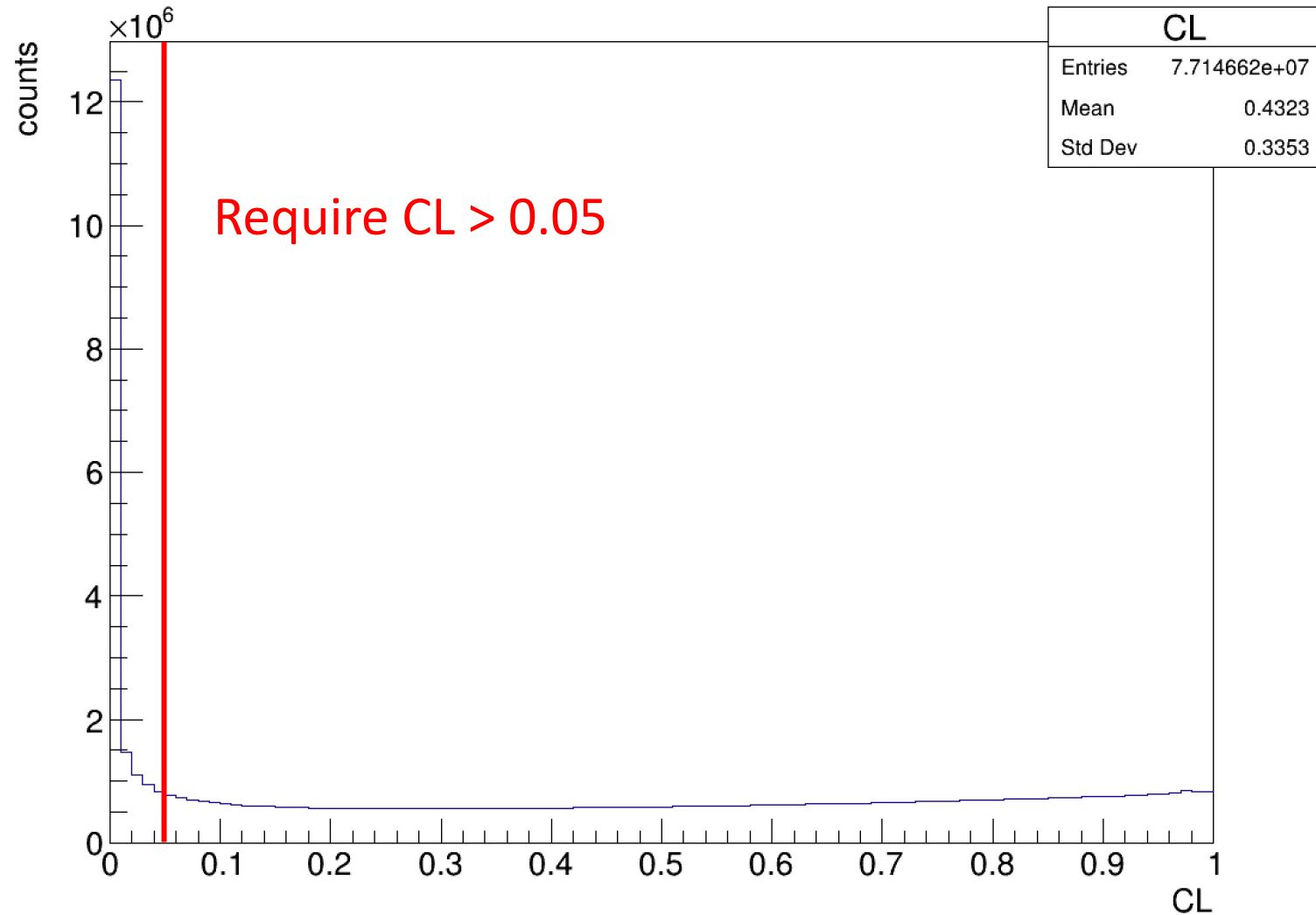
Performed a kinematic fit requiring:

- Positive and negative tracks have the same vertex

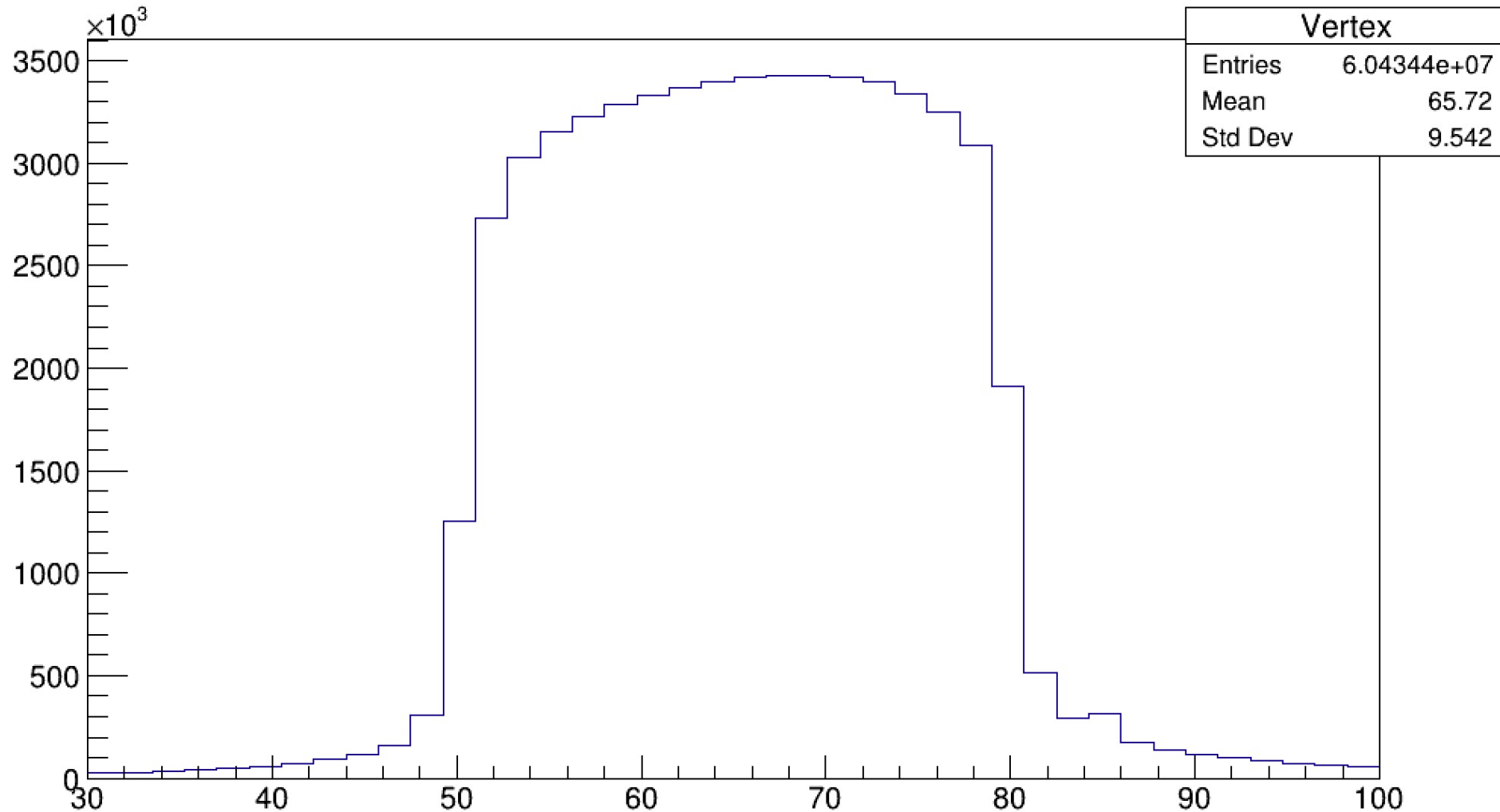
Analyzing He data to start

Kinematic Fit Result (Helium)

Confident Level



Reconstructed Z-vertex position



Vertex position clearly shows the helium cell in the expected place.

Selecting Good Events

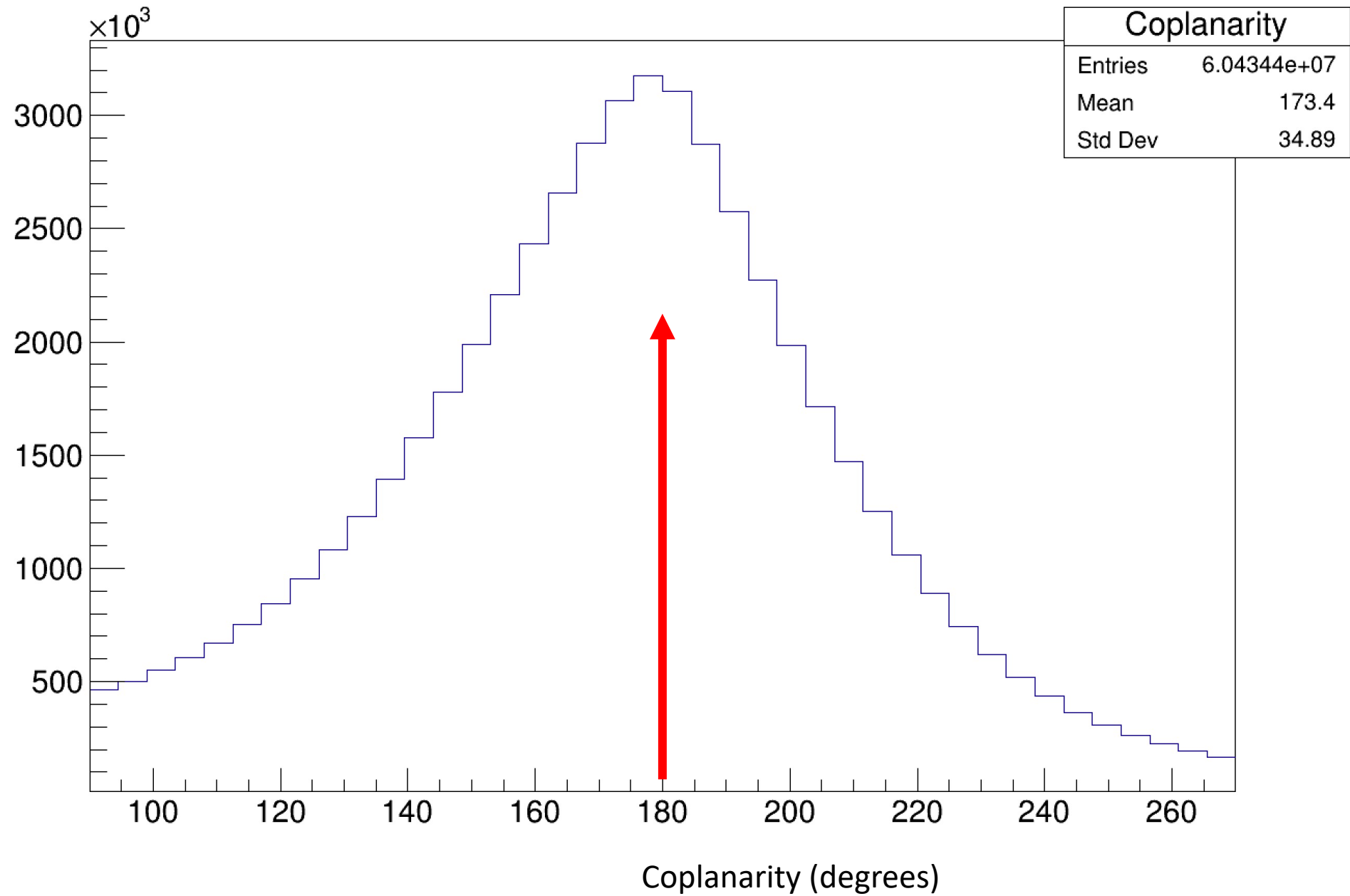
(not using beam photon energy yet)

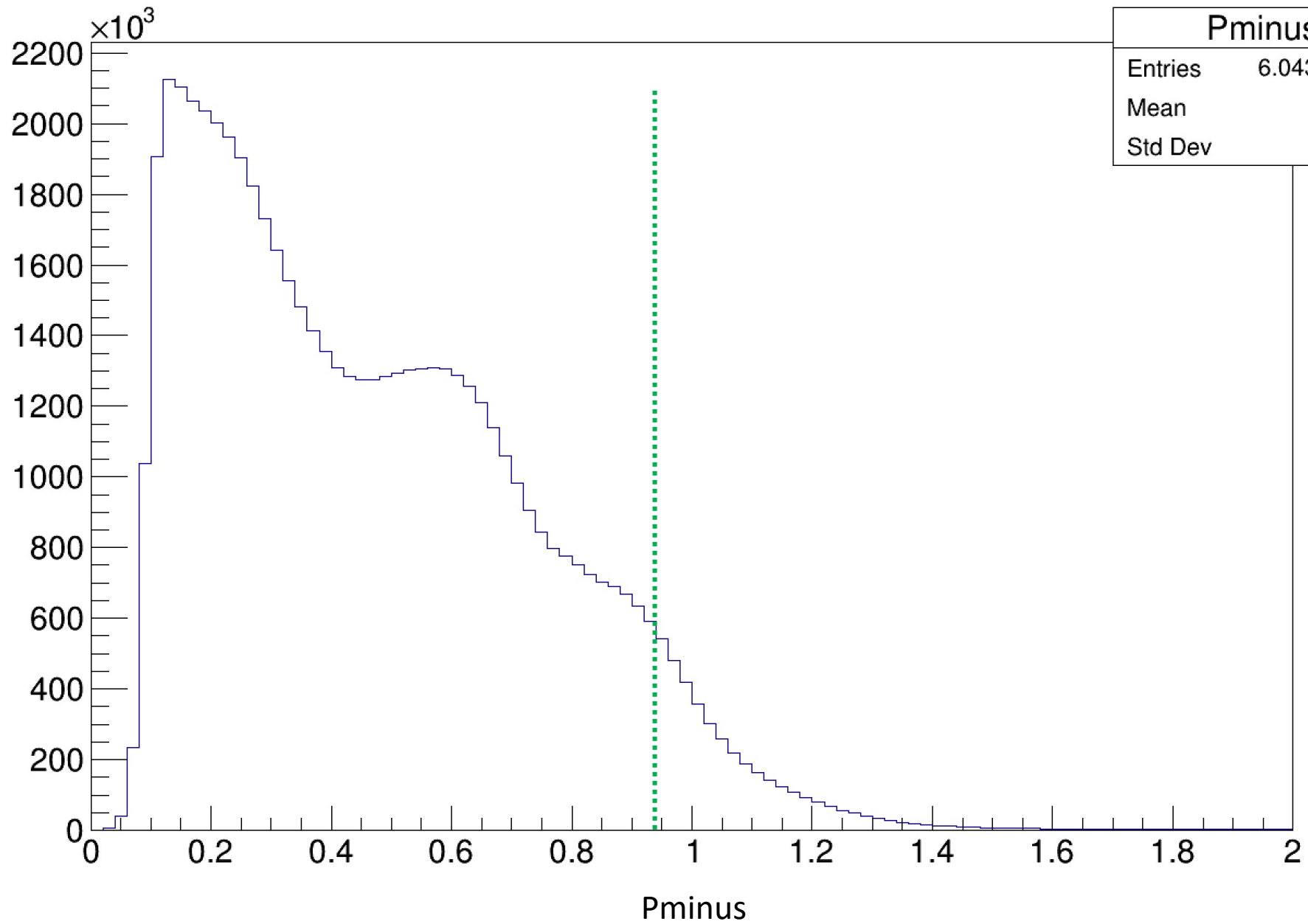
- Coplanarity

- $\gamma + n \rightarrow \pi^- + p$ events should be 180° apart in azimuth.

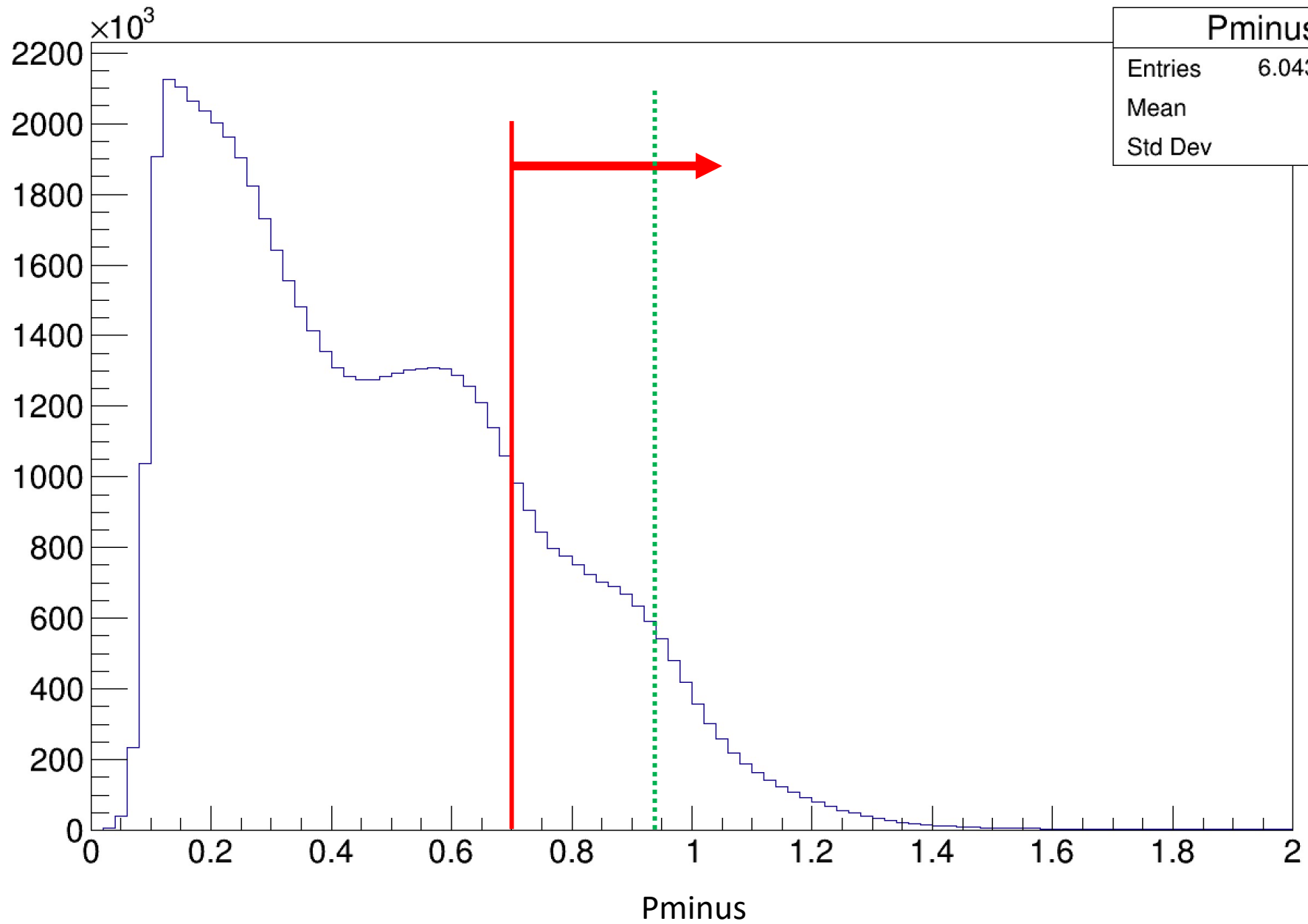
- Total Final Minus Momentum

- $P^- \equiv E^\pi - p_z^\pi + E^p - p_z^p$
- Should be close to the nucleon mass if there are no other undetected particles.

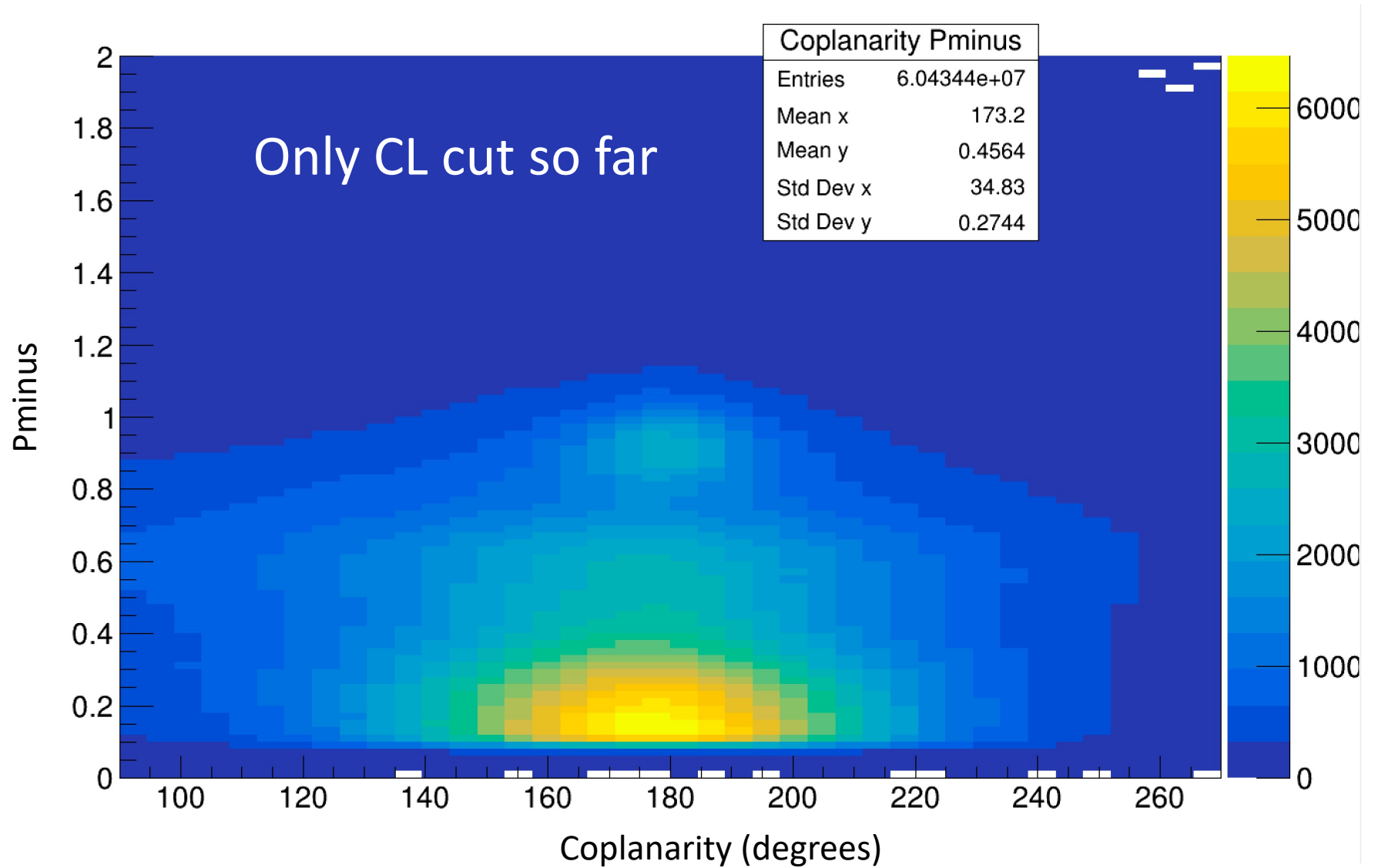




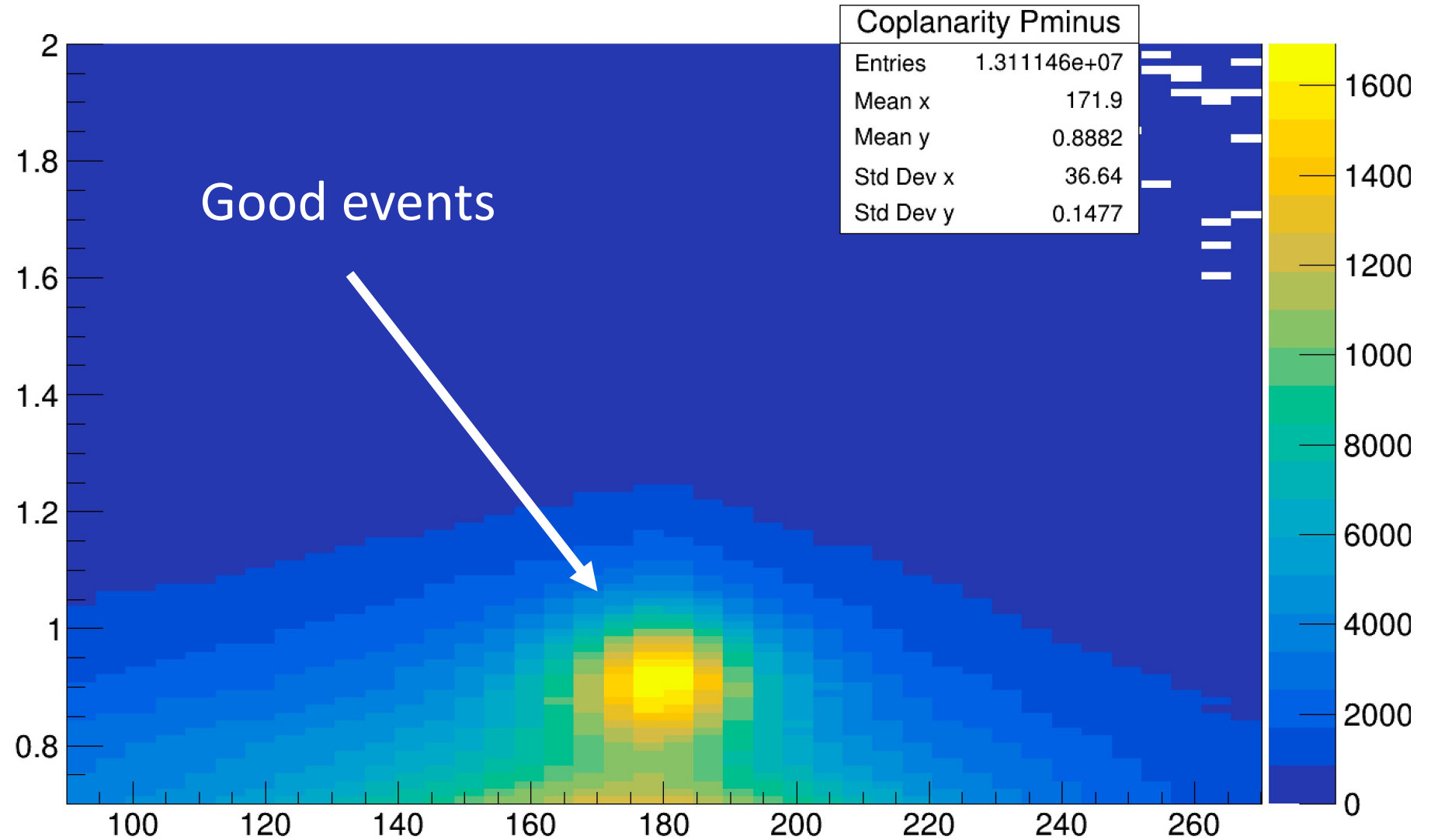
Pminus	
Entries	6.04344e+07
Mean	0.4722
Std Dev	0.2786



Over All He Data:

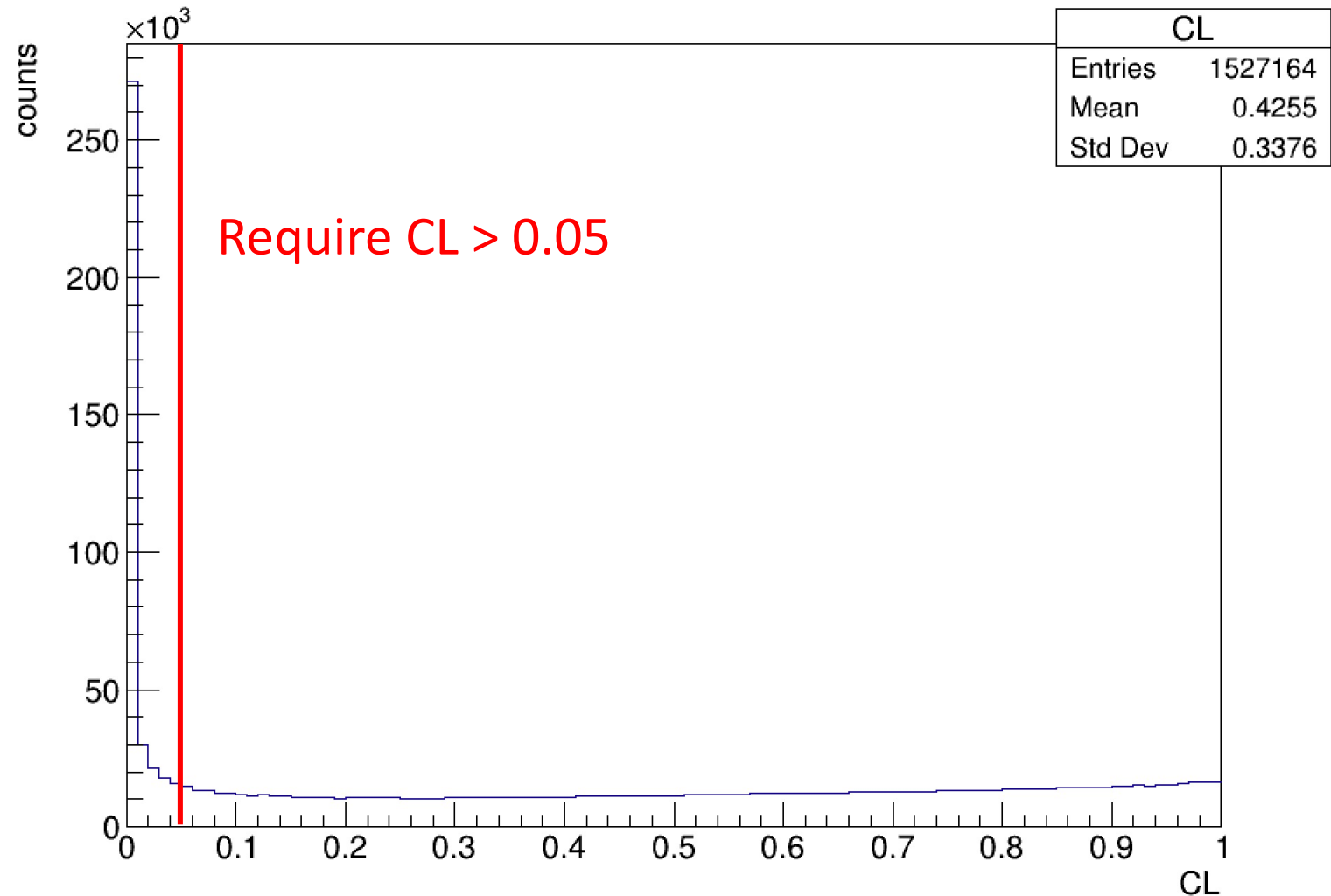


Reduced He Data:

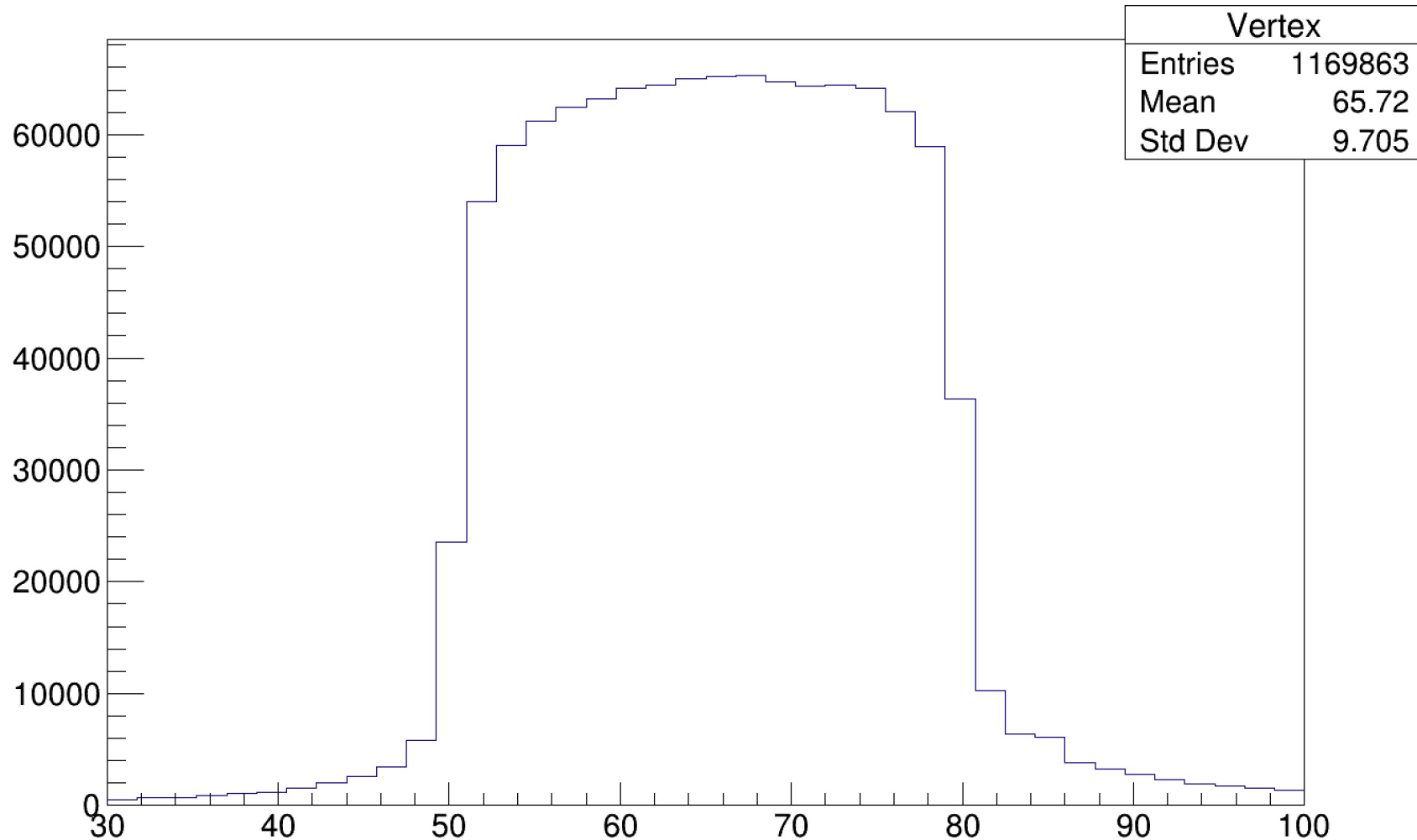


Kinematic Fit Result (Deuterium)

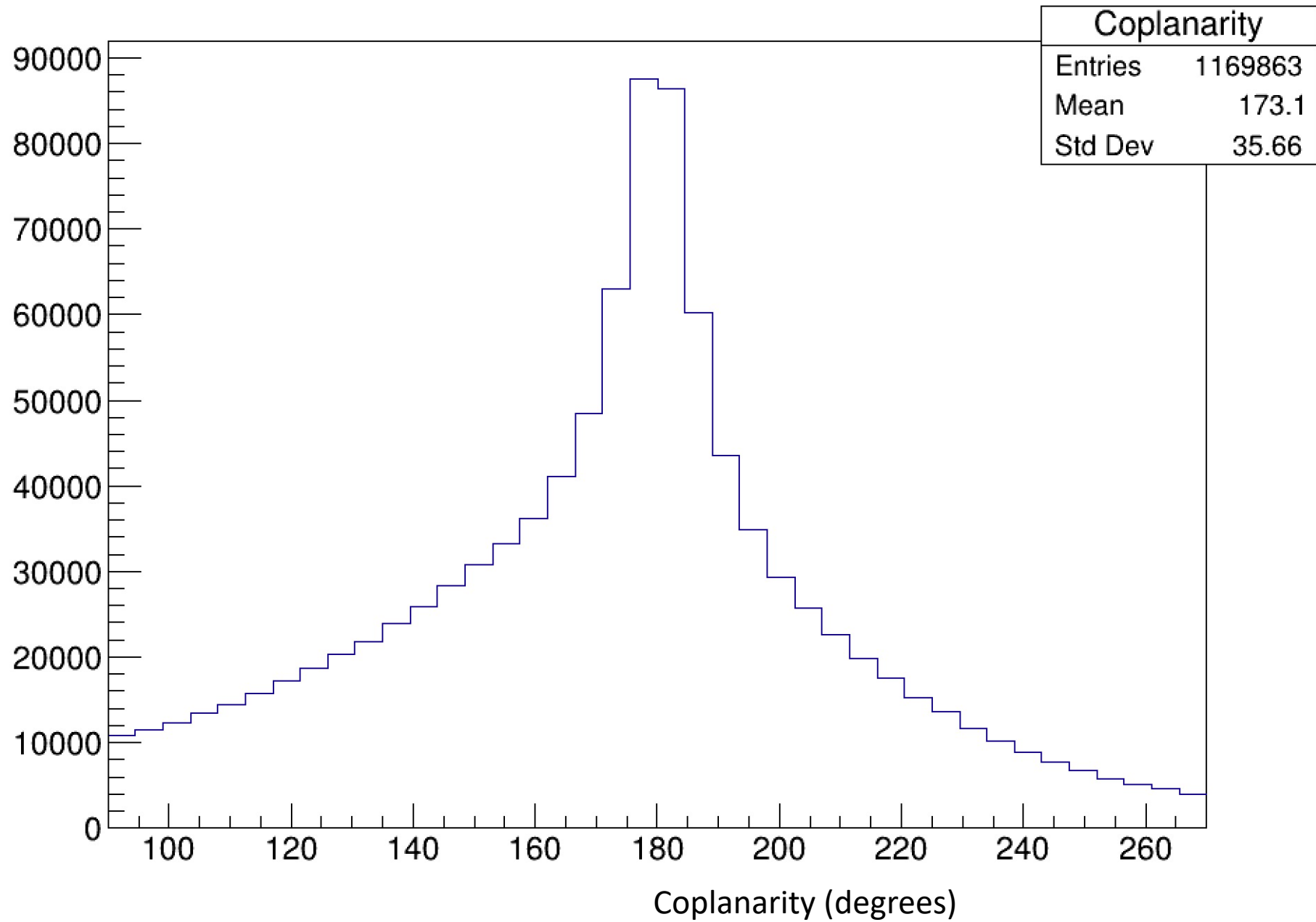
Confident Level

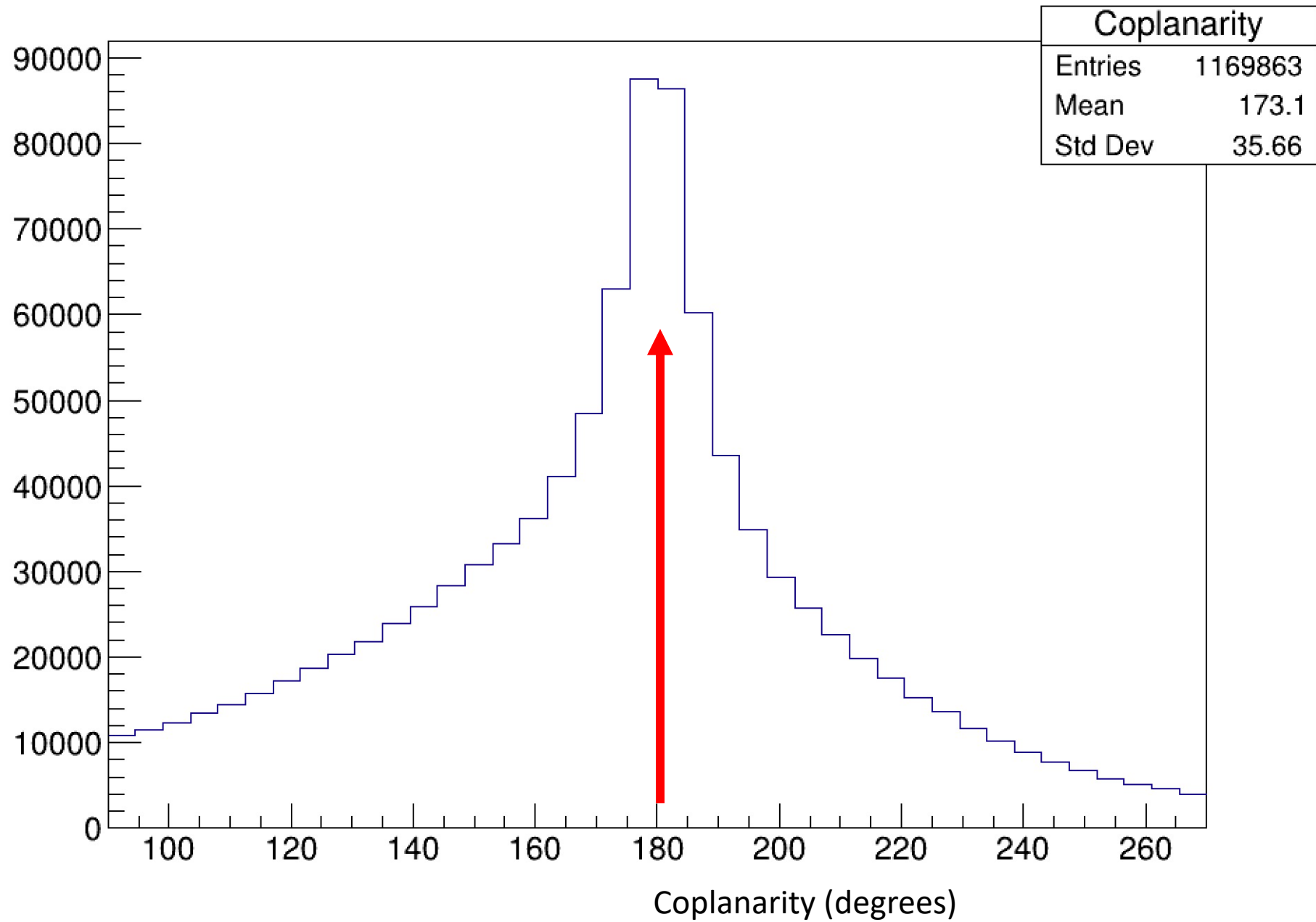


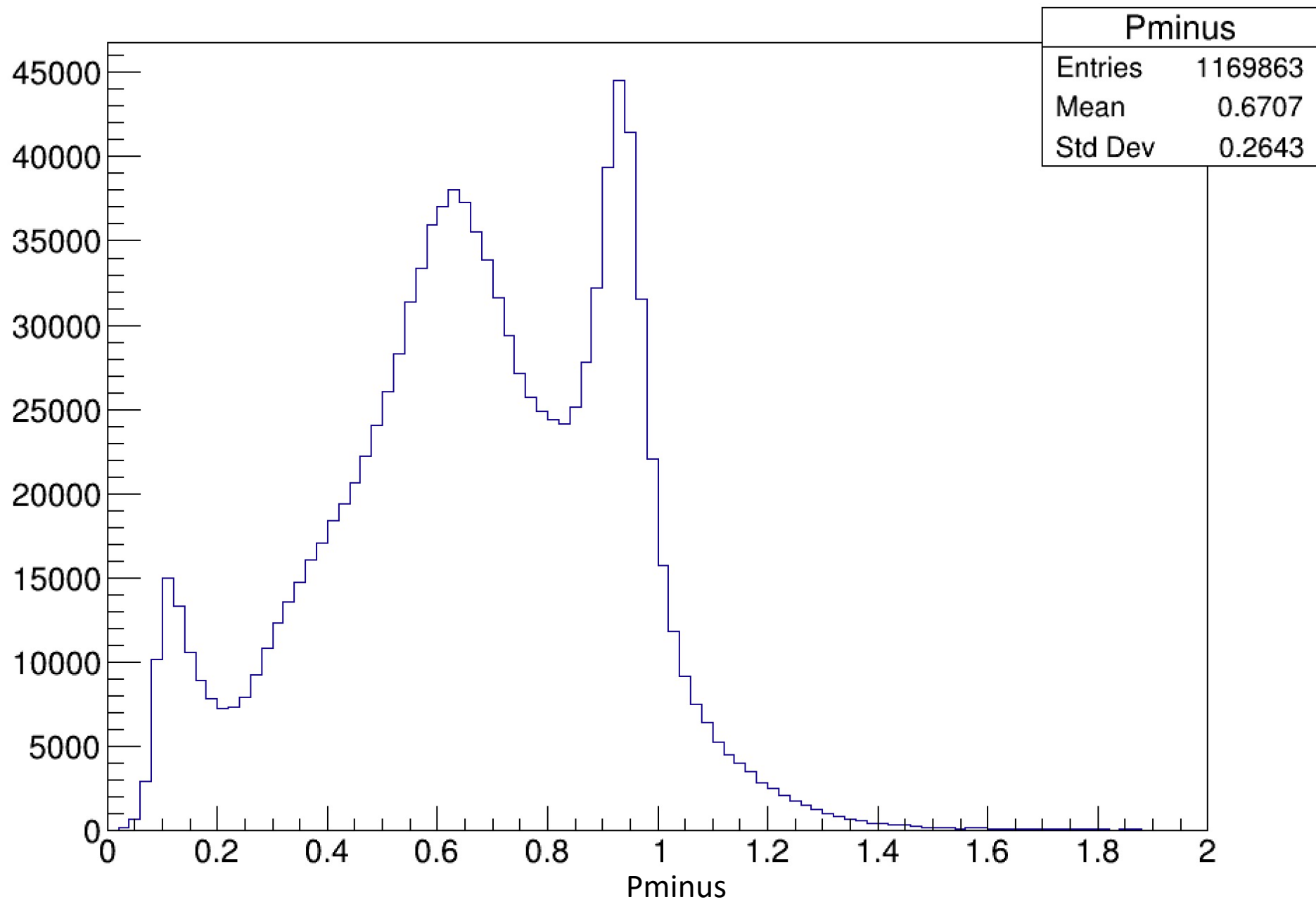
Reconstructed Z-vertex position



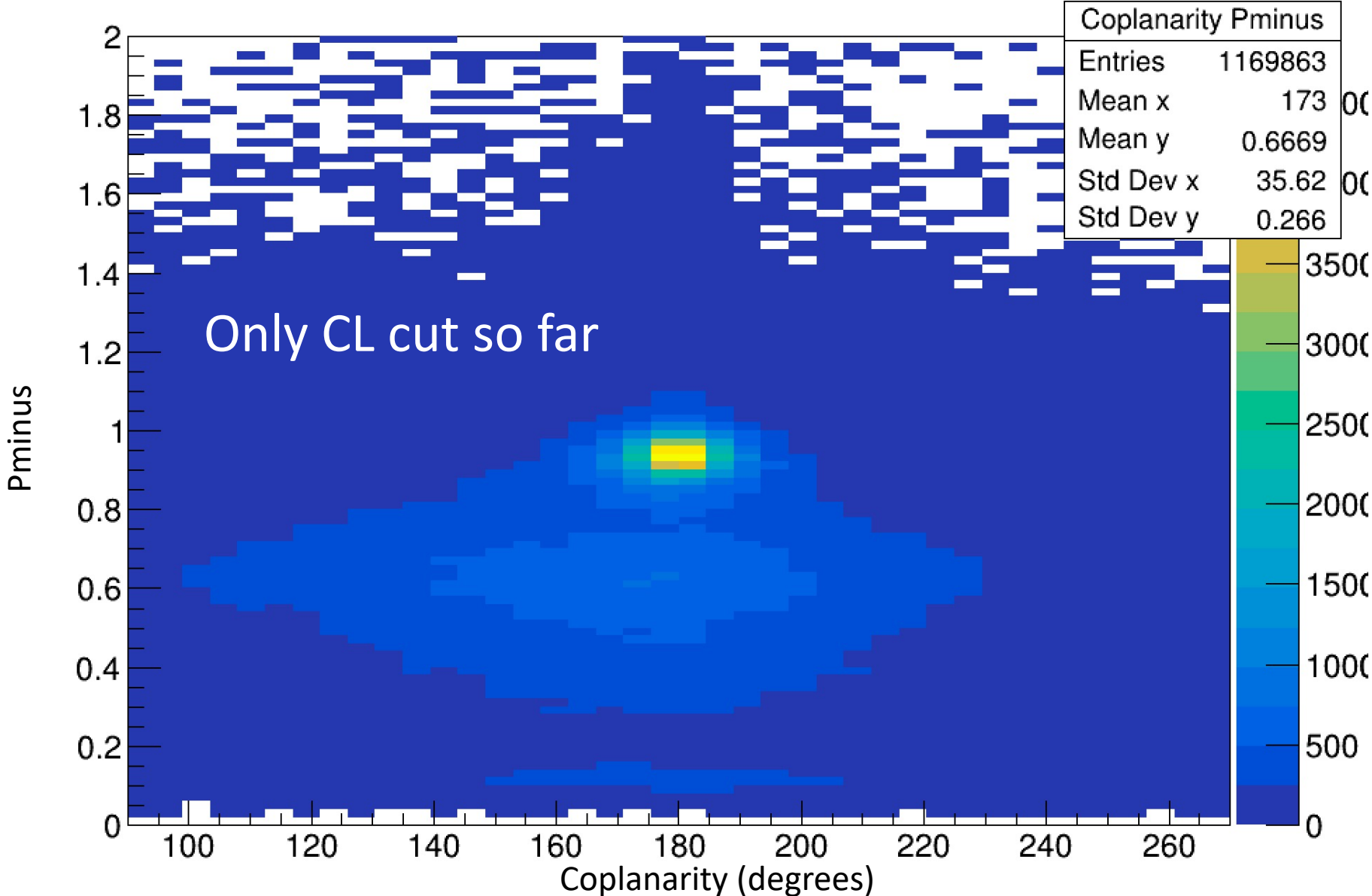
Vertex position clearly shows the deuterium cell in the expected place.







Over Some Deuterium Data:



Take-Aways:

- **We see the $[\pi^- + p]$ channel!**
- Now to:
 - make more cuts to narrow in on good π^- events, and
 - compare with the proposal...