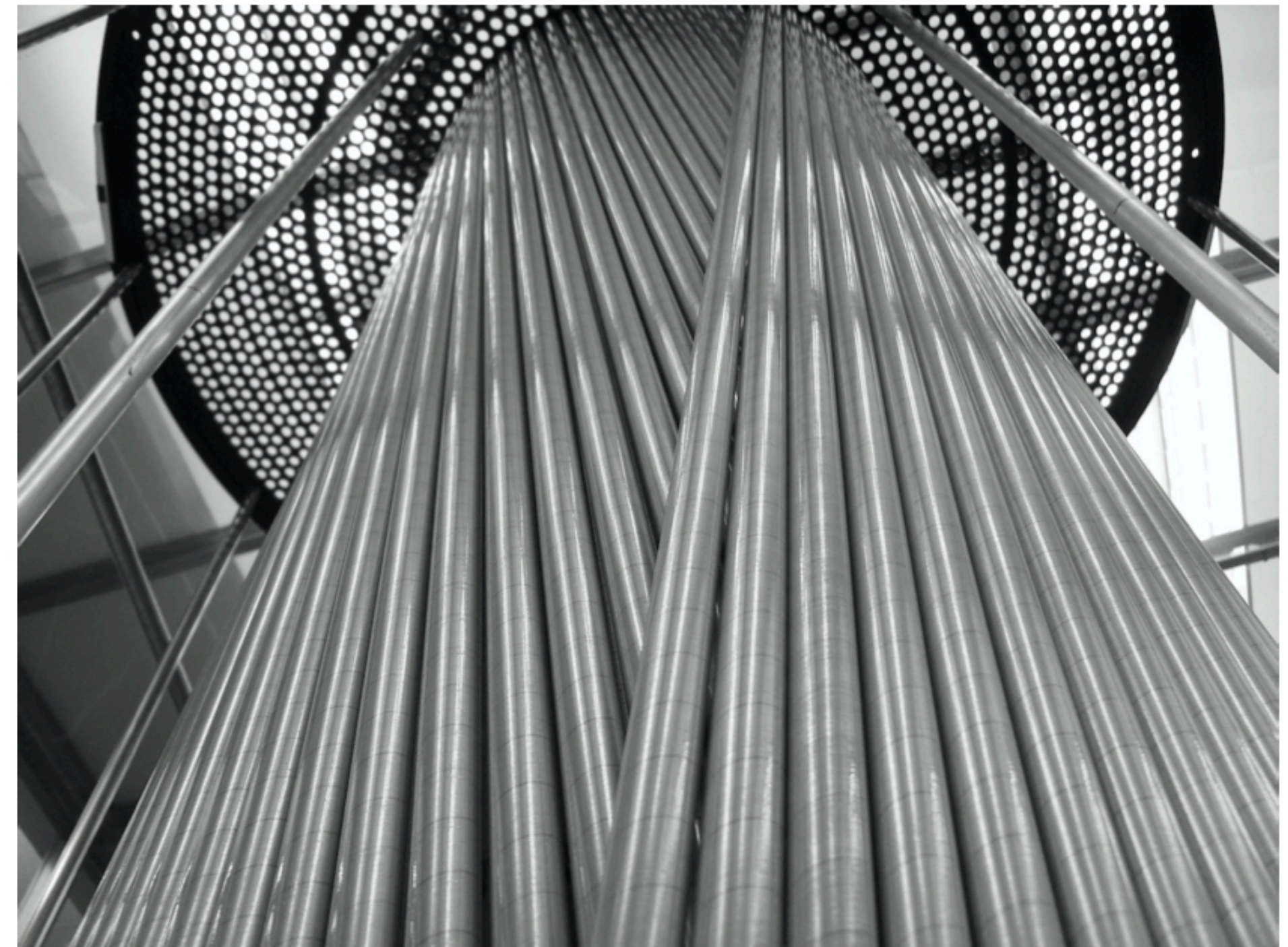


# **Central Drift Chamber Calibrations**

**Phoebe Sharp August 17, 2021**

# Central Drift Chamber

- Cylindrical, straw-tube wire chamber
  - 3522 straw tubes arranged in 28 layers: 12 axial and 16 at  $\pm 6^\circ$  offset from axial
  - Straws are 1.5 m long with 1.6 cm diameter
  - Gold-plated tungsten wire as the anode
  - 50:50 mix of Ar:CO<sub>2</sub> flows through straws
- Used to detect and track charged particles with momenta  $p > 0.25$  GeV/c
- Can also be used for PID using  $dE/dx$



# 2 Types of Calibration

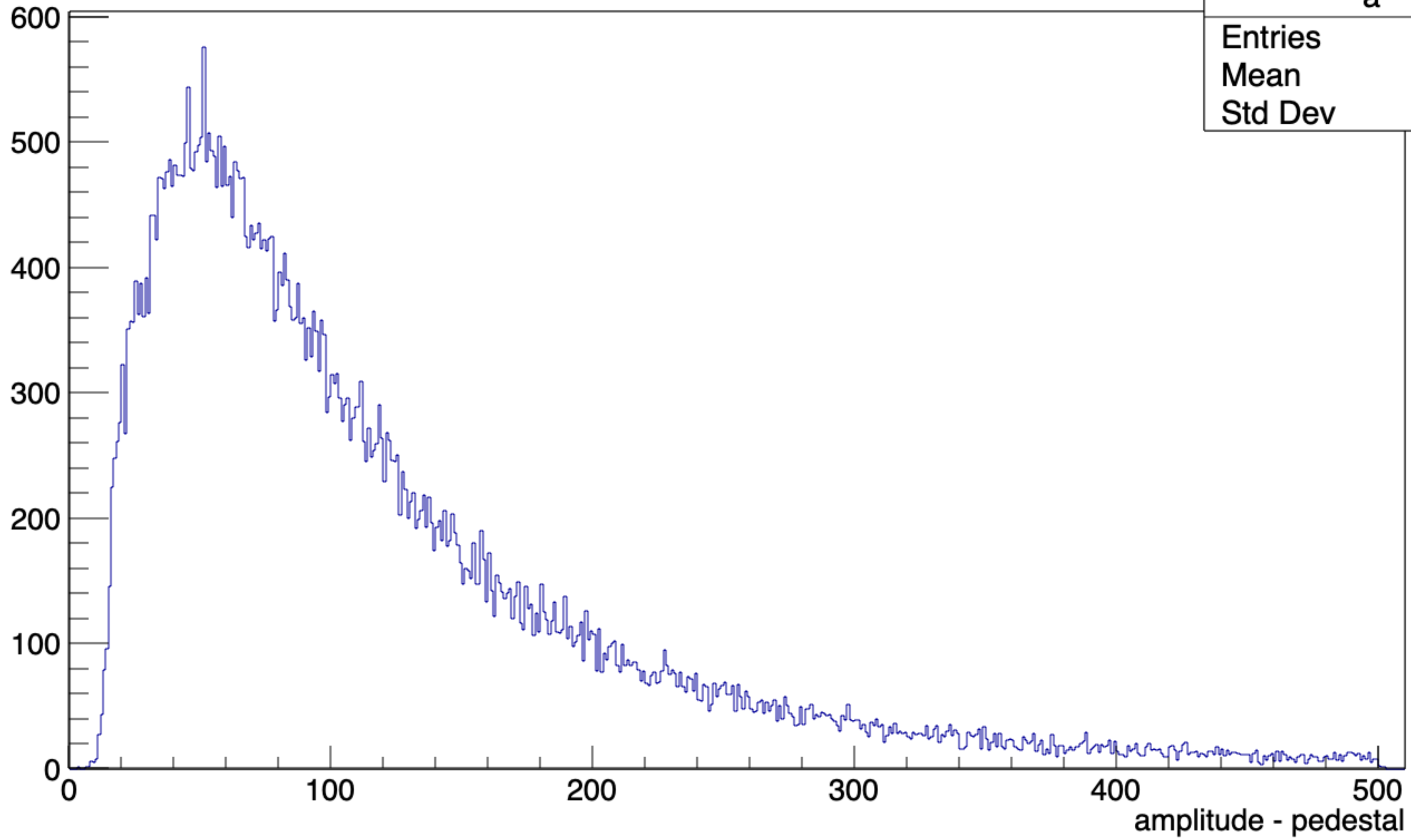
- Gain
  - Calculate the gain for each wire, the gain of the chamber, and to find dead straws
  - Wire gains are with respect to the sum of all the wire gains
  - Automatically calibrates the entire chamber
  - Process of Gain Calibration:
    - Fit Landau curve to each wire's gain and the sum of wires' gain histogram
    - Scale individual wire gain for fitted most probable value (mpv) of Landau fit to the fitted most probable value (mpv) of Landau fit to the sum of wires' gain histogram



# Gain Calibration

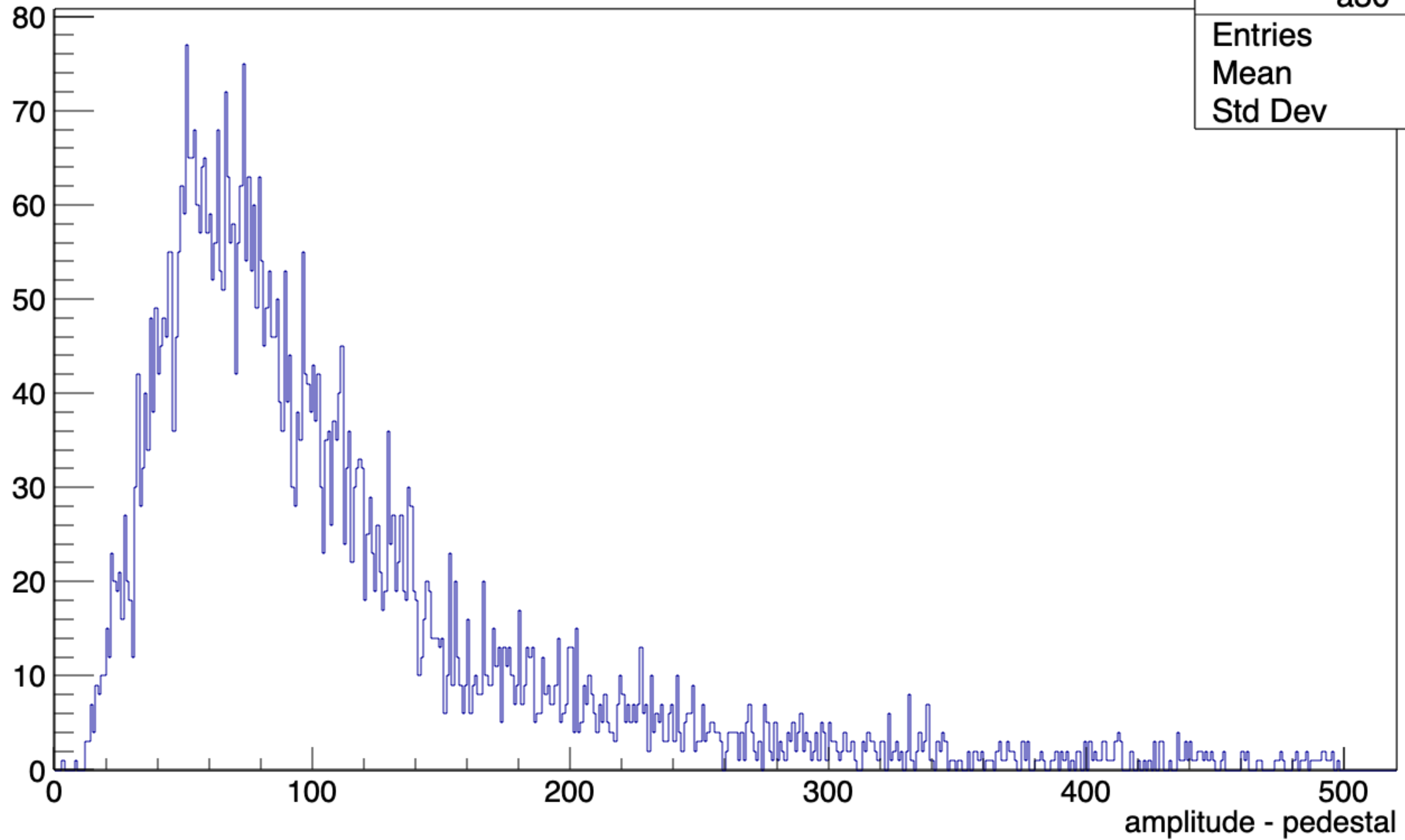
- Many plots are produced:
  - Amplitude vs number/time/angle/etc. of hist on tracks
  - Amplitude vs number/time/angle/etc. of hist on tracks with cuts on drift time in particular regions of the detector
  - Amplitude vs distance of closest approach (DOCA) [in certain regions of the detector]

# CDC amplitude (hits on tracks)

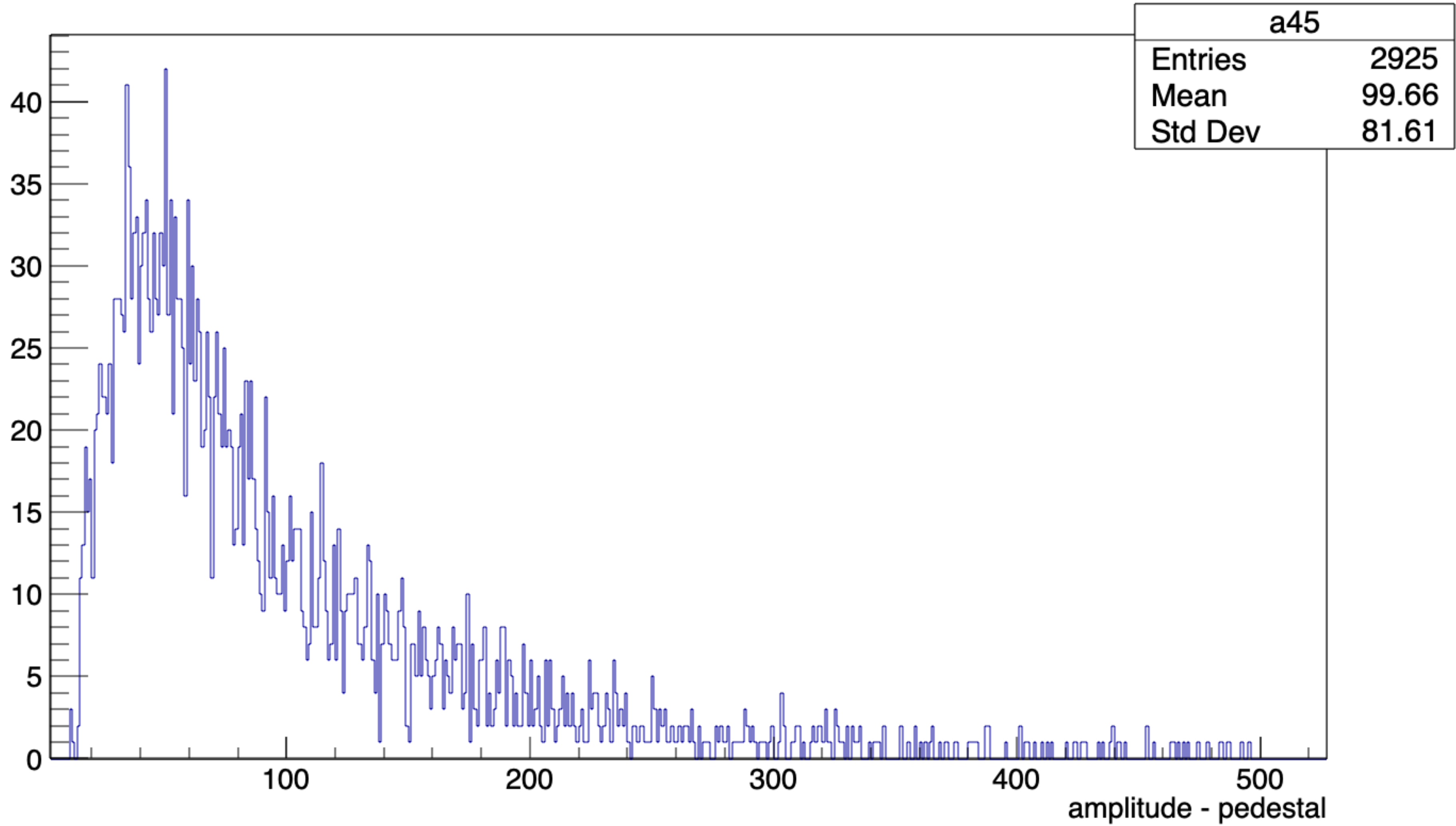


a	
Entries	63174
Mean	117.1
Std Dev	90.39

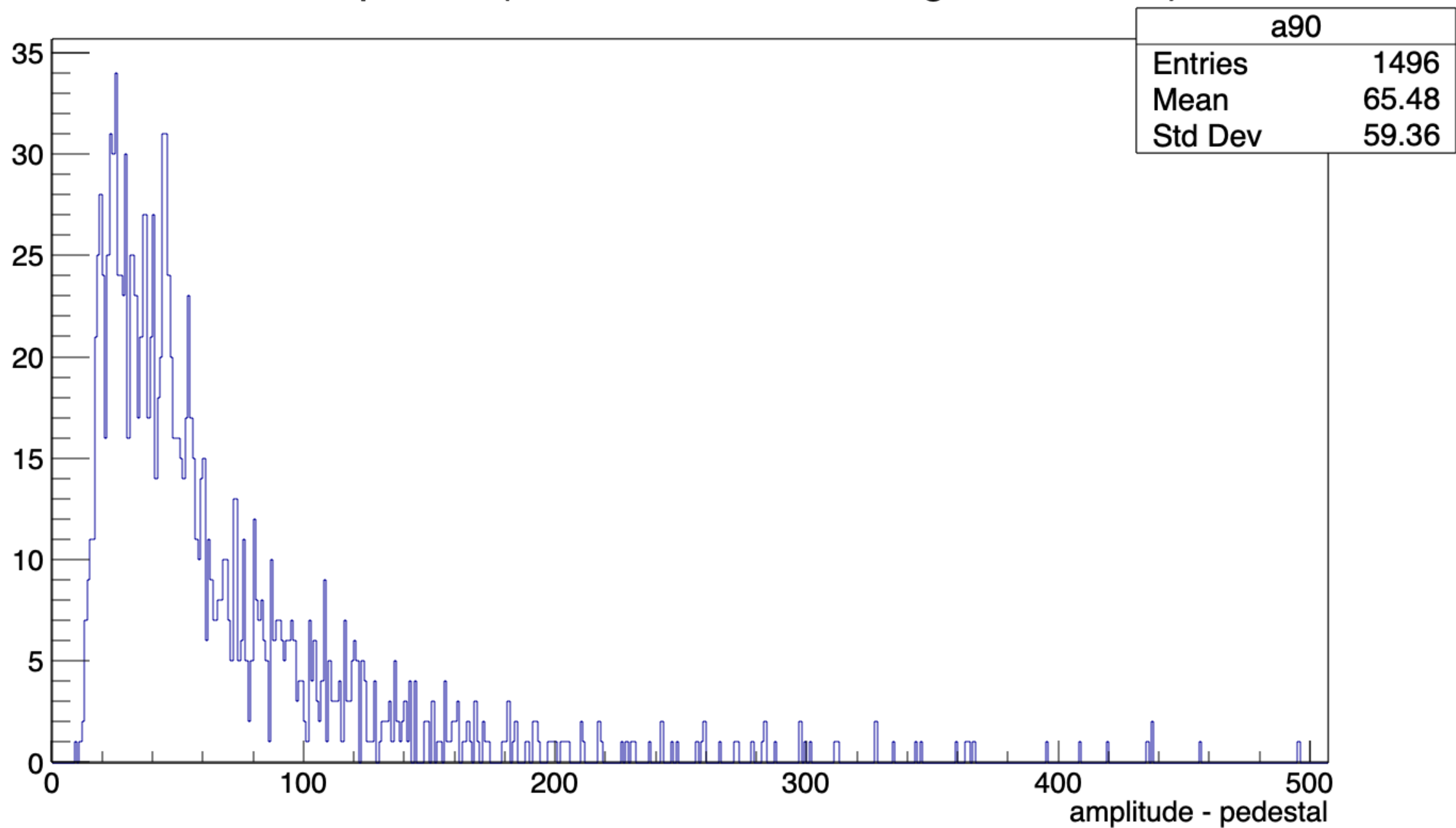
# CDC amplitude (tracks, theta 28-32 deg, z 52-78cm)



# CDC amplitude (tracks, theta 43-47 deg, z 52-78cm)

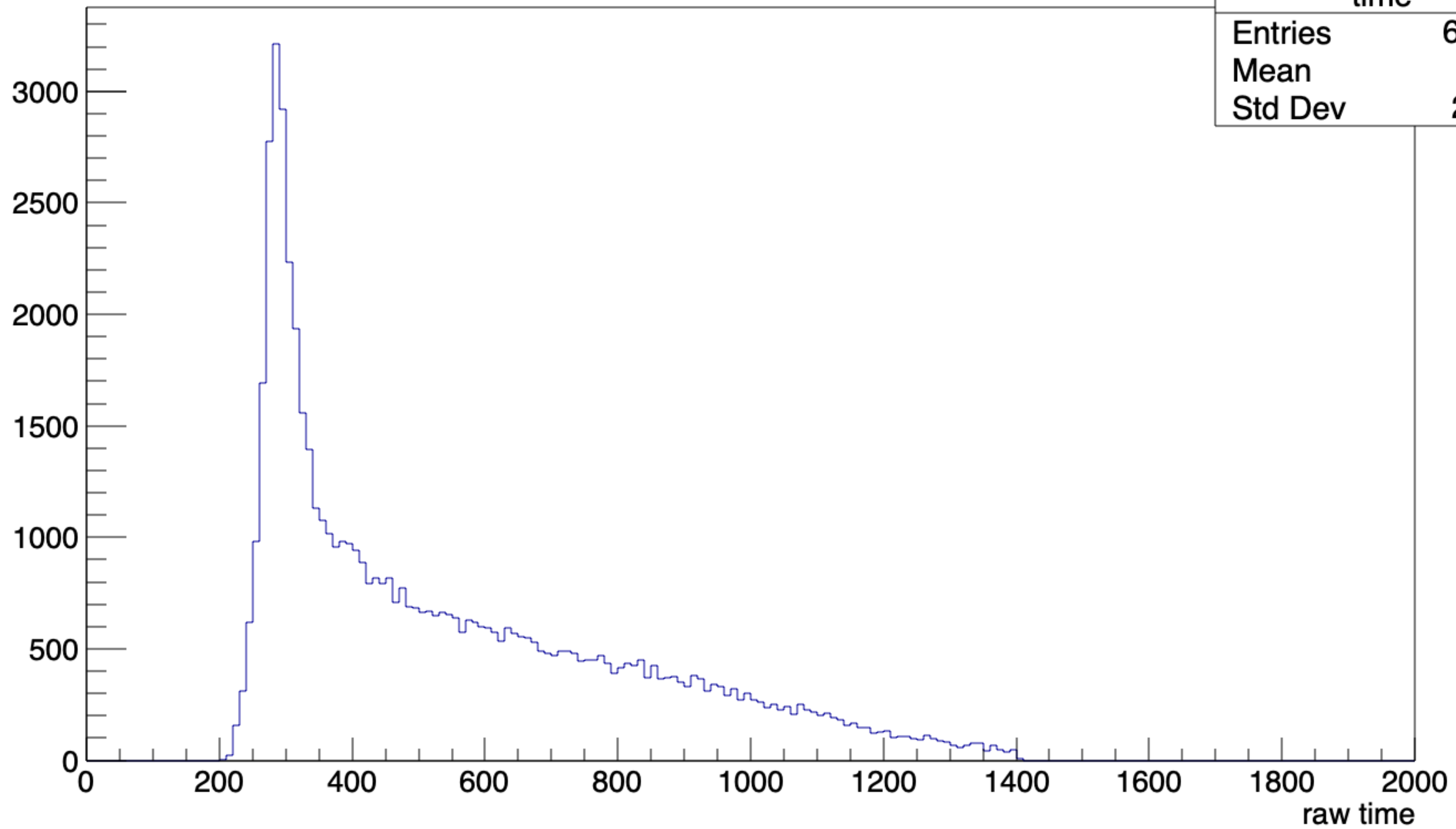


### CDC amplitude (tracks, theta 85-95 deg, z 52-78cm)

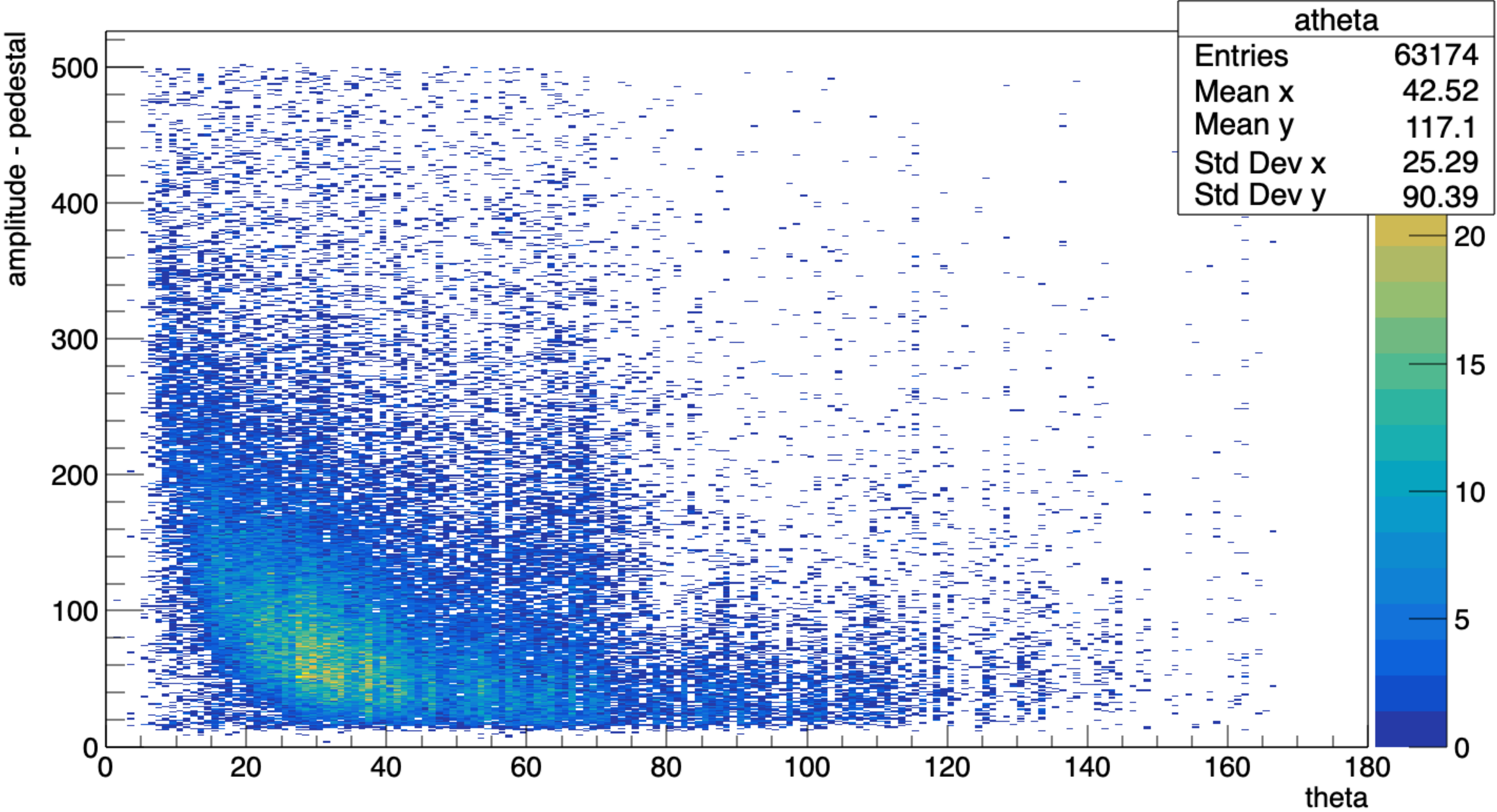




# CDC time (hits on tracks)



CDC amplitude vs theta (hits on tracks)



# 2 Types of Calibration

- Gain
  - A quick check
- Time to Distance
  - Much more complex
  - Calculate drift time and straw sagging