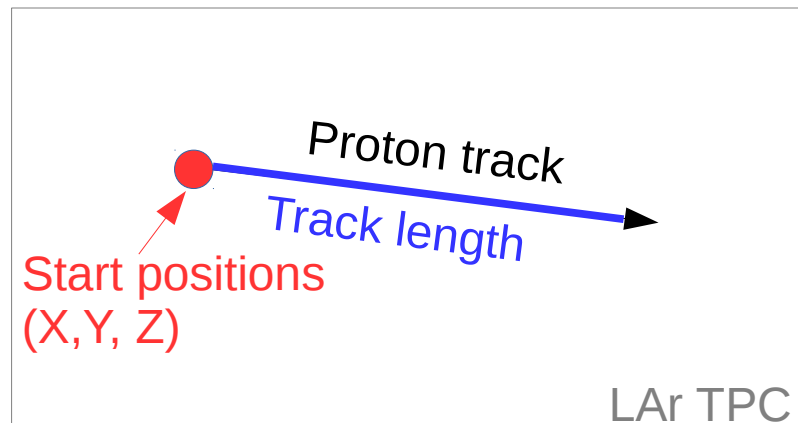


# Update on Proton Analysis

Heng-Ye Liao, Glenn Horton-Smith, Tingjun Yang  
ProtoDUNE sim/reco meeting  
Jan 09, 2019

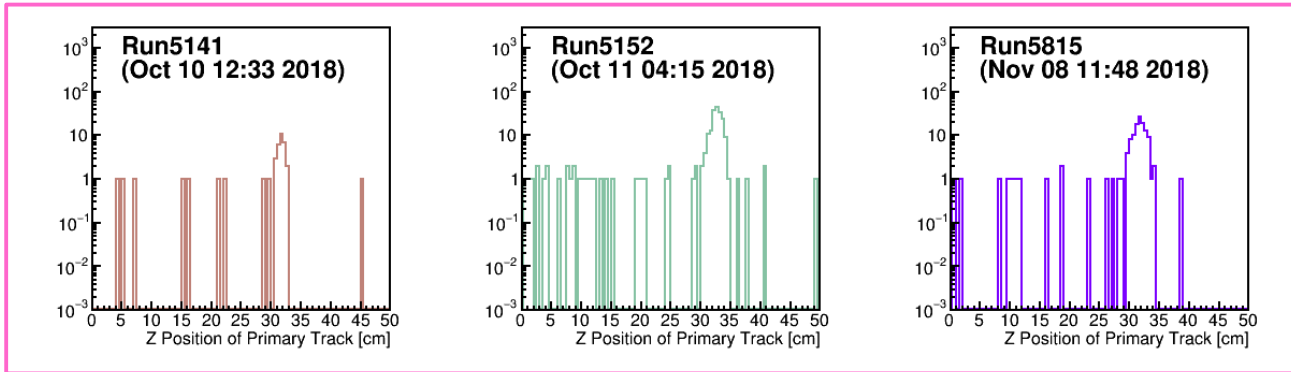
# Outline

- Time dependent study of primary track positions
  - Flavio and David indicated the beam offset is different in Run4875\*.  
(see page 10 in Hannah's report:  
<https://indico.fnal.gov/event/18731/contribution/5/material/slides/0.pdf>)
  - David suggested checking whether the start positions of proton tracks have shifted or not.
- Comparison of Monte Carlo and real data
  - Start positions of primary track
  - Track length

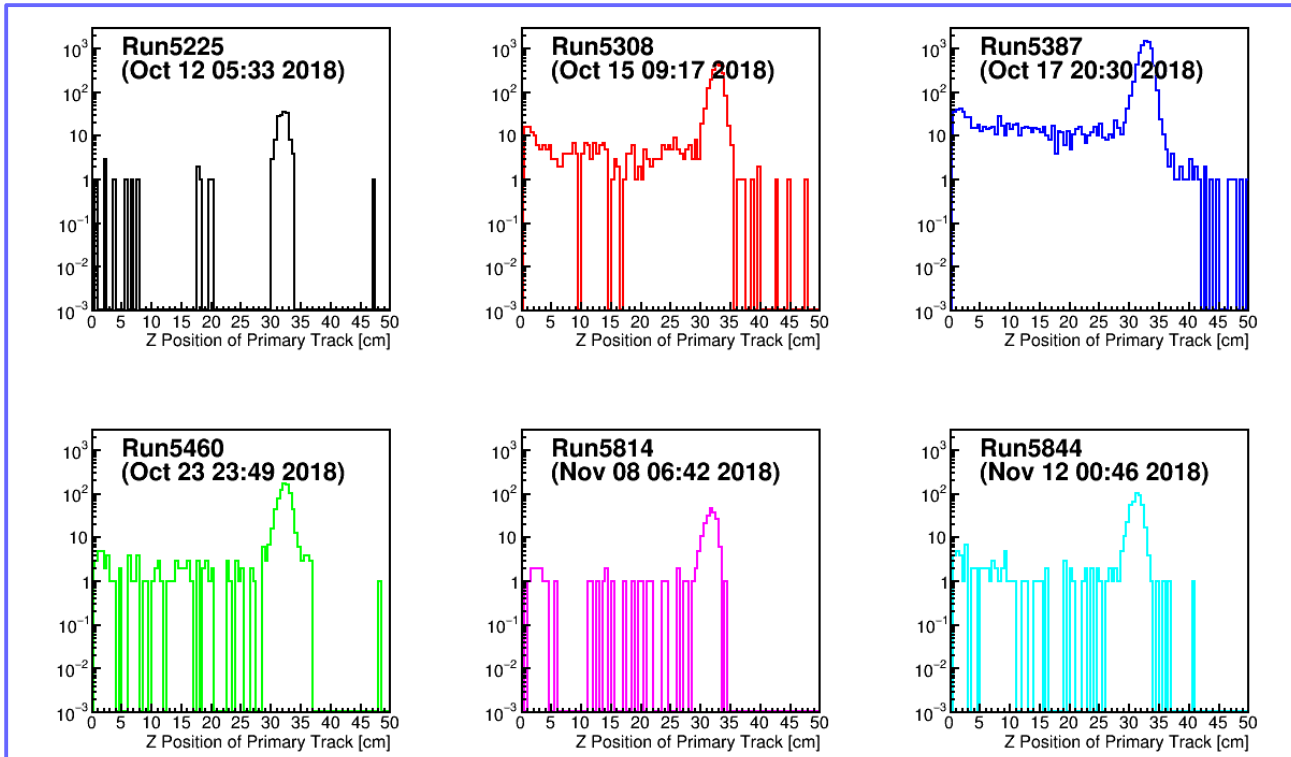


# Z Position of Primary Track

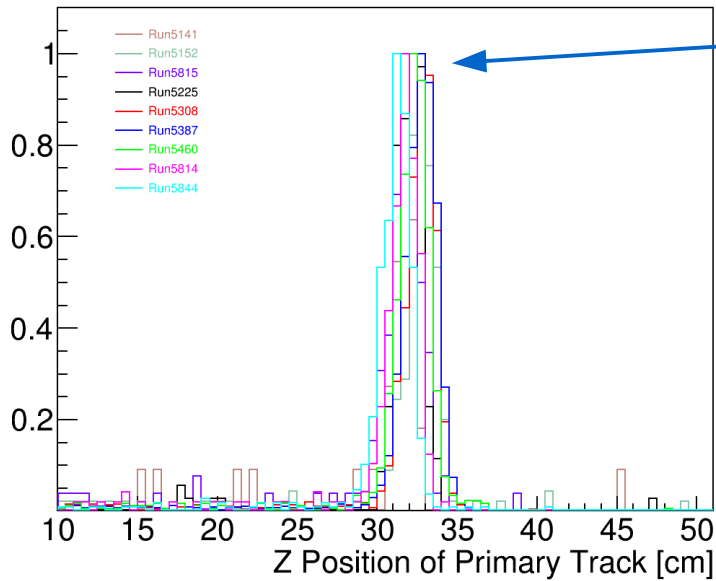
7 GeV/c Proton



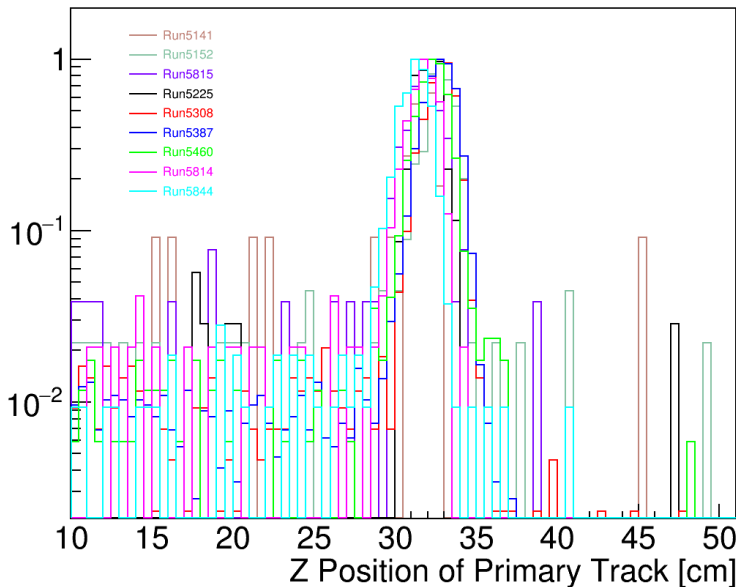
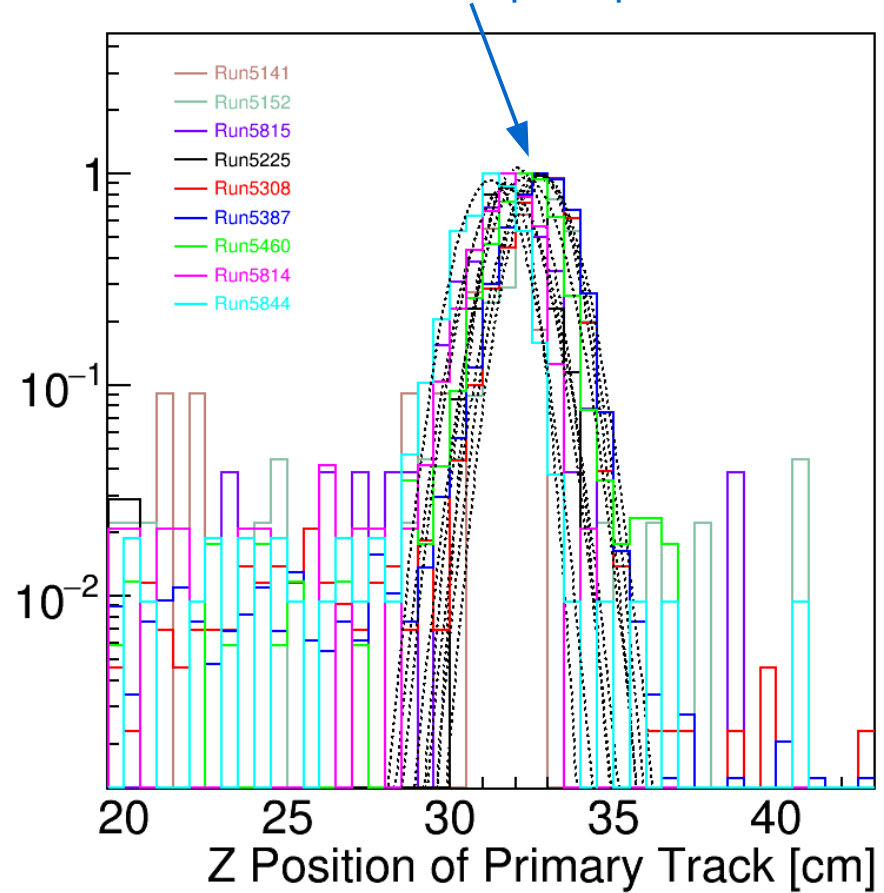
1 GeV/c Proton



# Z Position of Primary Track

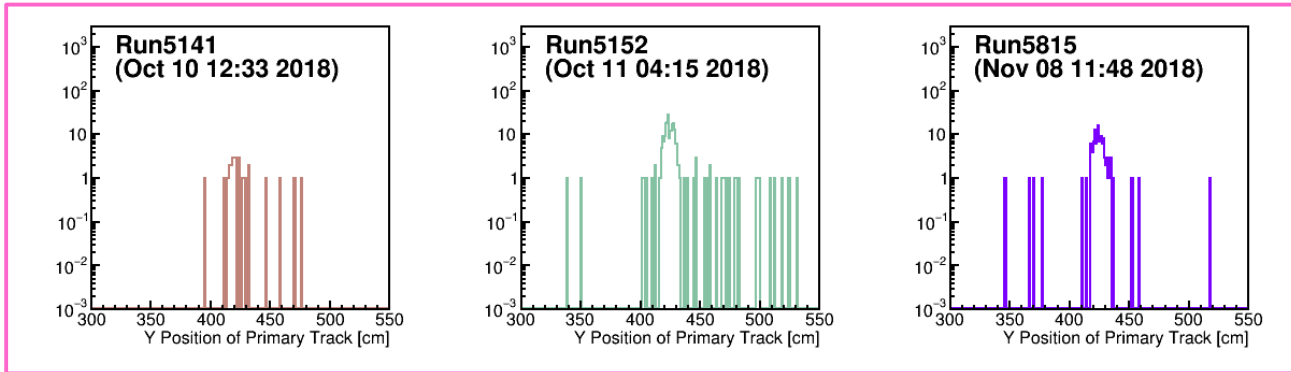


Fit a Gaussian to extract the peak position of each run

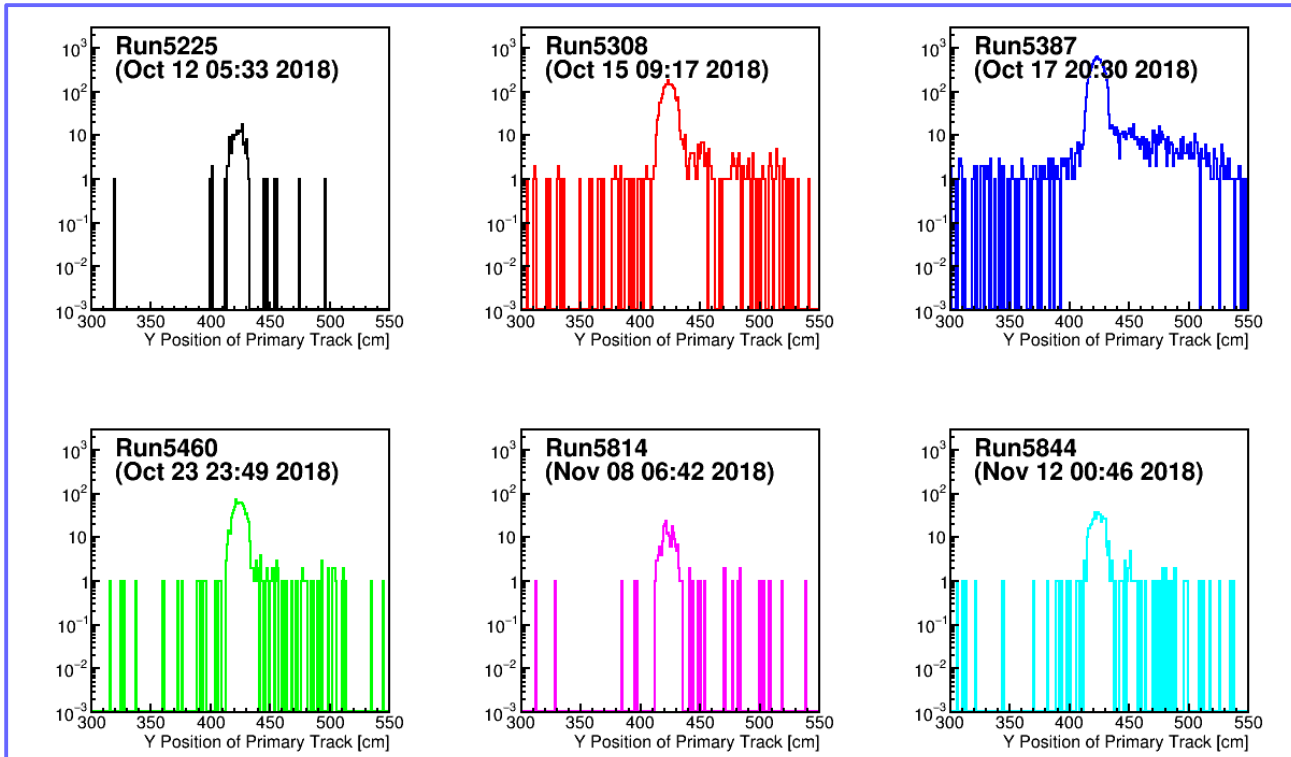


# Y Position of Primary Track

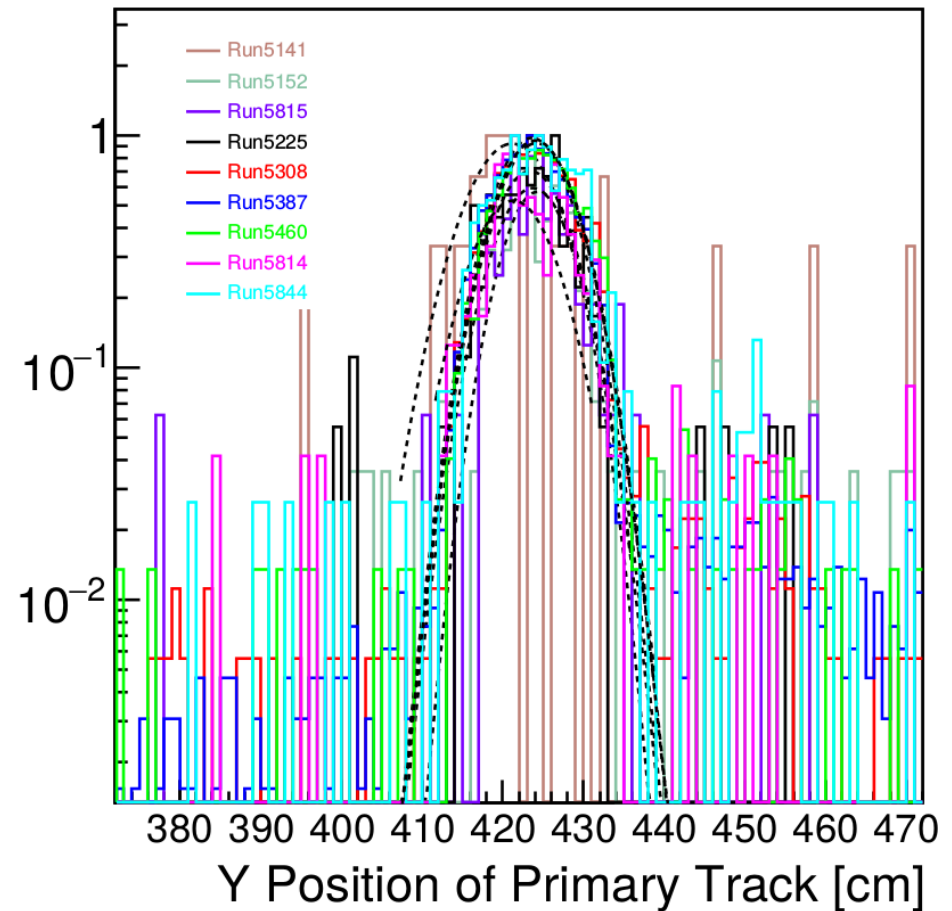
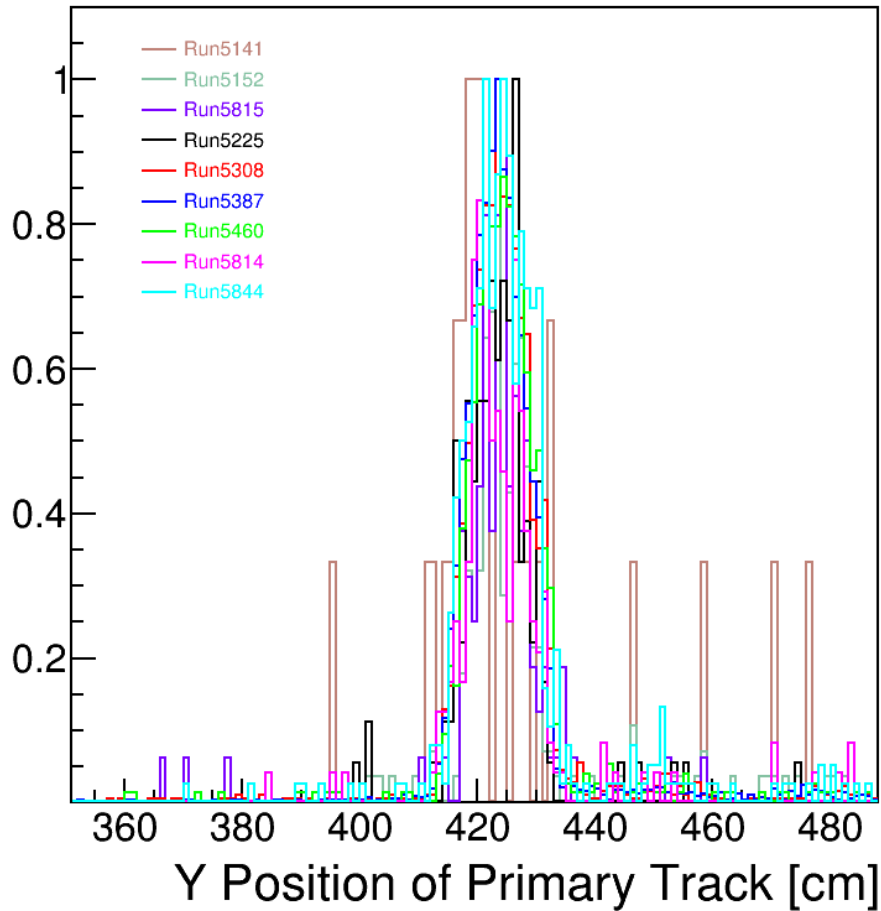
7 GeV/c Proton



1 GeV/c Proton

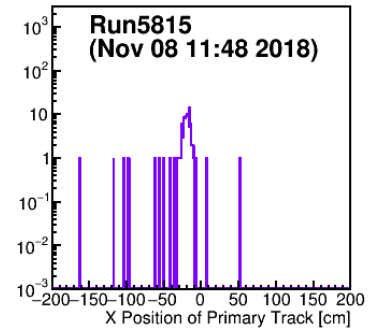
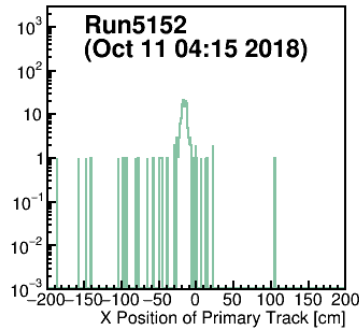
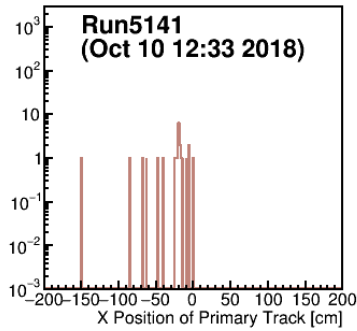


# Y Position of Primary Track

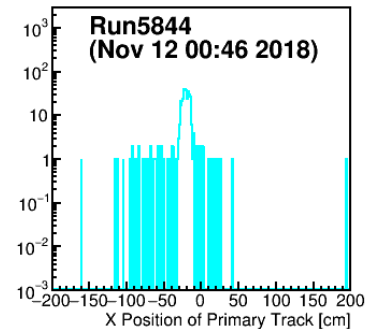
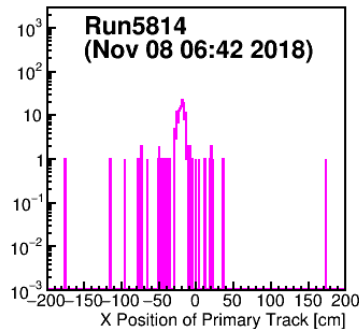
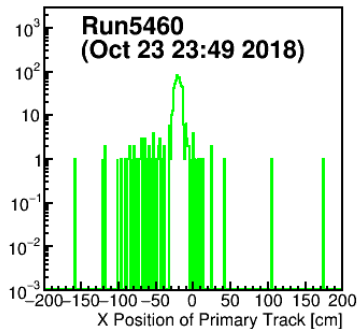
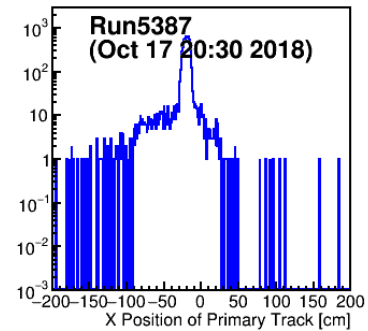
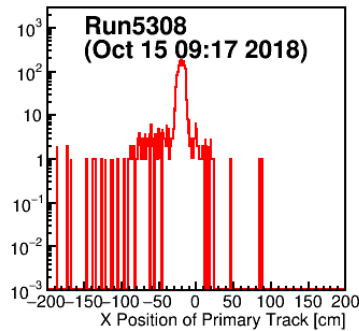
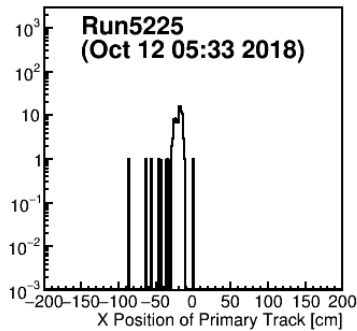


# X Position of Primary Track

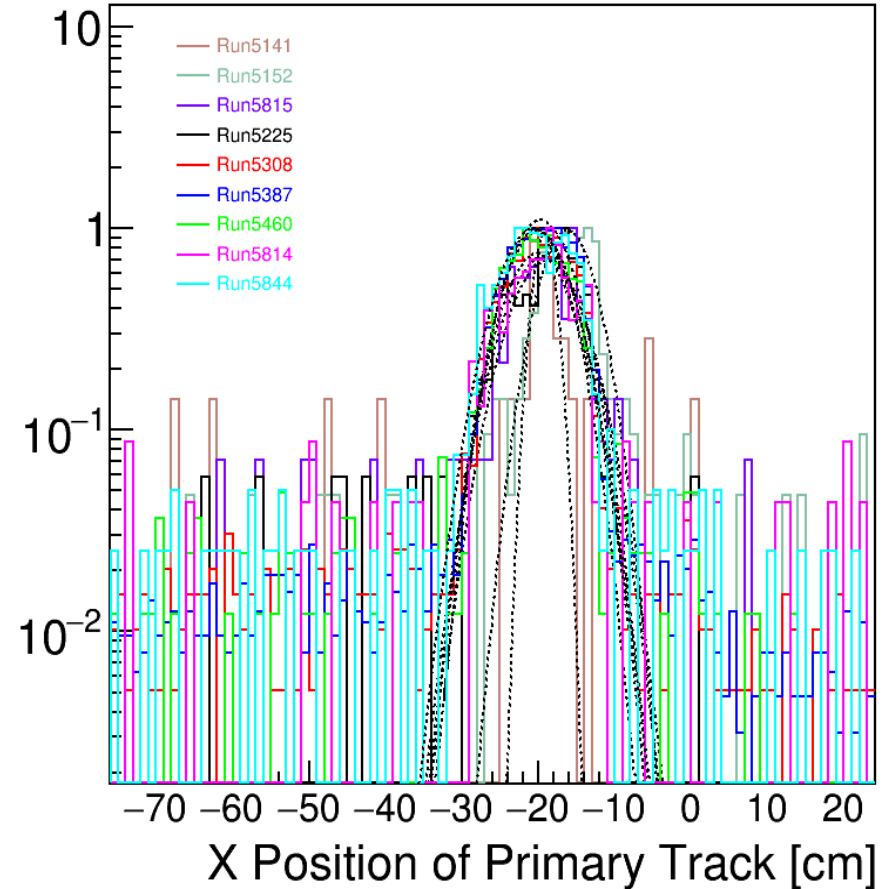
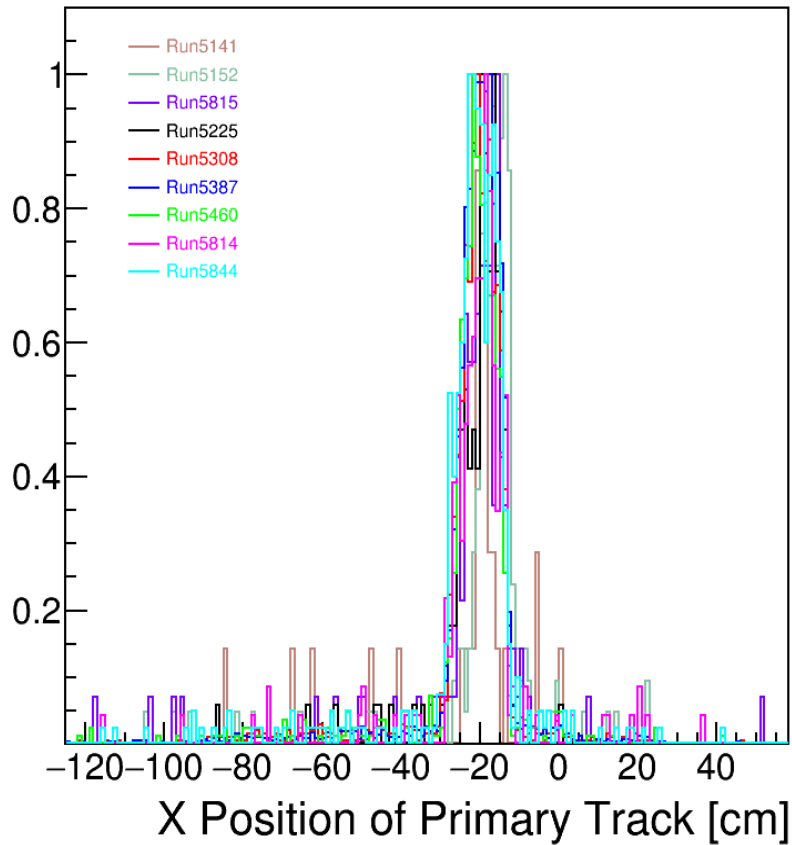
7 GeV/c Proton



1 GeV/c Proton

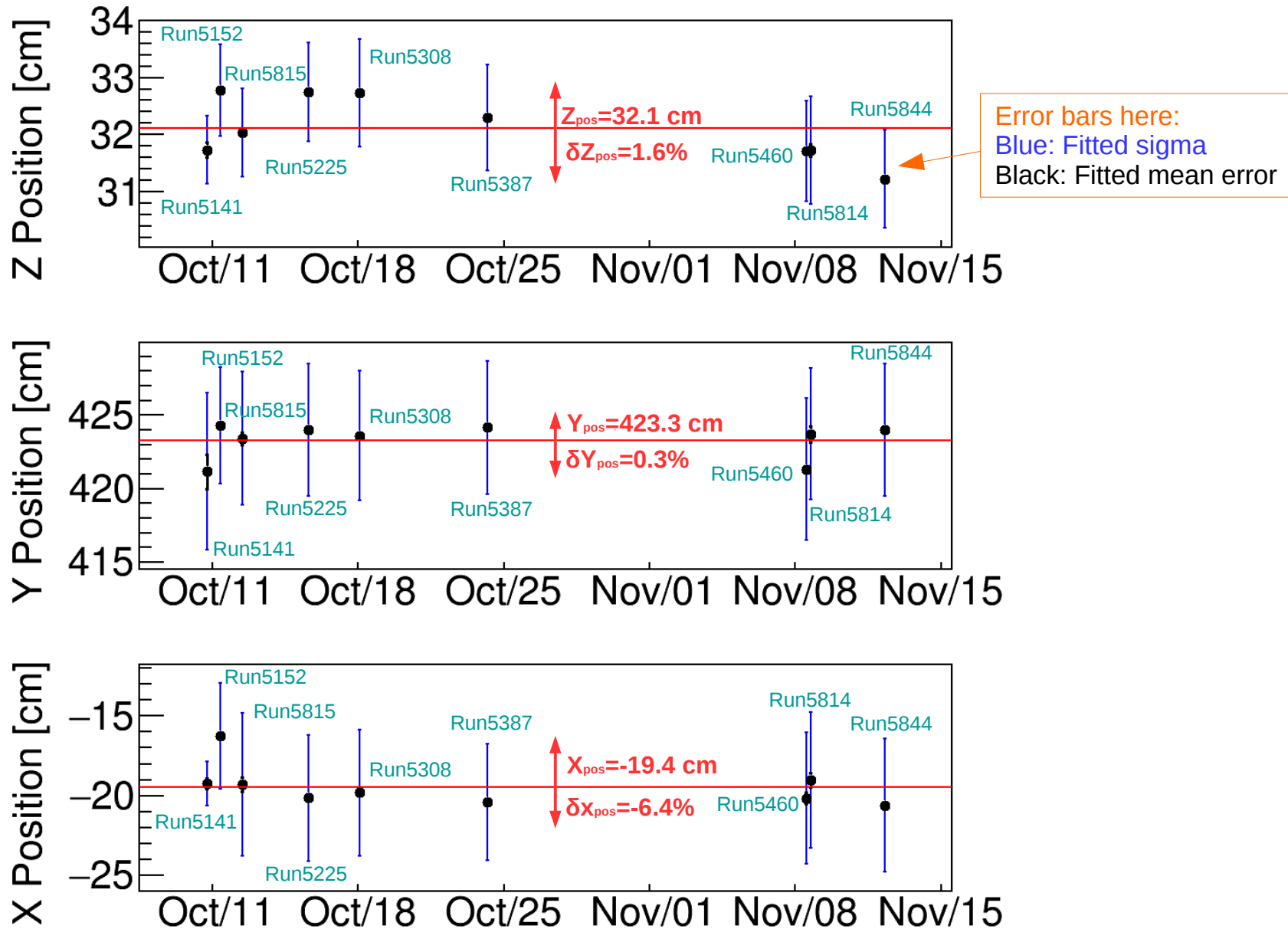


# X Position of Primary Track

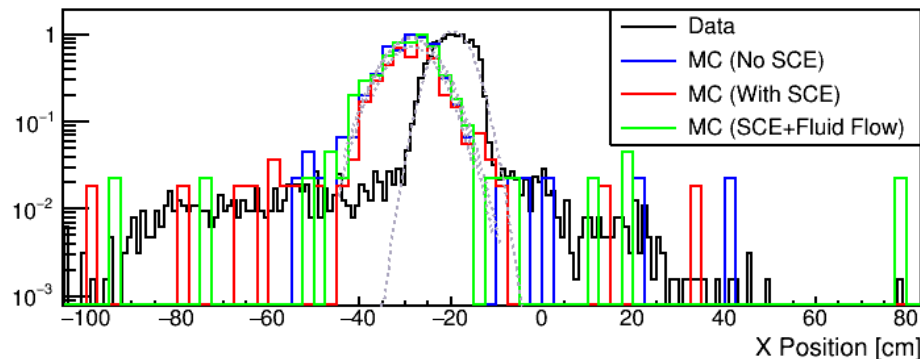
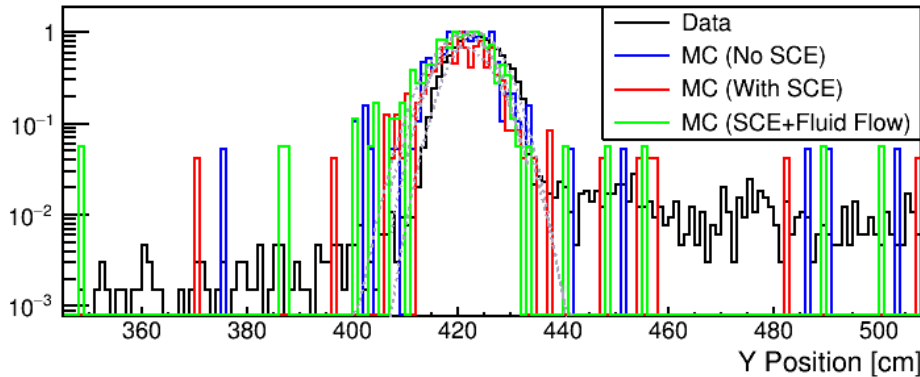
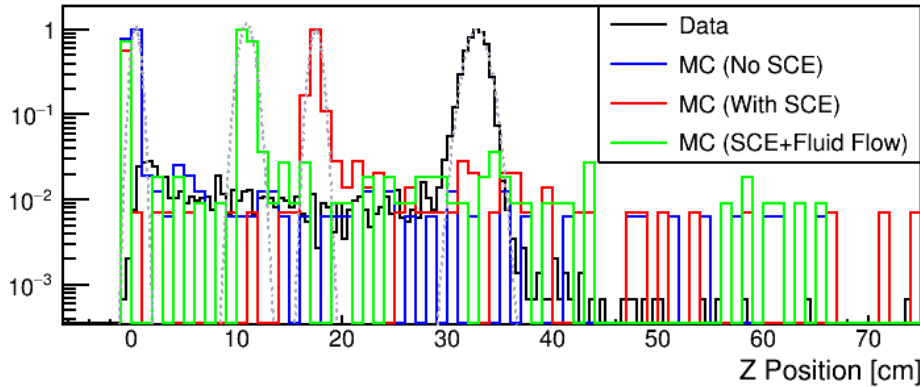




# Time Dependence of Primary Track Positions



# Comparison of MC & Data - Positions

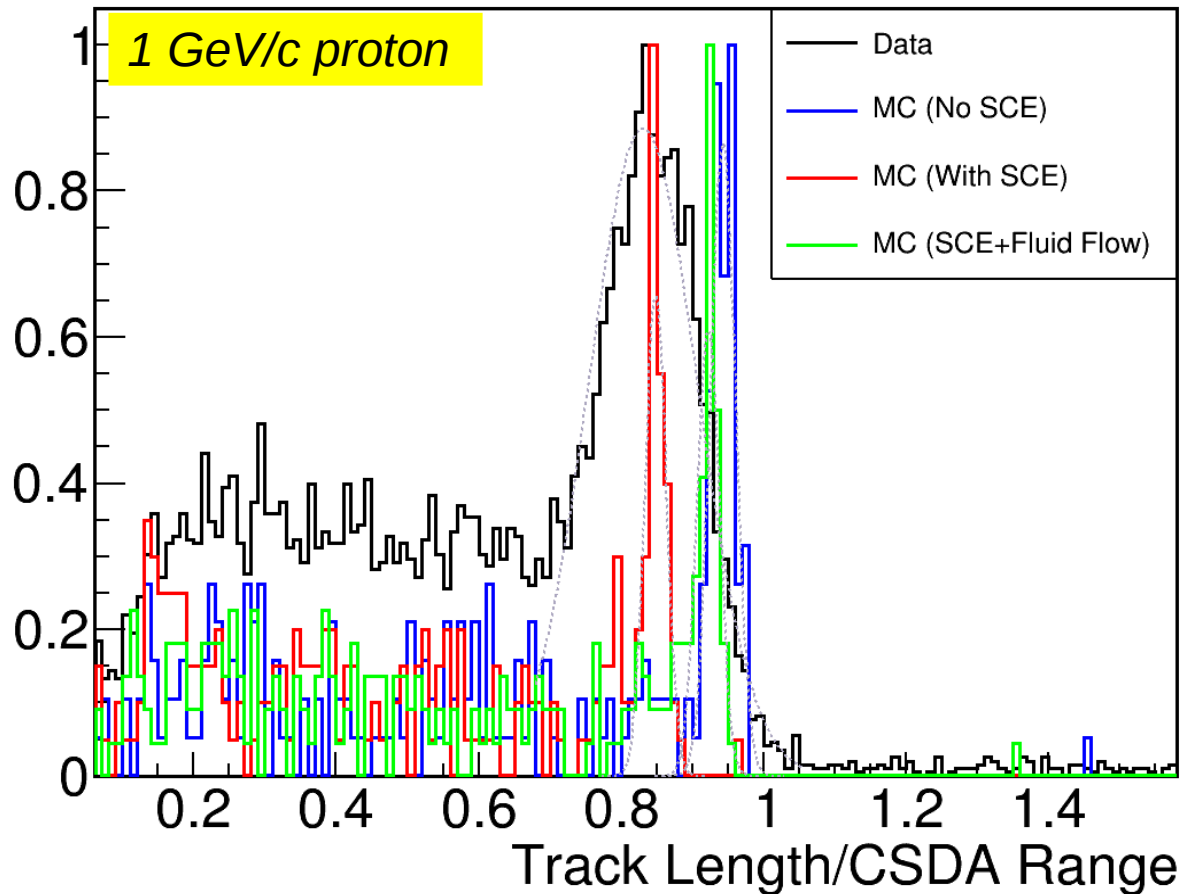


## 1 GeV/c proton sample

Position	Offset (MC-Data) [cm]		
	No SCE	SCE	SCE+Fluid Flow
Z	-32.4	-15.3	-21.9
Y	-2.3	-2.8	-2.9
X	-9.0	-8.8	-9.0

- Run number of data: 5387
- Monte Carlo: MCC11
- Fitted mean for data:  
Z/ Y/ X: 32.7/ 423.6/ -19.8 [cm]

# Comparison of MC & Data – Track Length



*Peak Position of Track Length / CSDA Range*

Data	No SCE	SCE	SCE+Fluid Flow
0.83	0.94	0.85	0.92

# Summary & Outlook

- Start positions of proton tracks are stable
- Offsets of start positions between MC and real data
- Track Length from MC with SCE matches data well
- Work in progress:
  - Calorimetry info of proton tracks
  - PFparticle associations