Start Counter Efficiency & Attenuation Update

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GLUEX

Jefferson Lab

Projected tracks selection and Efficiency Calculations

- Do not use SC time in track fitting.

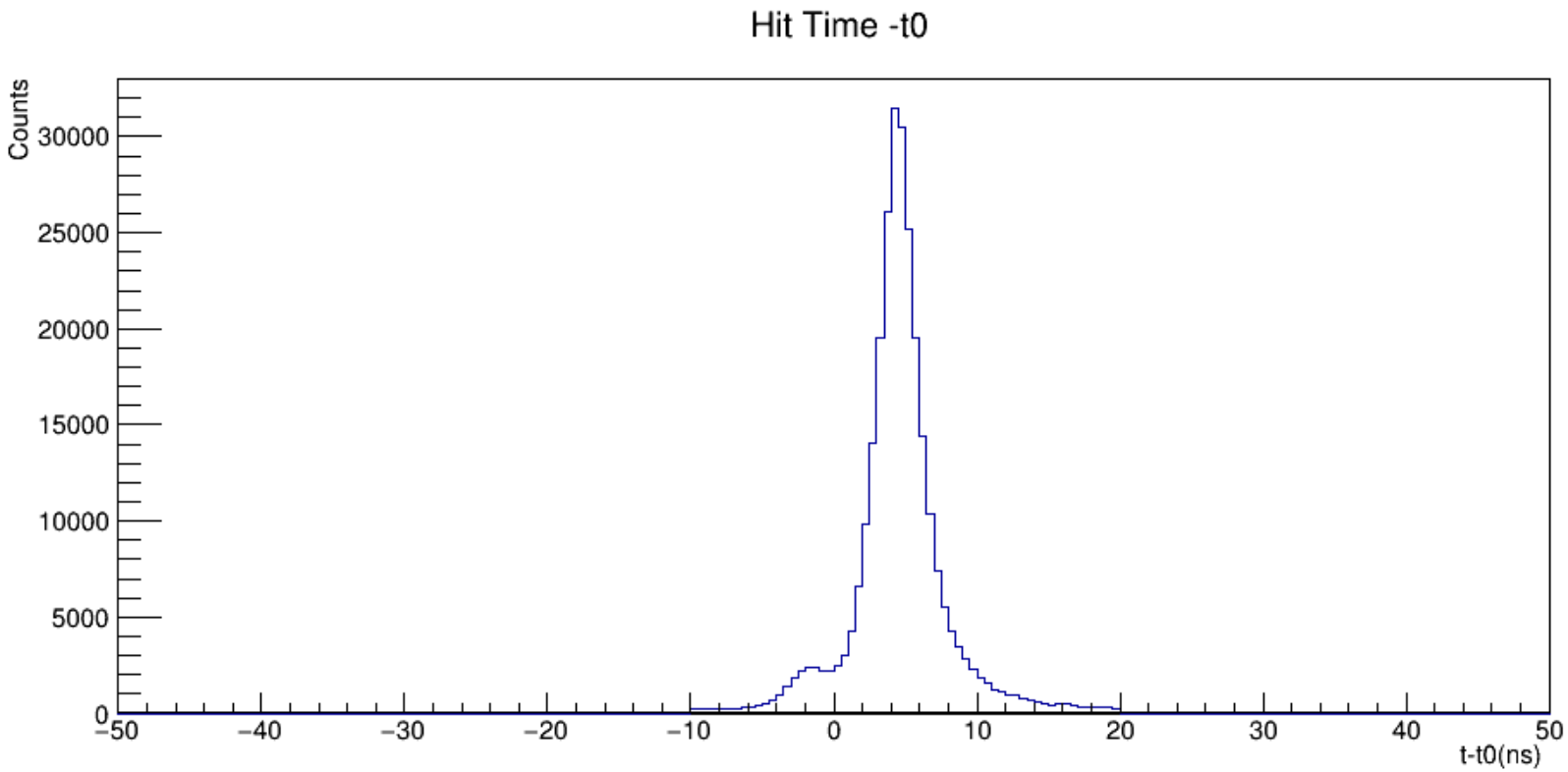
- Get a quality charged track with the following cuts:
  - Number of Hits per track >=14
  - Track_FOM >= $2.69E^{-3}$
  - abs(vertex_z – target center) <=15 cm
  - Radial cut < 1 cm

- The track must be matched to BCAL OR (FCAL && TOF).

- Get the t_0 of each track projected to a SC sector.

SC Hits and Efficiency Calculations

- Loop over the SC hits determined by the hit factory.
- Get the hit time t.
- If -10 < t-t0 < 20 ns, check if the same projected sector had hit or its nearest paddle, (SC hits).

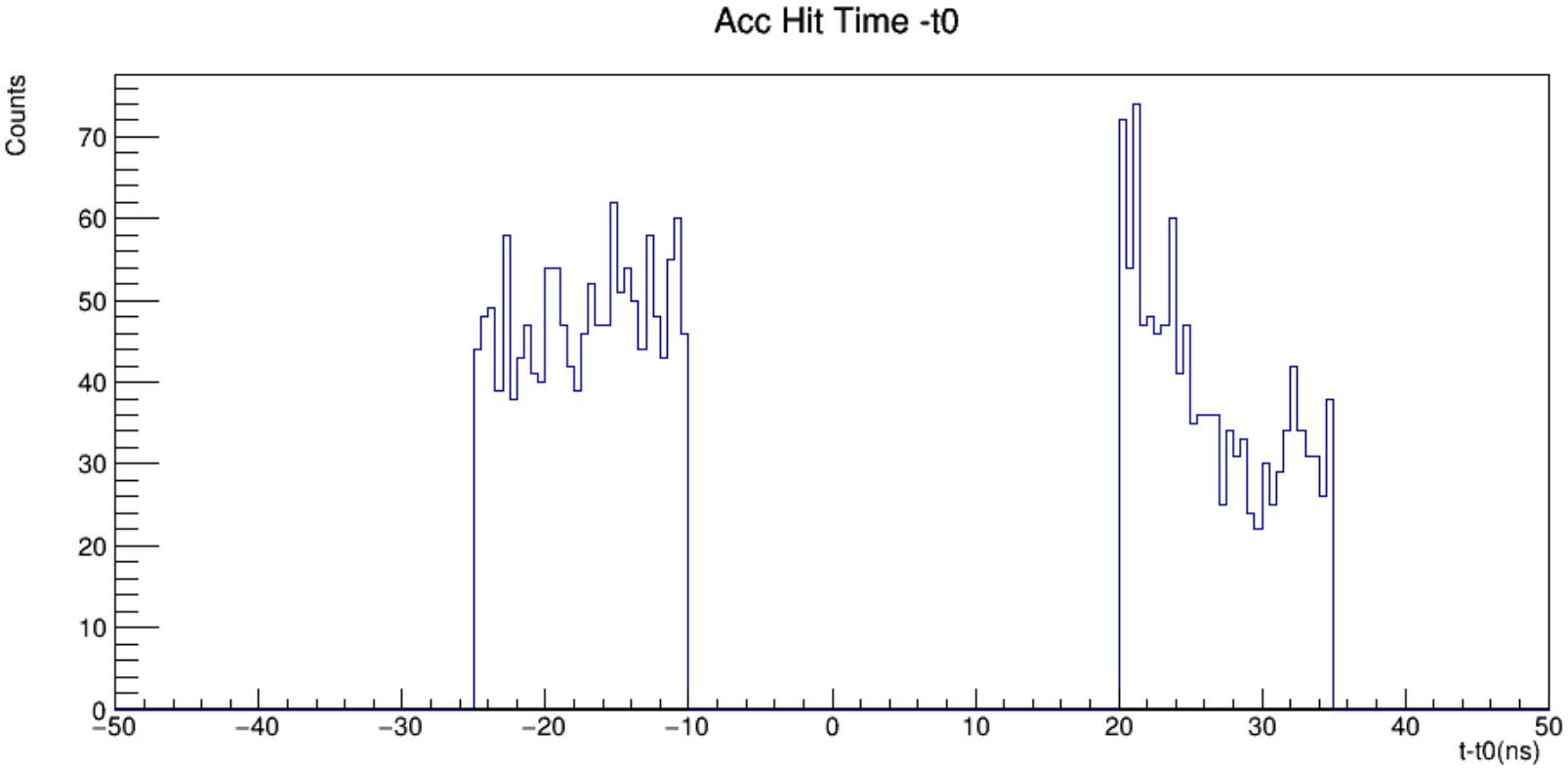


250K events of run30279

SC Hits and Efficiency Calculations

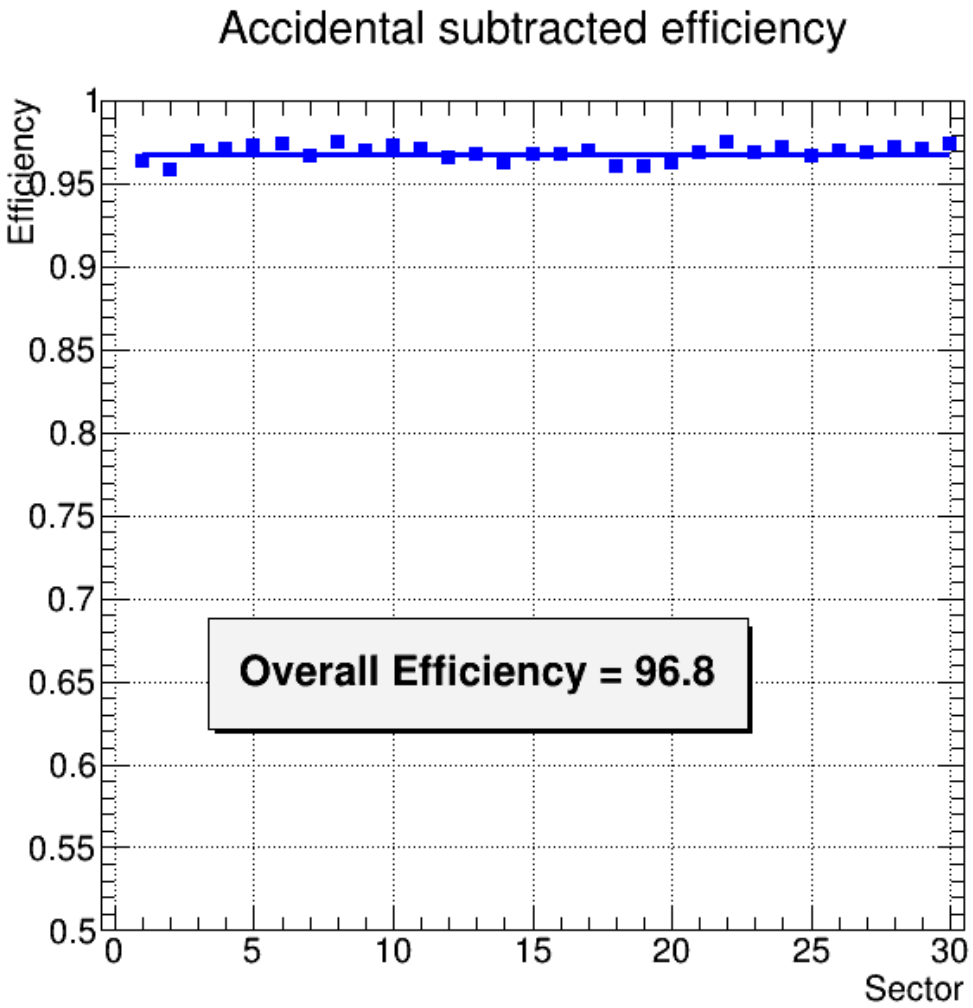
- Calculate the accidentals by counting the out of time hits for -25 < t-t0 && t-t0 < 35

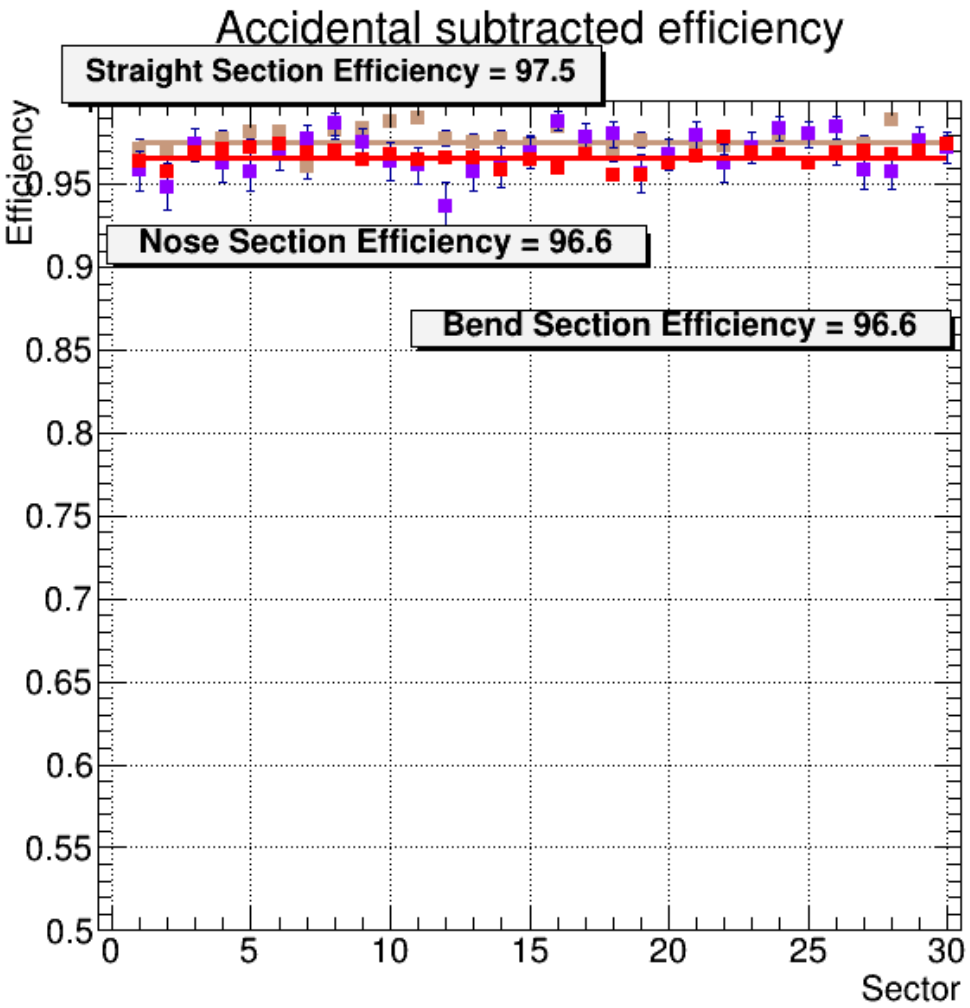
- Calculate the accidental subtracted efficiency = (SC hits - accidentals) / Projected hits.



250K events of run30279

SC Efficiency





Attenuation Corrections

- Select quality fast pion tracks with the following cuts:
  - Number of Hits per track >=14
  - Track_FOM >= $2.69E^{-3}$
  - abs(vertex_z – target center) <=15 cm
  - Radial cut < 1 cm.
  - Momentum > 500 MeV

- Define t_0 as the time based track time

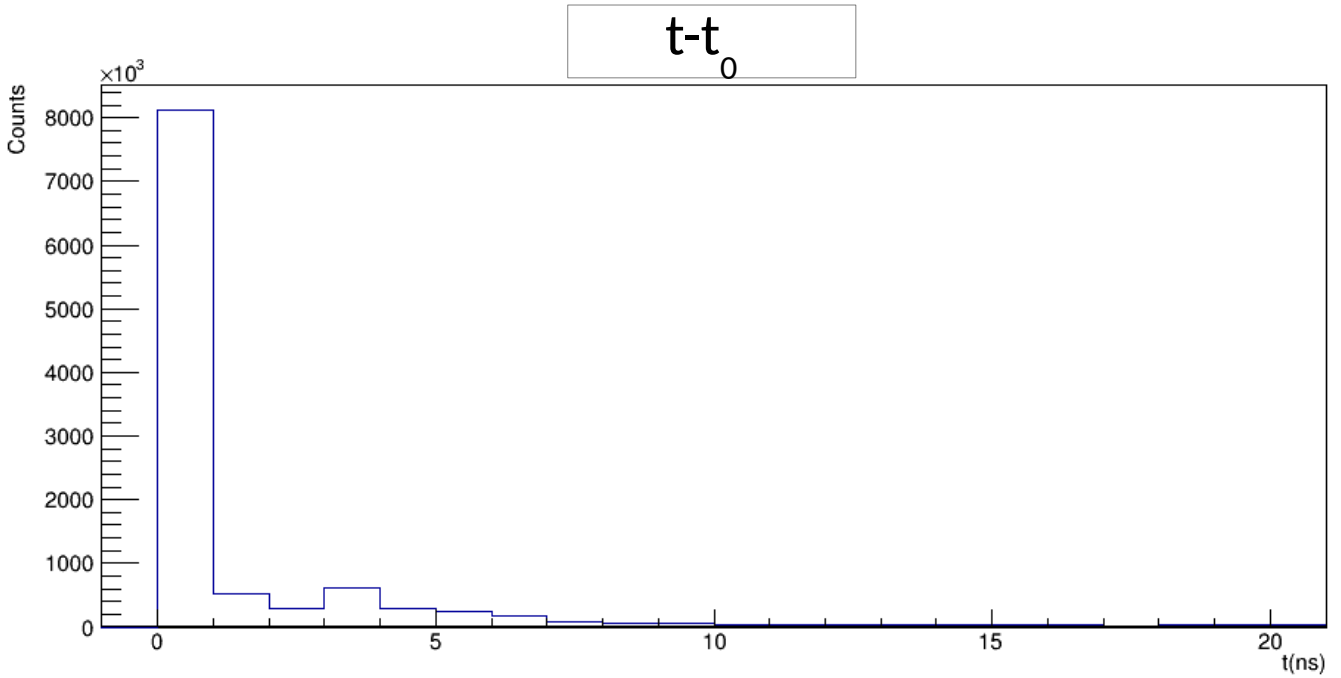
- Loop over the ADC digihit object and get the hit time,sector, and pulse integral corrected for pedestal.

- Plot the time difference between the hit time and t_0.

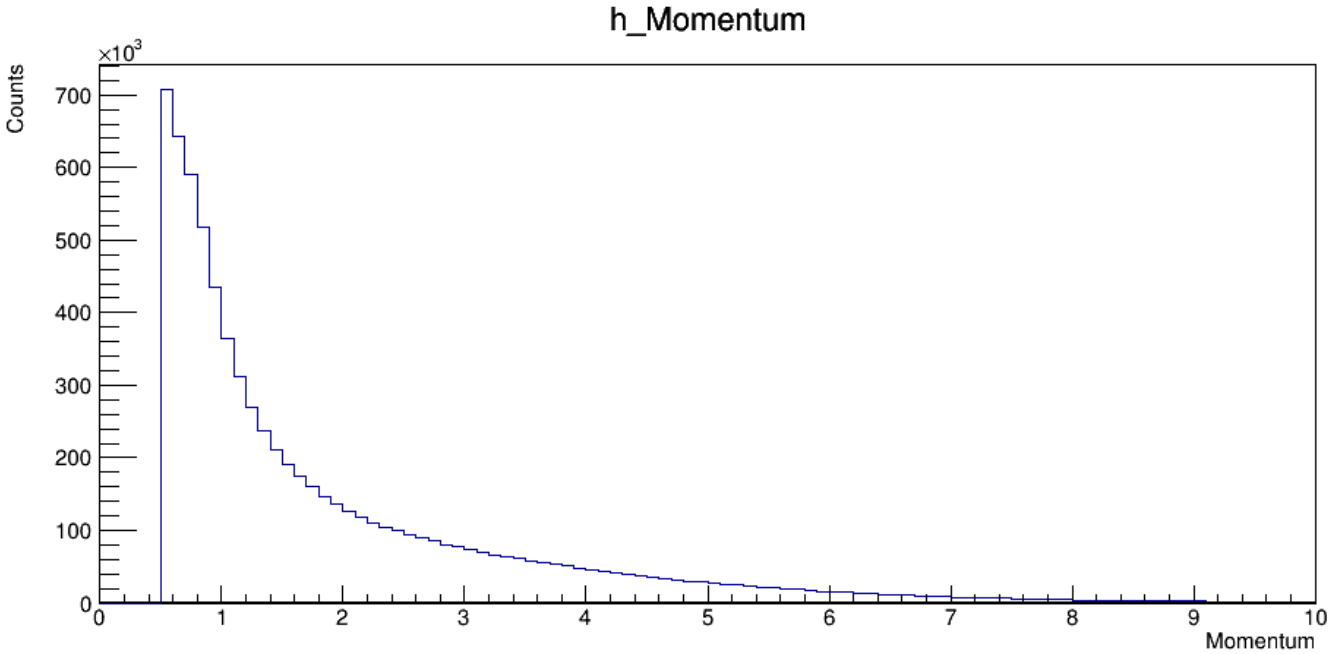
Timing Cut & Momentum Cut

T <= 2 ns

Run 30279

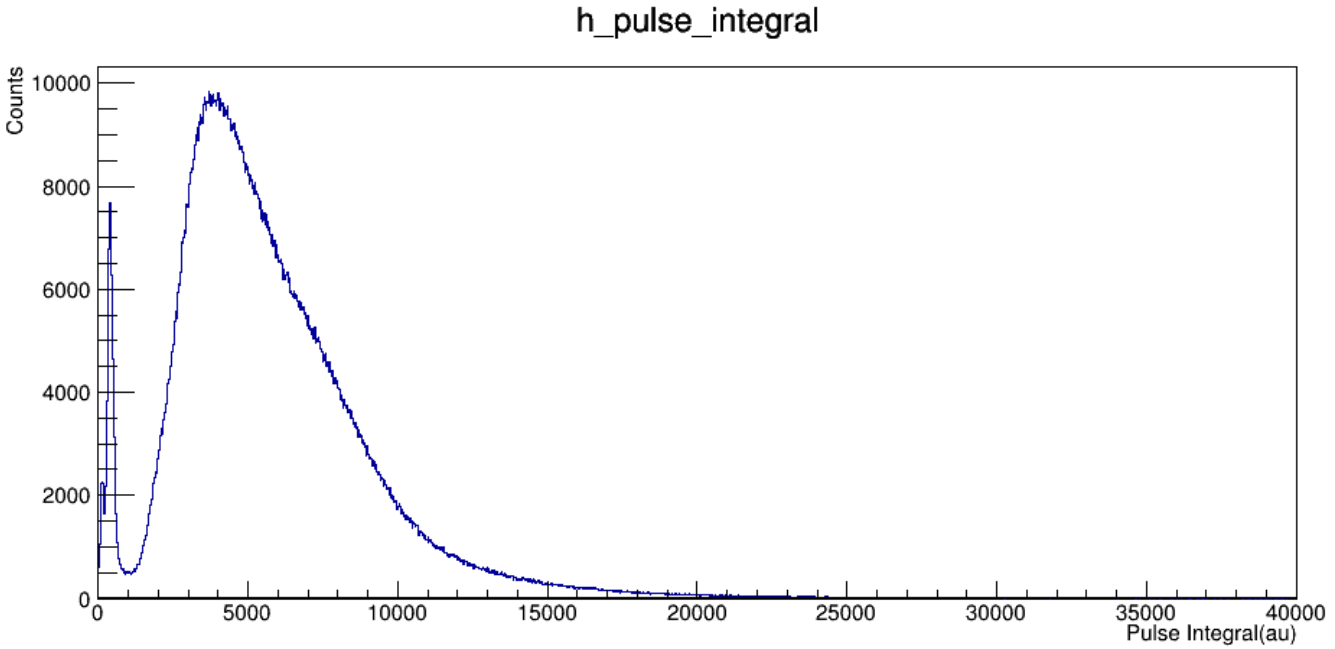


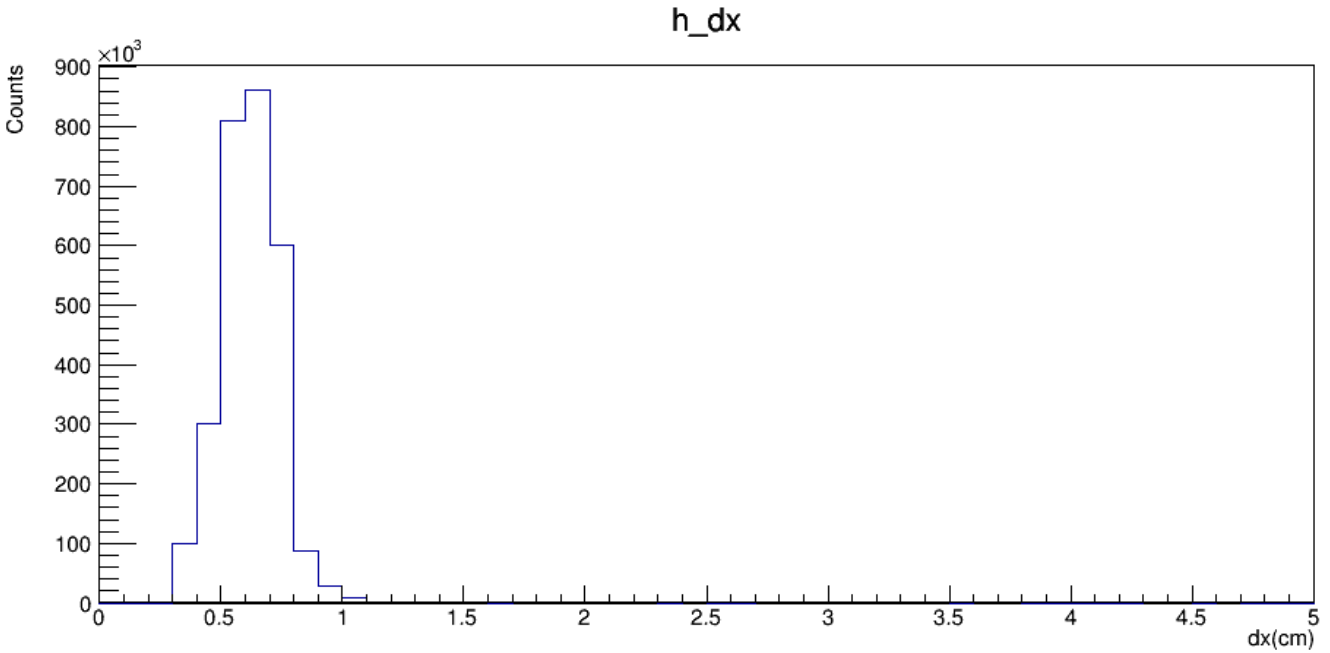
Momentum >= 500 MeV



Pedestal corrected pulse integral & path length

Run 30279





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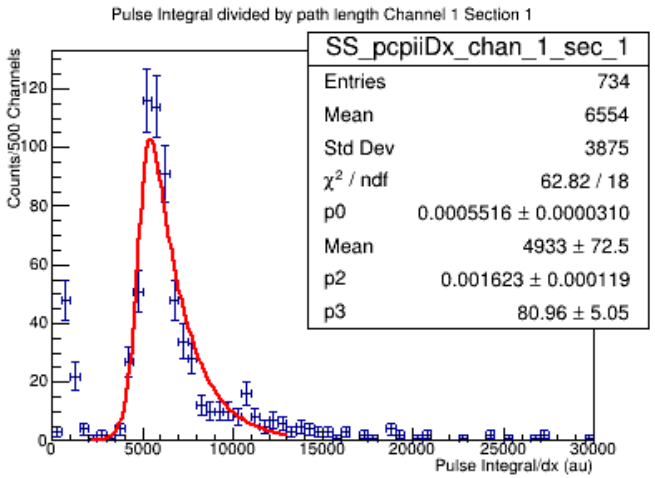
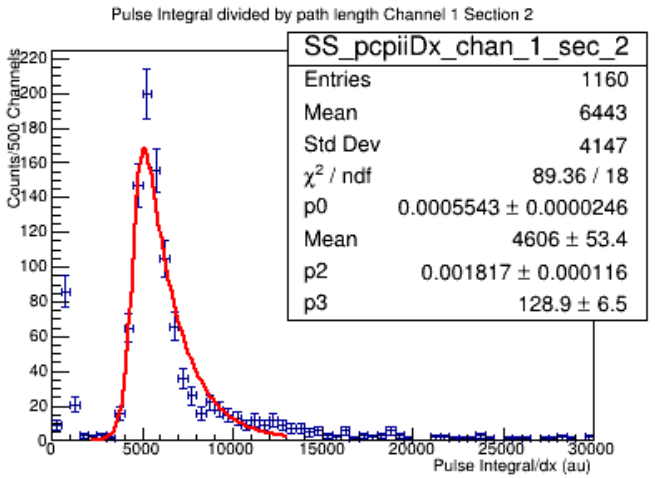
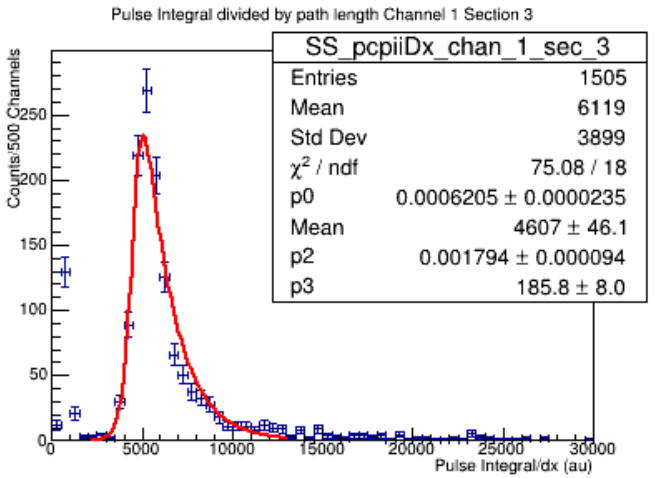
Pulse integral/dx Plots for paddle 1

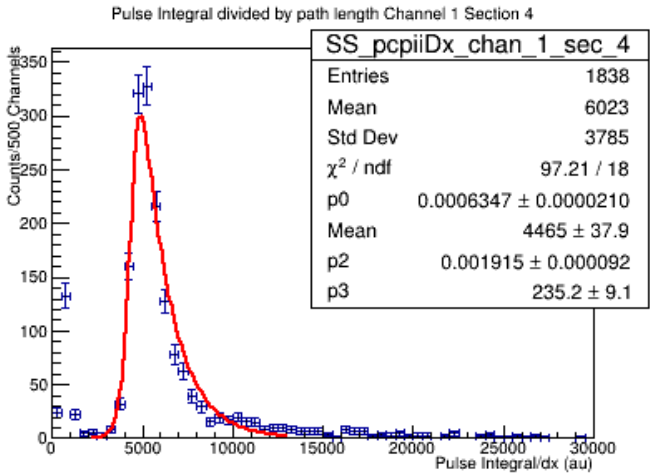
Each paddle is divided into 12 intervals along z starting from z=62 cm. Each interval is about 3 cm in length.

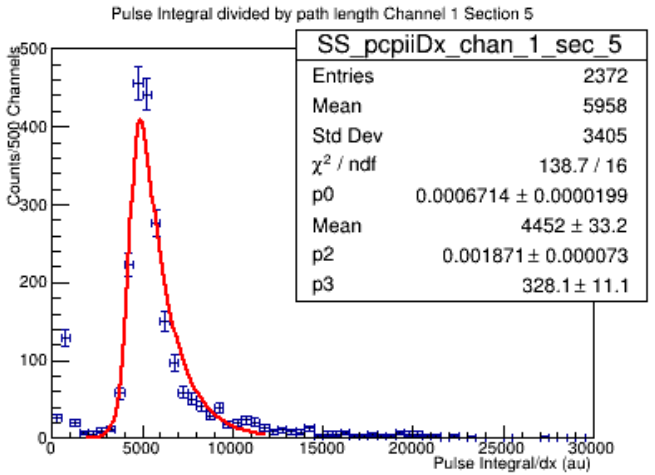
Fit the empirical function $f(x) = P_3 (e^{-p0\,(x\,-Mean)}) (1+ \tanh(p_2(x-Mean)))$ to the data

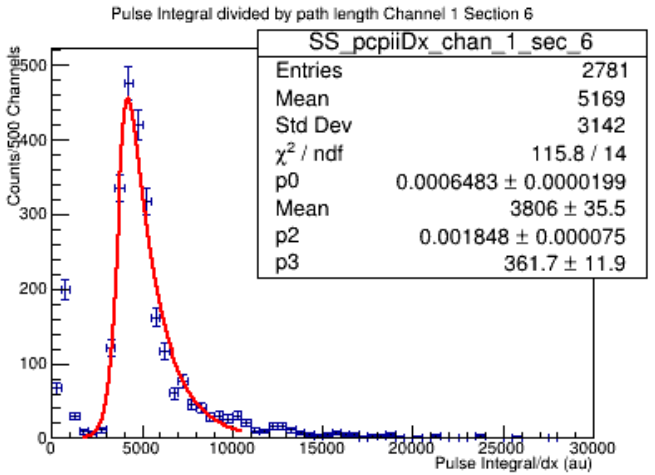












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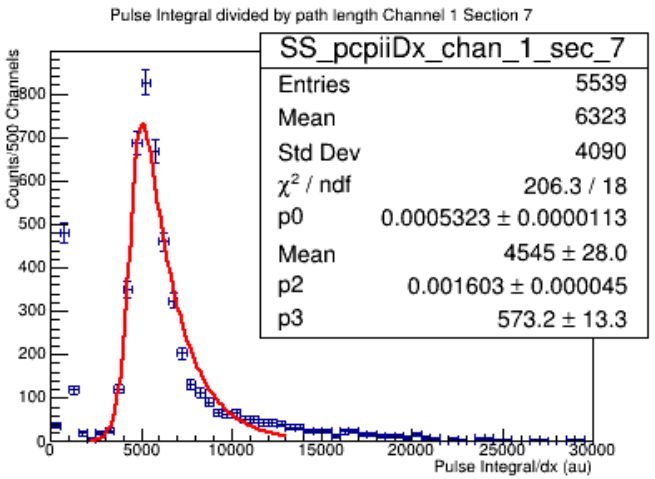
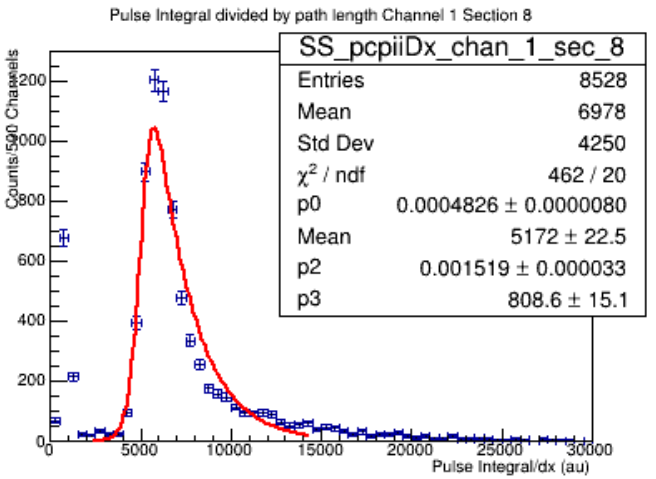
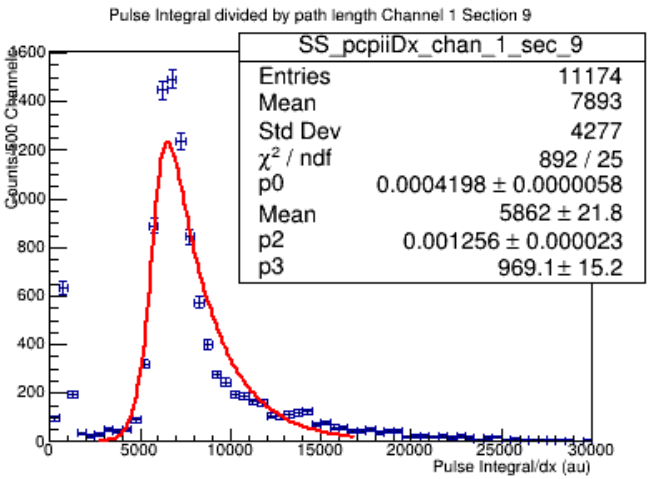
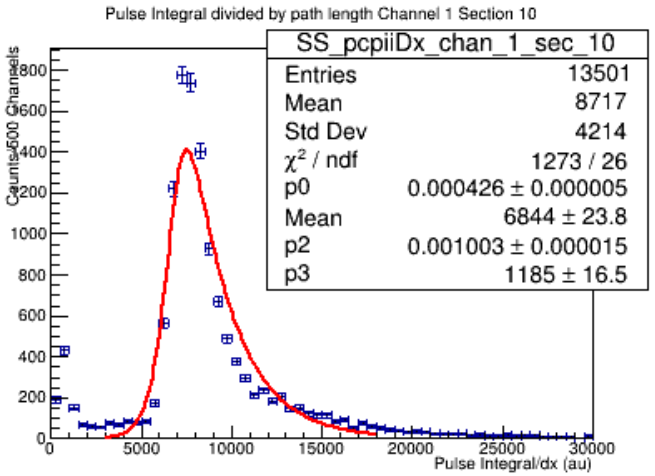
Pulse integral/dx Plots for paddle 1

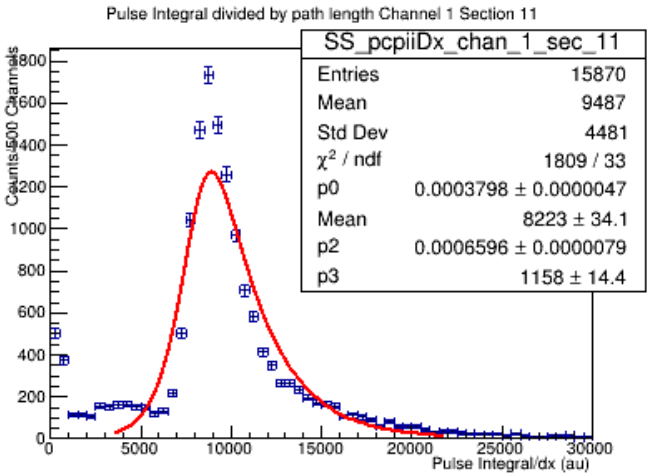
Last 6 intervals

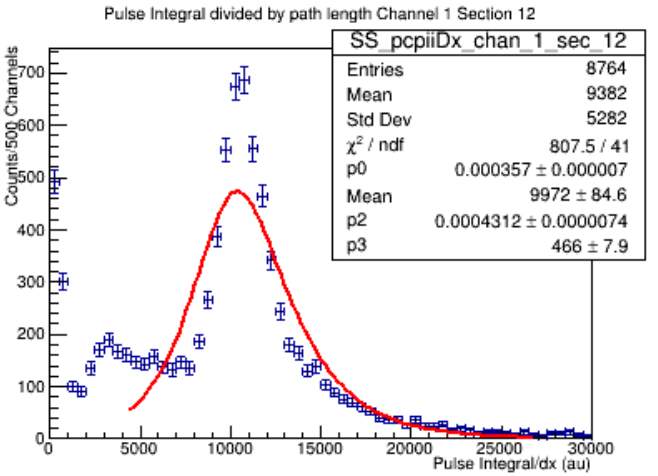






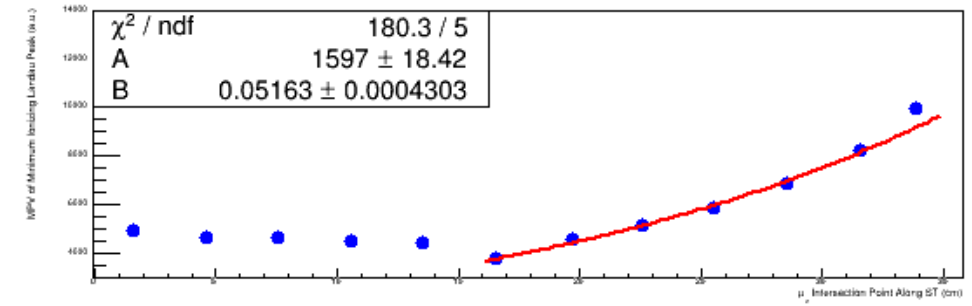


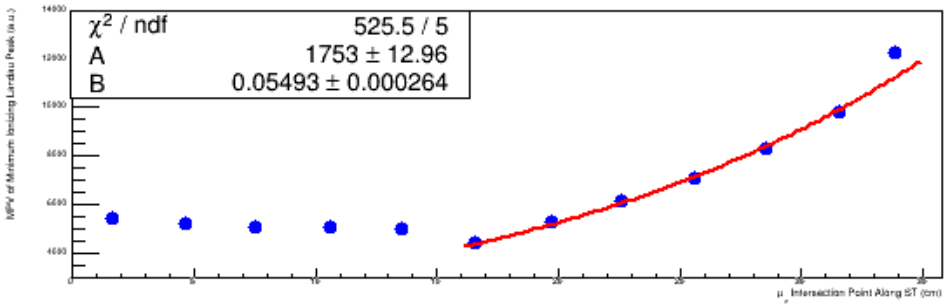


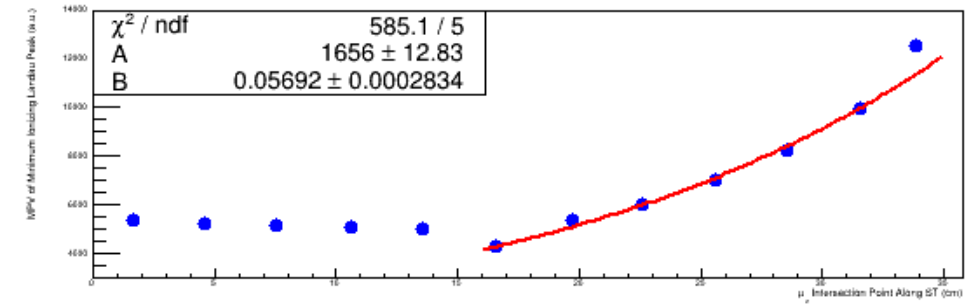


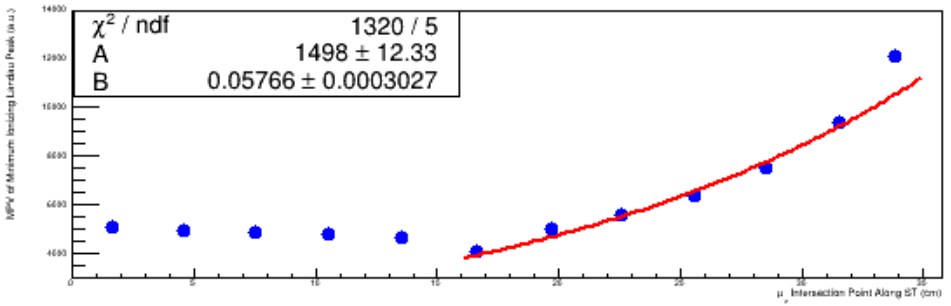
MPV of PCPI/dx Vs Z

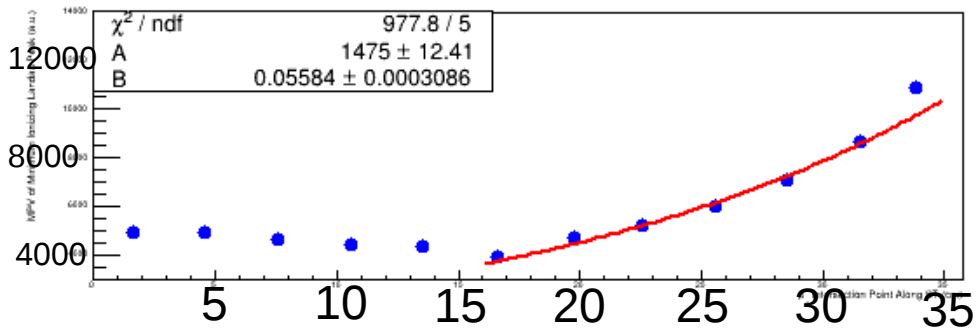
Fit exponential function to get the attenuation constants for each paddle (paddles 1 to 6 are shown)

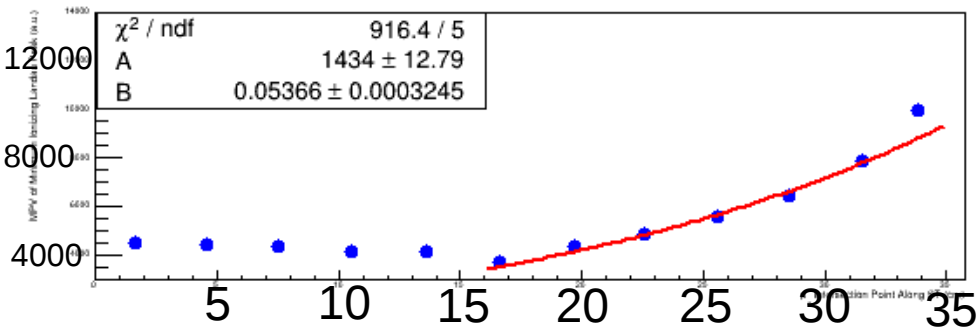












MPV of PCPI/dx Vs Z

Problematic paddles are 10, 13, 25, and 29:

They have very small number of hits compared to the other paddles and the fit does not work

Next step: Apply the corrections and compare dE/dx before and after the corrections.