Muon TB2023 Analysis

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May 13, 2025

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Muon TB2023 Analysis

Objective

Since we would like to work on the $\frac{e}{MIP}$ ratio, we have to obtain a pure muon beam:

- To check Muon data
- Apply some selections/cuts
- Implement SiPMs and PMTs intensity maps

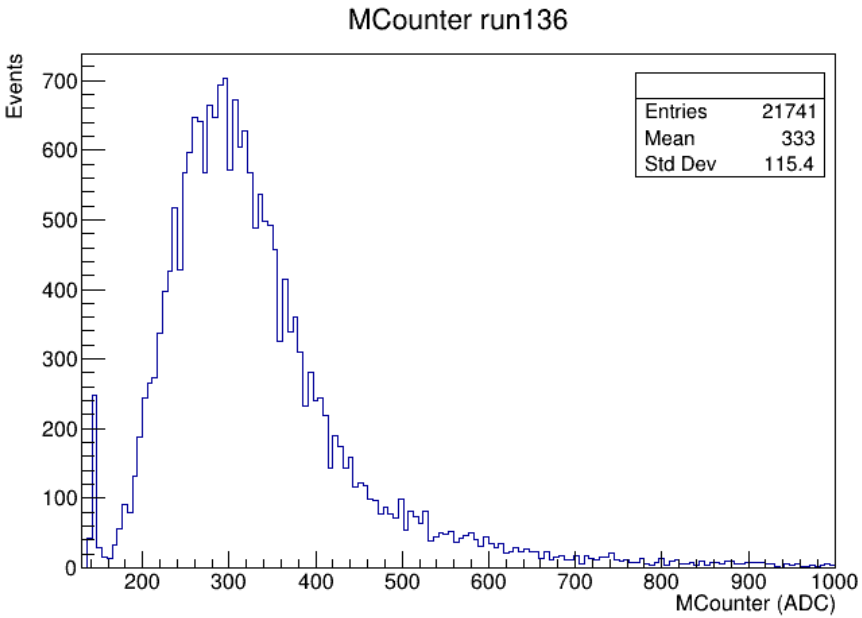
Vertical angle 2.5°, Muons beam 160 GeV

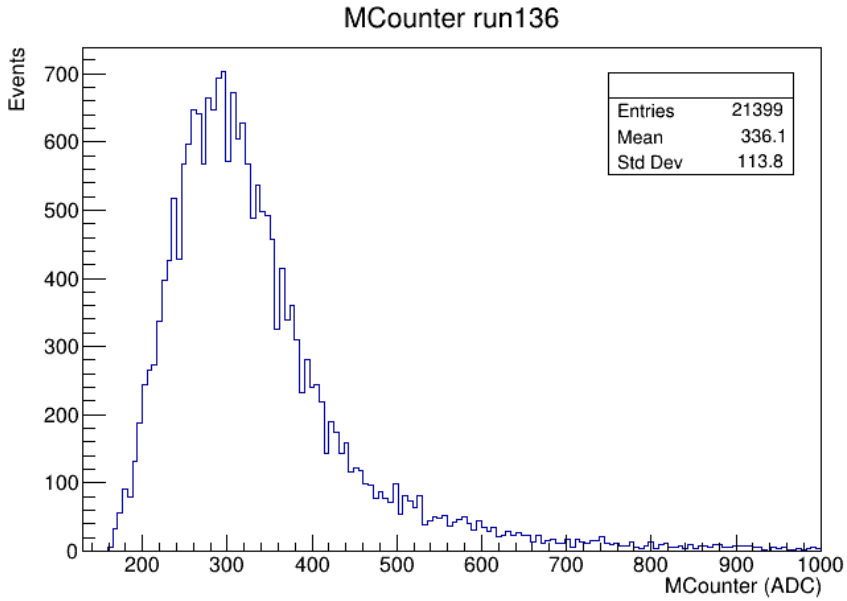
- running in T0 (x = 1 mm; y =1170 mm)
- **preshower included**
- Cherenkov Counters: Final pressures for He 344mBar, for CO2 ~49mBar

Angle	Run #	N. Event	Comments
deg		(x1000)	
2.5°	136	21	x = -8.1mm, y = 1176mm

Muon Counter

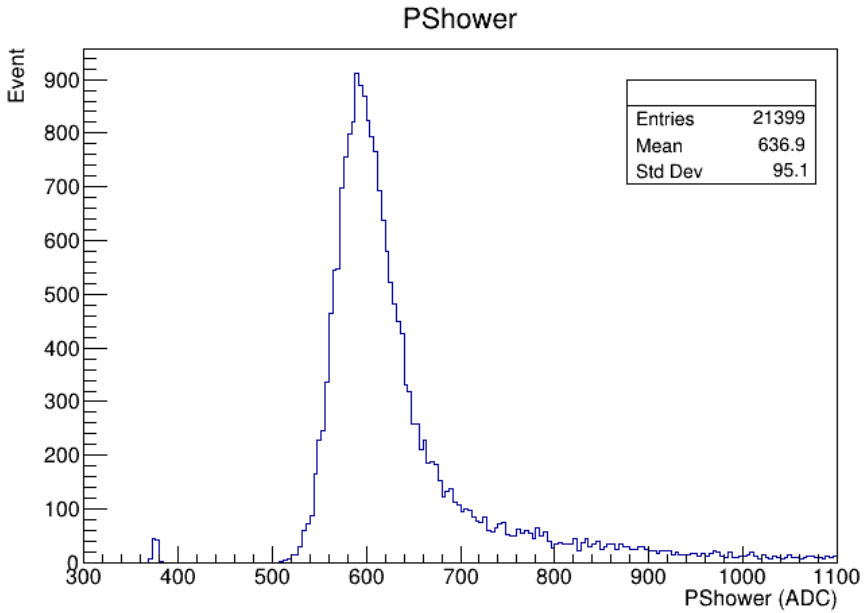
- Muon Counter $>$ 160

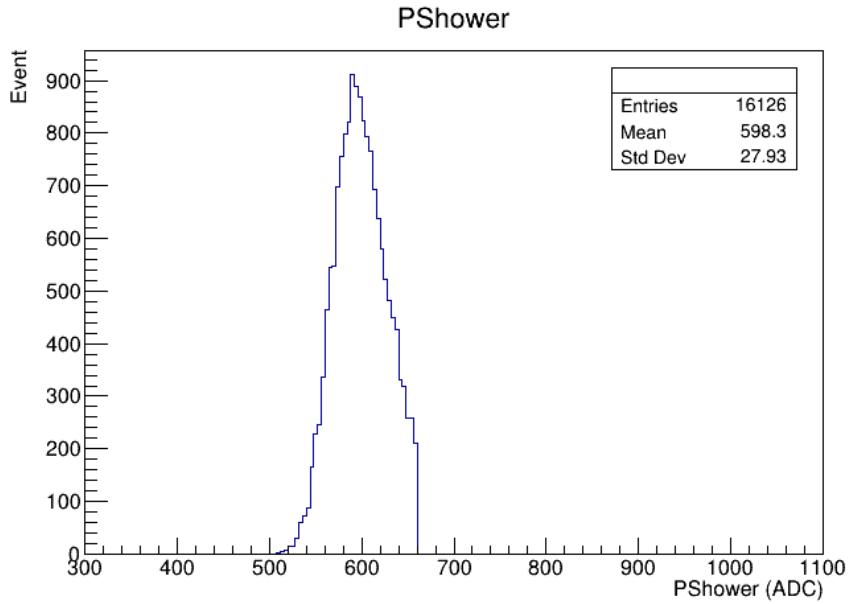




Preshower

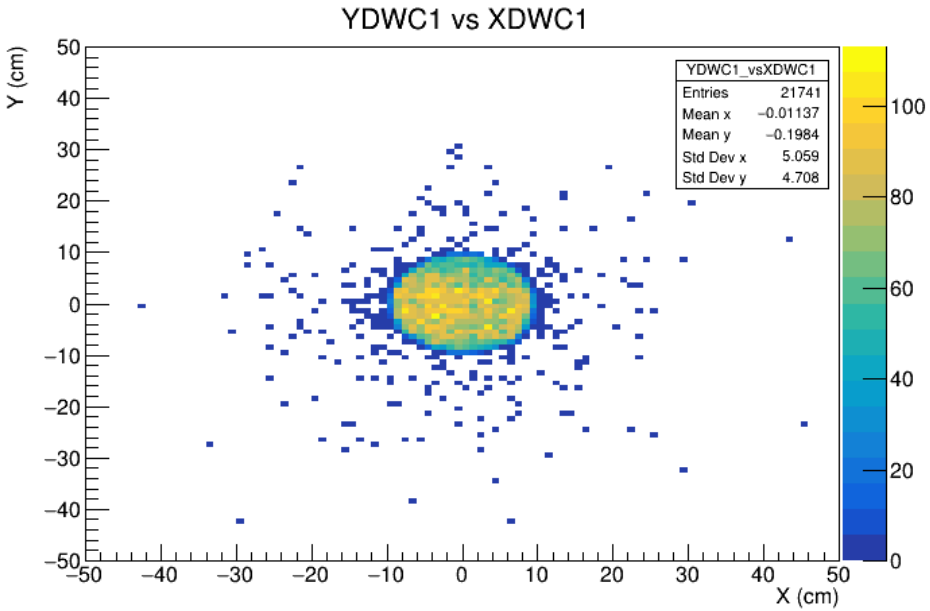
- $500 < \text{Preshower} < 660$

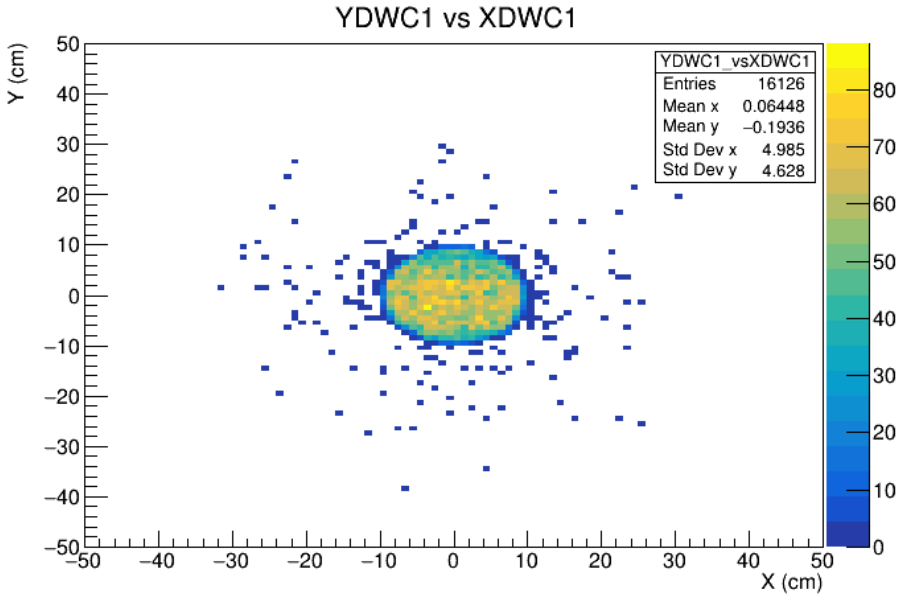




DWC1

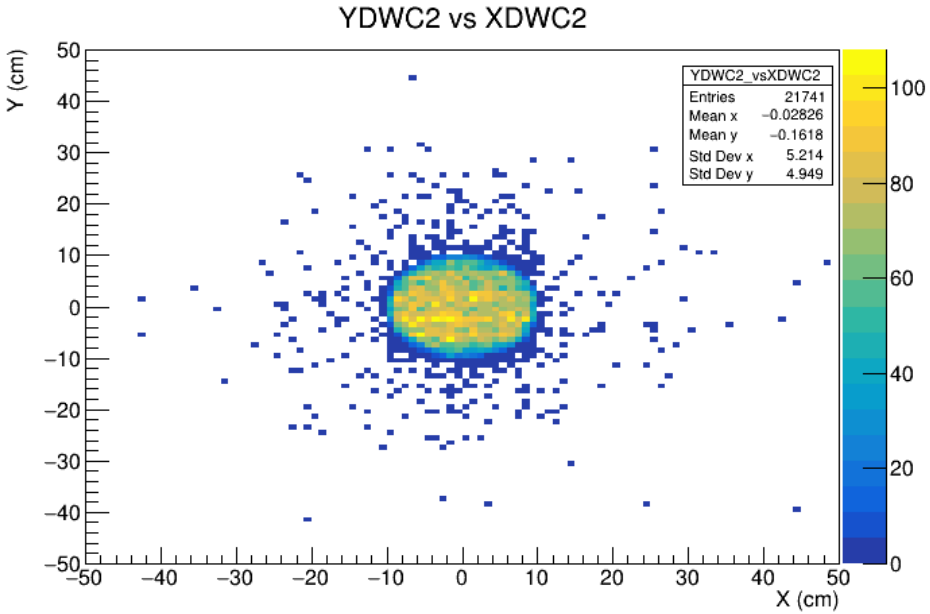
Left is the DWC1 before cuts on MCounter and PShower, right is after

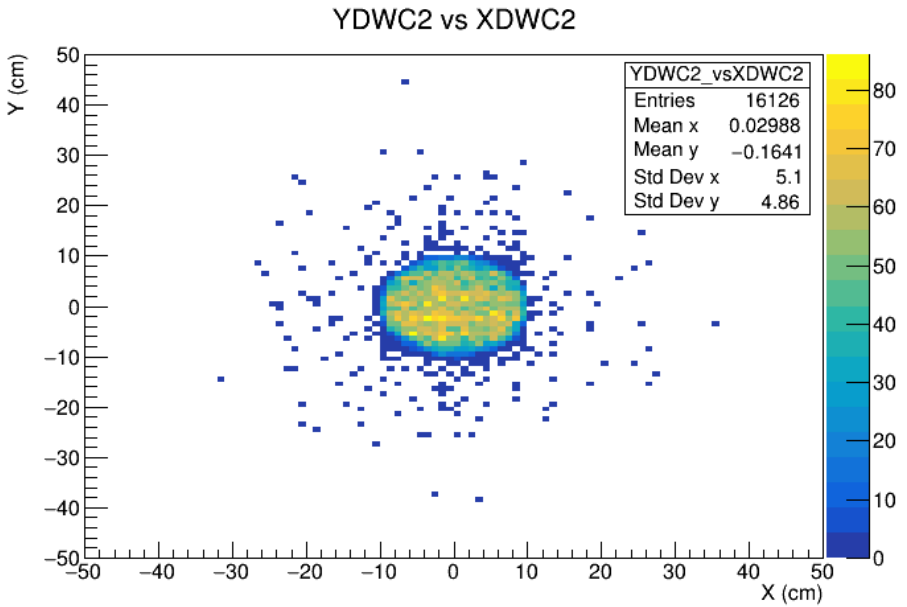




DWC2

Left is the DWC2 before cuts on MCounter and PShower, right is after





Event selection using DWCs coordinates

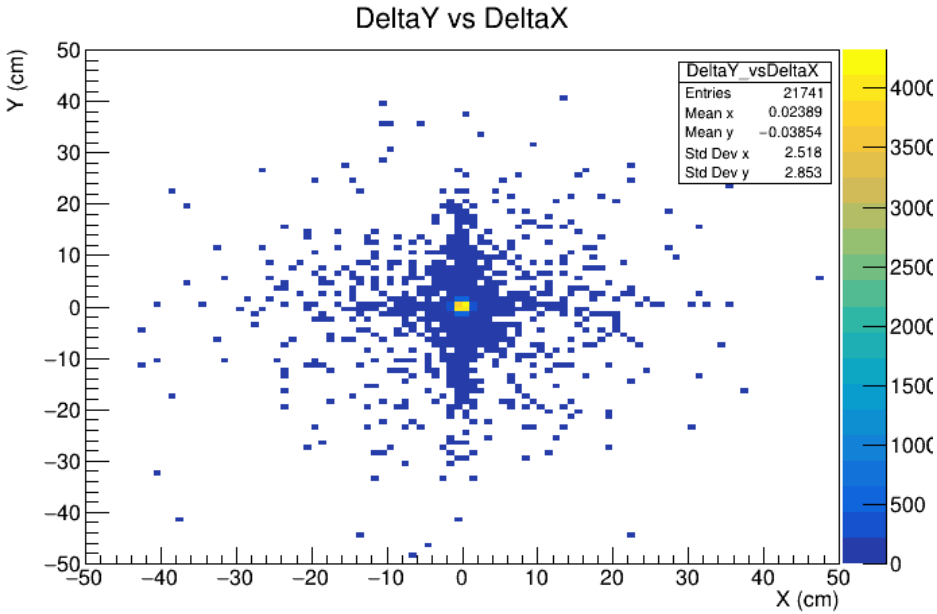
Beam position correction

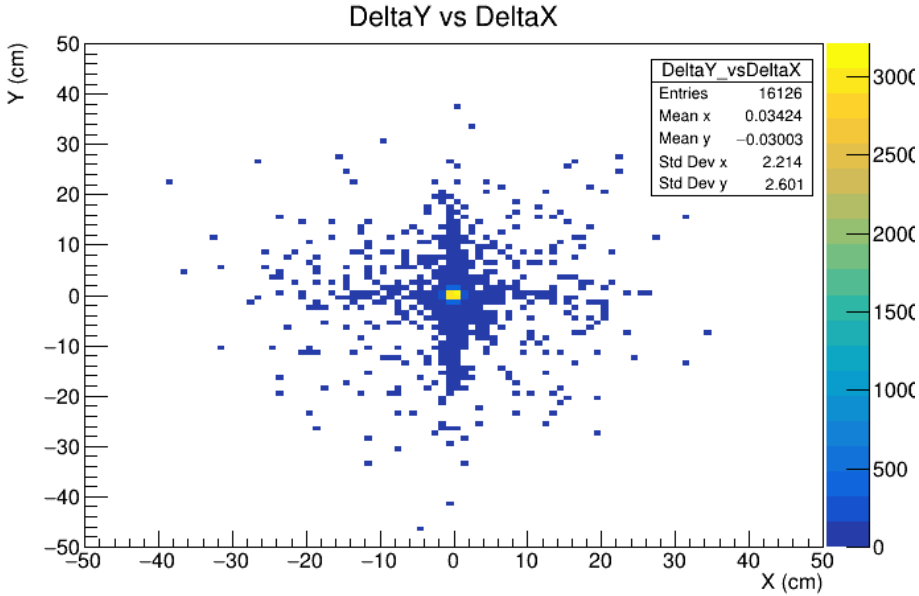
We want to correct the position of the beam using the wire chamber coordinates (based on Yuchen's studies):

- Calculate Δ_x and Δ_y, event by event, for both DWCs
- Define corrections:
  1. $Correction_x(C_x)$ = the average of the difference between 'XDWC1' and 'XDWC2'
  2. $Correction_y(C_y)$ = the average of the difference between 'YDWC1' and 'YDWC2'
- Event selection: $|\Delta_x - C_x| < 2cm$ and $|\Delta_y - C_y| < 2cm$, , *i.e.* we select a very colllimated beam. The maximum angle of a muon is: $\theta_{MAX} = tan^{-1}(\frac{2cm}{174cm}) = tan^{-1}(0.011) = 0.66^{\circ}$ degrees

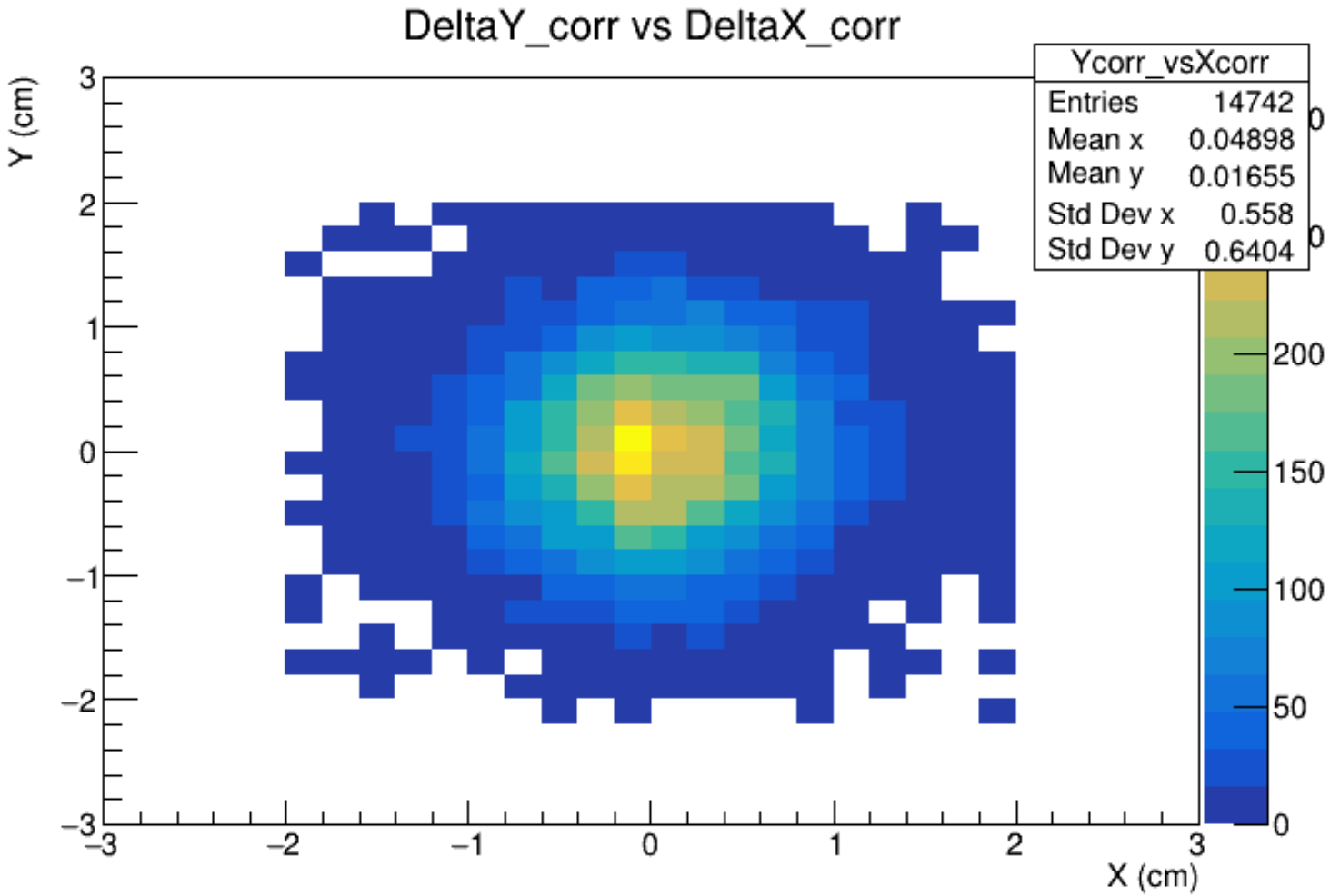
Δ_x and Δ_y DWCs

Left is before cuts on MCounter and PShower, right is after



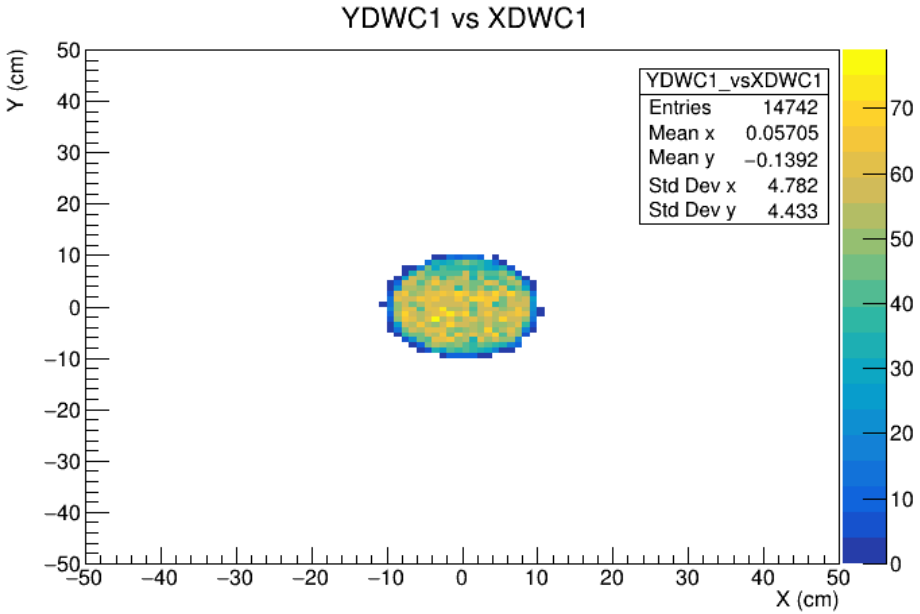


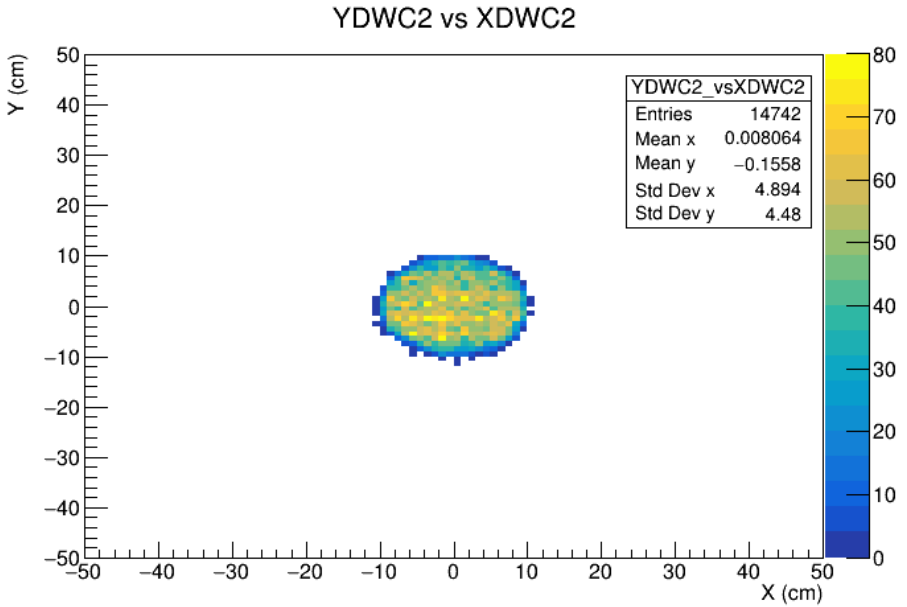
Corrected positions



DWCs after corrections

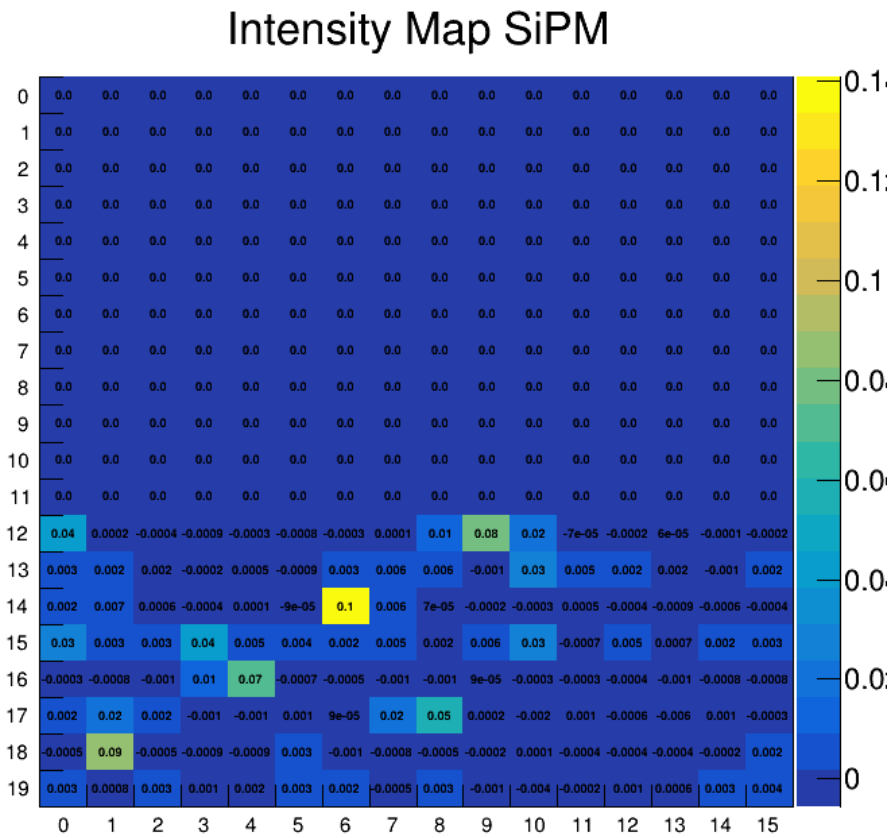
Left is DWC1 right is DWC2

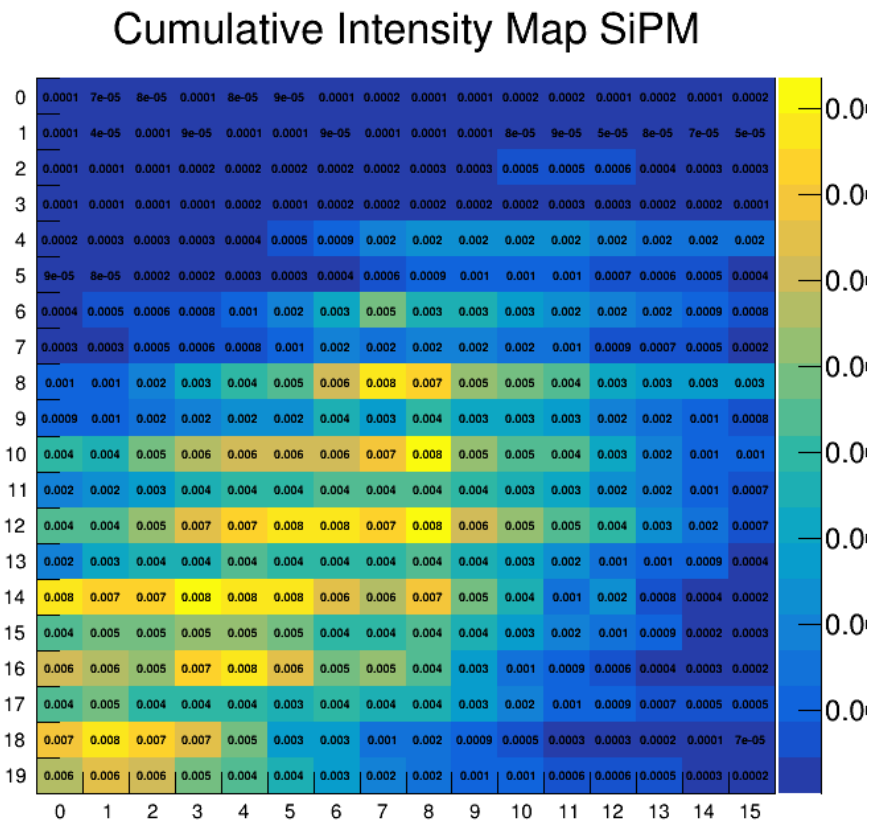




SiPMs Intensity Maps (after selections)

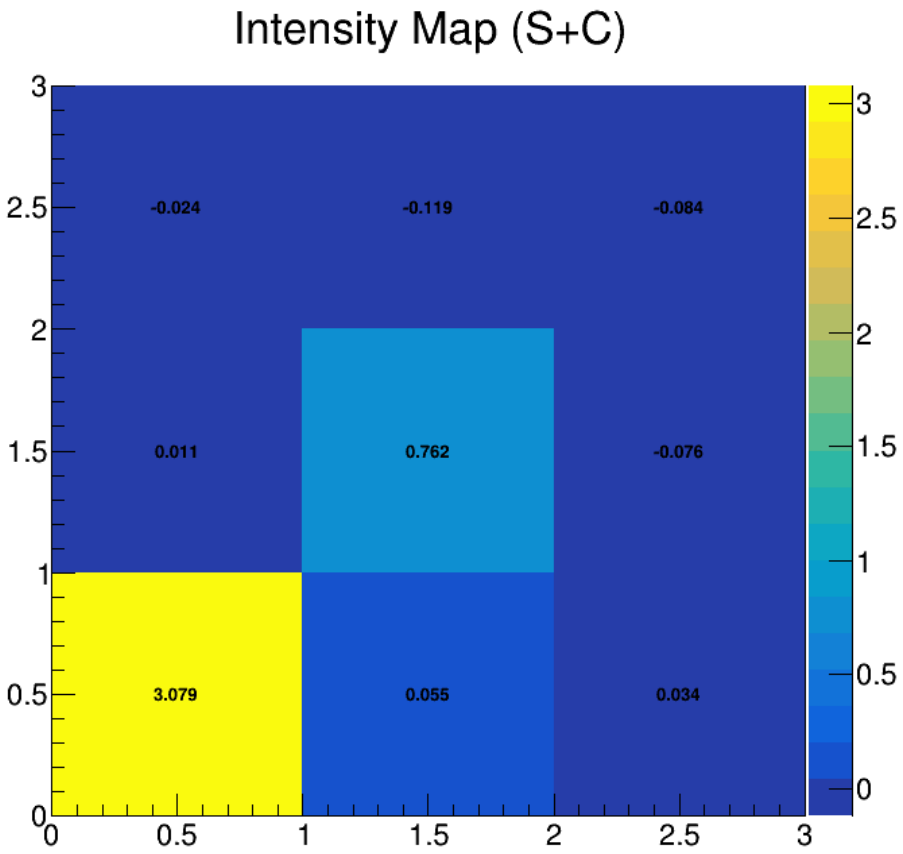
Left is run 136 event 136, right is the cumulative one (sometimes negative signals)

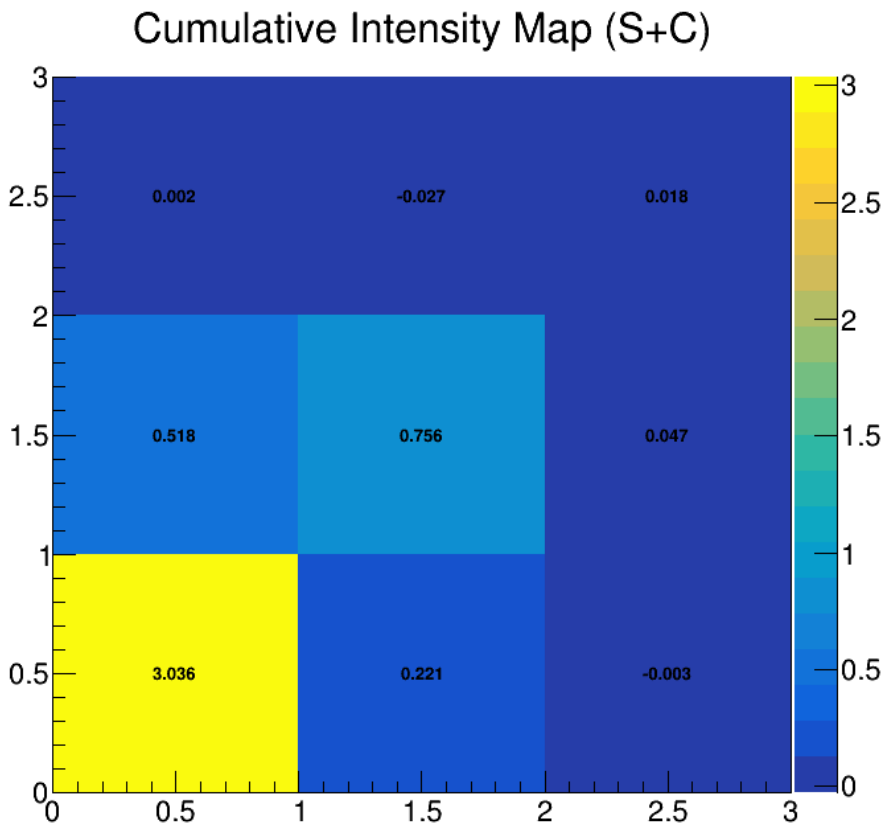




Calo Intensity Maps (after selections)

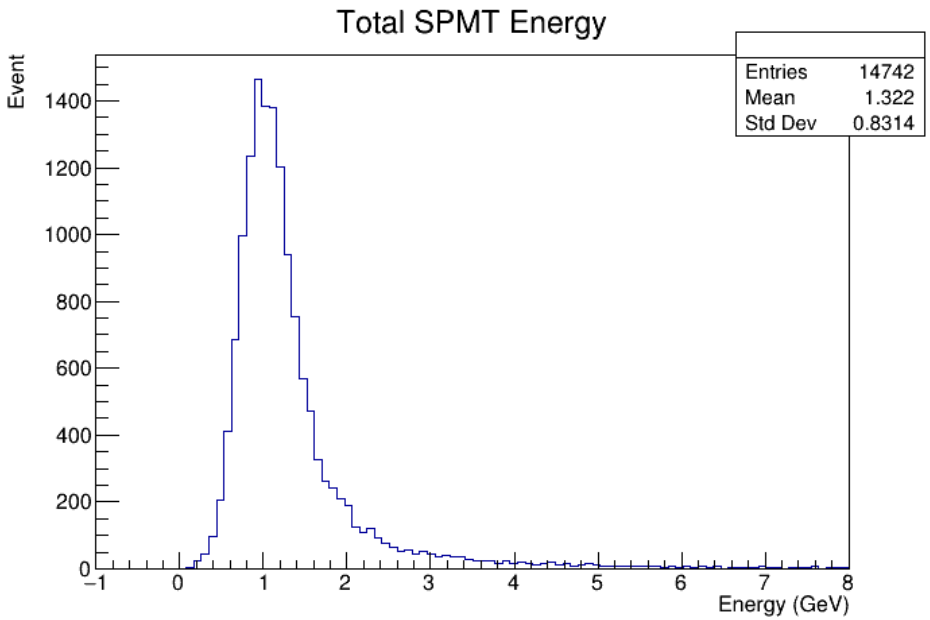
Left is run 136 event 136, right is the cumulative one (sometimes negative signals)

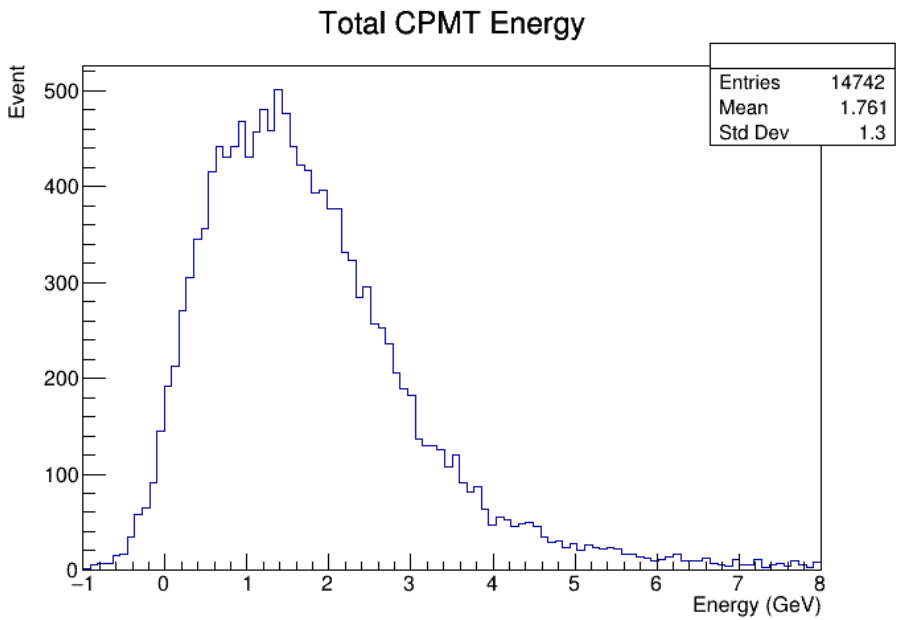




Issue with run 136

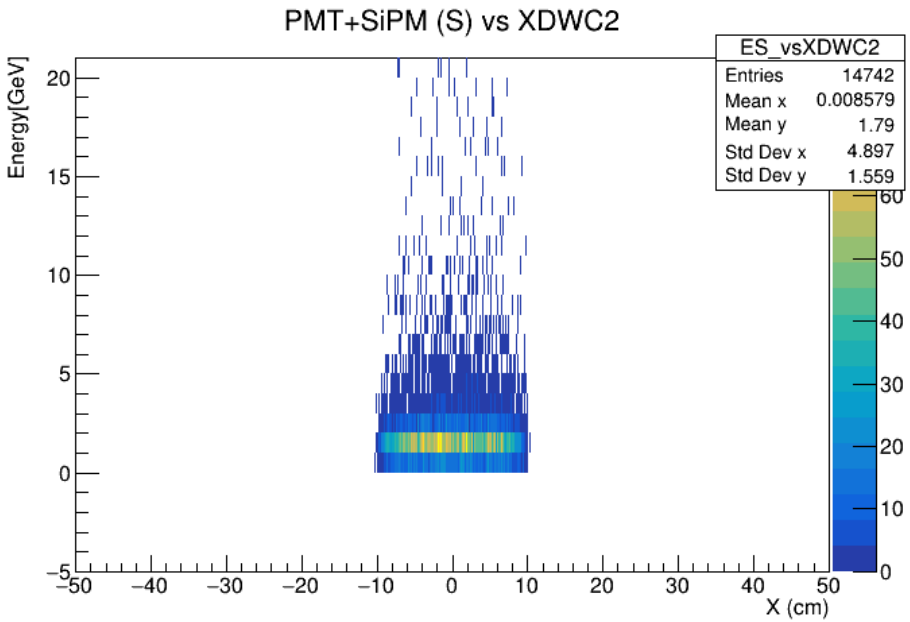
Understand why Cerenkov signal is bigger than the scintillating one

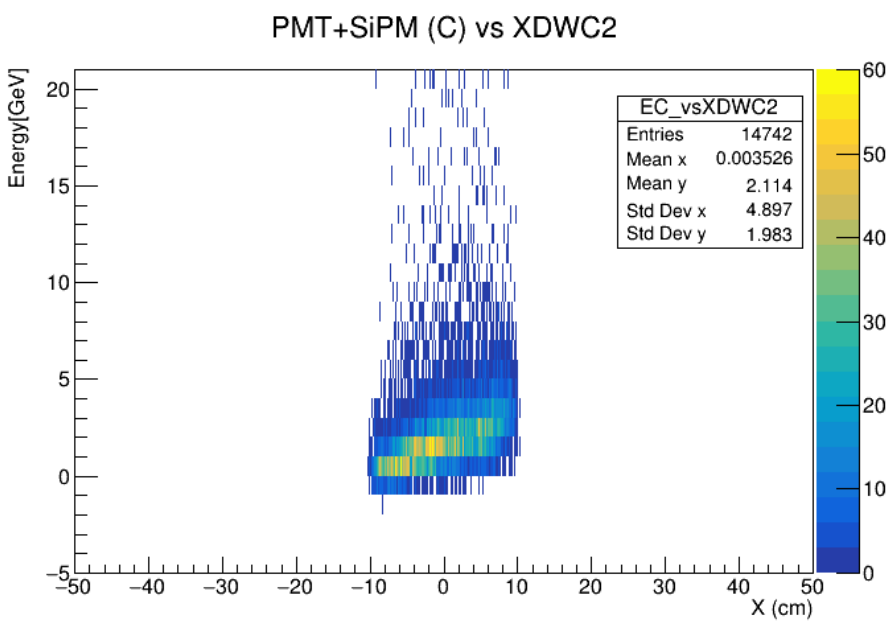




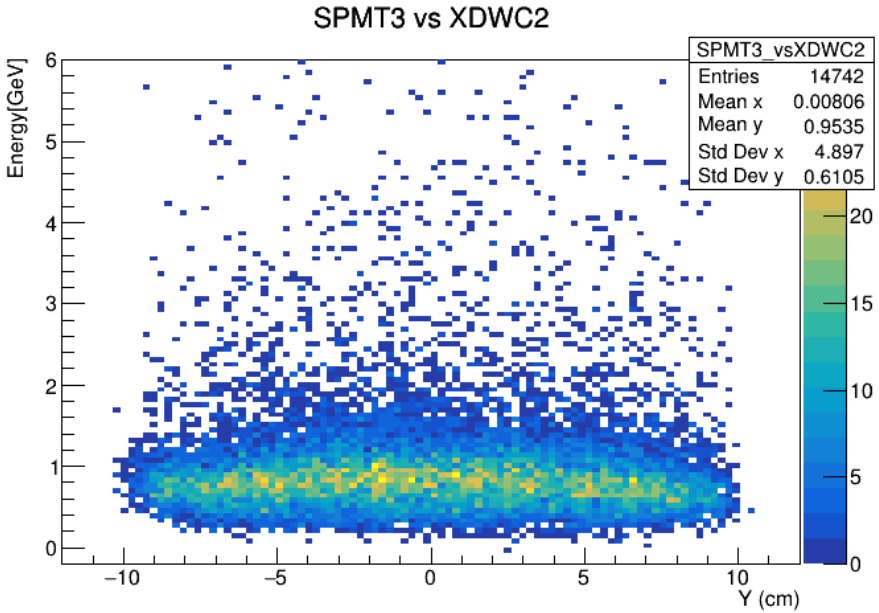
Issue with run 136

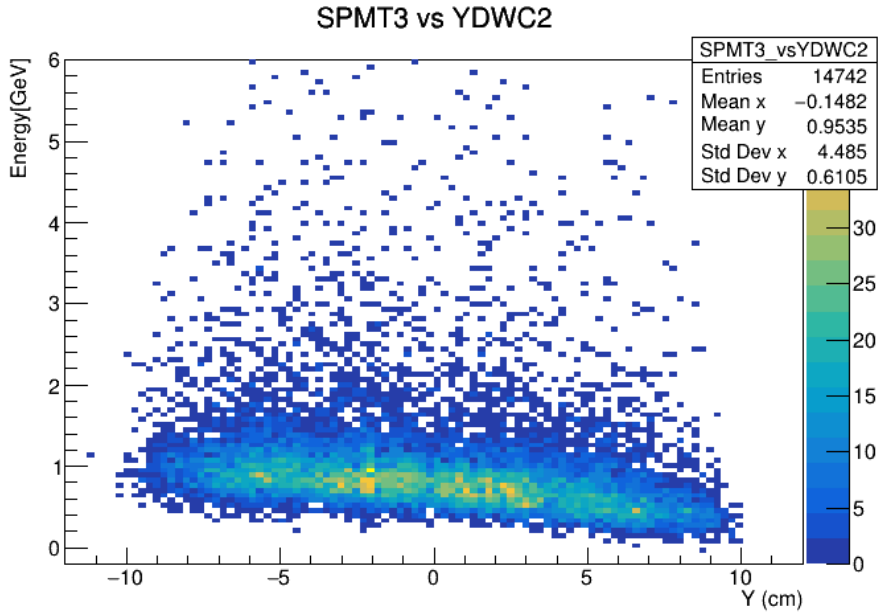
To investigate this: (same for DWC1)

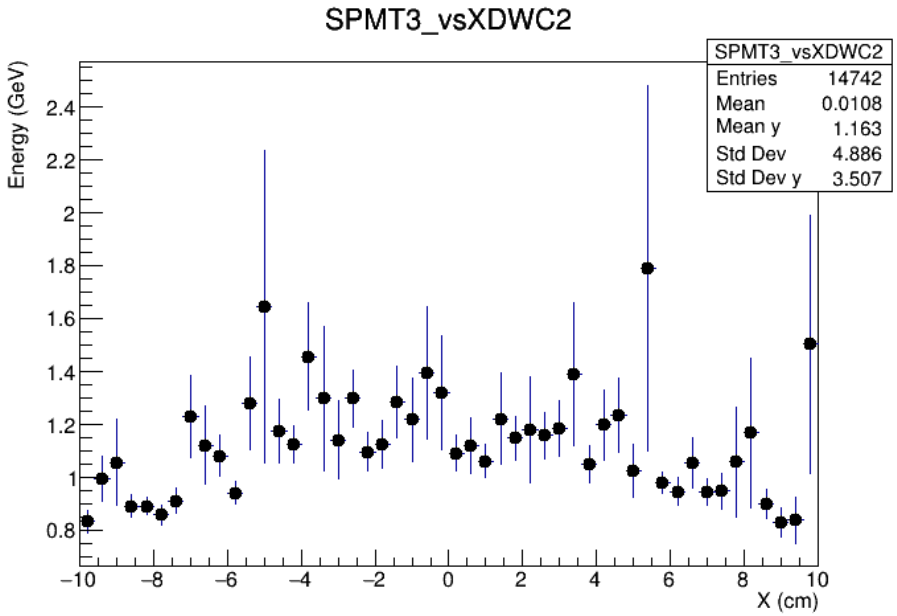


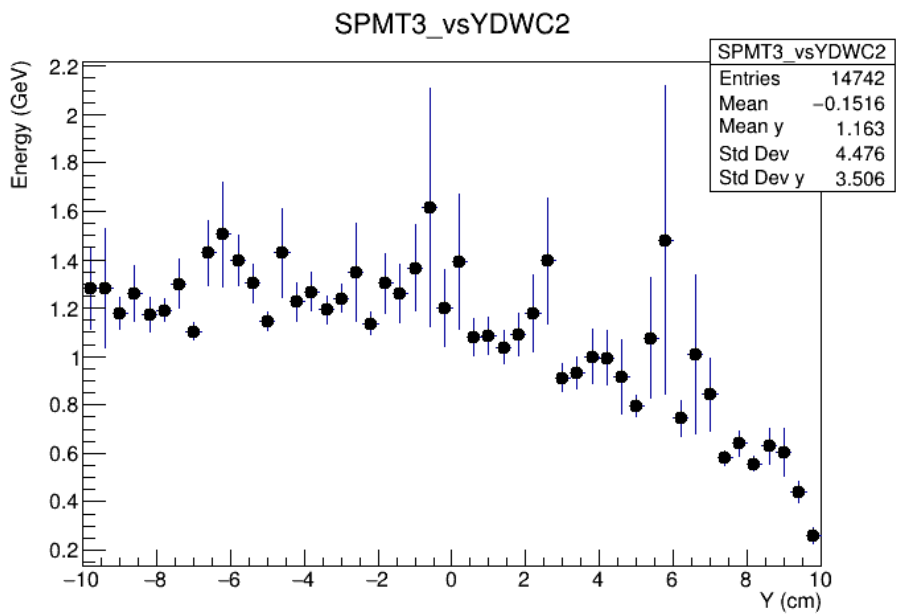


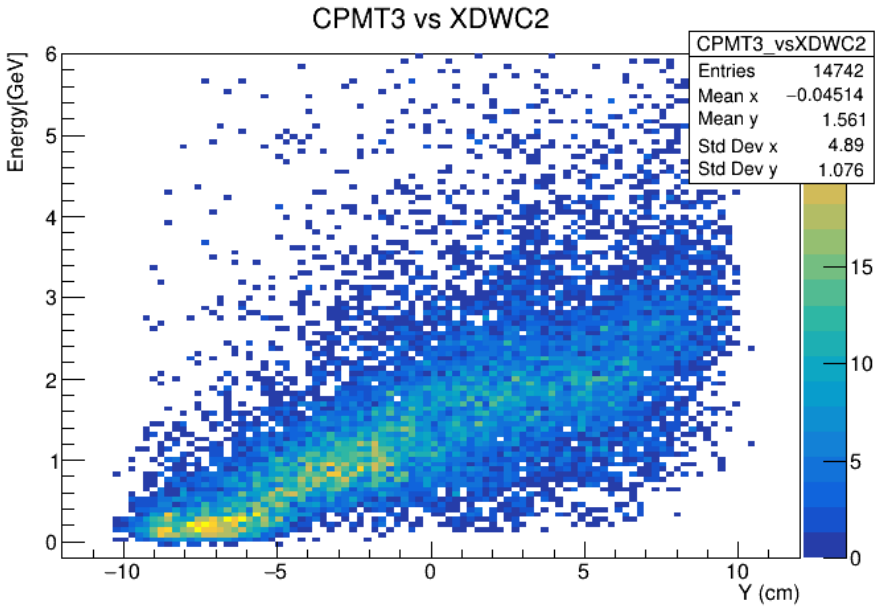
The effect is present only in the X direction

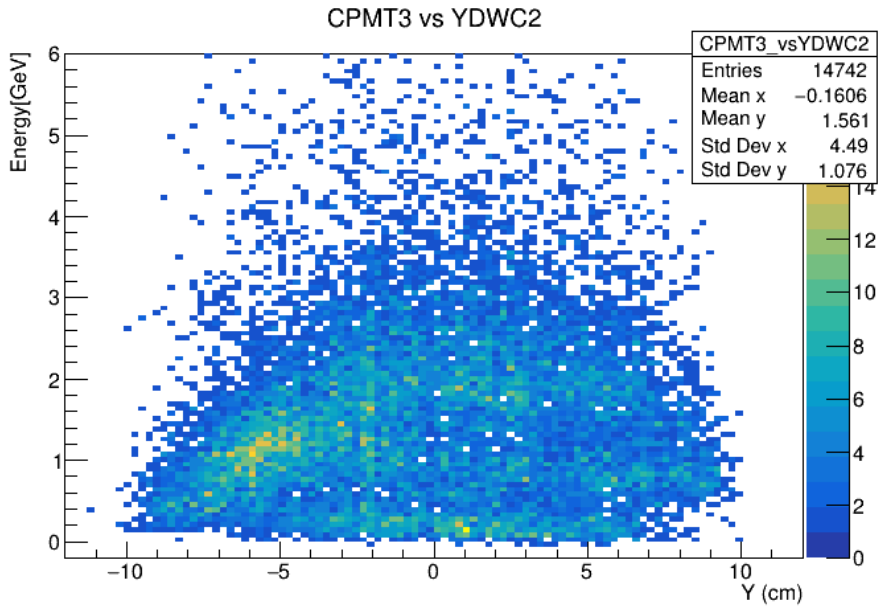

SPMT3 vs XDWC2
SPMT3_vsXDWC2
Entries 14742
Mean x 0.00806
Mean y 0.9535
Std Dev x 4.897
Std Dev y 0.6105
Energy[GeV]
Y (cm)

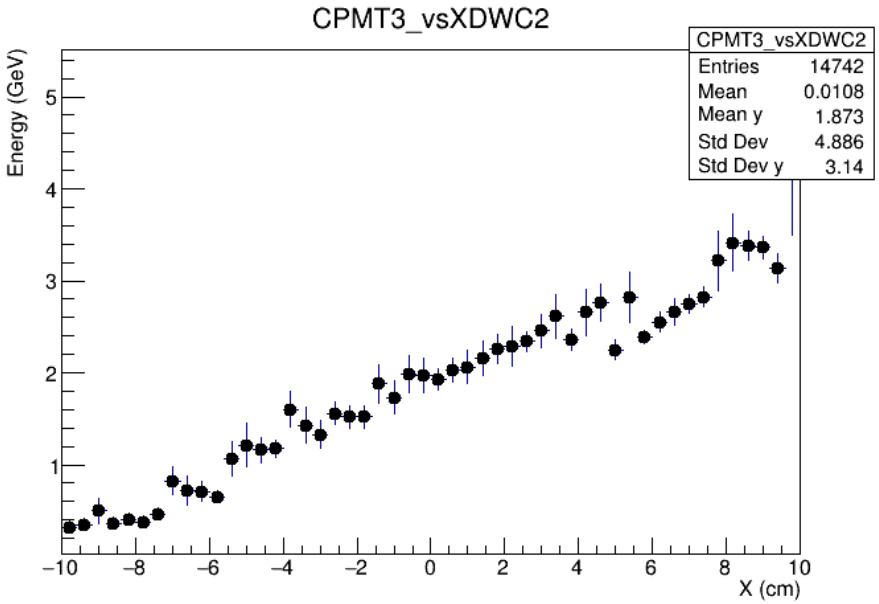

SPMT3 vs YDWC2
SPMT3_vsYDWC2
Entries 14742
Mean x −0.1482
Mean y 0.9535
Std Dev x 4.485
Std Dev y 0.6105
Energy[GeV]
Y (cm)

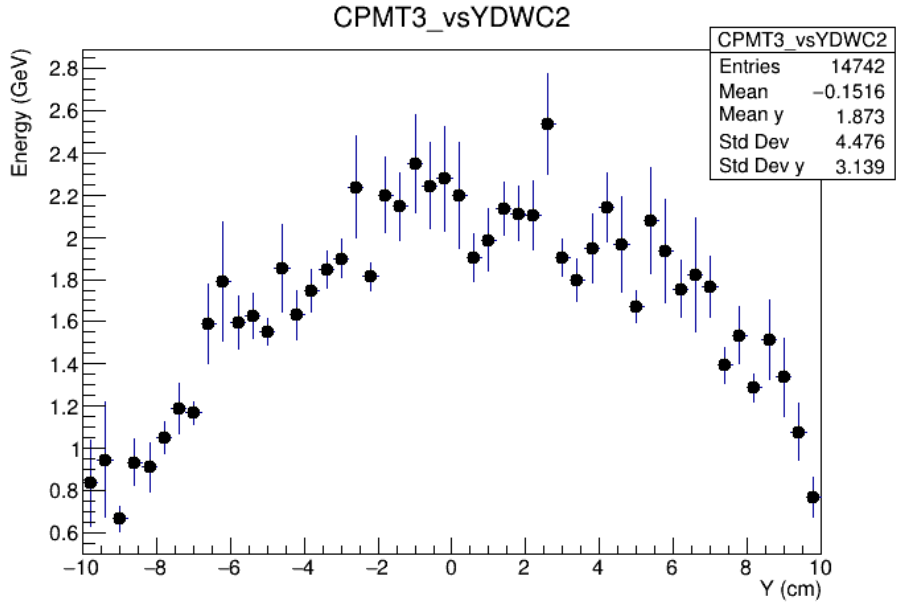

SPMT3_vsXDWC2
SPMT3_vsXDWC2
Entries 14742
Mean 0.0108
Mean y 1.163
Std Dev 4.886
Std Dev y 3.507
Energy (GeV)
X (cm)


SPMT3_vsYDWC2
SPMT3_vsYDWC2
Entries 14742
Mean −0.1516
Mean y 1.163
Std Dev 4.476
Std Dev y 3.506
Energy (GeV)
Y (cm)


CPMT3 vs XDWC2
CPMT3_vsXDWC2
Entries 14742
Mean x −0.04514
Mean y 1.561
Std Dev x 4.89
Std Dev y 1.076
Energy[GeV]
Y (cm)

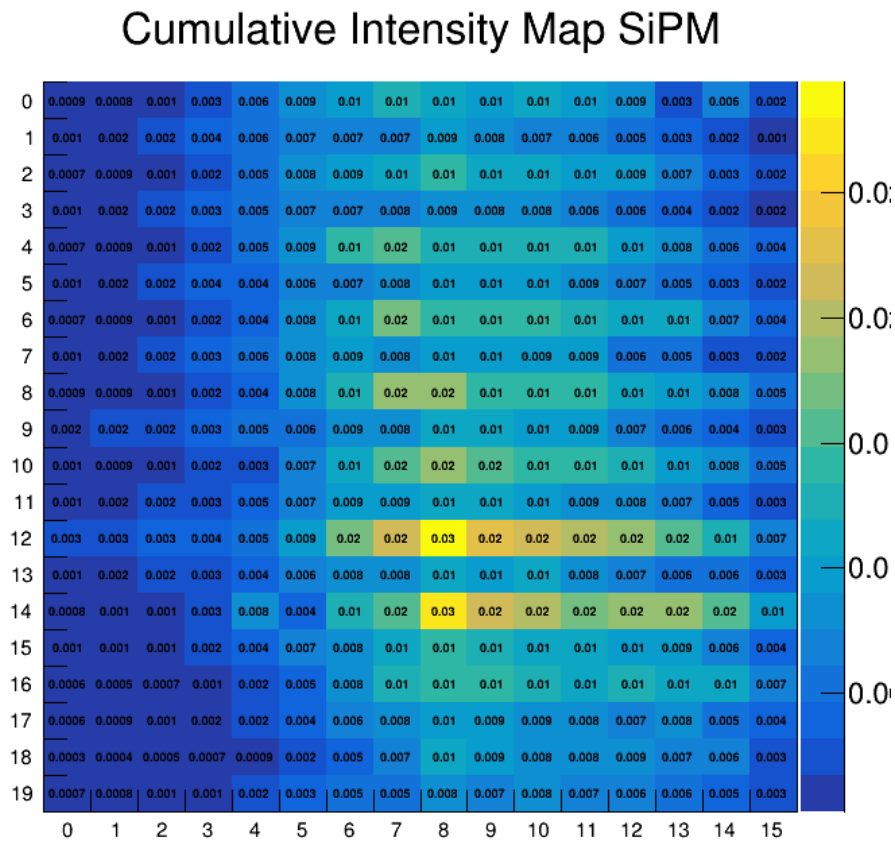

CPMT3 vs YDWC2
CPMT3_vsYDWC2
Entries 14742
Mean x −0.1606
Mean y 1.561
Std Dev x 4.49
Std Dev y 1.076
Energy[GeV]
Y (cm)

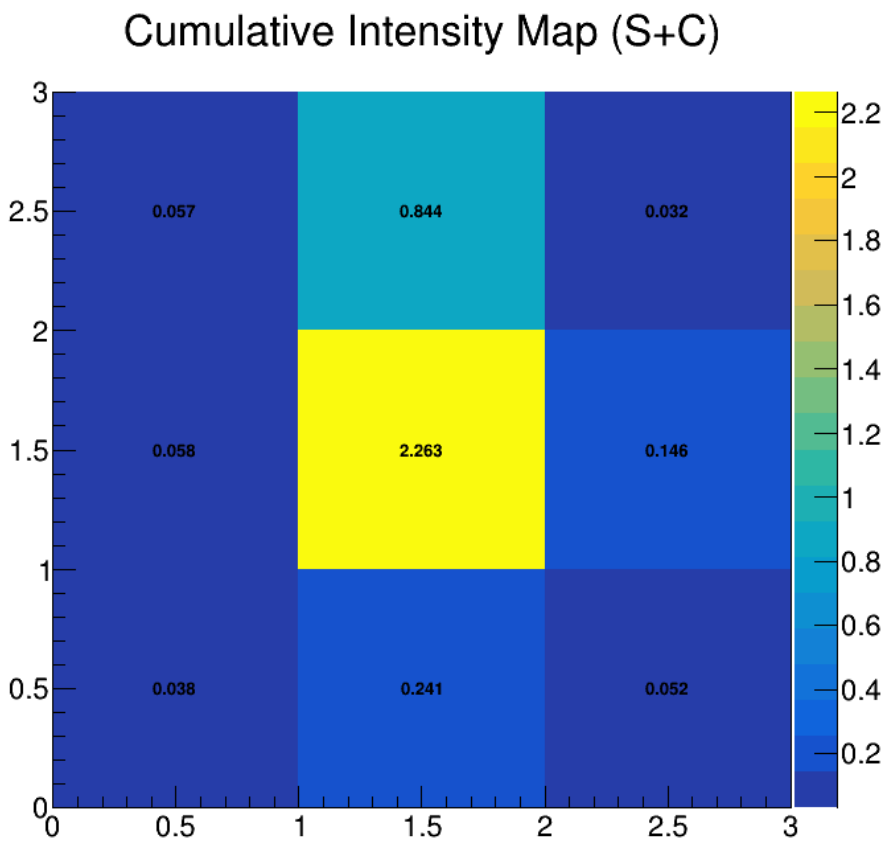

CPMT3_vsXDWC2
CPMT3_vsXDWC2
Entries 14742
Mean 0.0108
Mean y 1.873
Std Dev 4.886
Std Dev y 3.14
Energy (GeV)
X (cm)


CPMT3_vsYDWC2
CPMT3_vsYDWC2
Entries 14742
Mean −0.1516
Mean y 1.873
Std Dev 4.476
Std Dev y 3.139
Energy (GeV)
Y (cm)

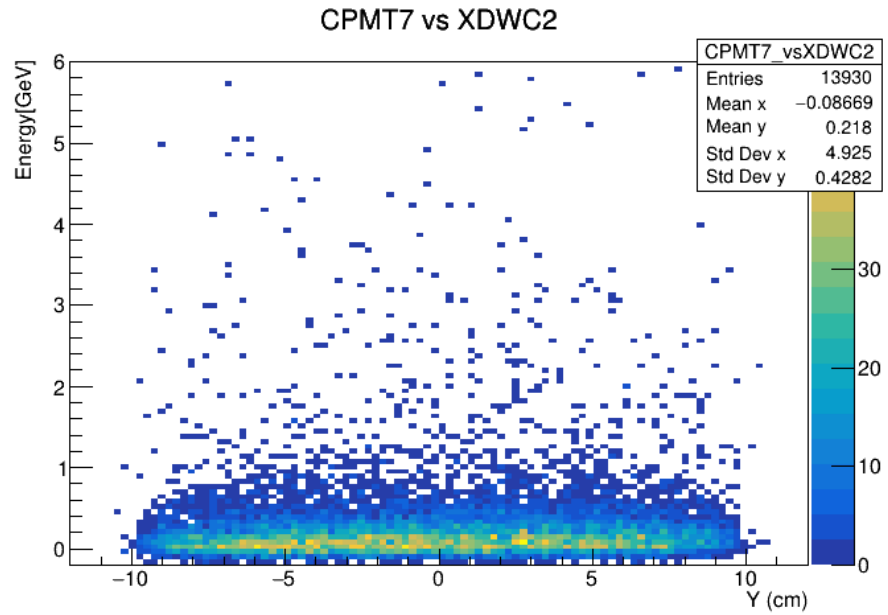
What to do next?

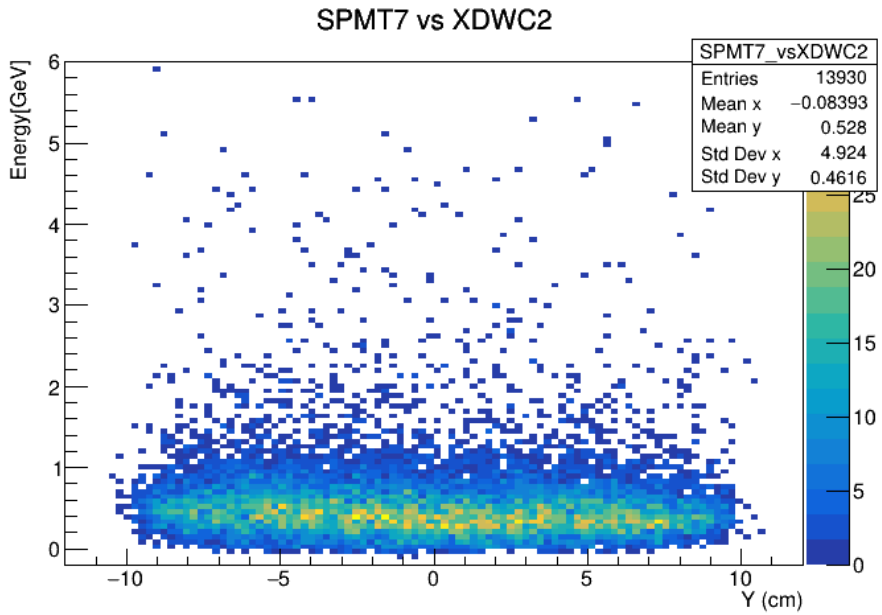
We tried with run 149: vertical angle 2.5° and orizontal angle -1°

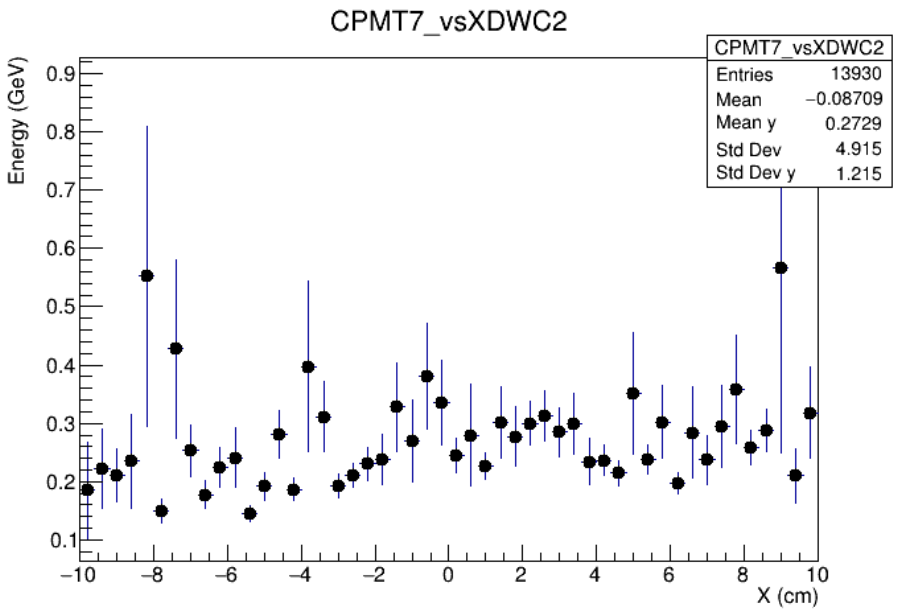


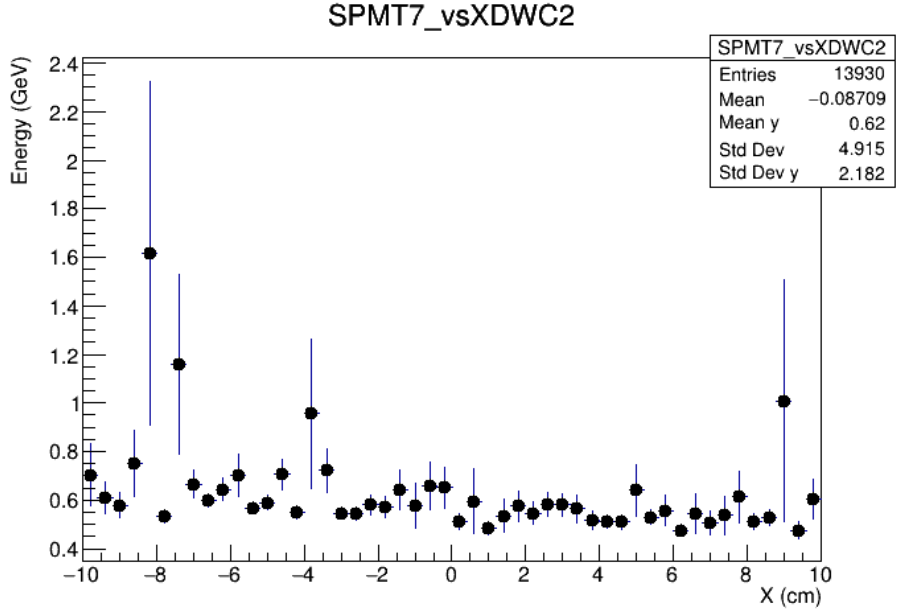
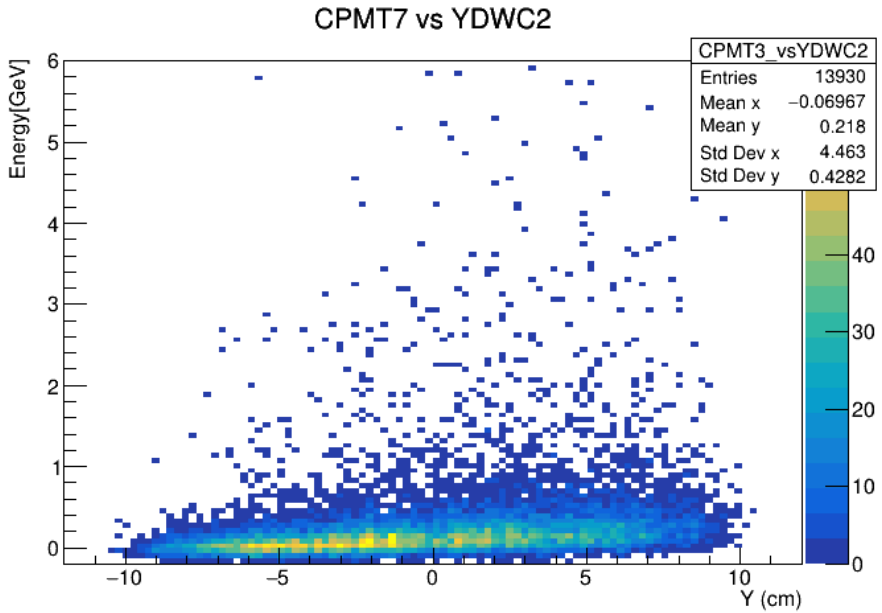
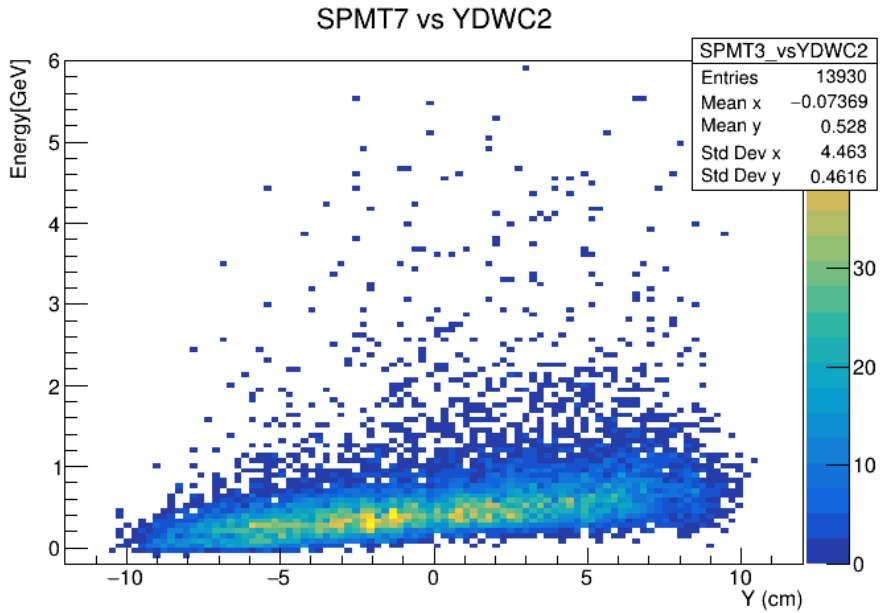
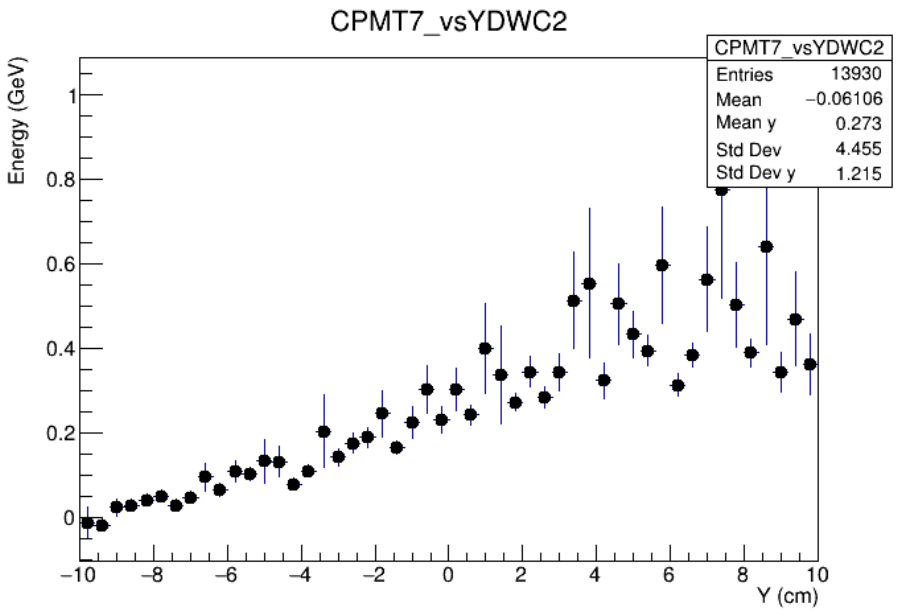
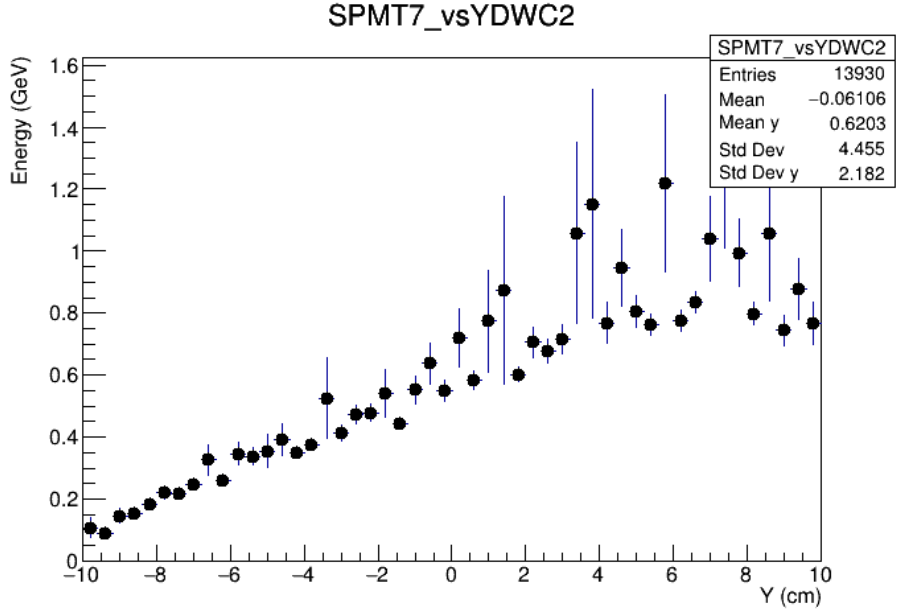


The same occurs for DWC1









The same occurs for DWC1