Week 4 Review

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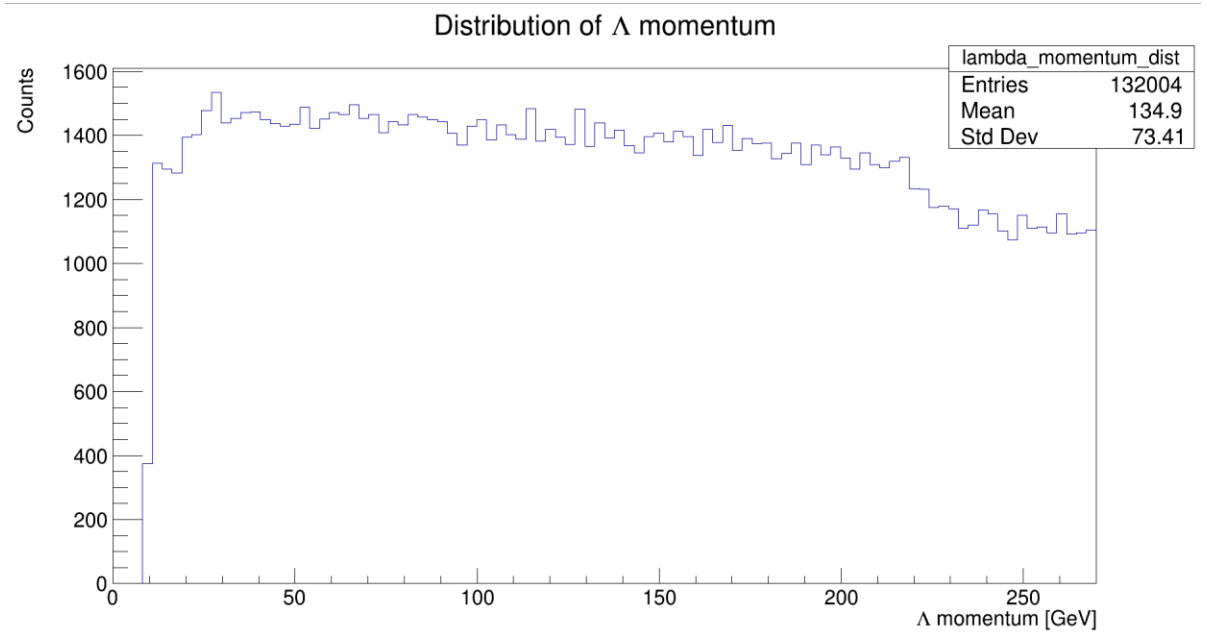
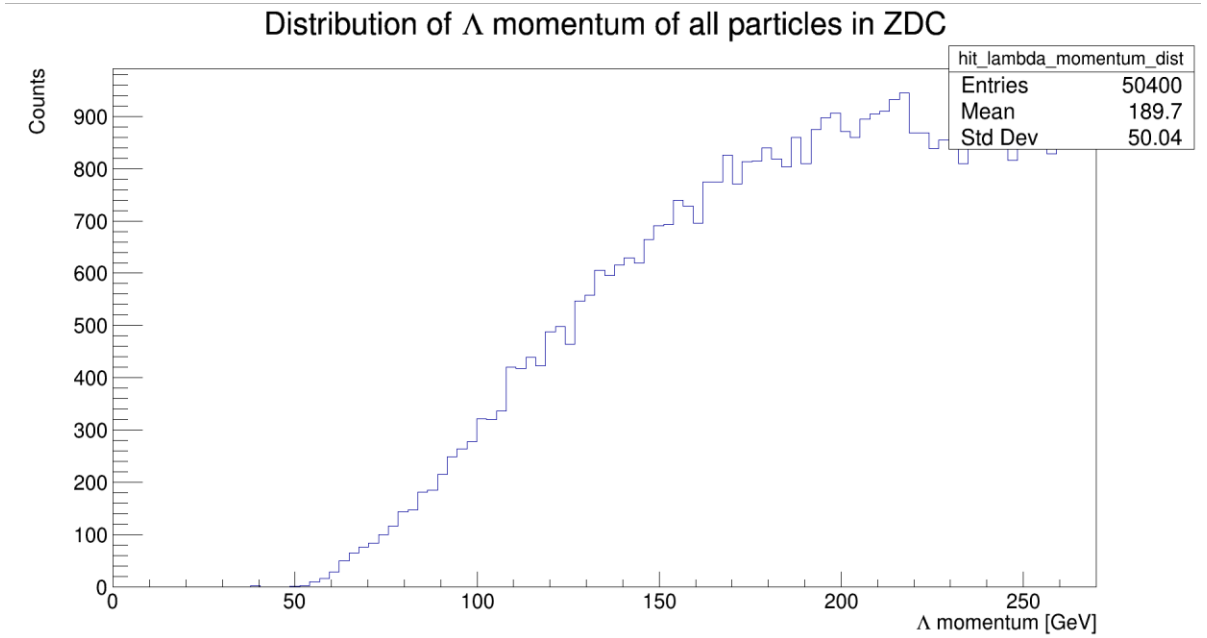
Lambda Acceptance and Efficiency Study

- Lambda particle gun from origin, 25mrad, 0 to 270 GeV lambda momentum, current ZDC design, 140k events (before cuts)
- Goal is to find what are the characteristics of events which the ZDC could potentially reconstruct
- Two parameters: Lambda momentum, Lambda decay distance
- Determined candidate events by checking if neutron and 2 gamma land in Ecal (determined by using MC truth momentum vectors and decay vertex)
- Additional cuts remove beam pipe collision events

Momentum Distributions





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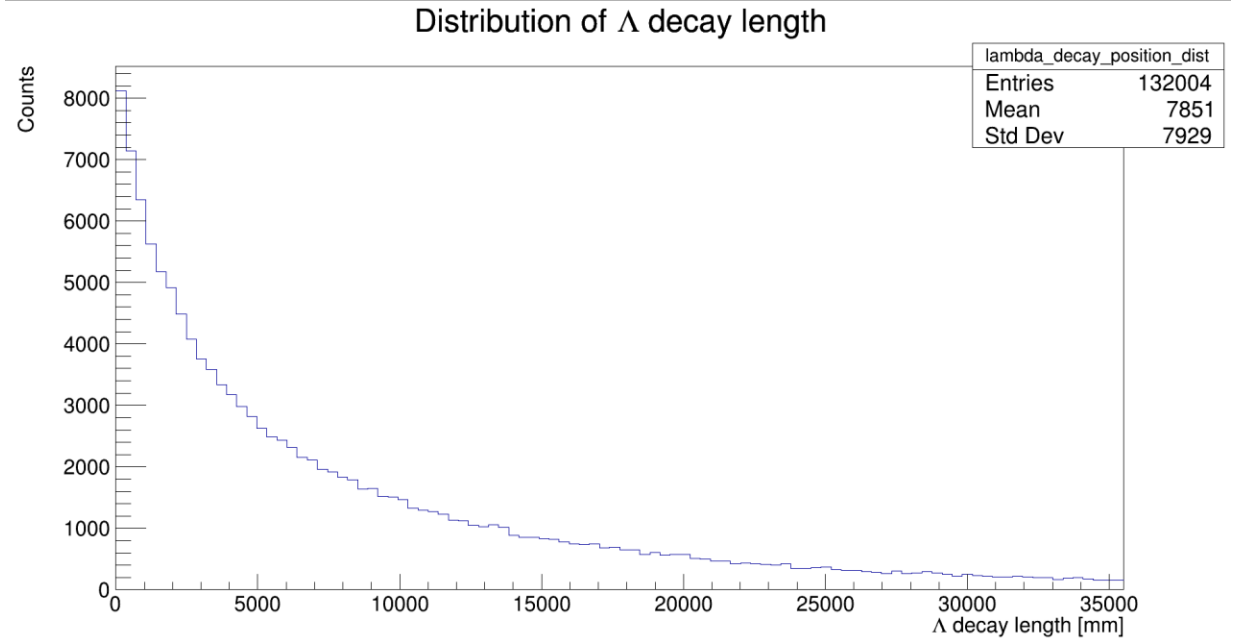
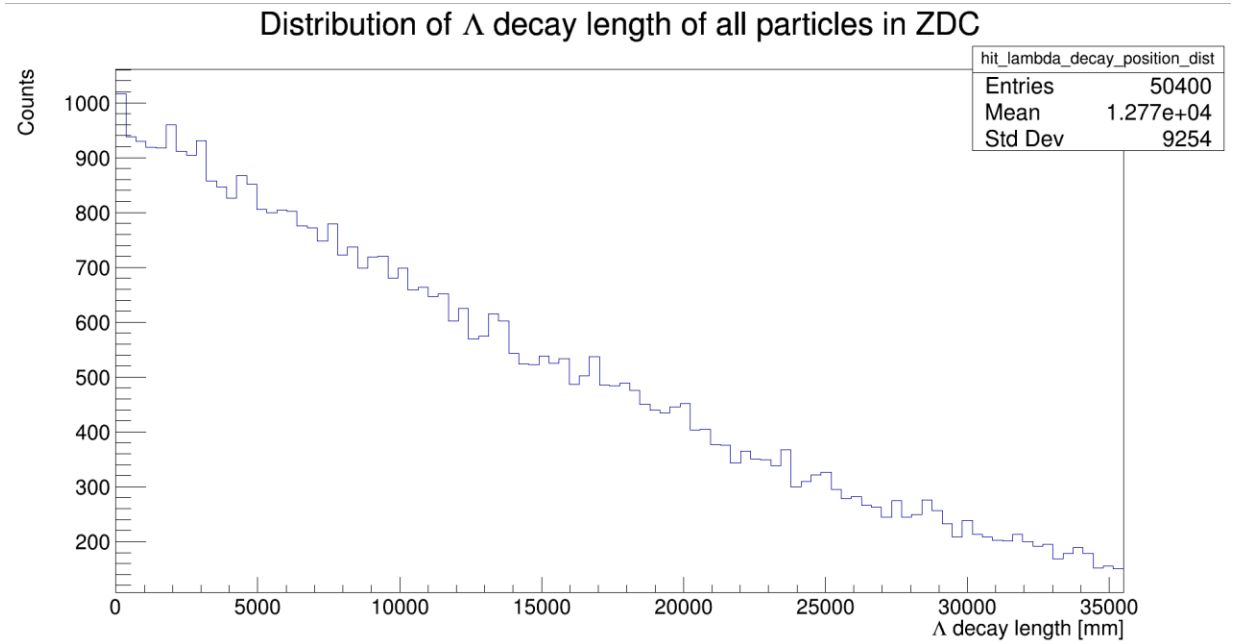
Decay positions





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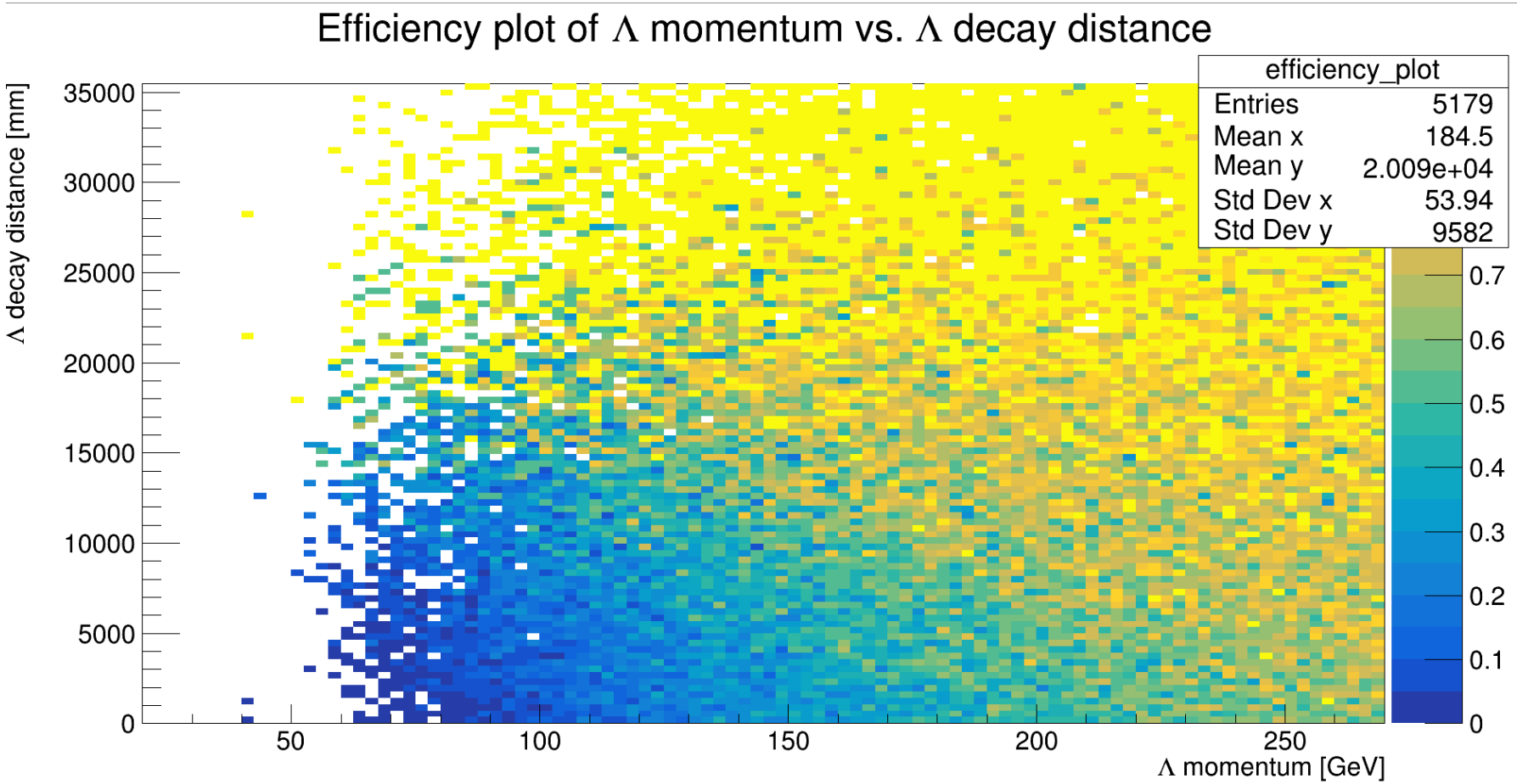
Efficiency Plot



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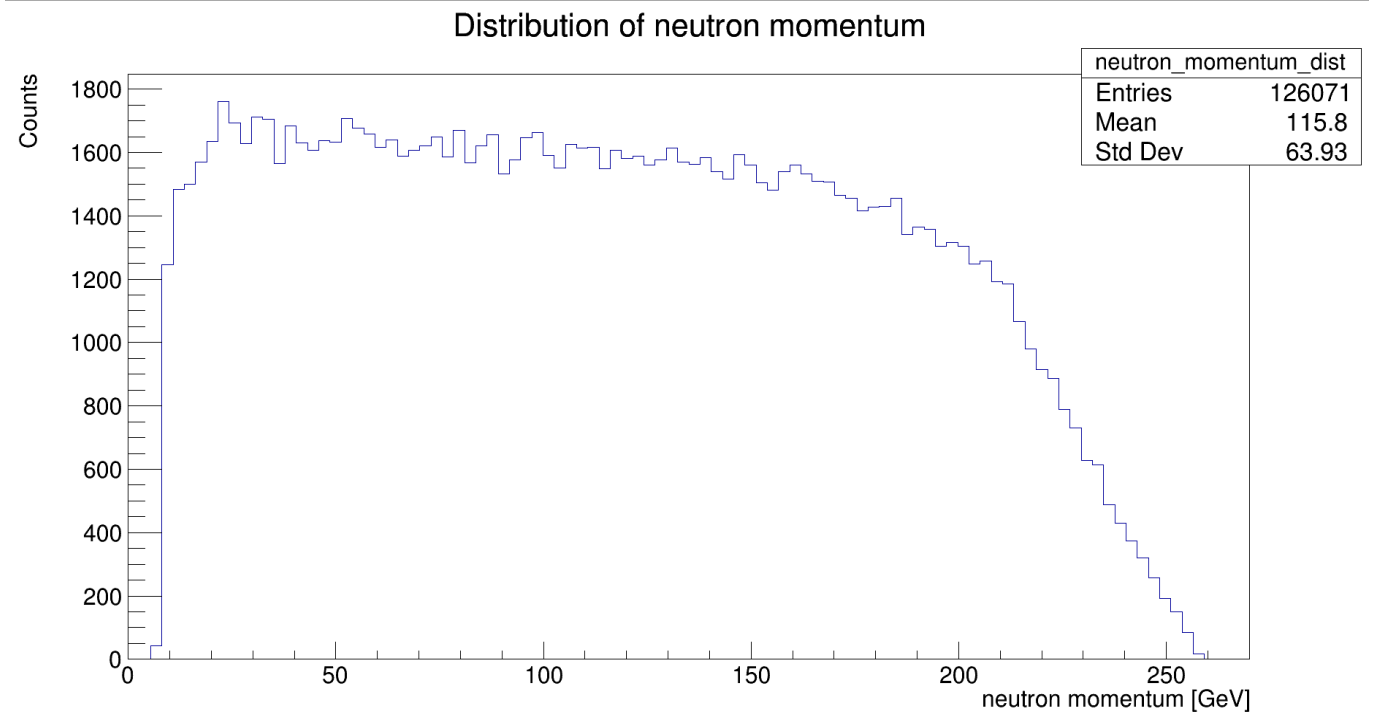
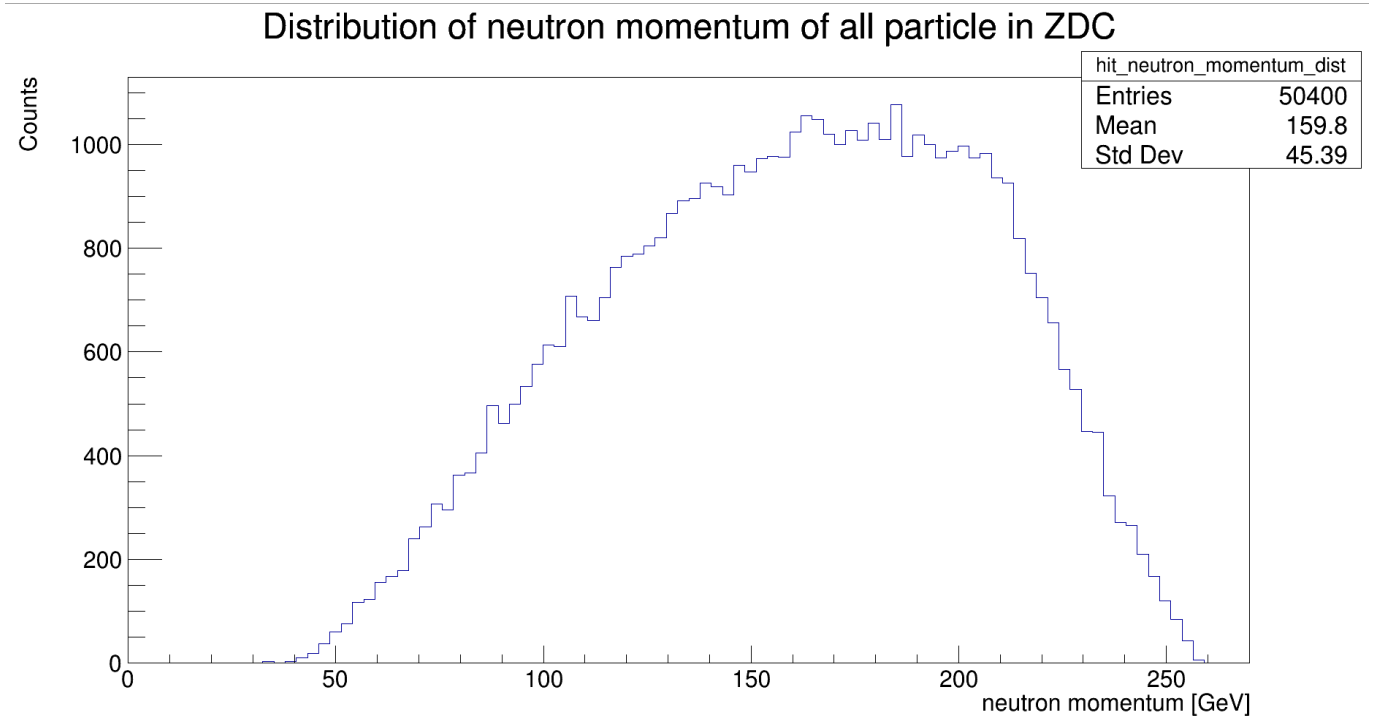
Neutron momentum





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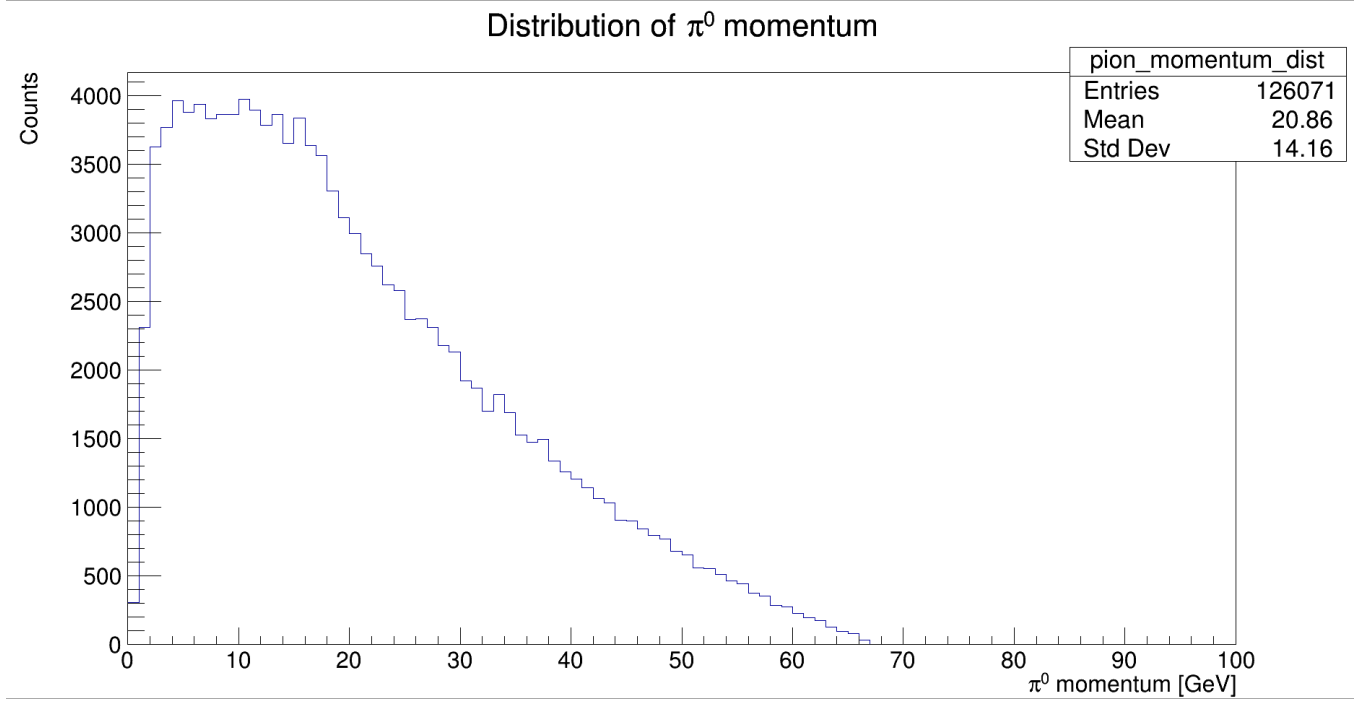
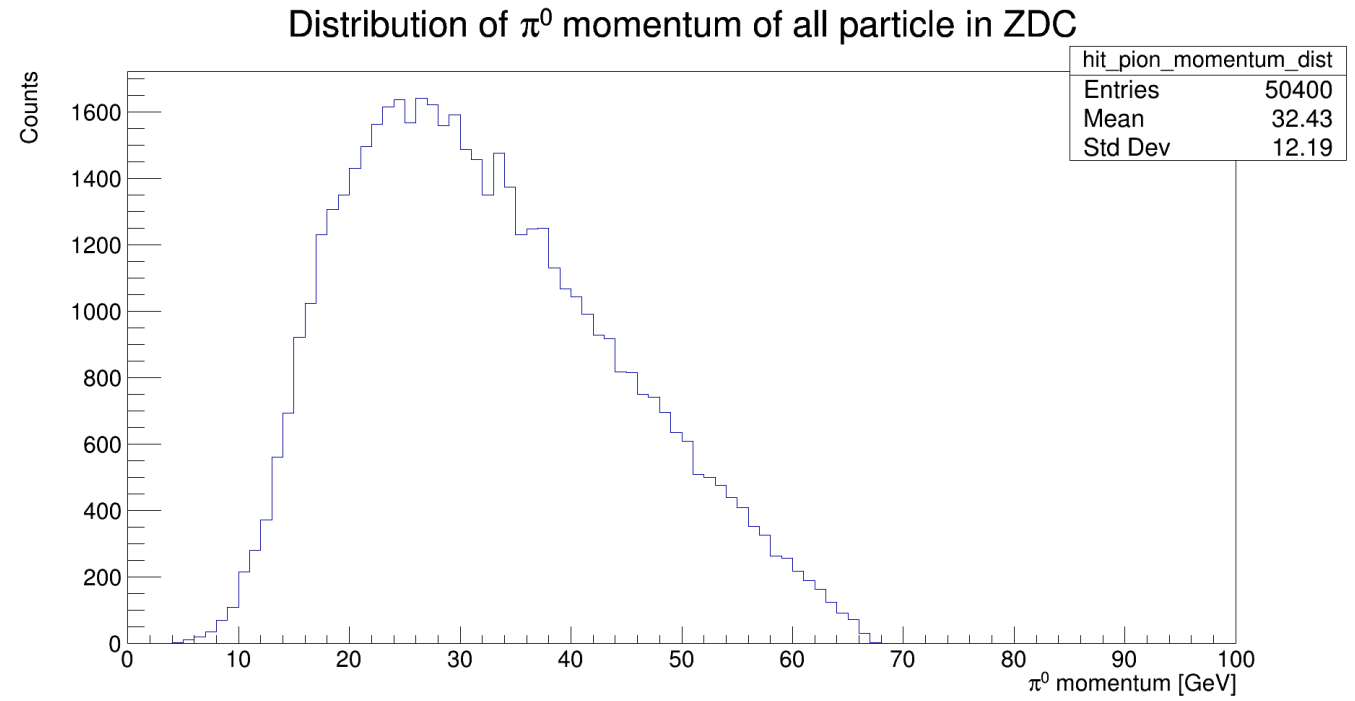
Pi0 momentum





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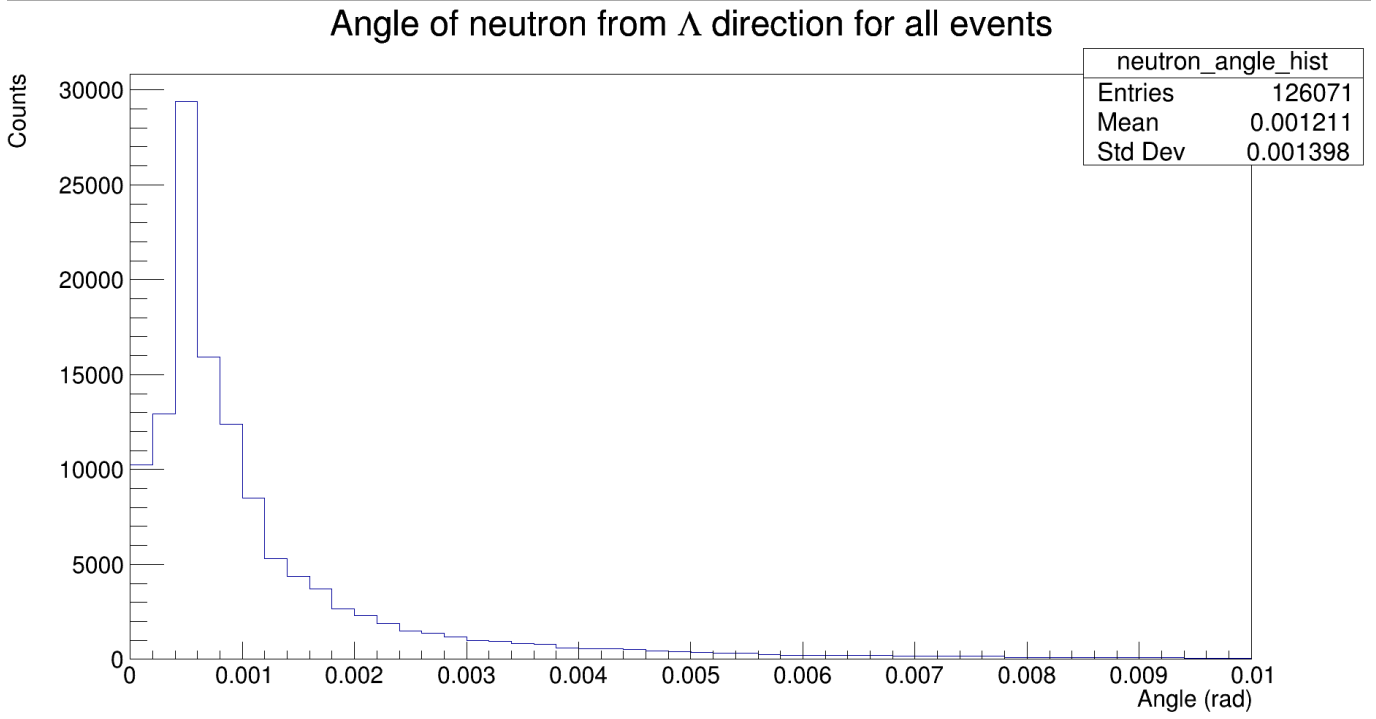
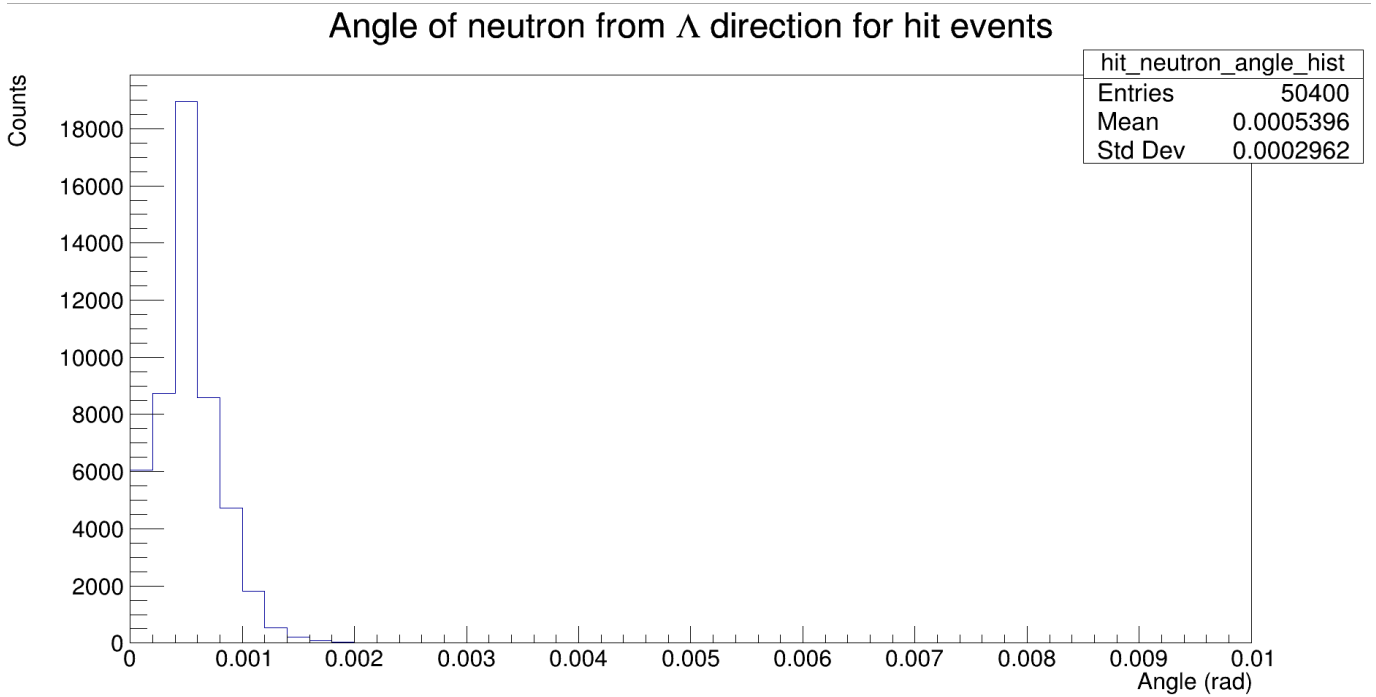
Neutron angle from Lambda direction





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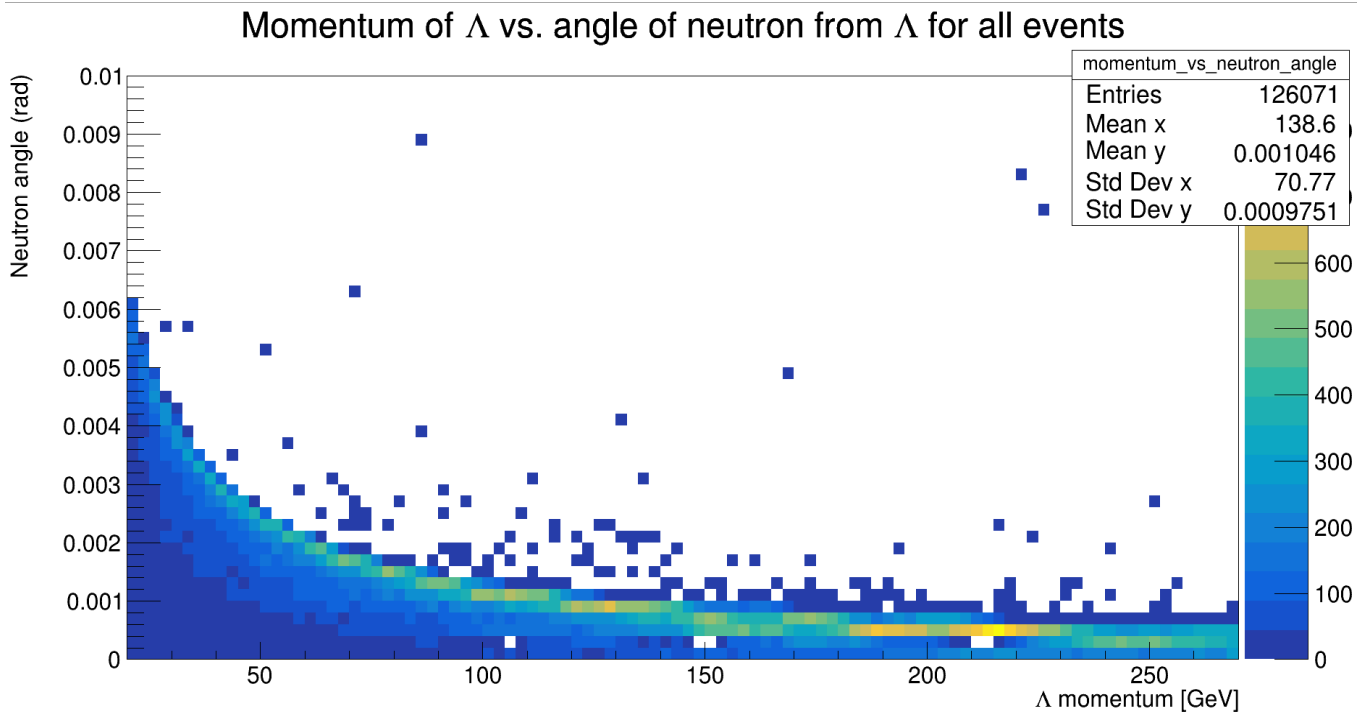
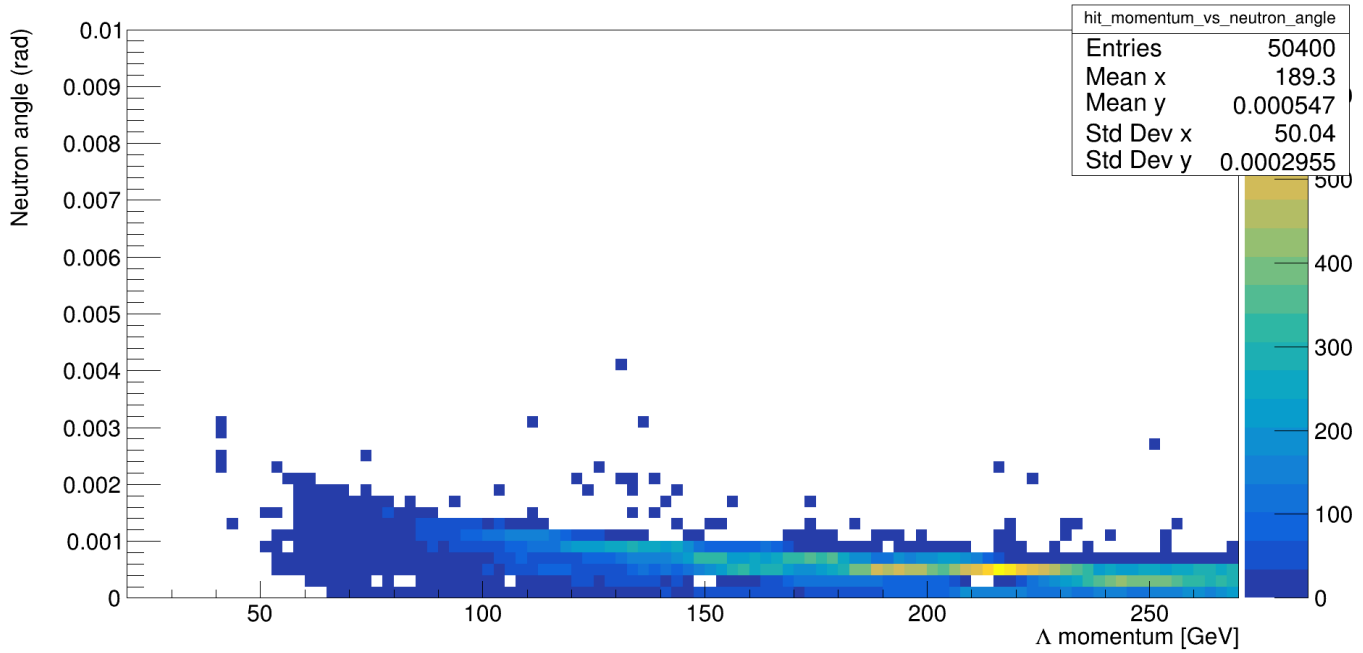
Neutron angle from Lambda direction, function of Lambda momentum





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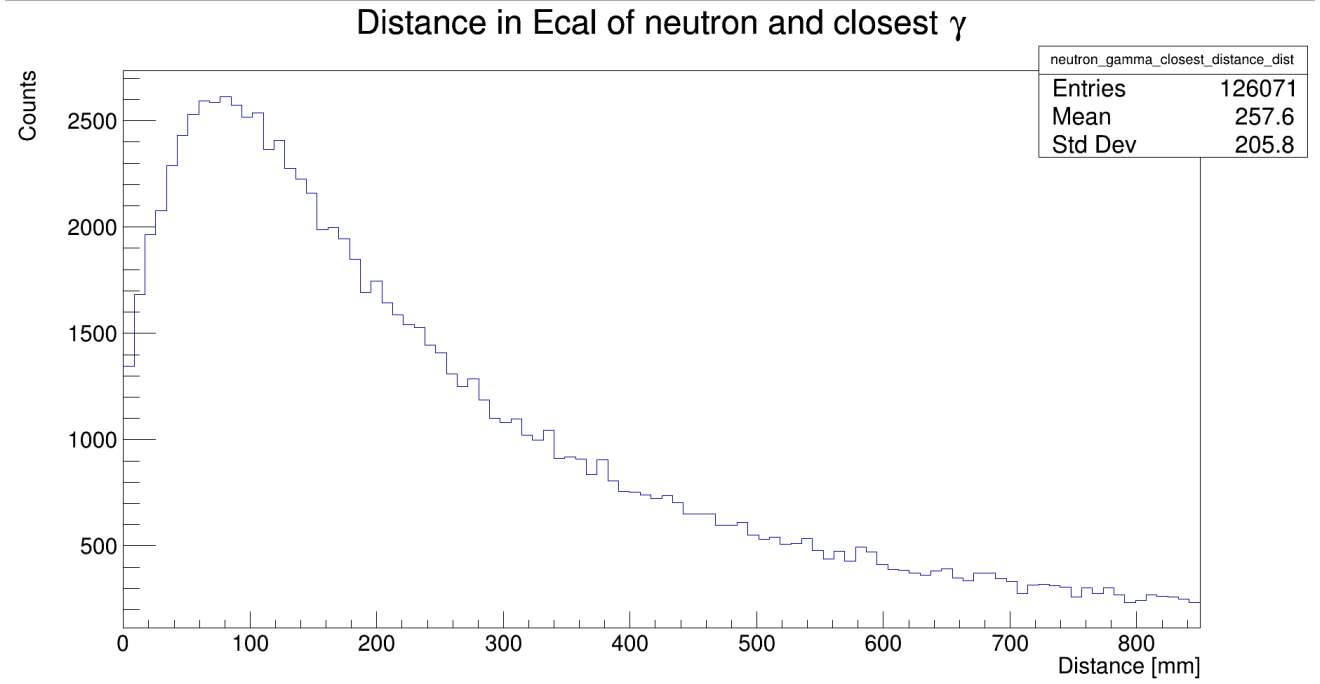
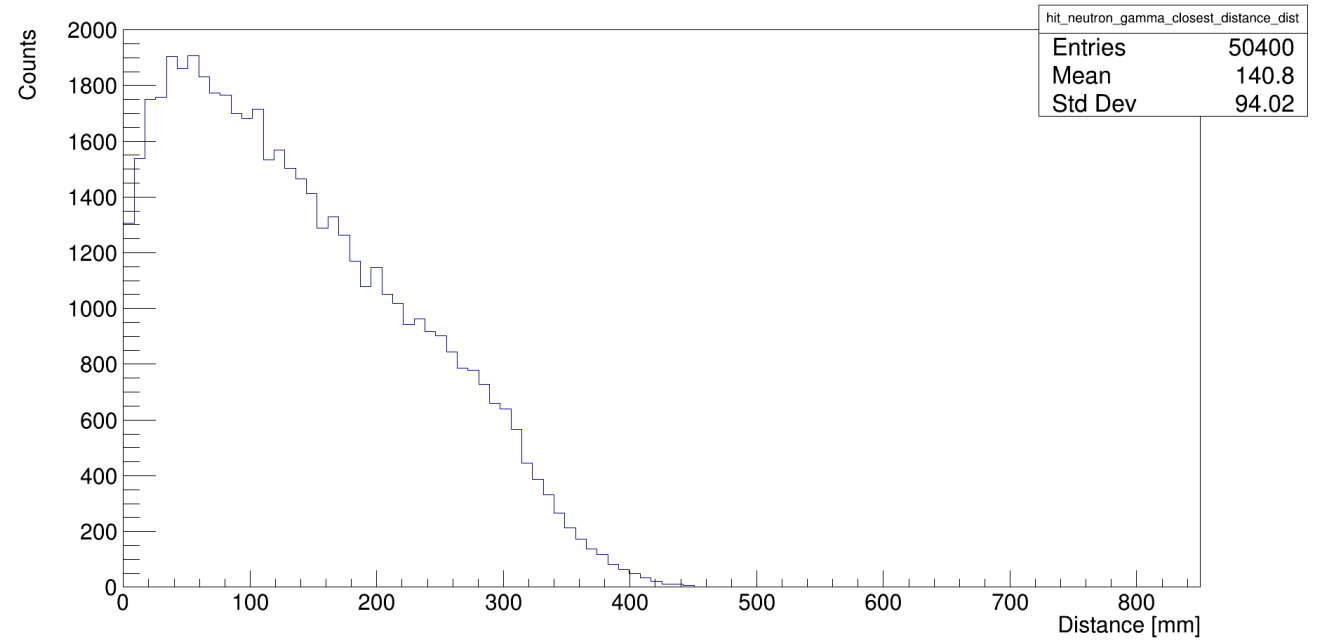
Distance between neutron and closest gamma





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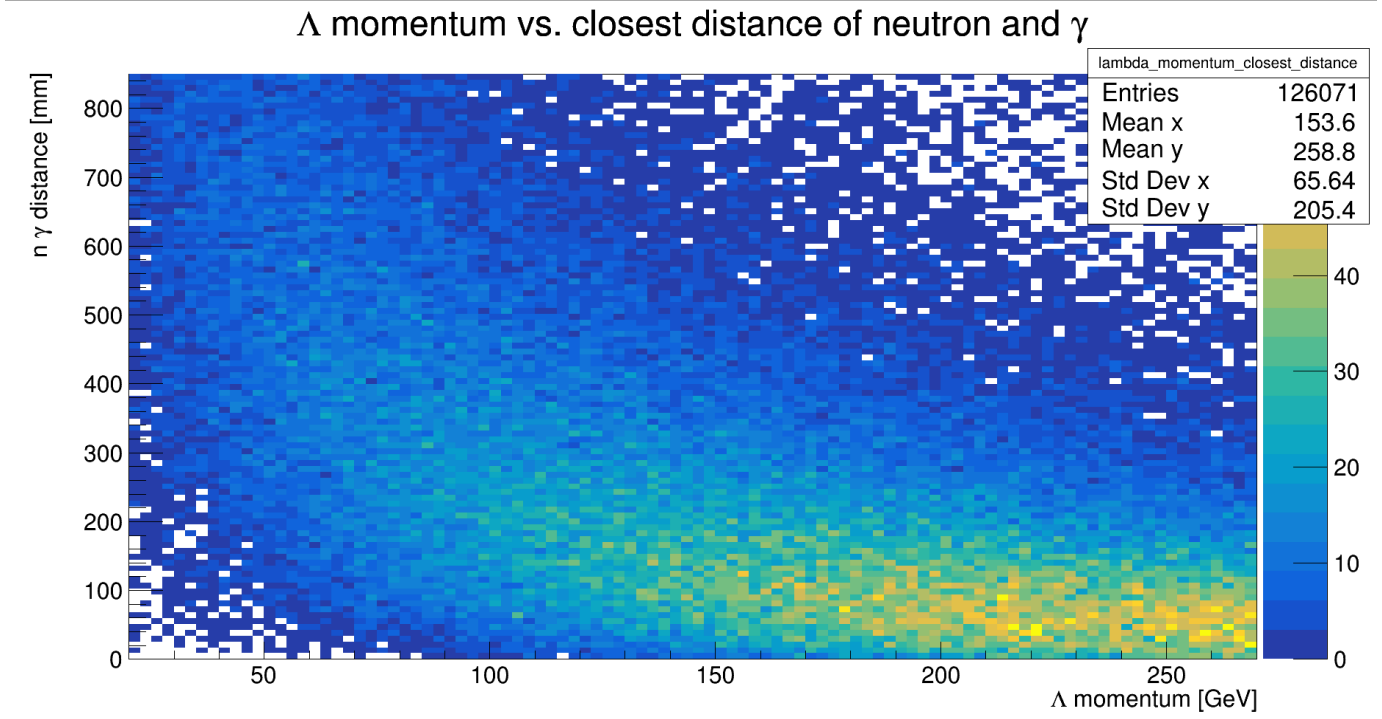
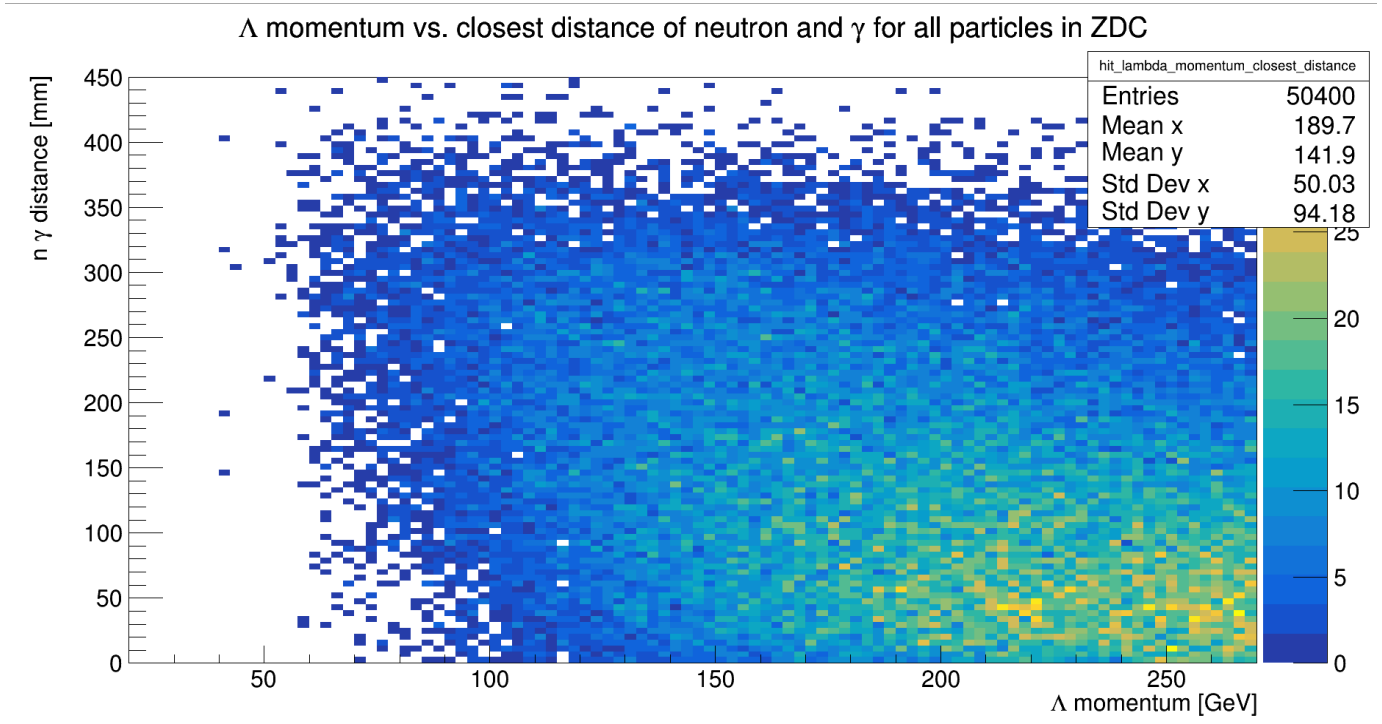
Closest distance of neutron to a gamma vs Lambda momentum





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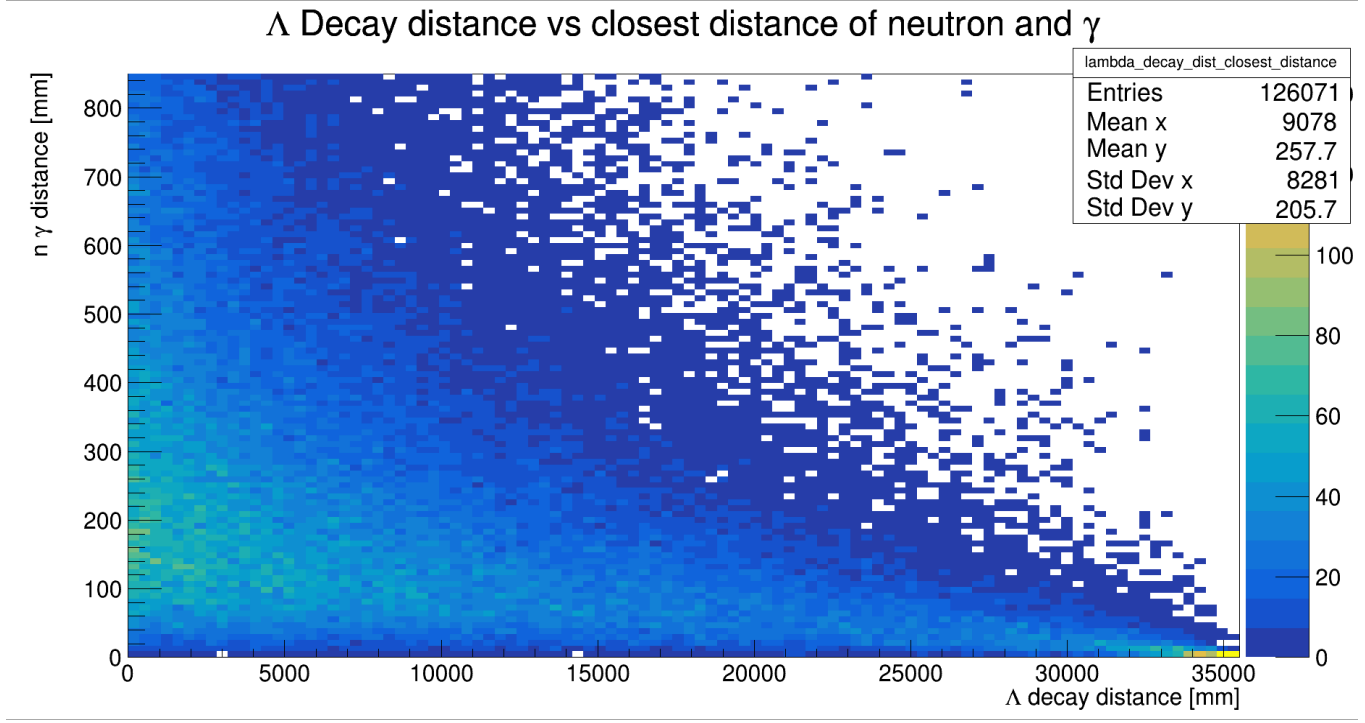
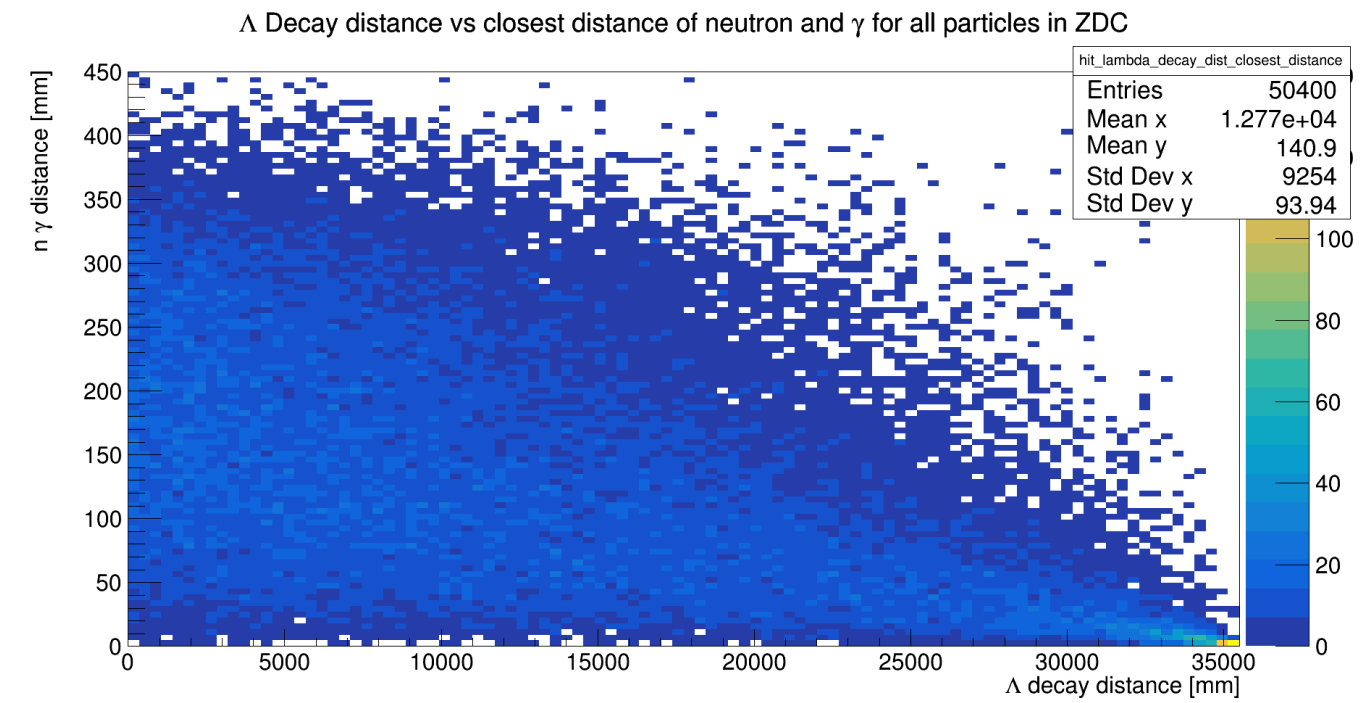
Closest distance of neutron to a gamma vs Lambda decay position





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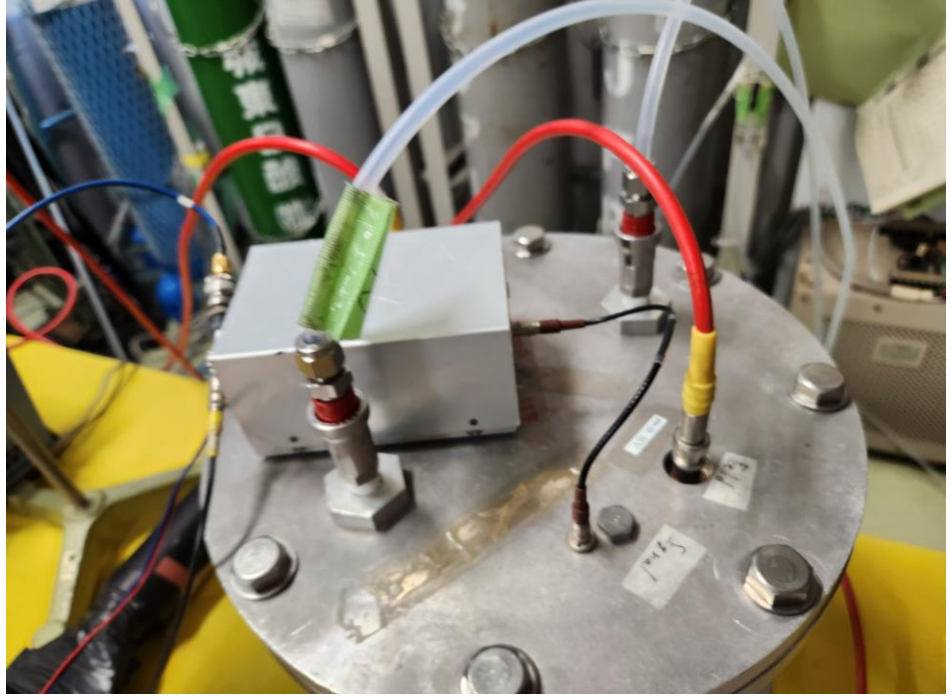
Additional Notes and Updates

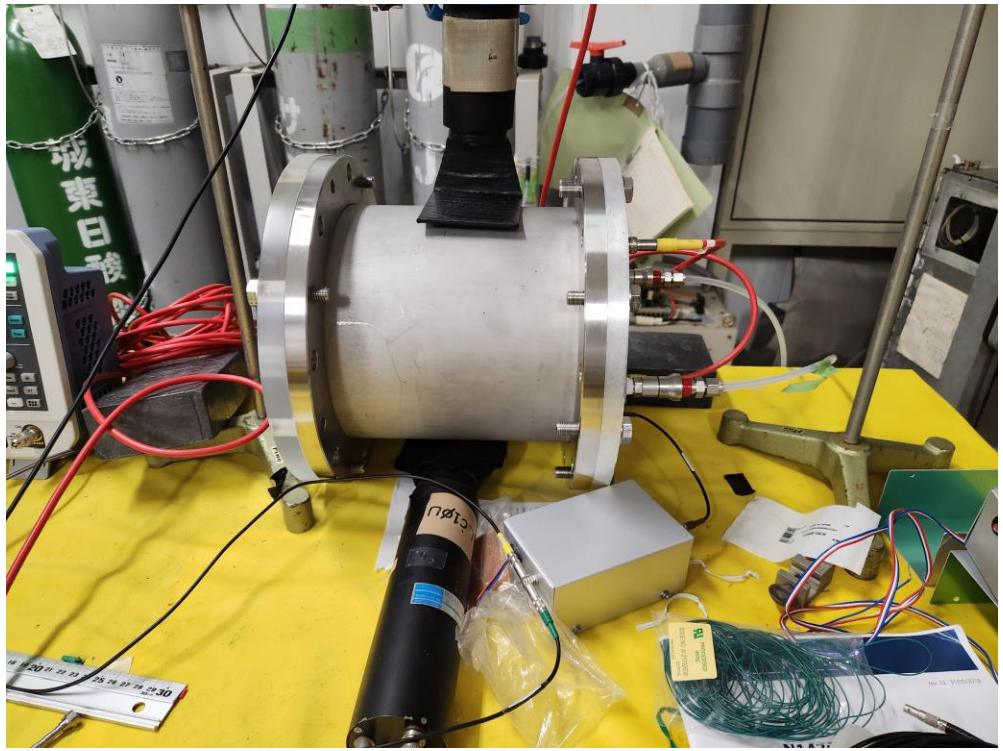
- New version of Firebird to be posted soon, plots of the showers coming soon
- Ongoing work to understand how the edm4hep files provide hit contributions, we do not yet completely understand how this information is stored (this will be vital for clustering)
- Work has begun on clustering Ecal and Hcal hits, one focus is unsupervised NN and another is a layer-by-layer, energy density clustering
- Clustering algorithm also needs a PID algorithm (Potentially very simple)

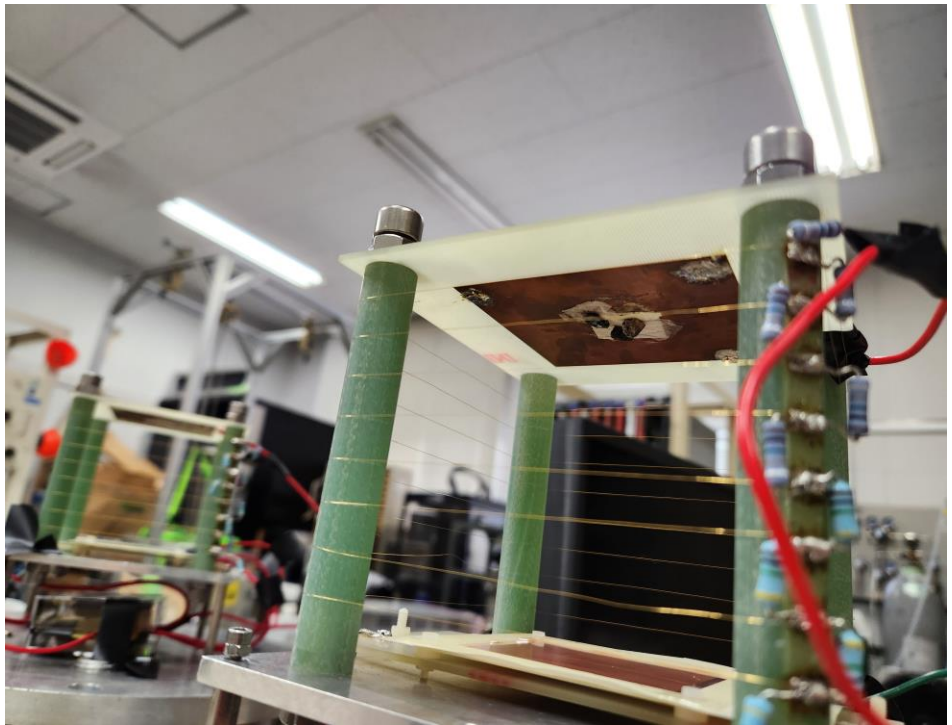
TPC Construction and testing

- GEM and alpha source was placed into TPC and top was sealed
- Double checked that field and GEM HV had correct resistances to GND, attached pre-amplification circuit to signal
- Set up CAEN power supply for field voltage (-1000V) and GEM voltage (1320V)
- Attached output to oscilloscope, observed "signal" in N2 indicating sparks
- Continued seeing false signal with P10
- Turned gas off and opened up TPC to retape circuit board and other parts
- Continued to see false signal

TPC Photos







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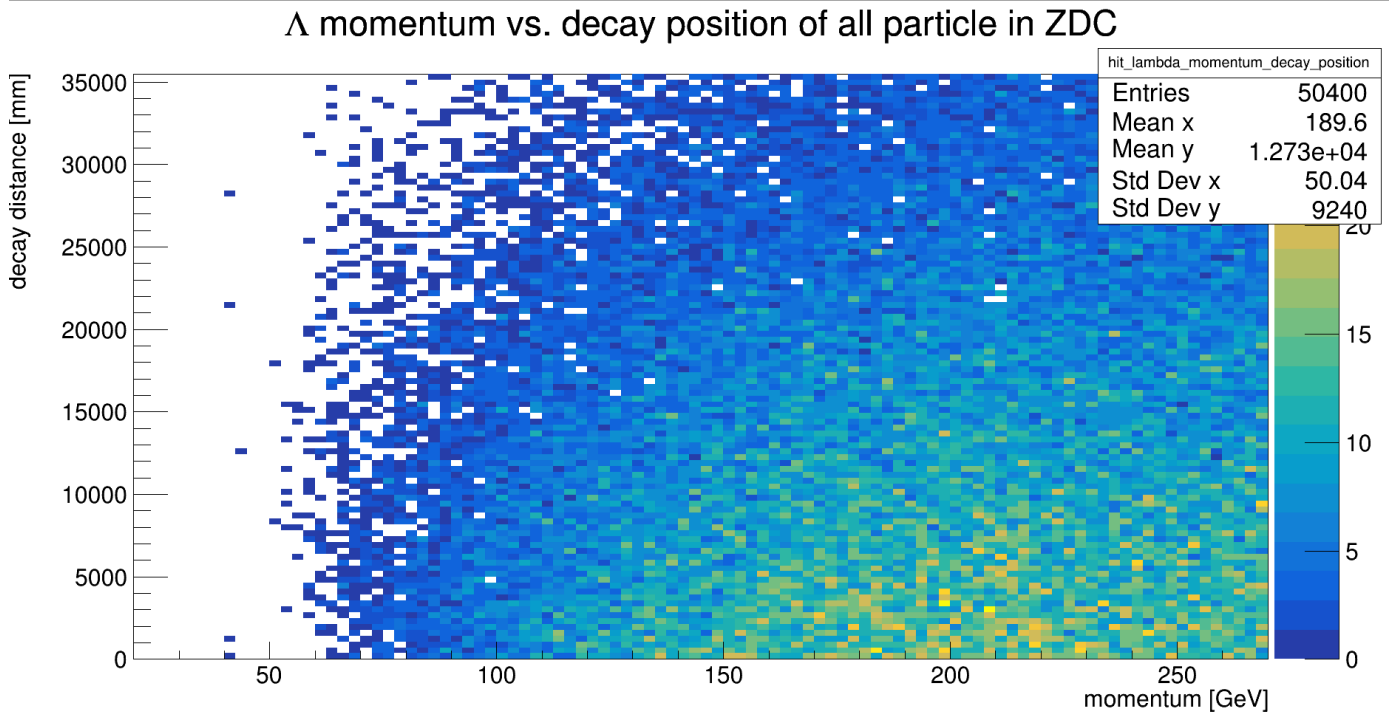
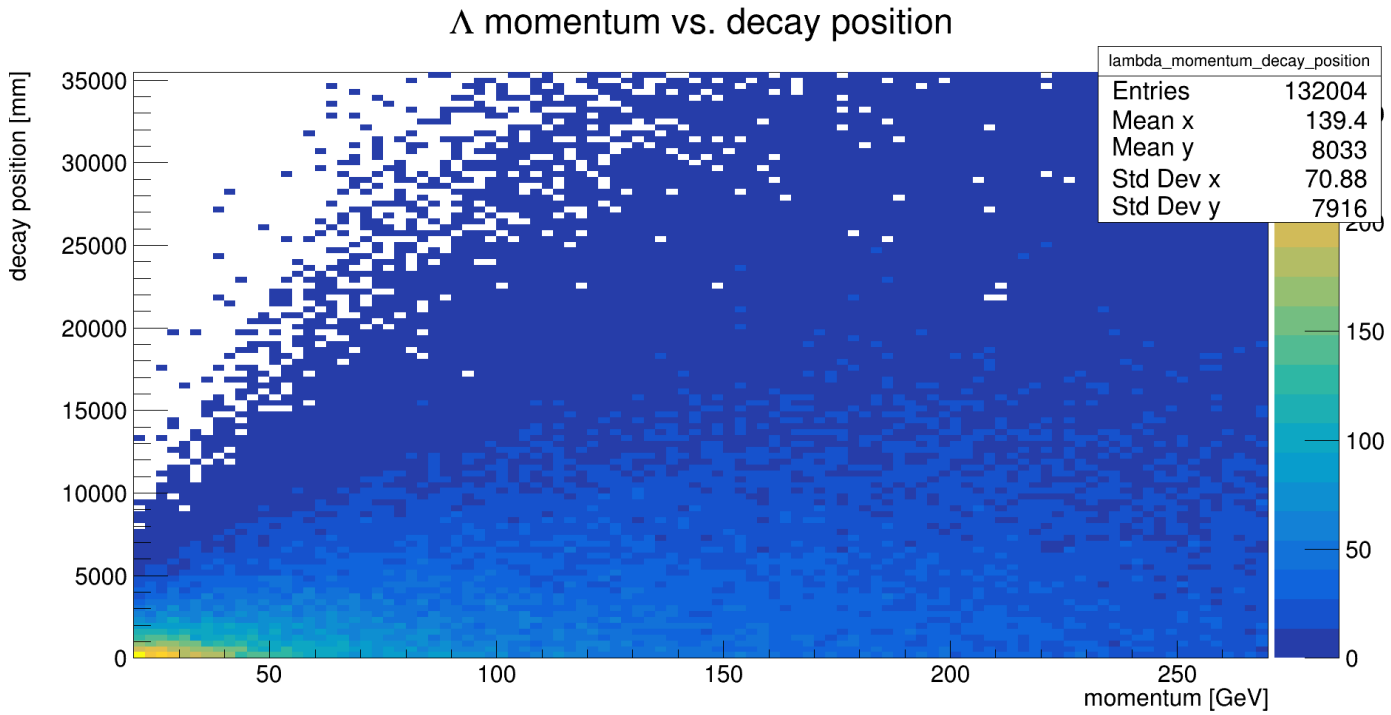
Goals for this coming week

- Generate and analyze lambda data with various angles with the aim to determine what the acceptance for non-zero angles is
- Show showers in ZDC with/without WSi using Firebird
- Start data processing and start testing clustering algorithms
- Continue debugging TPC
- Set up TPC DAQ (if possible), start taking data with oscilloscope

Extra Plots 1





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