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PhD Project Status Update

Current Progress:

1. Resolved the issue of empty output branches in the analysis macro that had been affecting the readout of the MUST geometry simulation data.
2. Successfully generated the full set of histograms from the simulation output, including the PDG code of tracks hitting MUST, the decoded MUST station ID, momentum and energy loss at the MUST point, the MUST hit position, and the momentum distributions of primary and secondary tracks.
3. Produced the MUST Z-distribution histograms, separated into all, primary, and secondary particle contributions.
4. Generated the station- and layer-wise XY hit-position distributions for Station 0 and Station 1 (Layers 0-5).
5. Continued running the simulation and analysis chain to build up statistics and cross-check the output against the updated geometry configuration.

The histograms produced from this stage of the analysis are shown below.

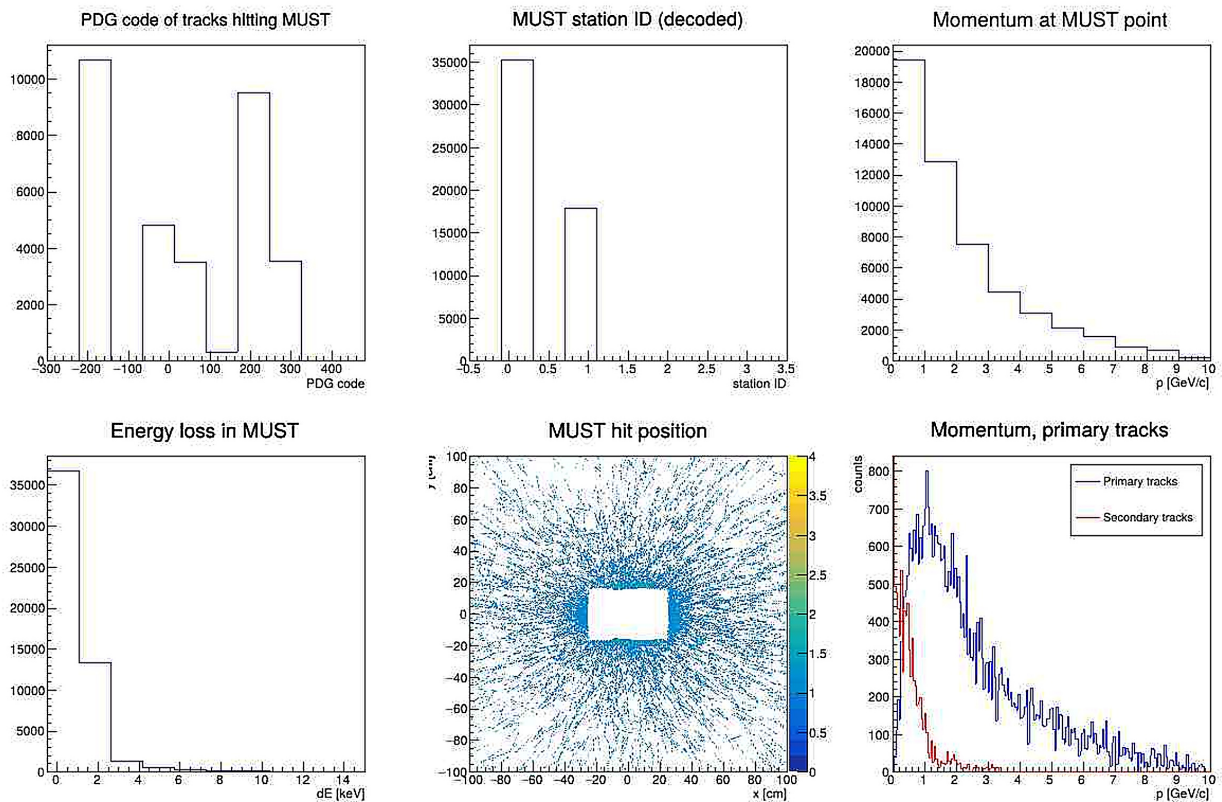


Fig. 1: These plots show basic properties of the particles that hit the MUST detector.

MUST Z Distribution

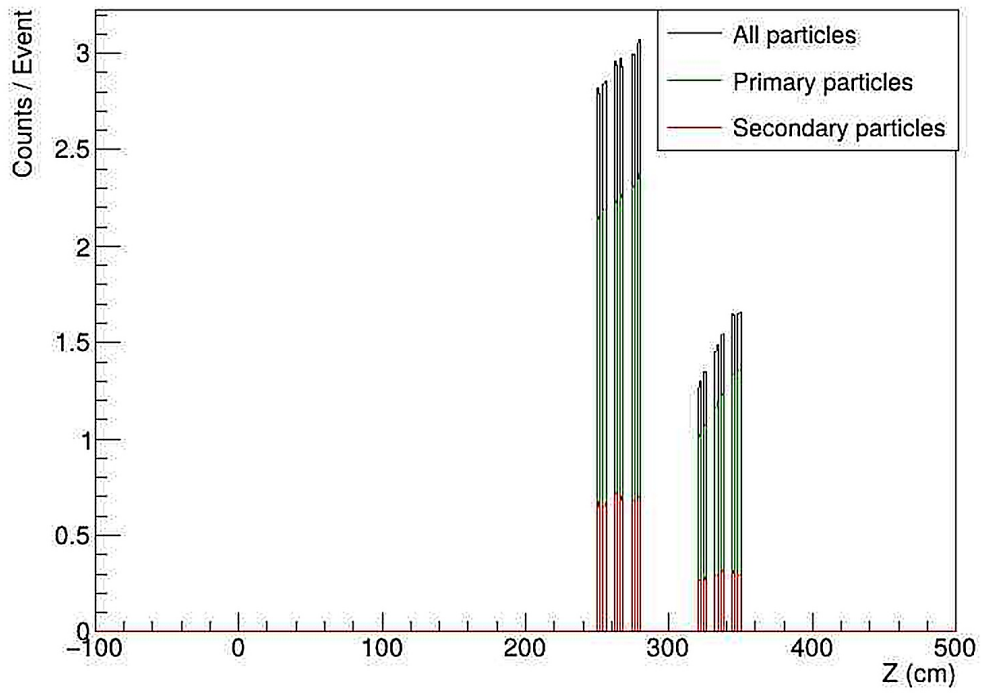


Fig. 2: This plot shows where along the beam direction the particles hit MUST.

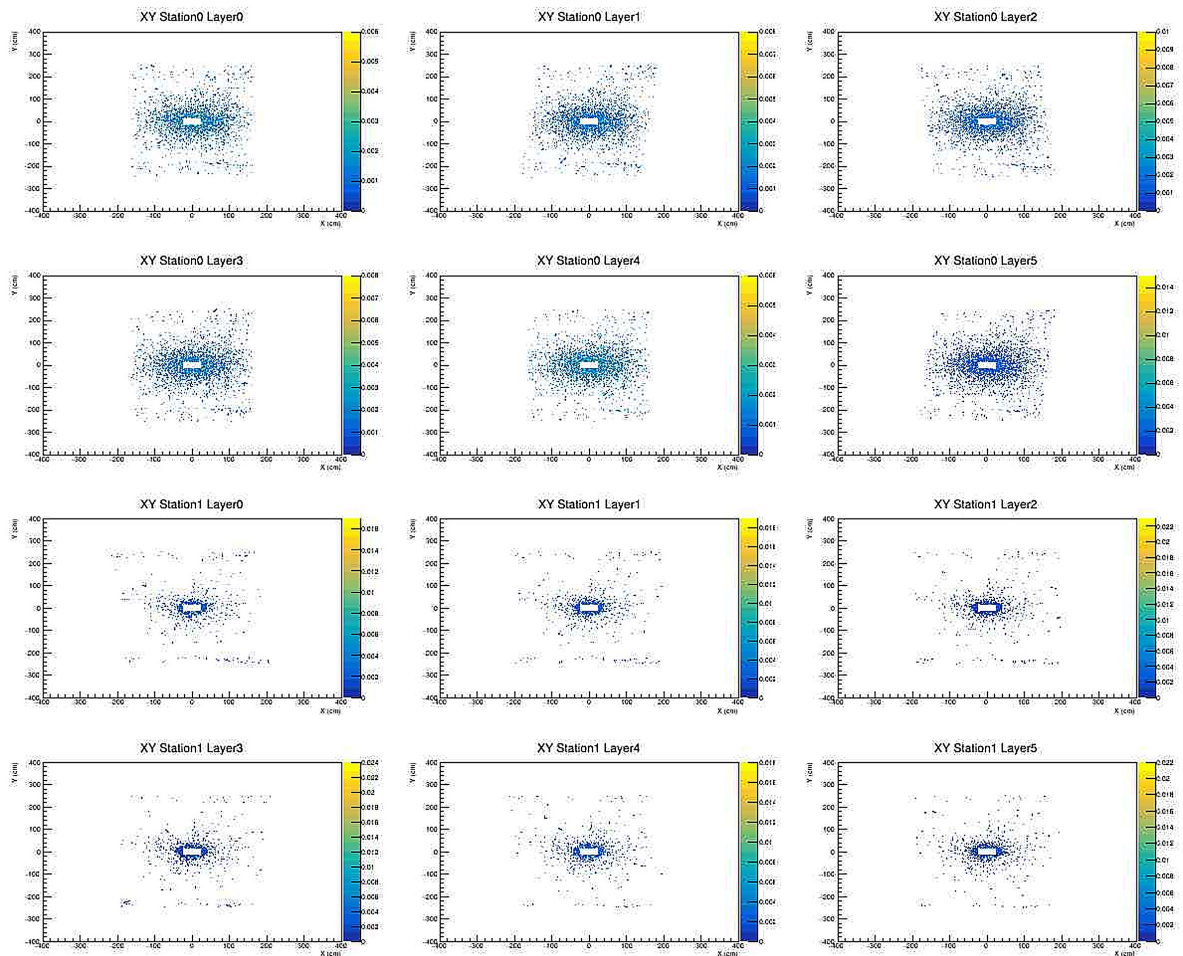


Fig. 3: These plots show where the particles hit each layer of MUST, in the X-Y plane.

Current Focus:

With the empty-branch issue resolved and the full set of histograms now being produced correctly, the focus for the coming period shifts to carrying out the detailed analysis of these distributions and extracting the corresponding physics results. In particular:

The MUST station ID plot shows many more particles at the first station than at the second, suggesting that a good number of particles are being absorbed in between. This gives a cleaner signal, but I want to study the background in more detail to make sure nothing important is being missed.

I will use the PDG code plot to identify which particle species are hitting MUST.

I am planning to look at what happens if the detector position is shifted slightly (moved further away or lower), and study the effect on the results.