

Update on direct E-Slice vs. Endpoint Slice Comparison

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Previous attempts saw some discrepancy between the cross sections from the energy and endpoint slicing methods, particularly in the total inelastic cross section.

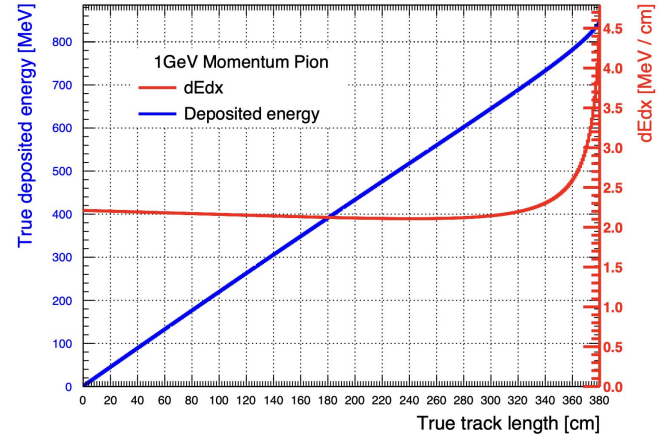
Now, by directly importing Francesca's code, instead of trying to re-implement it, the two align much better.

One change was in the method of calculating the interacting energy:

Instead of reading the final energy/momentum directly from the MC values, we follow Francesca's thesis and calculate the energy loss from the track length using Bethe-Bloch, and then subtract this from the initial energy

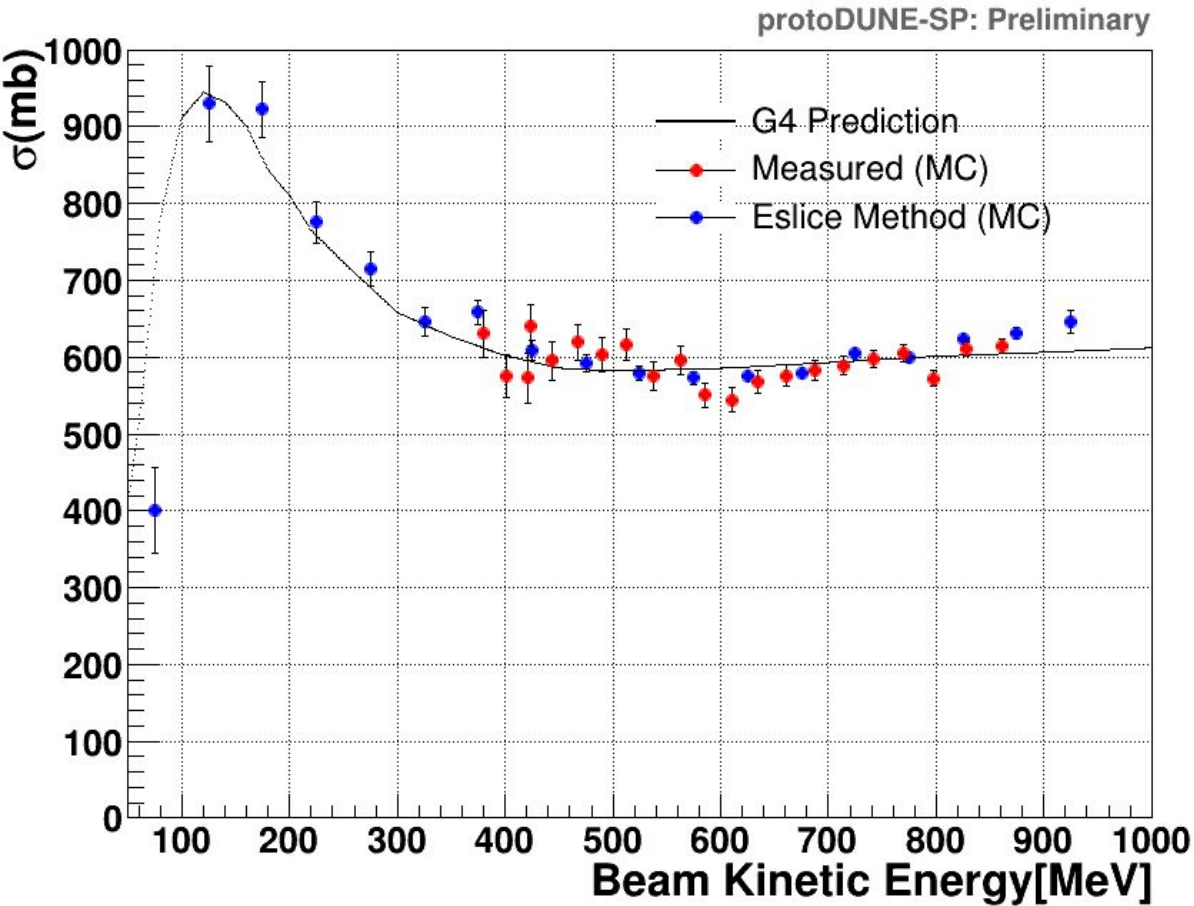
$$E_{\text{KE interacting}} = E_{\text{KE initial}} - \Delta E_{\text{deposited}}$$

One additional difference is to perform operations at all steps of the xsec calculation by using functions that operate on histograms, instead of doing bin-by-bin calculations on arrays



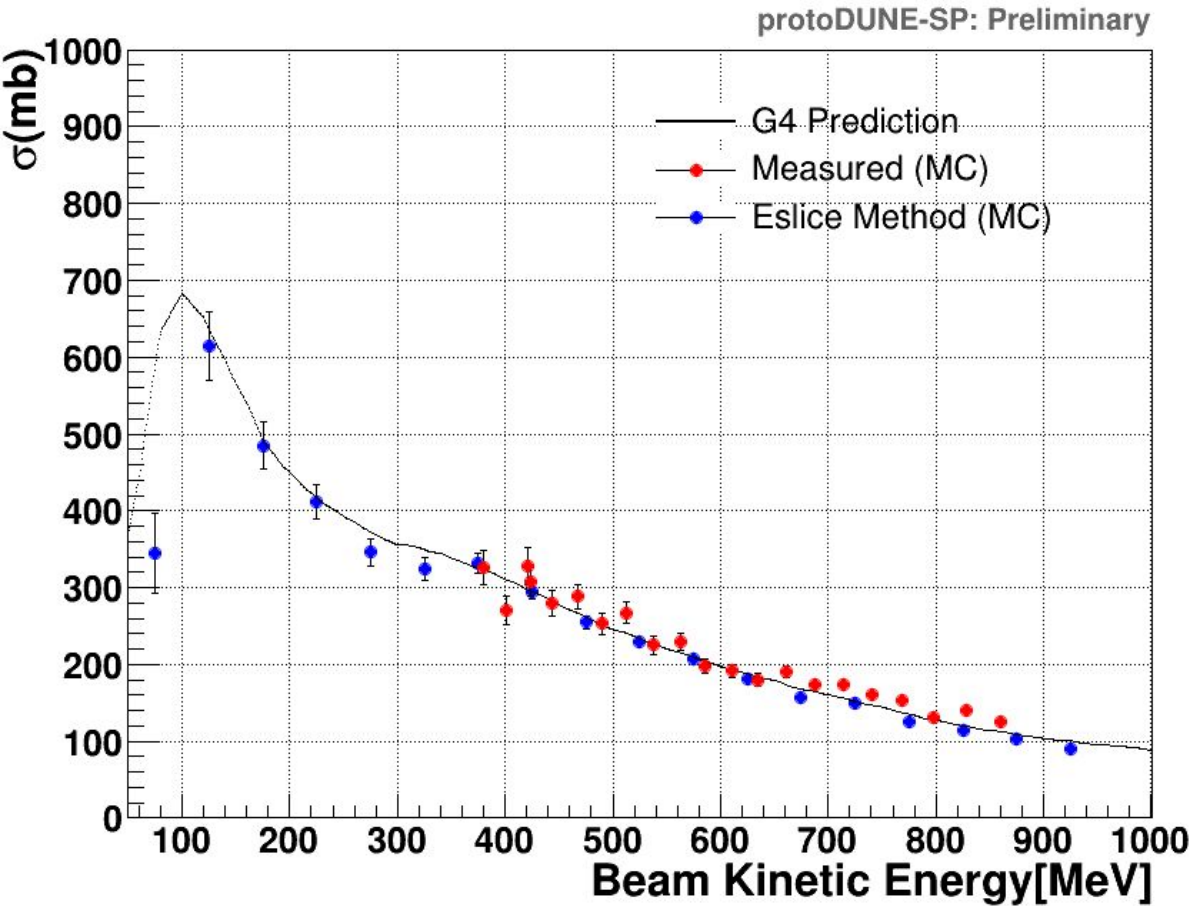
dE/dx and deposited energy vs. track length in LAr by a 1 GeV pion (Fig. 7.1 from Francesca's thesis)

Total Inelastic



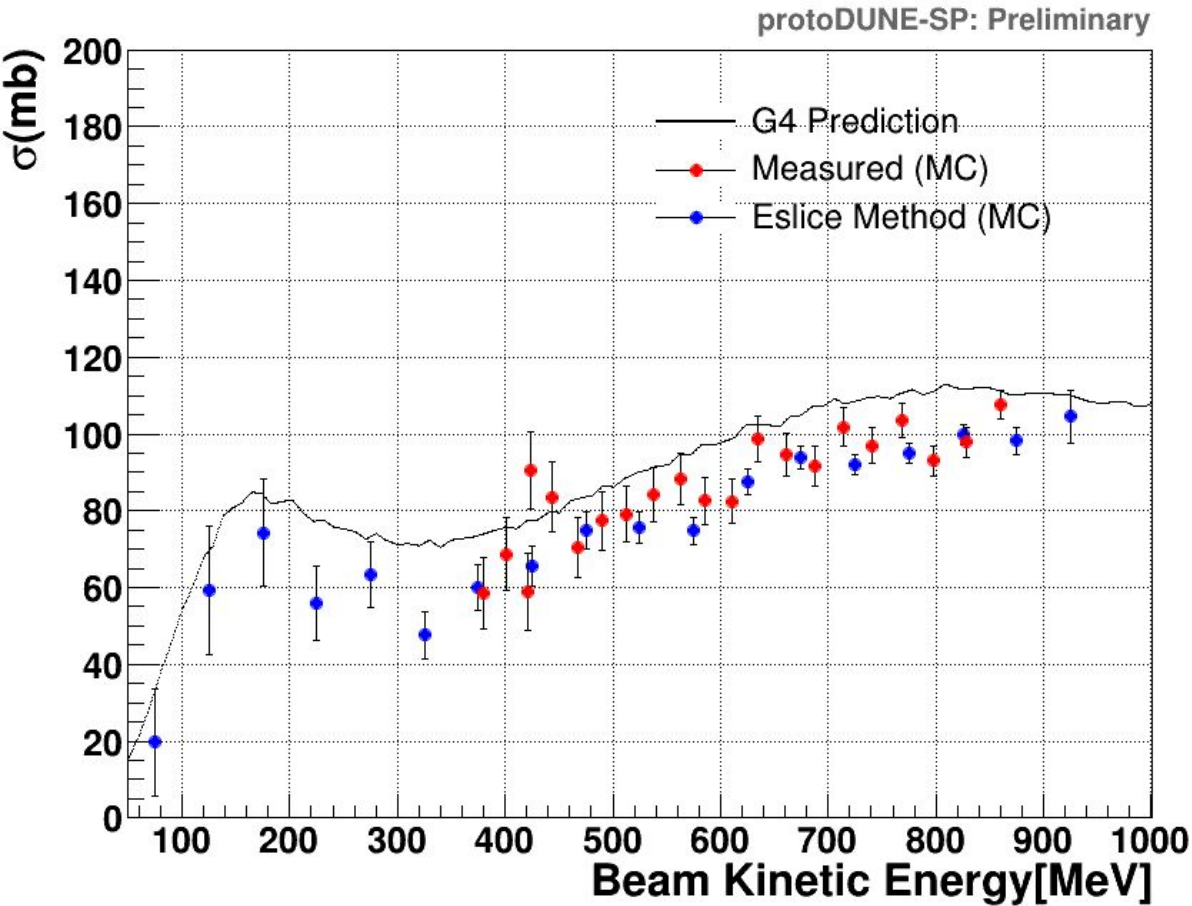
- Statistical errors only

Pion Absorption



- Statistical errors only

Charge Exchange



- Statistical errors only
- Charge exchange xsec seems to be slightly below G4 input for both methods, but they are consistent with each other

Conclusion

The two methods agree very well for the MC truth information

The next step will be to move to a comparison for the reconstructed MC and the data, and then an investigation of the systematic uncertainties