

Update on the Proton Analysis

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ProtoDUNE analysis meeting
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Outline & Motivation

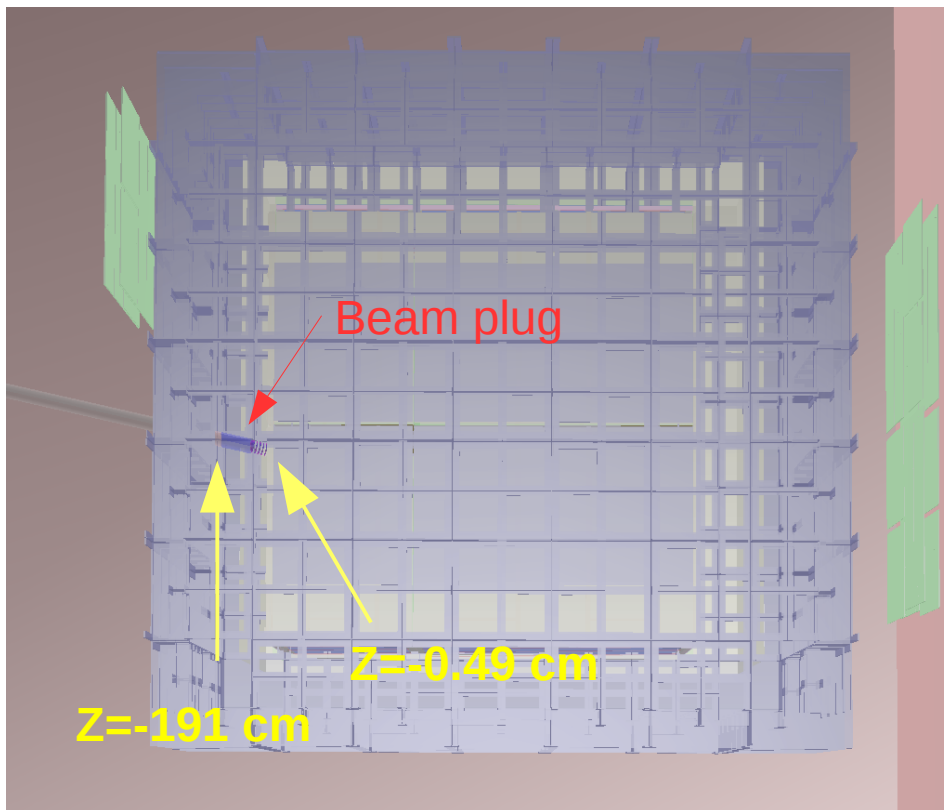
- **Beam Energy Loss for the 1 GeV/c protons**
 - I quoted the number of energy loss, $<0.5\%^*$, for the 1 GeV/c protons in my previous talk in the DUNE collaboration meeting**.
 - Flavio pointed out that 2 MeV energy loss for the 1 GeV/c protons can not be true. He suggested having a cross-check on the MC result that I quoted.
 - The quoted number is for 4 GeV/c protons, NOT for 1 GeV/c protons.
 - Energy loss is one of the key parameters for calorimetric reconstruction (We need this parameter for the proton-argon cross section analysis)

*: <https://indico.fnal.gov/event/18166/contribution/6/material/slides/0.pdf>

** : <https://indico.fnal.gov/event/16764/session/17/contribution/66/material/slides/0.pdf>

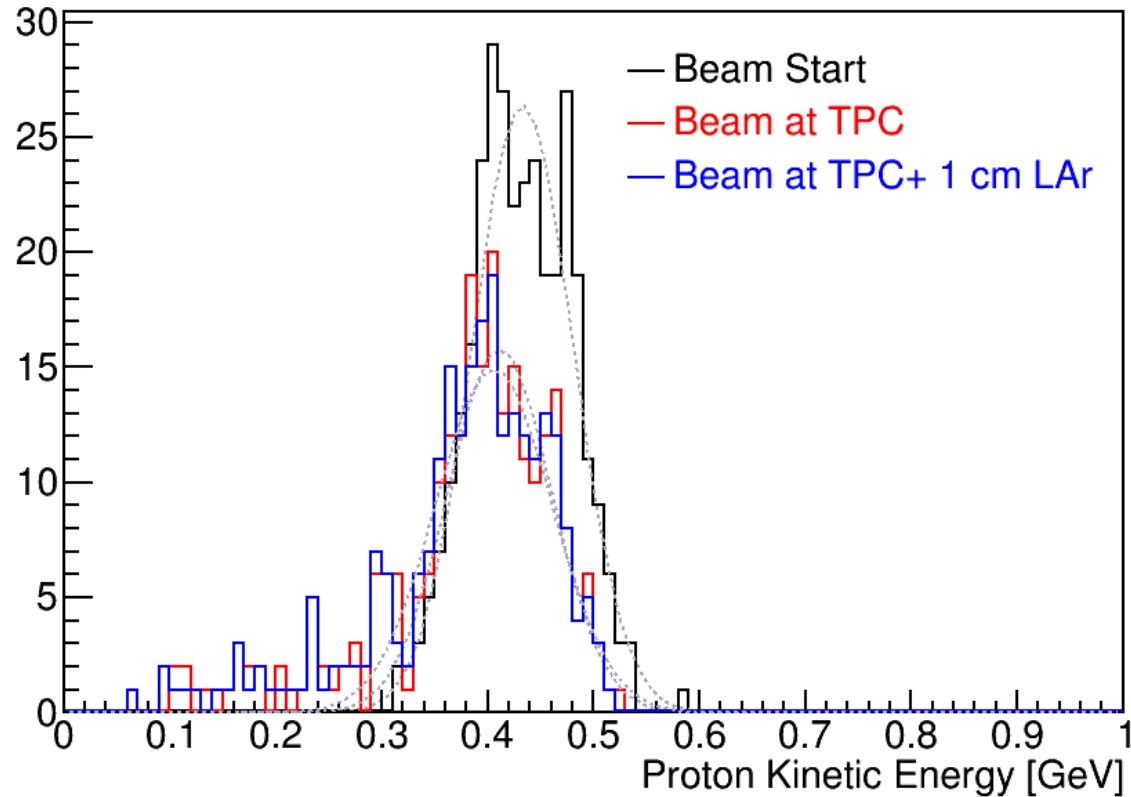
Analysis Method

- Following Owen's analysis method to study the beam energy loss for the 1 GeV/c protons
- Thanks to Owen for providing all the technical details of the analysis
- Analysis Method: Proton kinetic energy before and after entering TPC



- Before entering TPC: $Z=-191$ cm
- After entering TPC: $Z=-0.49$ cm
- Beam energy loss before/after entering TPC

Beam Energy Loss (MC)



	Position in Z [cm]	Kinetic Energy [MeV]	KE Fraction (in %)
Beam Start	-191	432.83	100
Beam at TPC	-0.49	411.11	94.98
Beam at TPC +1 cm LAr*	-0.49	405.68	93.73

- Nominal KE for 1 GeV/c protons: 432.99 MeV
- *One centimeter layer of LAr is not included in the MCC 11. Calculate energy loss after 1 cm of LAr

Summary & Outlook

- Beam Energy Loss for the 1 GeV/c protons after entering TPC: ~ 6%
- Work in progress:
MC-based proton-argon cross section