FLUKA Neutrino interactions

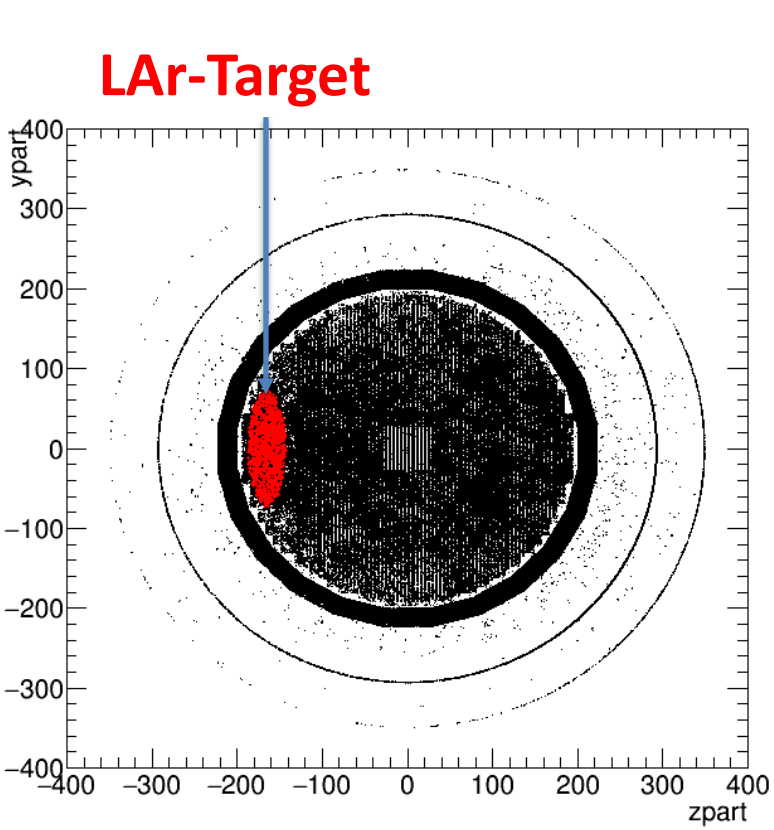
in LAr-Target

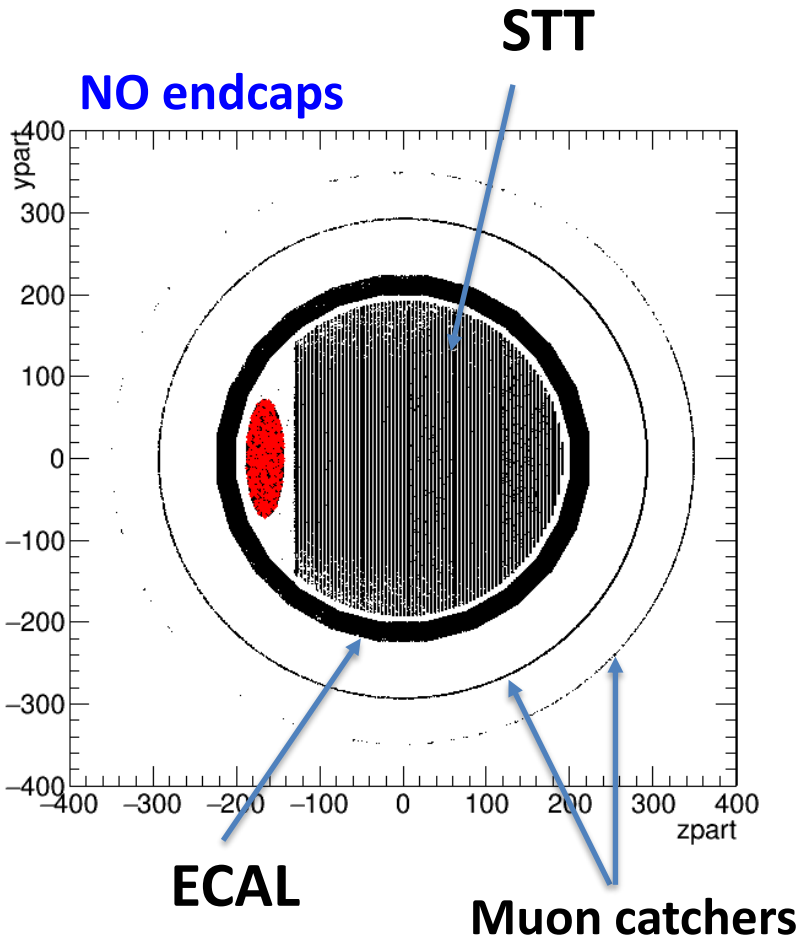
(first look)

P. Bernardini
A. Surdo
11-Dec-2020

Detector layout in FLUKA simulation

- ✓ **Lens-shaped LAr-Target inside SAND**

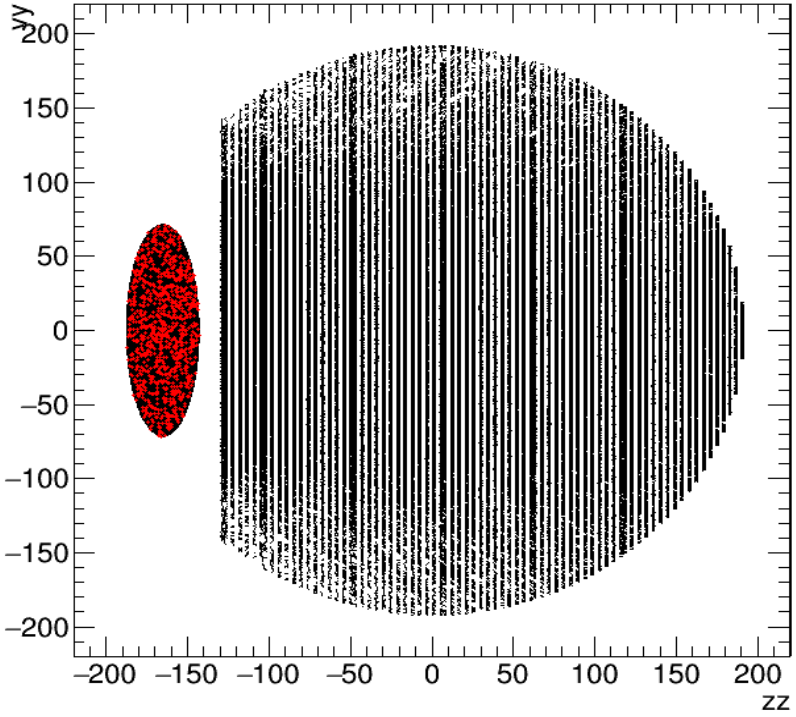




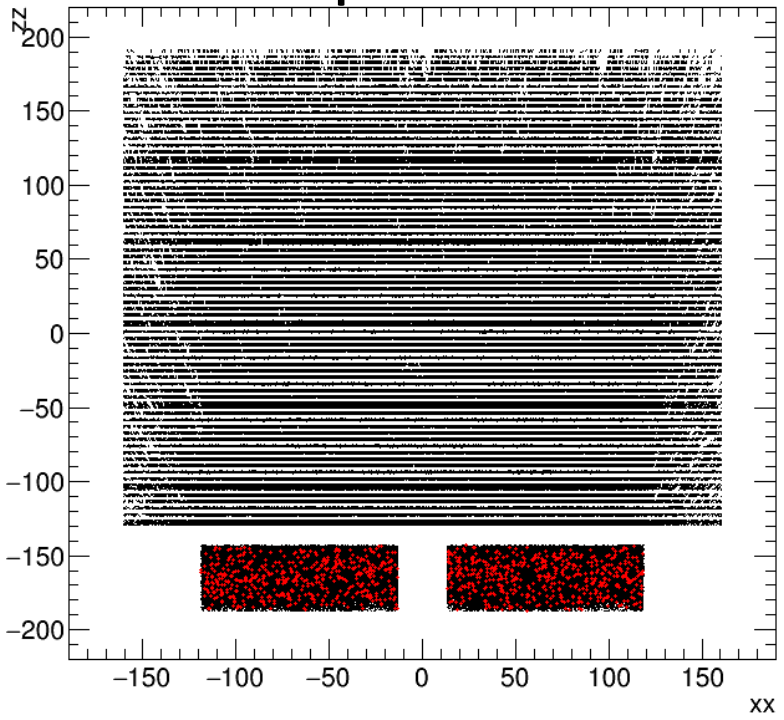
Event sample simulation (LAr-Target + STT)

- ✓ **FLUKA sample of 10,000 ν_μ-CC interactions in LAr-Target**

Side view

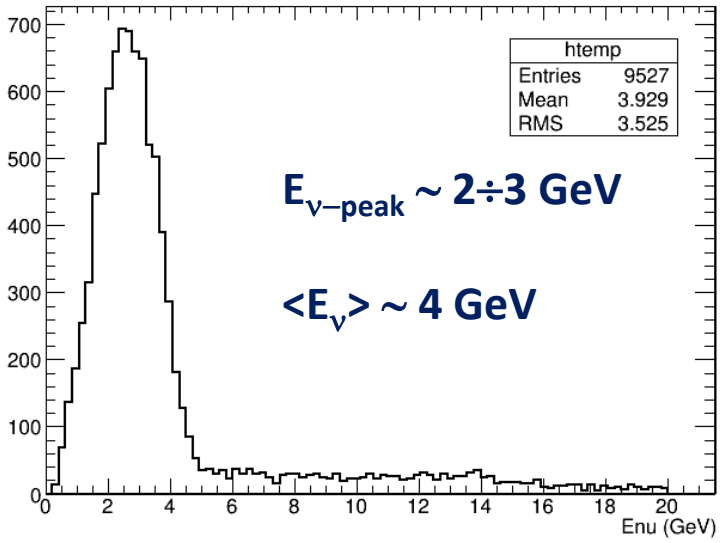


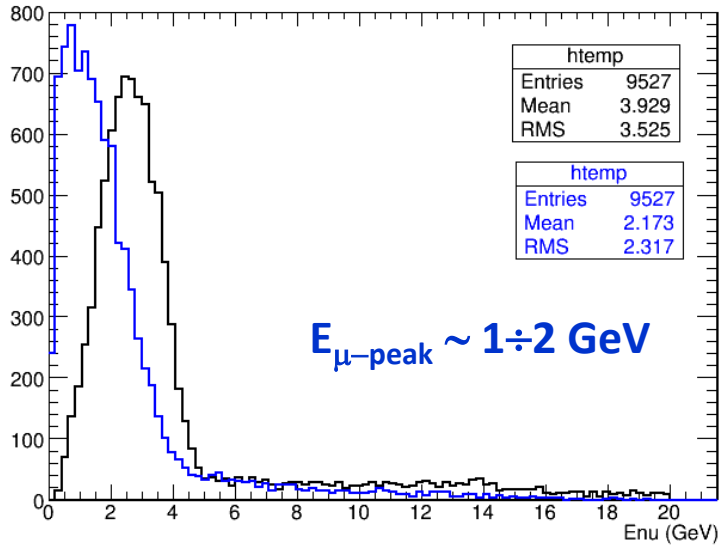
Top view



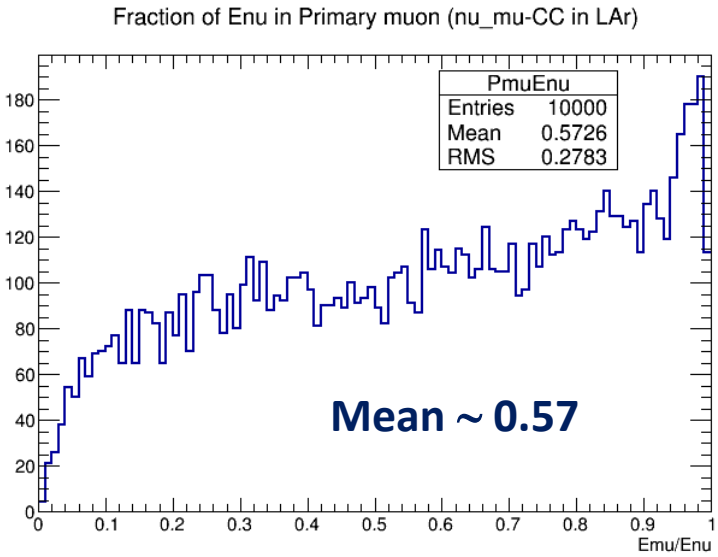
Interaction Vertices in red

Neutrino and muon spectra

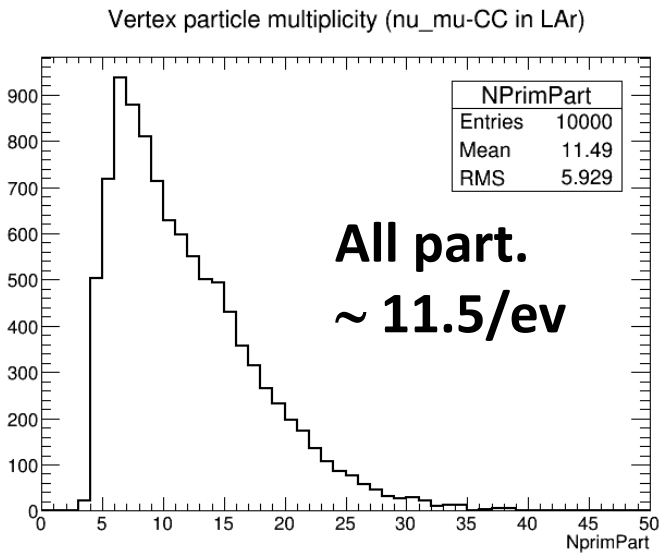


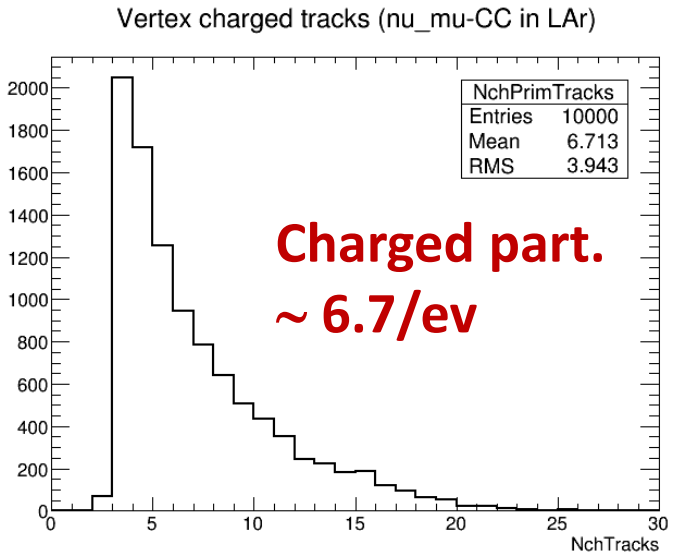


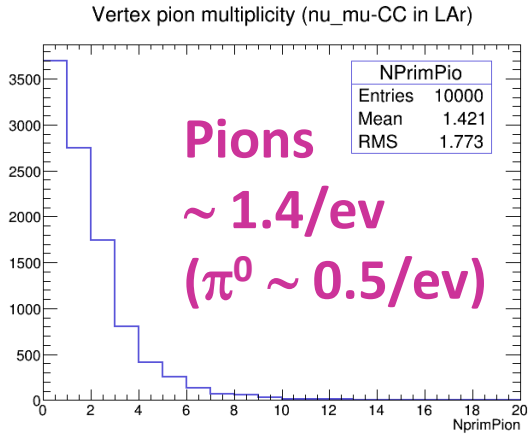
Ratio Pmu/Enu

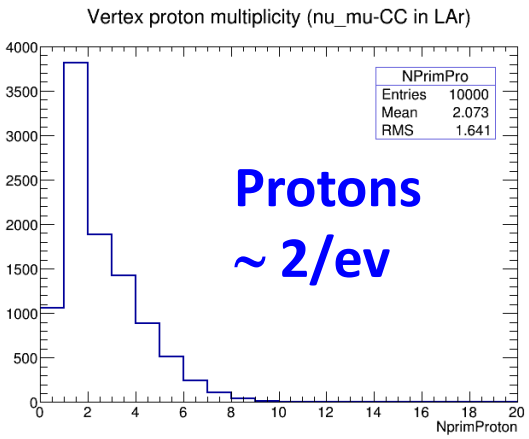


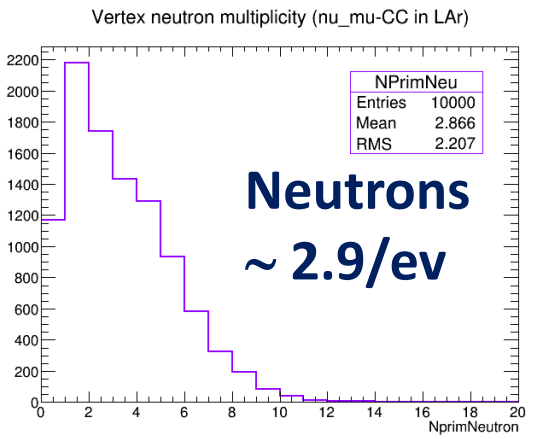
Primary particle multiplicities





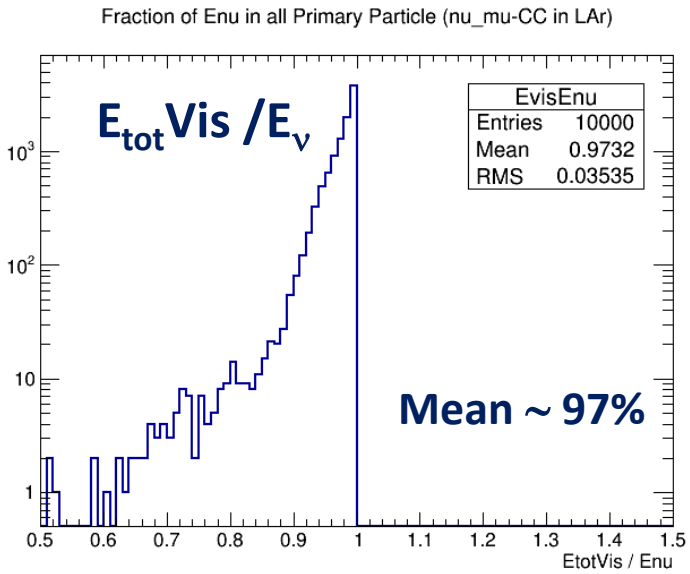






Nuclear fragments ~ 2.6/ev, **Photons ~ 1.4/ev**

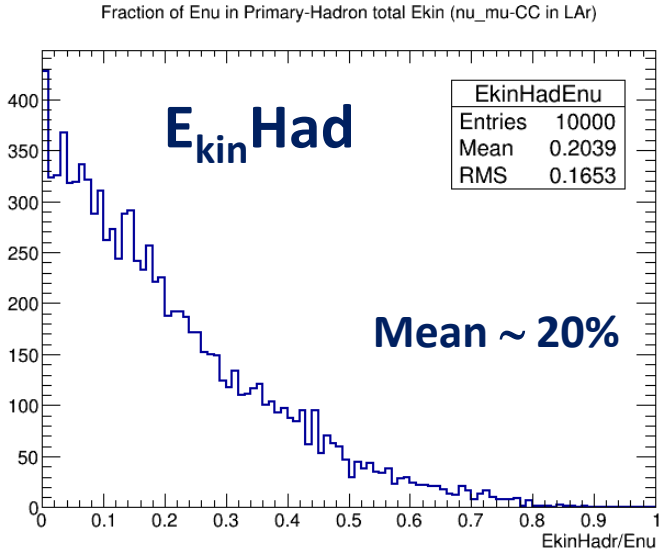
Energy carried out by primary particles

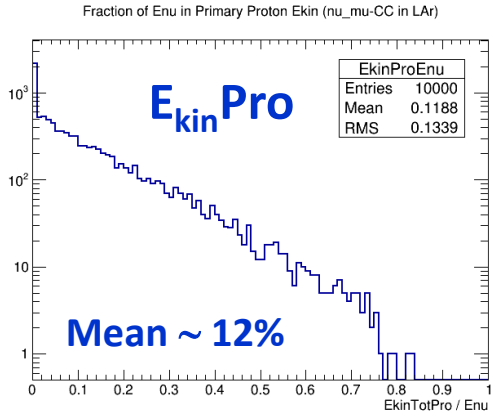


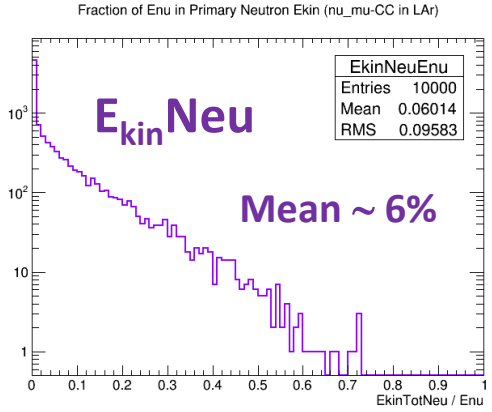
$E_\nu \rightarrow E_{tot}Vis = E_{kin}Had + E_{tot}Part$

$E_{kin}Had = E_{kin}Pro + E_{kin}Neu + E_{kin}Frag$

$E_{tot}Part = E_{Muon} + E_{Pion} + E_{phot}$

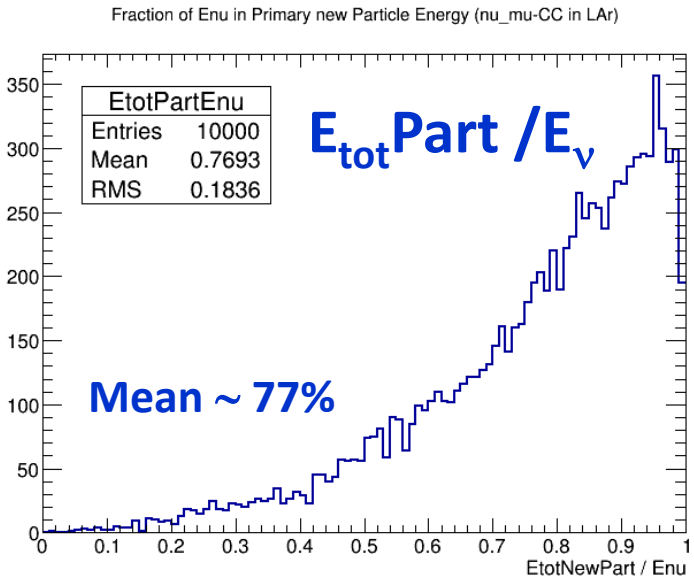


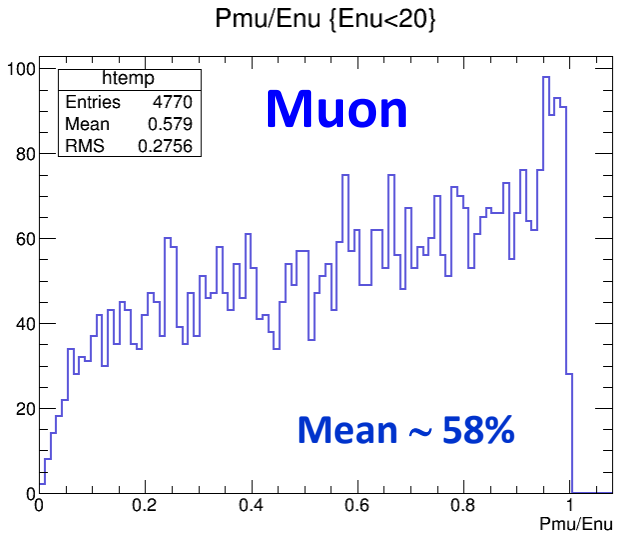


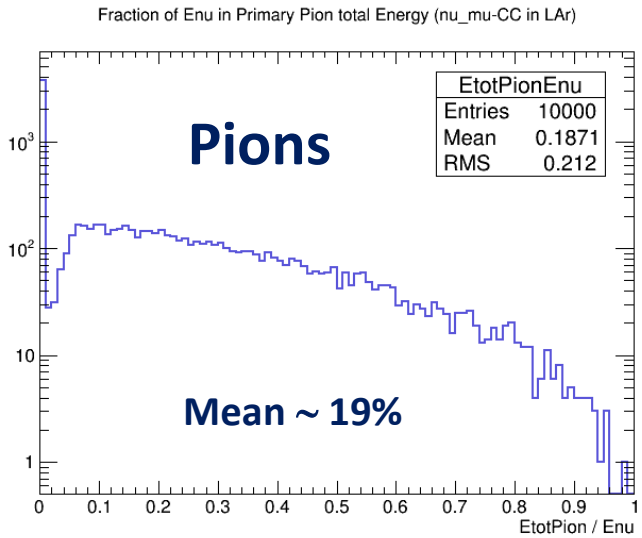


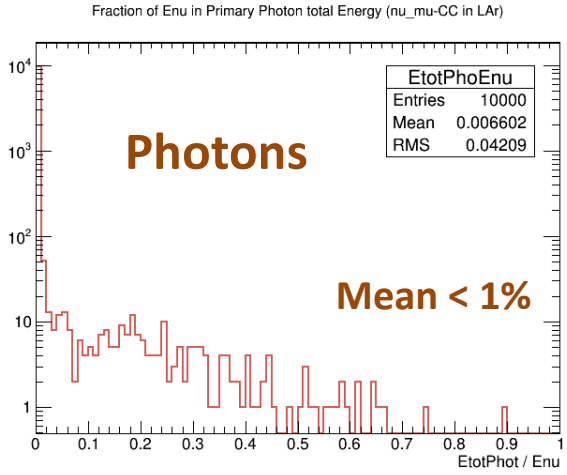
Nuclear fragments: ~2% E_ν

Energy carried out by primary particles

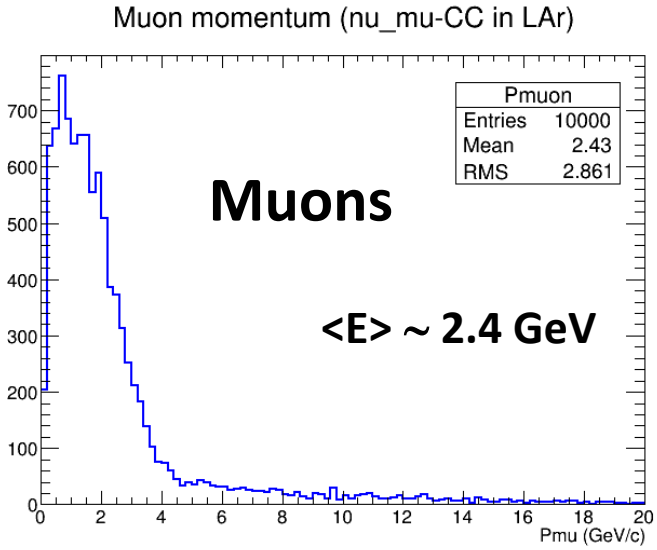


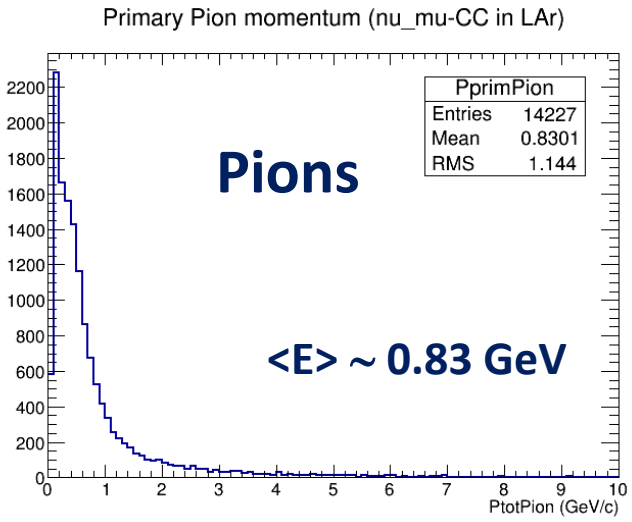


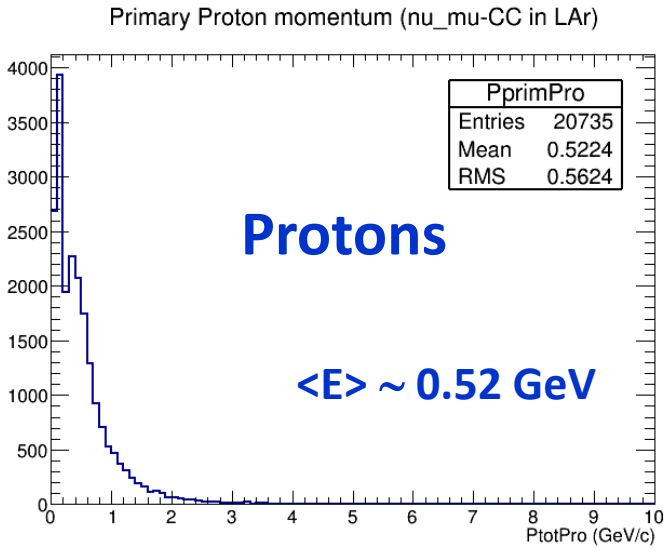


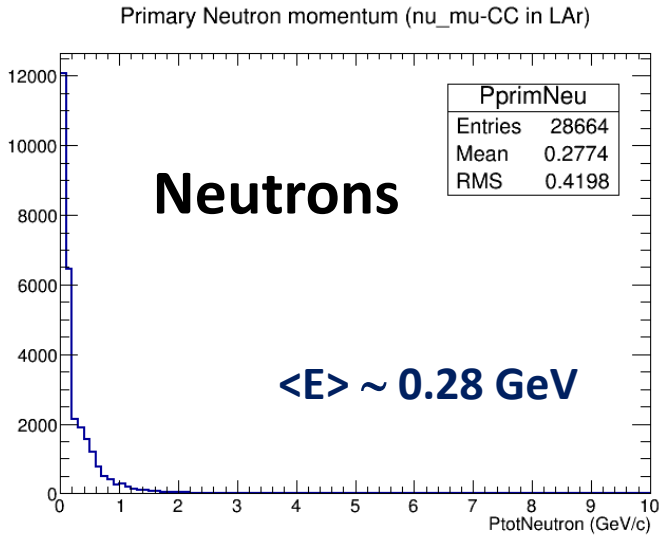


Primary particle spectra

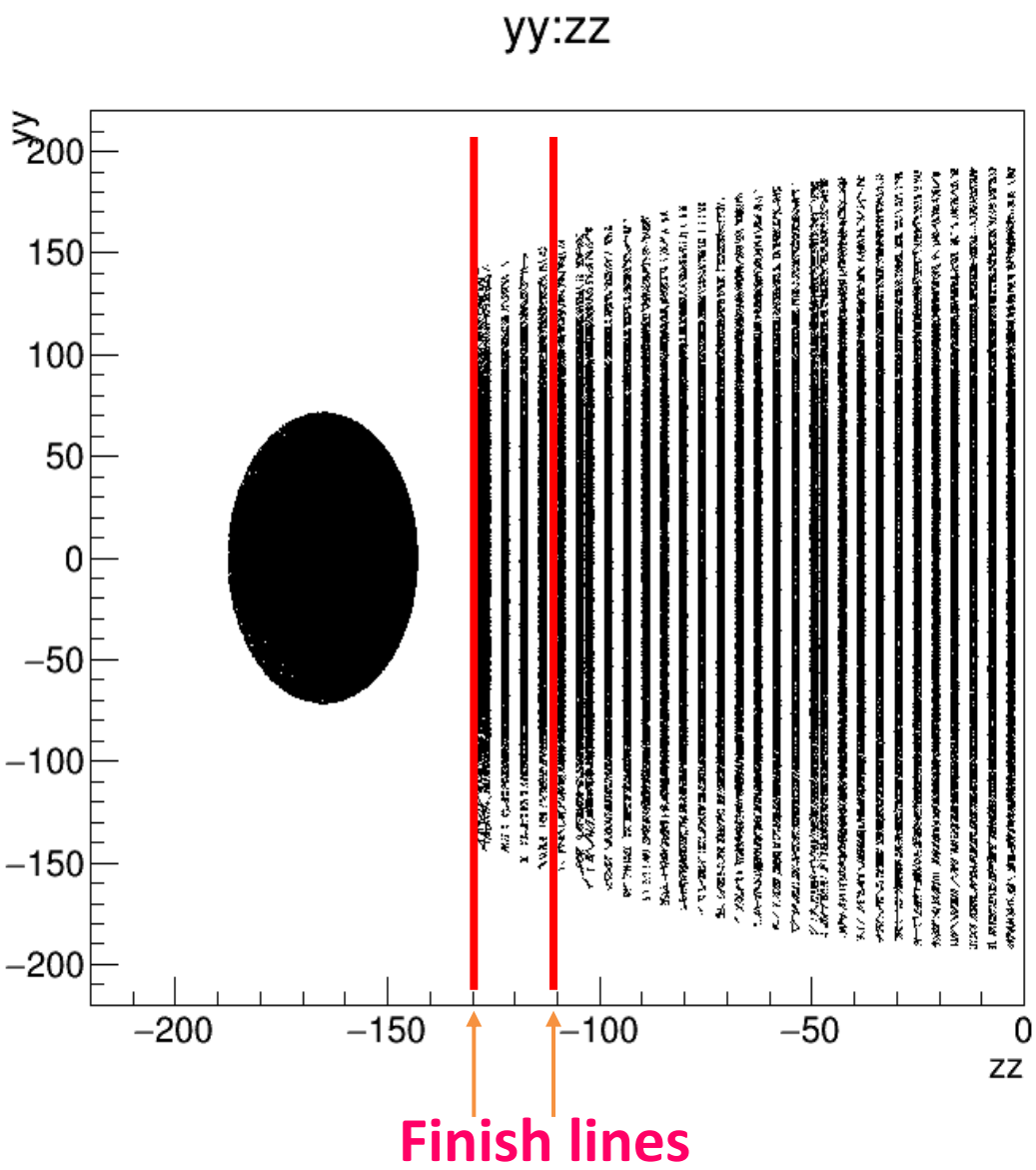








Hits at 1° ST and after 20cm



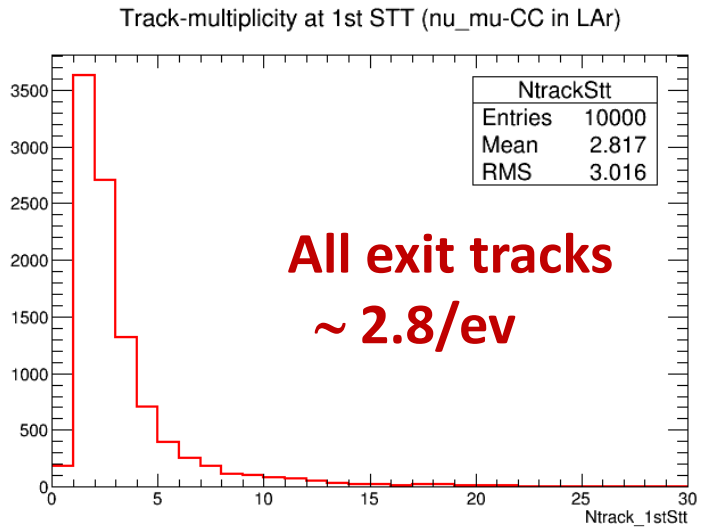
20 ST layers ~ 20cm as a minimum length for track reconstruction

Hits in STT both from primary and secondary particles

Multiplicities ?

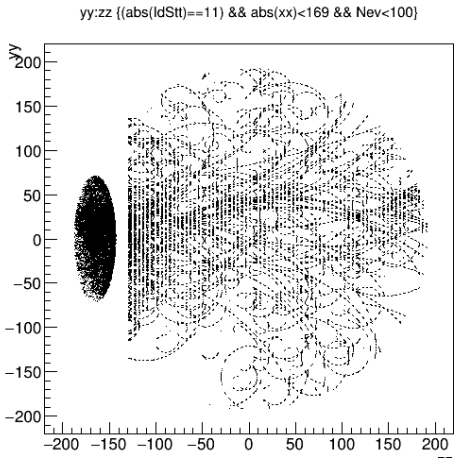
Energy ?

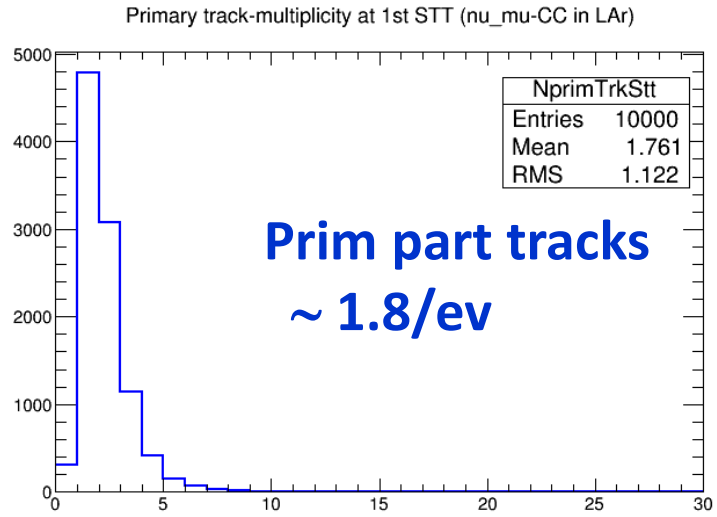
Track multiplicities at 1° ST layer

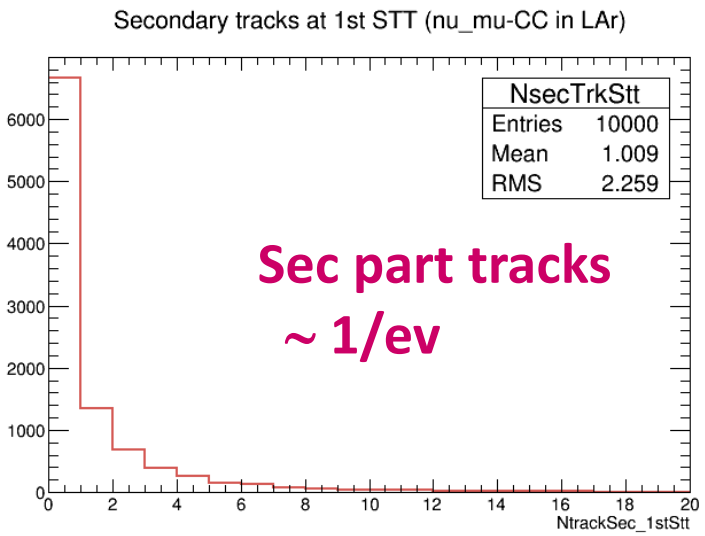


Tracks from Primary and Secondary particles …

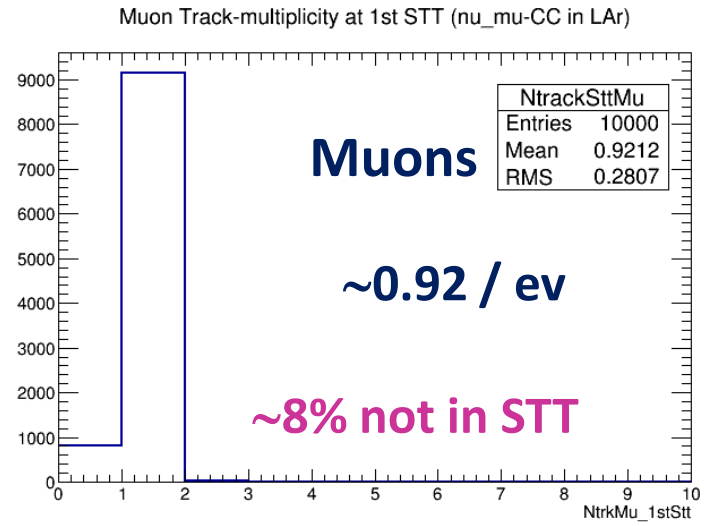
Many secondary electrons (δ rays) in LAr

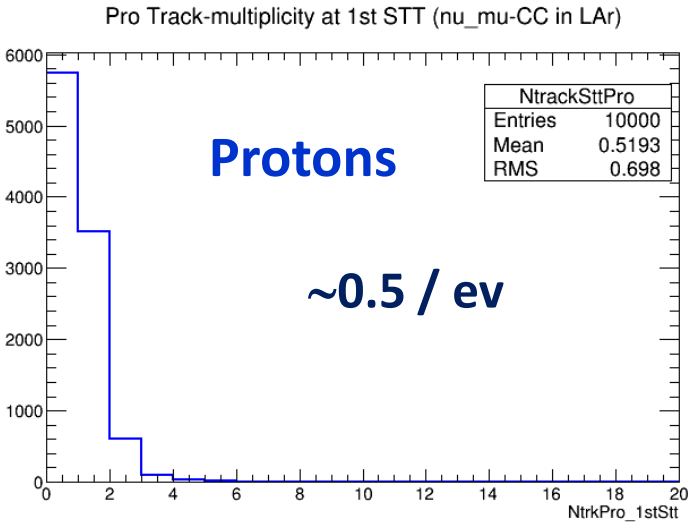


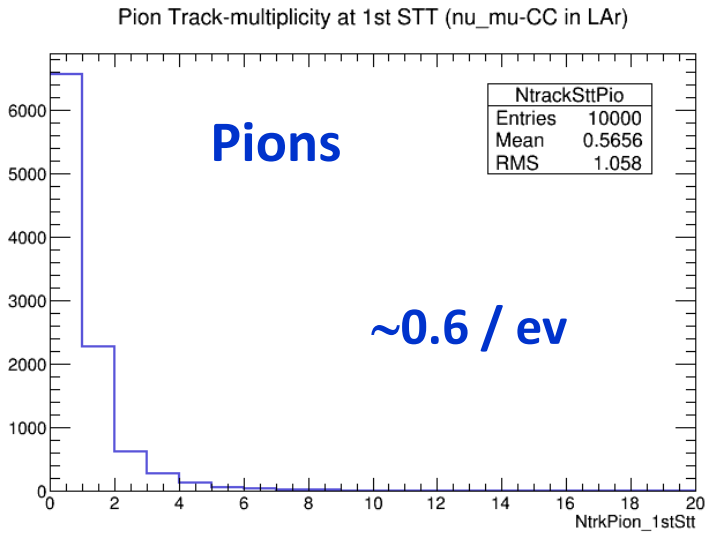


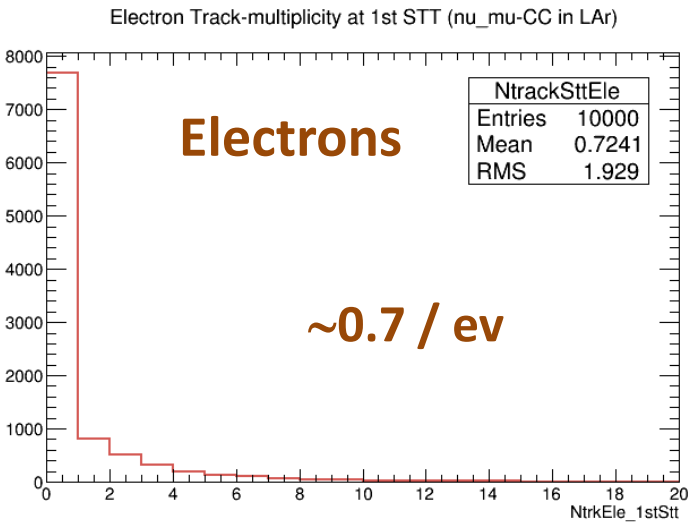


Track-type multiplicities at 1° ST layer

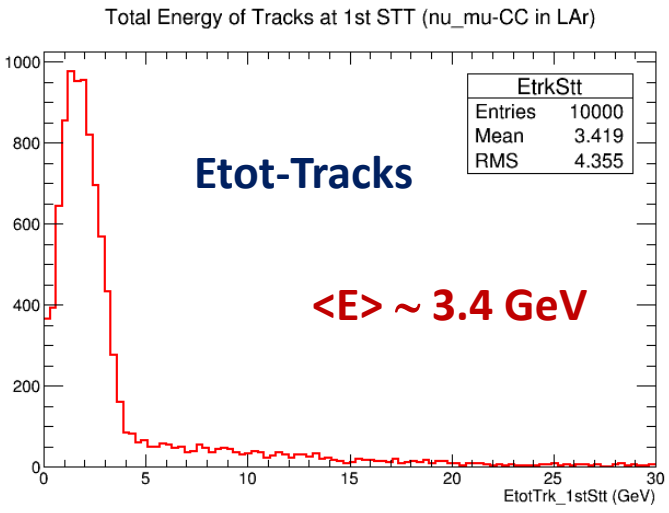


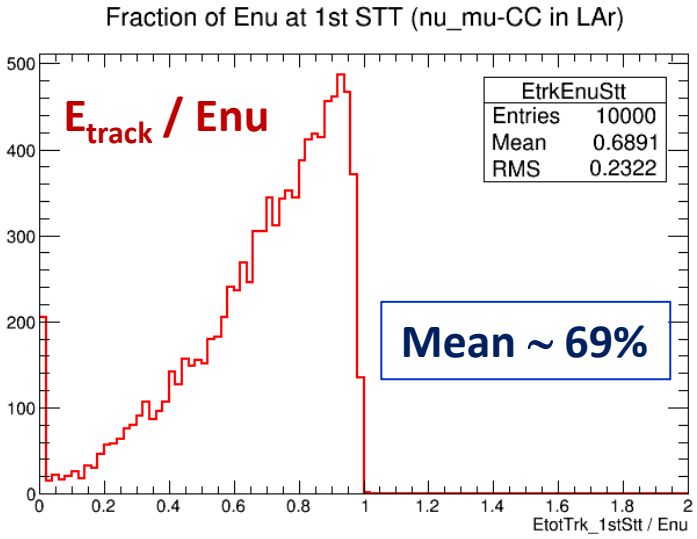


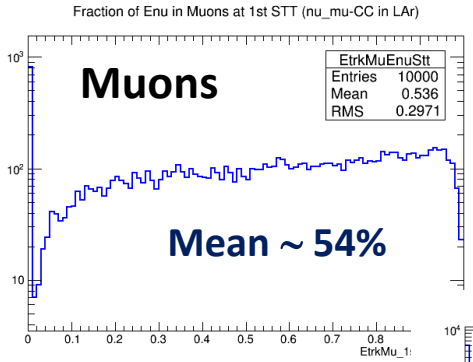


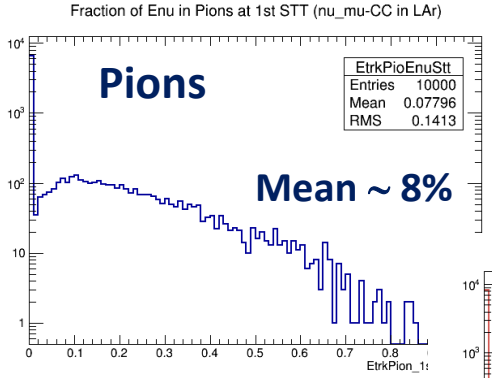


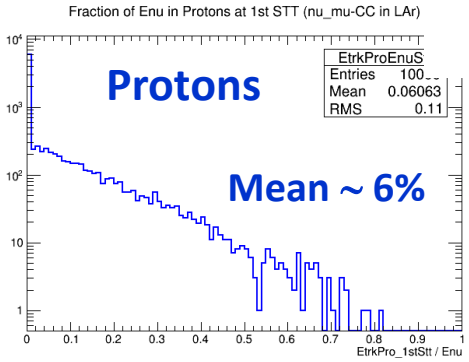
Energy at 1° ST layer

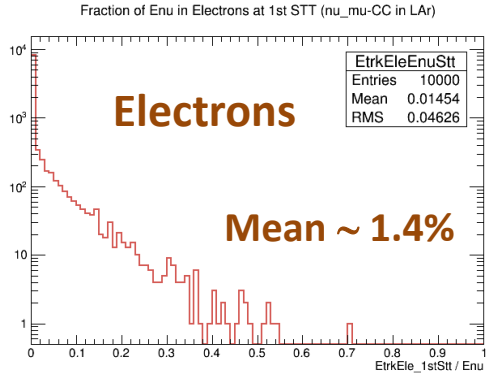




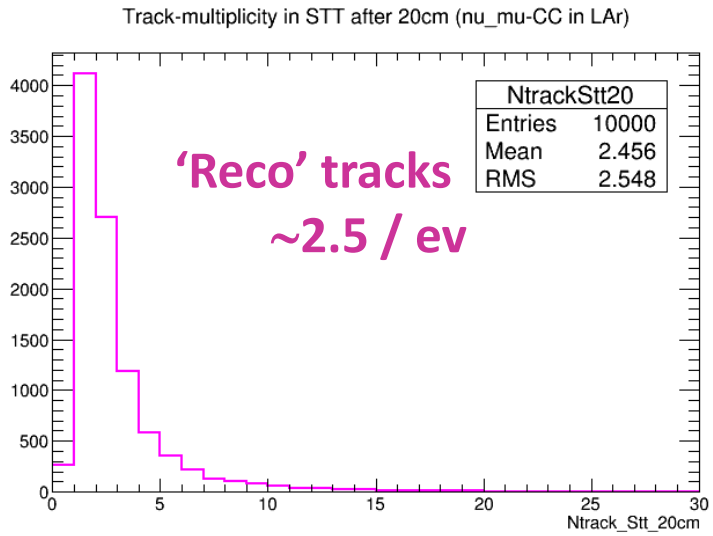


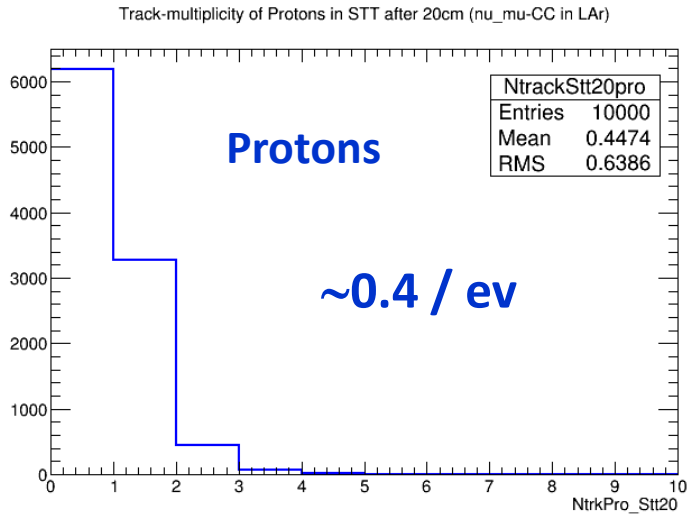


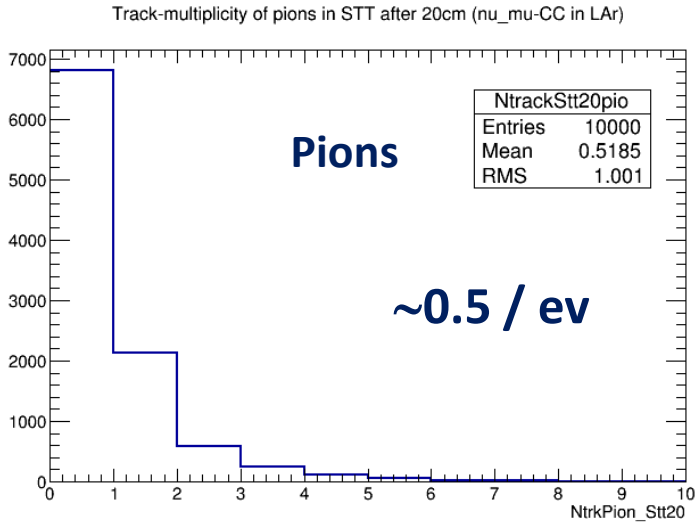


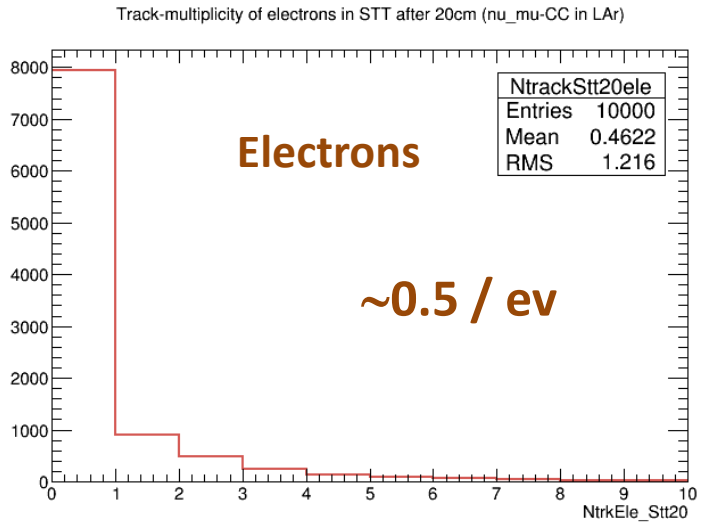


Track multiplicities at 20° ST layer

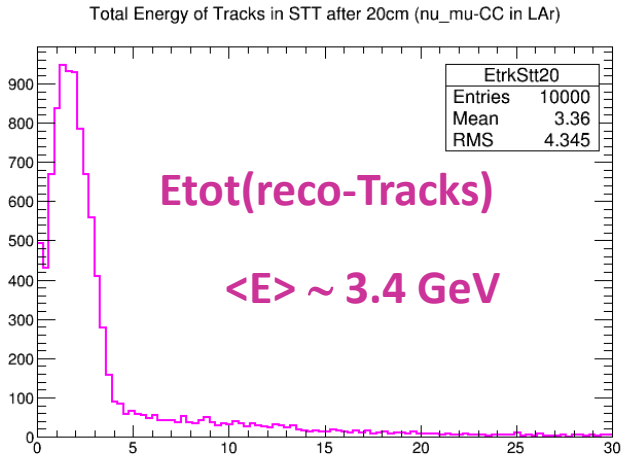


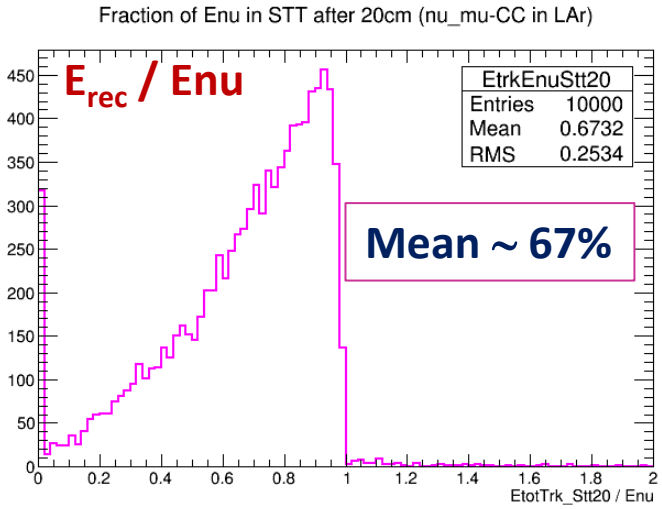


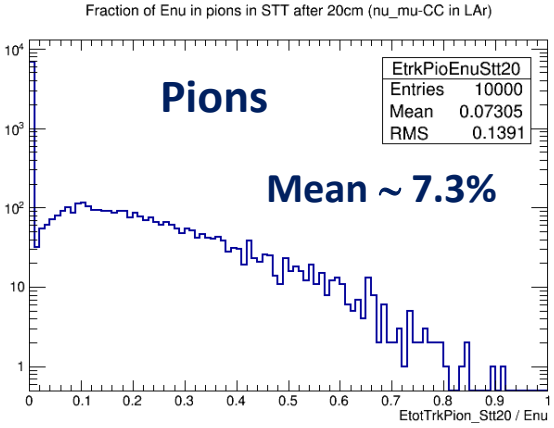


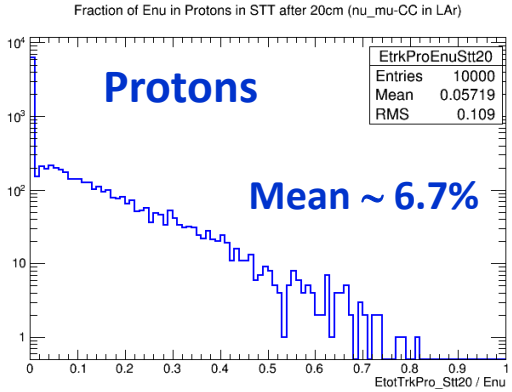


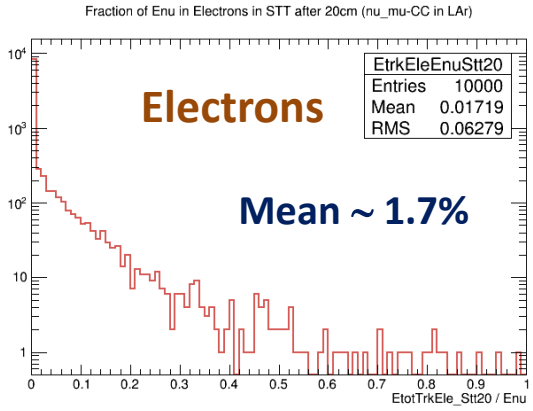
Energy at 20° ST layer







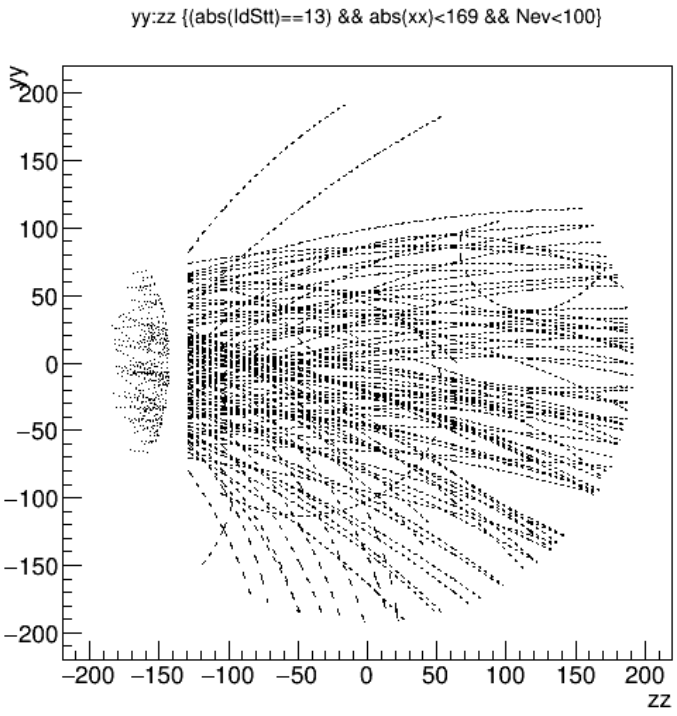




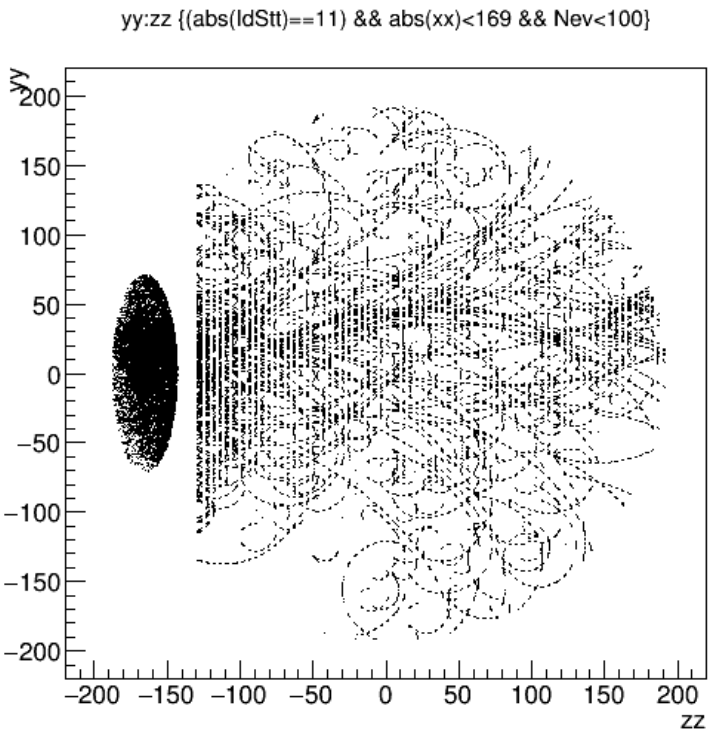
Backup

Hits and tracks in STT

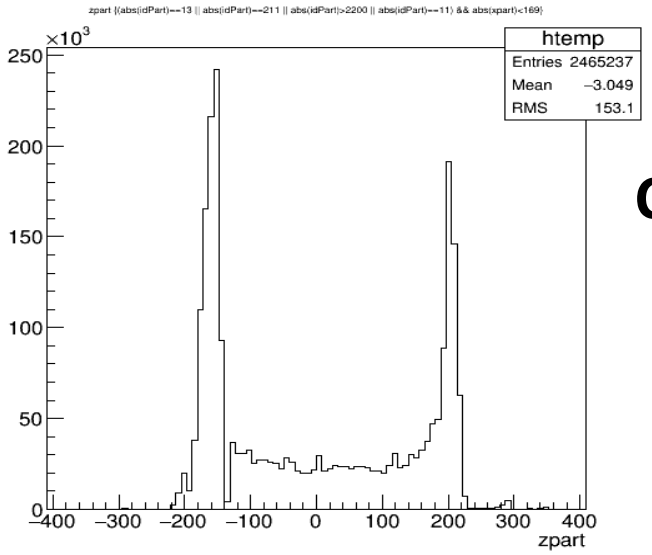
Muons



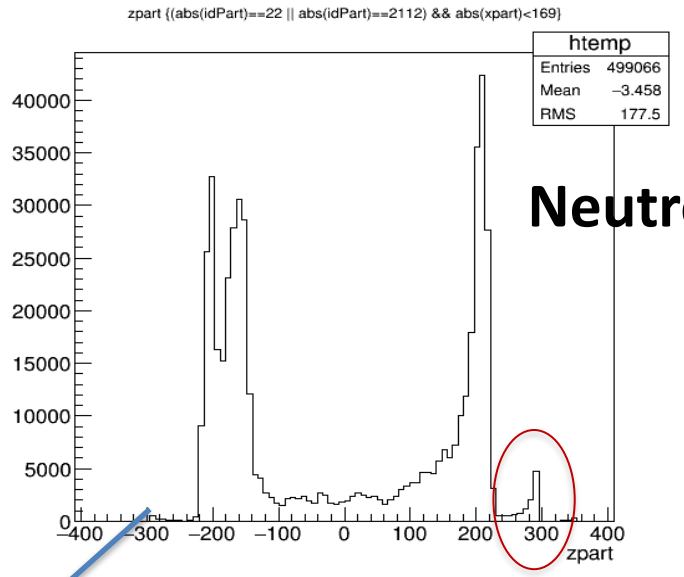
Electrons



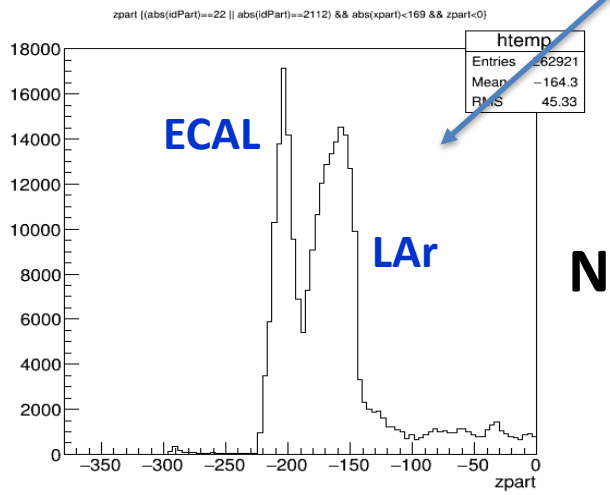
Hit distribution along Z



Charged

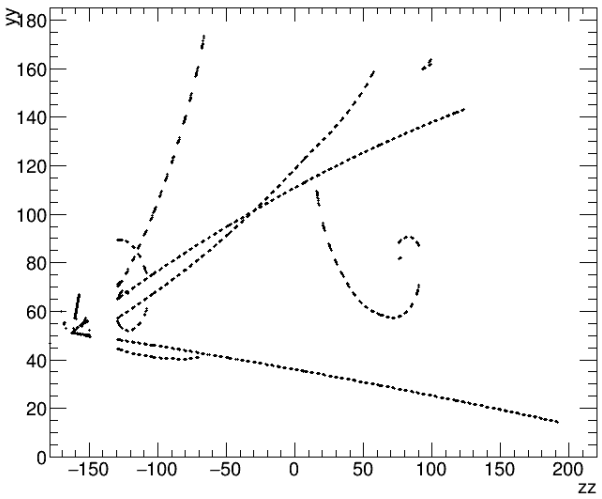


Neutrons

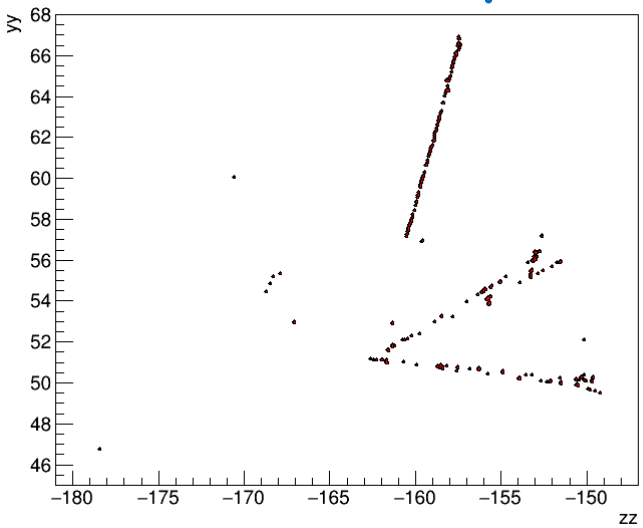


Neutrons

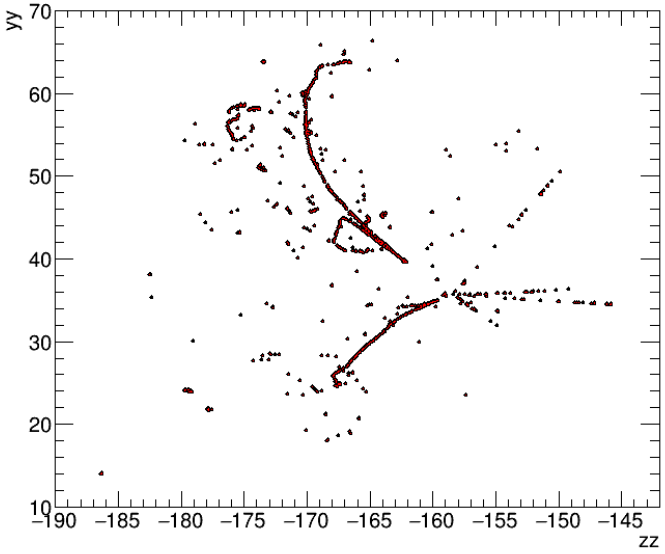
Event 1 (global)



Event 1 - Only LAr



Event 4 Only LAr



Many electrons (δ rays) accompanying charged tracks