Beam Energy Loss Study

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Introduction

Intro;

- PhD student at University of Manchester
- Worked so far mainly on MicroBooNE
- Recently on ProtoDUNE as well.

Aim;

- Investigate possible energy loss of particles in beam before entering the TPC, using simulation.
- Losses between momentum measurement in the beam and particle entering the TPC need to be accounted for.

Method

Used “mcc10_protodune_beam_p4GeV_cosmics_3ms_sce_mcc10.0” sample.

Wrote module which accessed the MCParticle truth trajectory information of the primary beam particle for each event using ProtoDUNETruthUtils.

Calculate the fraction of its original kinetic energy the particle has at its first geant step inside the TPC (z = -0.49375 cm)

Fraction of Kinetic Energy

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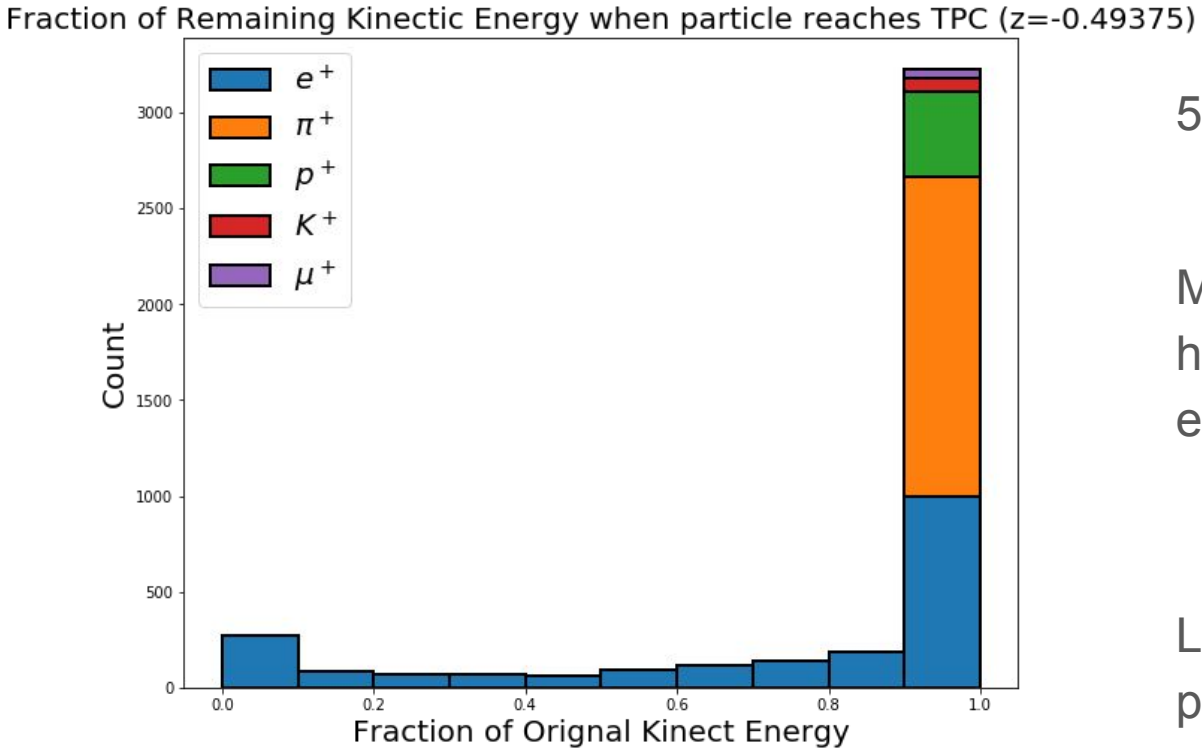

5000 events

Majority of particles retain high proportion of Kinetic energy

Low energy tail made up of positrons as expected

Effect for Pions/Kaons/Protons

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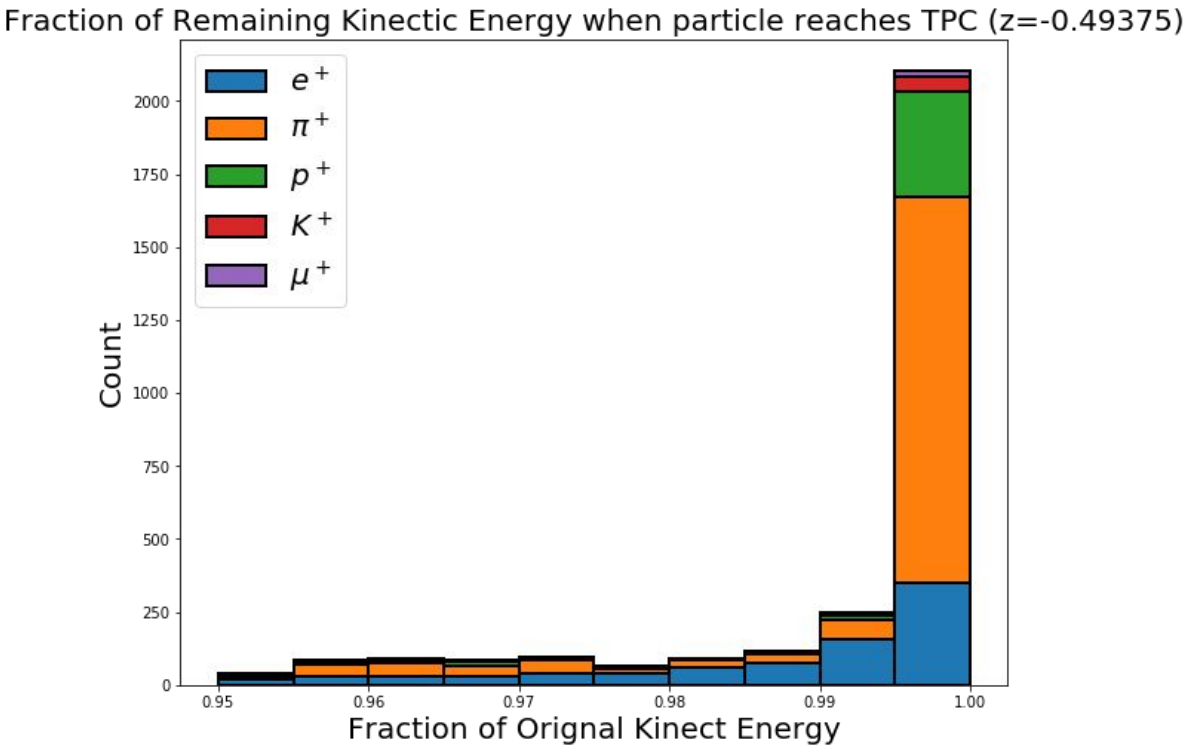

Same plot as before but for x range=[0.95,1]

Can see losses for Pions/Kaons/Protons typically less than 0.5%

Thanks, Any Questions?

Beam position

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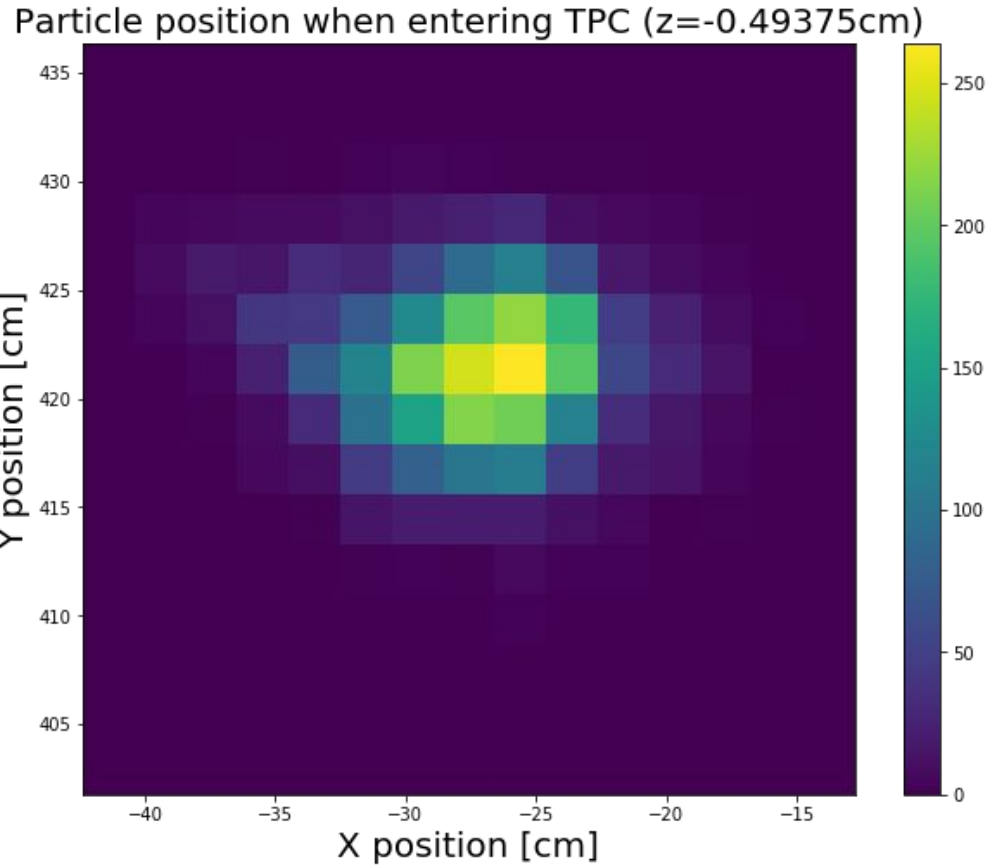

Position;

X mean= -27.2725 cm X std=3.78764 cm
Y mean= 421.501 cm Y std=3.18806 cm

Direction;

Mean p_x/p=-0.178177
Mean p_y/p=-0.196387
Mean p_z/p=0.959408