ProtoDUNE

dE/dx electrons vs gammas

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dE/dx electrons vs gammas

work in progress

Electrons
Gammas from π^0

What is causing this 1 MIP peak?

Arbitrary Units

dE/dx (MeV/cm)
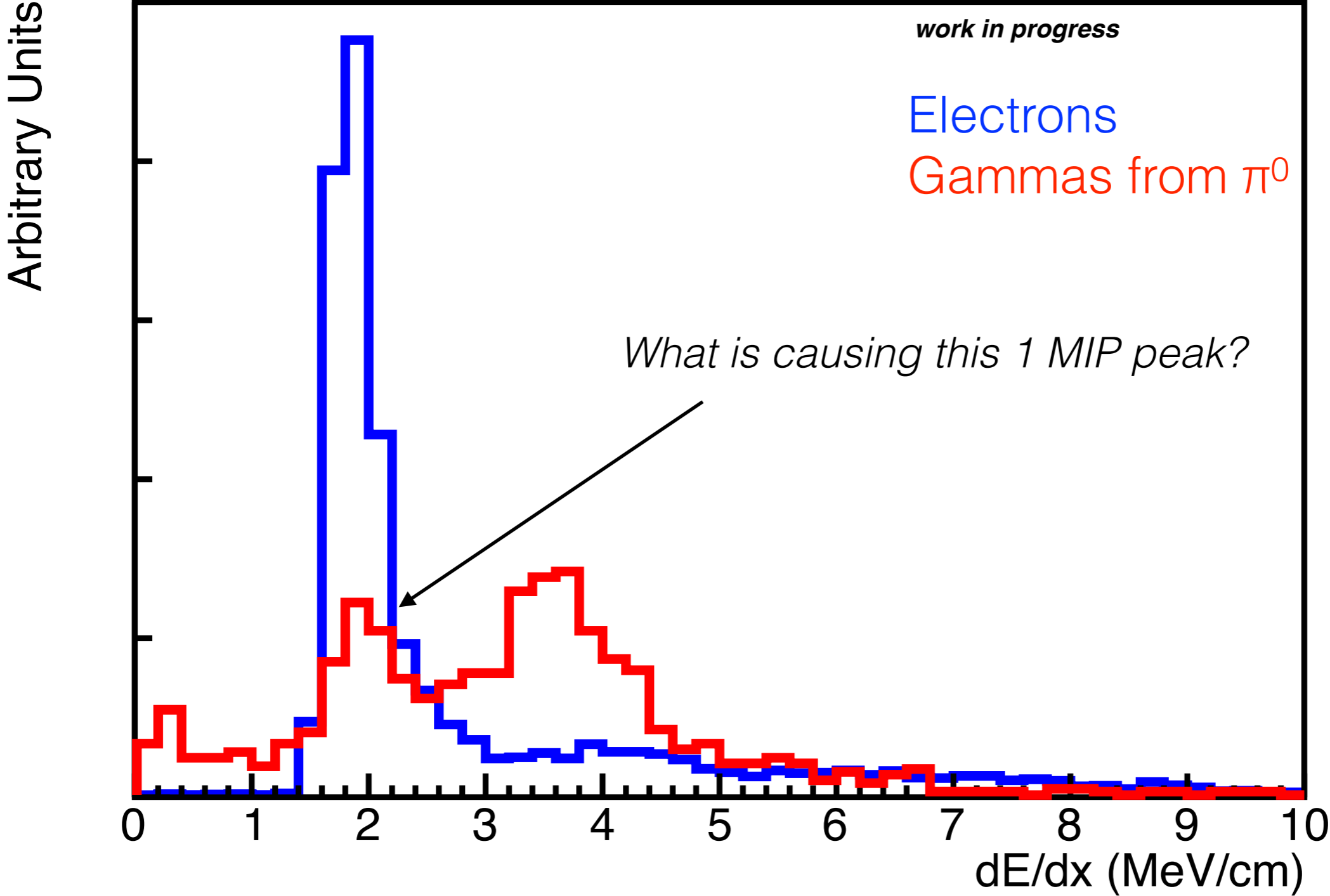
dE/dx electrons vs gammas

Where can we get gammas? Pion scattering: $\pi + {}^{40}Ar \longrightarrow \pi^0 + X$

To study dE/dx electron-gamma separation I generated single particles

Single positron with momentum 1GeV sigma = 5% w/vertex at the beamline window
Single pions+ with momentum 1GeV sigma = 5% w/vertex at the beamline window
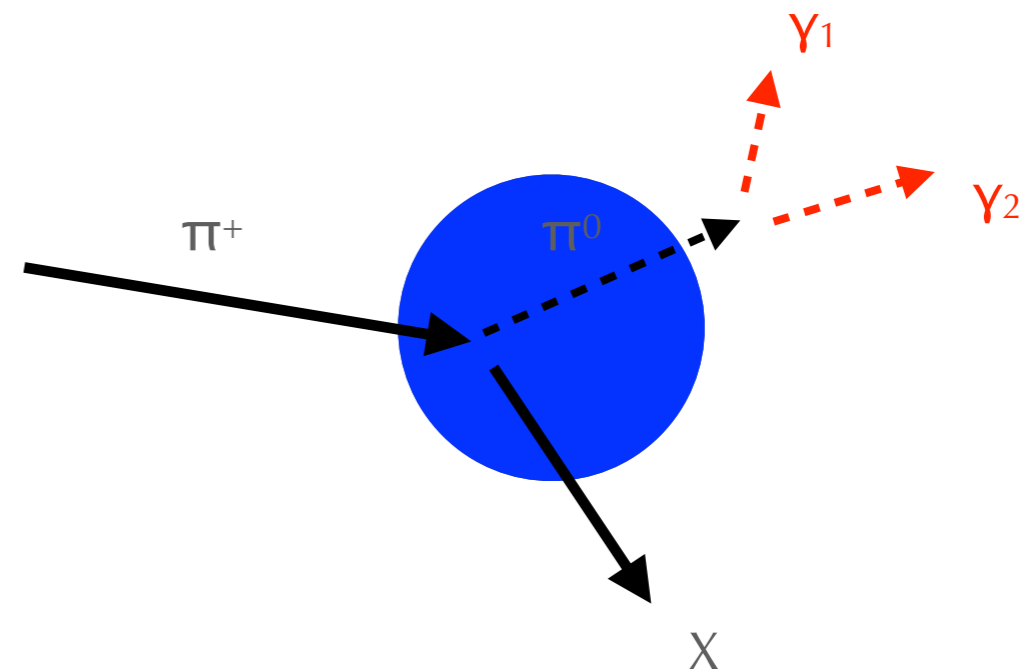dunetpc v08_10_00 w/Pandora reconstruction, w/NO SCE

Selection:
 Events with at least one true π^0
All below based on reco info
 A track Primarybeam PFParticle
 W/two daughter showers
 reconstruct invariant mass

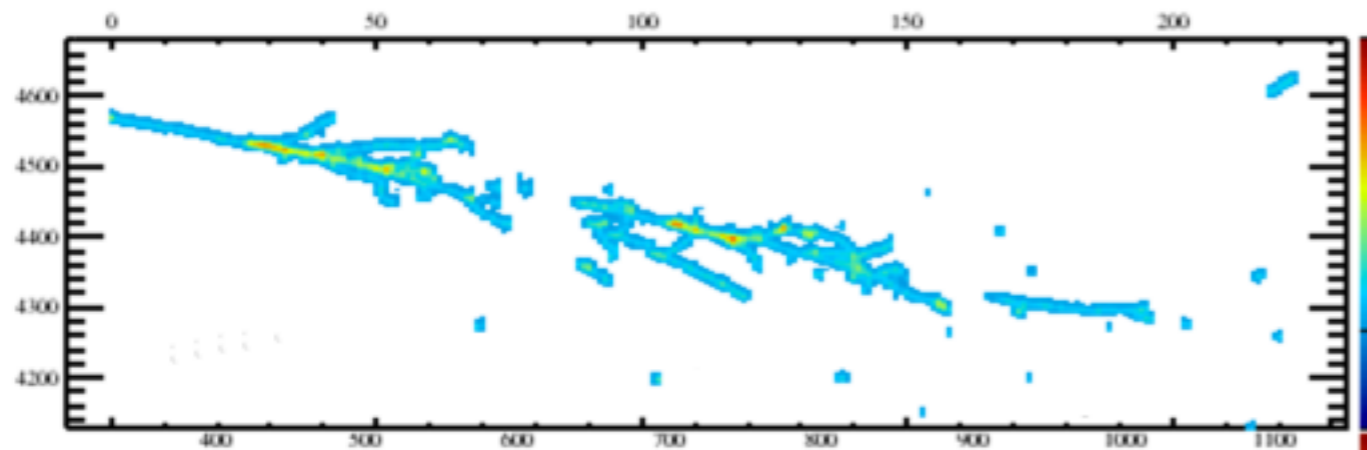**See previous talk for more details, old results uses v07_13_00**

dE/dx electrons vs gammas

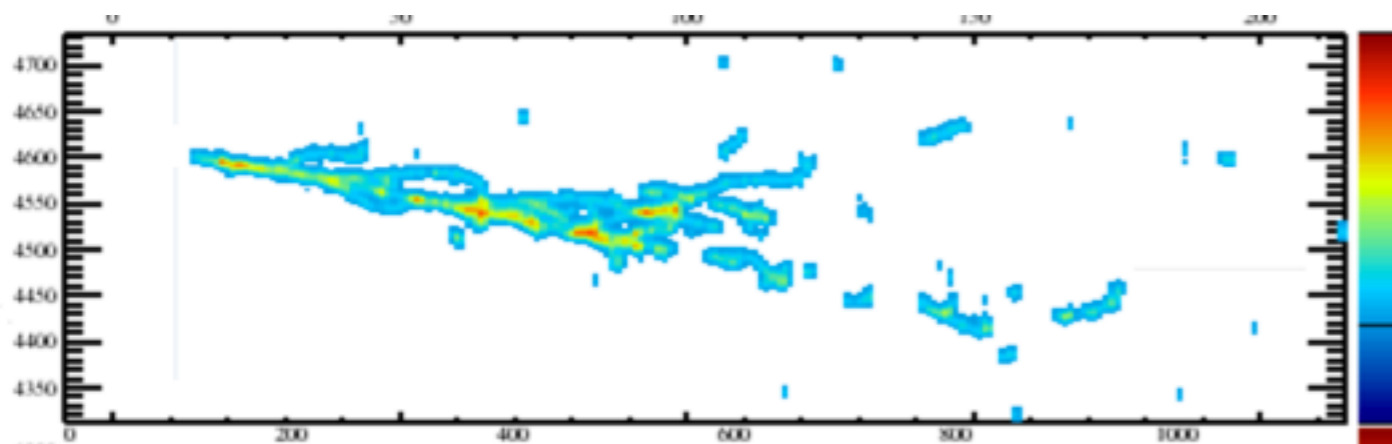To study dE/dx electron–gamma separation I generated single particles

Single positron with momentum 1GeV sigma = 5%
Single gamma with momentum 1GeV sigma = 5%
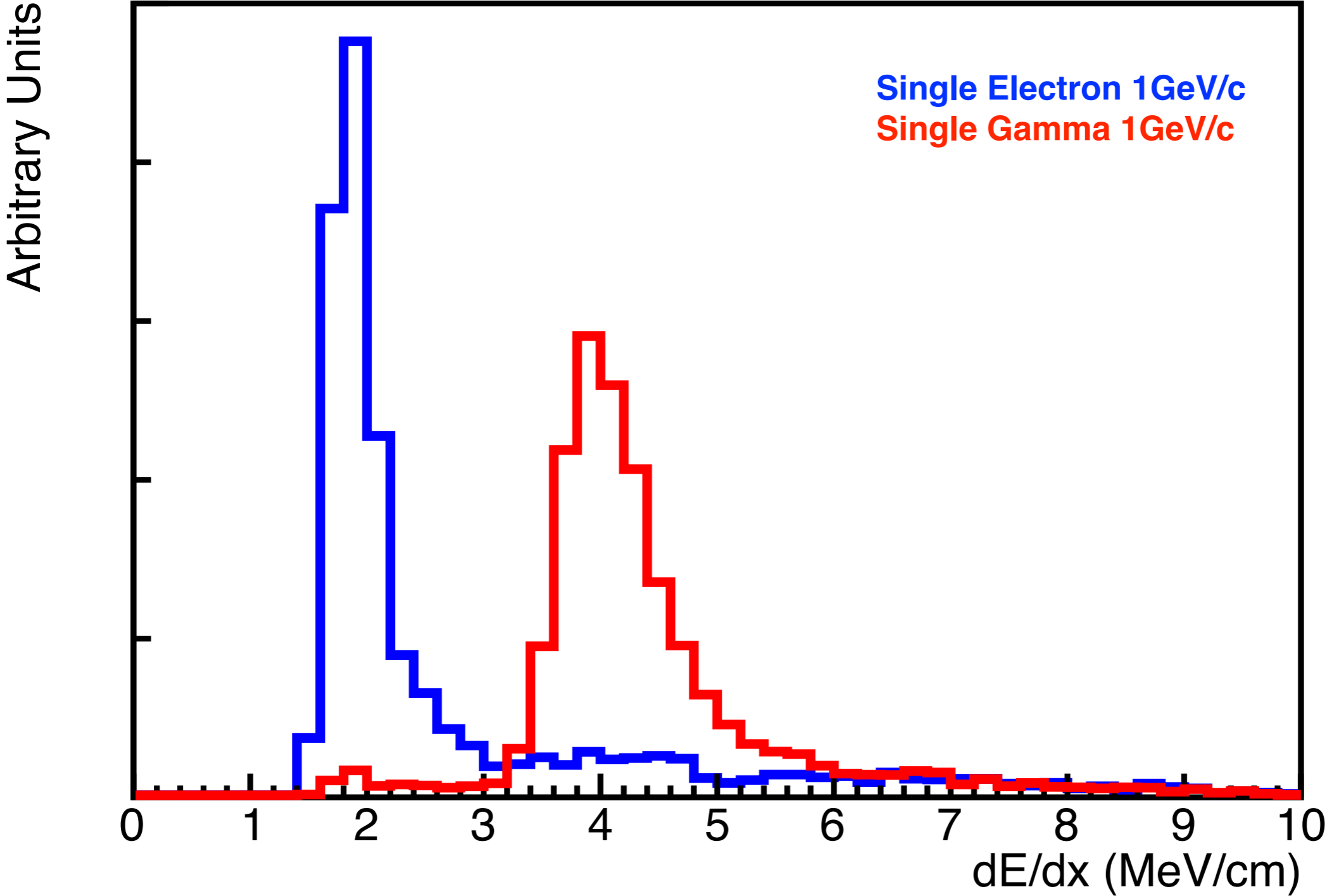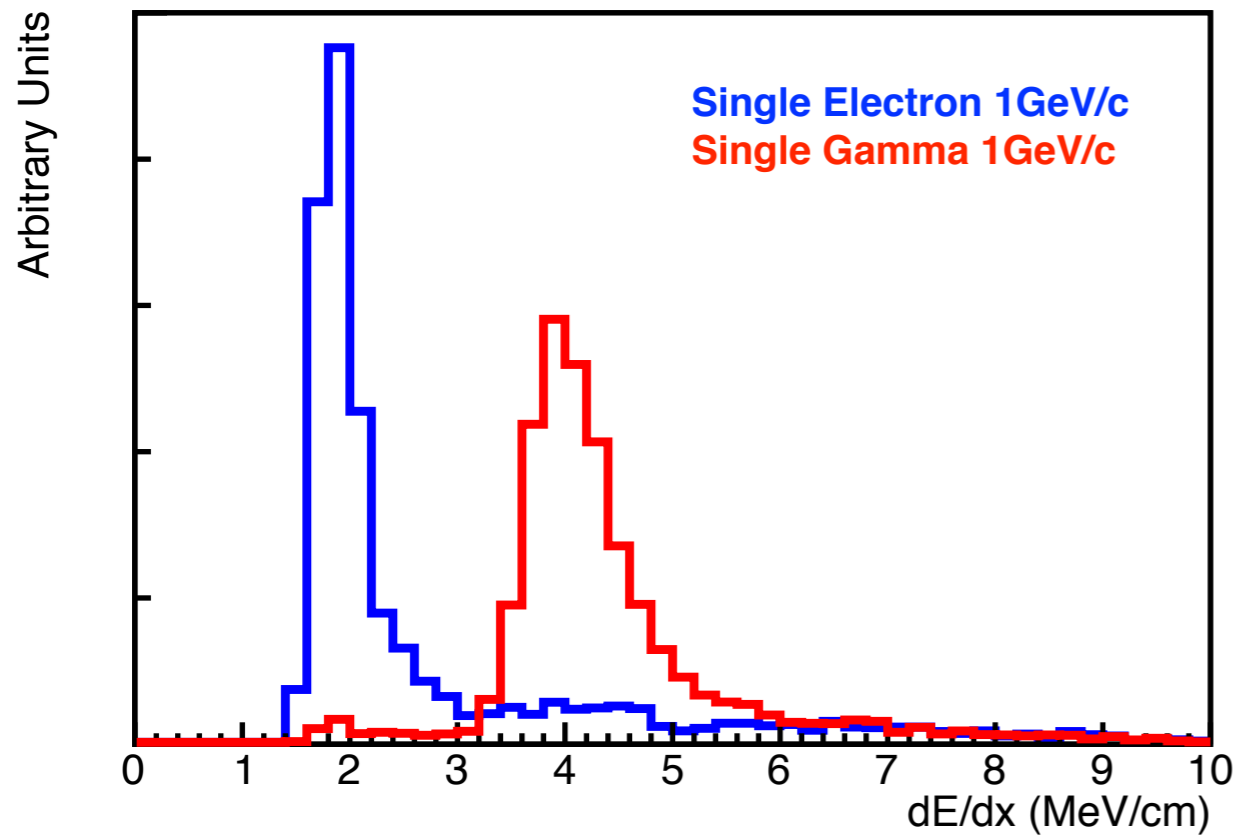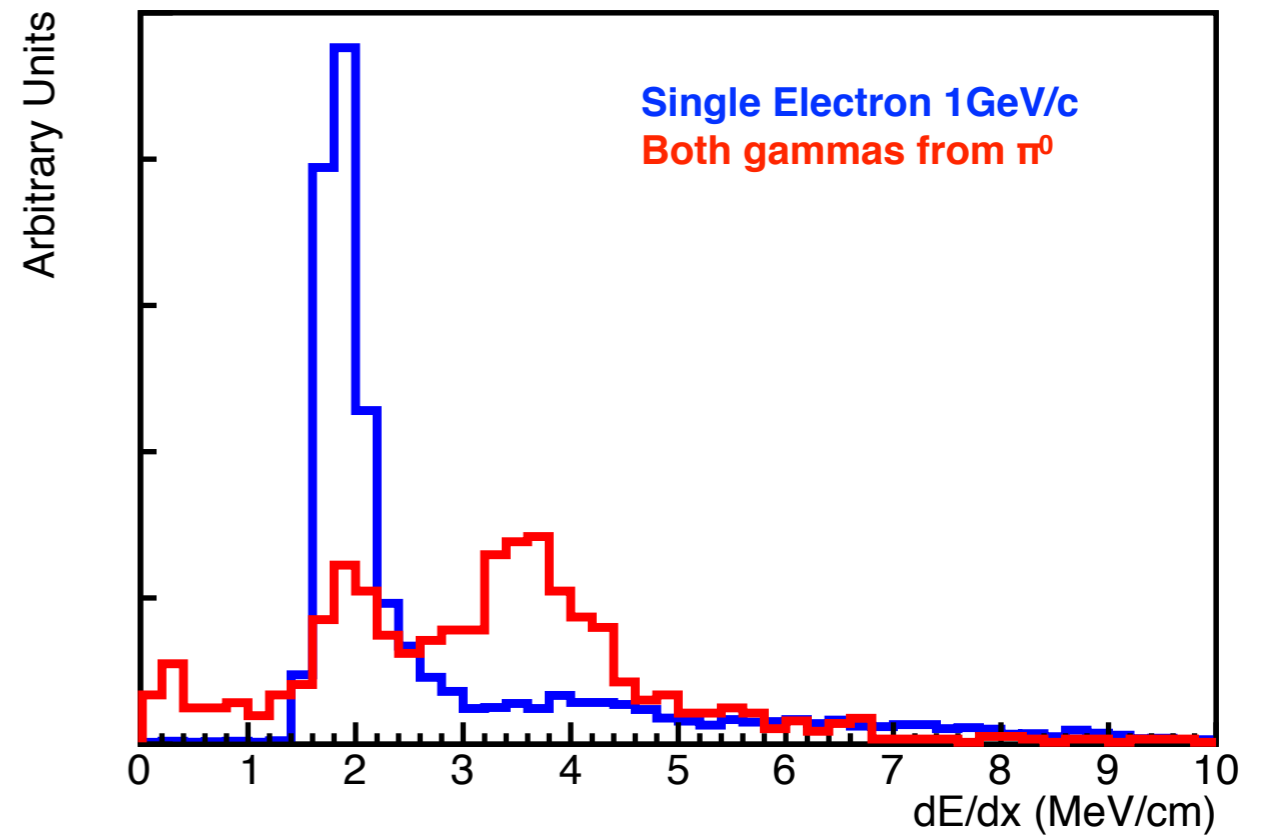dunetpc v08_10_00 w/Pandora reconstruction, w/NO SCE

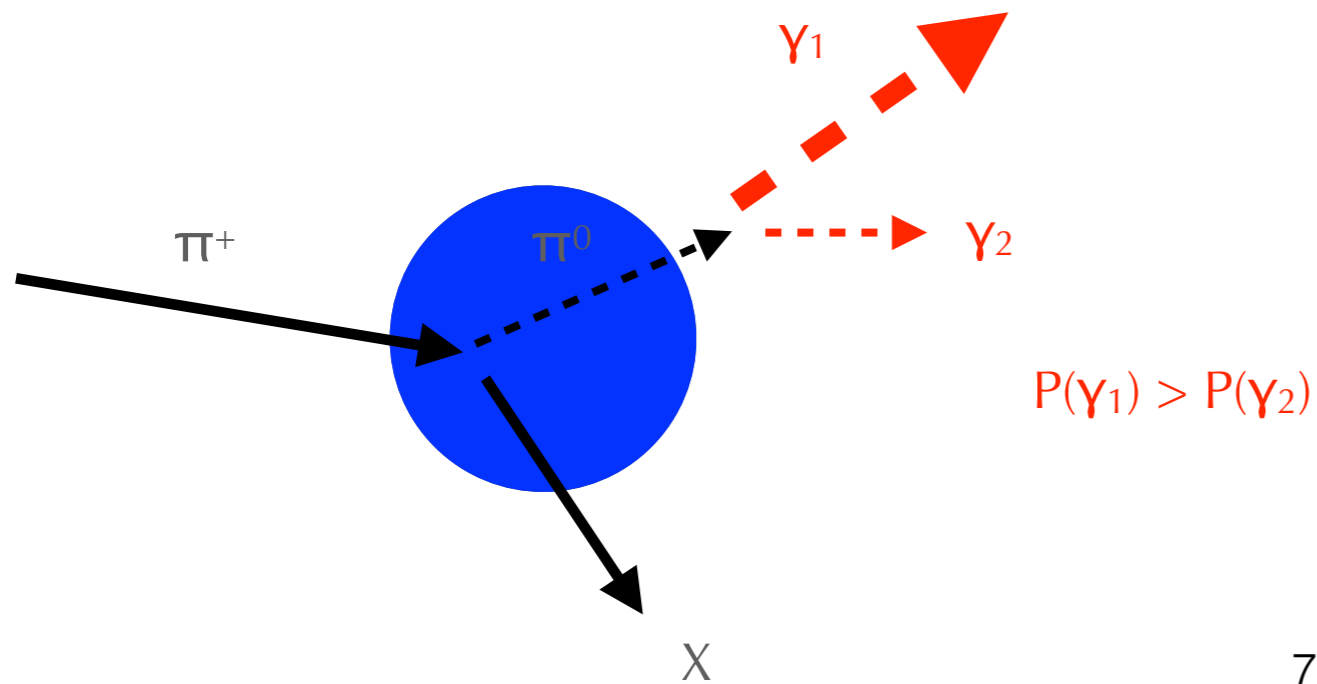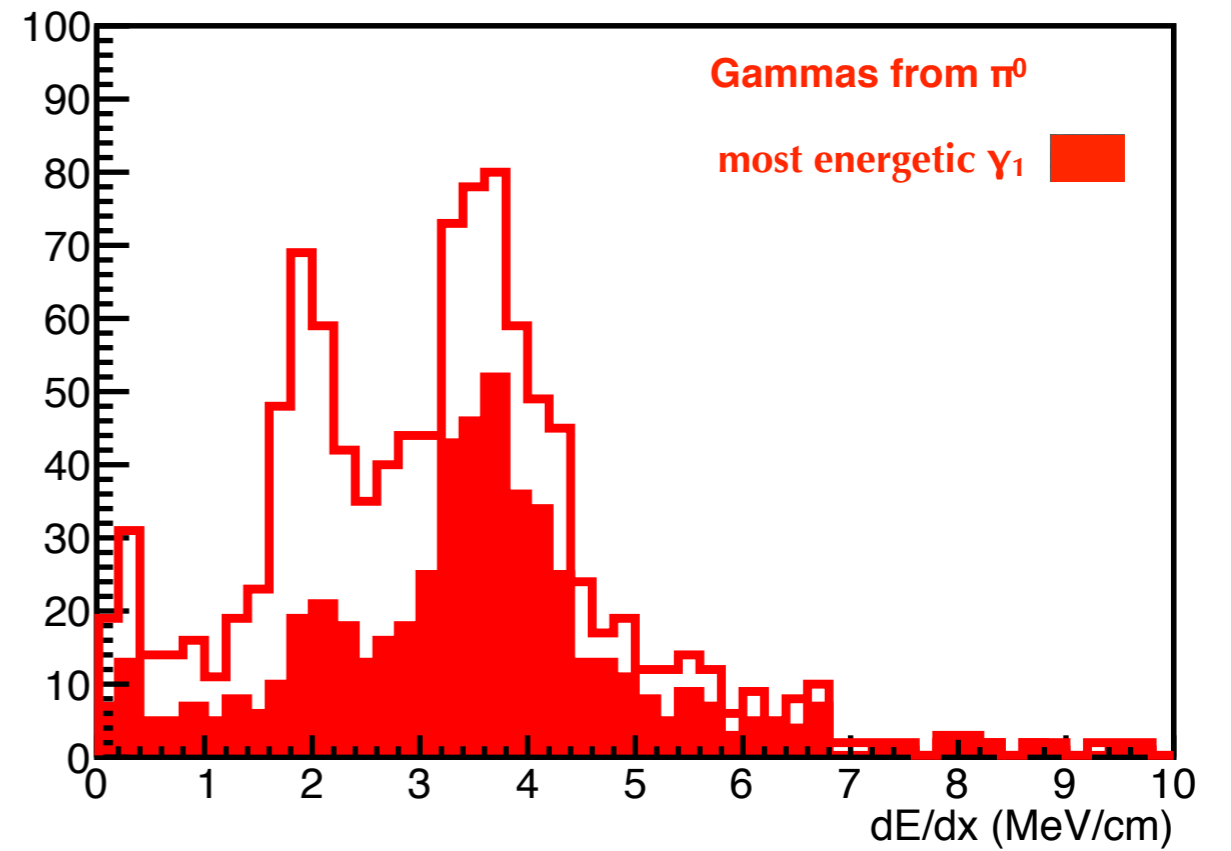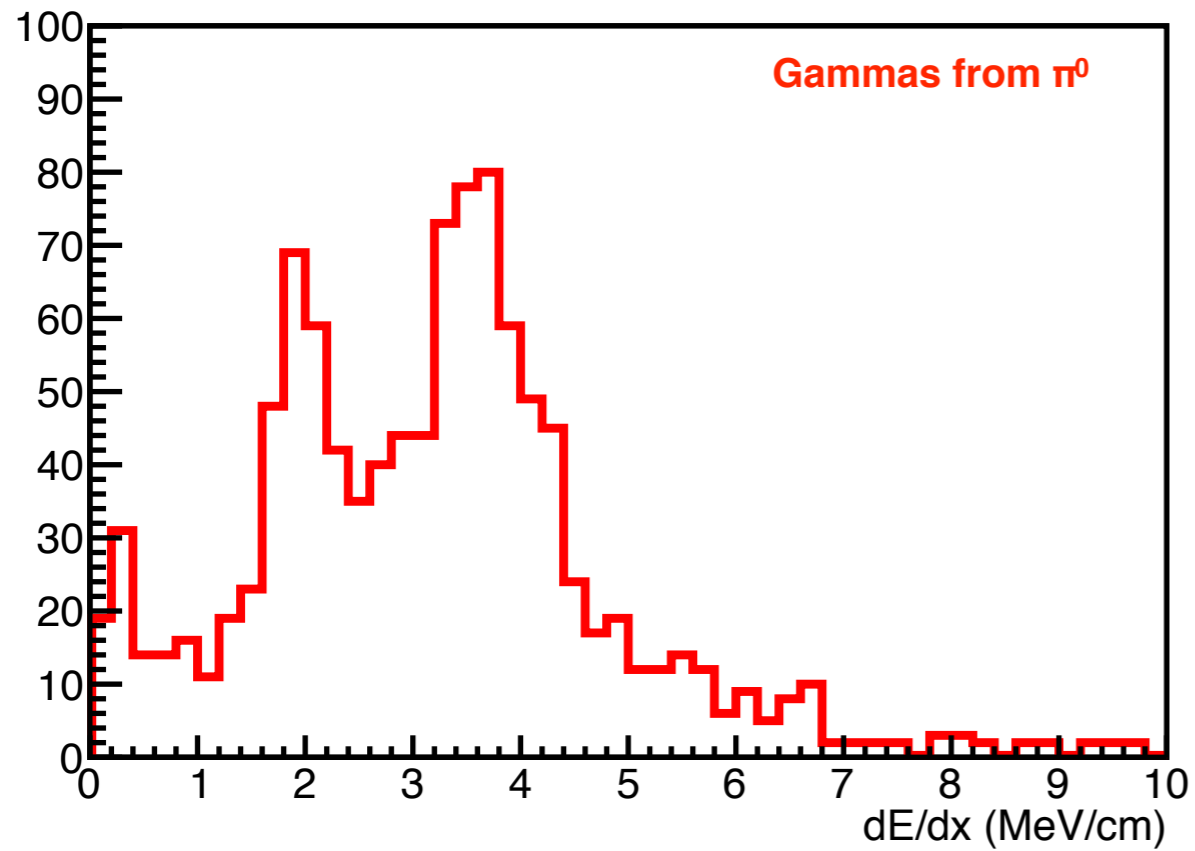

Single positron

Single gamma

dE/dx electrons vs gammas

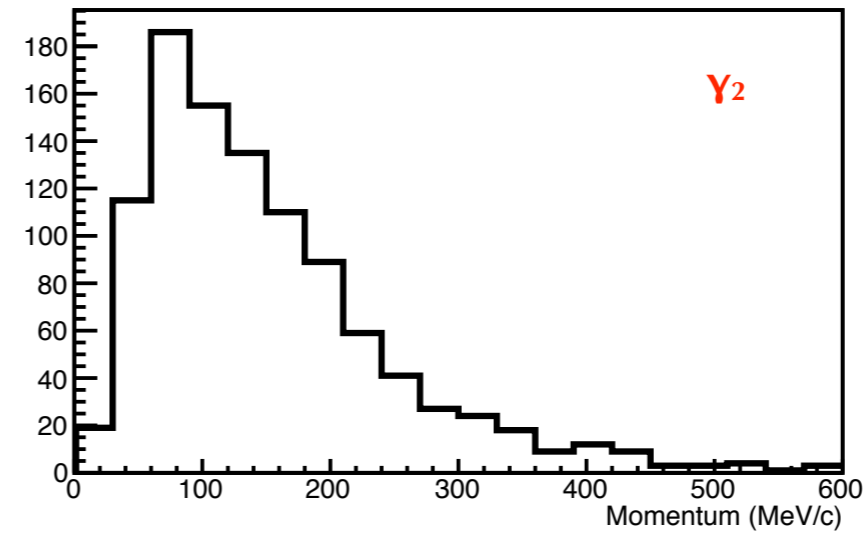# dE/dx electrons vs gammas

Gammas 1000 MeV/c
Well developed shower
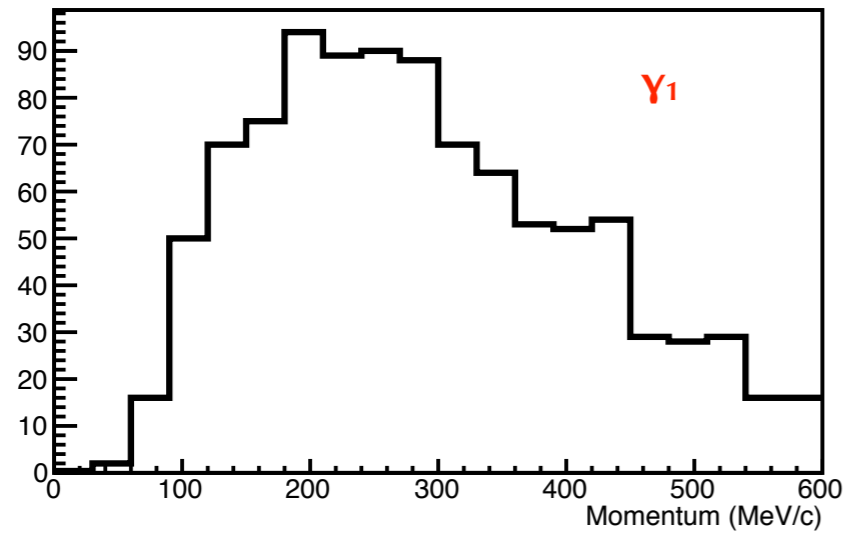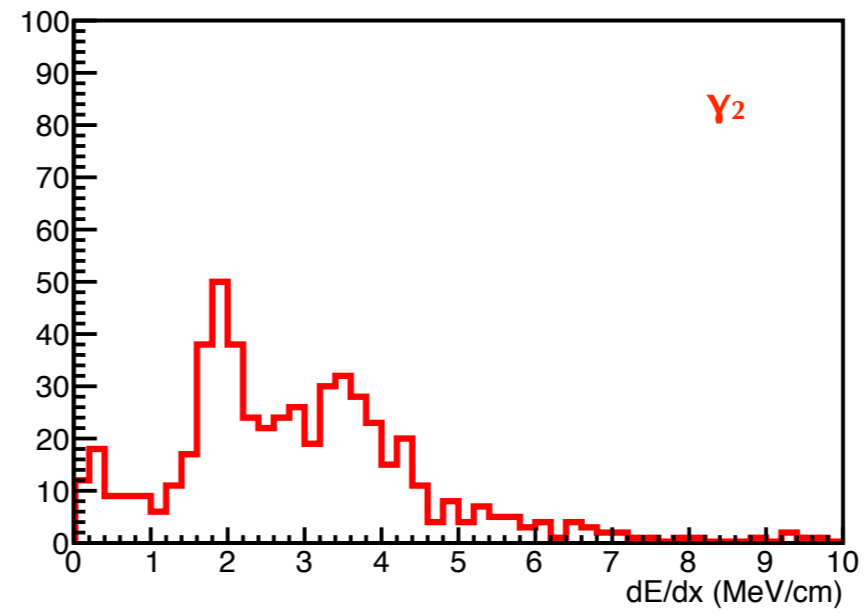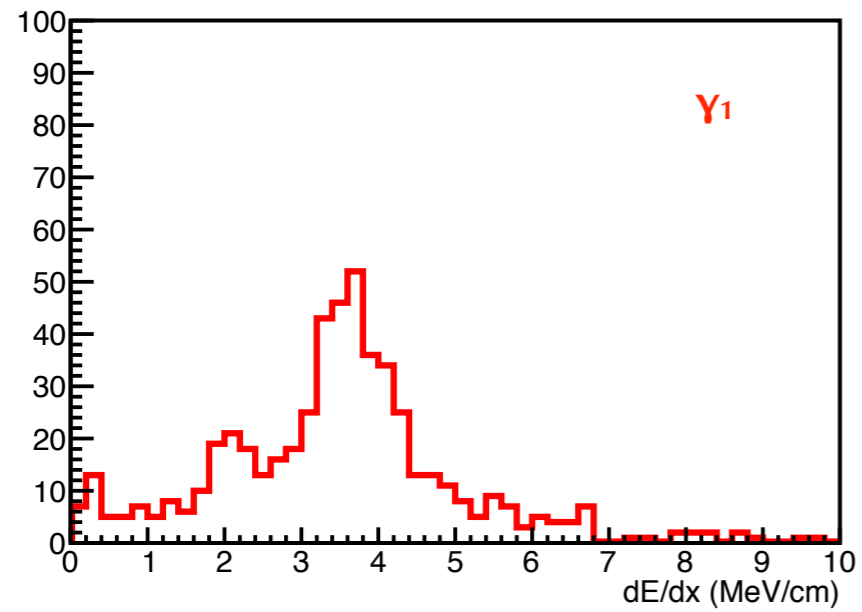
Gammas from π⁰ are below 500 MeV/c
Asymmetry from π⁰ decay
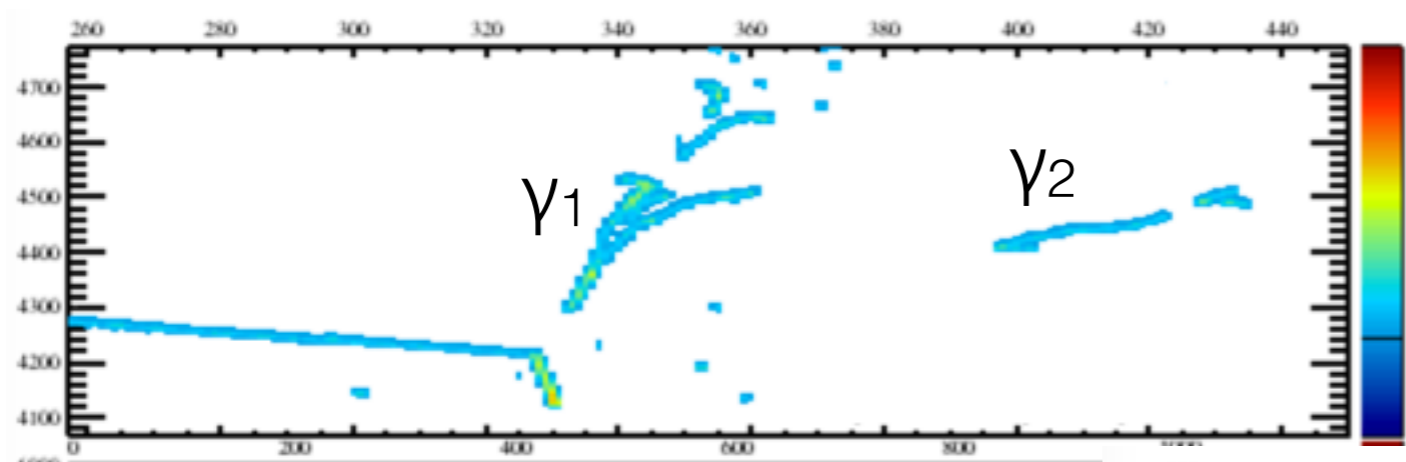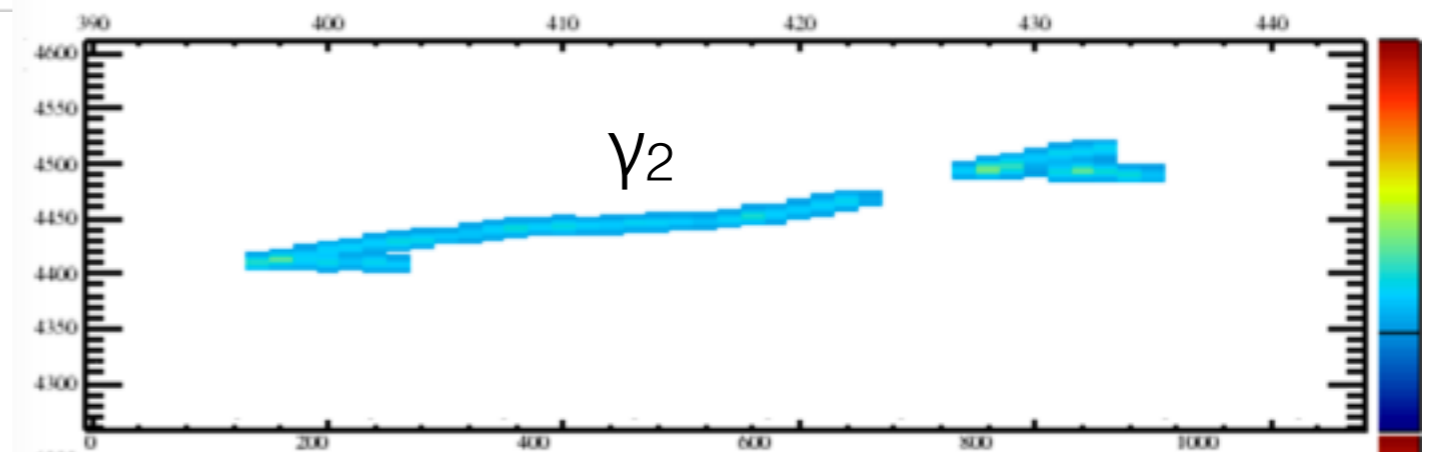Isotropically distributed
etc

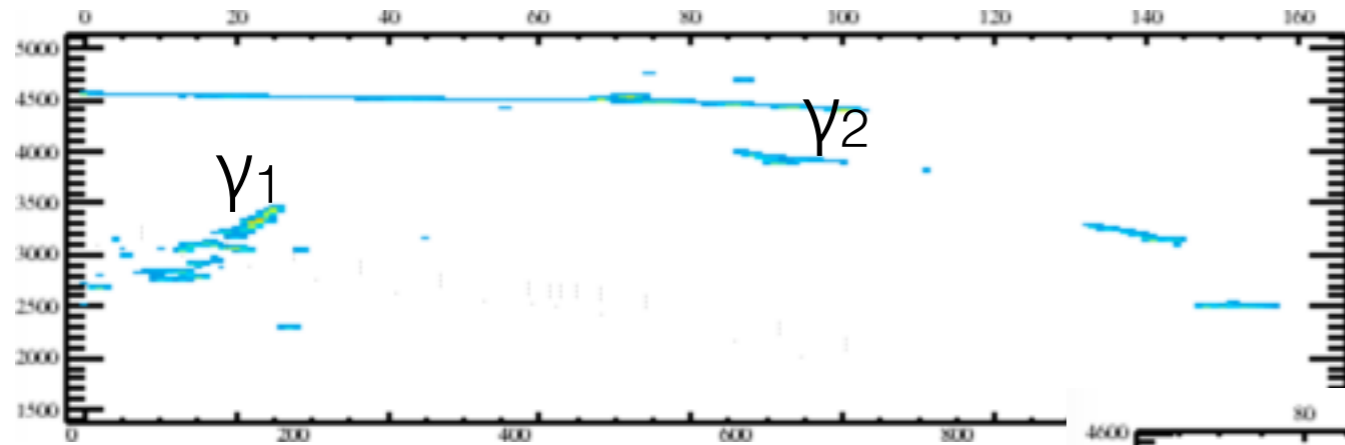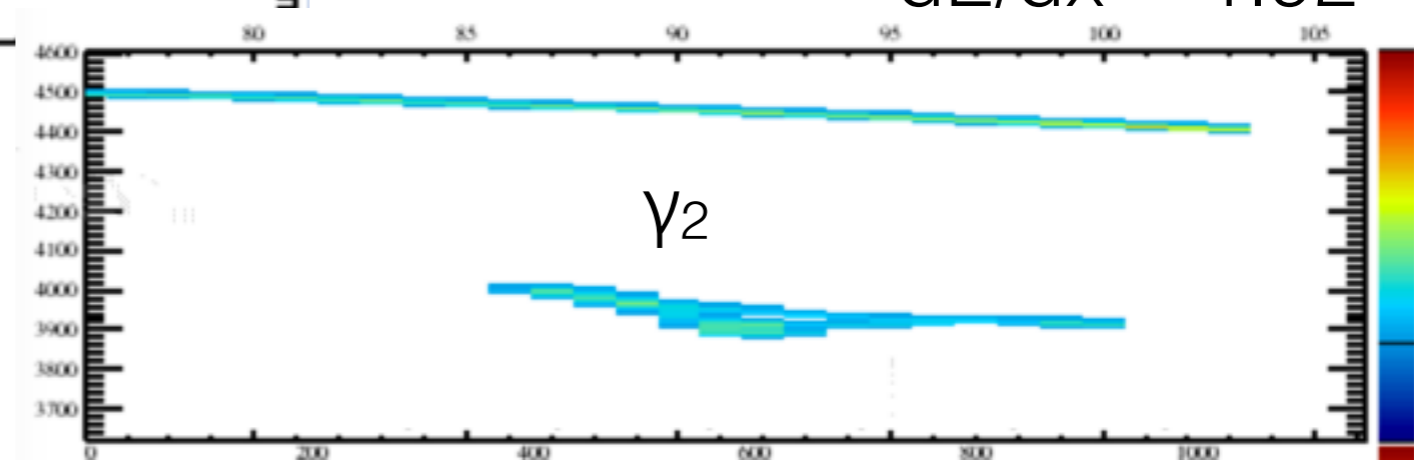# dE/dx gammas from π^0

dE/dx gammas from π^0
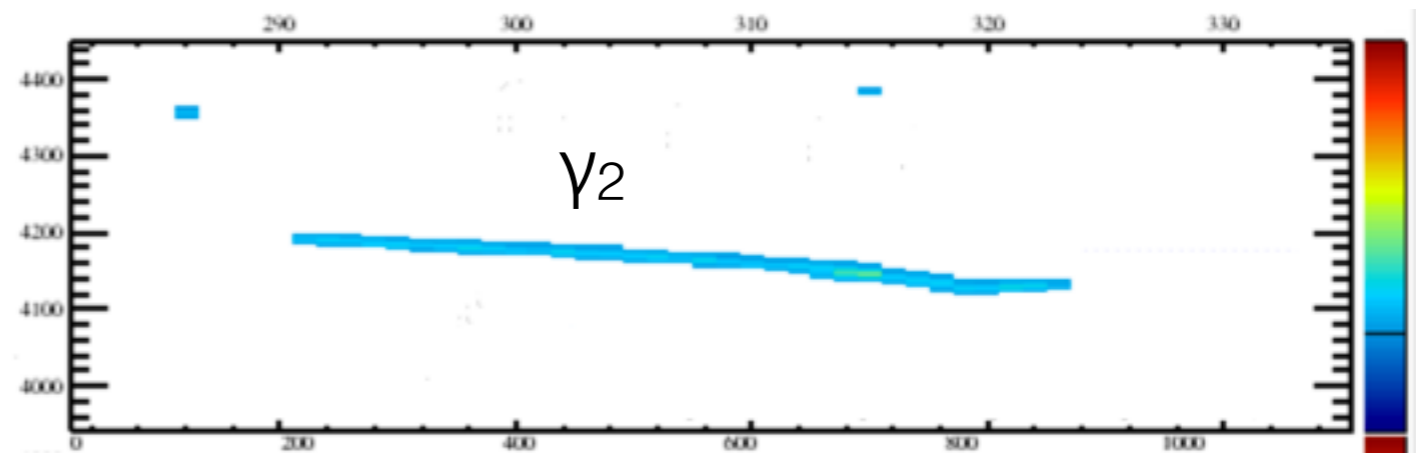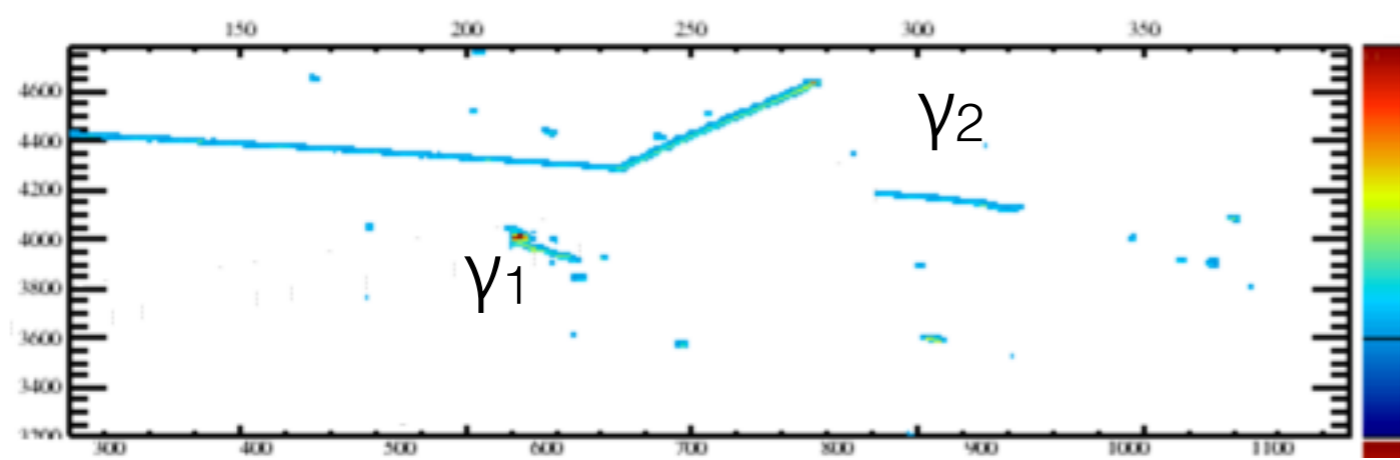
dE/dx gammas from π^0

dE/dx = 1.68

dE/dx gammas from π^0

γ_1

γ_2

dE/dx = 1.92

γ_2

dE/dx gammas from π⁰

dE/dx = 1.74

dE/dx gammas from π^0

Incomplete shower γ_2

dE/dx = 1.002

dE/dx gammas from π^0

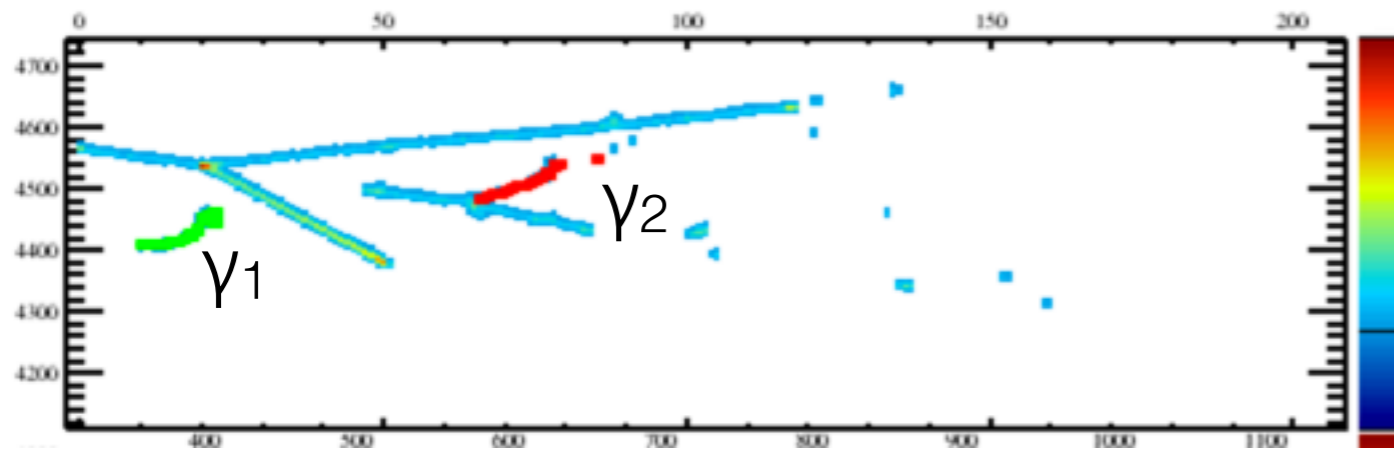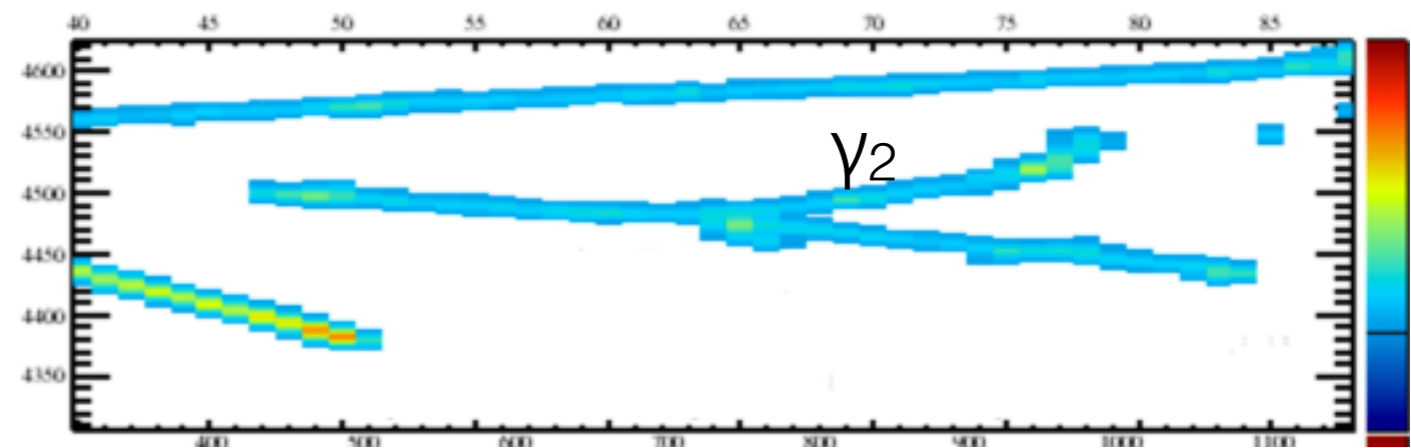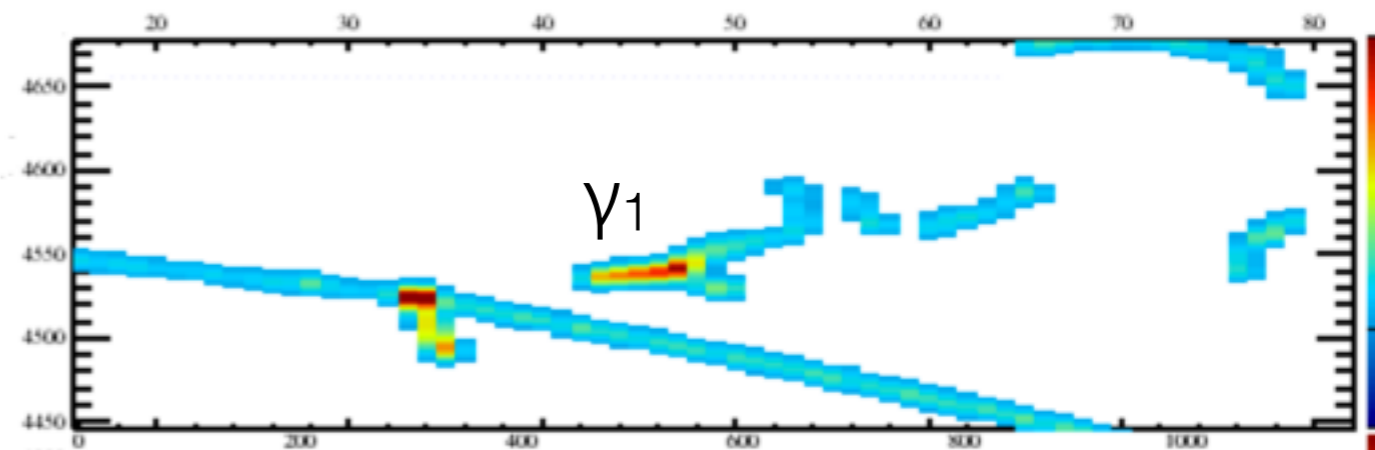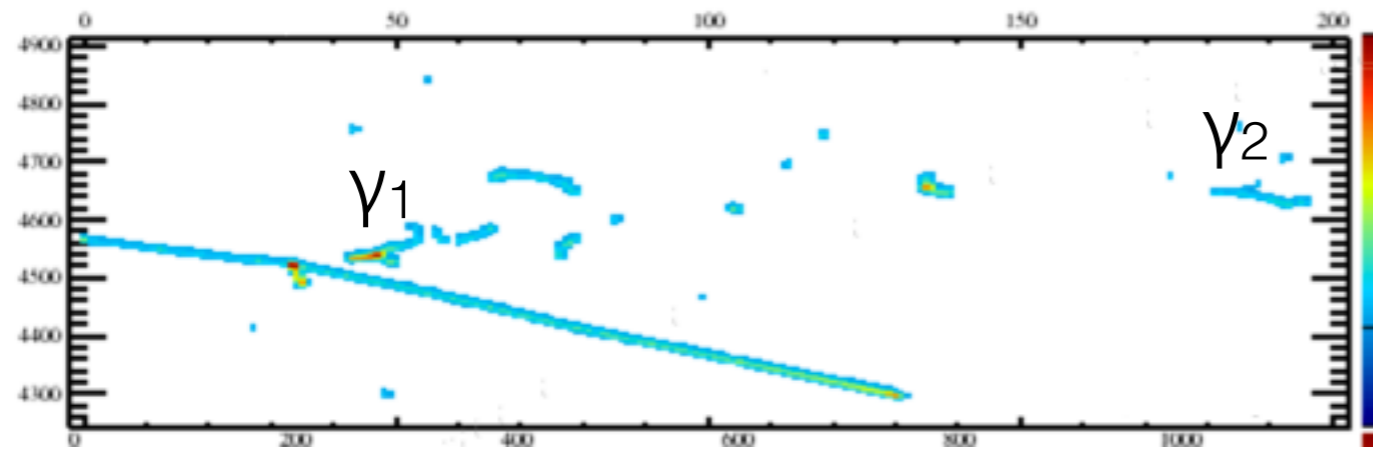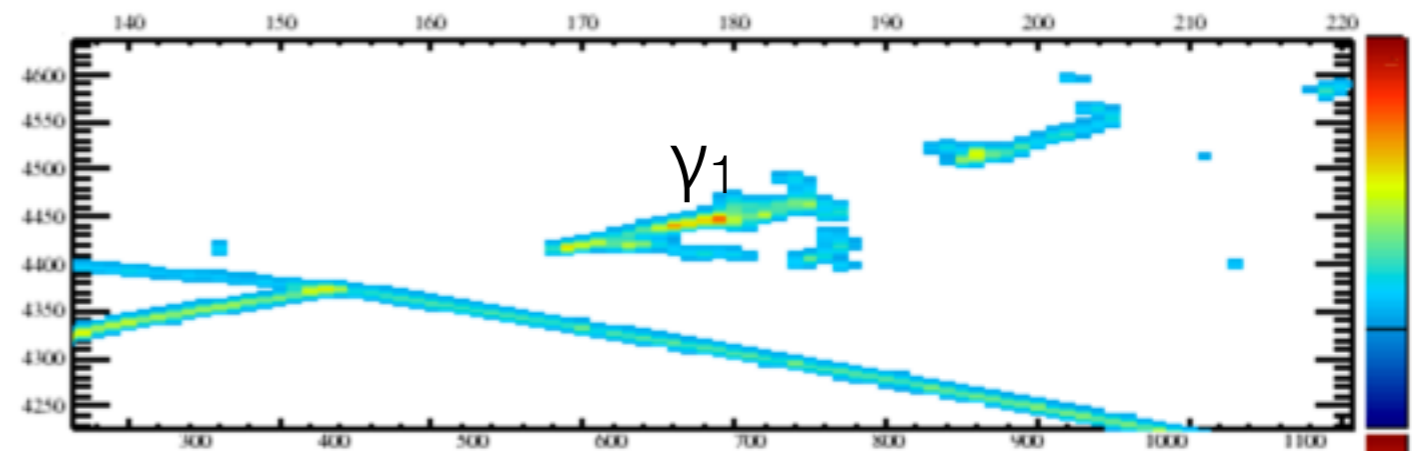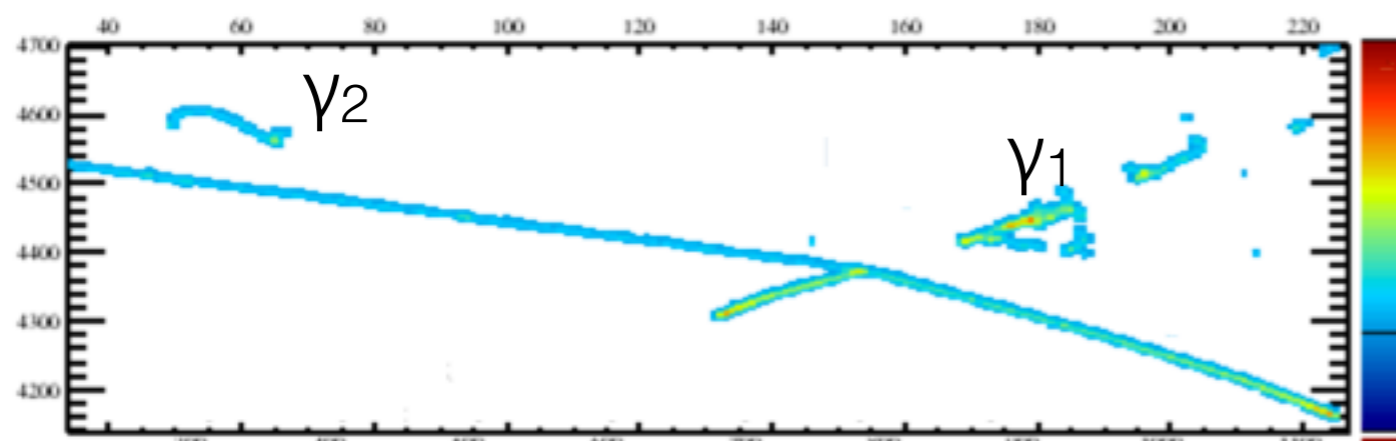dE/dx = 3.40

dE/dx gammas from π^0

dE/dx = 3.19

Comments

1. π^0 Decay asymmetry causes a good shower and bad shower
2. Most common cause of 1 MIP dE/dx for gammas is asymmetry e+e−
3. Pi-zeros are going to be a challenge

The End