SSRI: Sim progress

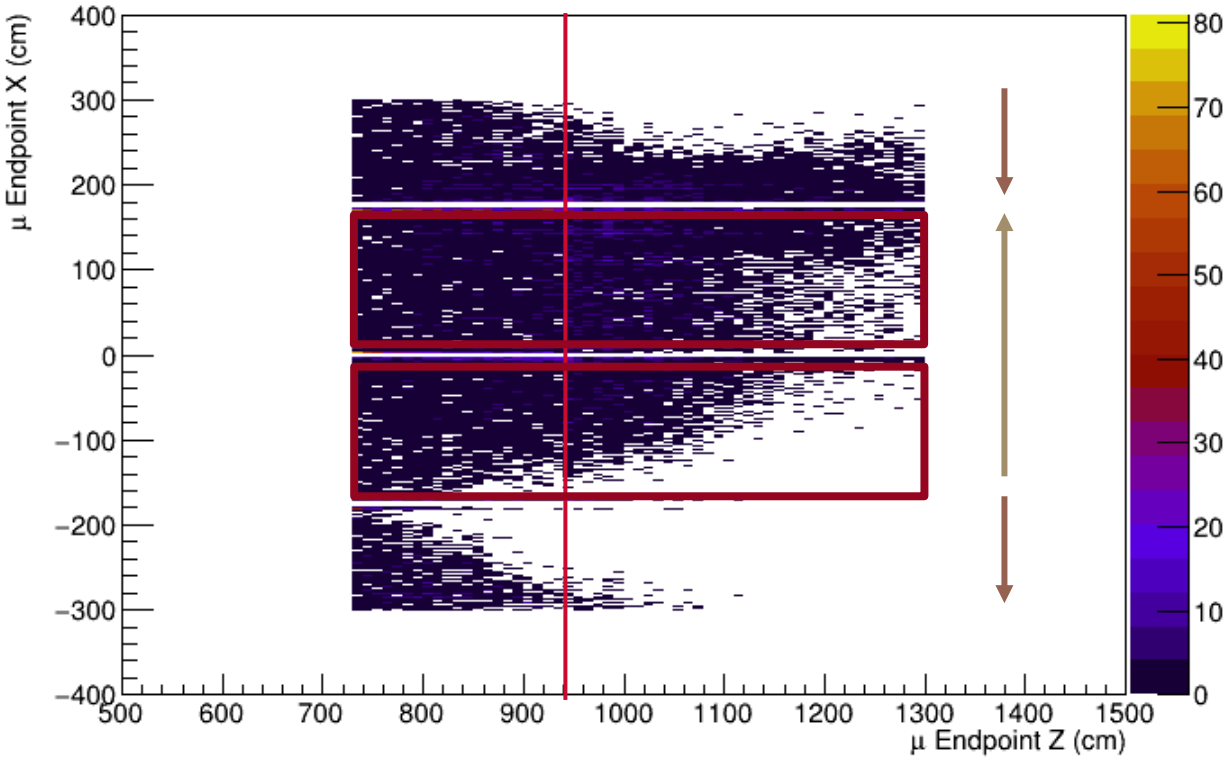
"sign-selecting range indicator"

Gavin S. Davies

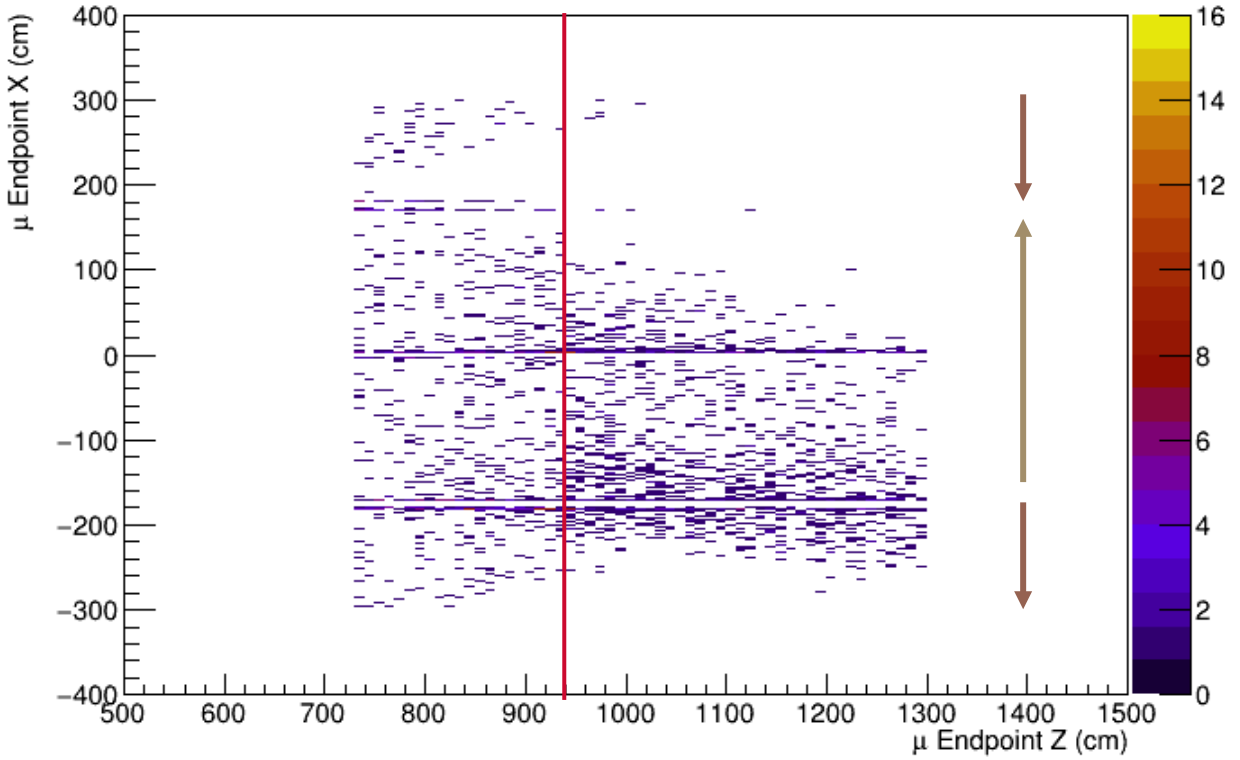
Track Length Cleanup: Reminder

- Extended nplanes cut to 8. Initial 4 plane restrictive because of the empty layers in the structure.
  - SSRI containment based on last hit position, front-entering muons
  - Cut on events in the uniform region

Neutrino



Antineutrino

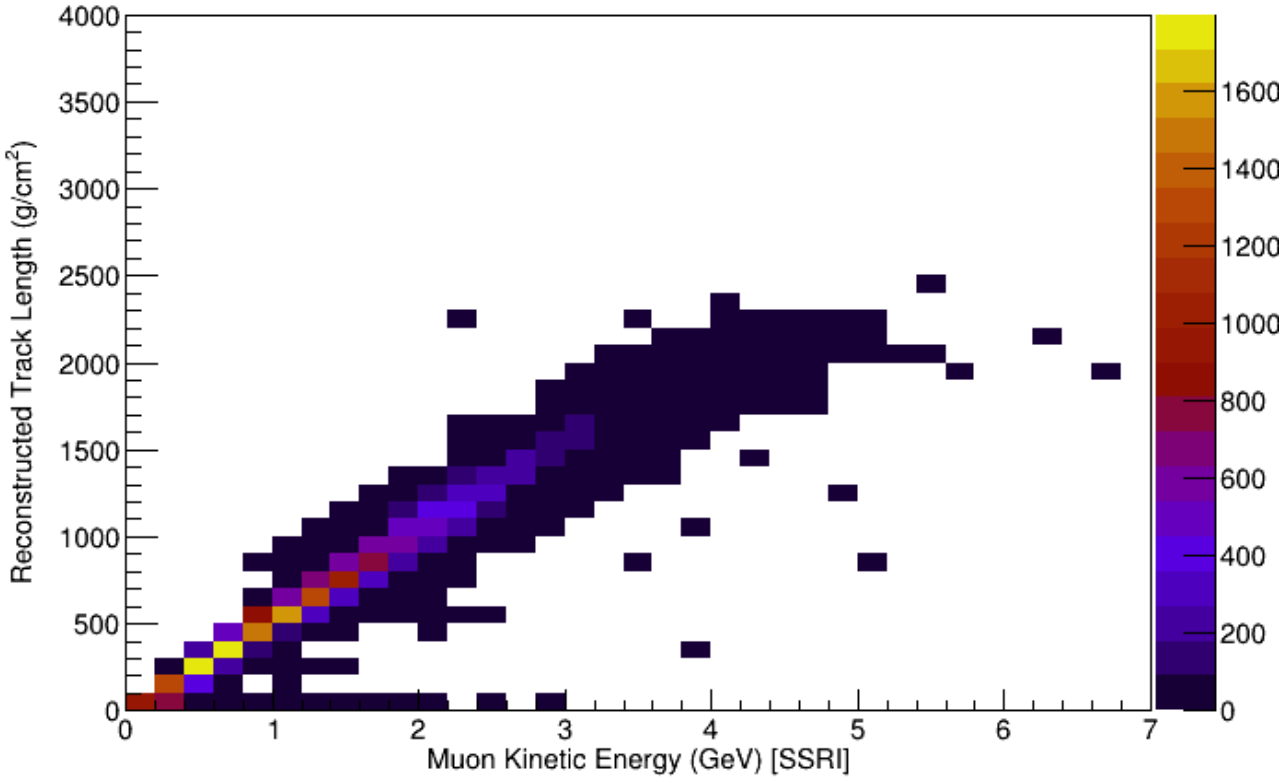


KE vs. Track Length (Previously)

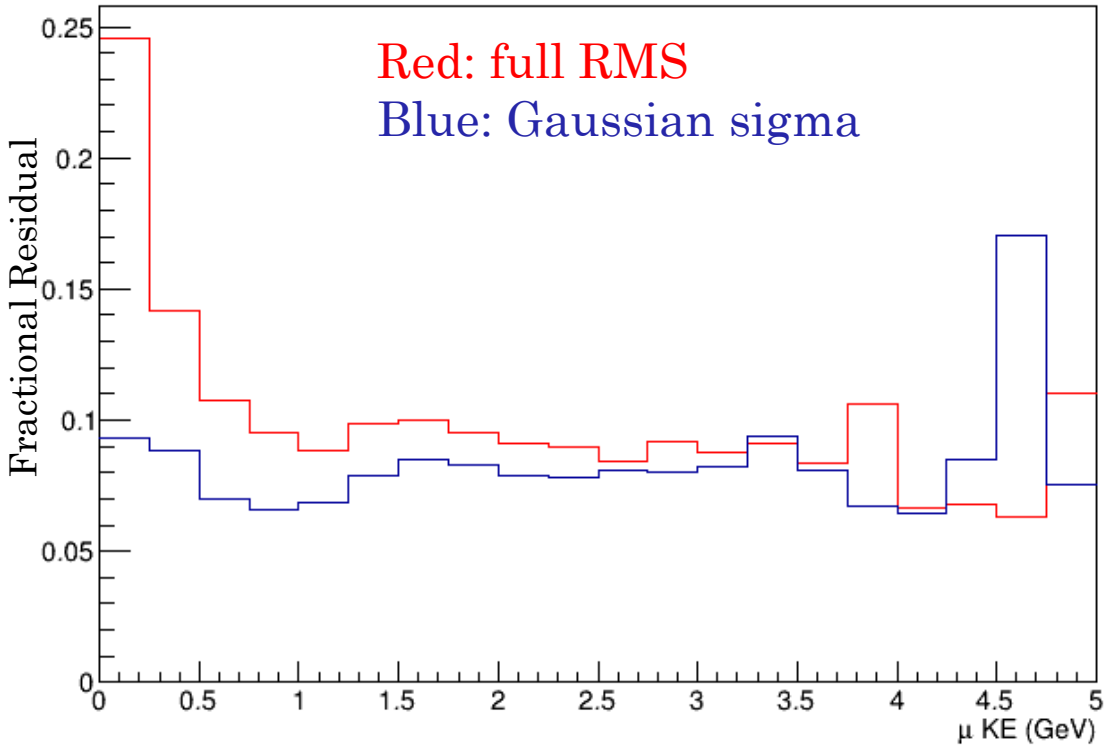
Correction for KE may clean up (currently KE of last hit in LAr)

- need average material traversed between LAr active and SSRI first layer

Neutrino

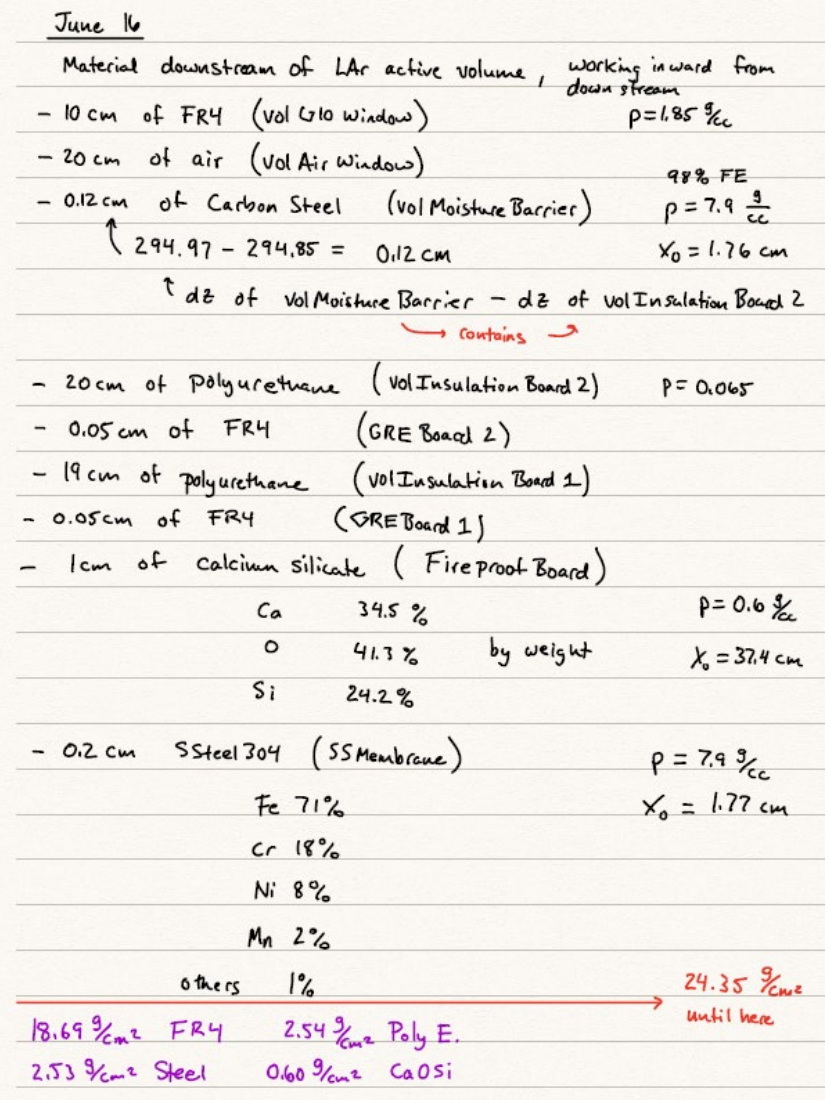


Neutrino



Average material: LAR->SSRI

Thanks to **Mike Kordosky**


June 16

Material downstream of LAr active volume, working inward from downstream

- 10 cm of FR4 (vol G10 Window) ρ=1.85 g/cc
- 20 cm of air (vol Air Window)
- 0.12 cm of Carbon Steel (vol Moisture Barrier) 98% FE ρ = 7.9 g/cc
  294.97 − 294.85 = 0.12 cm X_0 = 1.76 cm
  dz of vol Moisture Barrier − dz of vol Insulation Board 2
  → contains →
- 20 cm of Polyurethane (vol Insulation Board 2) ρ = 0.065
- 0.05 cm of FR4 (GRE Board 2)
- 19 cm of Polyurethane (vol Insulation Board 1)
- 0.05 cm of FR4 (GRE Board 1)
- 1 cm of Calcium Silicate (Fireproof Board) ρ = 0.6 g/cc

Ca	34.5 %	by weight	X_0 = 37.4 cm
O	41.3 %		
Si	24.2 %		

- 0.2 cm SSteel 304 (SS Membrane) ρ = 7.9 g/cc X_0 = 1.77 cm

Fe	71%
Cr	18%
Ni	8%
Mn	2%
others	1%

24.35 g/cm² until here

18.69 g/cm² FR4 2.54 g/cm² Poly E.
2.53 g/cm² Steel 0.60 g/cm² CaOSi

Punchline: 24.35 g/cm^2

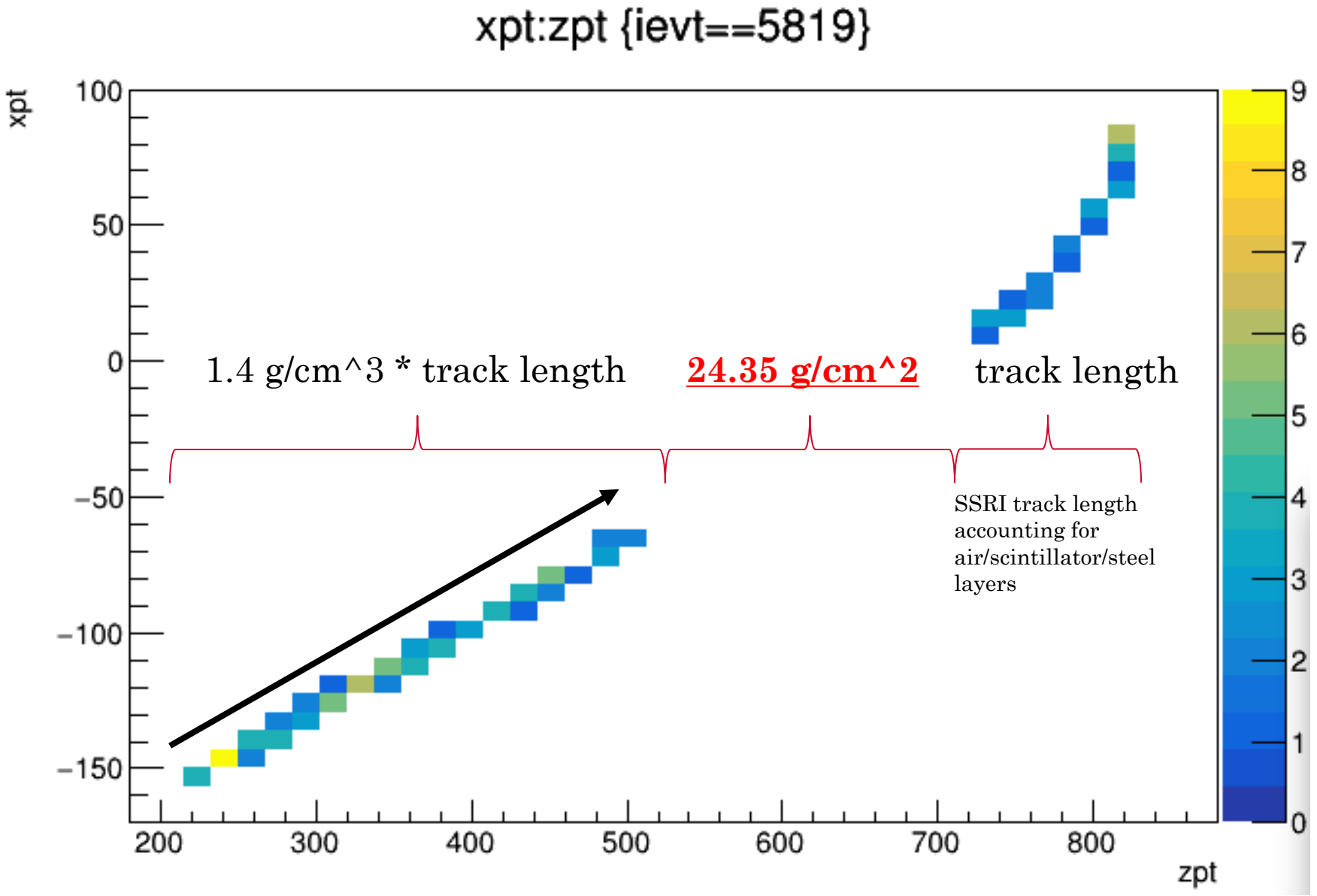
18.69 FR4, 2.54 PolyEurethane, 2.53 Steel, 0.60 "calcium silicate"
There is also a negligible 20 cm airgap

Concern: “LAr geometry has the resistive field cage walls pressed right up against the inner membrane of the cryostat. It's a little hard to tell, but at most a 0.5 cm gap” [MK]

“One might need to add 0.4 g/cm^2 due to the light collector on the downstream module wall (0.4 cm at 1 g/cc)”

In principle:

Muon hits only



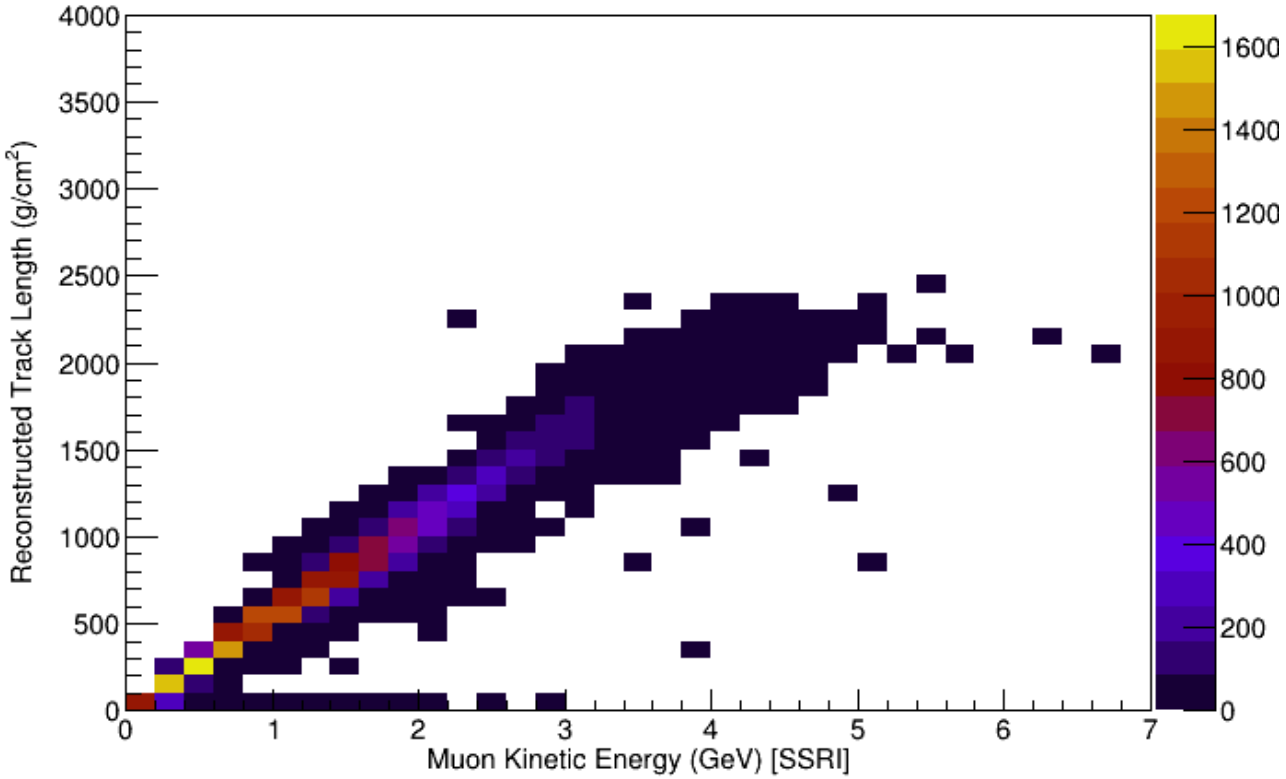
KE vs. Track Length (Previously)

Take KE exiting LAr

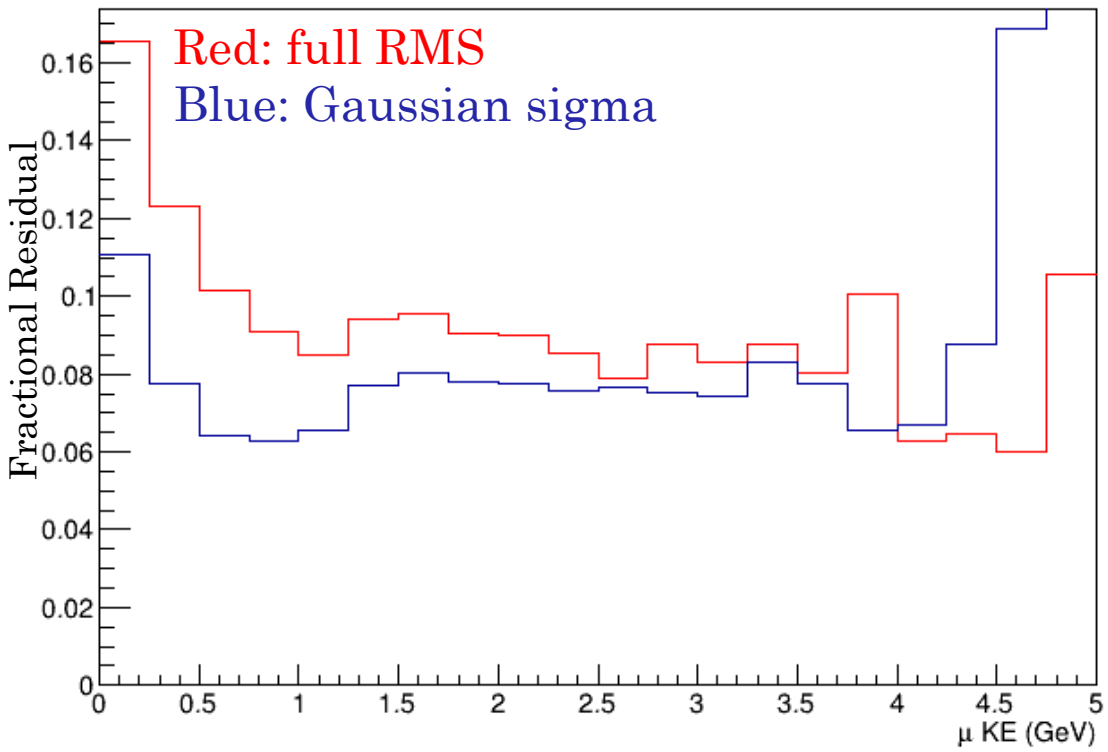
Additional material traversed between LAr and SSRI + reco track length

Also alternative method: Reco Track length in LAr + above ongoing

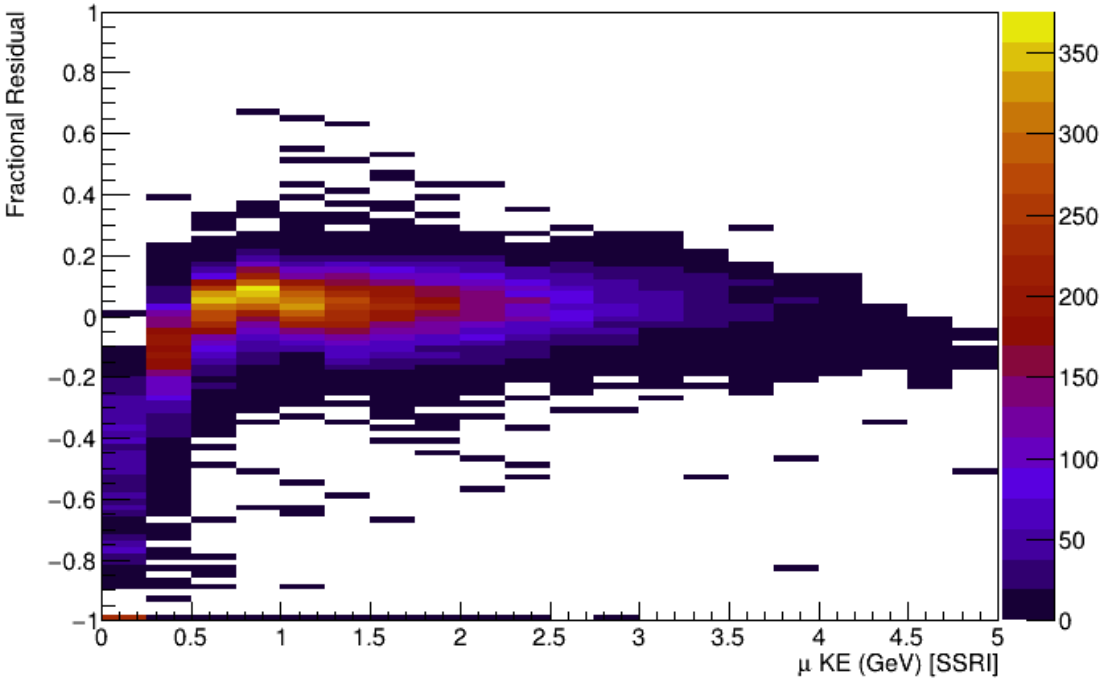
Neutrino



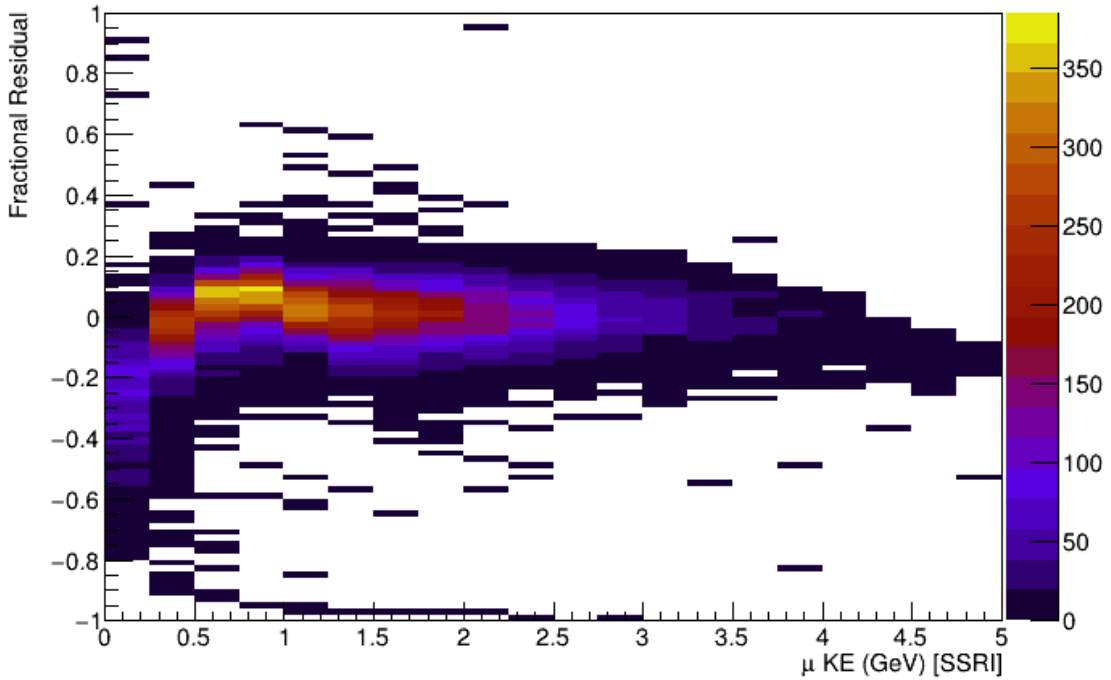
Neutrino



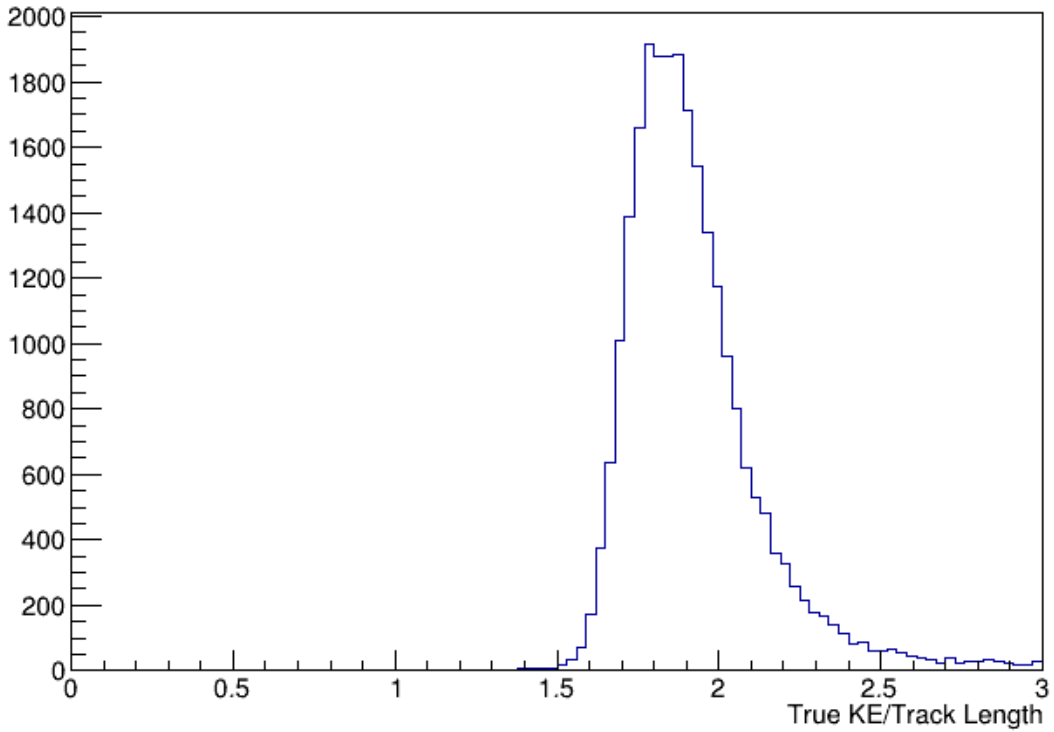
Before [1 M]

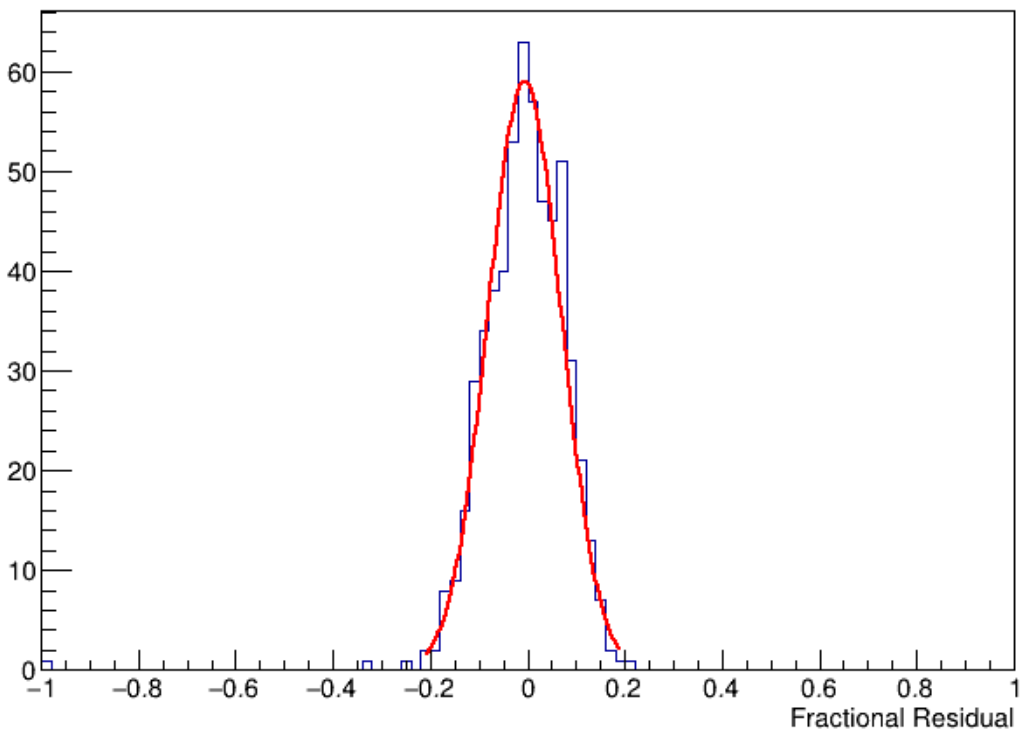


After

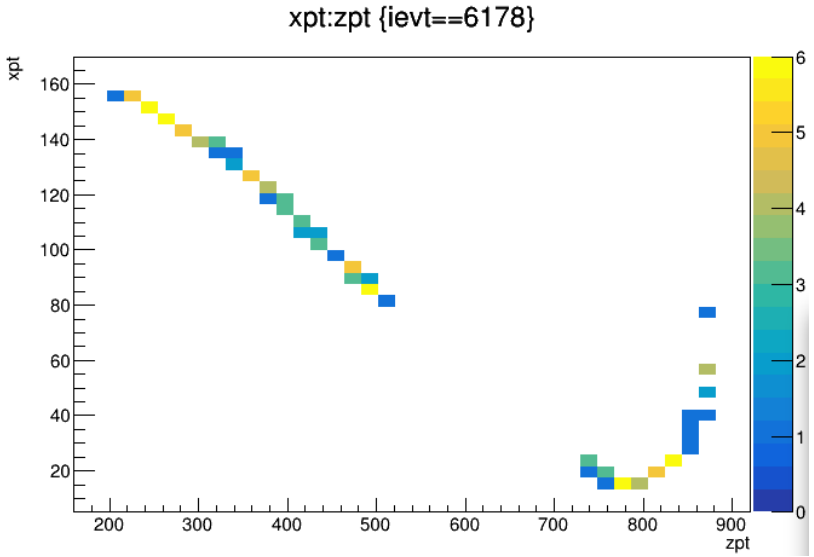


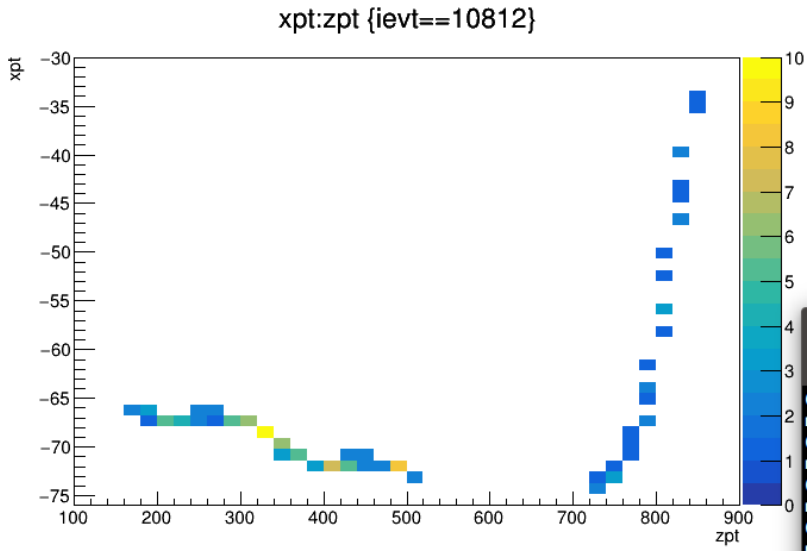
2.8 – 3.0 GeV

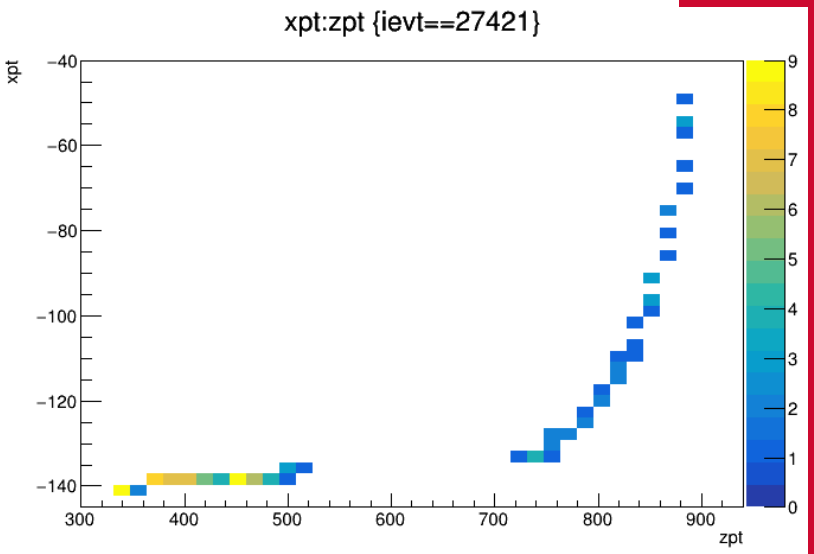

2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
3
True KE/Track Length

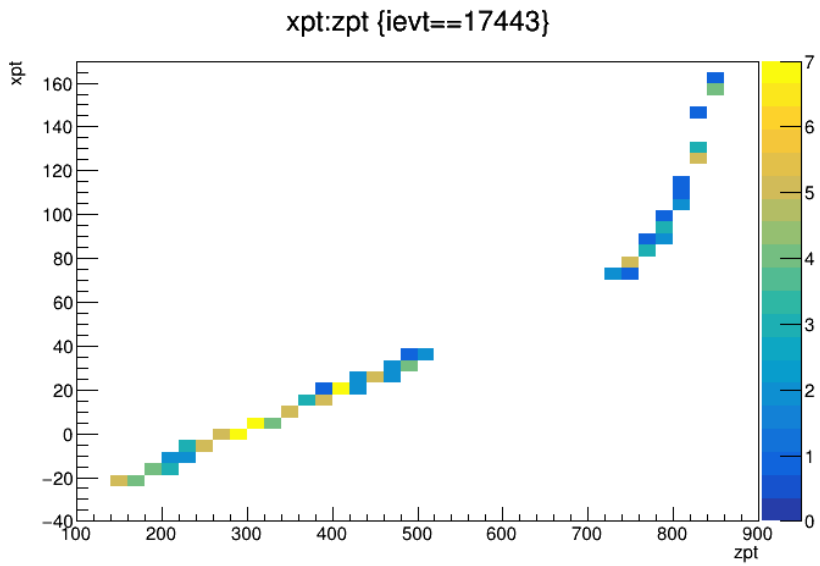

60
50
40
30
20
10
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1
Fractional Residual

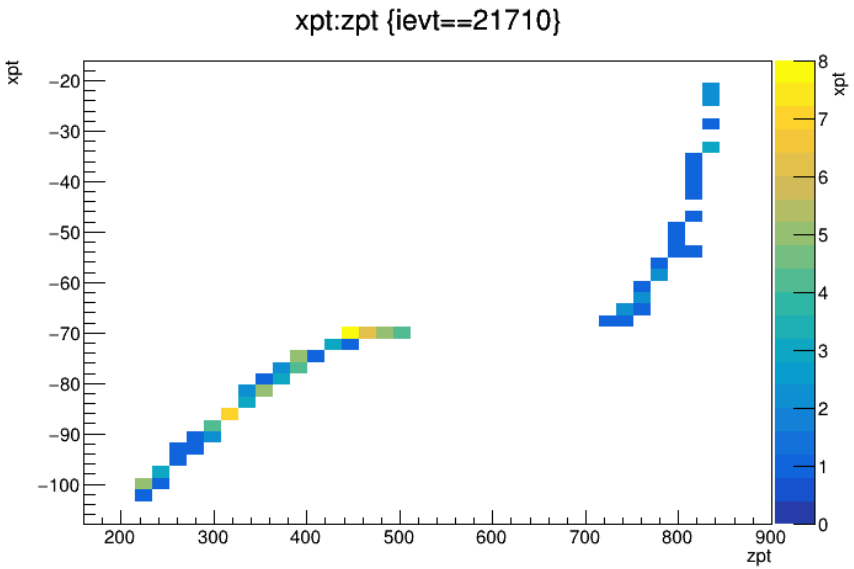
Example selected SSRI events: X vs. Z

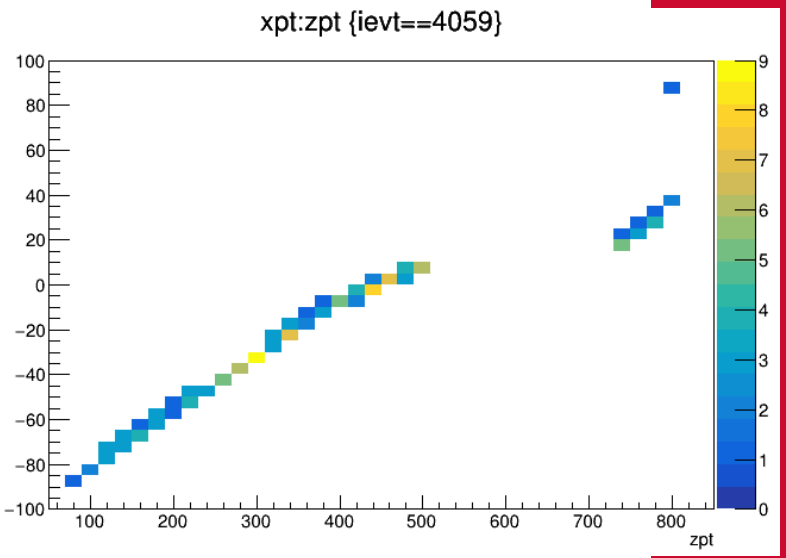






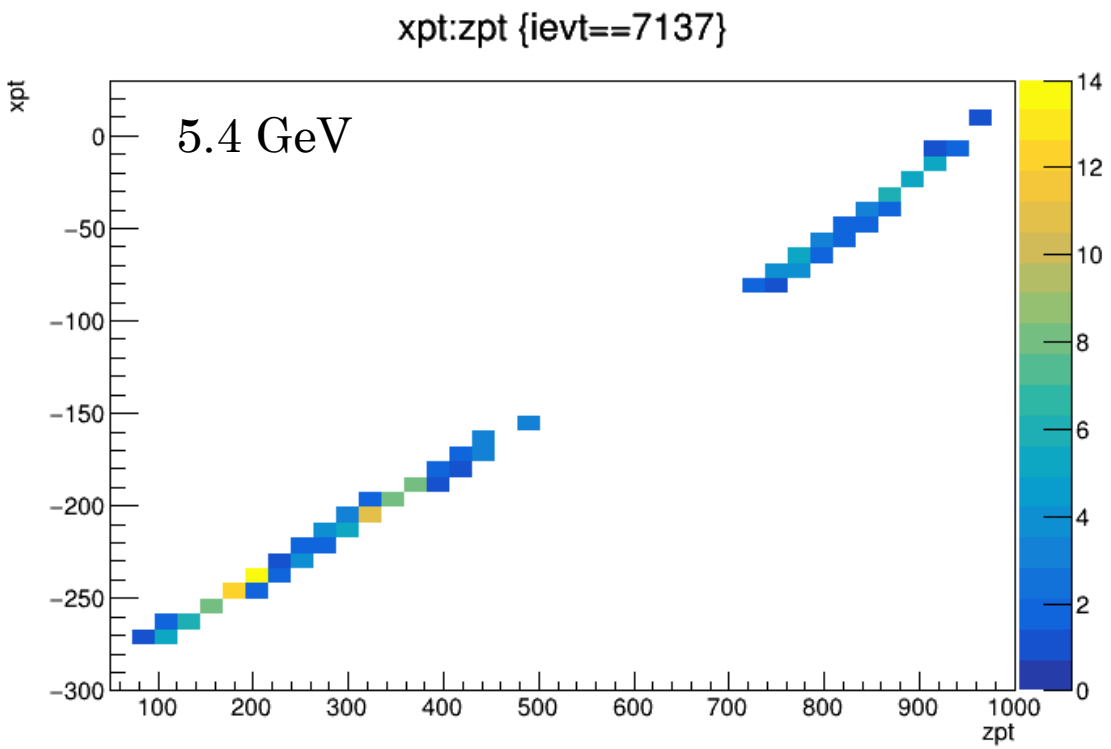


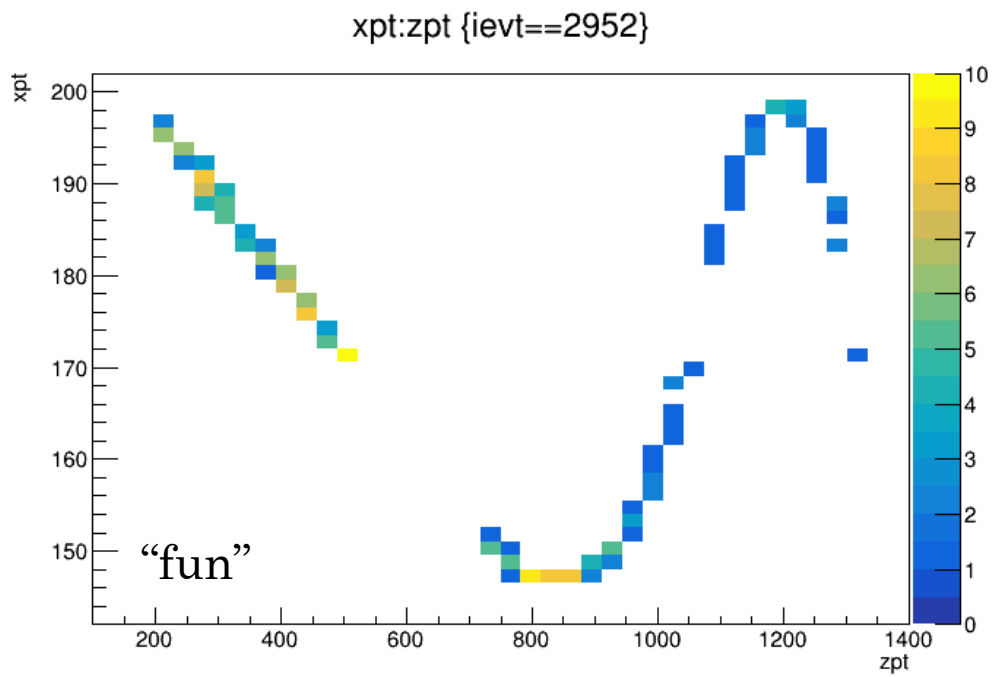


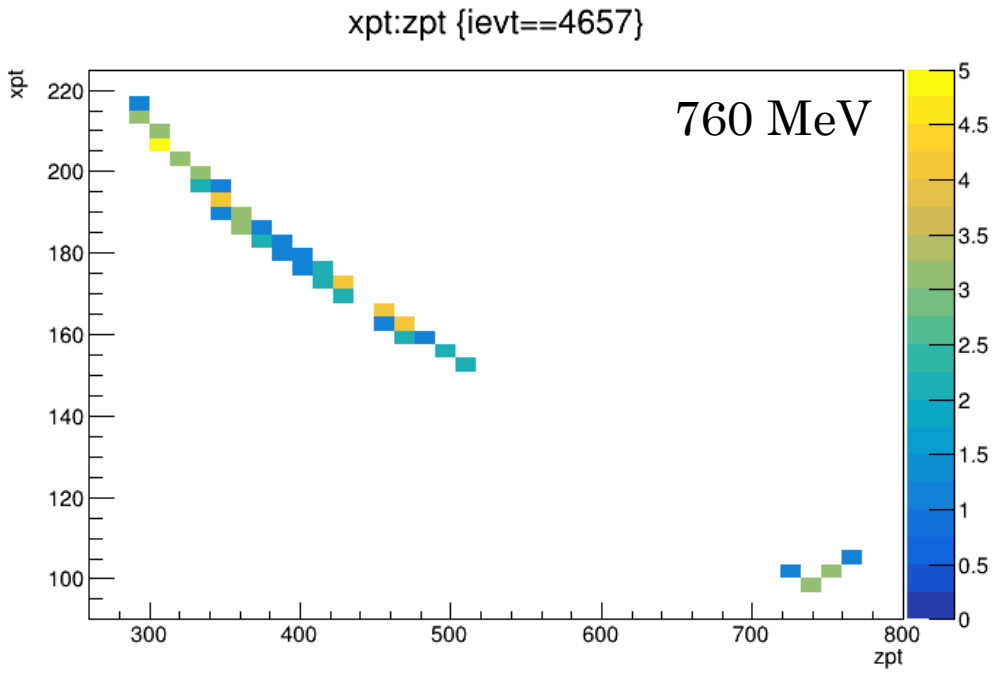


All events in 1.2 – 1.5 GeV KE range

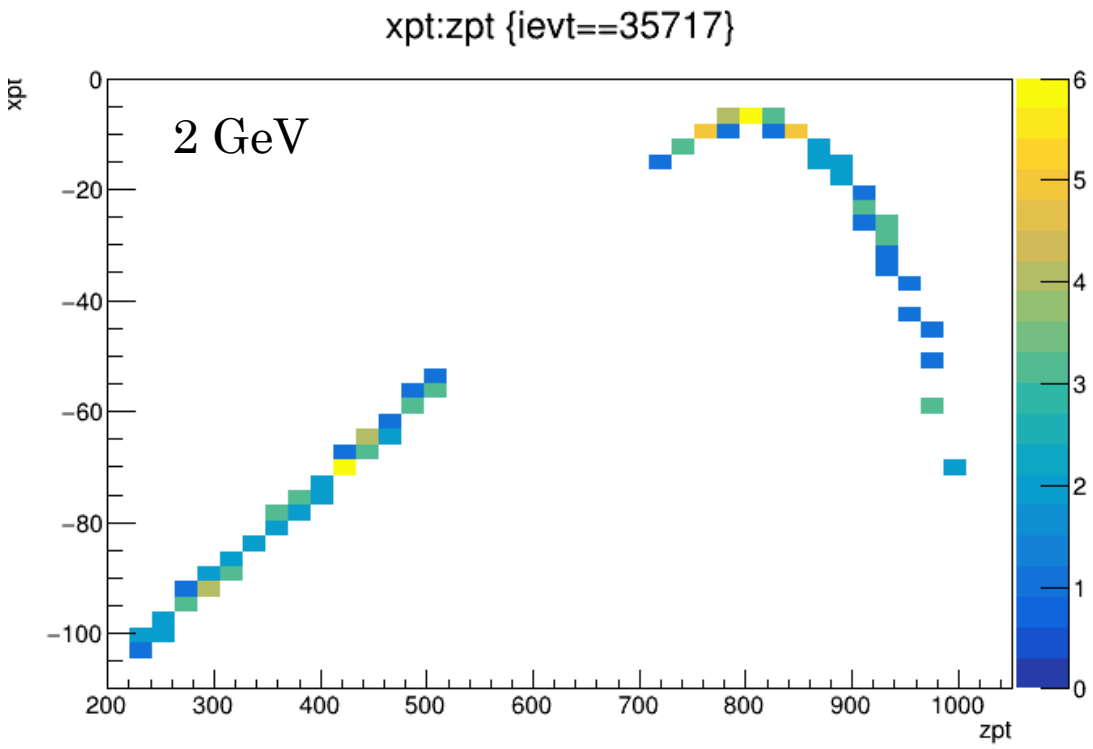
Challenging

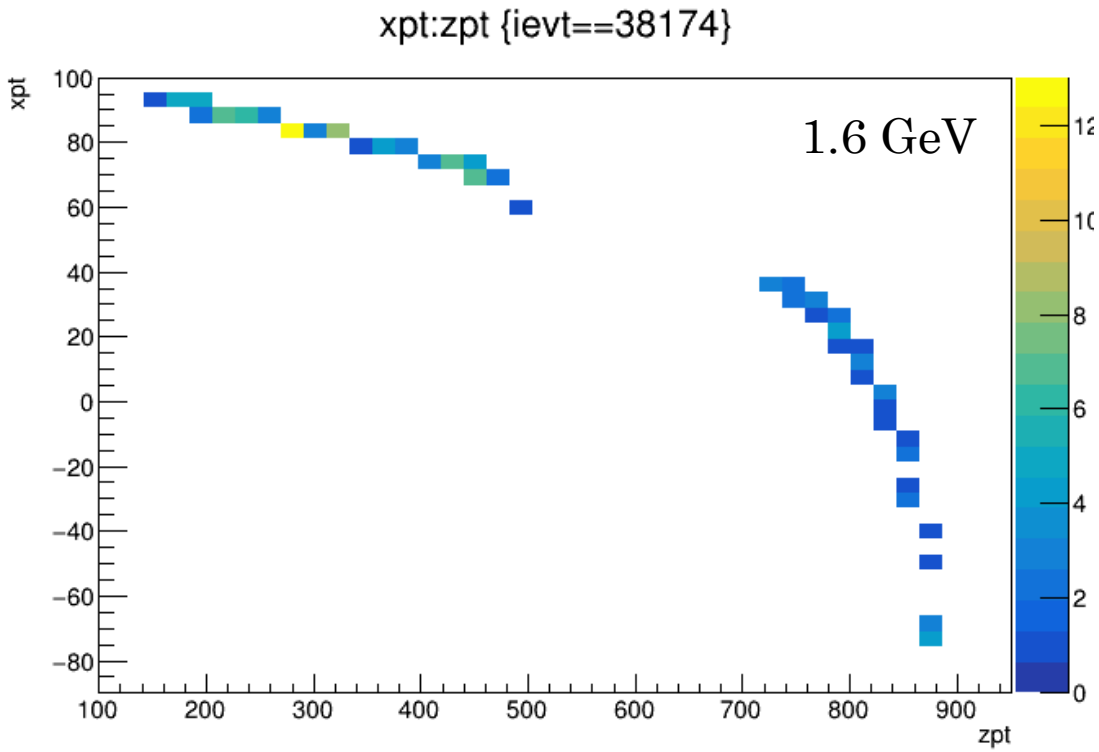






Antineutrinos

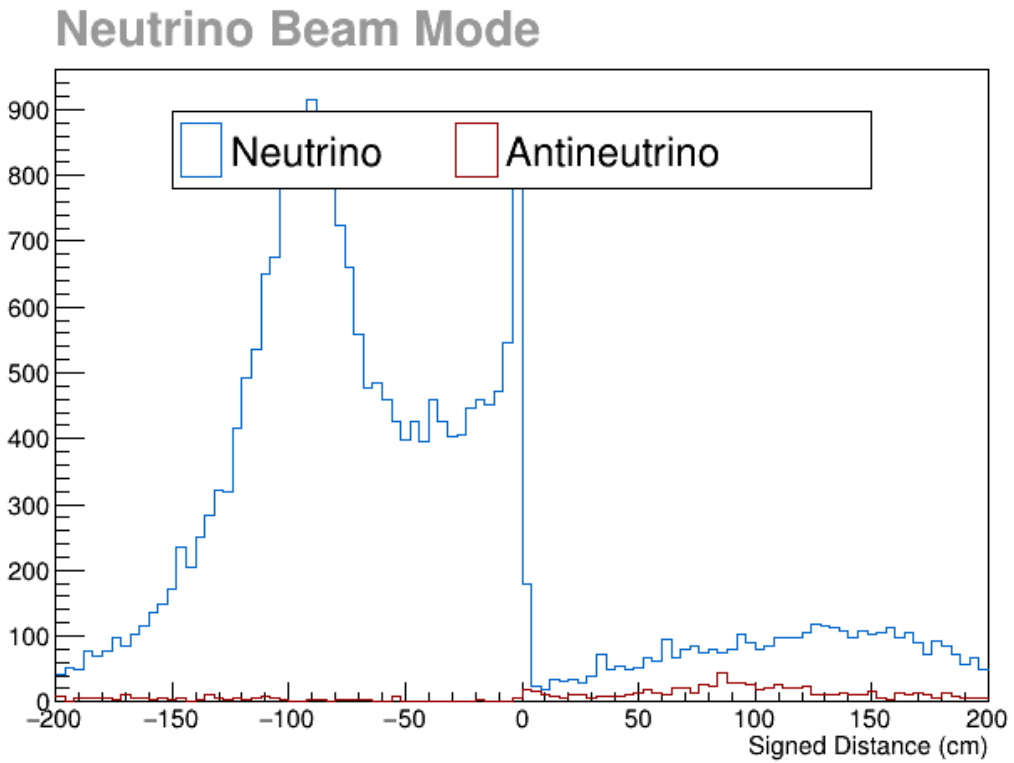


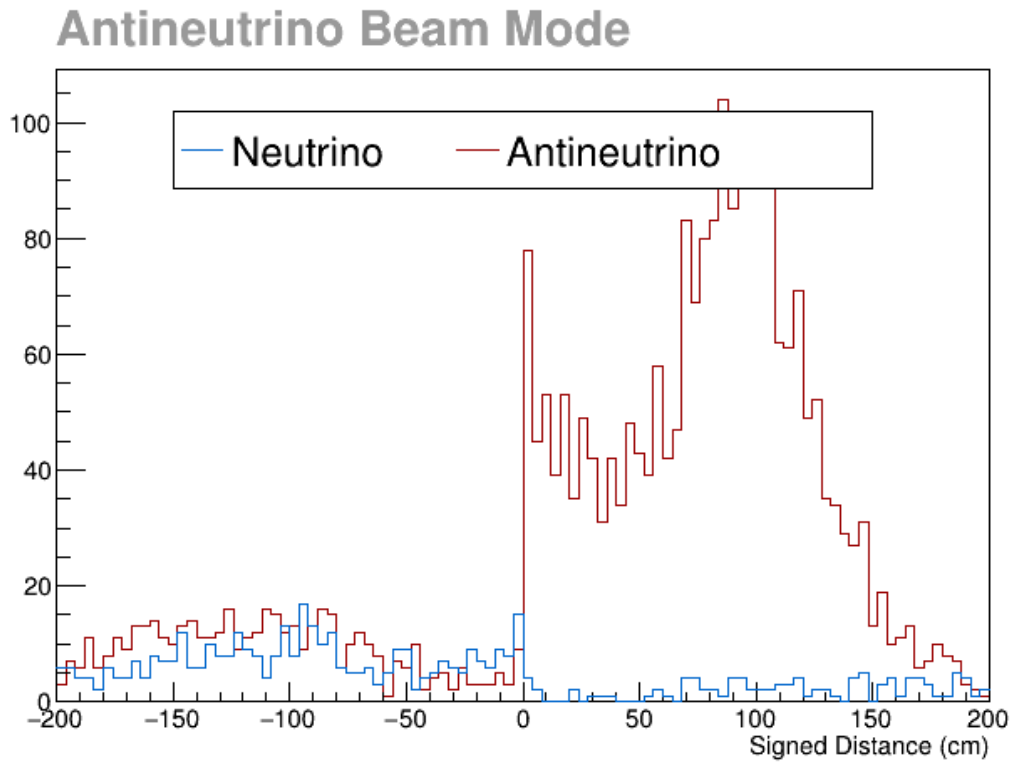


Sign selection

Signed distance metric

Last LAr Pt $= (x_1, y_1)$
First SSRI Pt $= (x_2, y_2)$
Final SSRI Pt $= (x_3, y_3)$
Signed distance from final SSRI Pt to Line from Last LAr Pt to First SSRI Pt
$= \frac{-(y_2-y_1)x_3+(x_2-x_1)y_3+(x_1y_2-y_1x_2)}{\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}}$





Full stats, 1M

Low stats, 100k