

Michel electron analysis update

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ProtoDUNE sim/reco meeting
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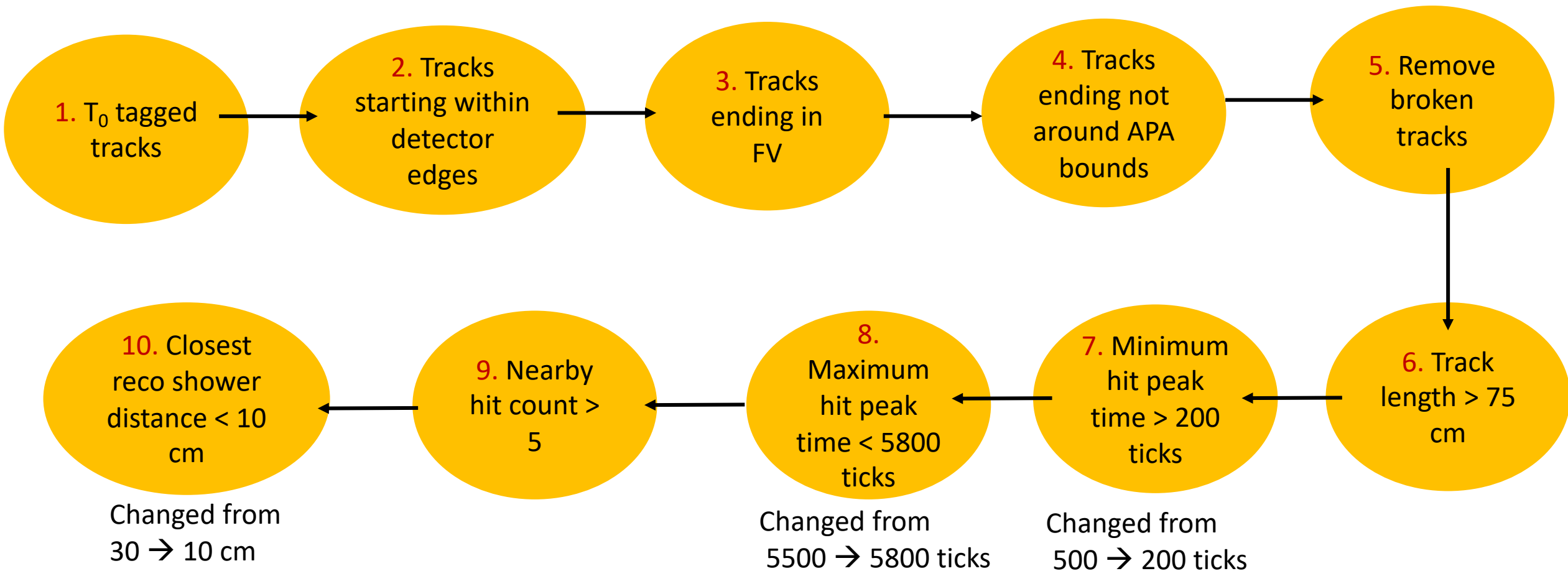
In this talk

- Updated the selection cuts to obtained higher purity
- Used high statistics data/MC samples
- Will present energy spectrum of michel electrons and parent muons

Data samples

- MC prod2:
 - PDSPProd2_MC_1GeV_reco_sce_datadriven
 - Full stats available: ~100,000 events
- Data prod2:
 - protodune-sp_runset_5809_reco_v08_27_XX_v0
 - With full stats available: ~150,000 events
- Selected events in the final sample
 - MC: ~20000
 - Data: ~10000

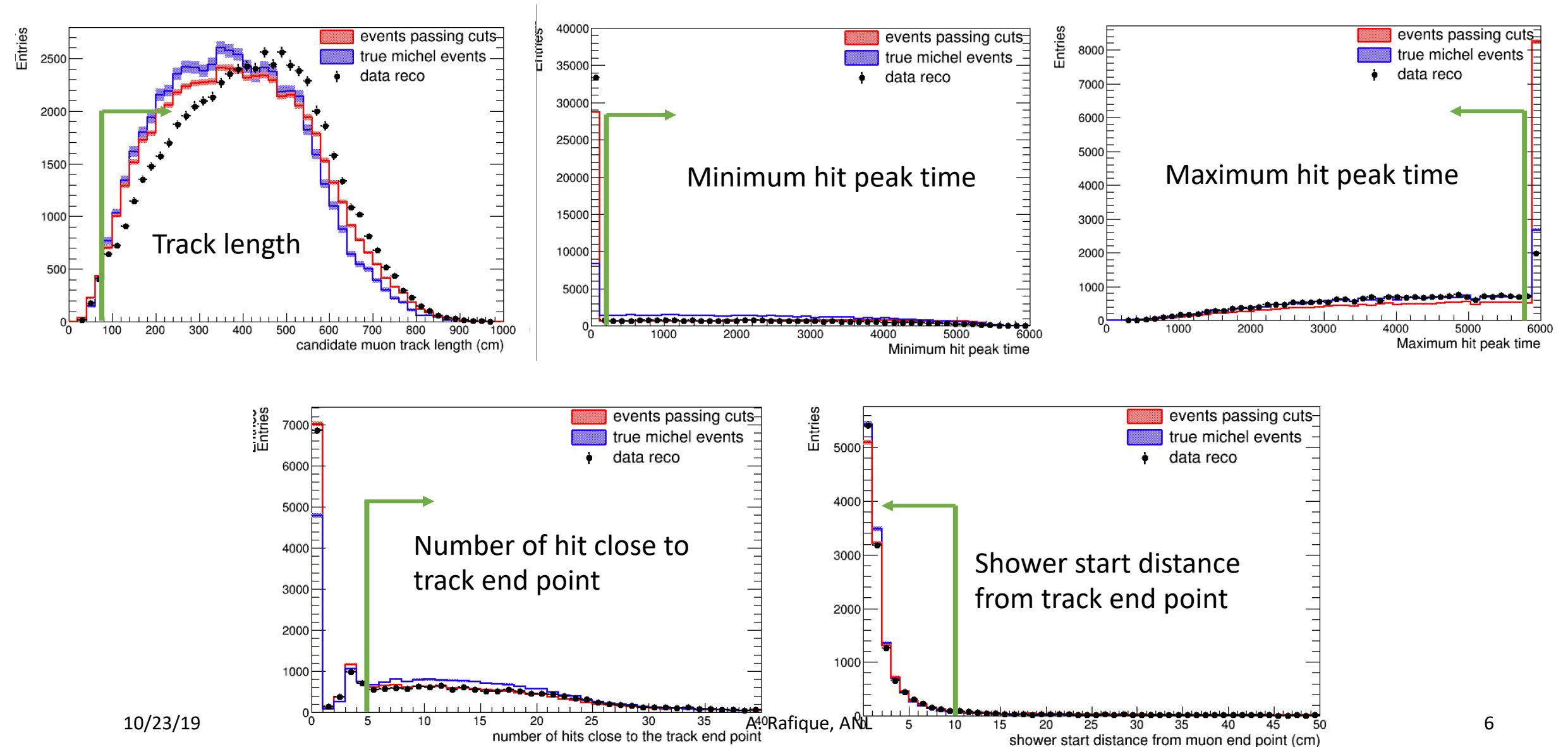
Event selection overview



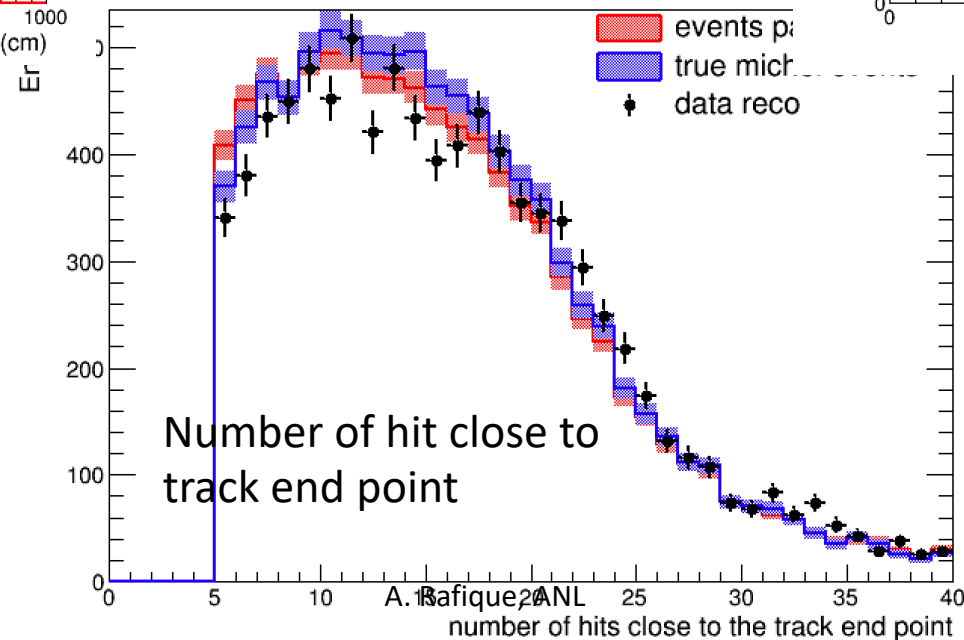
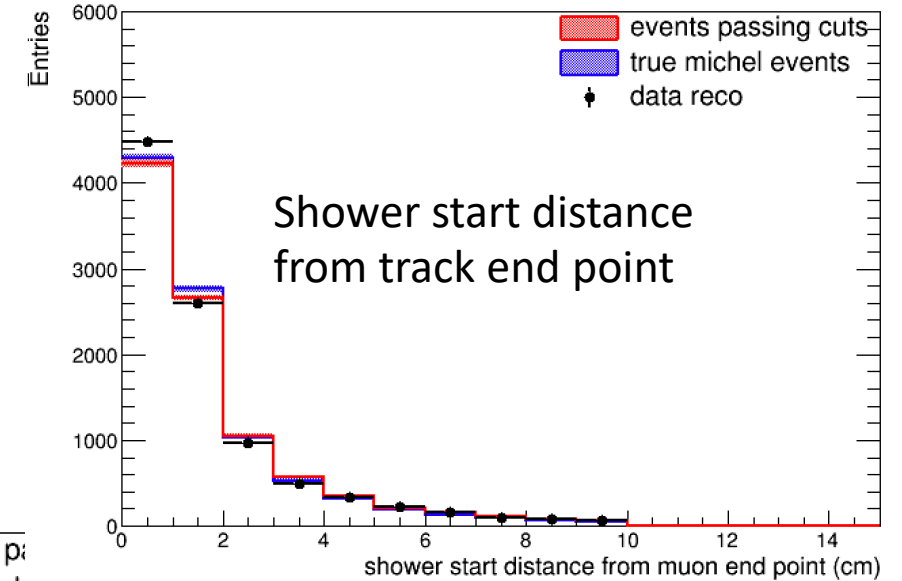
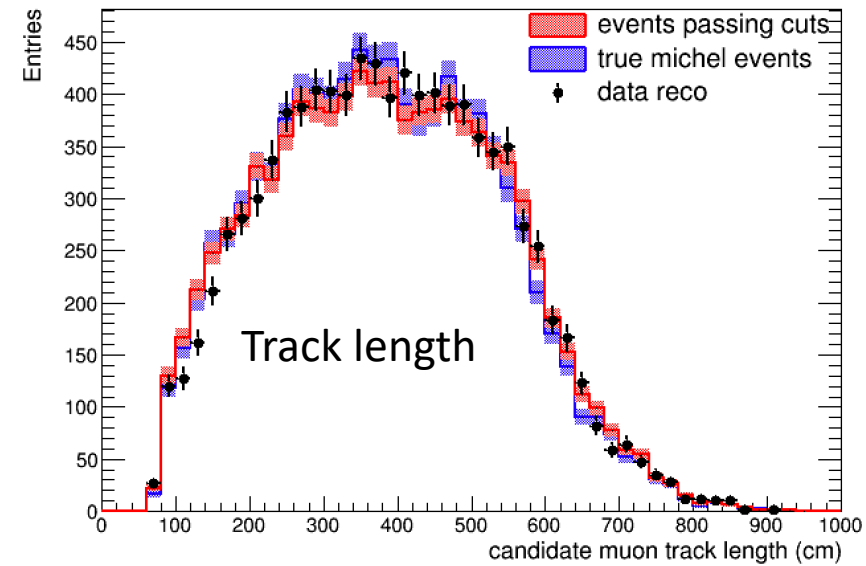
Efficiency and purity for MC and data

Cuts	Efficiency MC; wrt previous step (wrt T_0 tagged trks)%	Purity MC %	Efficiency Data; wrt previous step (wrt T_0 tagged trks)%
T_0 tagged tracks	13		1.7
Tracks starting from edges of detector	62 (62)		66 (66)
Tracks ending in FV	16 (10)		36 (24)
Removing APA bounds	89 (8.8)	28	75 (18)
Unbroken tracks	92 (8.1)	28	91 (16)
Tracks length > 75 cm	99 (8.1)	28	99 (16)
Min hit peak time > 200	50 (4.1)	48	42 (6.8)
Max hit peak time < 5800	65 (2.6)	64	90 (6.1)
Nearby hits > 5	38 (1.5)	76	59 (3.7)
Closest reco shower distance < 10 cm	75 (1.1)	81	72 (2.6)

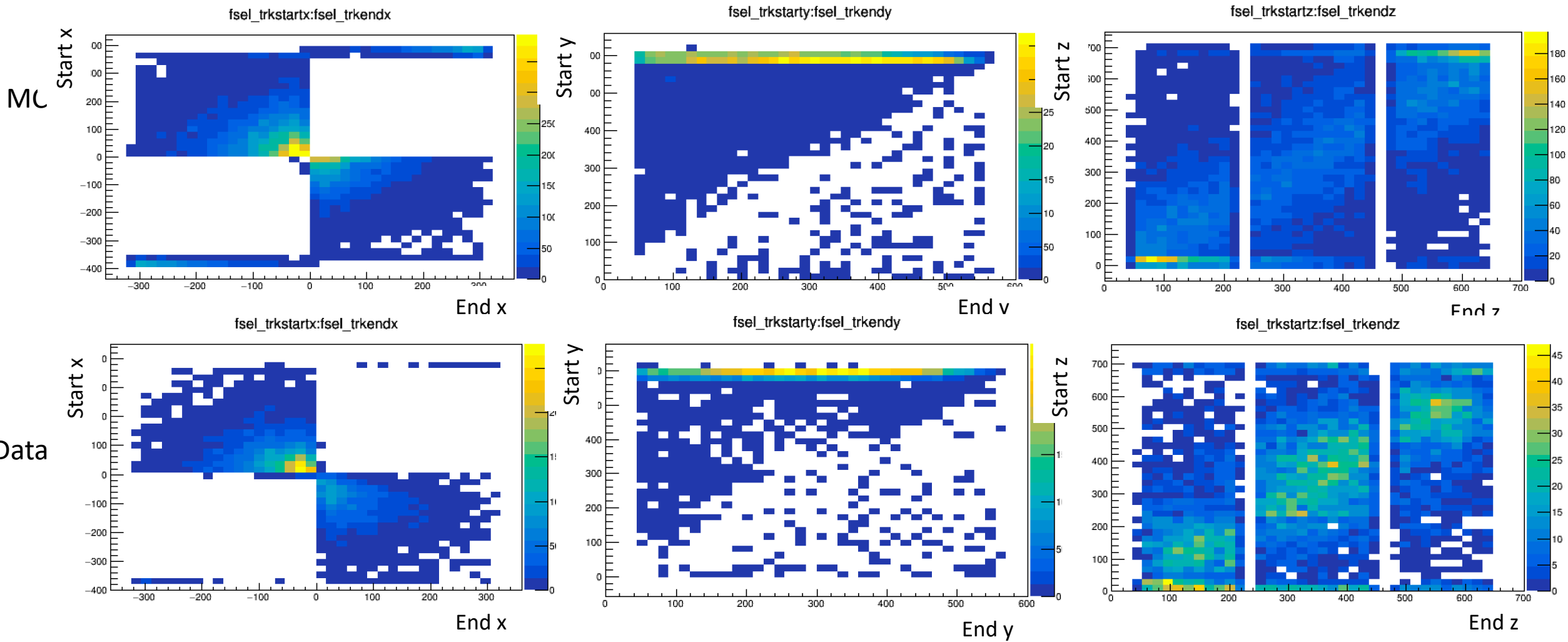
Data and MC comparison before selection



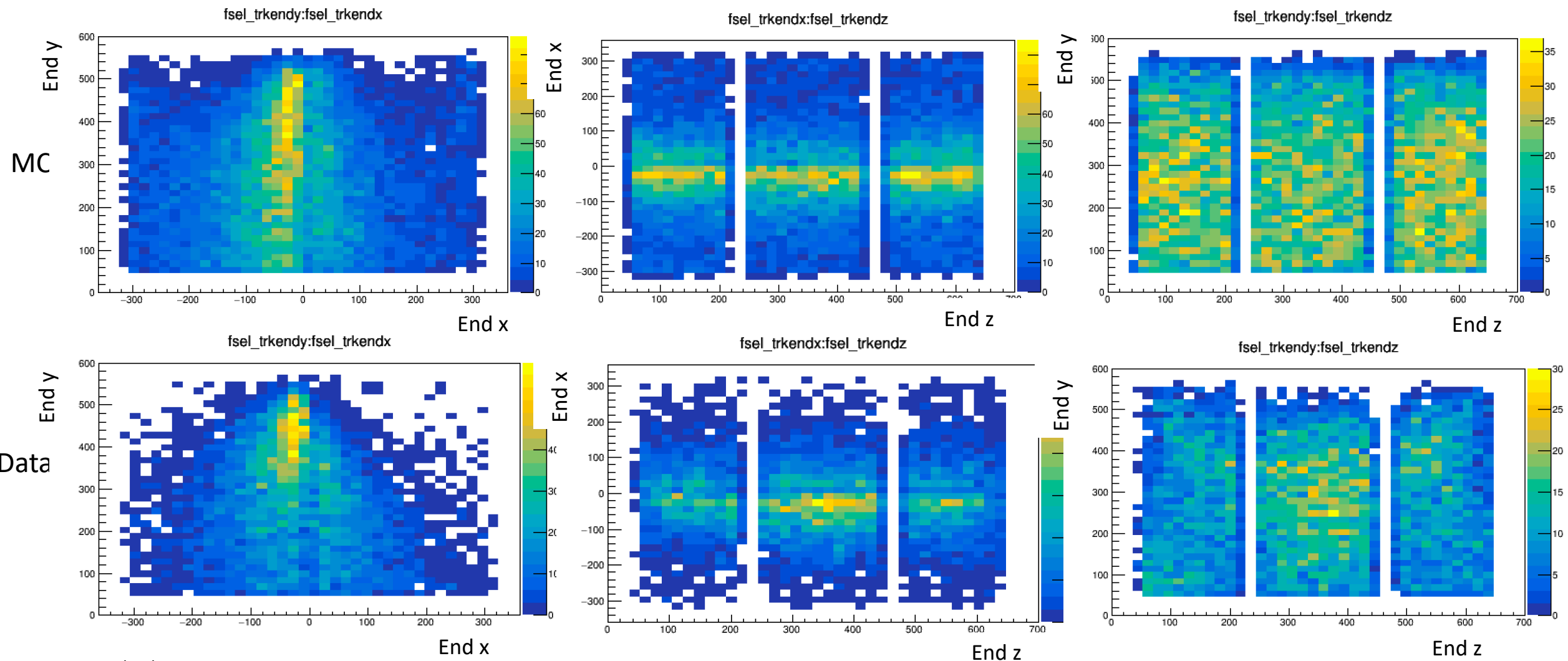
Data and MC comparison after selection



Candidate muon 2D kinematic plots

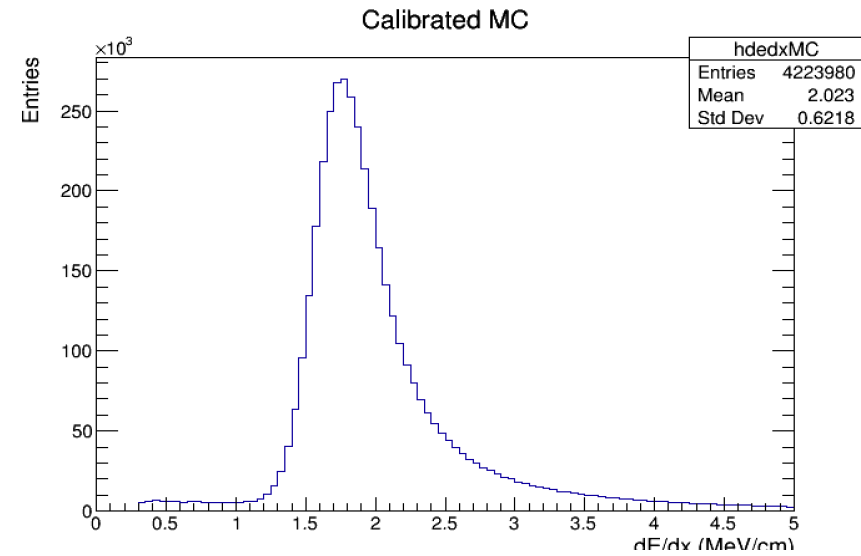
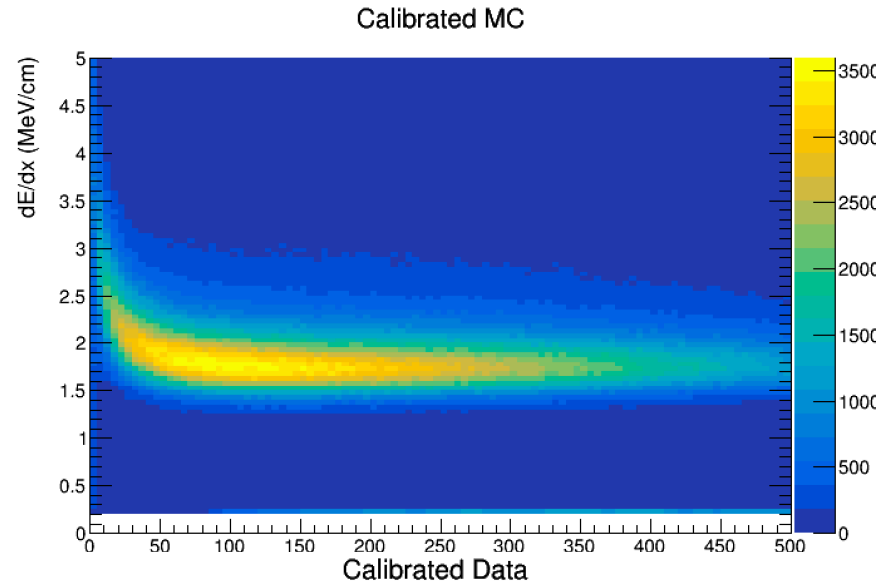


Candidate muon 2D kinematic plots

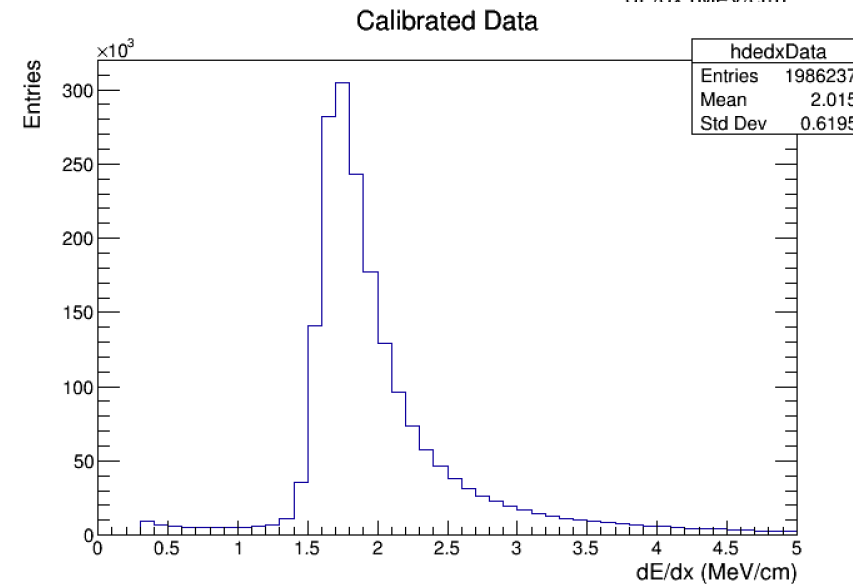
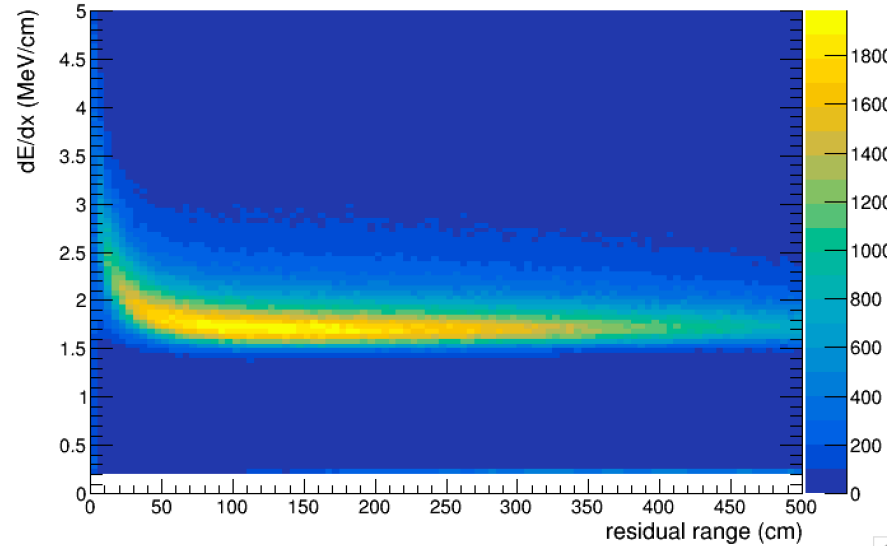


dEdx vs residual range plots

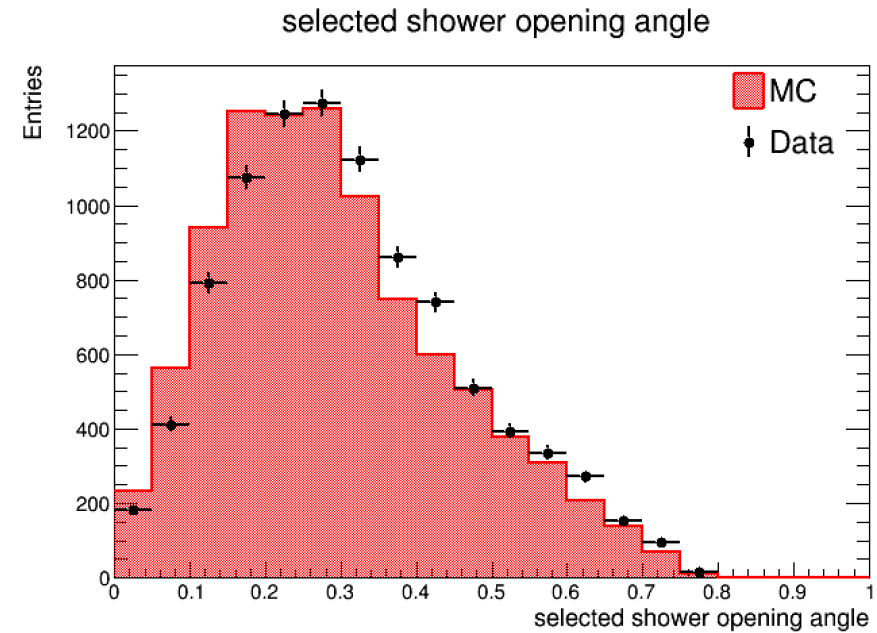
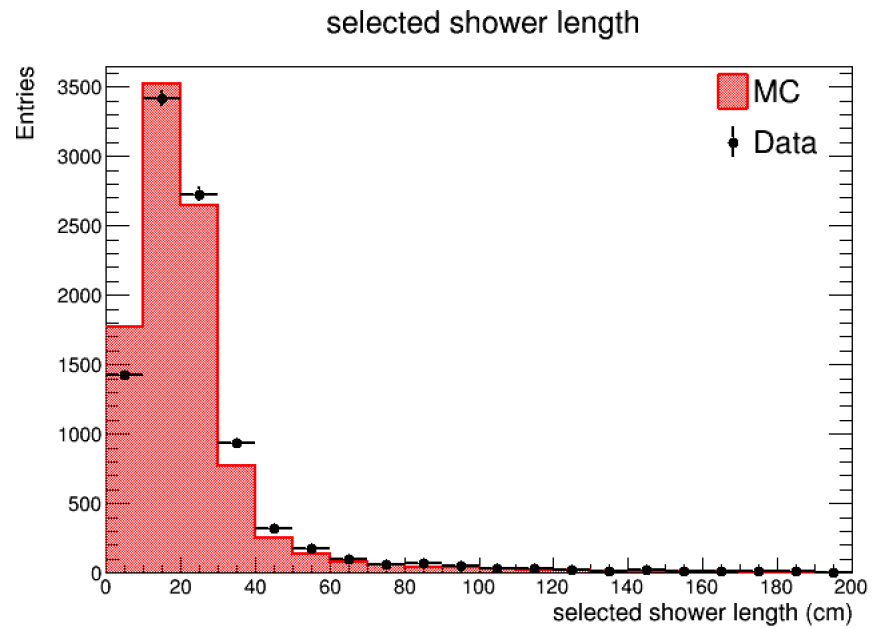
MC



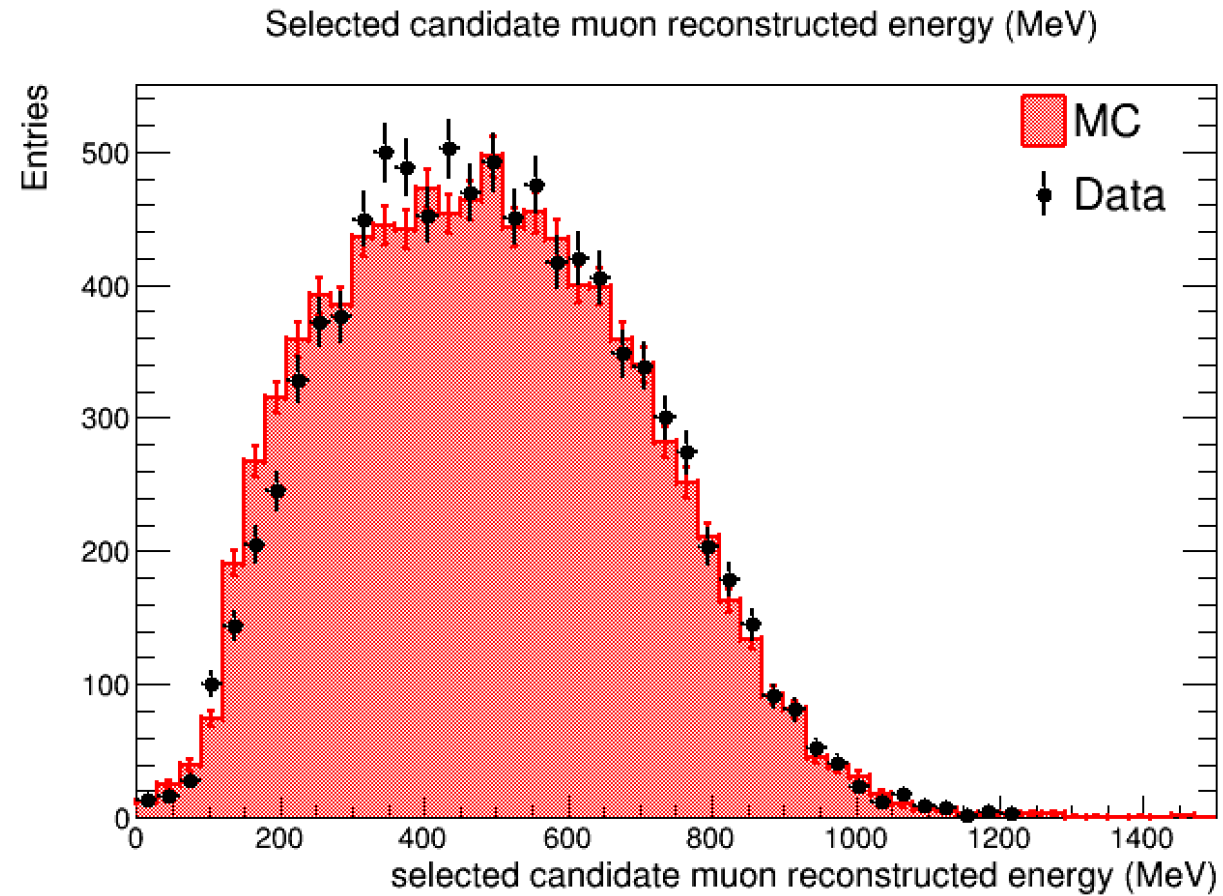
Data



Candidate electron kinematics



Selected muon energy spectrum

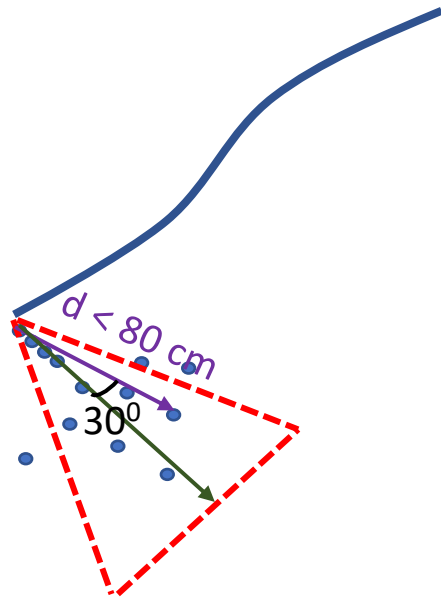


Michel energy spectrum

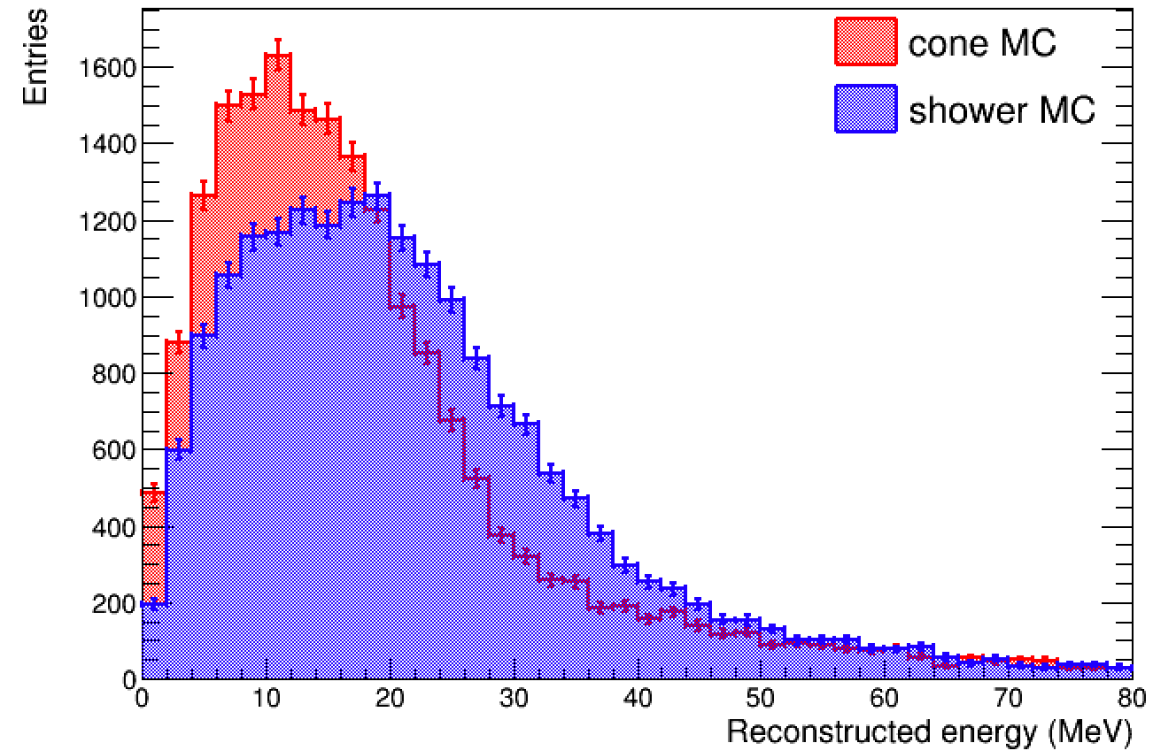
Two ways:

1- nearest shower energy spectrum “blue”

2- cone energy spectrum “red”



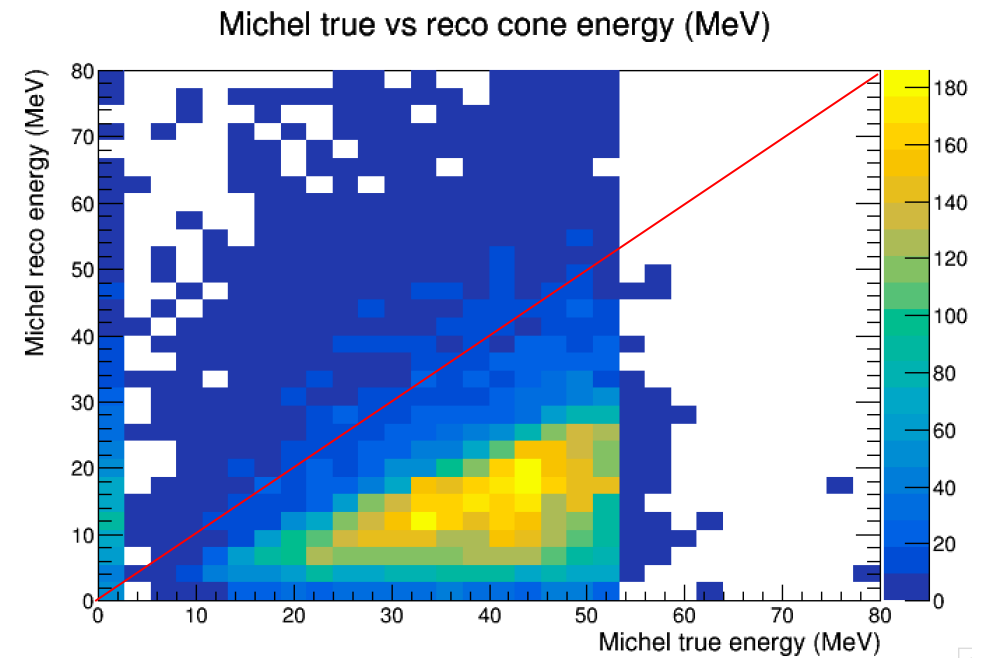
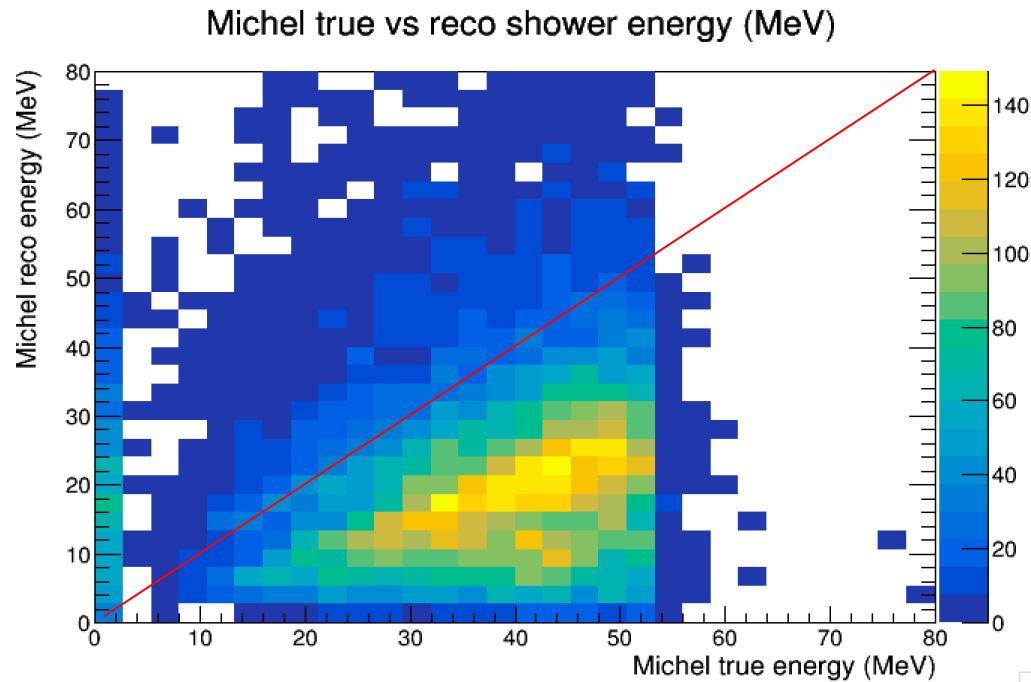
Selected candidate electron reconstructed energy (MeV)



True vs reco michel energy spectrum

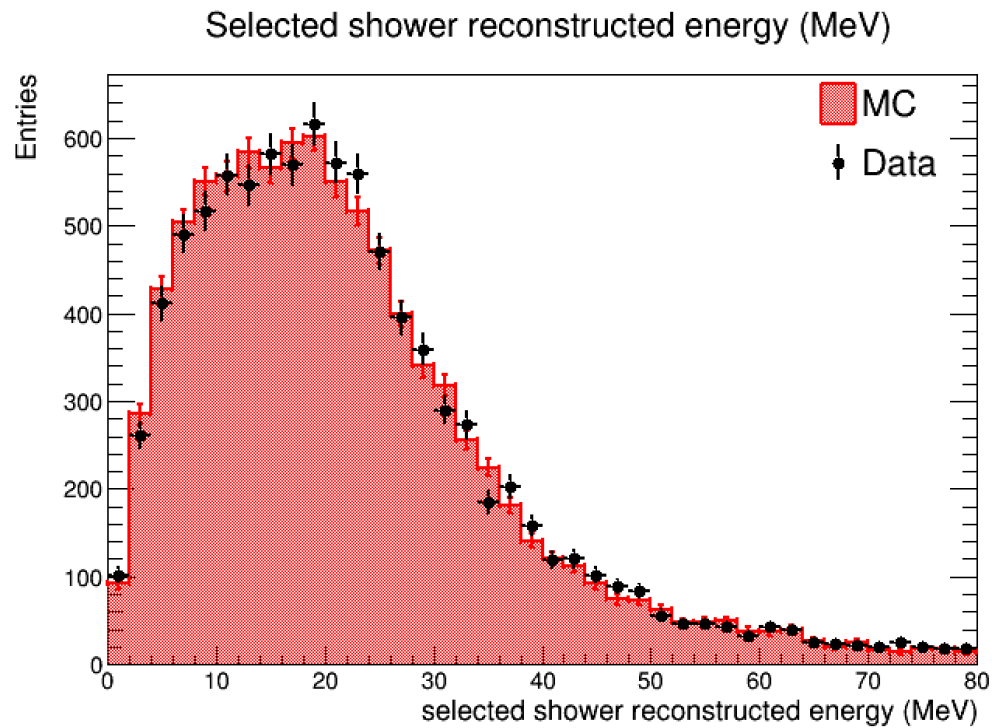
nearest shower energy

Cone energy

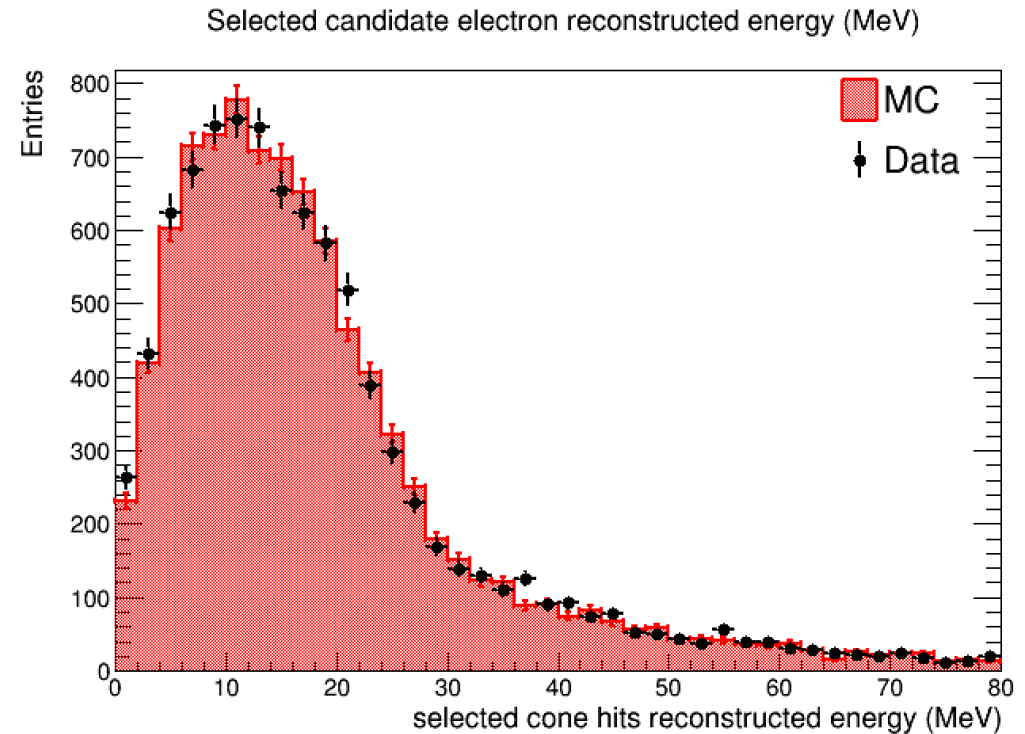


Energy spectrum michels

Nearest shower energy



Cone energy



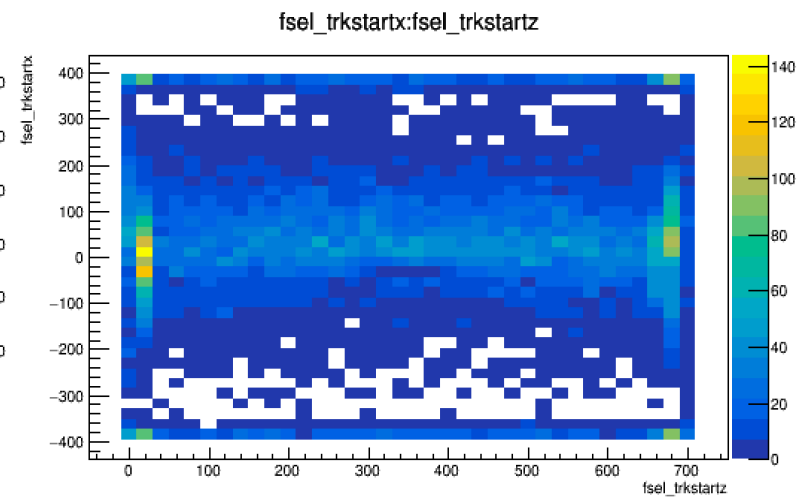
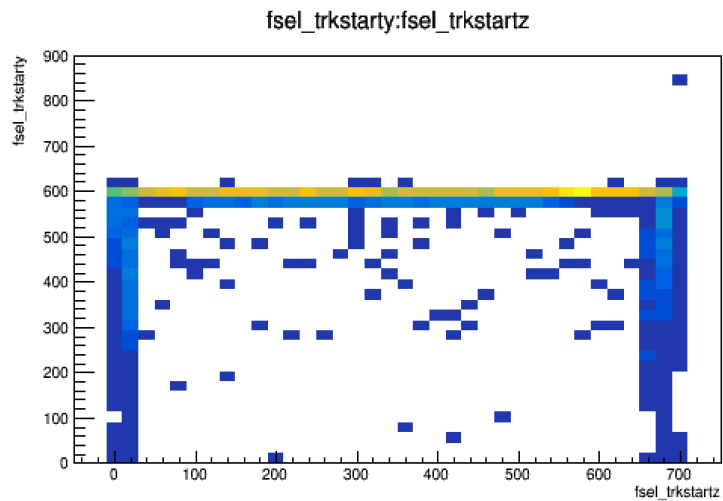
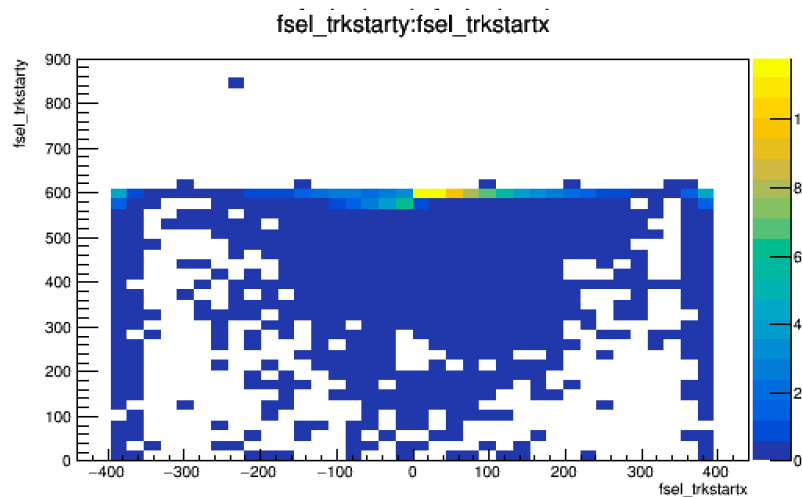
Next steps

- Tech note is in progress
- Also took a first look on selected michel events in the photon detector
 - First results look good

Backup slides

Candidate muon 2D kinematic plots

MC



Data

