(update)Electron Identification within Electromagnetic Calorimeter in SAND

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December 11, 2020

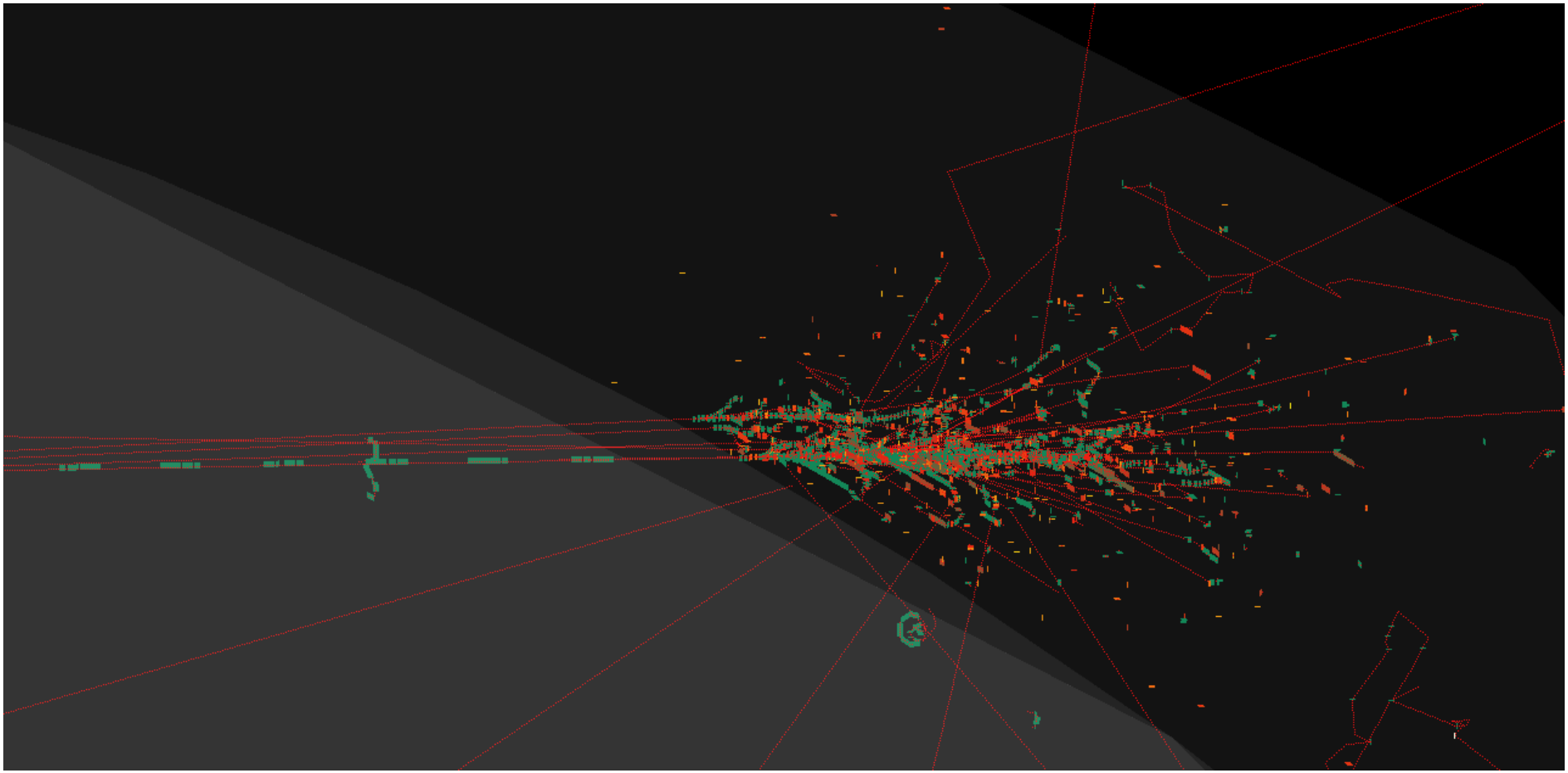
Outline

- Electron Identification plays a significant role in electron neutrino CC event selection.
- My study focus on maximizing electron neutrino event tagging efficiency and purity, but also can be used as an universal electron identification.

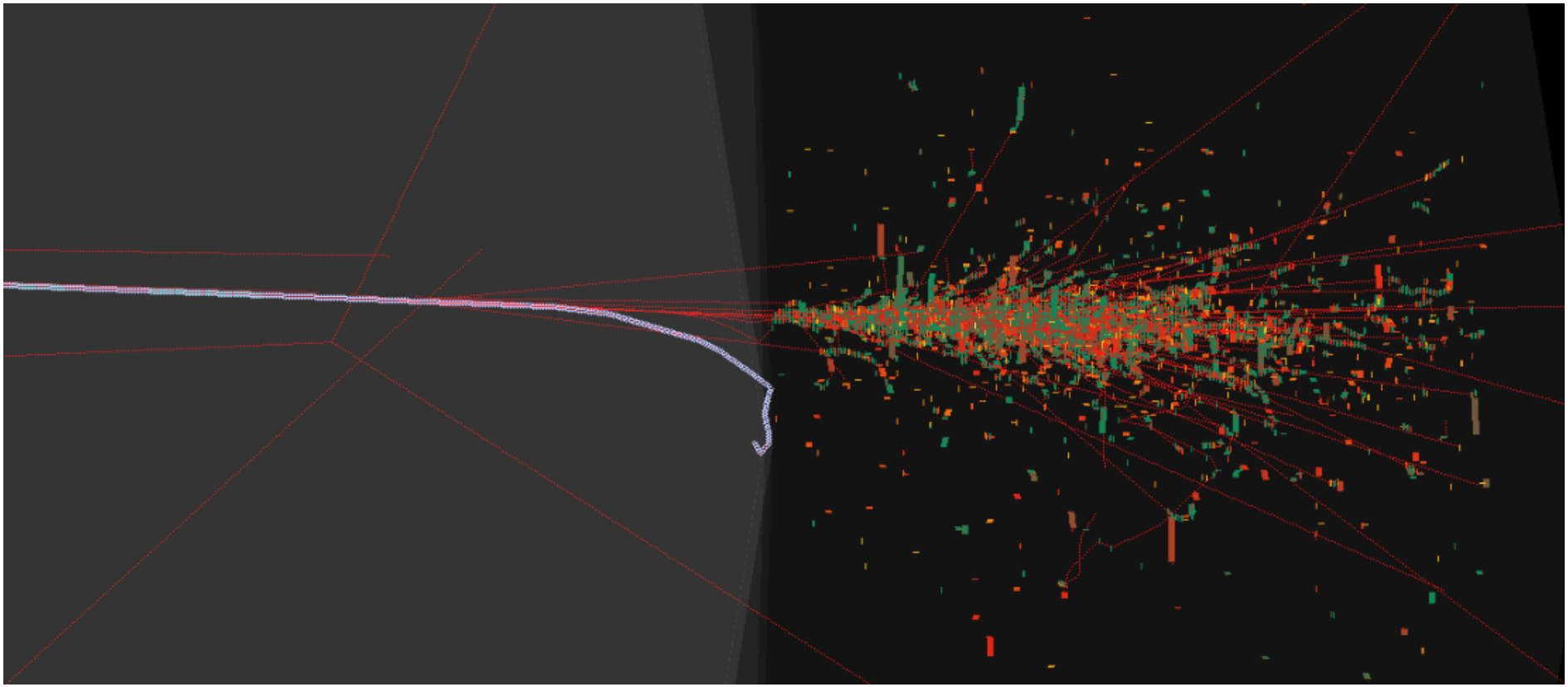
Procedures

- Go through every step of electron tagging, most electron candidates are pions(NC and CC), muons(CC) and electrons(CC). Since muons can be vetoed by yoke and muonID, pions are main background.
- Use energy depositions and cell topology in ECAL, find discriminating variables for NN training
  - shower shape along X, along YZ plane per layer, longitudinal shower shape
  - central cell energy deposition fraction per layer
  - Ratio ECAL energy deposition to momentum
- All results used CC sample only

Typical EM showers formed by a primary electron in ECAL



Typical EM showers formed by a primary electron in ECAL



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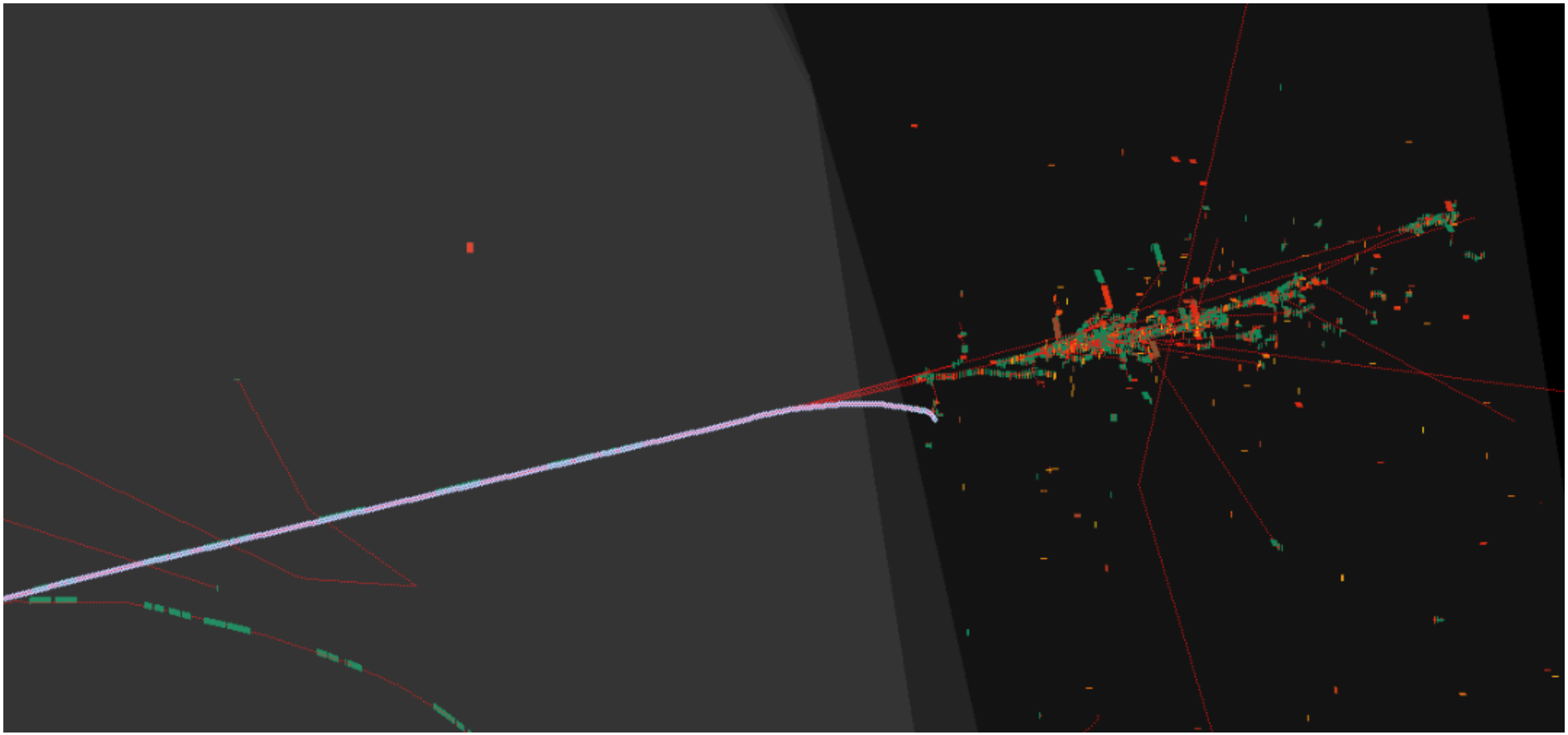
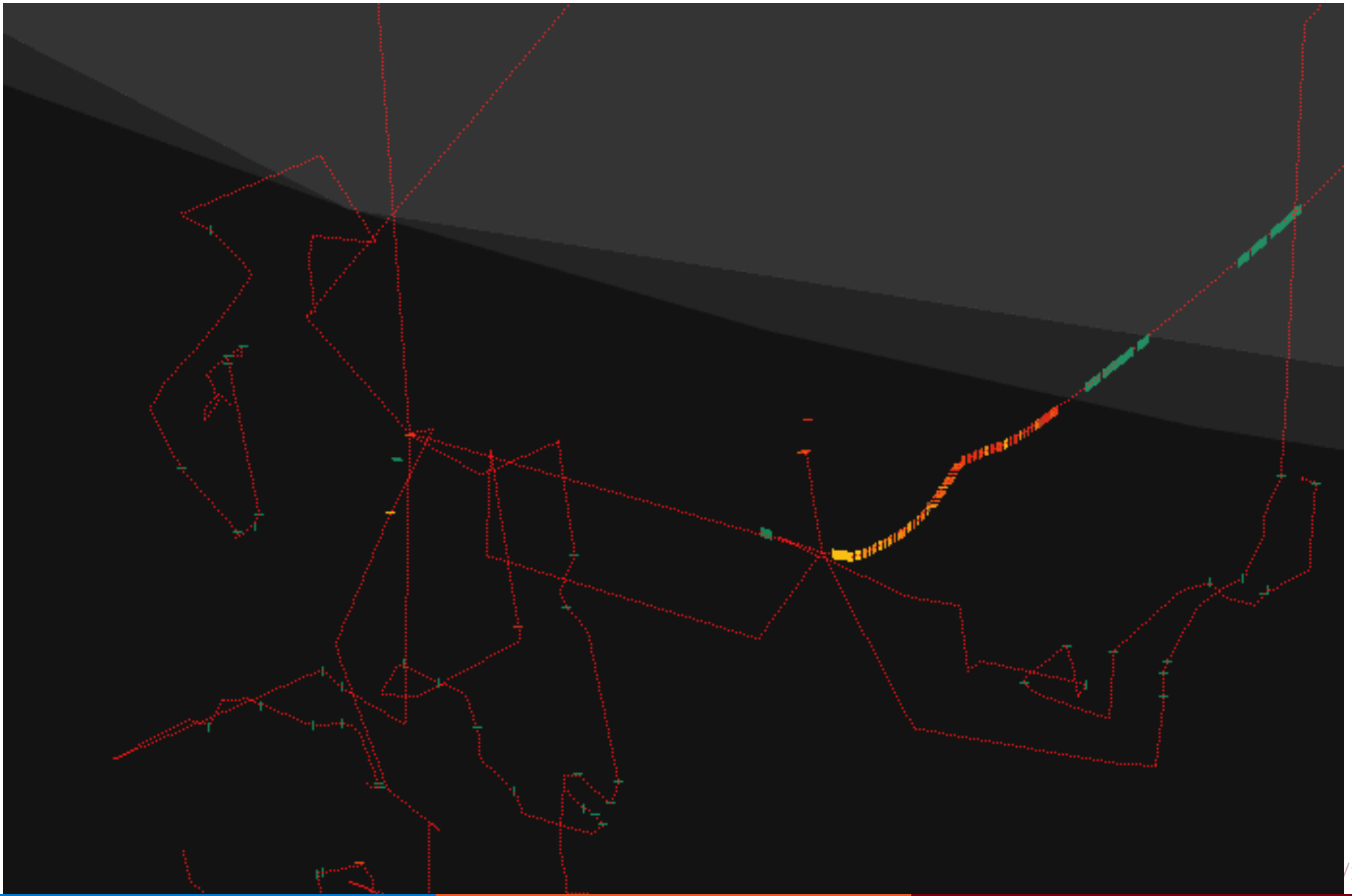
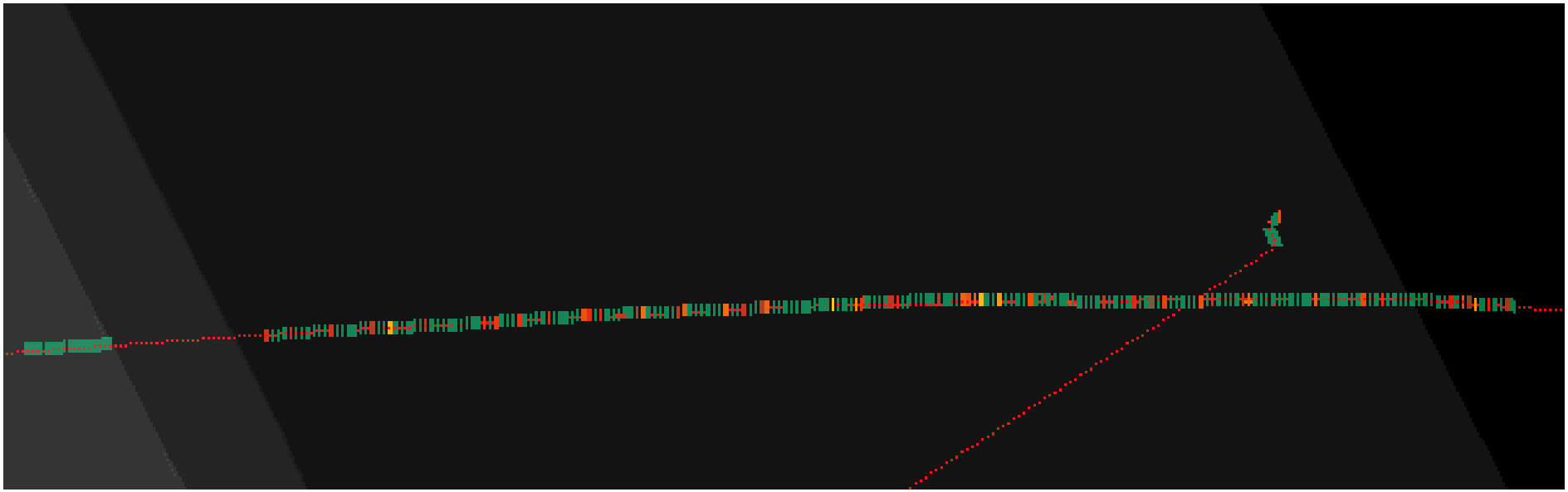


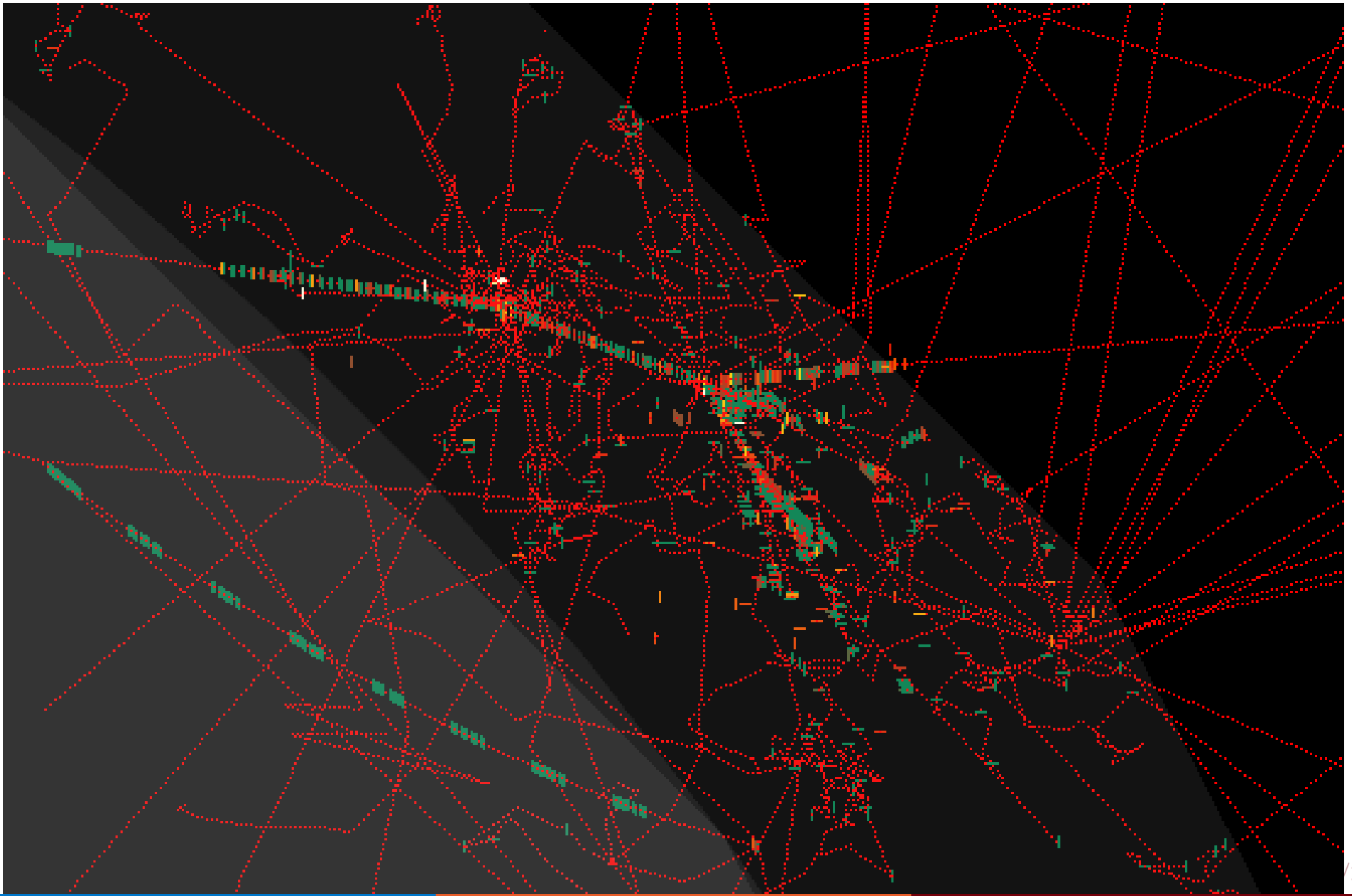
Pion in ECAL (332MeV)



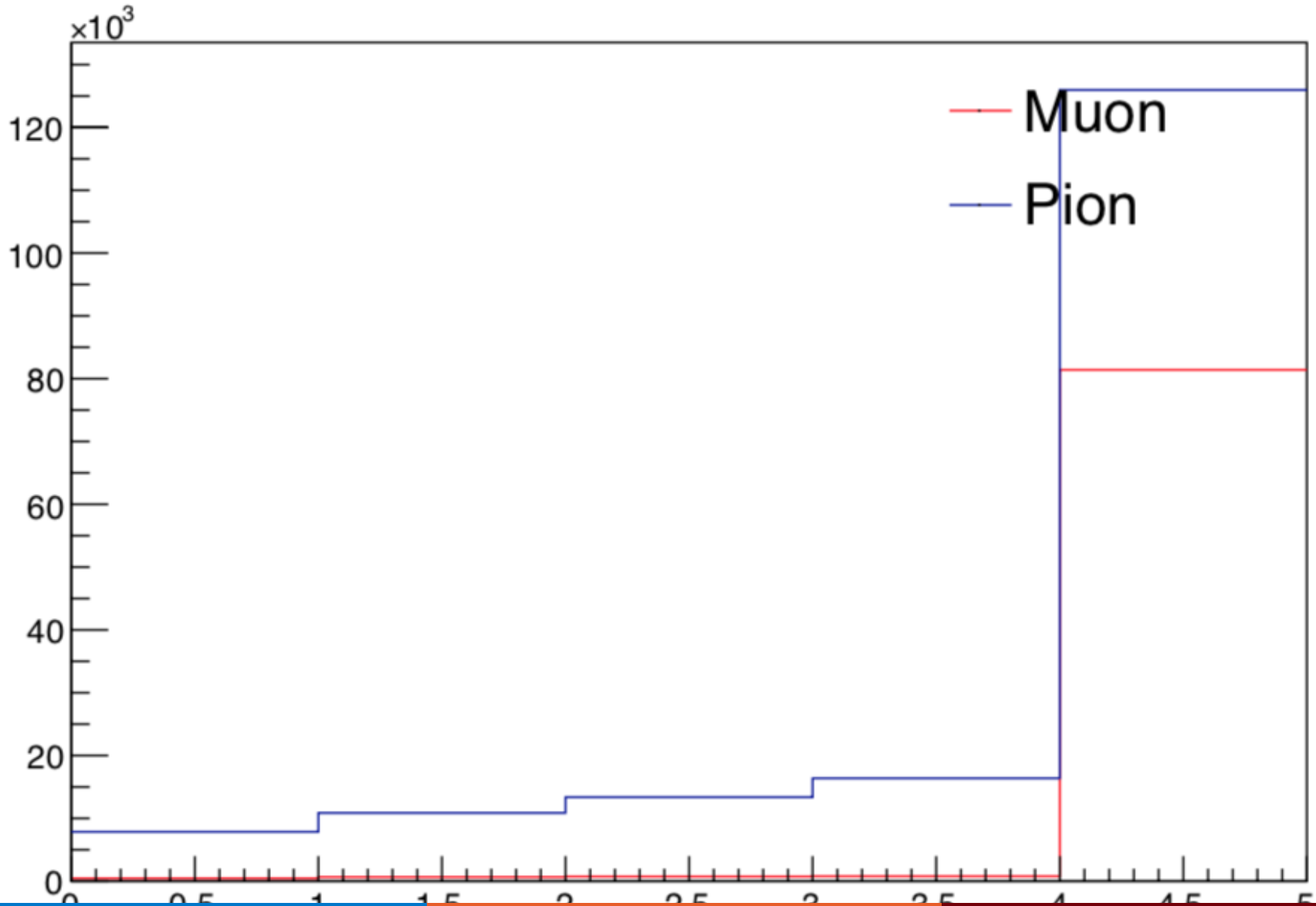
Pion in ECAL (773MeV)



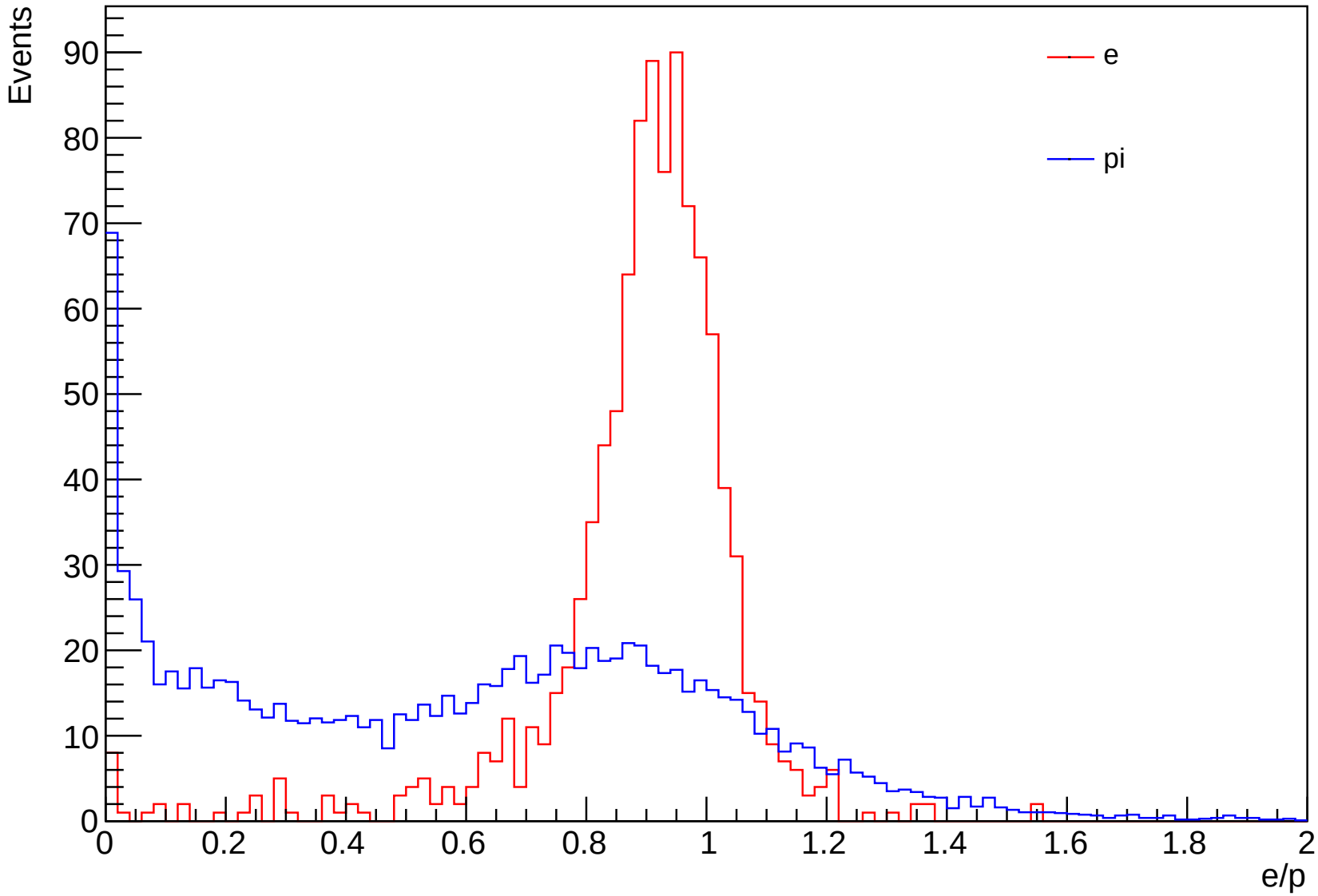
Pion in ECAL (3096MeV)



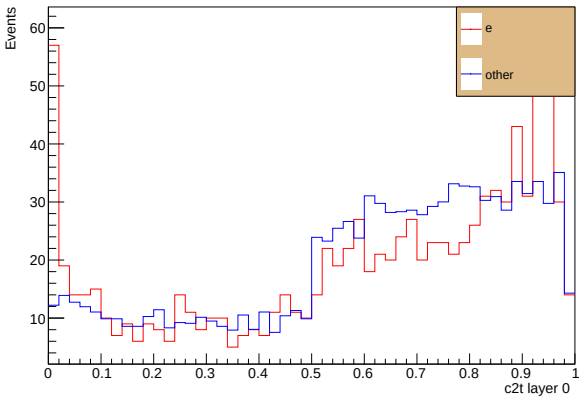
last layer distribution of pion

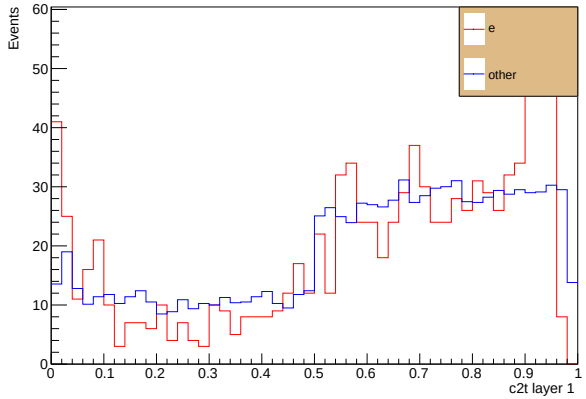


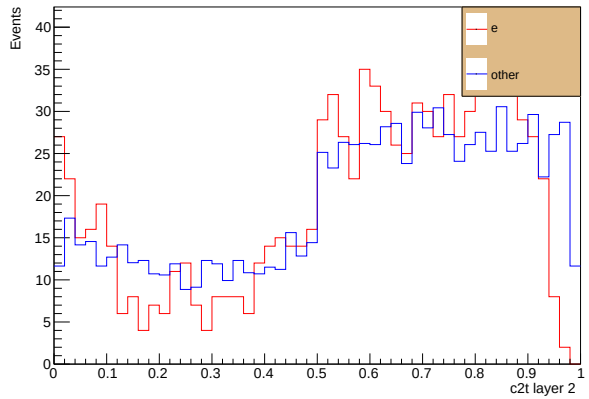
Ratio ECAL energy deposition to momentum

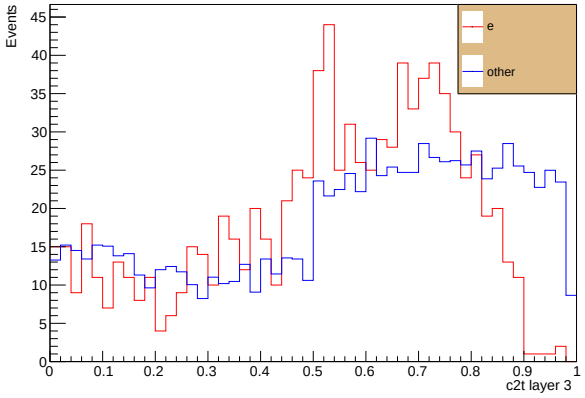


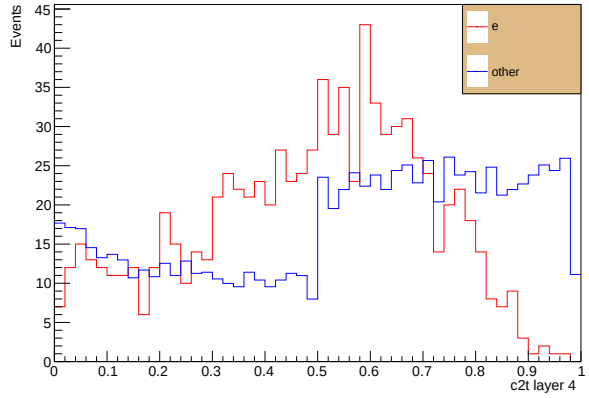
central cell energy deposition fraction per layer (c2t)



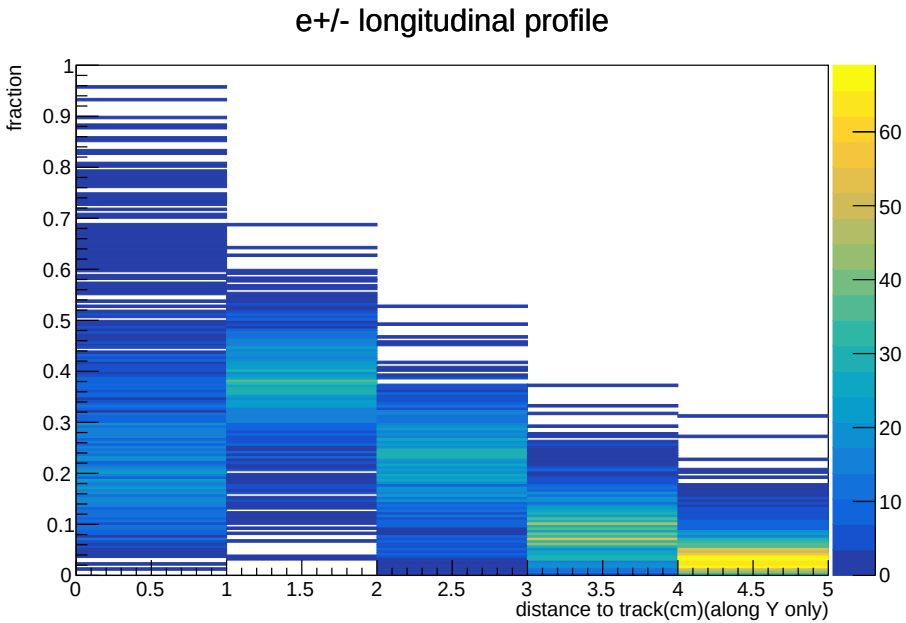


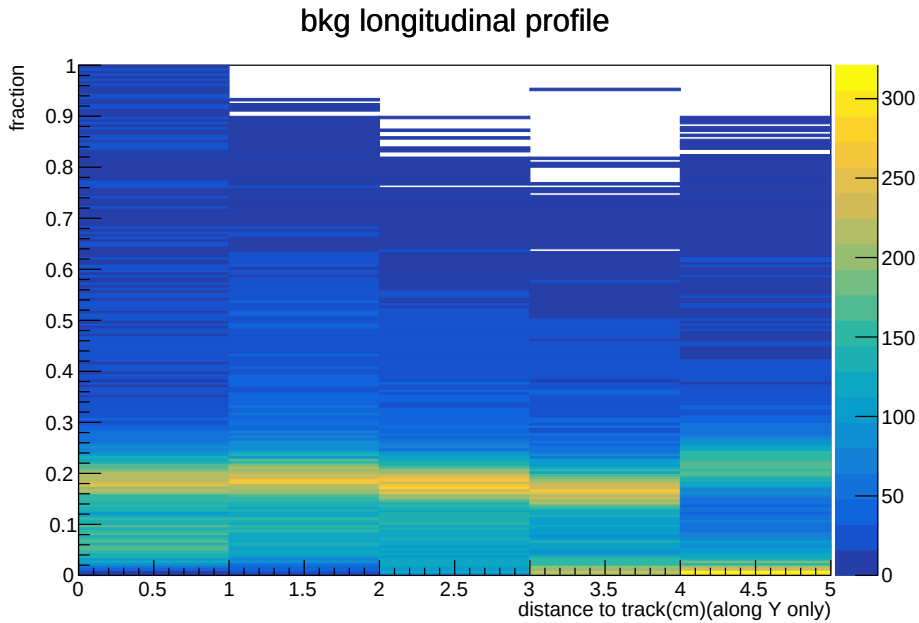




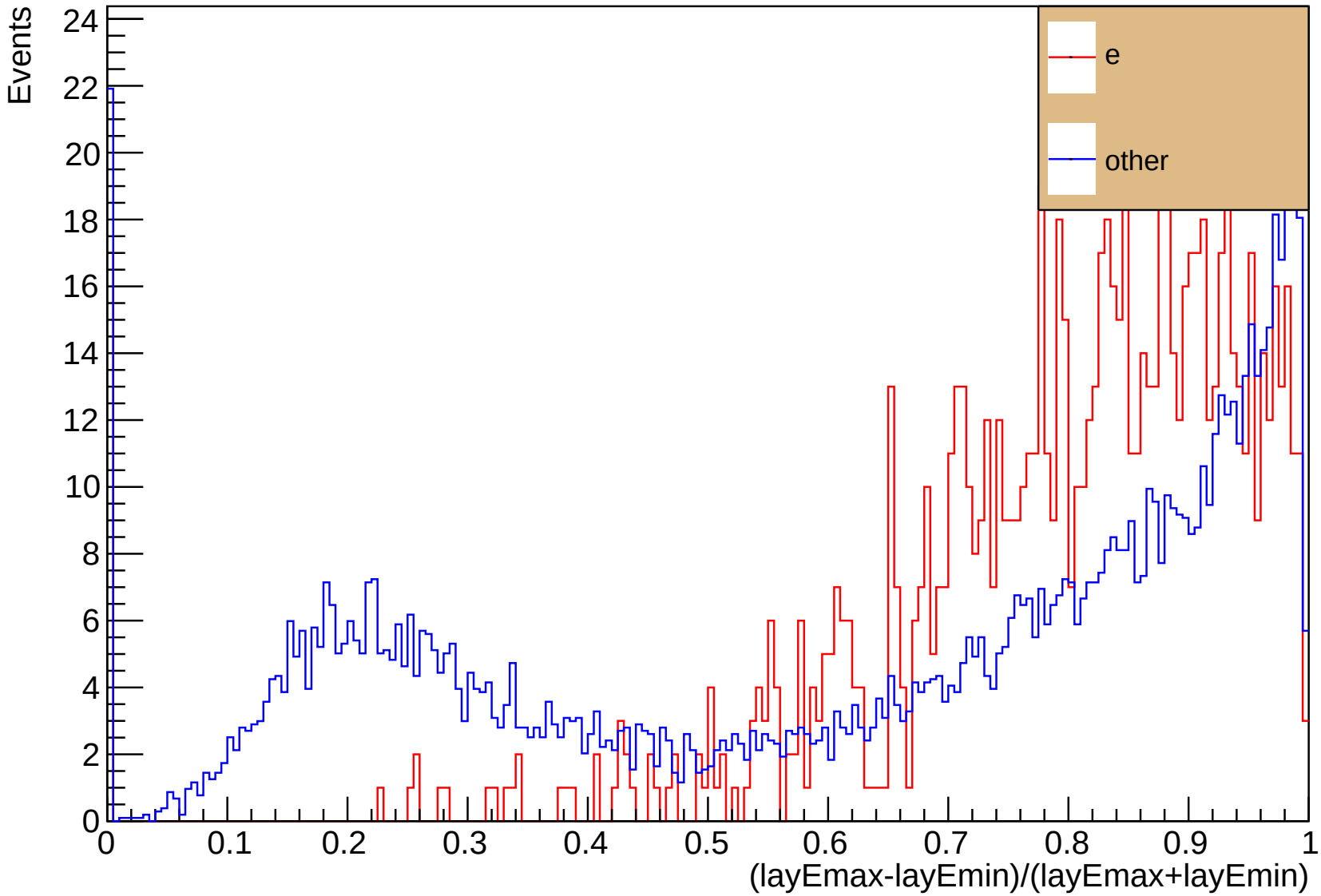


longitudinal shower profile





longitudinal ECAL deposition asymmetry



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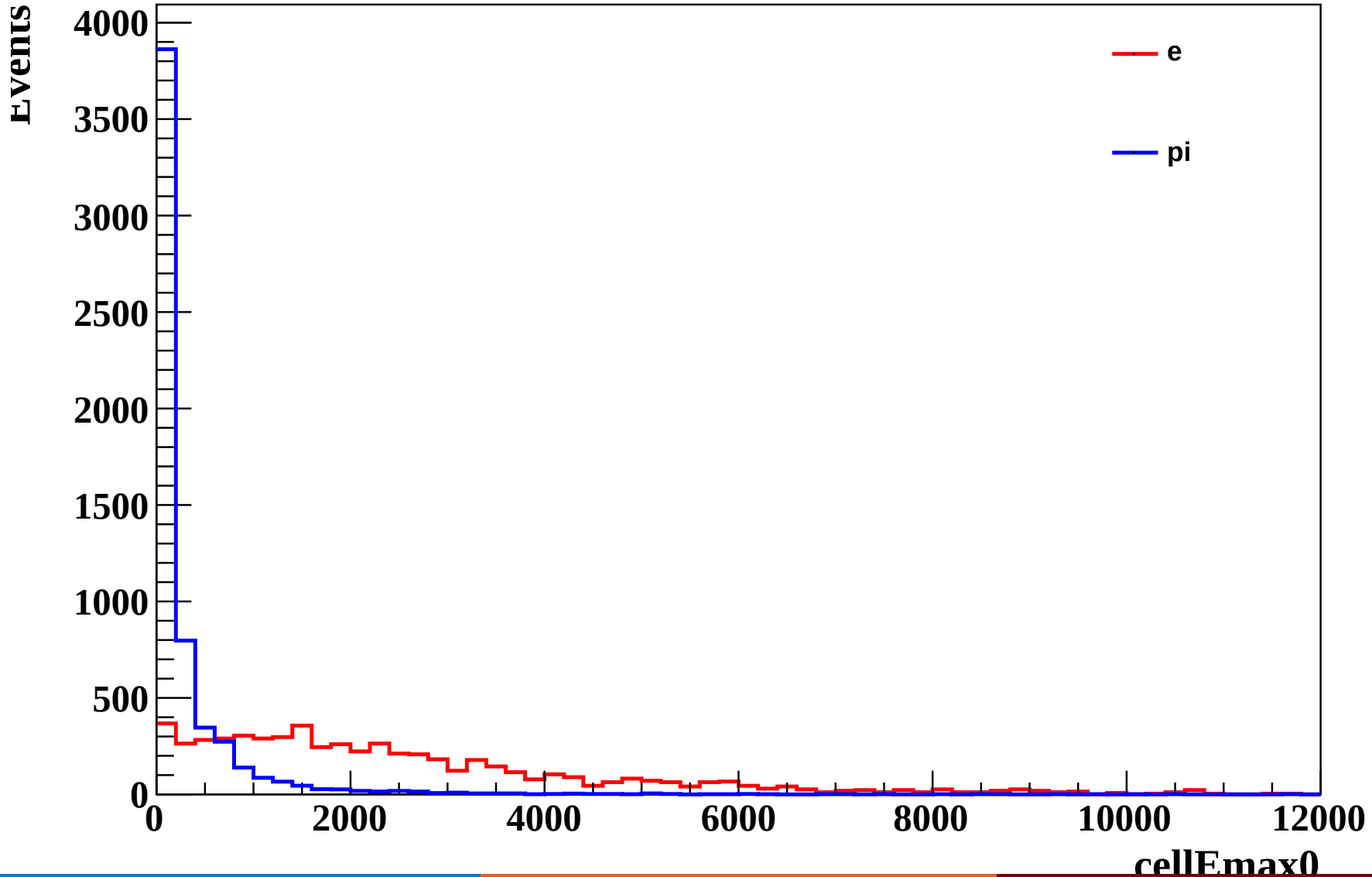
cellEmax in layer 0



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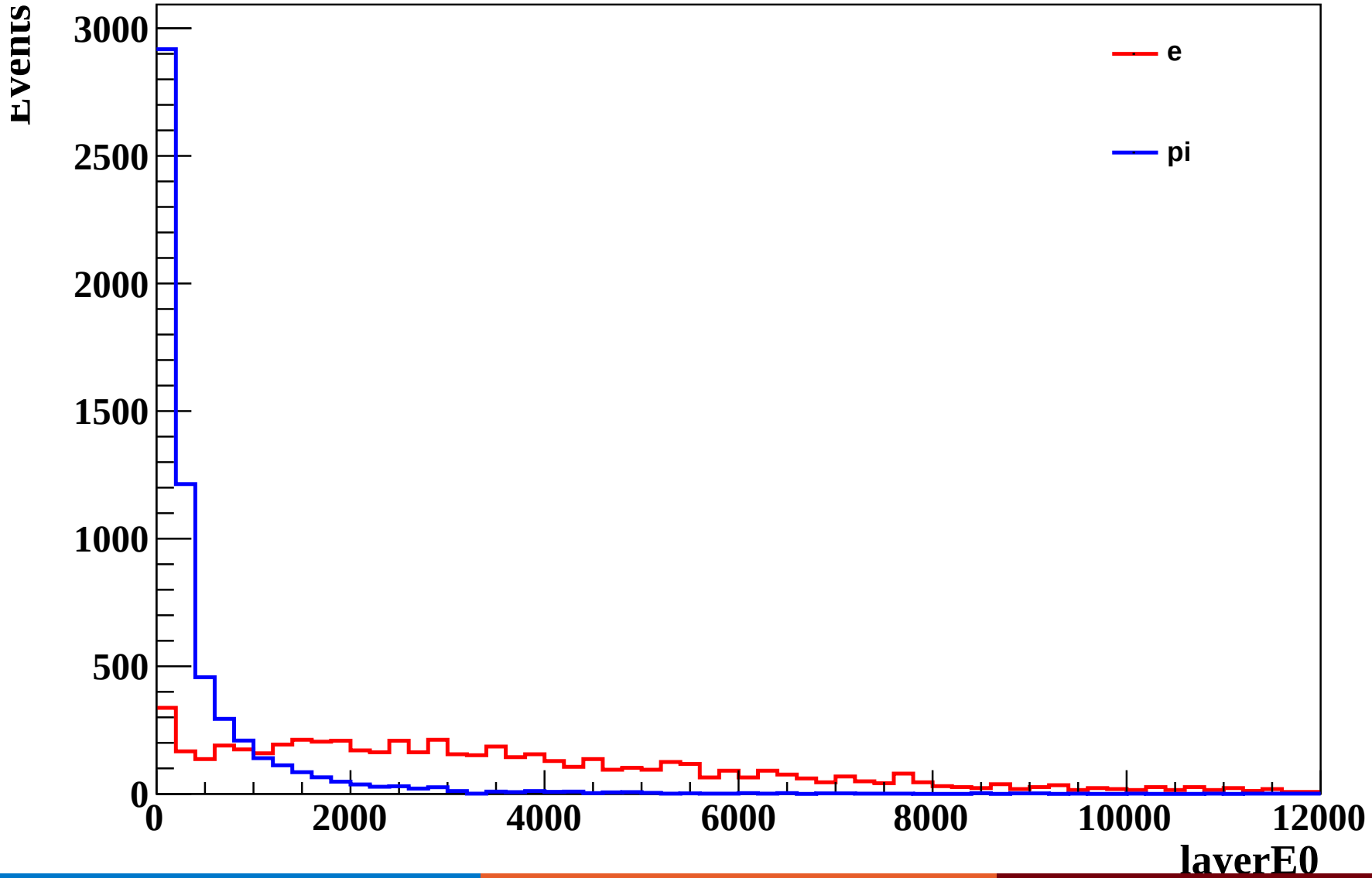
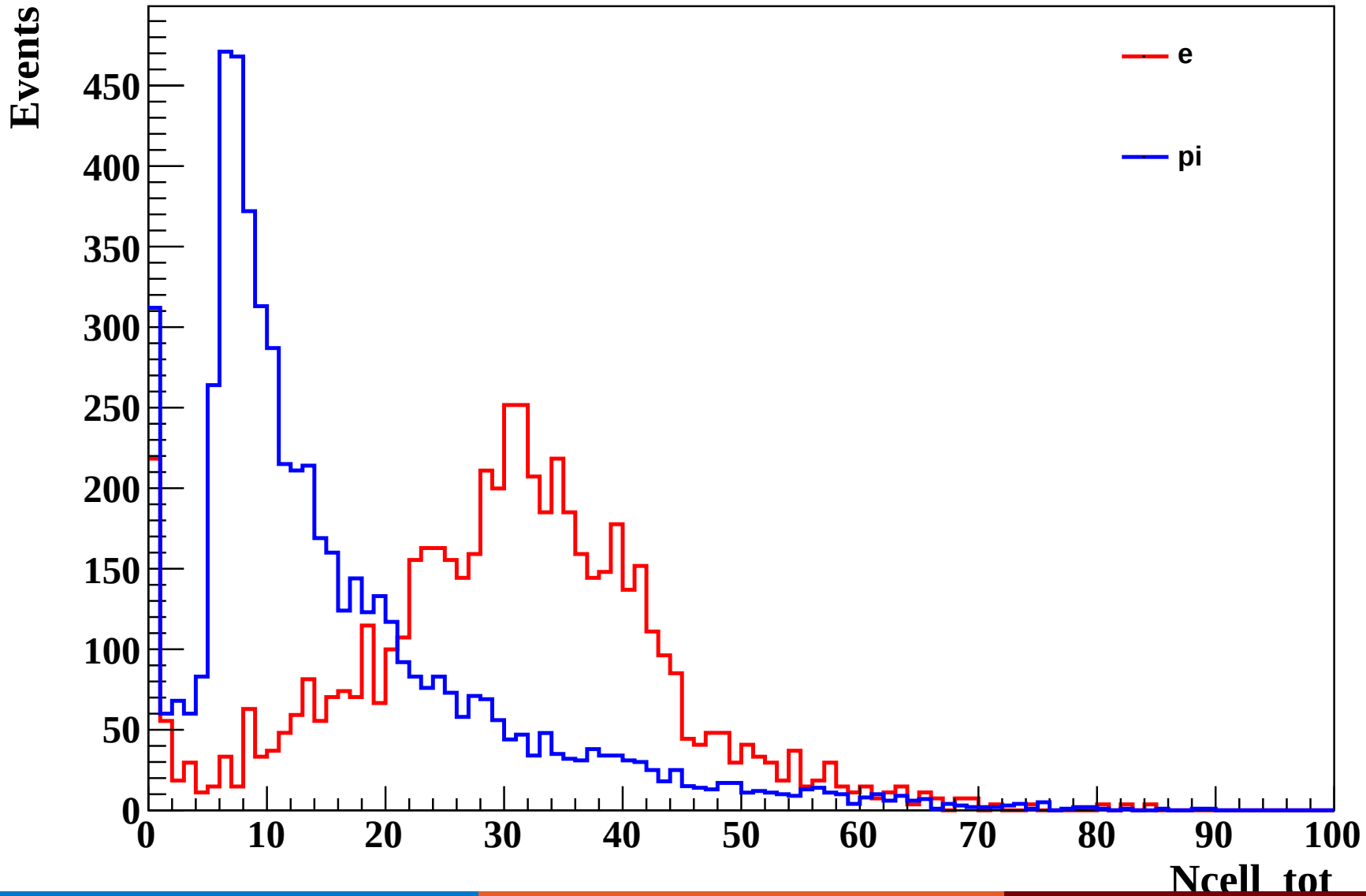
layerE0

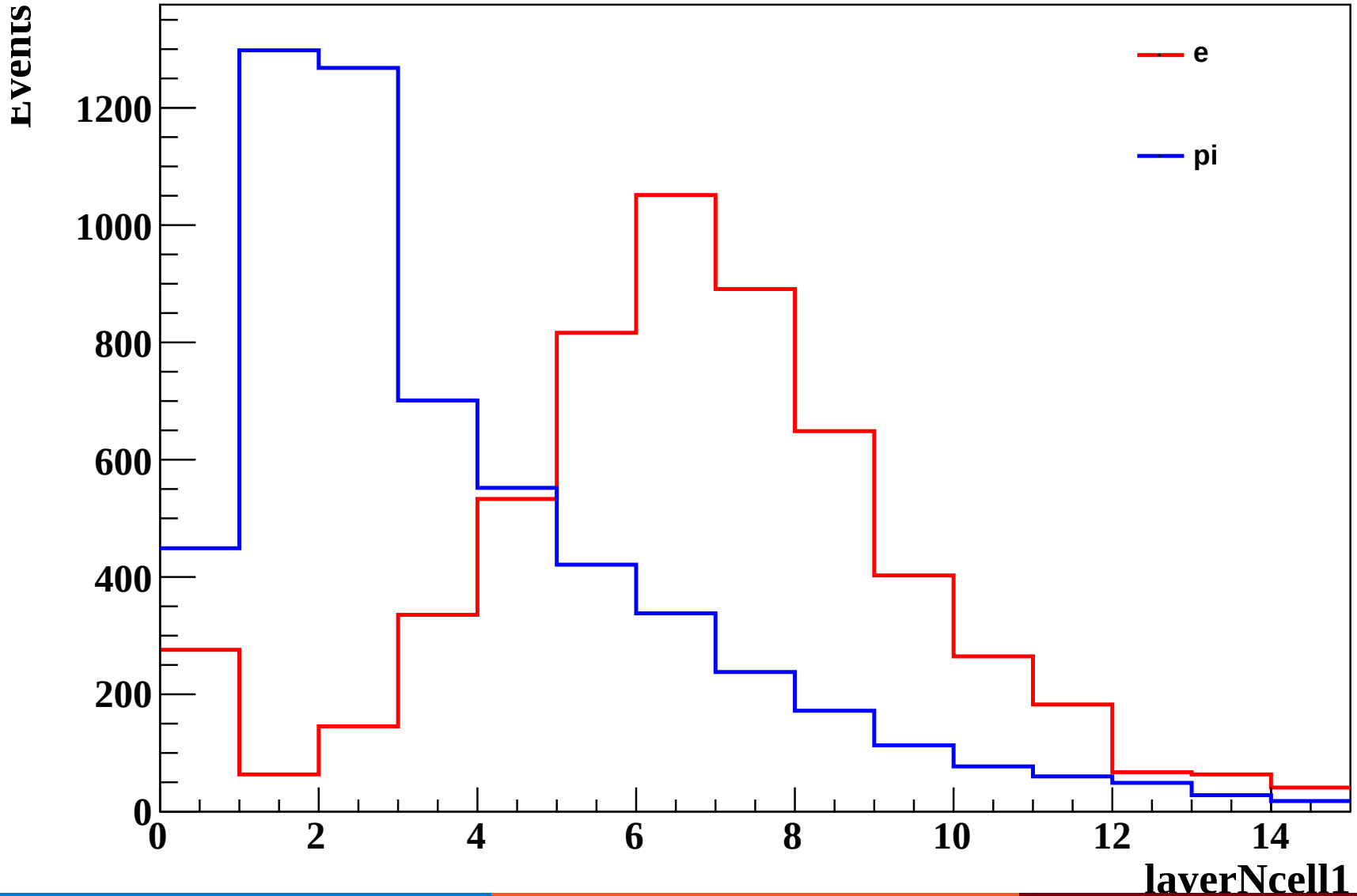

Events
3000
2500
2000
1500
1000
500
0
0
2000
4000
6000
8000
10000
12000
layerE0
e
pi

/22

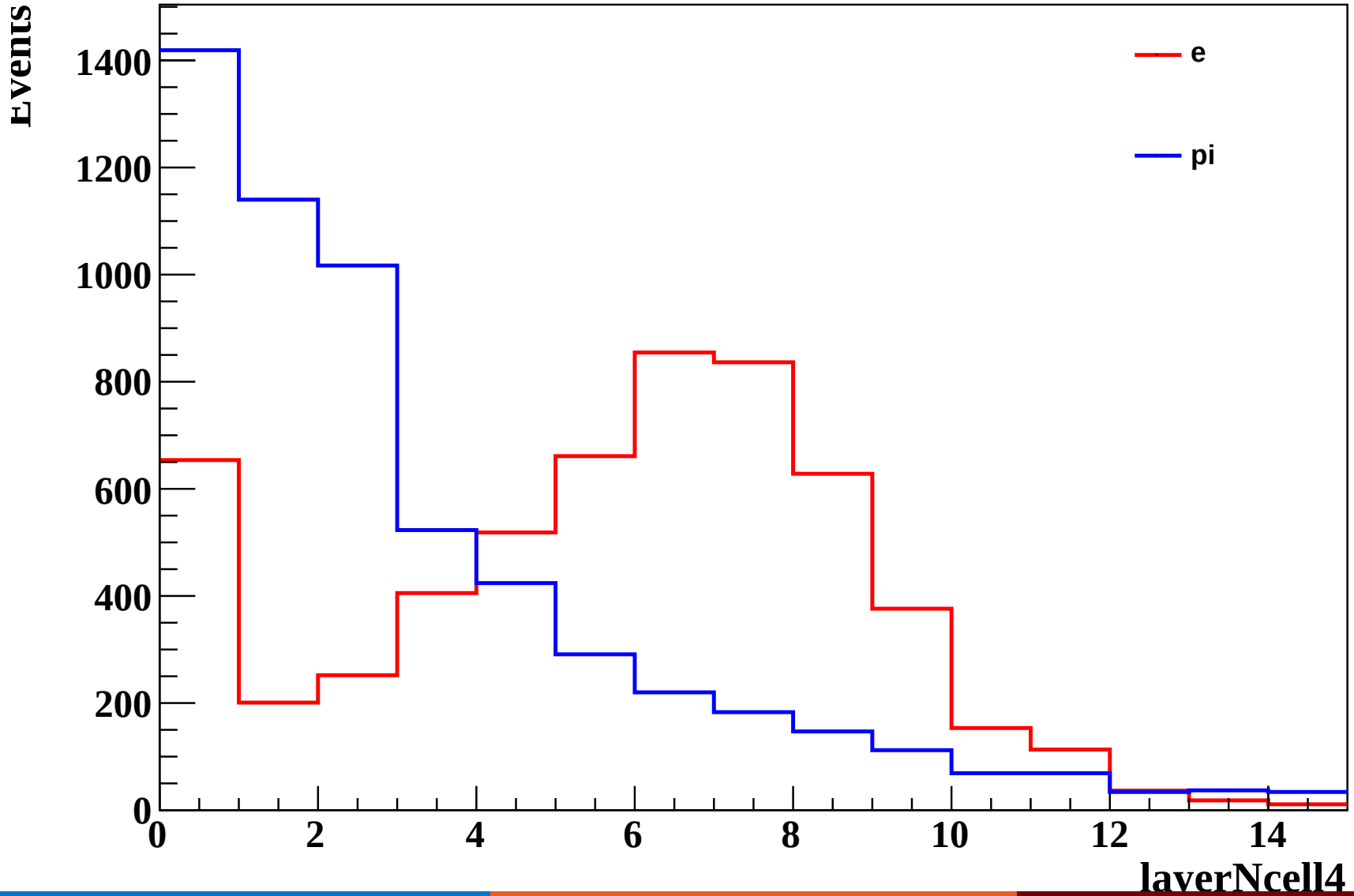
Total number of active cells



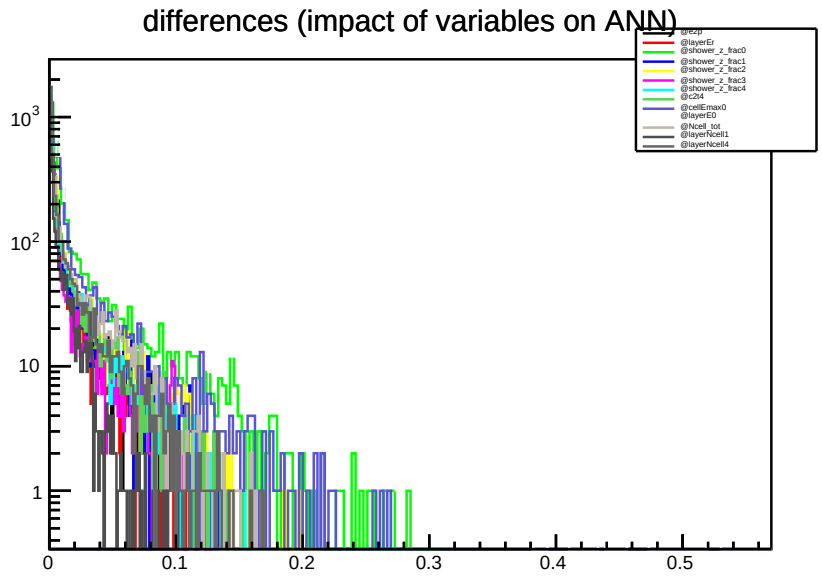
layerNcell1

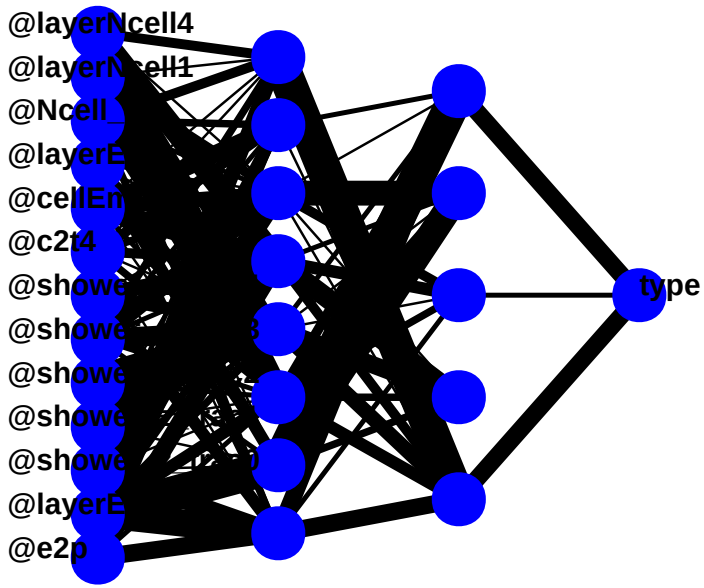


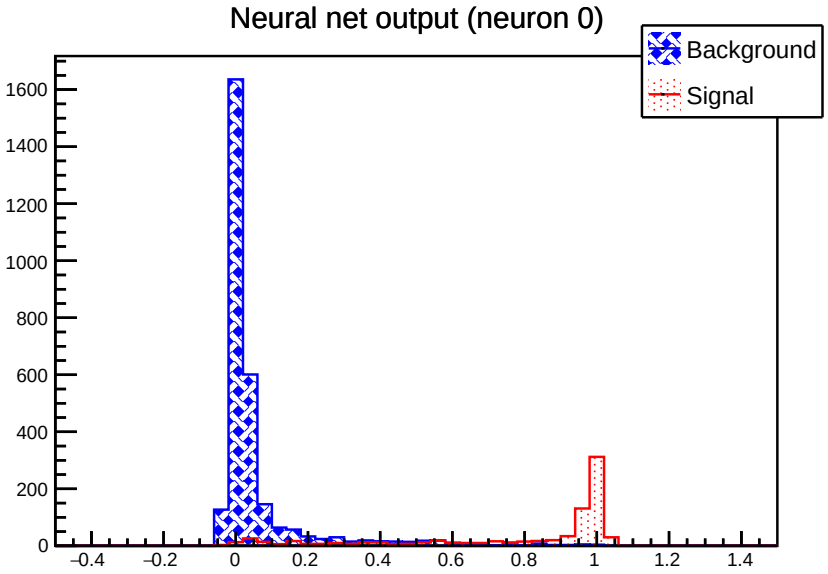
layerNcell4

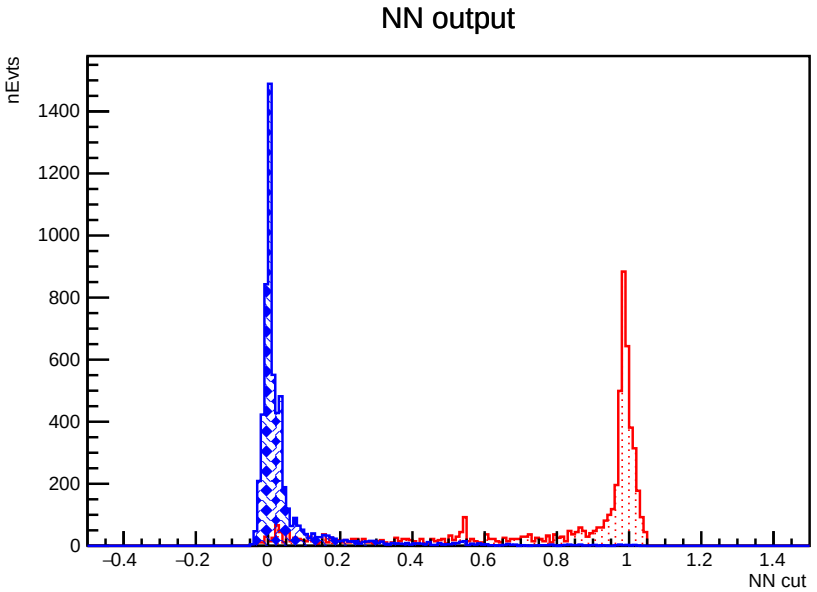


Neural Network Training

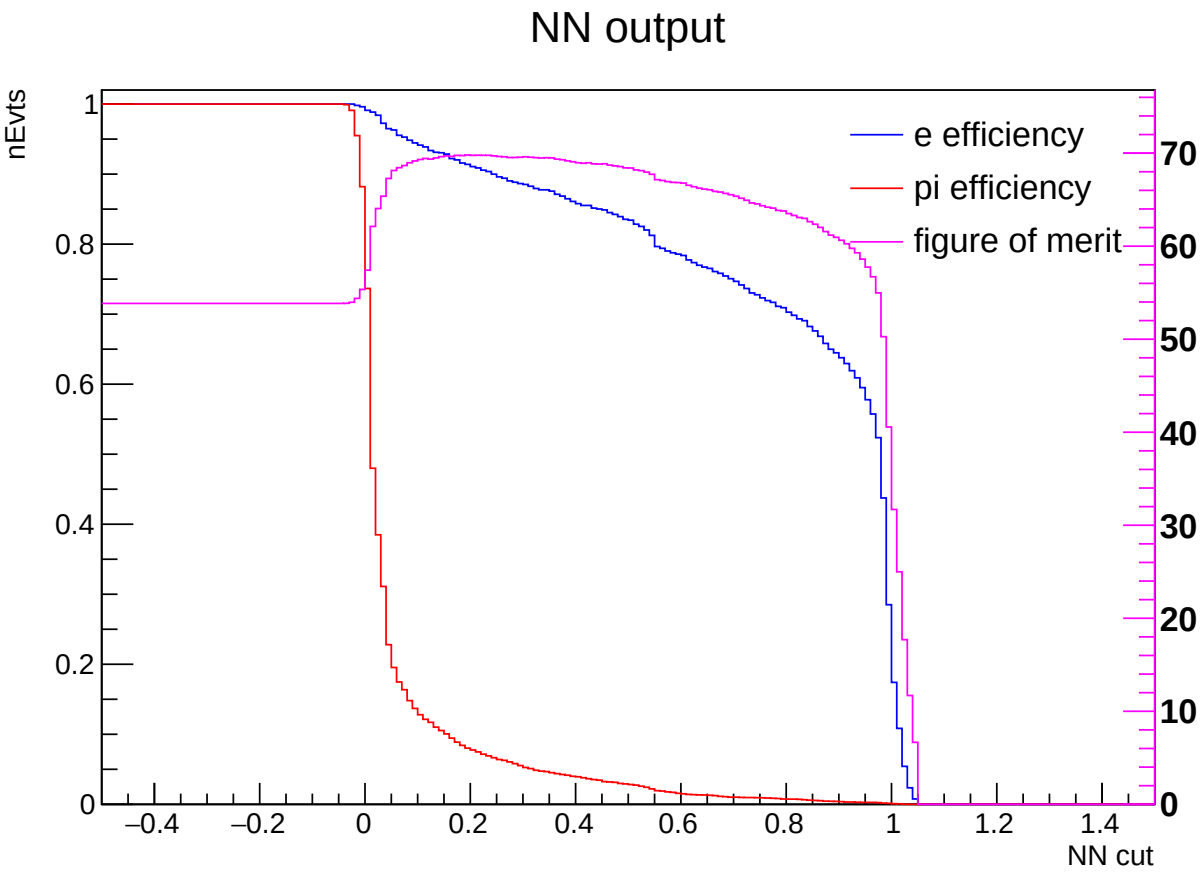








Combined Efficiency VS NN cut



Candidate NN cut: 0.24
Electron efficiency: 0.901
pion efficiency: 0.064

(old)Candidate NN cut: 0.03
(old)Electron efficiency: 0.919
(old)pion efficiency: 0.216

Next step

- Use ECAL timing information

BACKUP