Proton Identification/Veto

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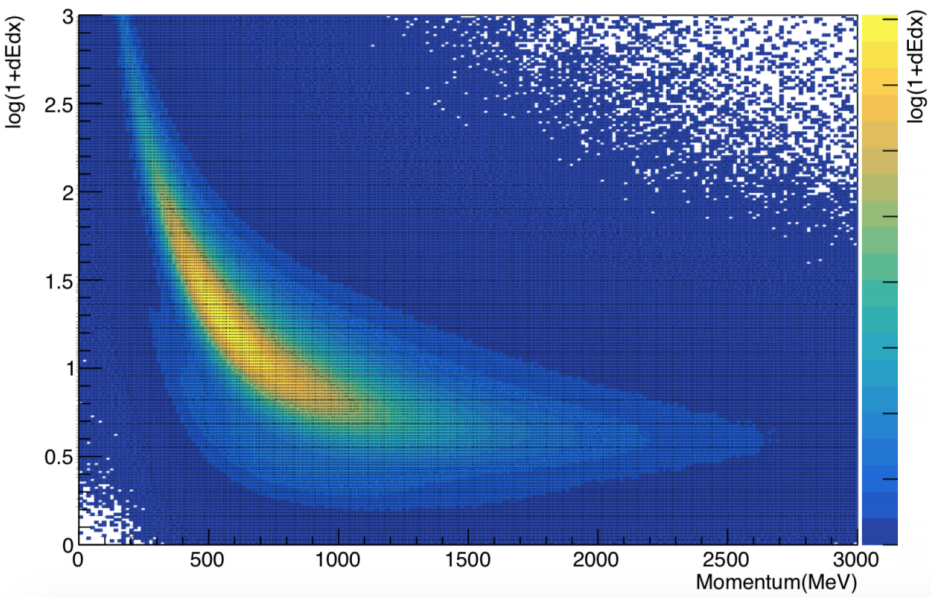
Outline

- The old proton identification is based on dedxID and rangeID with goal to separate proton from pion.
- The new proton Veto, based on the old dedxID training result and range calculation, new variables added.
- New training is trained aiming at reject most of proton but keep most of muons.
- The proton veto can be used in analysis like muon tagging.

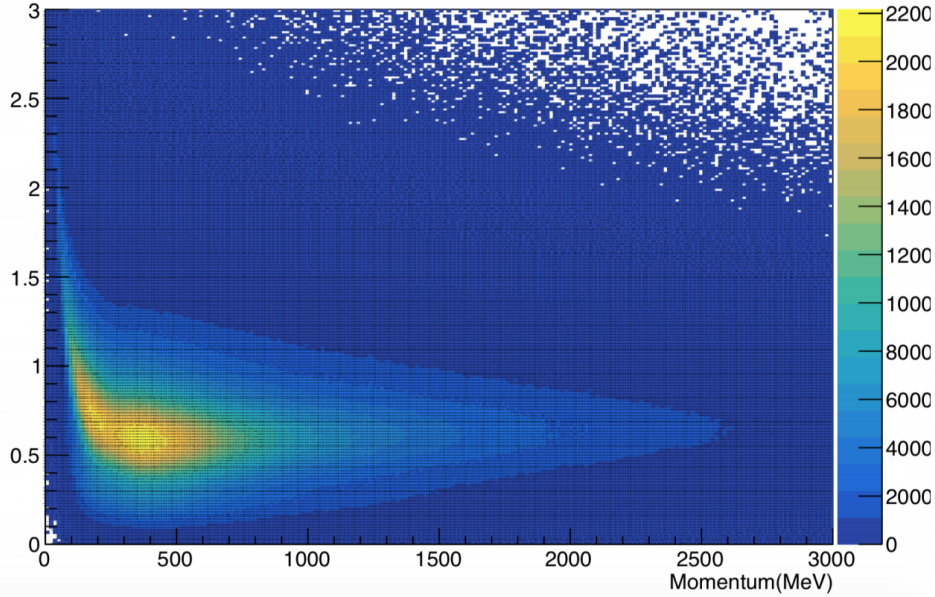
dEdx VS. momentum

- For each proton/pion track, they have multiple entries (=number of straw hit) in the 2D map

Proton



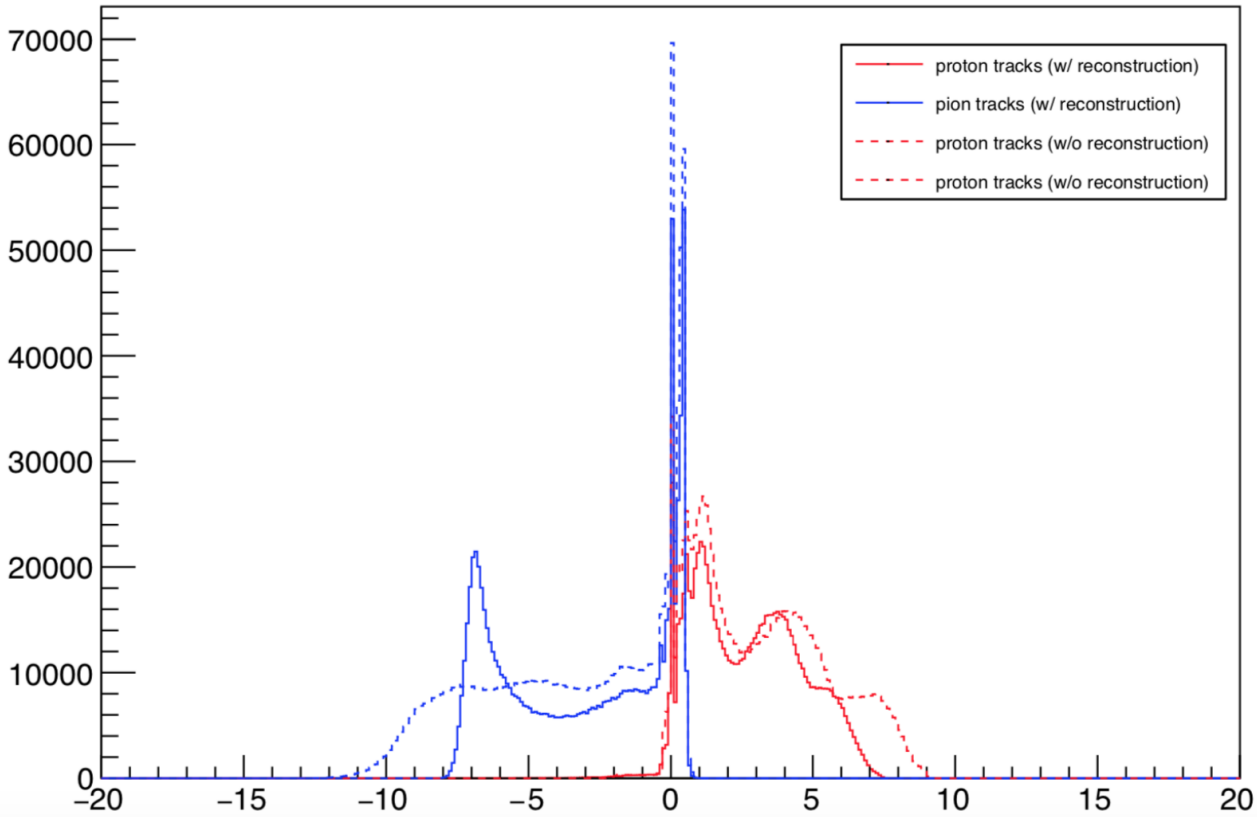
pion



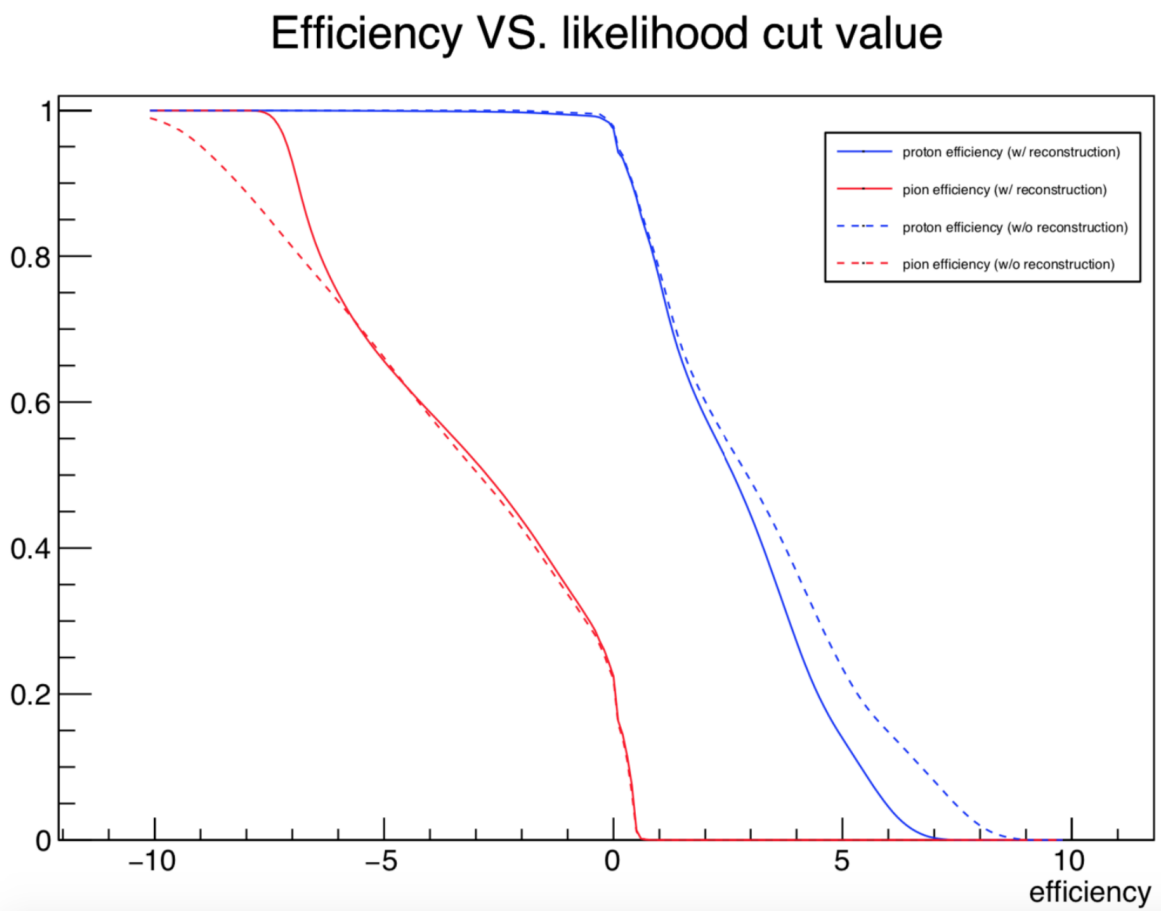
(OLD)dedx training

- the dedx is converted to log(1+1000*dedx)
- for each hit of each track, get single dedx from dedx-recoP map, then average to get likelihood

Likelihood distribution



(OLD)dedx training



(a) for 90% proton efficiency, we have pion efficiency 7.5%
(b) For 87% proton efficiency, we have 1% pion efficiency

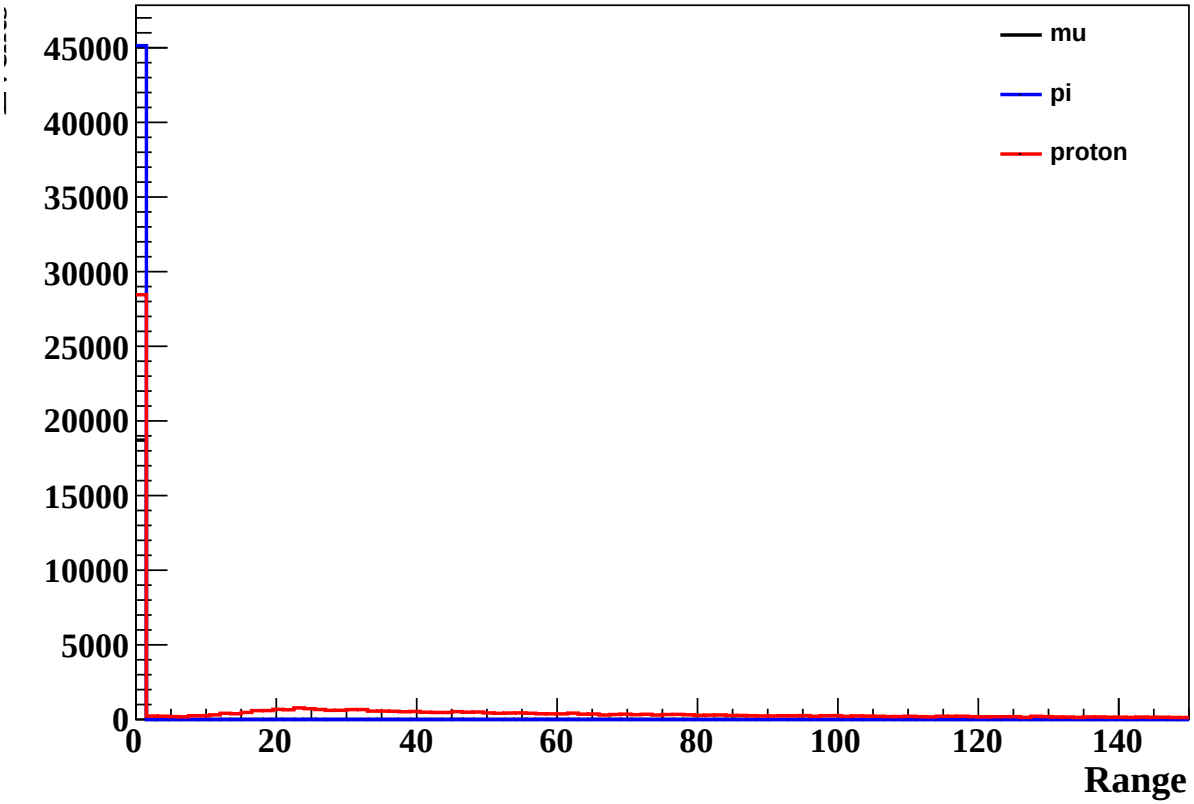
UPDATE

Proton Veto

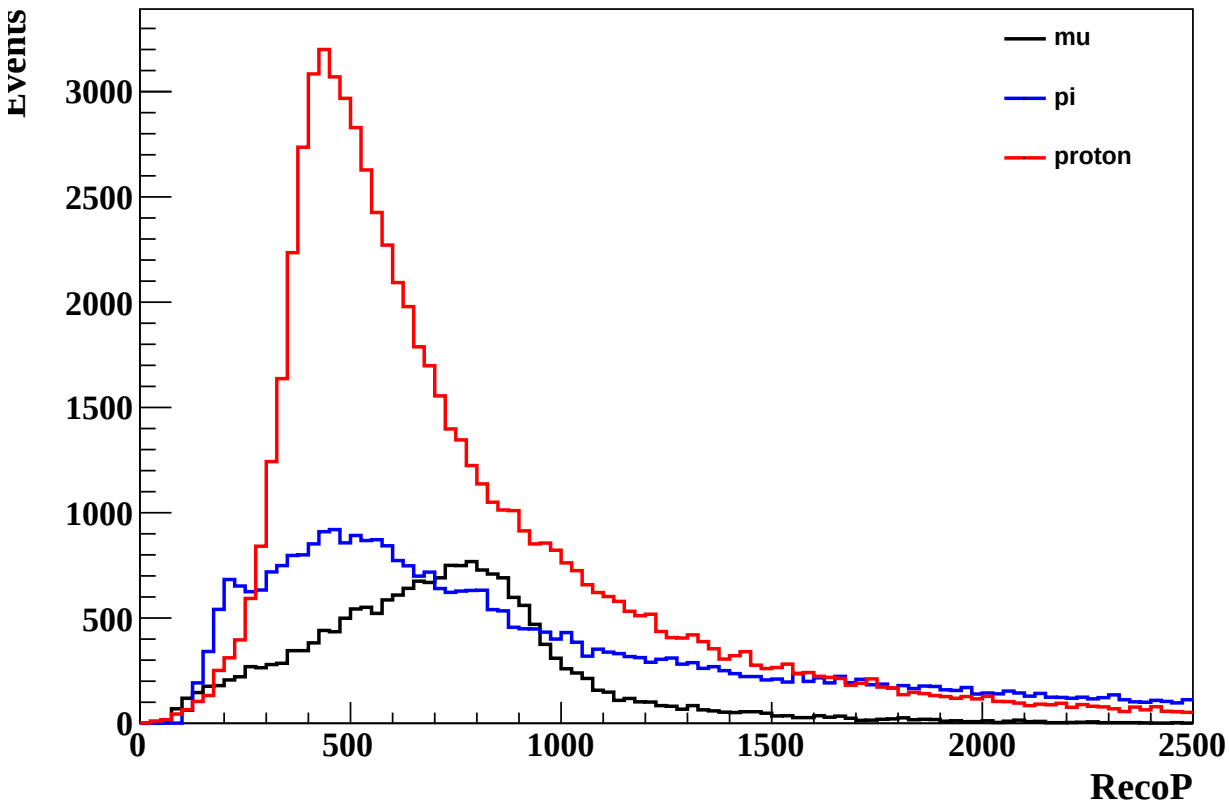
- item Use Neural network to separate muon from proton
- Only consider muons and protons do not cross yoke out

(Variables used for proton Veto training) equivalent range

in each different material segment, find the cross length and convert it to equivalent range in CH2, add all of them together to get the total range.

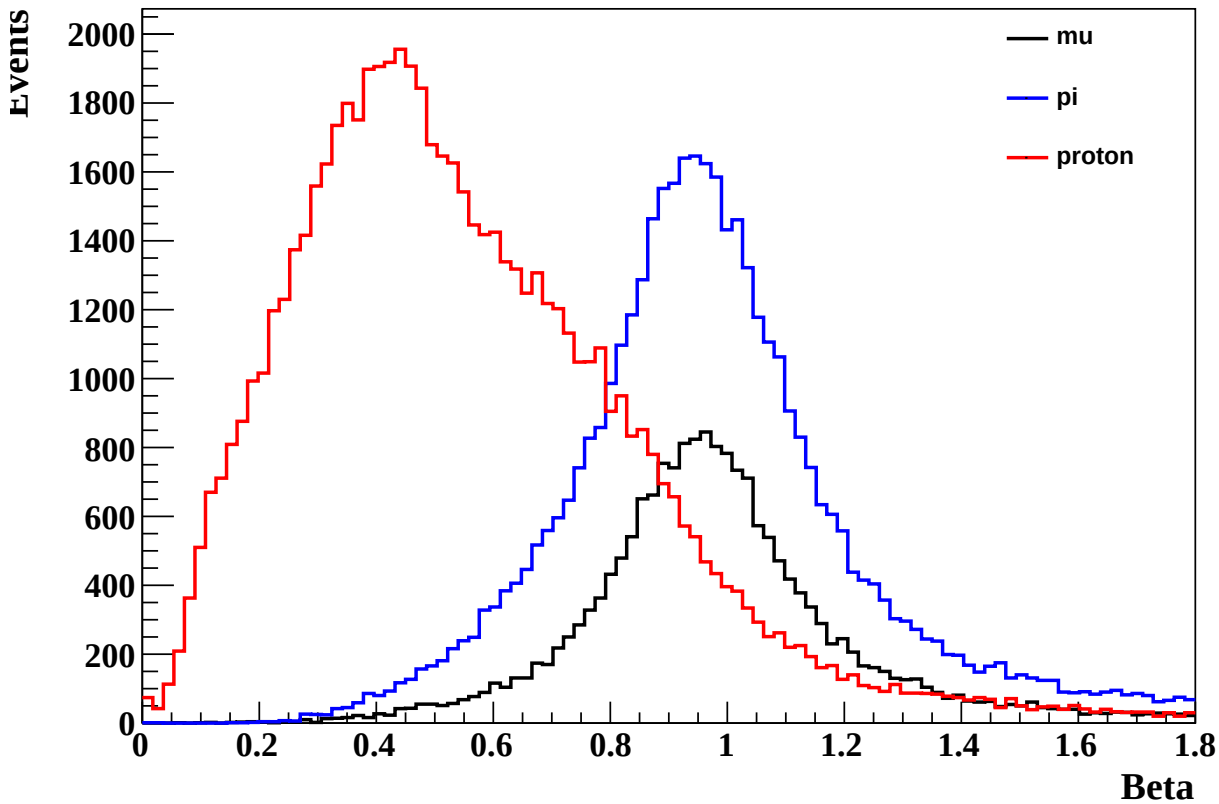


reconstructed momentum

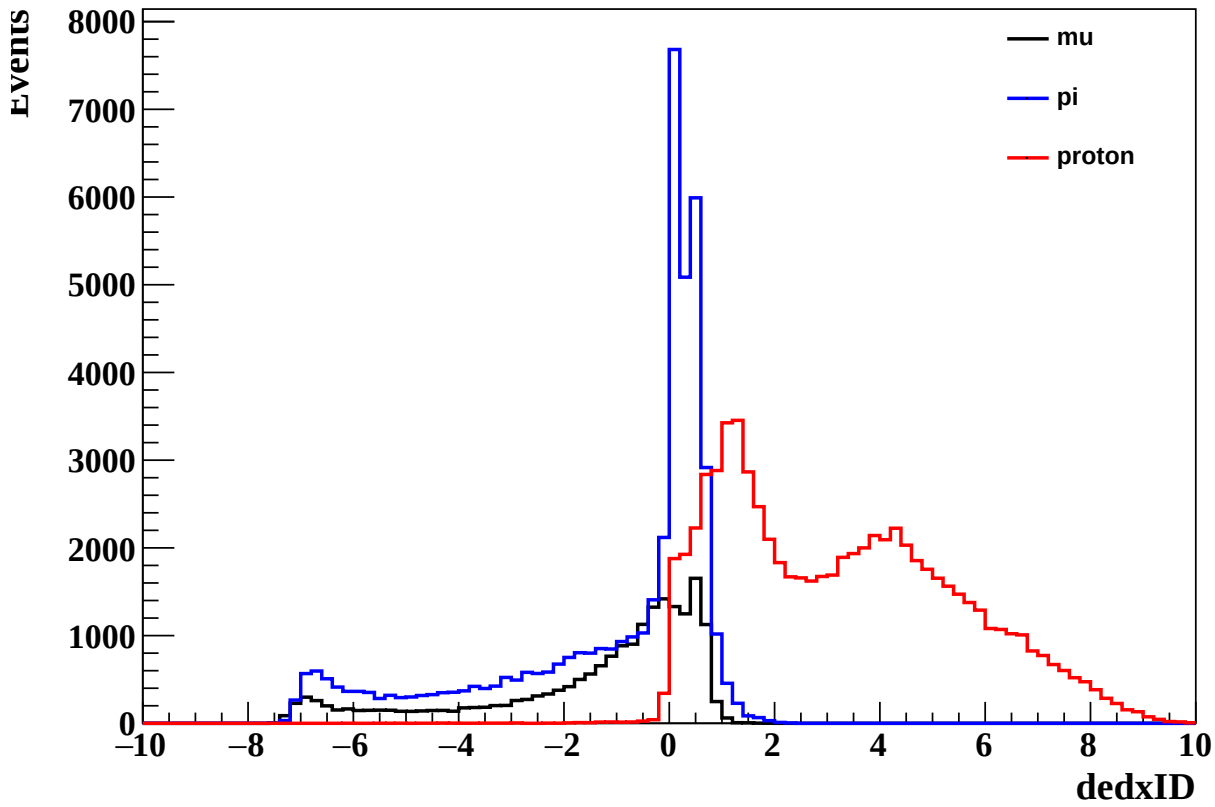


beta

Use the first hit in STT and first hit in ECAL(if it has ECAL hits) or last hit in STT.

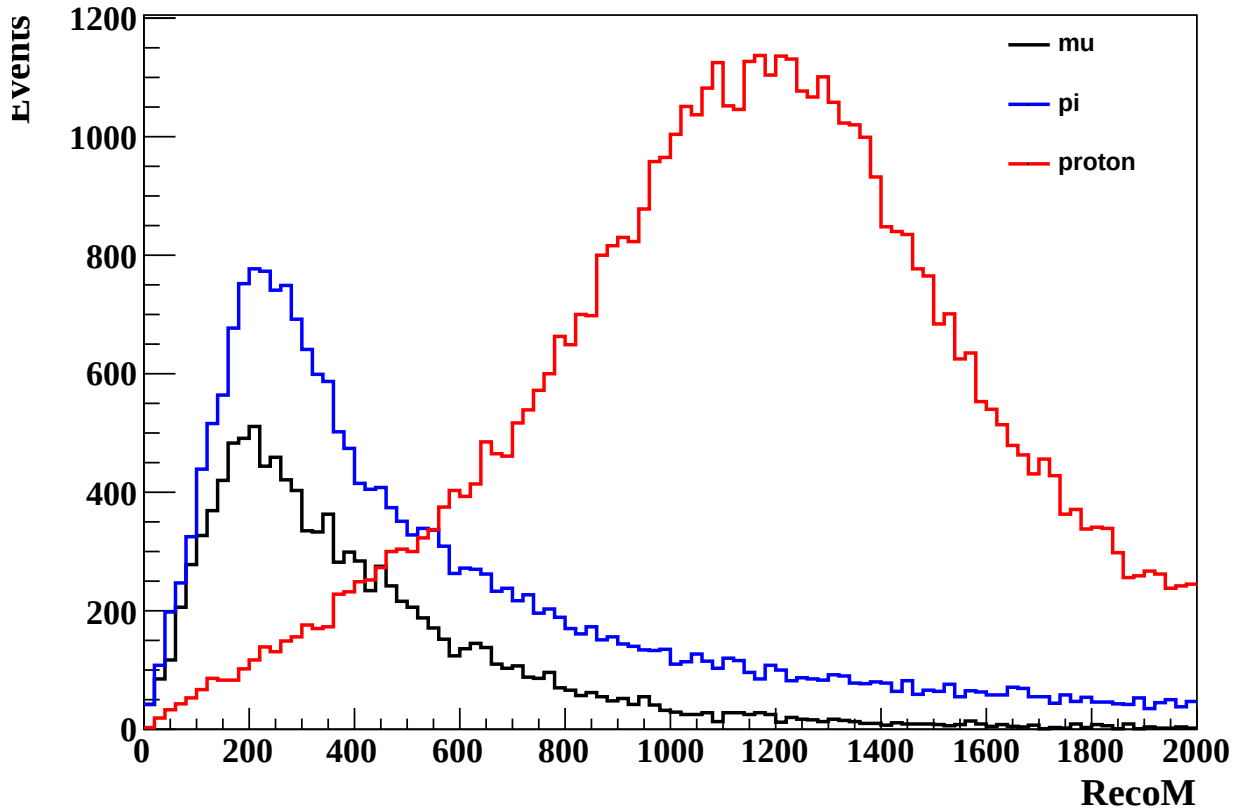


dedxID

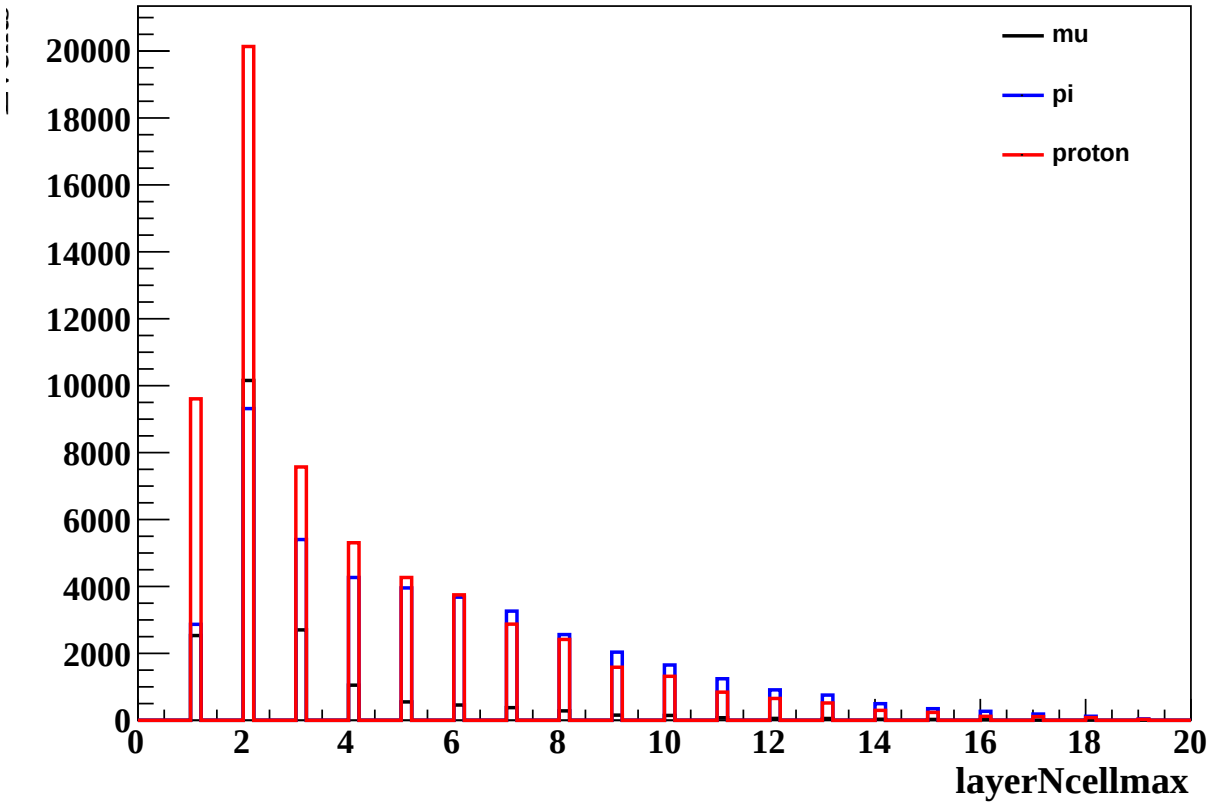


Used the old training

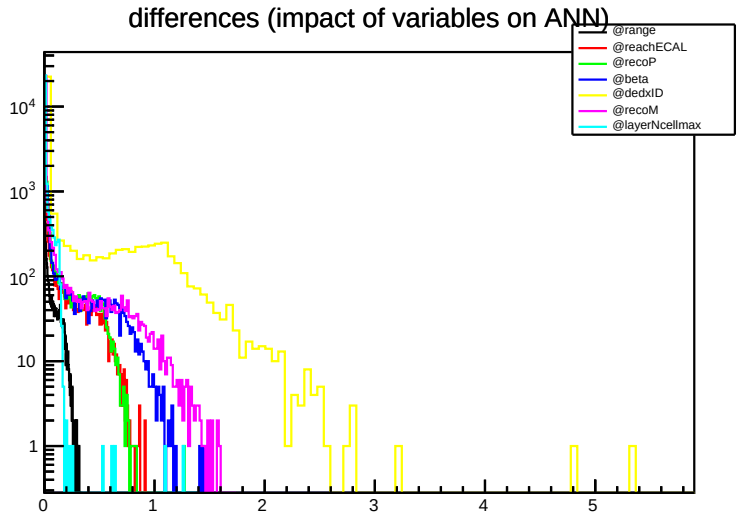
reconstructed mass

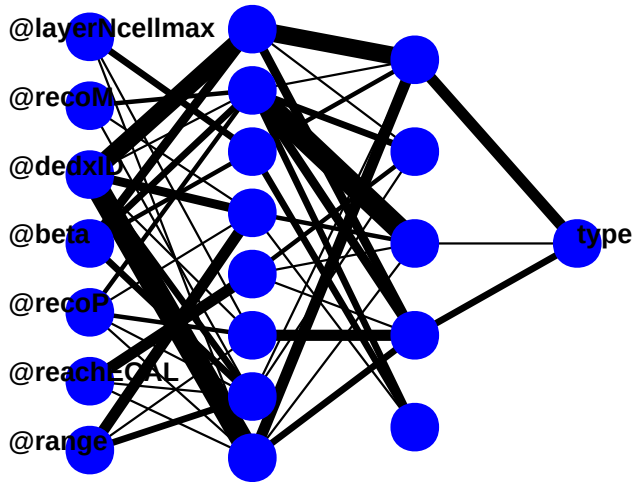


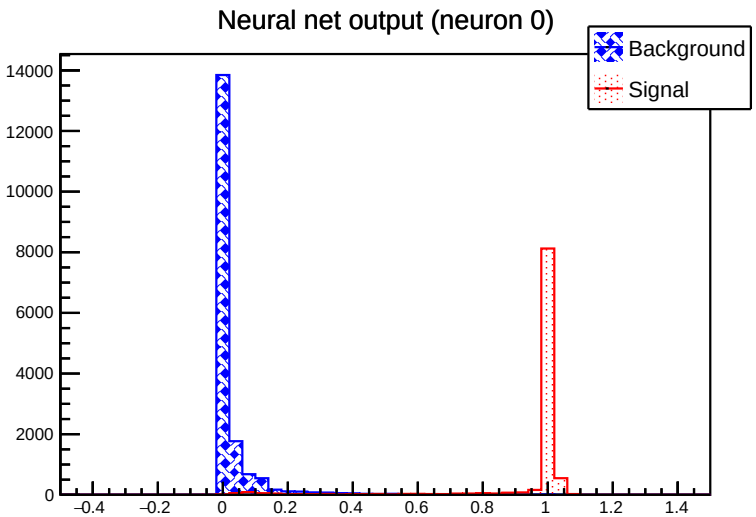
layerNcellmax

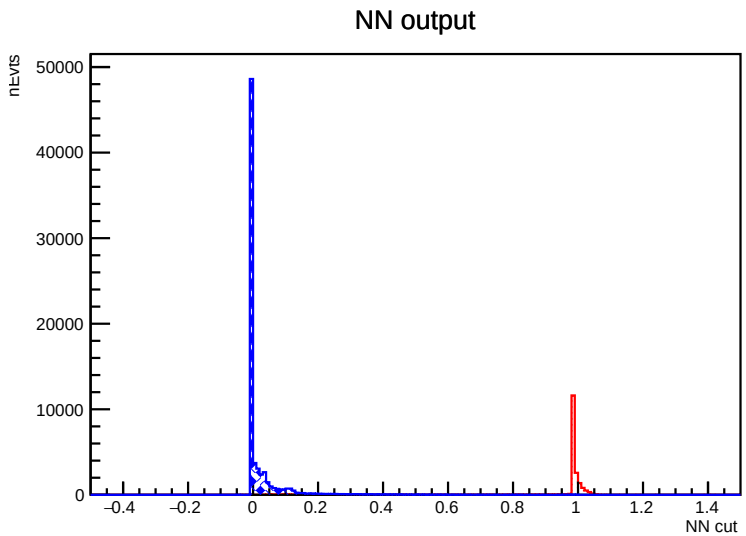


Neural Network

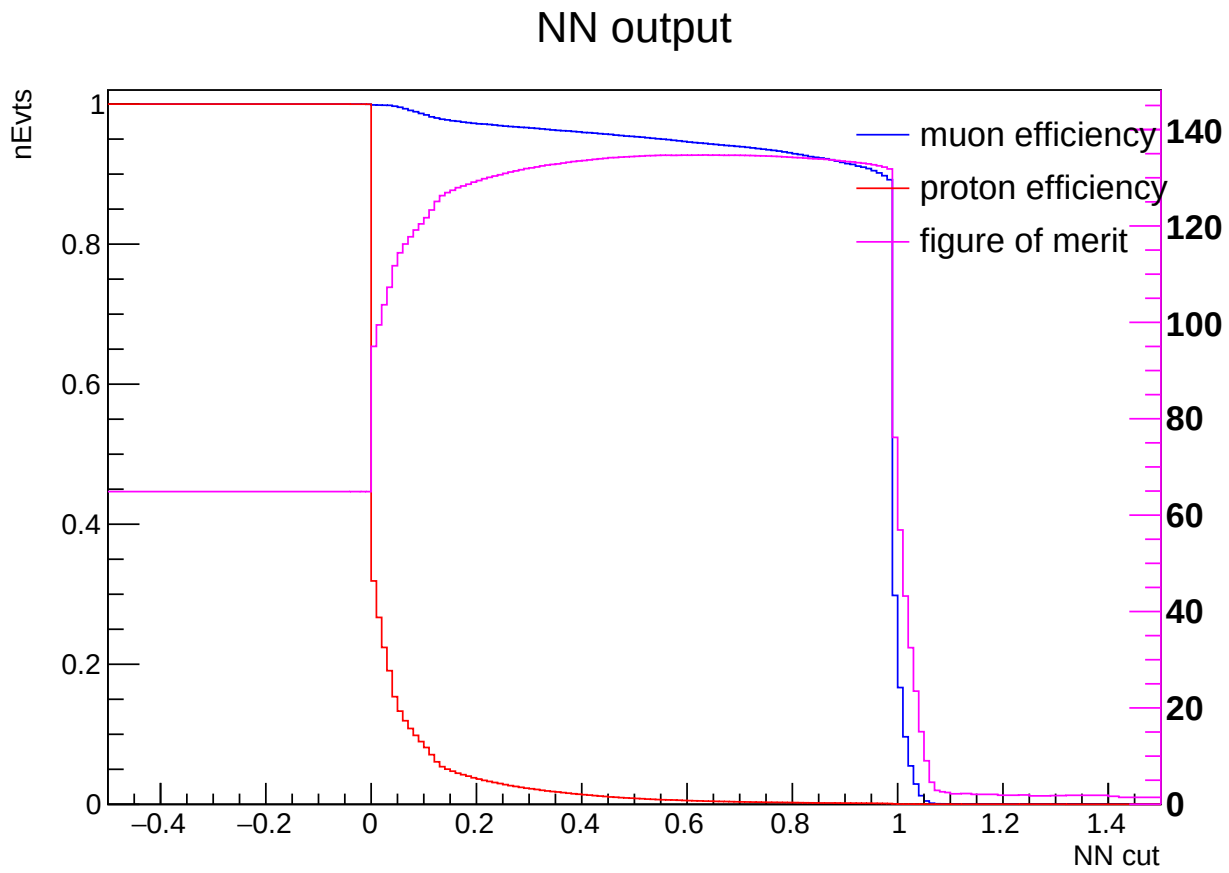








Purity and figure of merit



with cut 0.3, mu eff: 0.966, proton eff:0.022
with cut 0.54, mu eff: 0.950, proton eff: 0.007

Next Step

Improve range.