

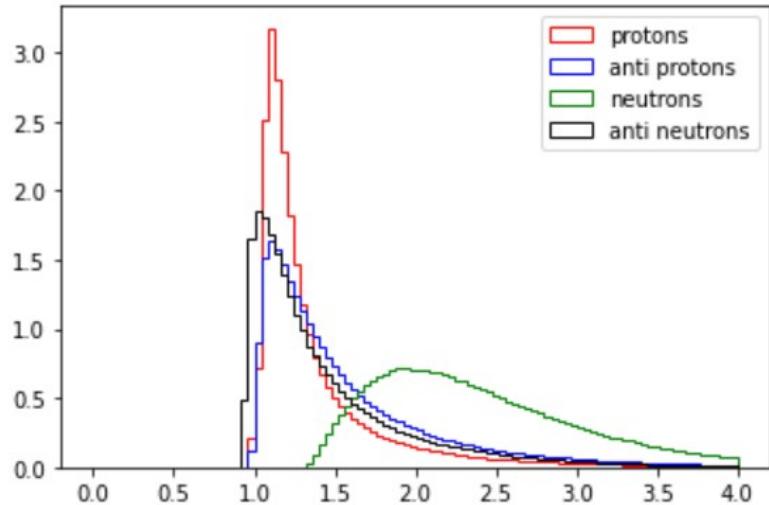
# **Anti-neutrons at Belle II**

MANTRA Meeting  
17/04/2025

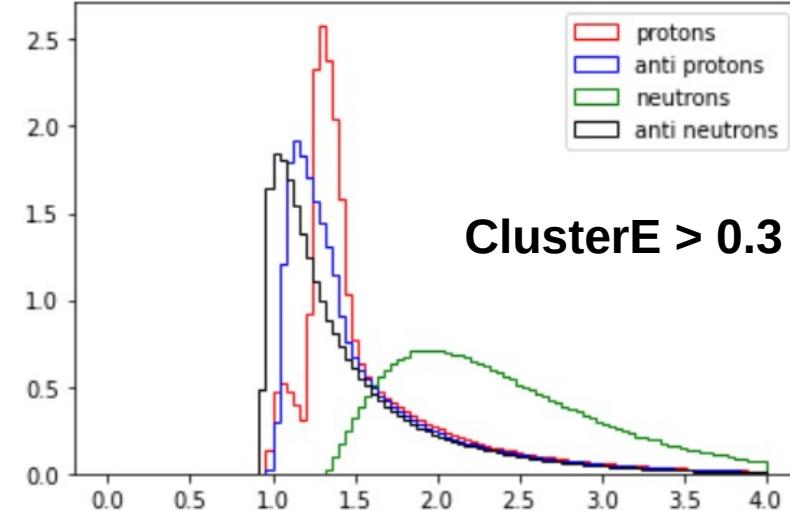
- We look for the agreement of the ECL variables for anti-neutrons and anti-protons, so that they can be used as proxies of each other.
- So far we saw that the distributions don't agree; but today we look further:
  - In bins of their respective MC momenta
  - In 5cm of the ECL

**ECL variables in bins of respective mcP  
(clusterE > 0.3)**

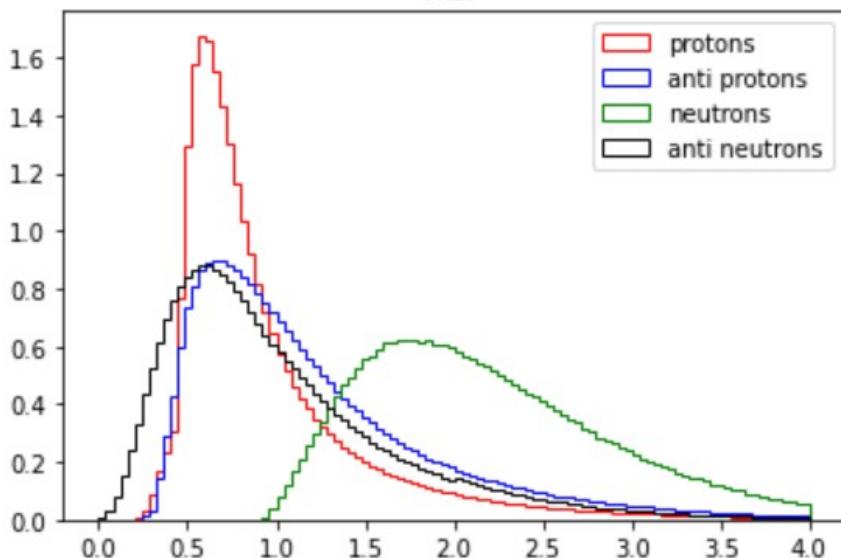
mcE



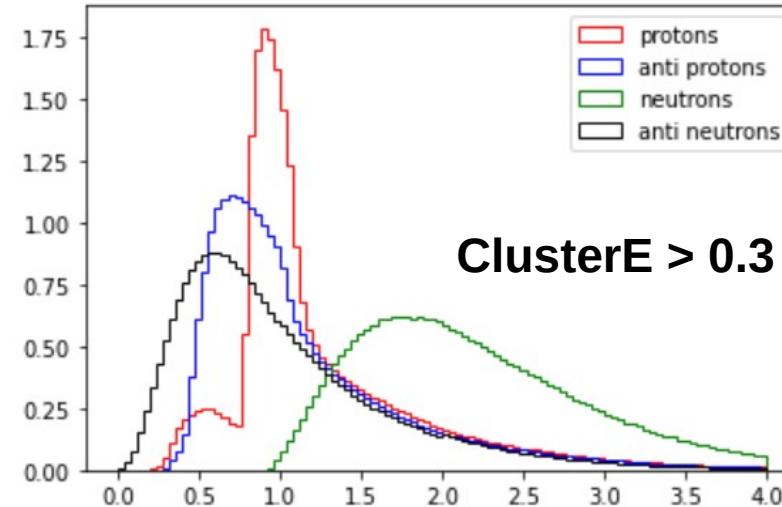
mcE

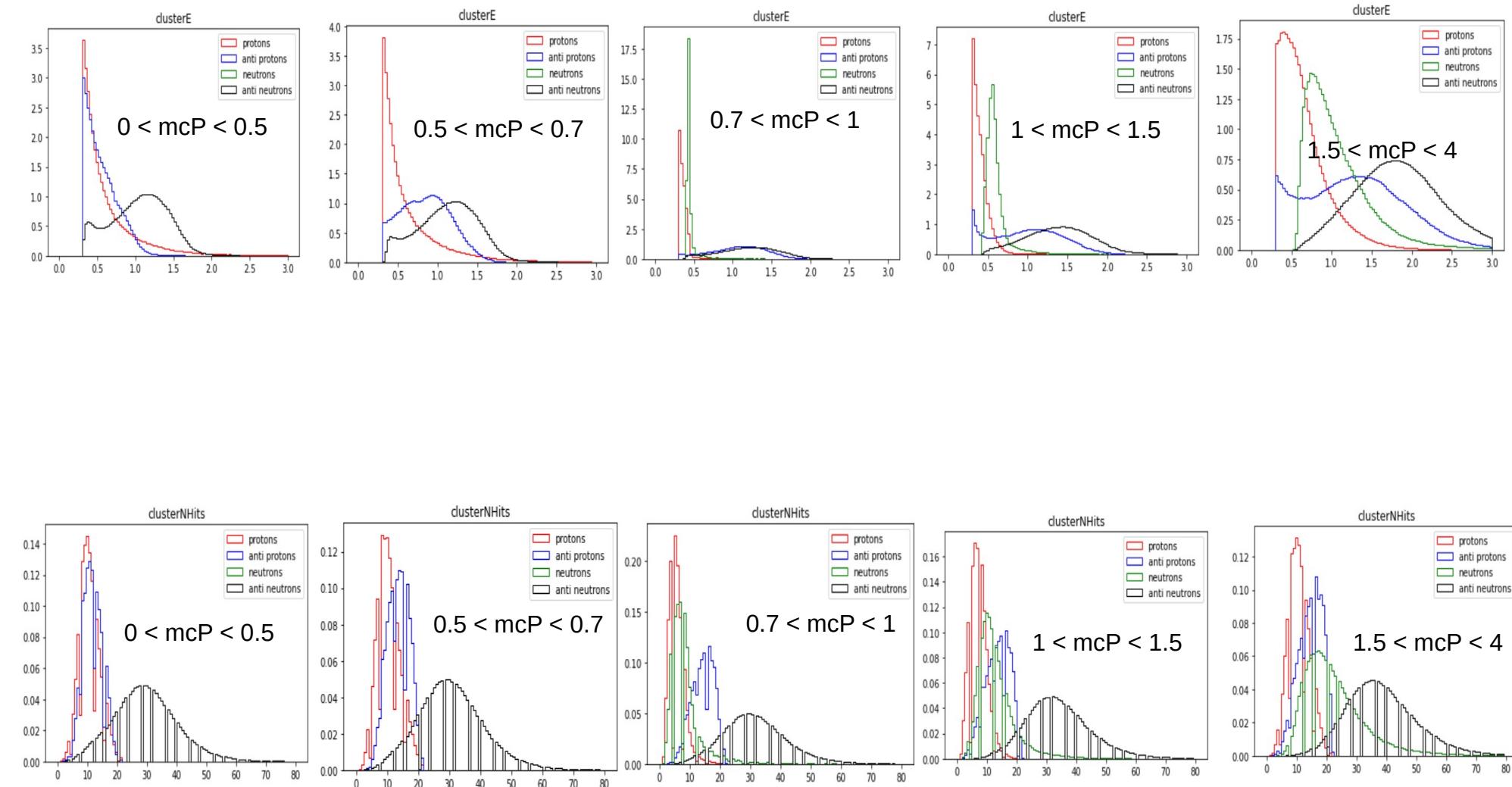


mcP



mcP





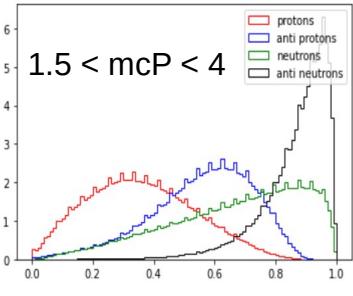
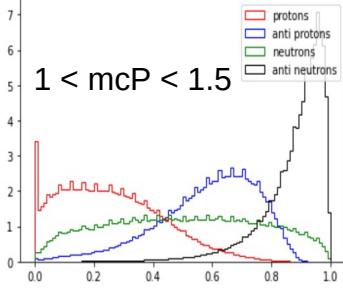
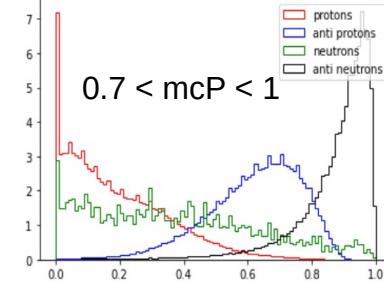
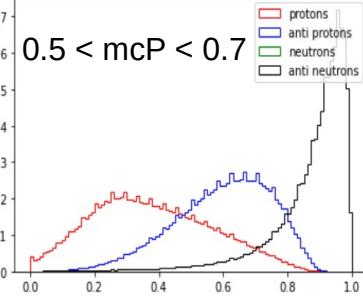
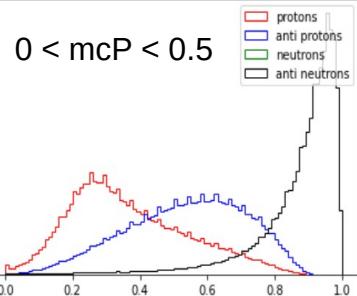
clusterLAT

clusterLAT

clusterLAT

clusterLAT

clusterLAT



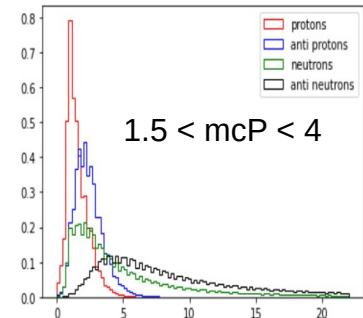
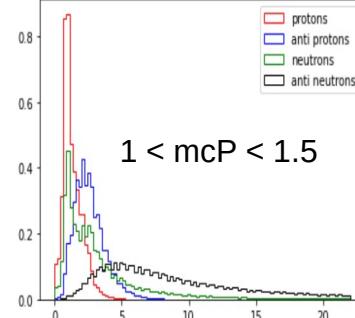
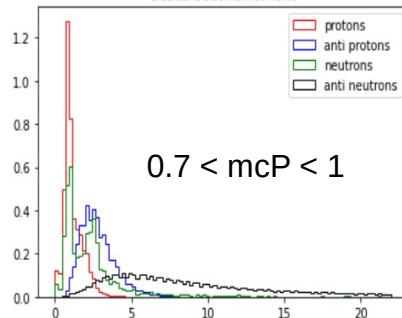
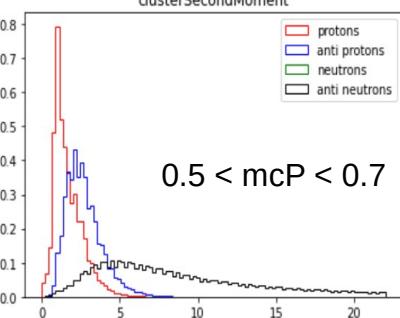
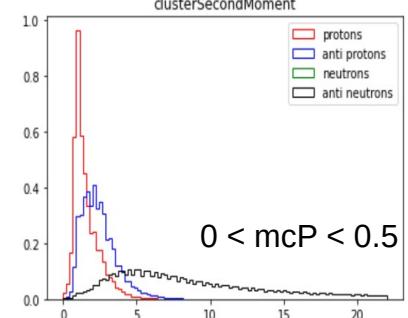
clusterSecondMoment

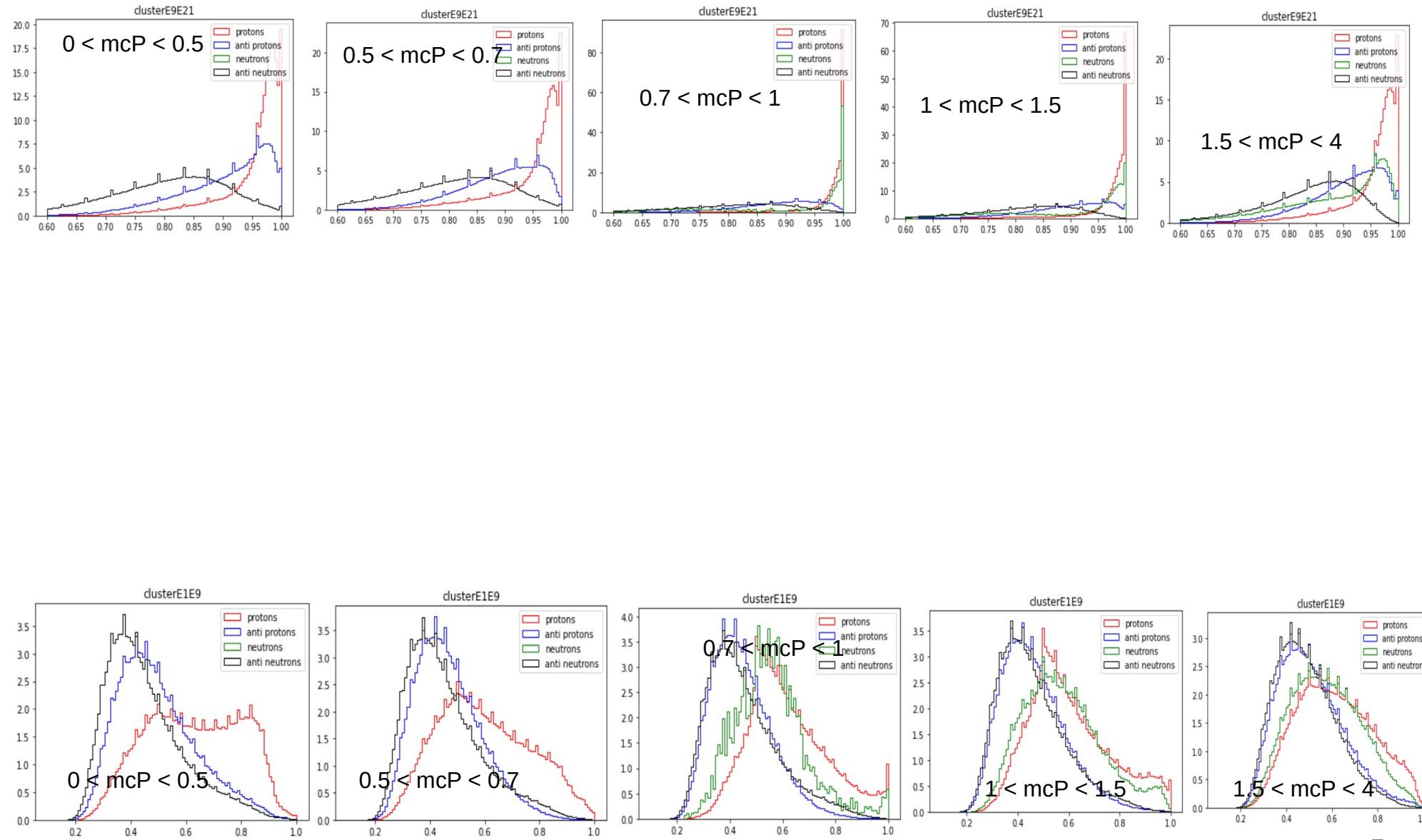
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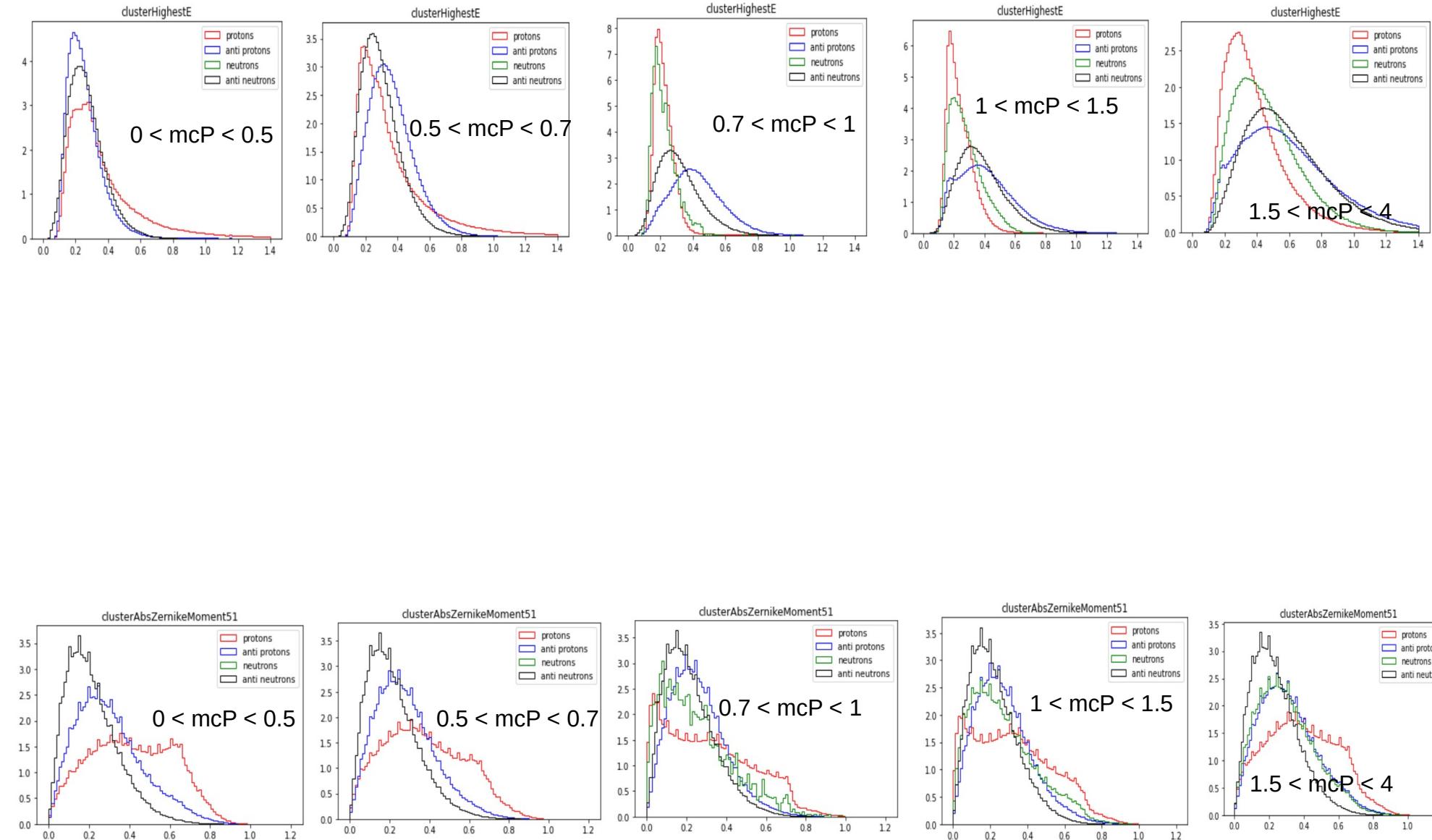
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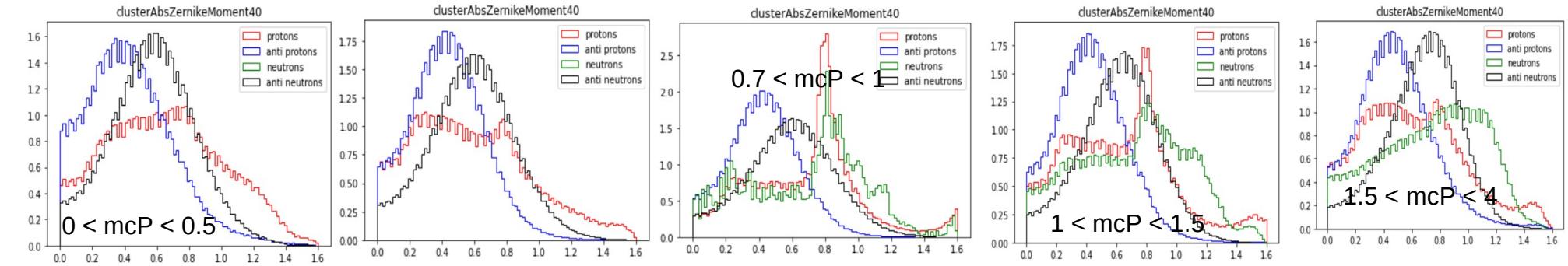
clusterSecondMoment

clusterSecondMoment



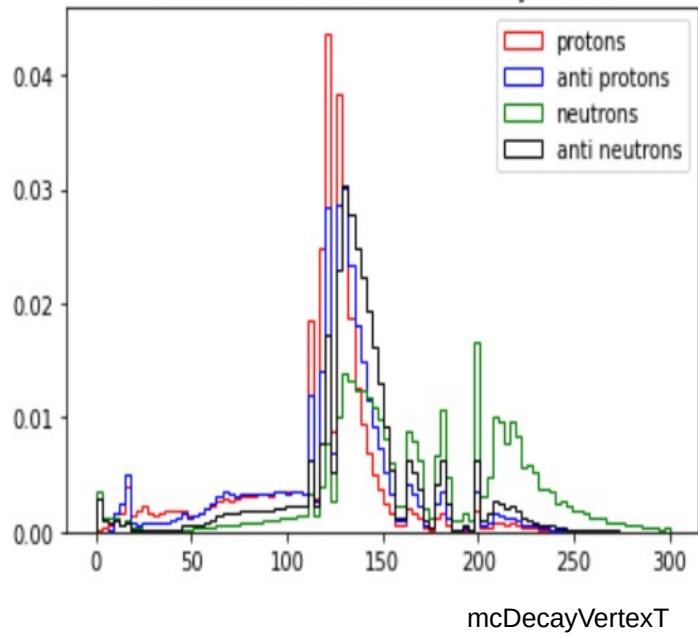




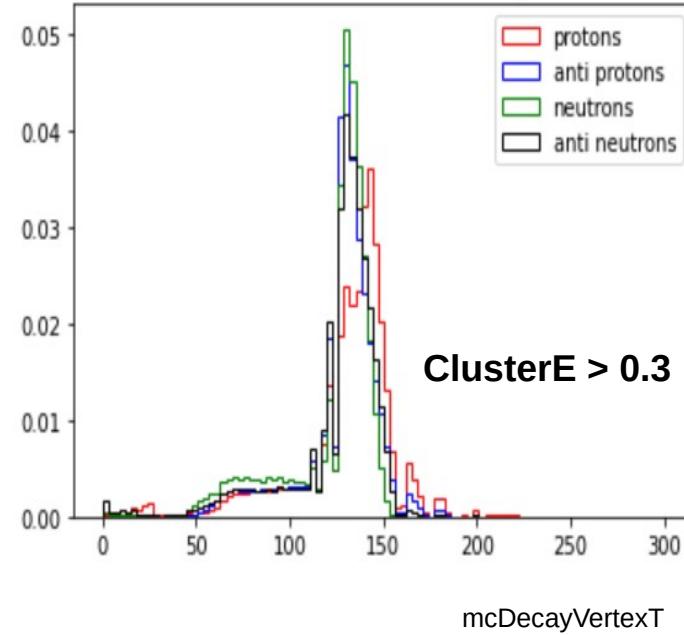


**ECL variables in the ECL region [125, 130] cm**

Transverse distance of the decay vertex



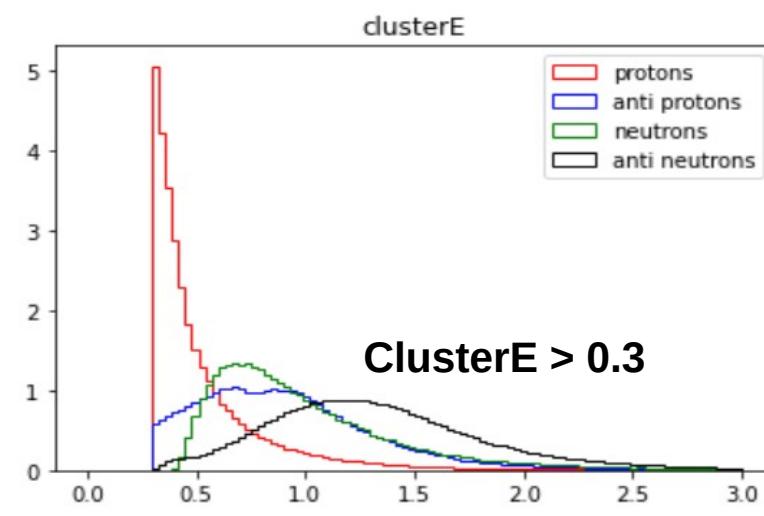
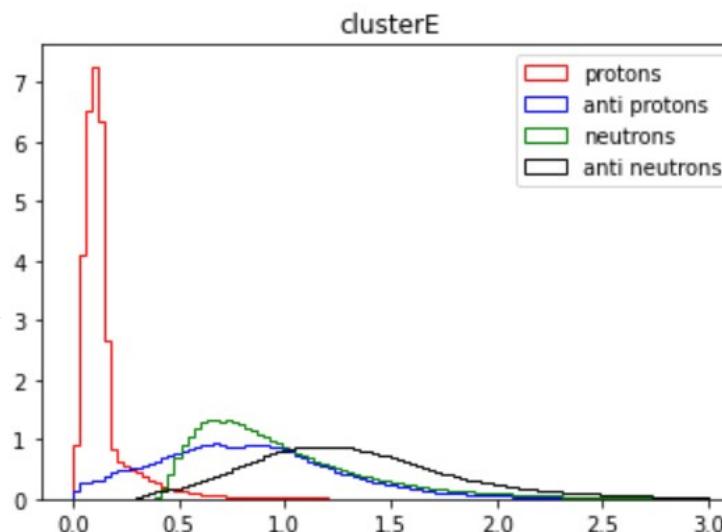
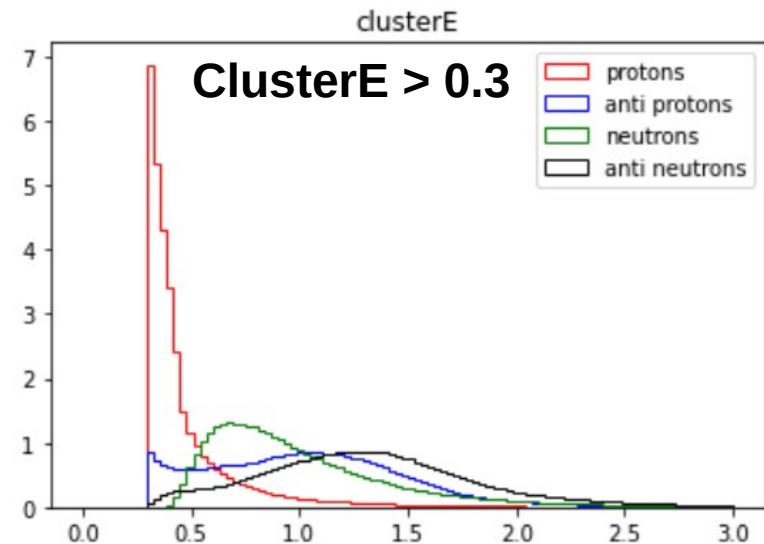
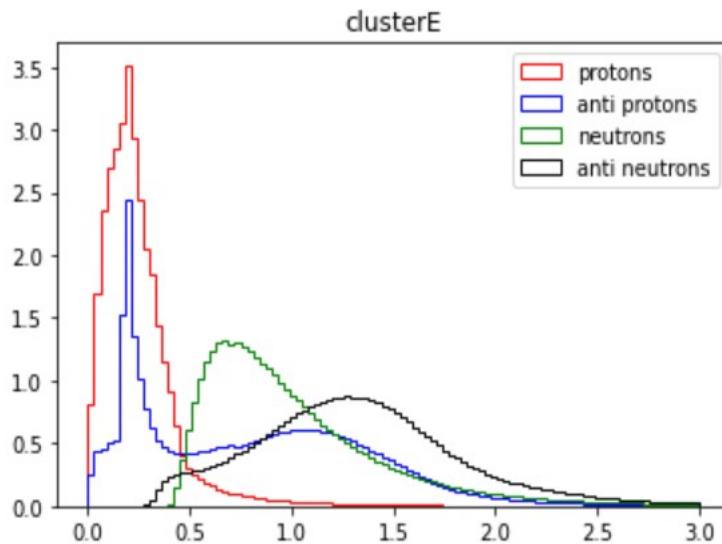
Transverse distance of the decay vertex



- 1<sup>st</sup> PXD layer at 1.4 cm
- 4<sup>th</sup> SVD layer at 14 cm
- CDC begins at 16 cm
- TOP begins at 118 cm
- **ECL begins at 125 cm**
- **ECL ends at 162 cm**
- KLM begins at 200 cm

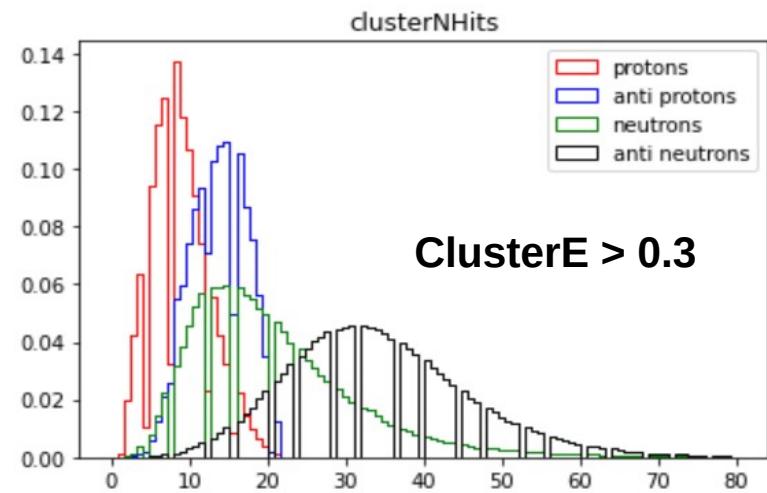
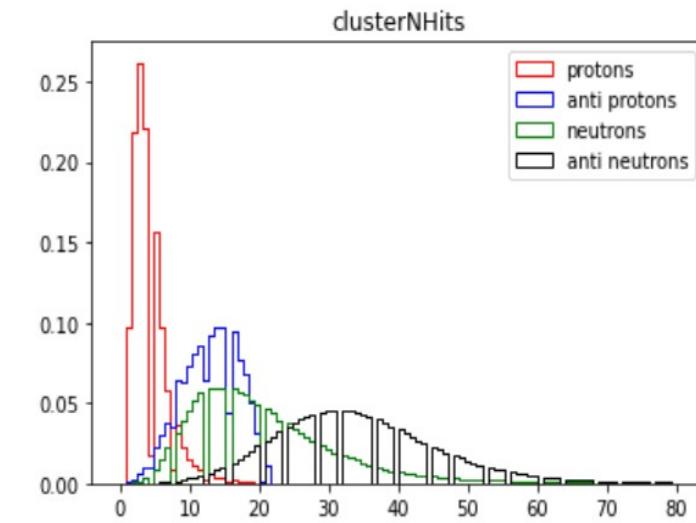
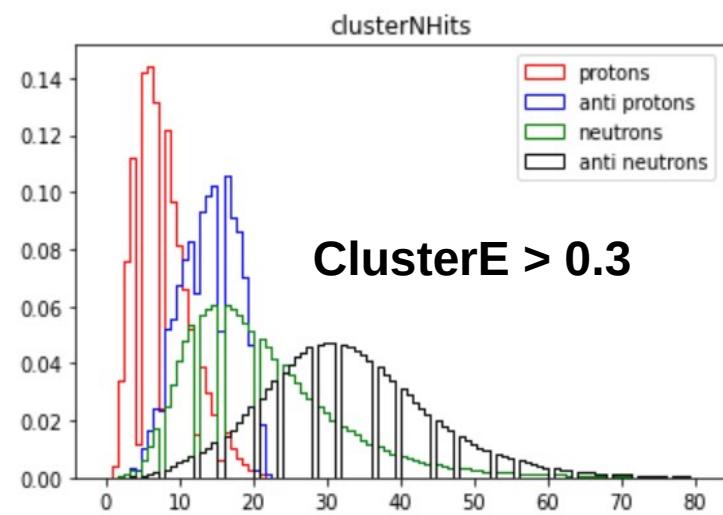
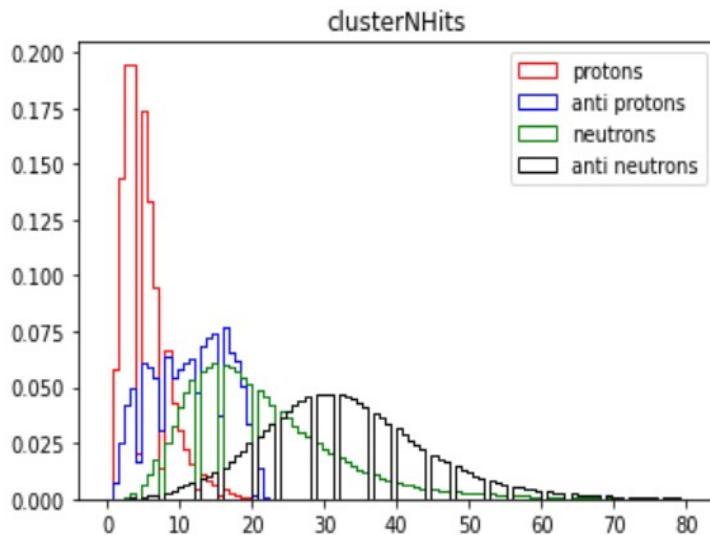
$$\text{McDecayVertexT} = \sqrt{[(\text{mcDevayVertexX})^2 + (\text{mcDevayVertexY})^2]}$$

DecayVertex = first point of interaction.

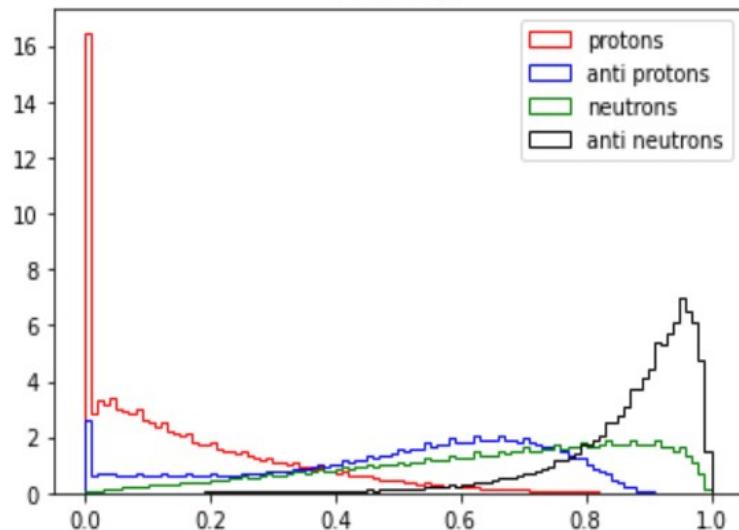


ECL region:  
[125, 130] cm

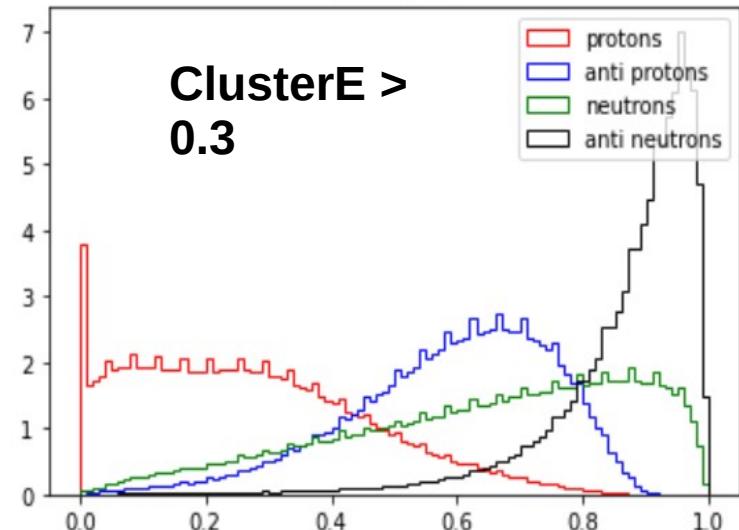




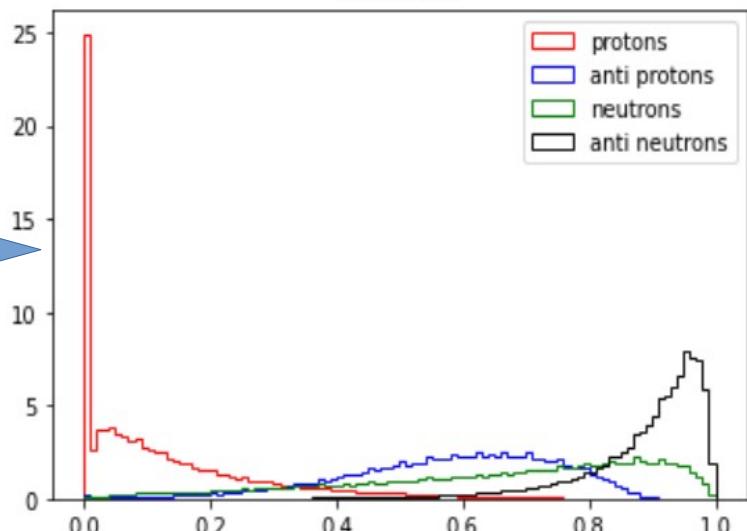
clusterLAT



clusterLAT



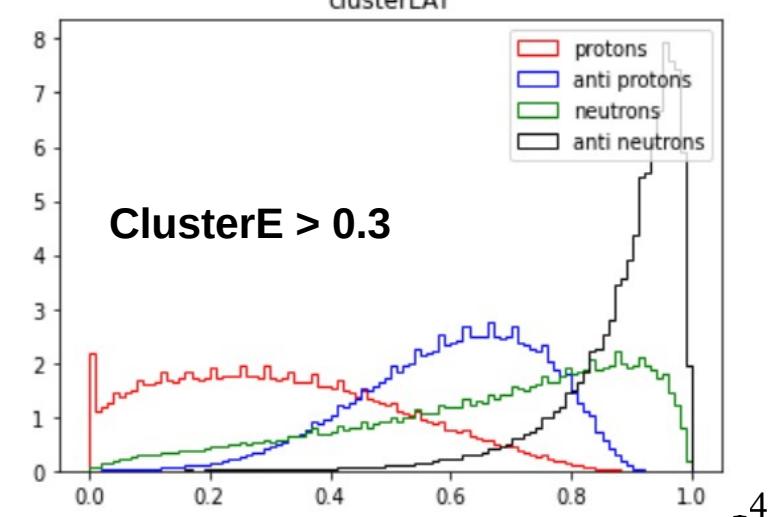
clusterLAT



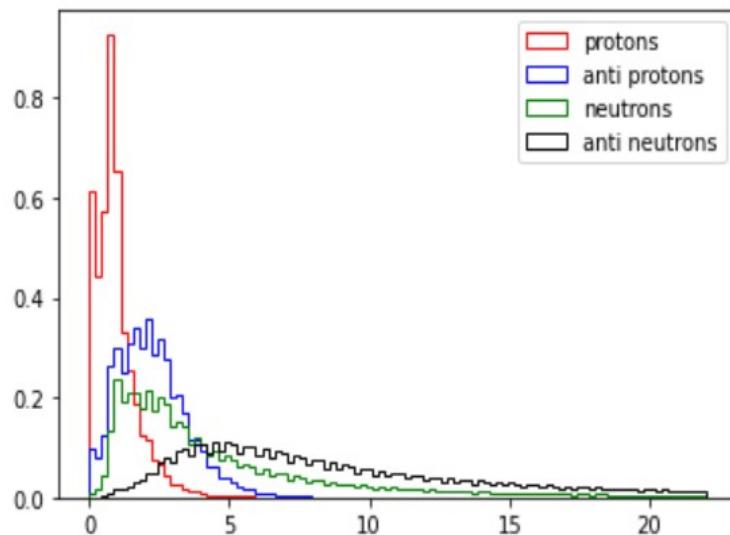
ECL region:  
[125, 130] cm



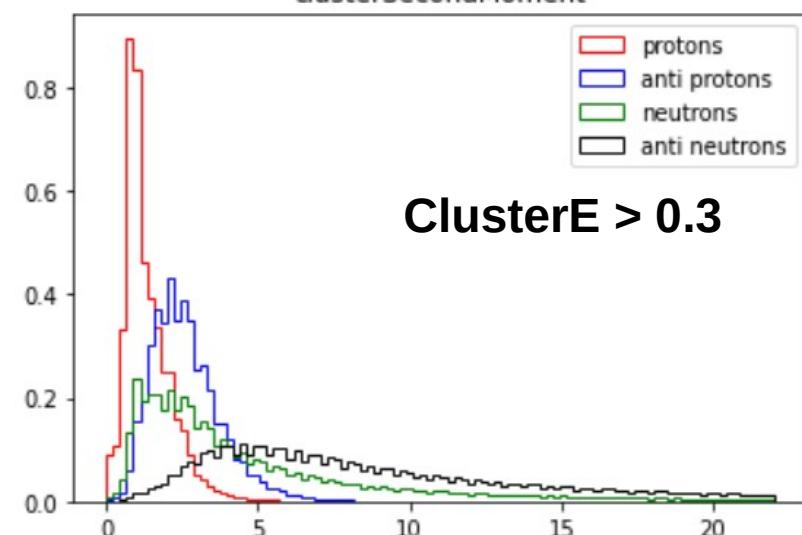
clusterLAT



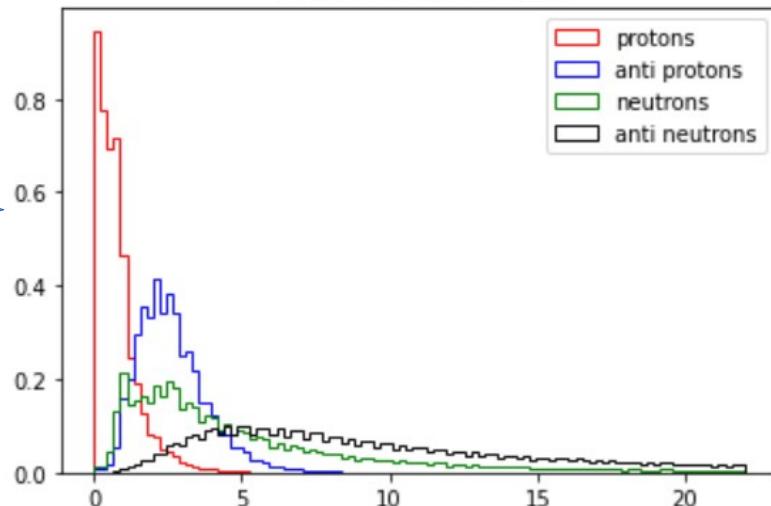
clusterSecondMoment



clusterSecondMoment

**ClusterE > 0.3**

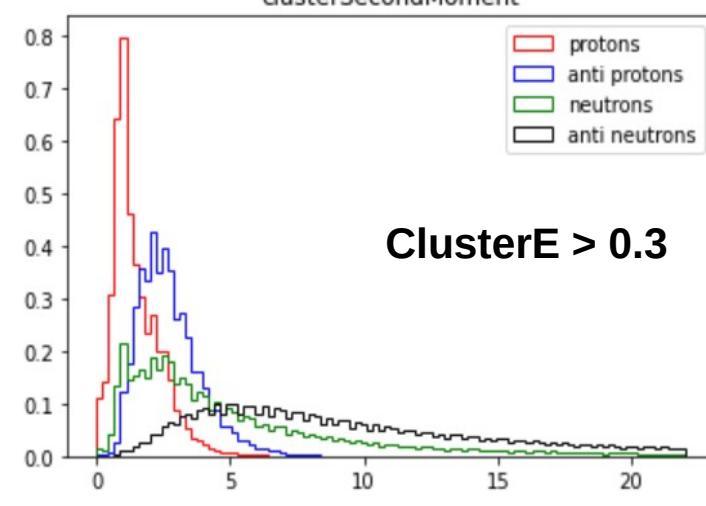
clusterSecondMoment



ECL region:  
[125, 130] cm

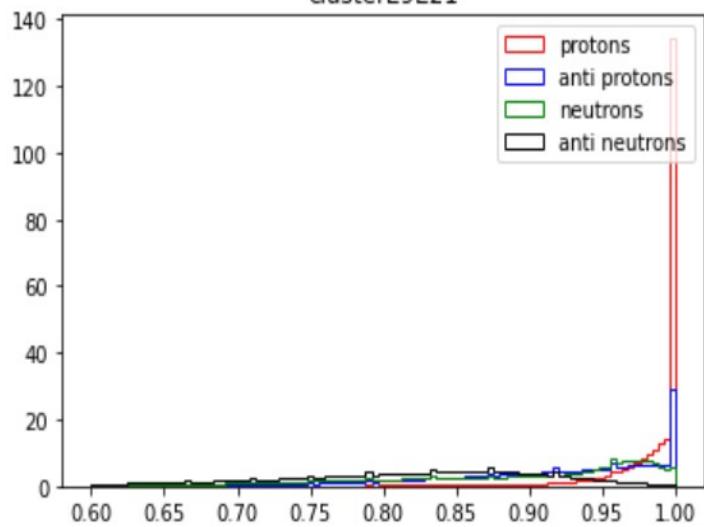


clusterSecondMoment

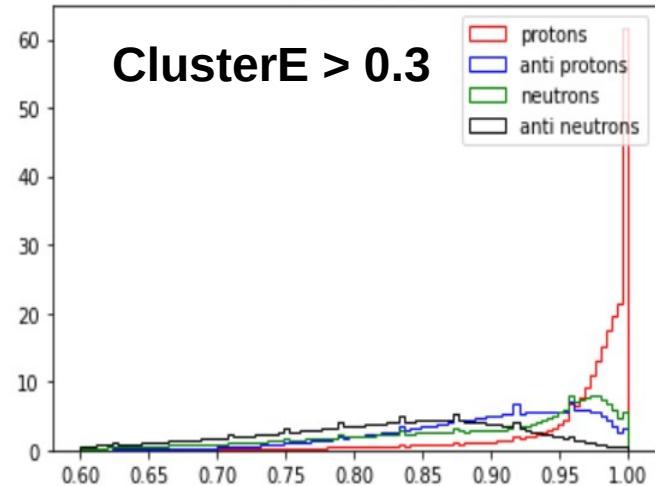
**ClusterE > 0.3**

15

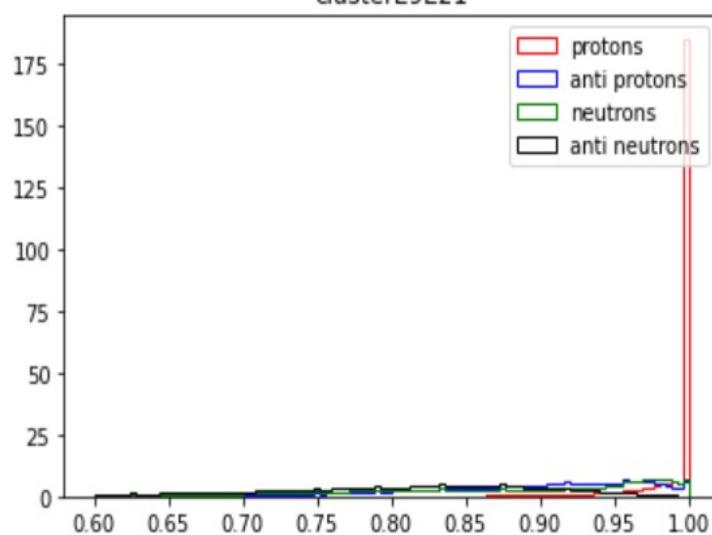
clusterE9E21



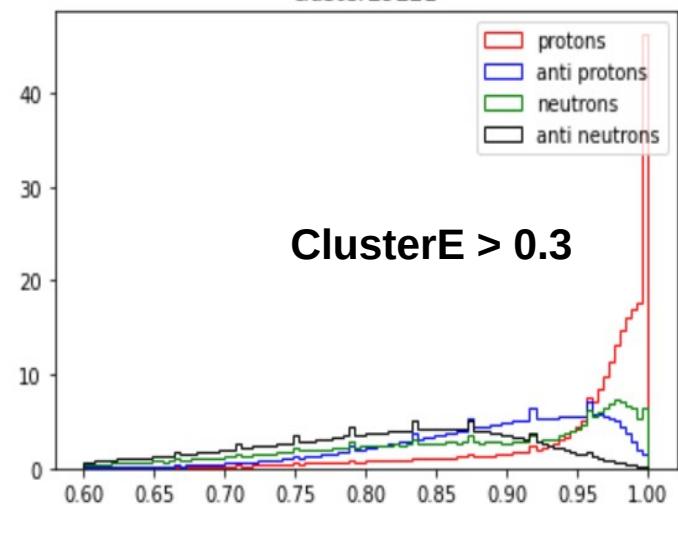
clusterE9E21

**ClusterE > 0.3**

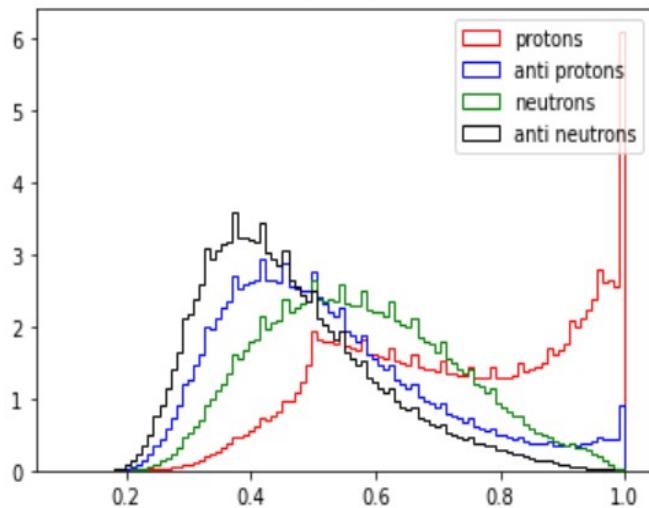
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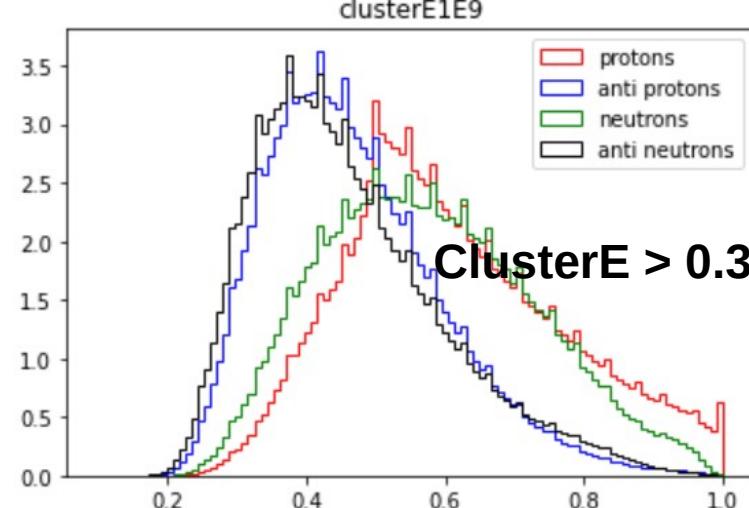
clusterE9E21

**ClusterE > 0.3**ECL region:  
[125, 130] cm

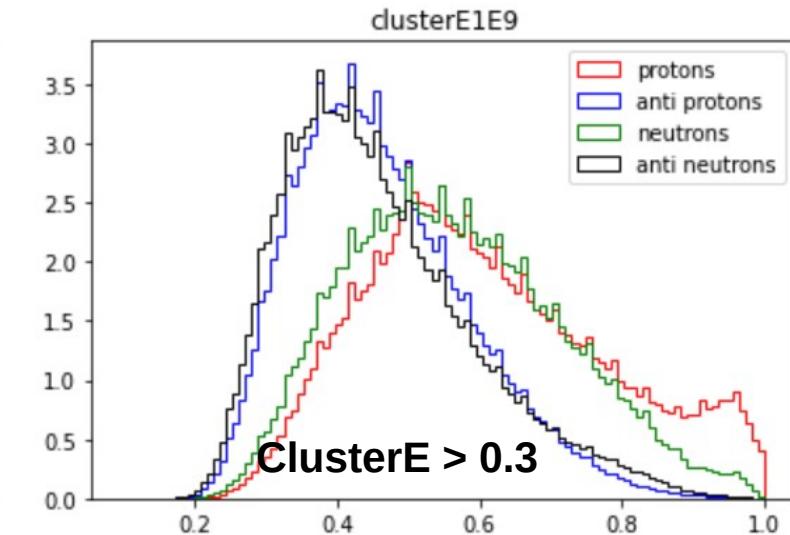
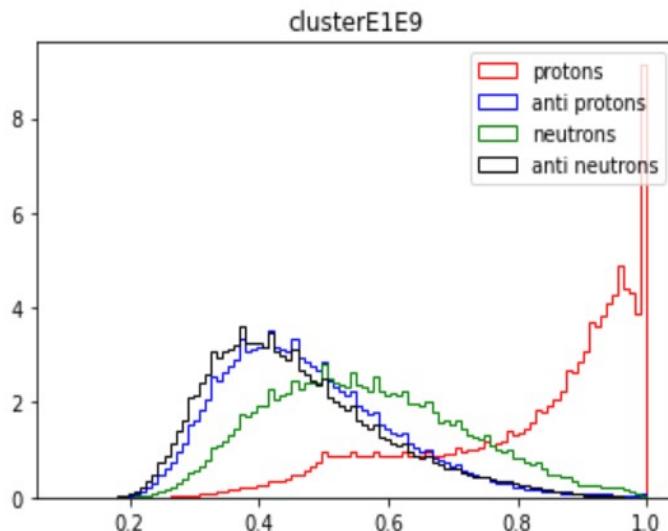
clusterE1E9



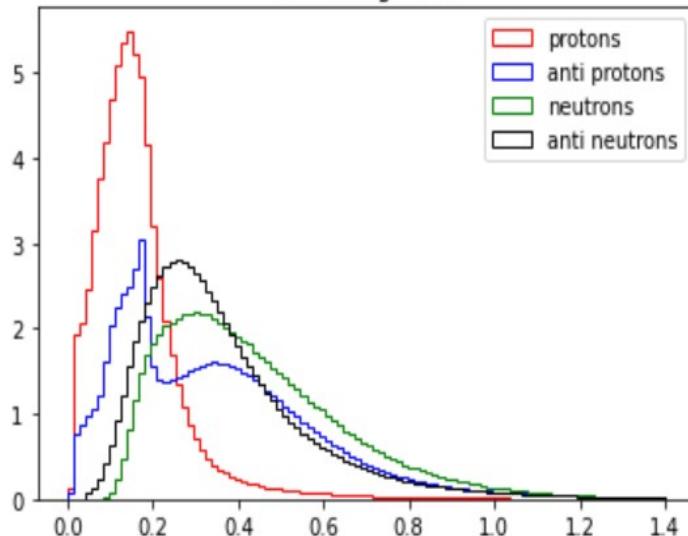
clusterE1E9



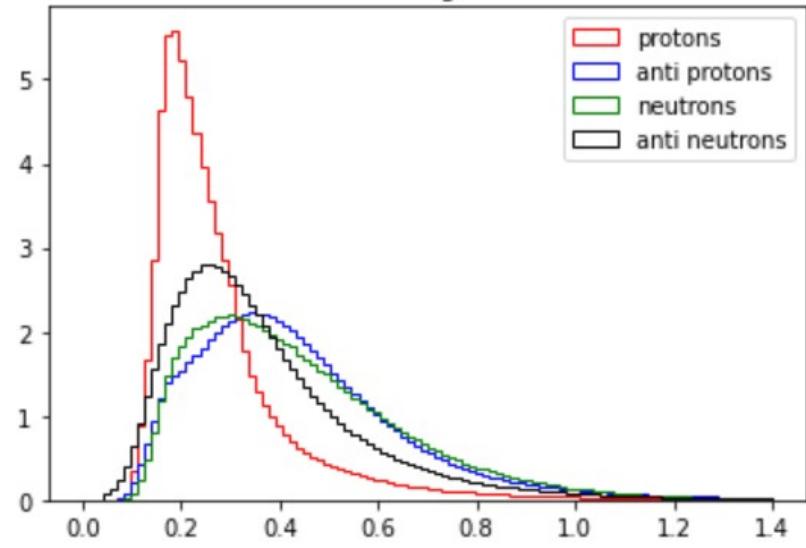
ECL region:  
[125, 130] cm



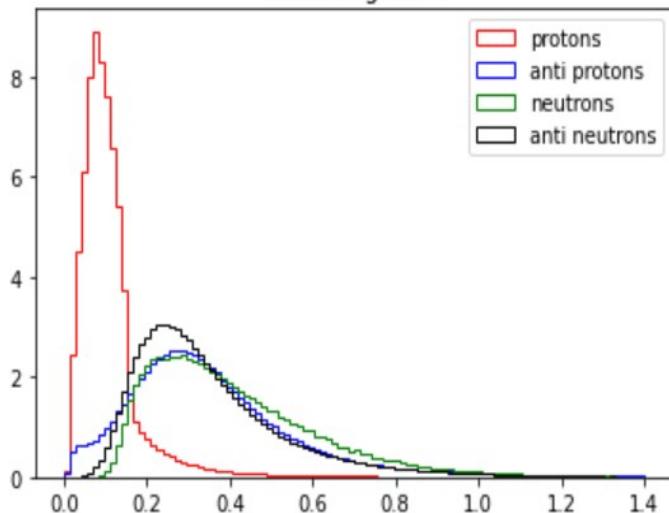
clusterHighestE



clusterHighestE



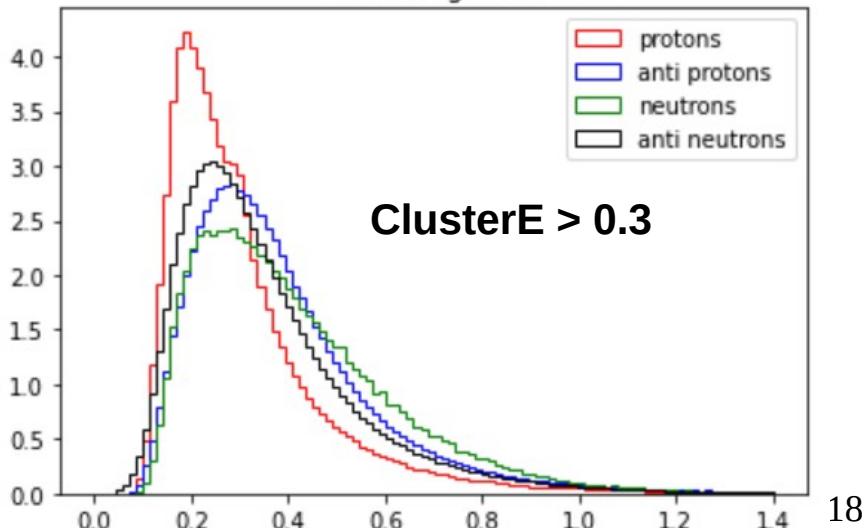
clusterHighestE



ECL region:  
[125, 130] cm

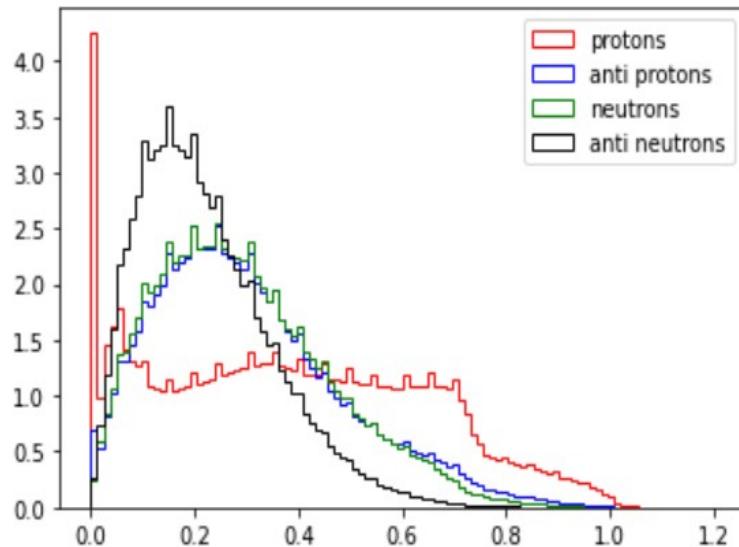


clusterHighestE

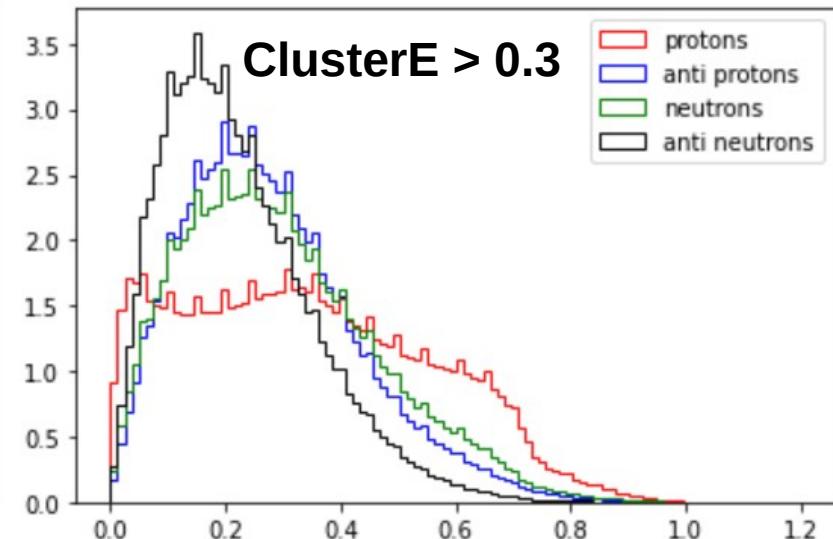


**ClusterE > 0.3**

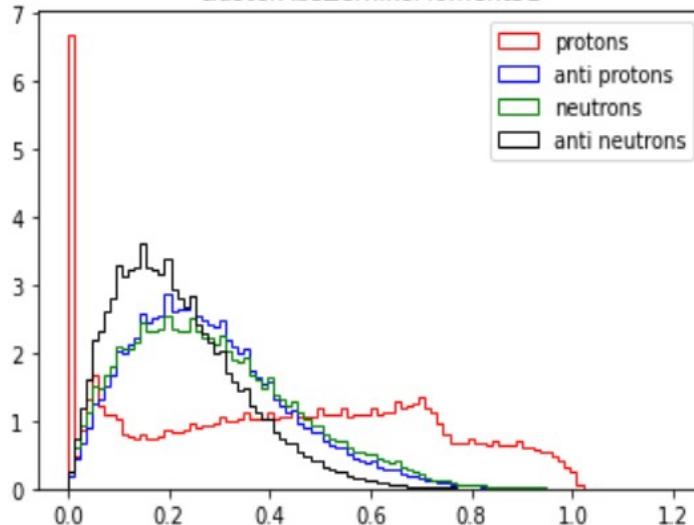
clusterAbsZernikeMoment51



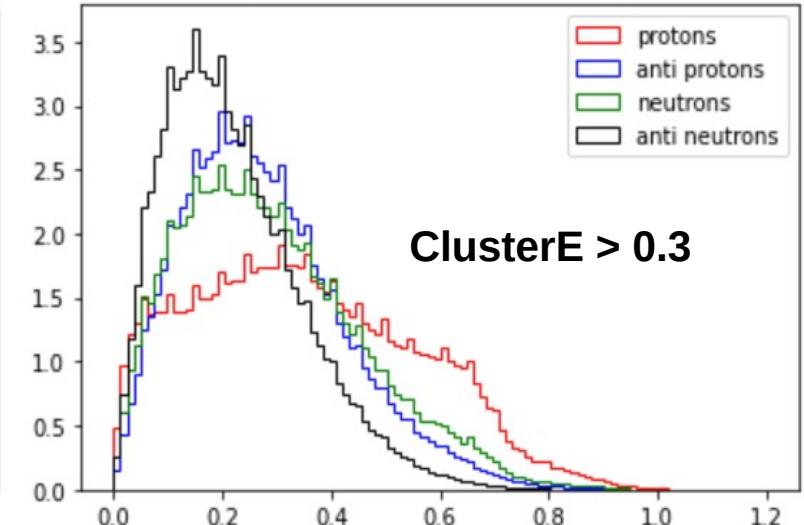
clusterAbsZernikeMoment51



clusterAbsZernikeMoment51



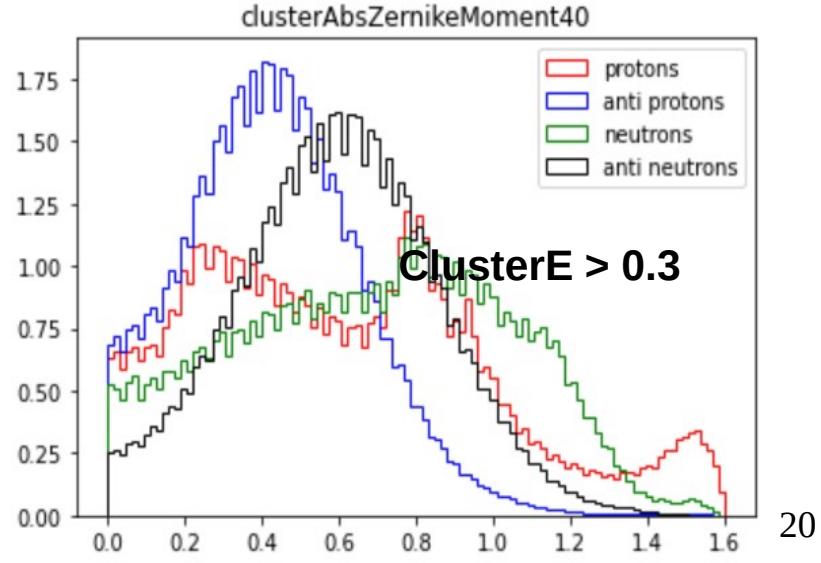
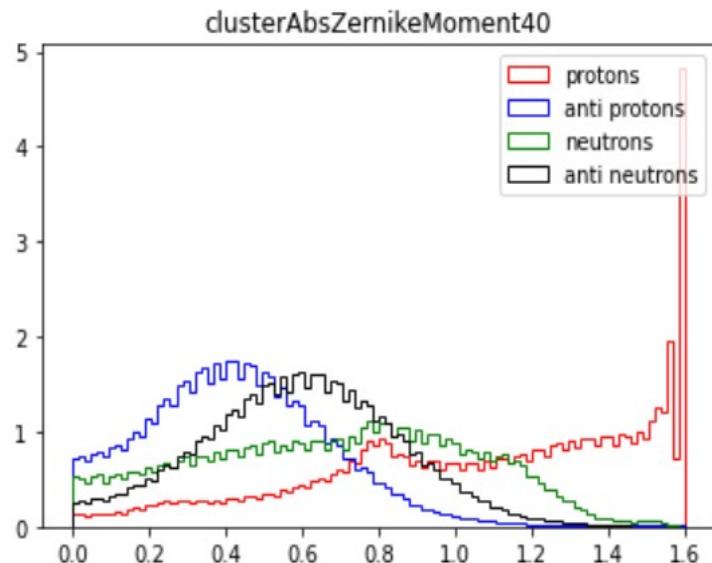
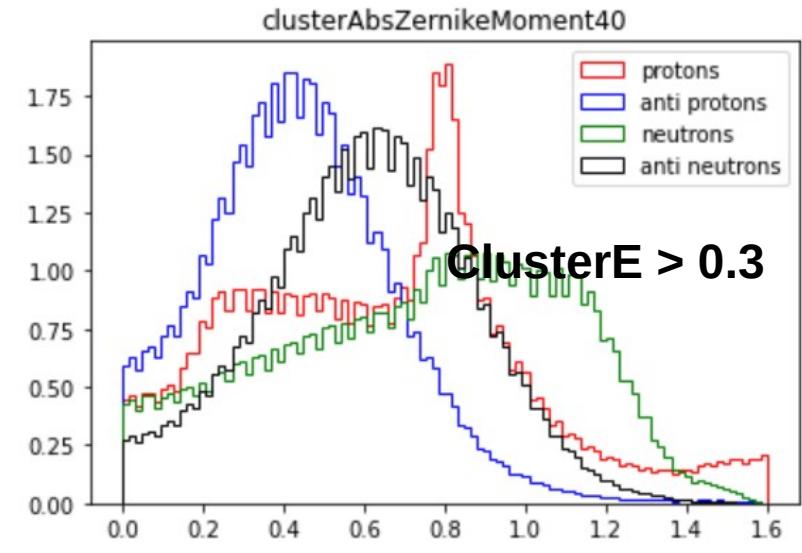
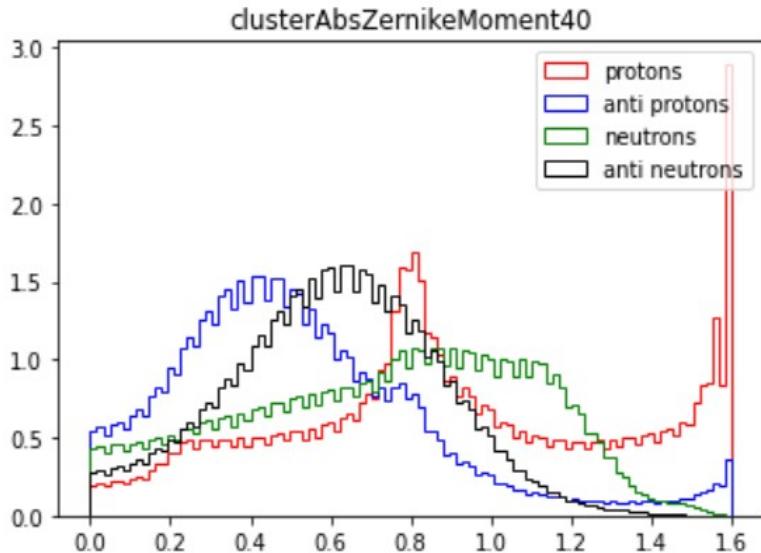
clusterAbsZernikeMoment51



ECL region:  
[125, 130] cm

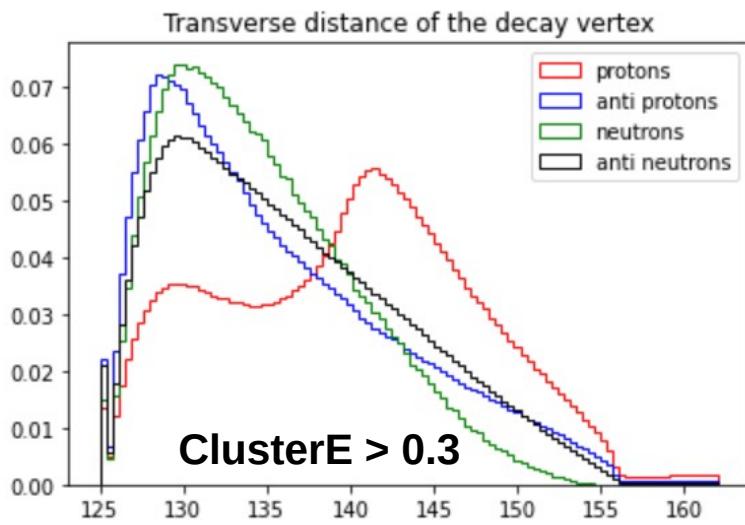
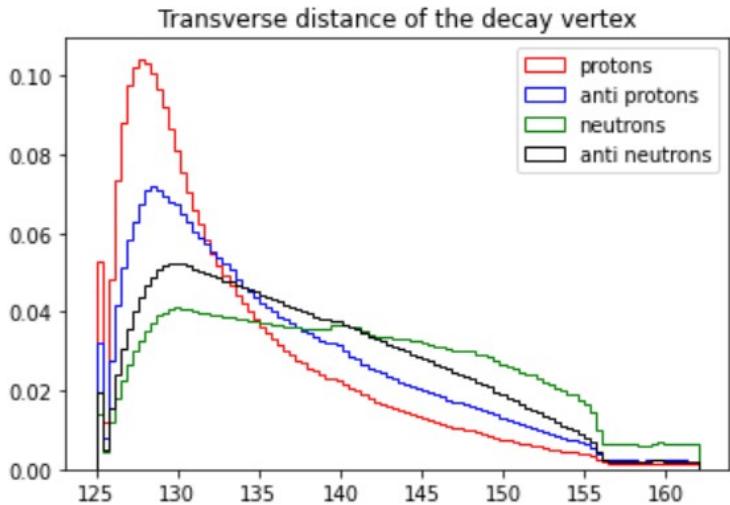


**ClusterE > 0.3**

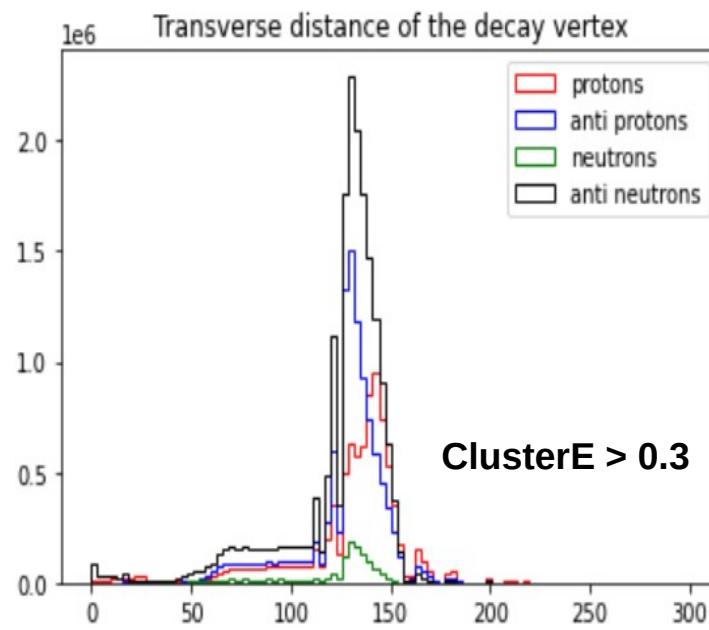
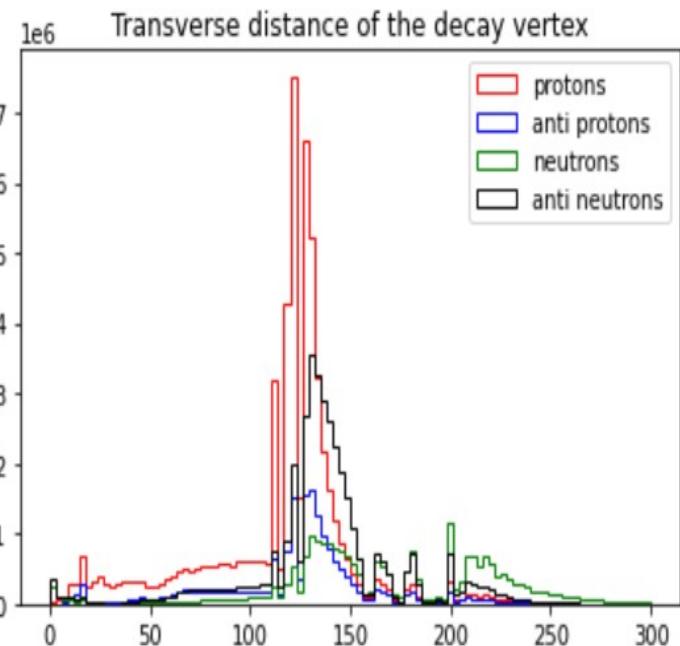


## **Backup Slides**

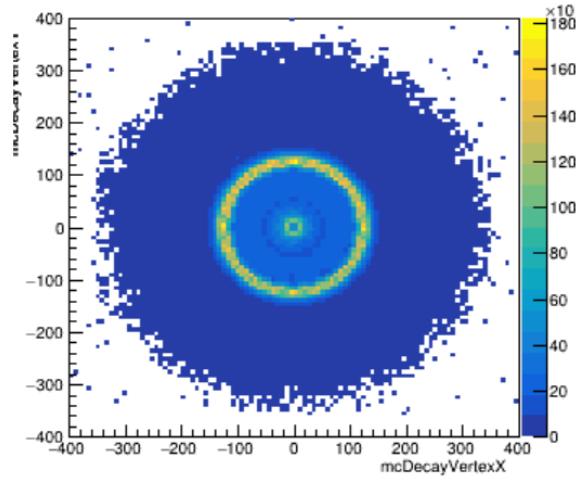
Zooming in to the complete ECL range (normalized):



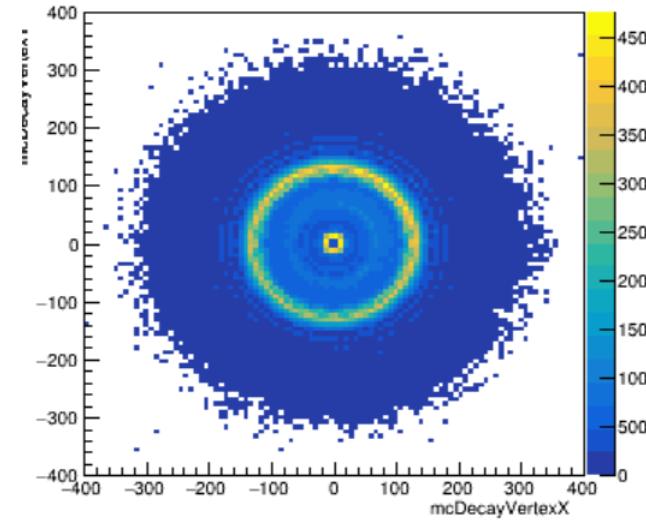
## Without Normalization



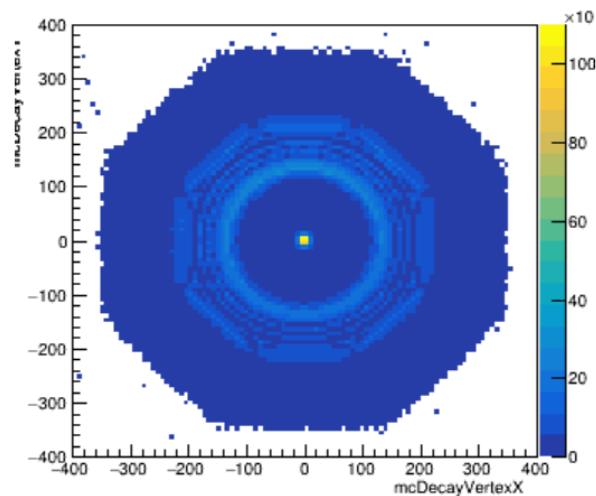
protons



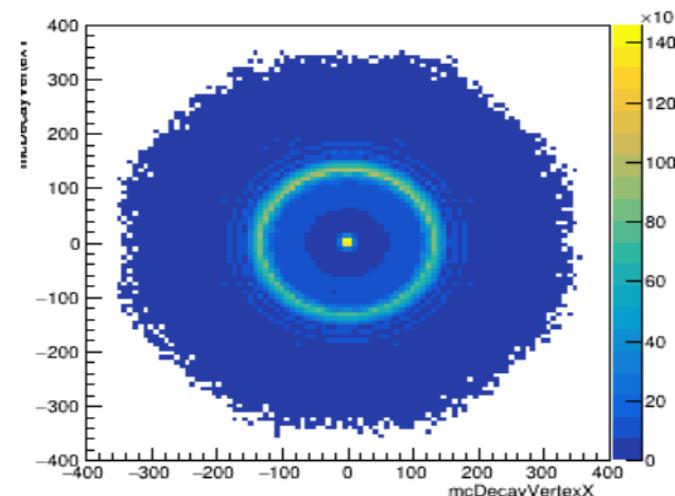
anti-protons



neutrons

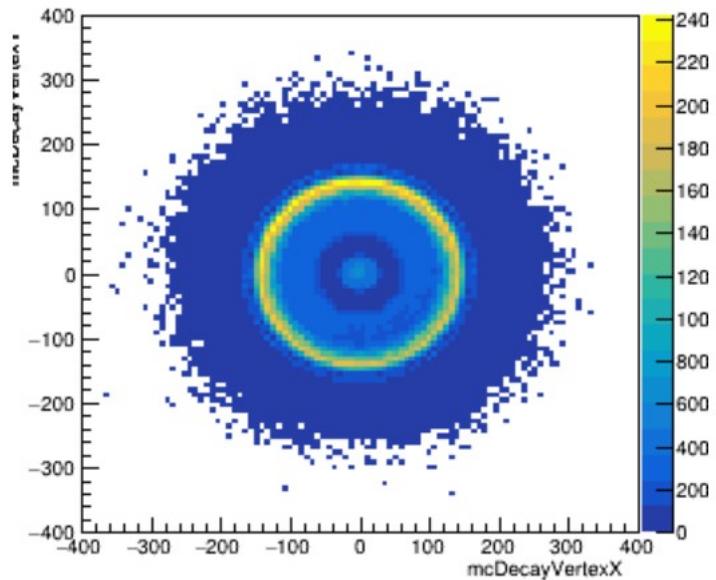


anti-neutrons

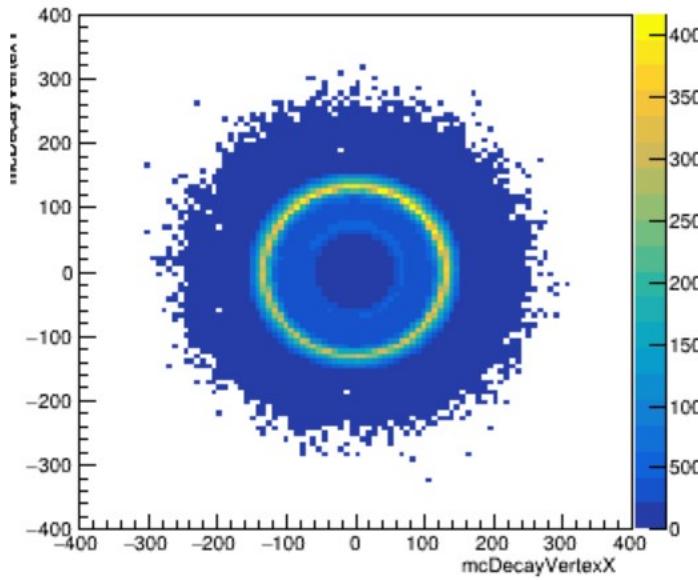


**ClusterE > 0.3**

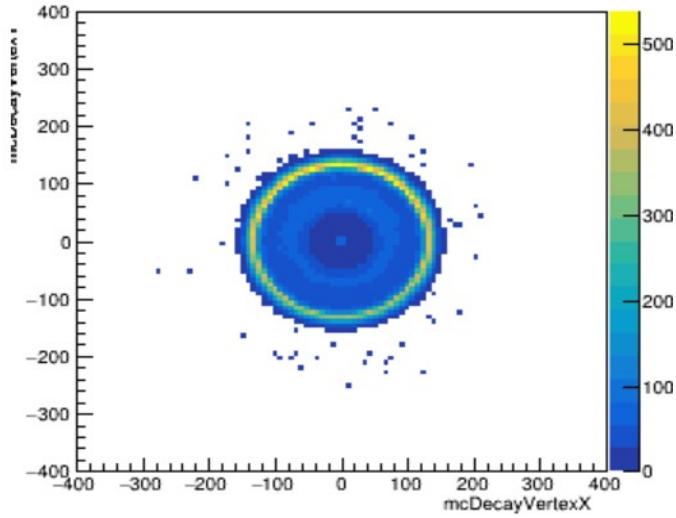
protons



anti-protons



neutrons



anti-neutrons

