# Shower Reconstruction Status

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LArIAT Meeting
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# Motivation

Shower identification can allow to:

- Improve cuts on pion inclusive analysis
- Allow to exclusive channel analysis (i.e. pion charge ex-change)
- Refined particle identification (electron/gamma)
- +hadronization studies (pi+ + Ar -> npi0 +X + N)

Desirable to obtain the number of showers, direction, length (&calorimetry) per event

# General Performance

**Clustering** algorithm, using hits as input.

**Showering** algorithm, using clusters as input

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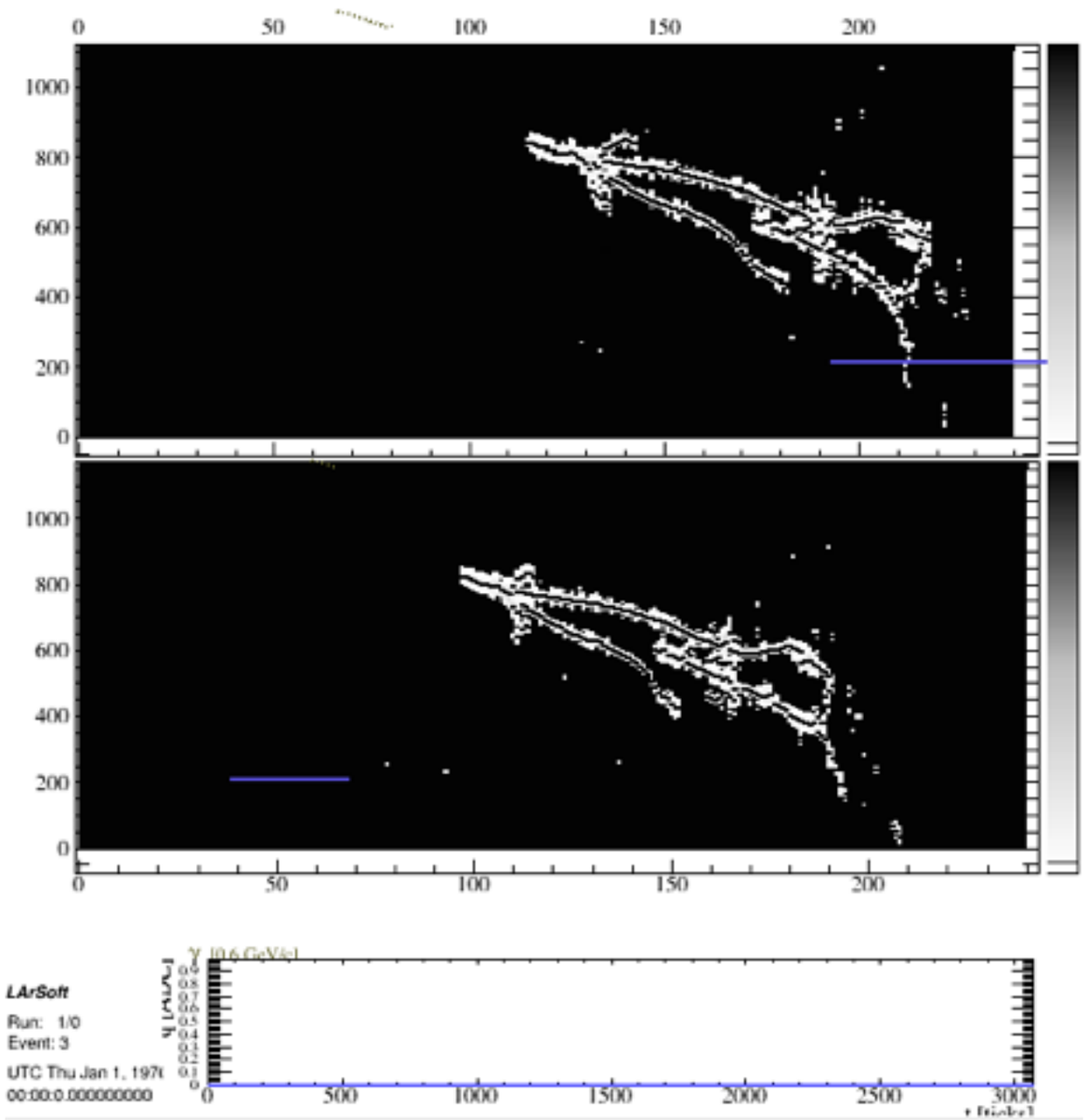
LArSoft

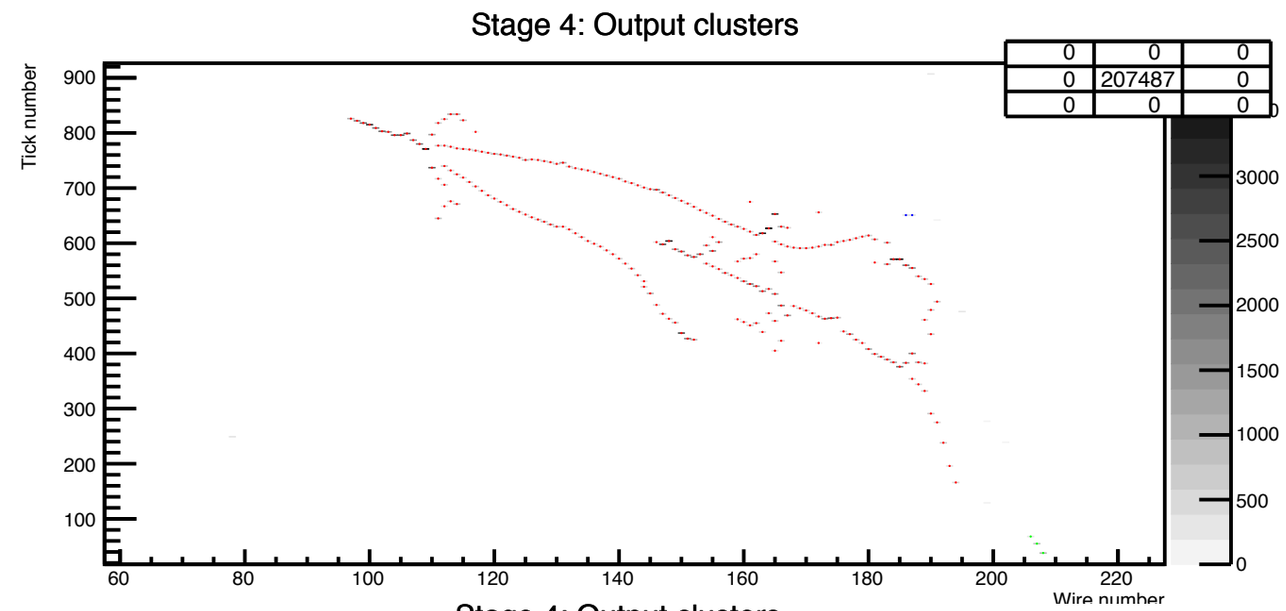
**FuzzyCluster**
not working in LArIAT
(maybe need some debugging)

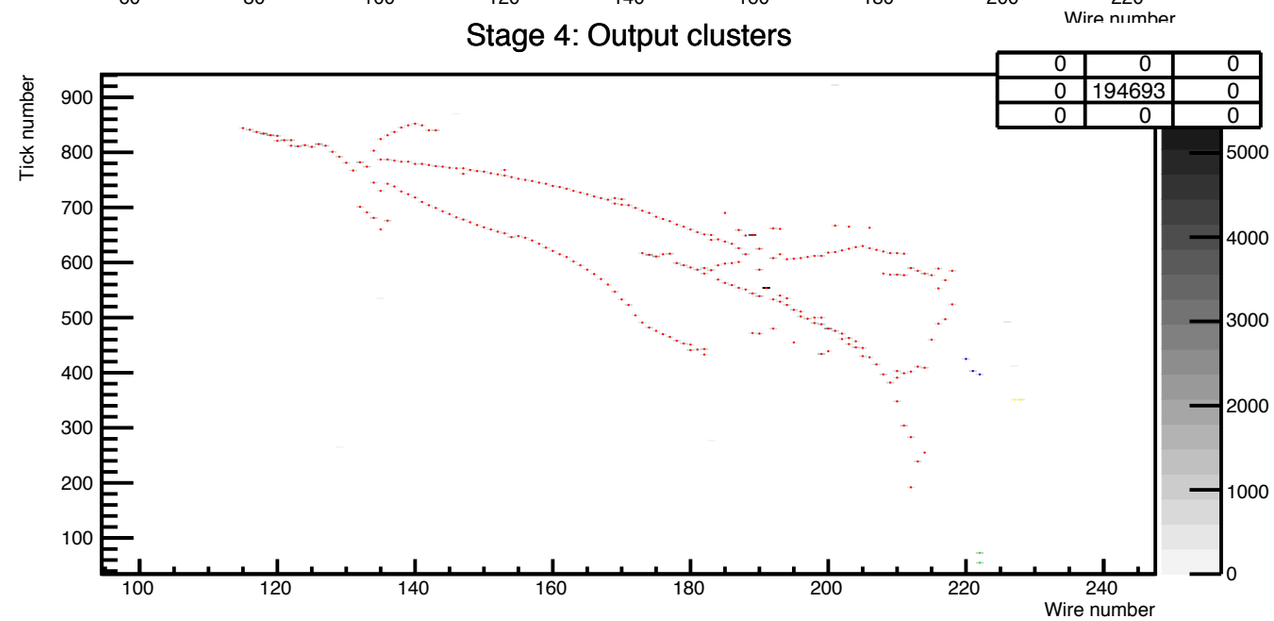
**BlurredCluster**
works for LArIAT

Implemented by Mike Wallbank (DUNE)

# A taste of BlurredCluster

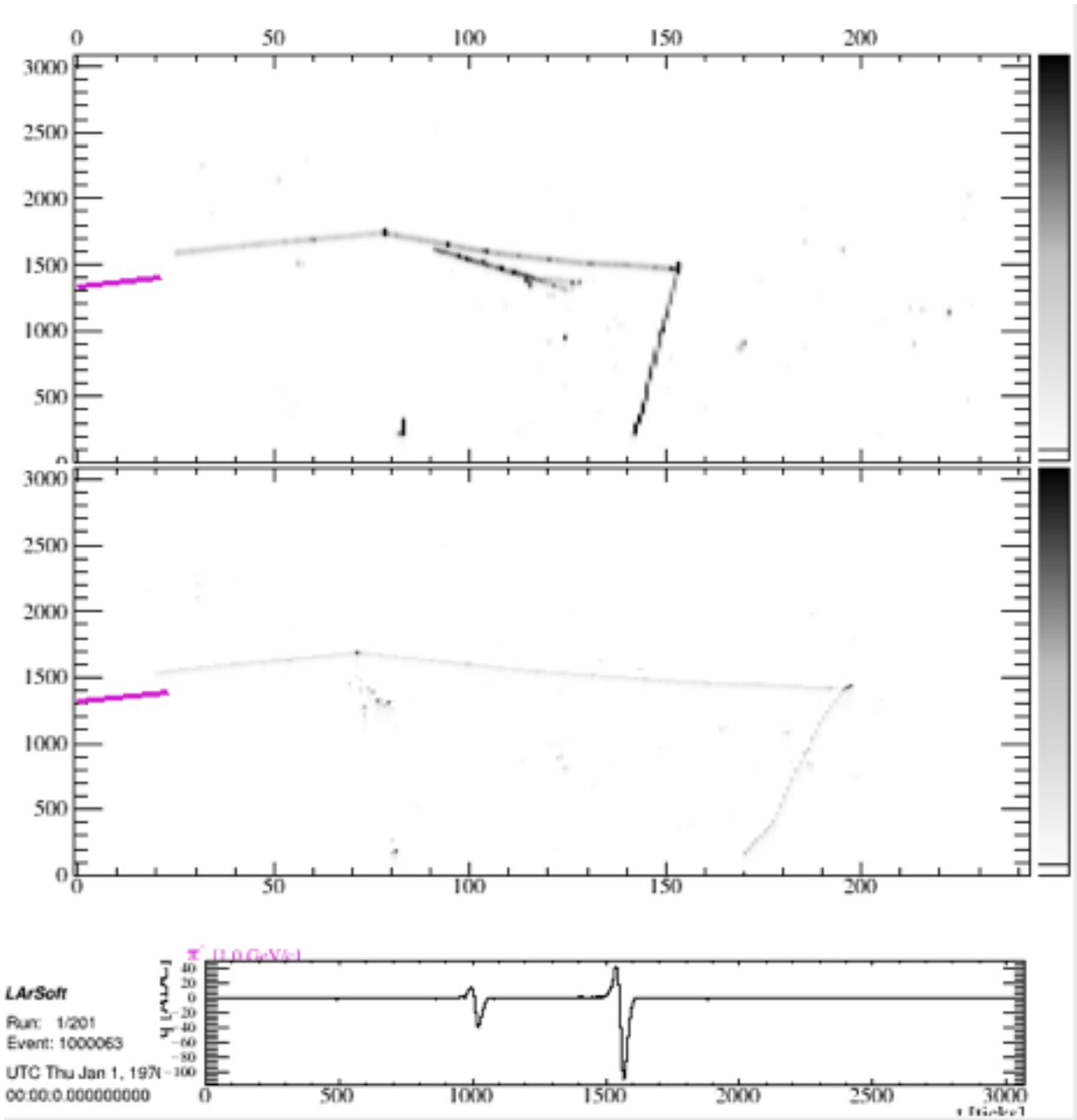


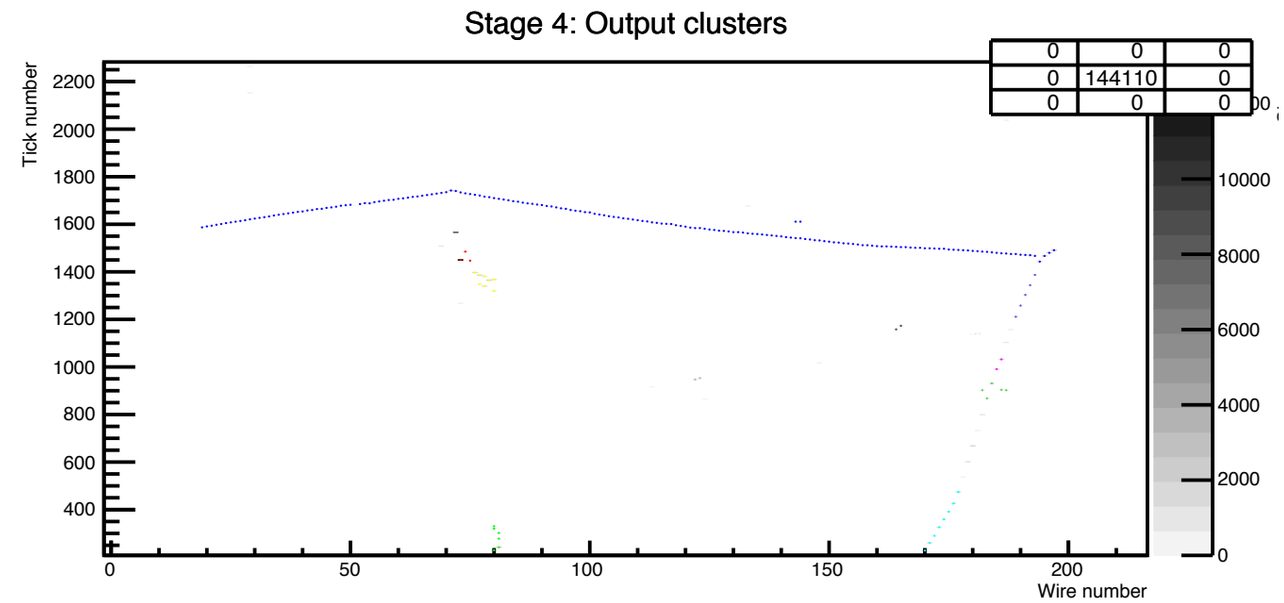



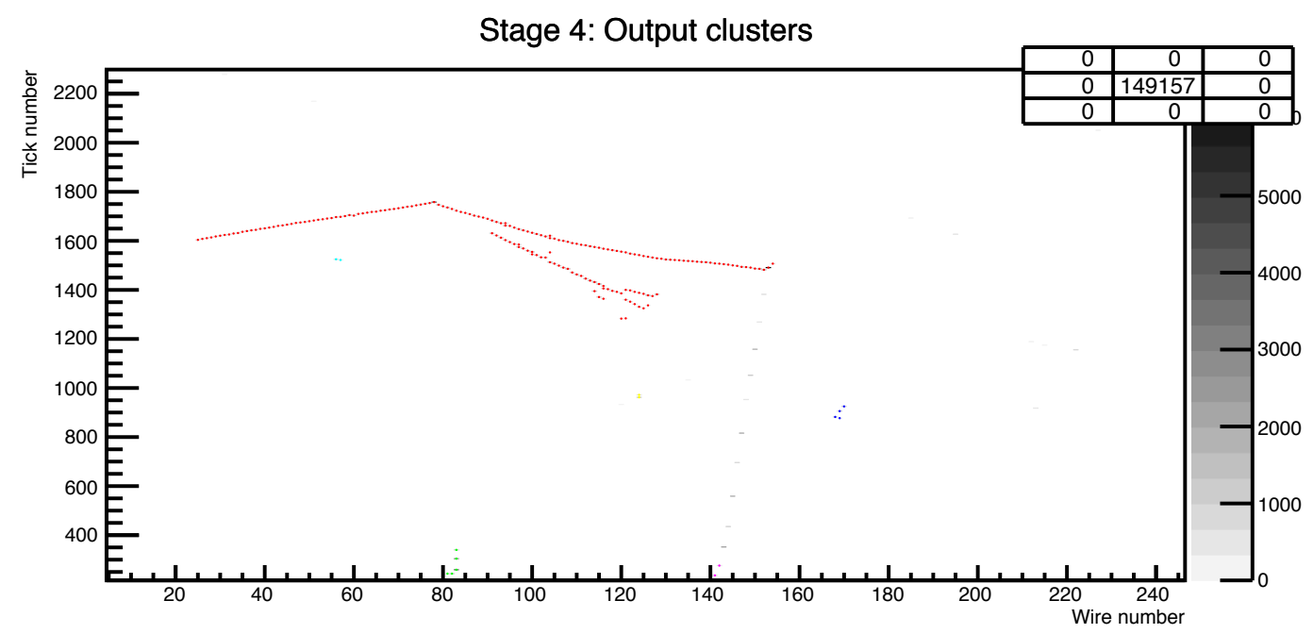




electron/gamma MC sample produced by Ryan

# A taste of BlurredCluster




Pion MC sample produced by Johnny

- Looking for different topologies that can be not well reconstructed (Npi0).
- Aiming to produce more MC sample to test pathologies.

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**Showering** algorithm, using clusters as input

LArSoft

**ShowerReco3D**

Need a fix on ShowerReco3D_module.cc (Kazu)

For the moment just add this line in your working directory (l.90):

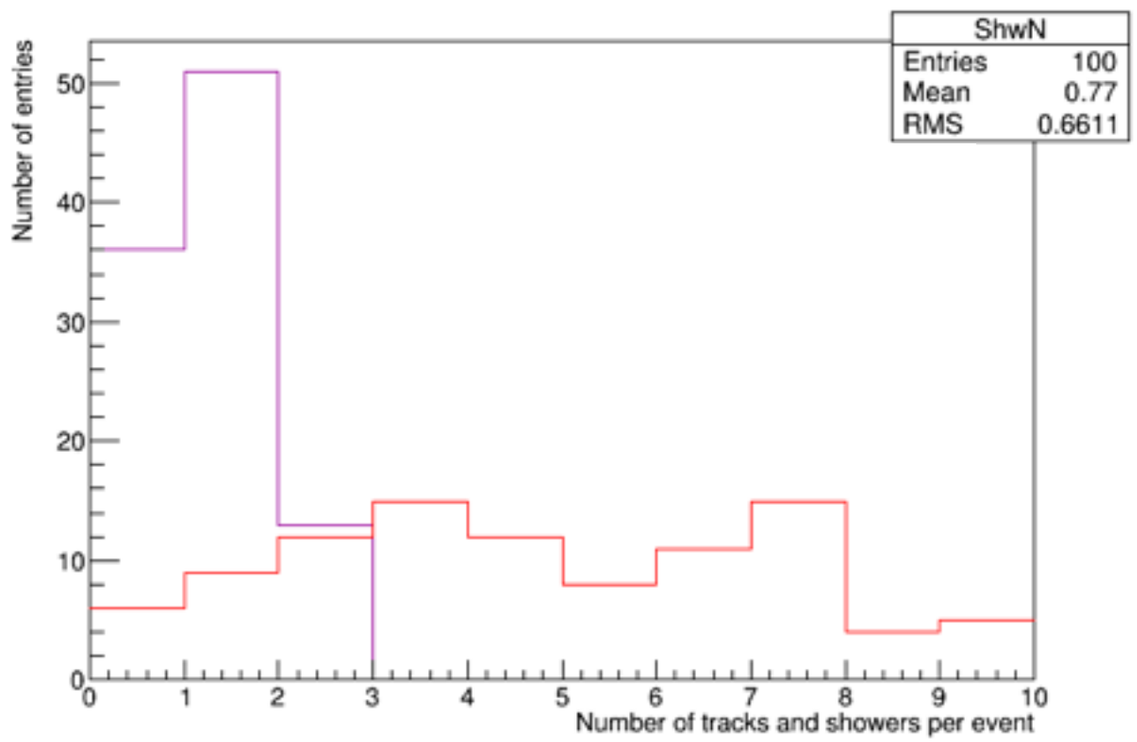
fCFAlgoTimeOverlap->RequireThreePlanes(p.get<bool>("RequireThreePlanes",false));

Developed by Kazu

# Under investigation

- Not sure how BlurredCluster and ShowerReco3D deals with several showers in 1 event.
- ShowerReco3D not always recognize as shower events when there is a shower (according event display and BlurredCluster looks fine).
- Not sure about possible double counting with tracks and showers (see next slides)
- Properties of the reconstructed showers are still under investigation.
- Difficulties to perform simpler tests since **Id** numbers of the objects are not related **reco track & reco shower & true particle.**

# Some Studies on the electron/gamma MC



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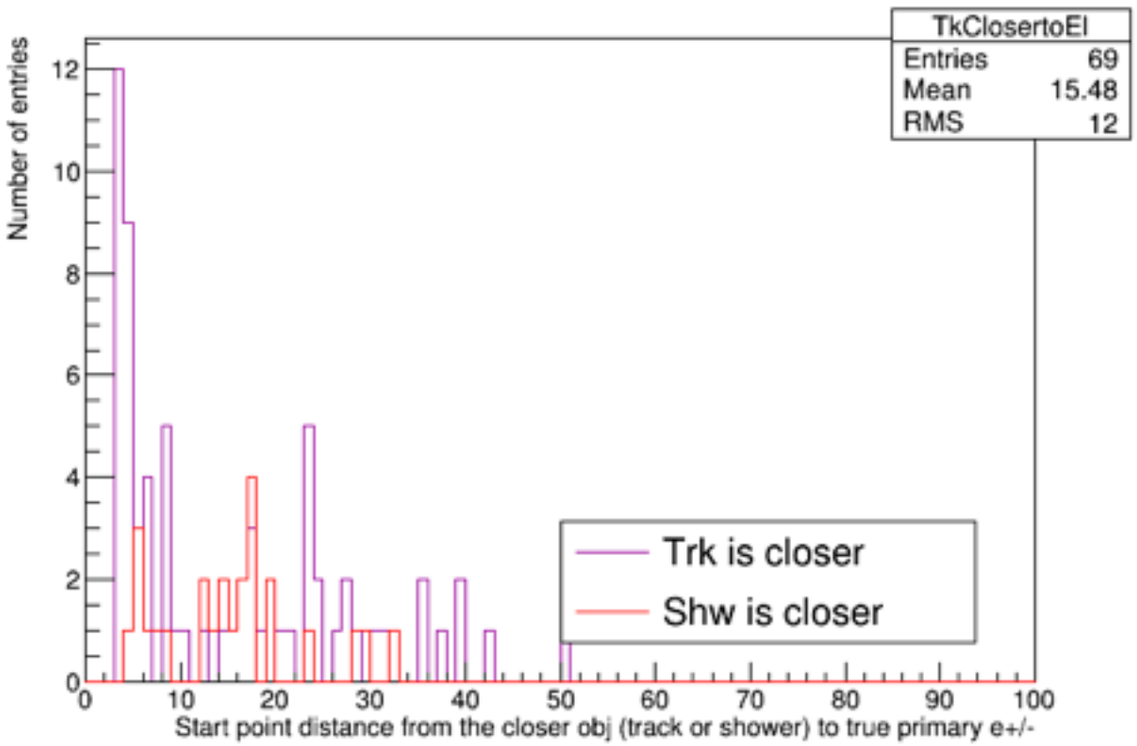


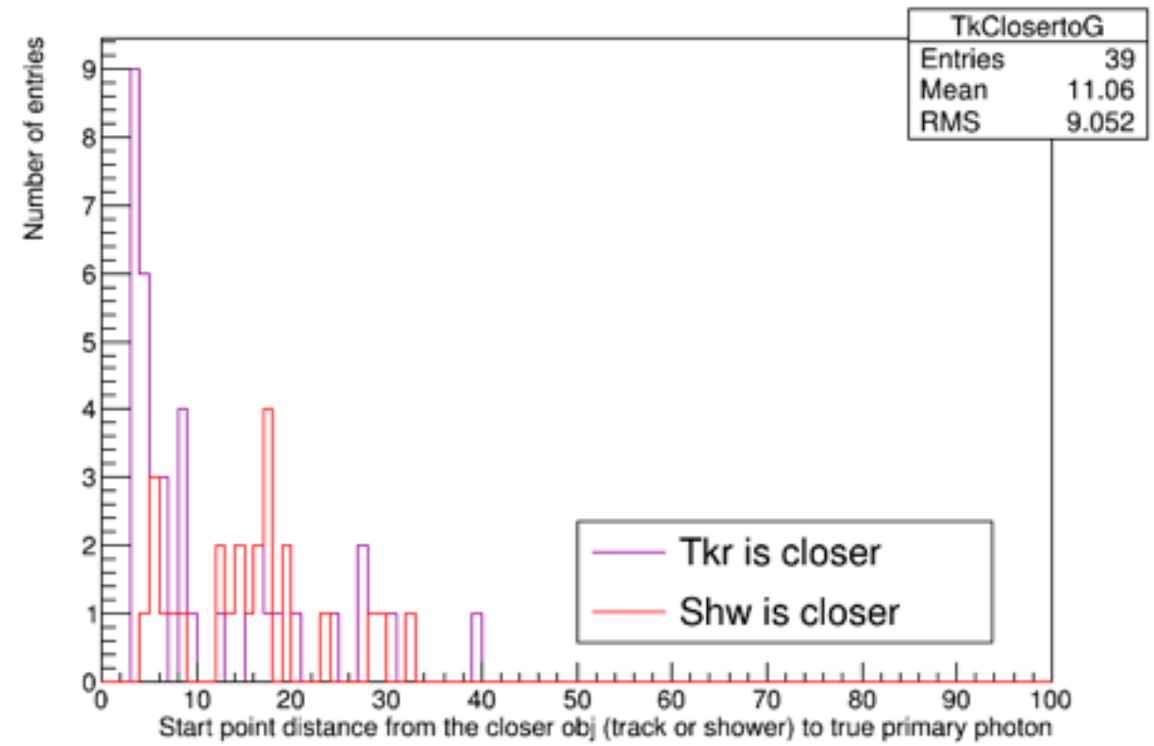


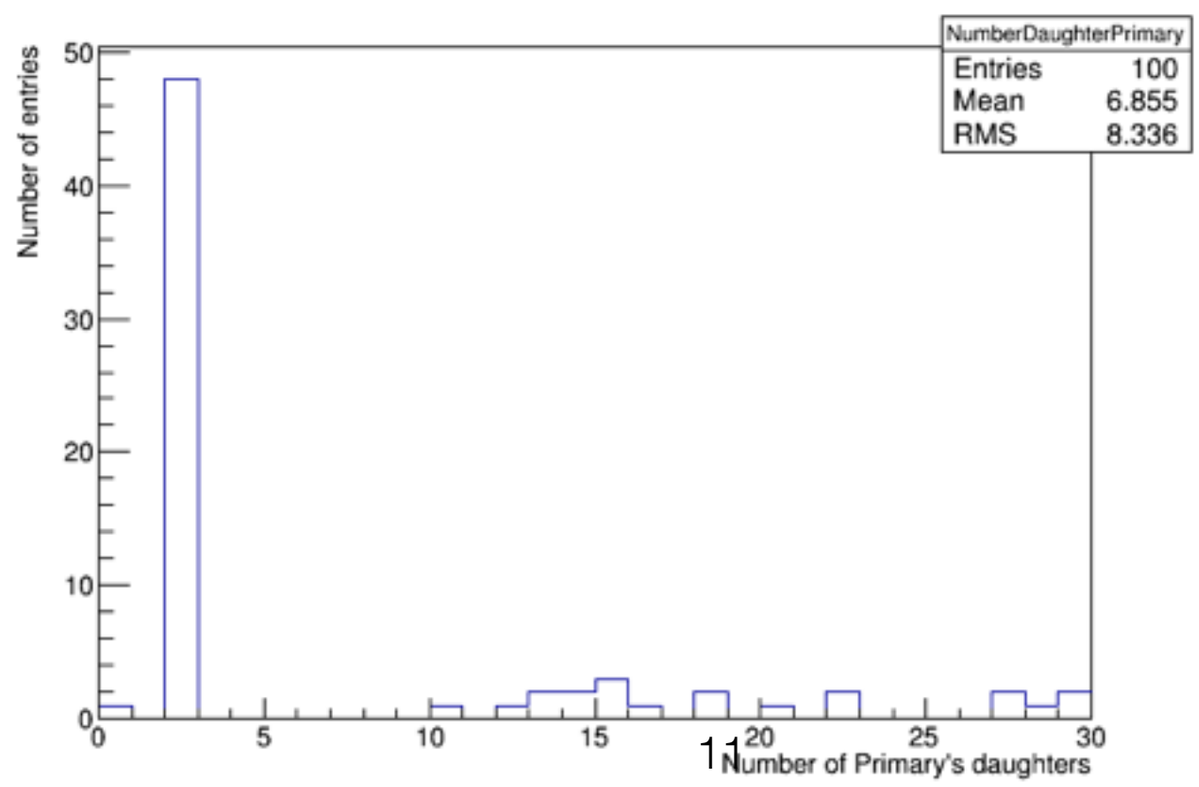

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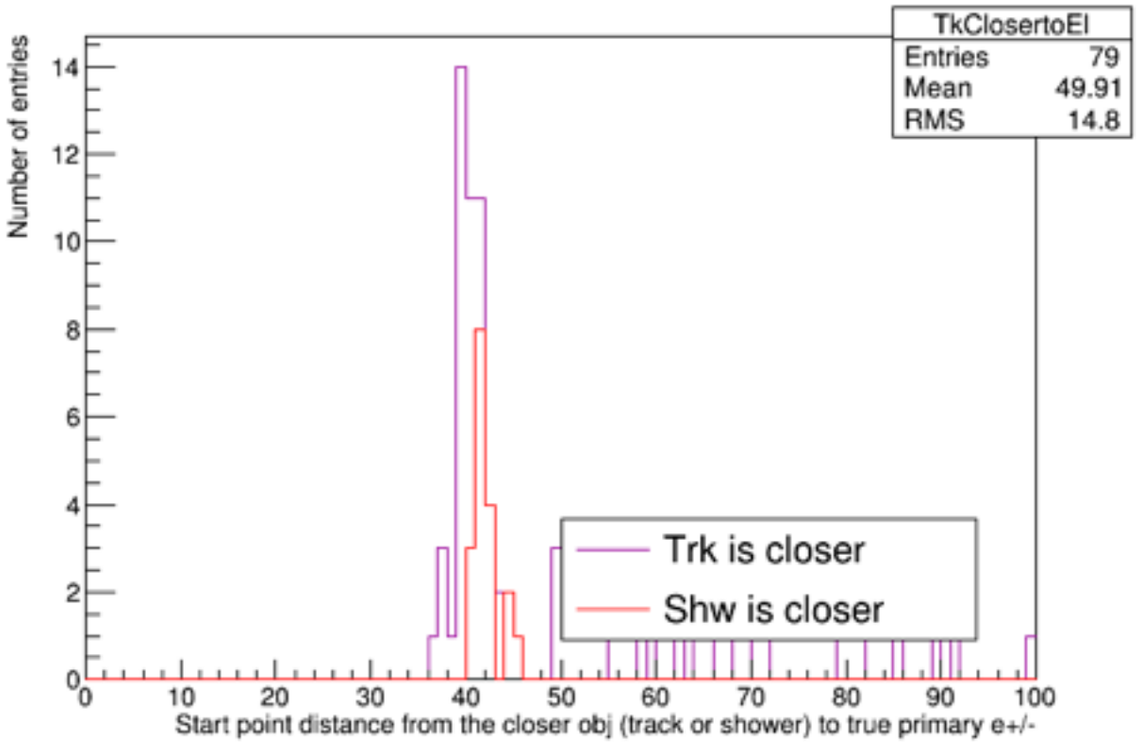


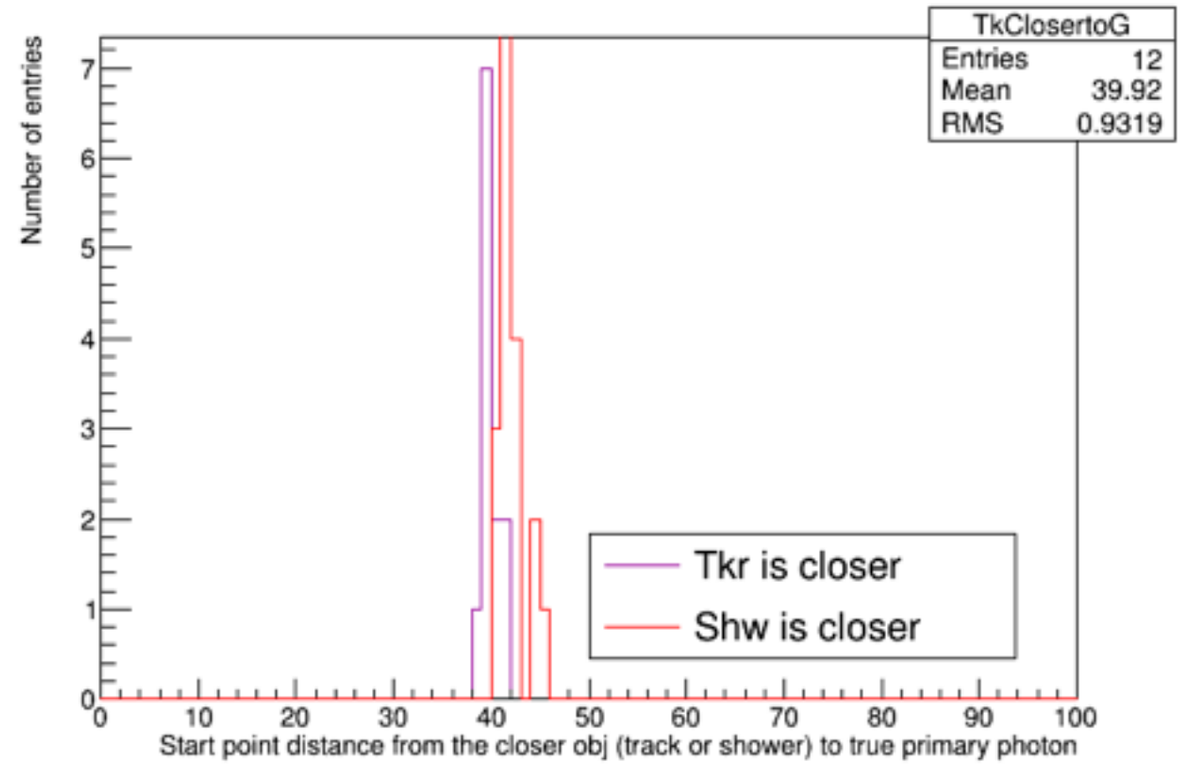


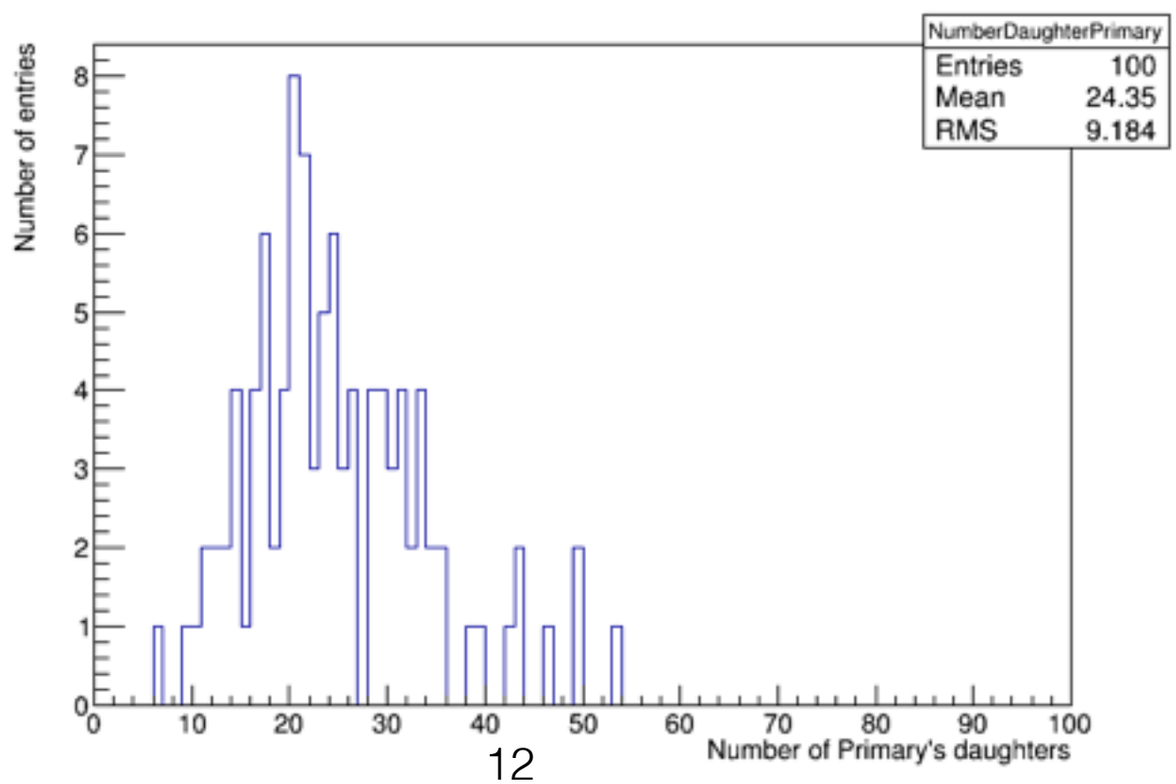

- Trying to find the if ShowerReco3D can work better.
- In the next weeks Mike Wallbank will make available another shower reconstructi algorithm -> let's test it
- Working with Bobby (Murrel?) MicroBooNE student on another shower algorithm.
- will be nice to test MCShower…