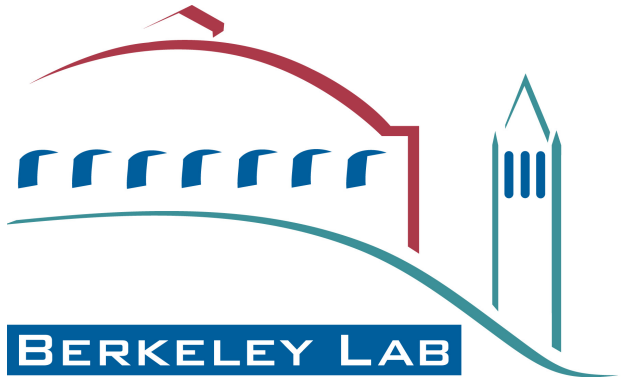
Deep Pion Analysis update with newer data

Ivan Chernyshev

December 19, 2017

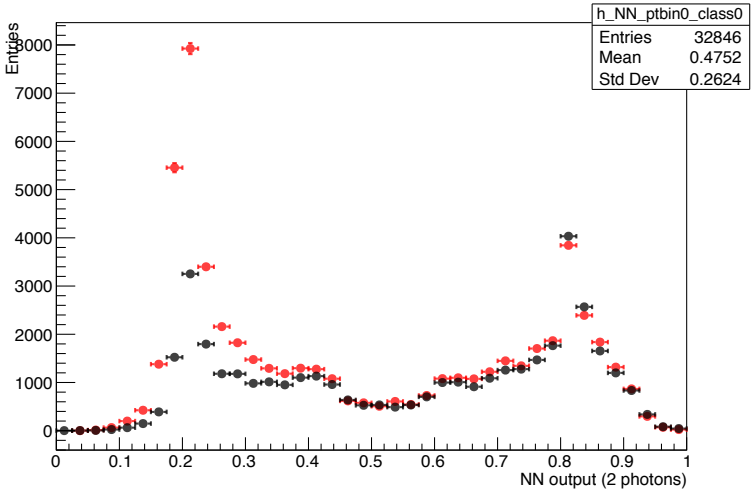


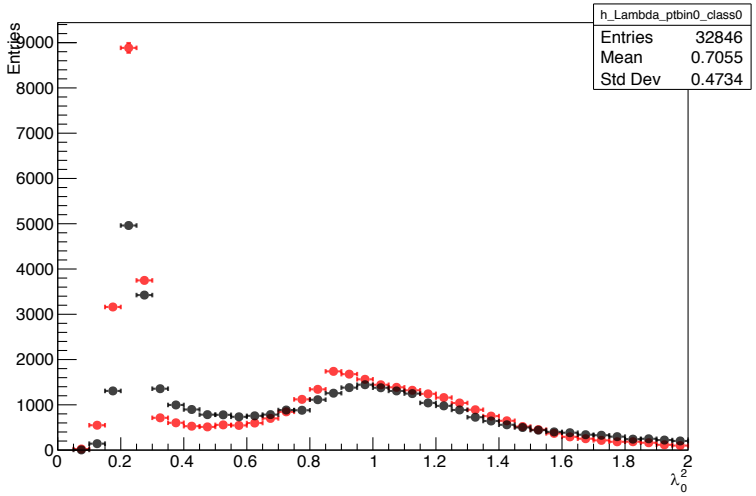
Introduction

- Used Dr. Miguel Arratia's Deep Pion Efficiency analysis software, which uses both Dr. Yue Shi Lai's neural net and λ_0- based data analysis, and compares them.
- Data: 2013 pPb (e period, processed with the clusv1 algorithm)
- MC: 17g6a3_pthat2 (I do not know which type of Monte-Carlo this is)

MC Normalized in NN > 0.85 and $\lambda_0^2 > 0.27$

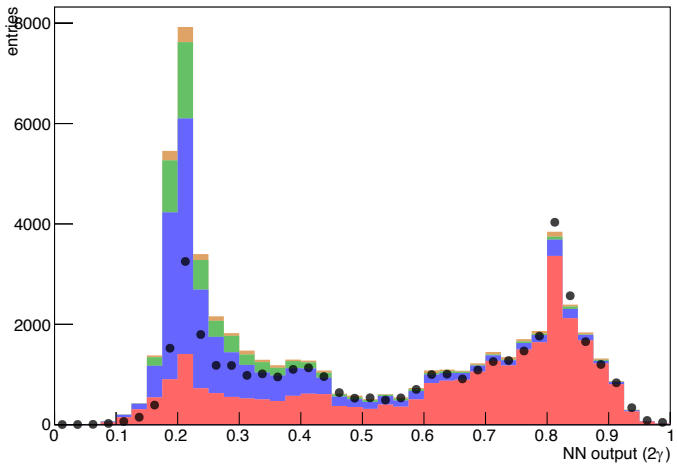
10 GeV <$pT_{cluster}$ < 12 GeV





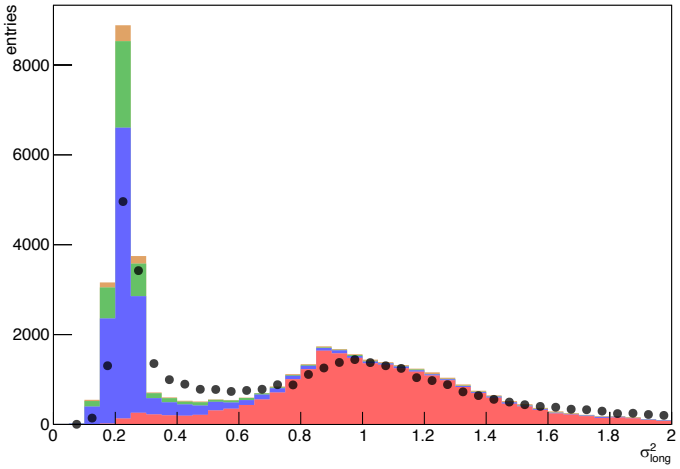
Legend

- Data
- MC



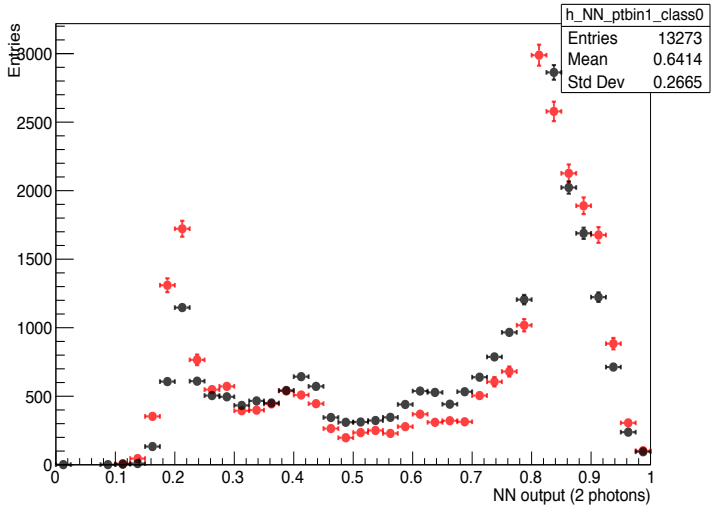
Legend

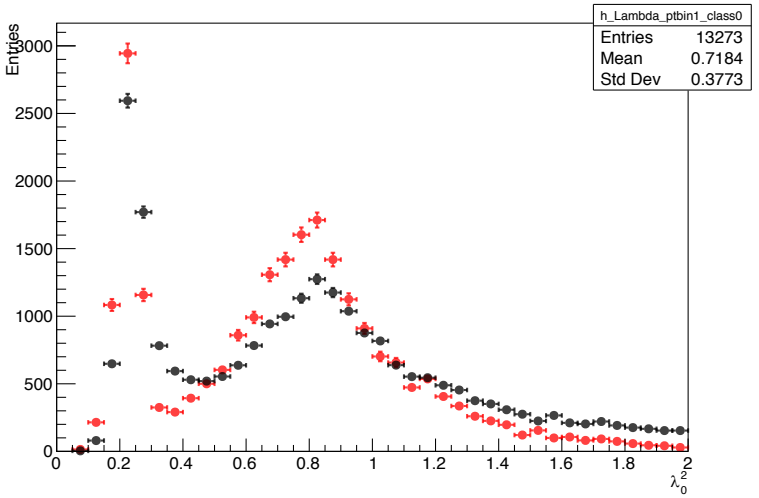
- data, pPb
- π^0 2 showers
- π^0 1 shower
- η BKG
- Other BKG



MC Normalized in NN > 0.85 and λ_0^2 > 0.27

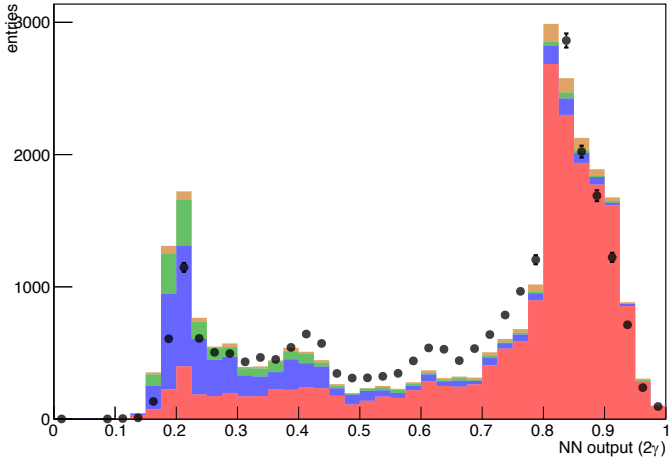
12 GeV <$pT_{cluster}$ < 14 GeV





Legend

- Data
- MC



Legend

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- π^0 2 showers
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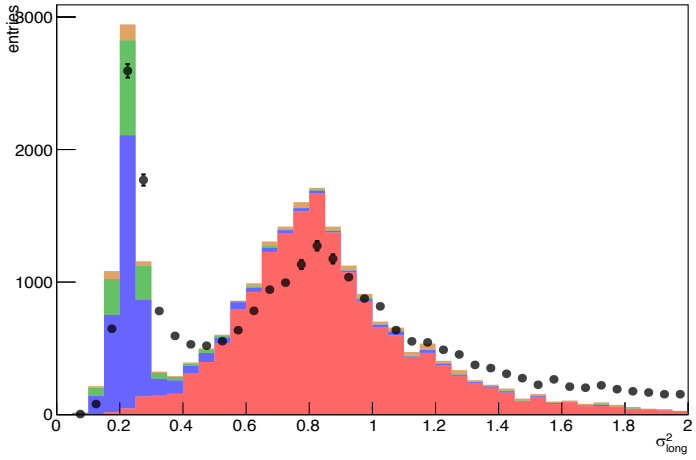
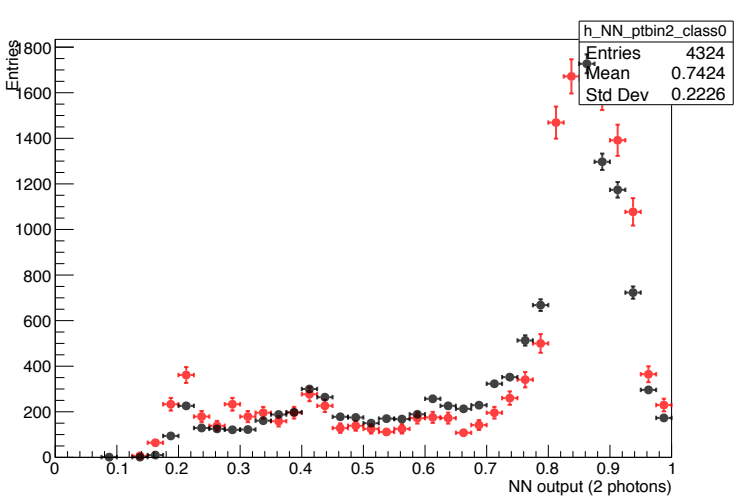
- η BKG
- Other BKG



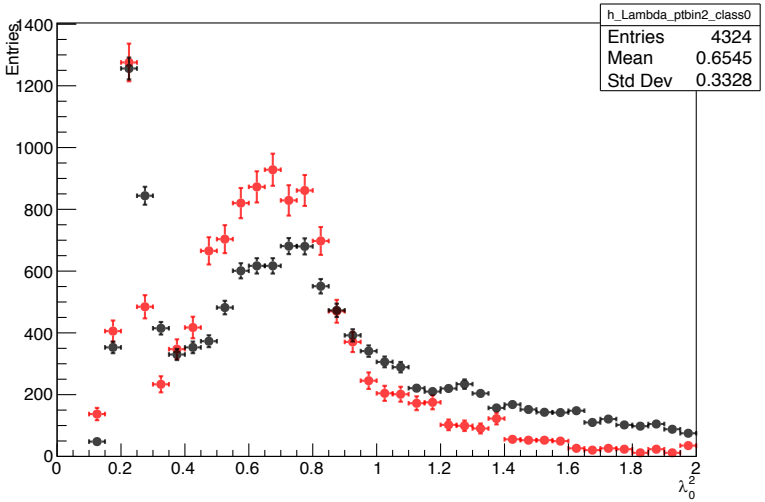
MC Normalized in NN > 0.85 and $\lambda_0^2 > 0.27$

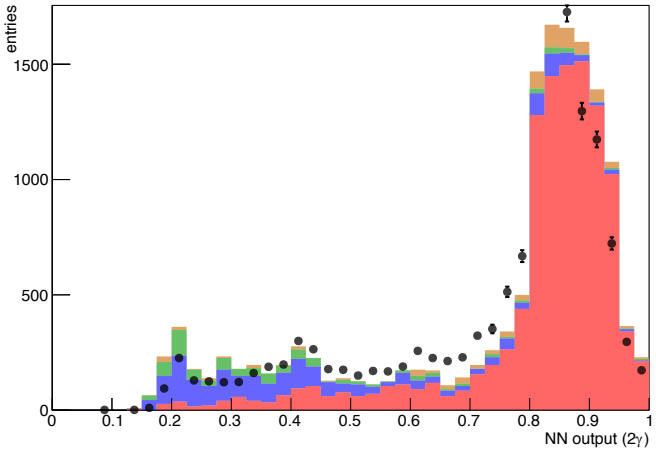
14 GeV <$pT_{cluster}$ < 16 GeV



Legend

- Data
- MC





Legend

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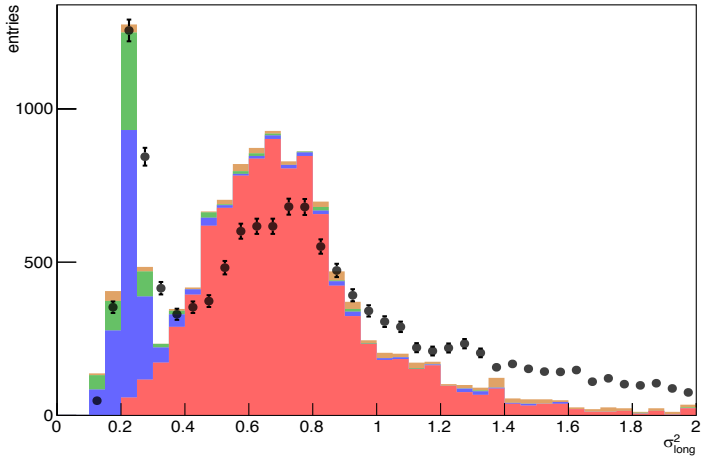
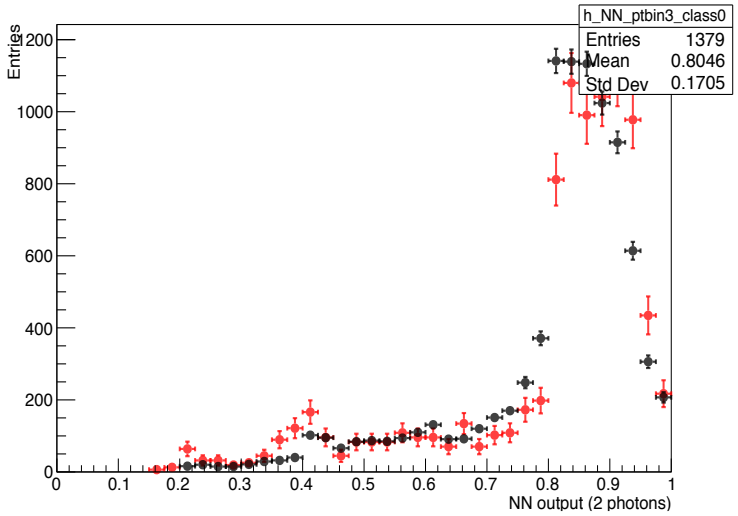
- π^0 2 showers
- π^0 1 shower
- η BKG
- Other BKG

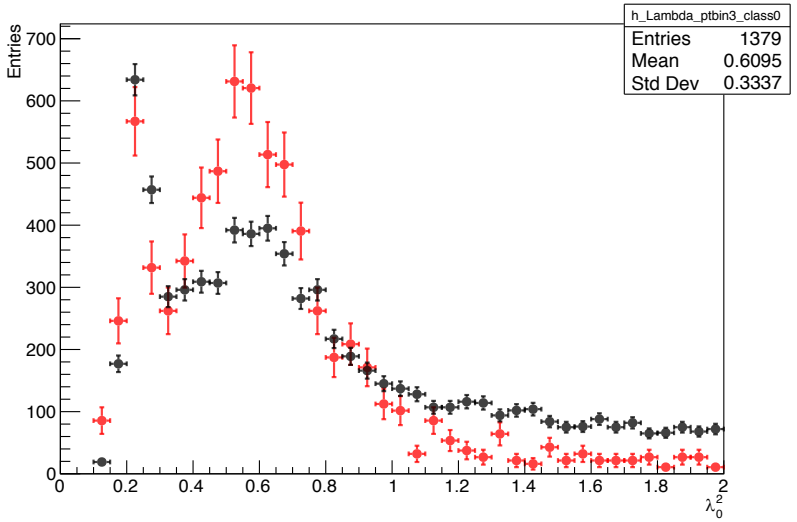


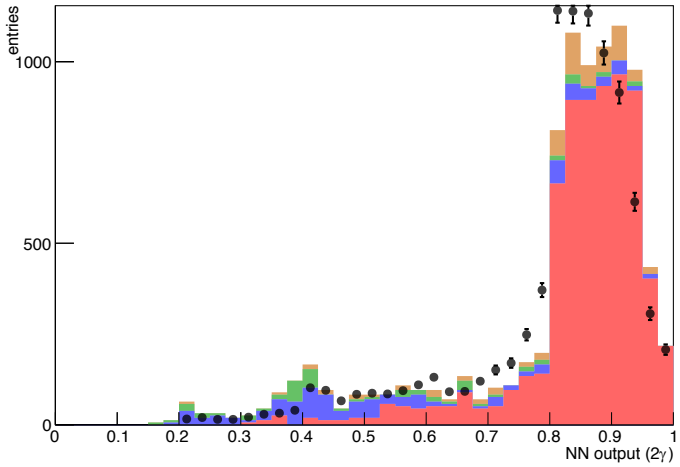
MC Normalized in NN > 0.85 and λ_0^2 > 0.27

16 GeV <$pT_{cluster}$ < 18 GeV



Legend
- Data
- MC





Legend
- data, pPb
- π^0 2 showers
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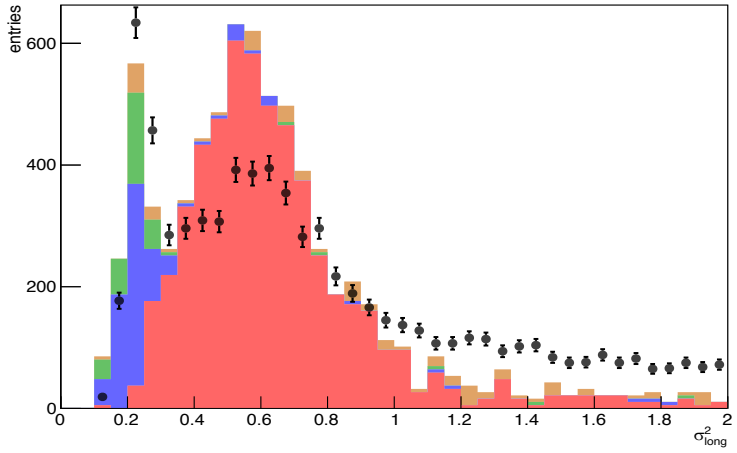
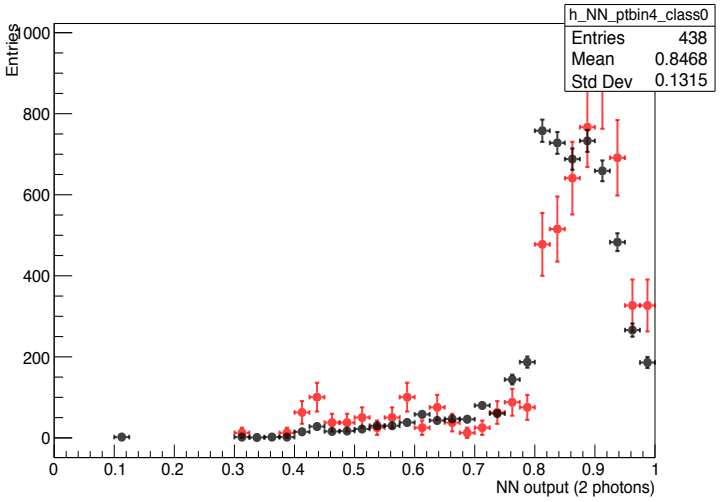
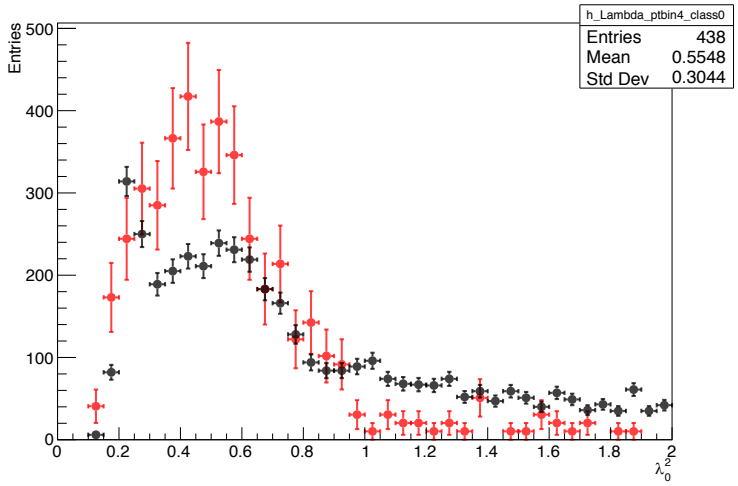
- η BKG
- Other BKG



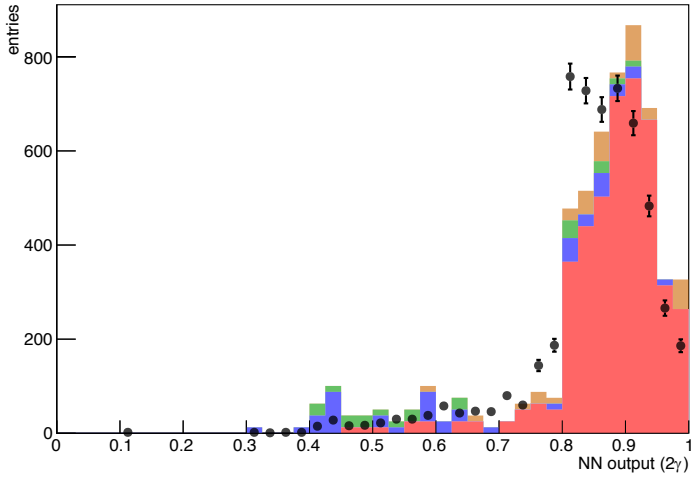
MC Normalized in NN > 0.85 and λ_0^2 > 0.27

18 GeV <$pT_{cluster}$ < 20 GeV

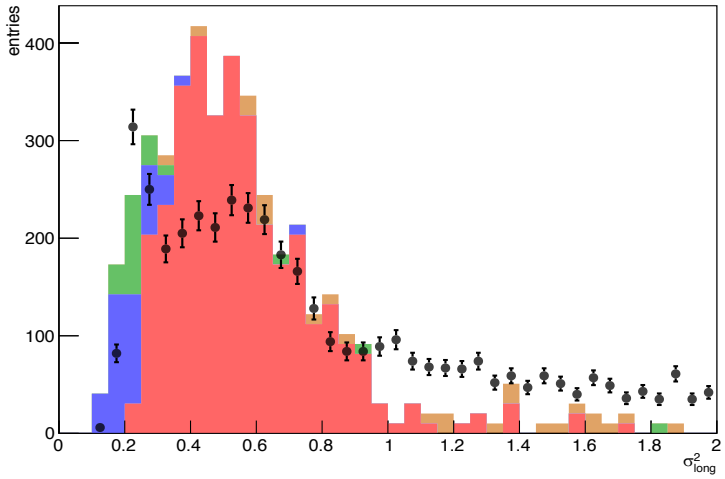




Legend
- Data
- MC

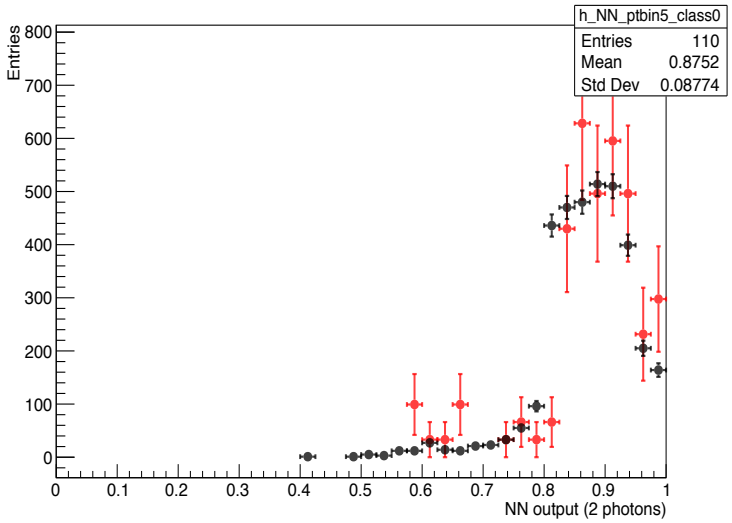


Legend
- data, pPb
- π^0 2 showers
- π^0 1 shower
- η BKG
- Other BKG

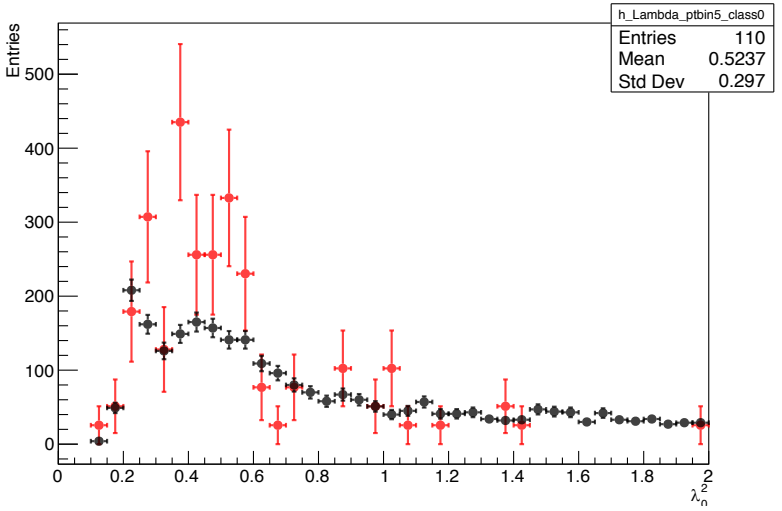


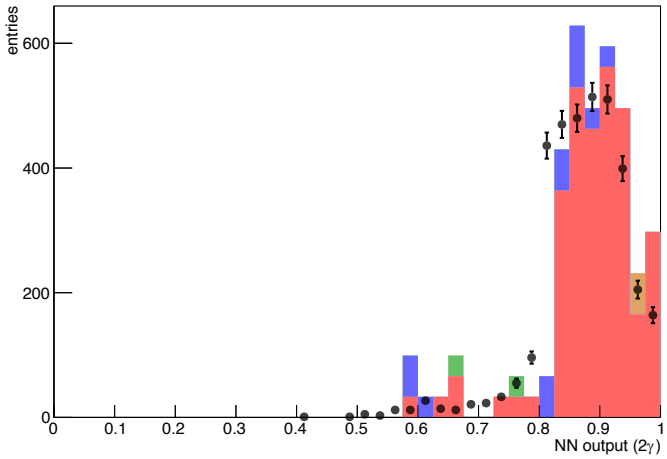
MC Normalized in NN > 0.85 and λ_0^2 > 0.27

20 GeV <$pT_{cluster}$ < 22 GeV



Legend
- Data
- MC





Legend
- data, pPb
- π^0 2 showers
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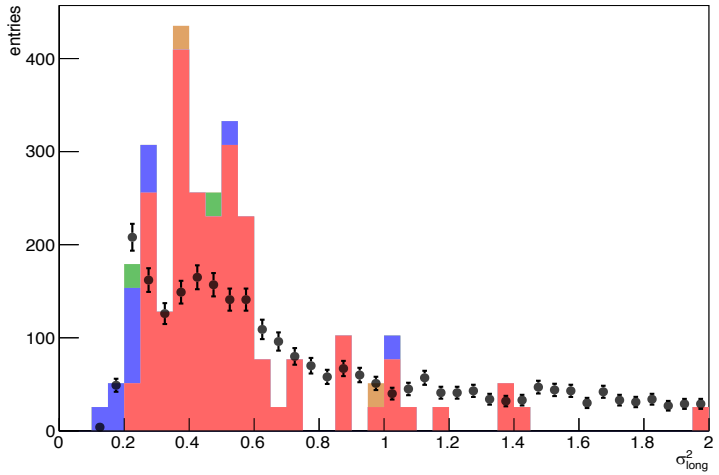
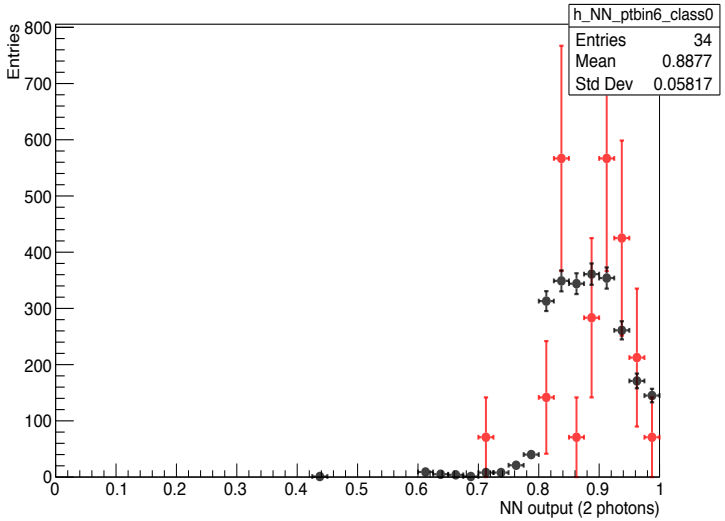
- η BKG
- Other BKG

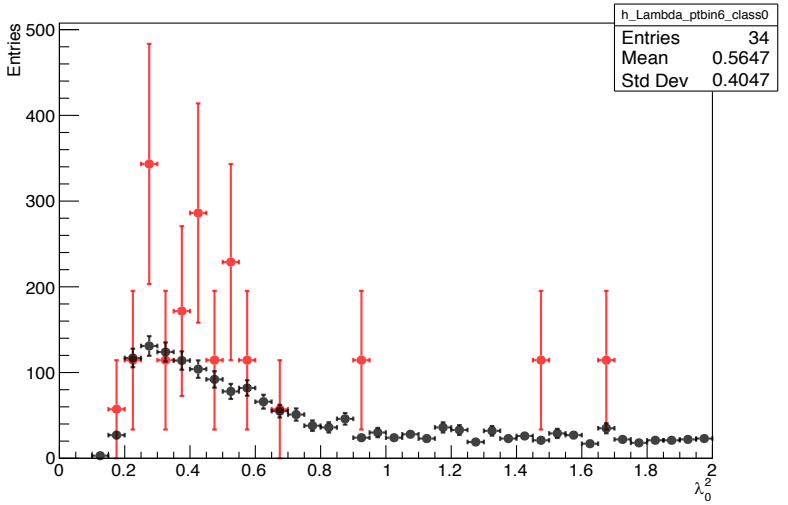


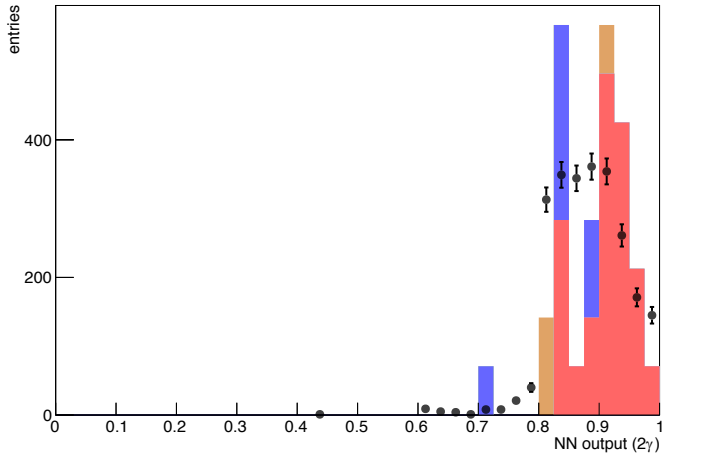
MC Normalized in NN > 0.85 and $\lambda_0^2 > 0.27$

22 GeV <$pT_{cluster}$ < 24 GeV



Legend
- Data
- MC





Legend
- data, pPb
- π^0 2 showers
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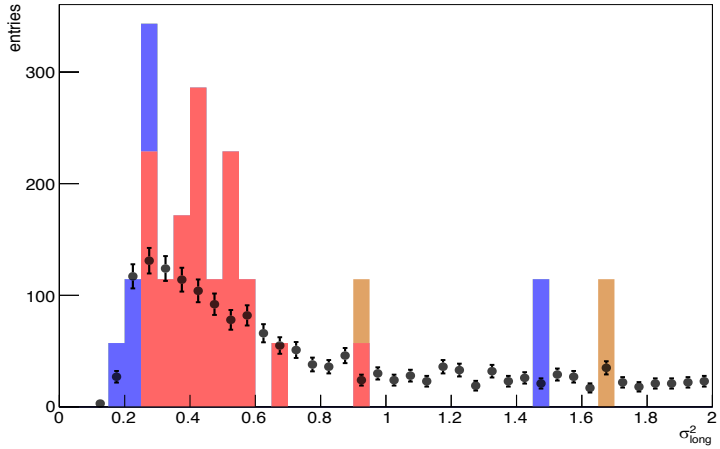
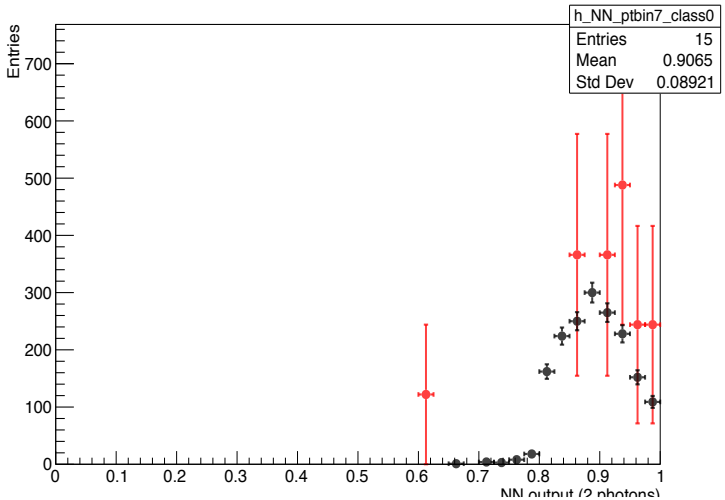
- Other BKG

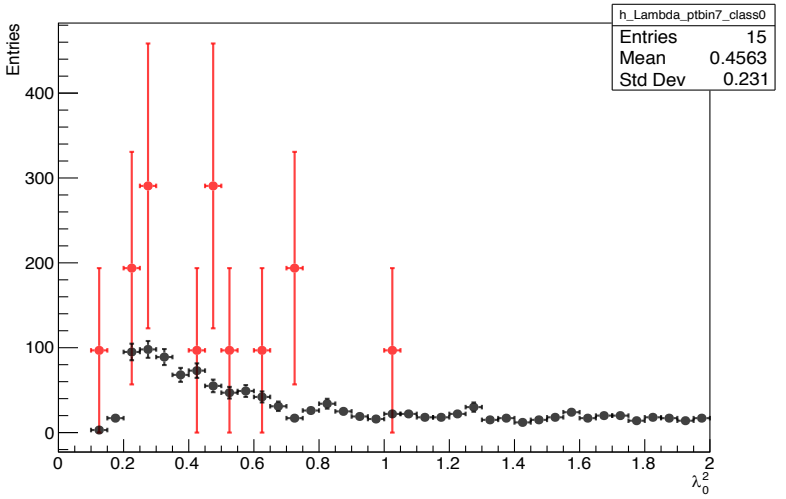


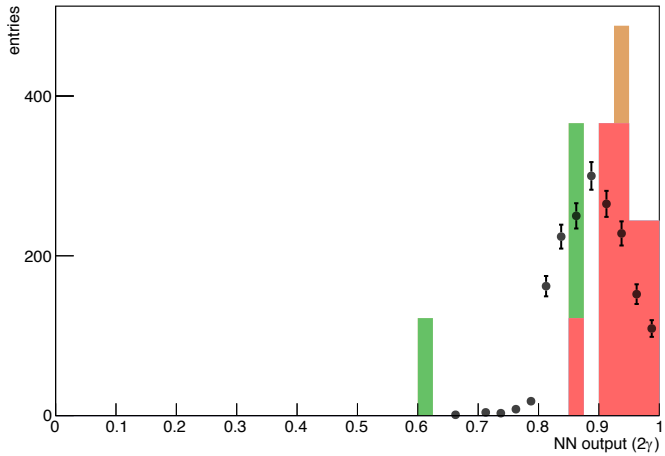
MC Normalized in NN > 0.85 and $\lambda_0^2 > 0.27$

24 GeV <$pT_{cluster}$ < 26 GeV



Legend
- Data
- MC





Legend
- data, pPb
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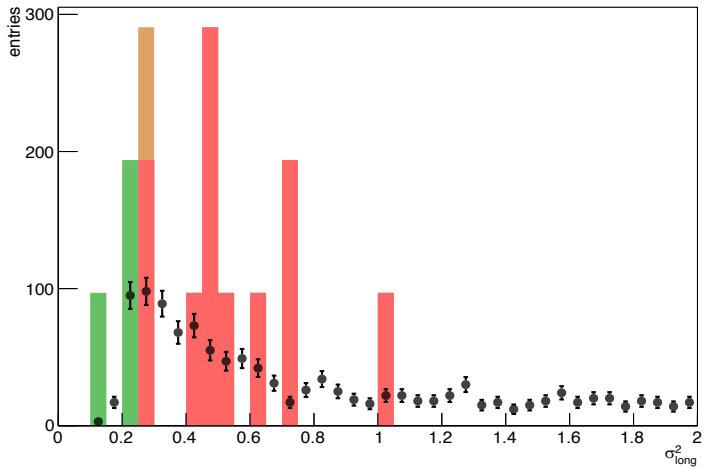
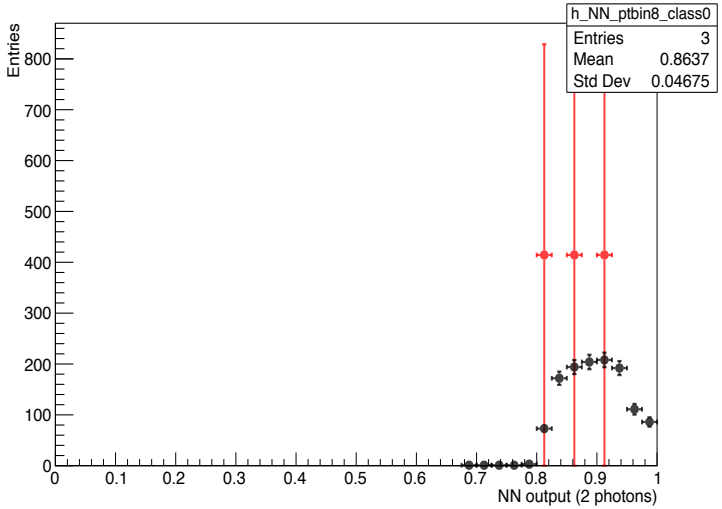


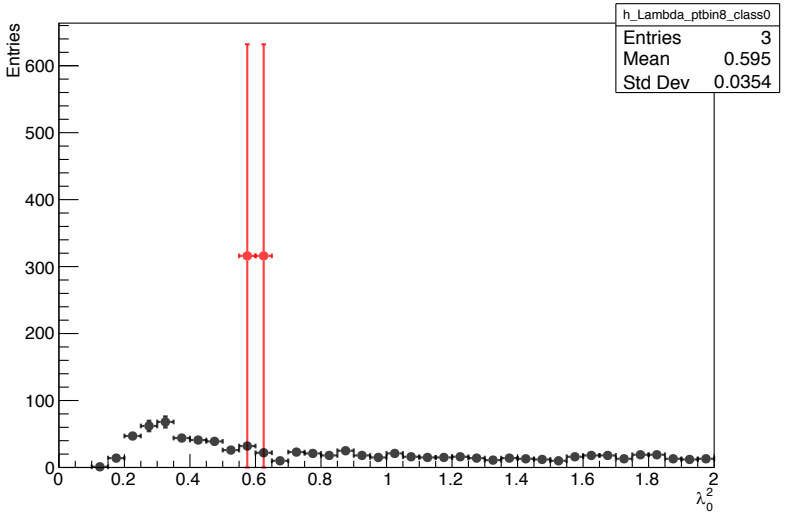
MC Normalized in NN > 0.85 and $\lambda_0^2 > 0.27$

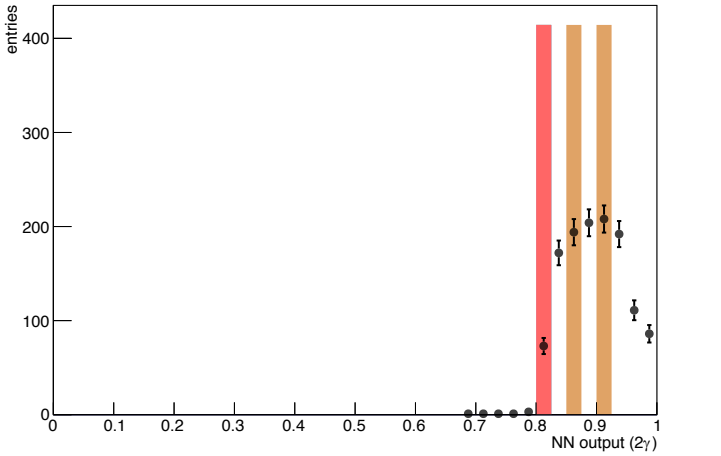
26 GeV <$pT_{cluster}$ < 28 GeV



Legend

- Data
- MC





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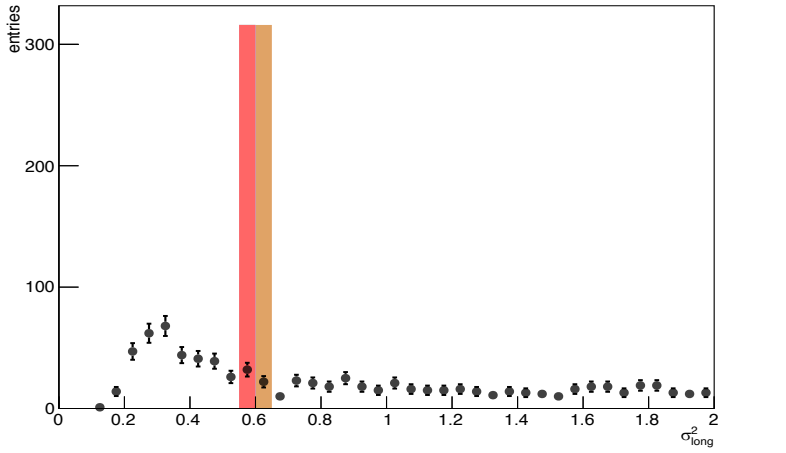
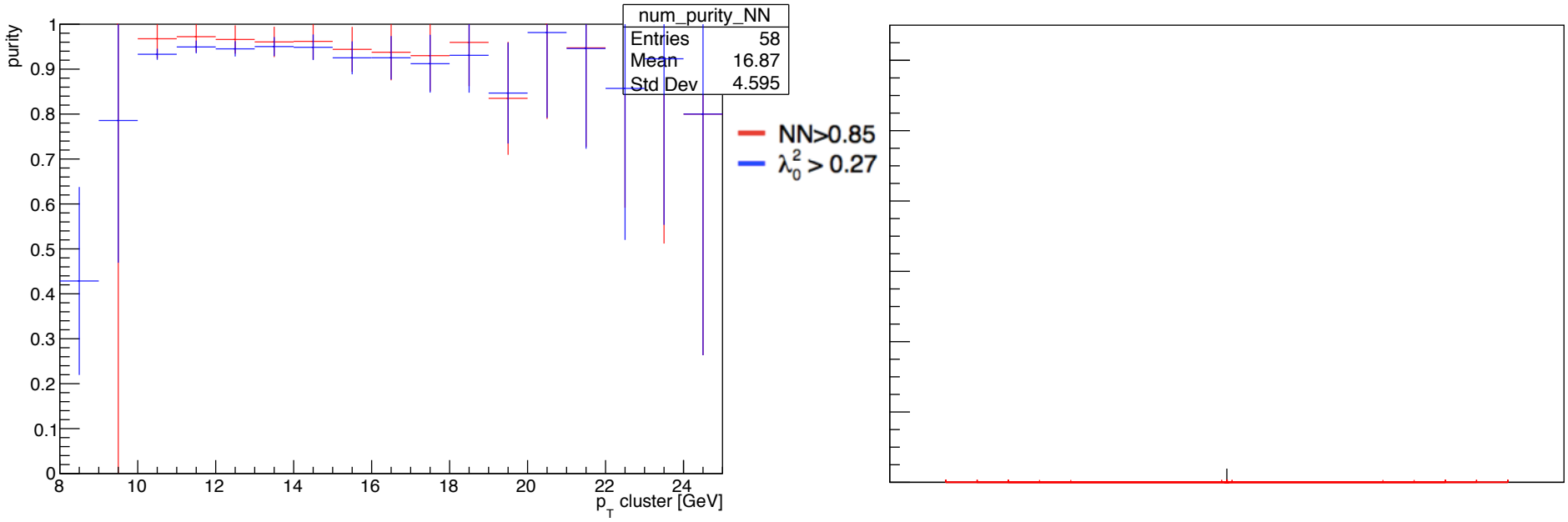
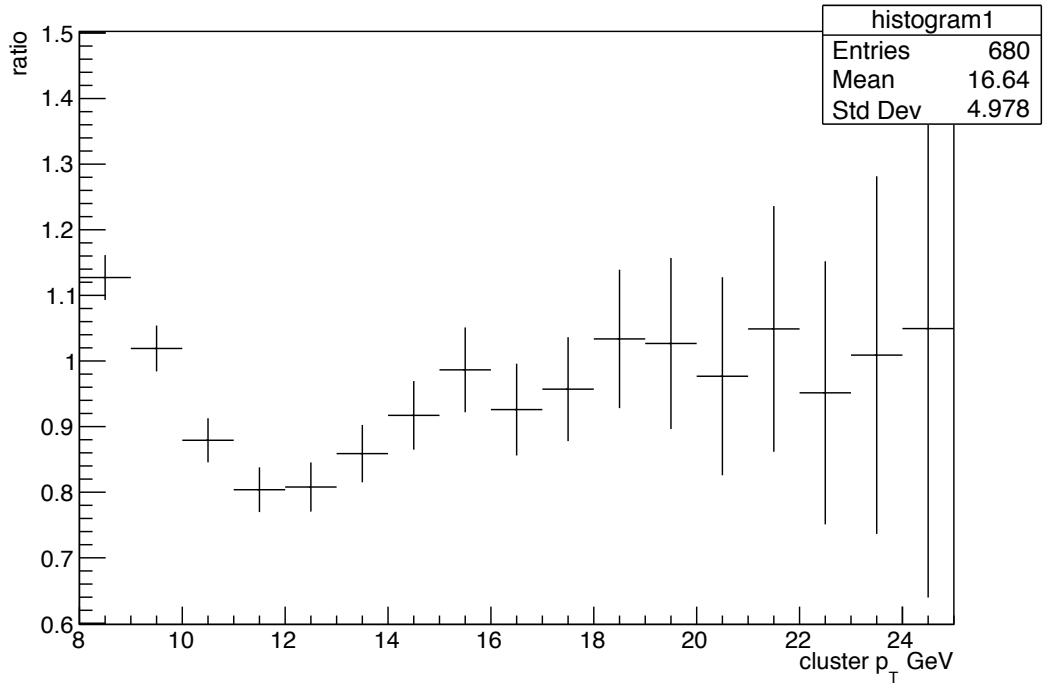


Purity and Efficiency



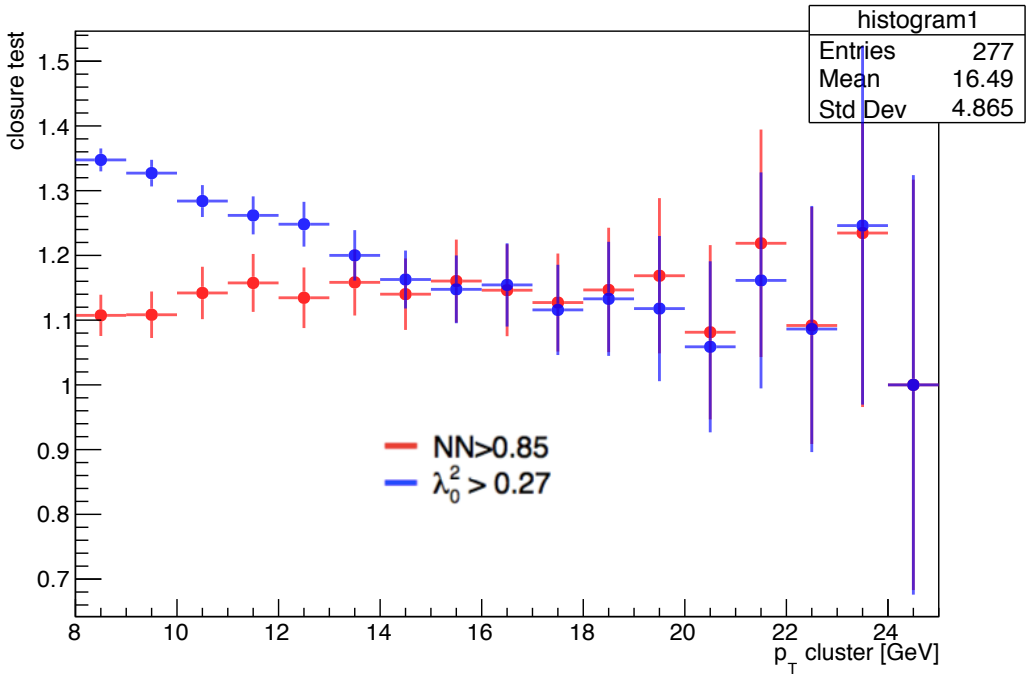
- In general, the purities are a, though there is one cell where NN data is missing, at $pT_{cluster}$ near 8GeV and very high error bars at $pT_{cluster} > 22$ GeV and $pT_{cluster} < 10$ GeV
- Miguel's code failed to produce good results for the efficiency

Purity-and-efficiency corrected spectrum ratios



- Agreement at $pT_{cluster} \geq 15$ GeV

Closure Test



Conclusions

- At $pT_{cluster} > 22$ GeV, there is not enough data.
- At 10 GeV < $pT_{cluster} < 22$ GeV, the neural-net shows a monte-carlo that is more consistent with data than the λ_0
- Neural-net closure test is within 10% of unity everywhere, whereas λ_0 closure test is only so at $pT_{cluster} > 15$ GeV
- Neural-net and λ_0 spectra are consistent with one another at $pT_{cluster} > 15$ GeV, while purities are consistent everywhere
- Miguel's code shows problems at the try and stack graphs with $pT_{cluster} > 20$ GeV, the efficency graph, and to a lesser extent the purity graph