

Resolution for Different Cluster Sizes with & without HGTD Information

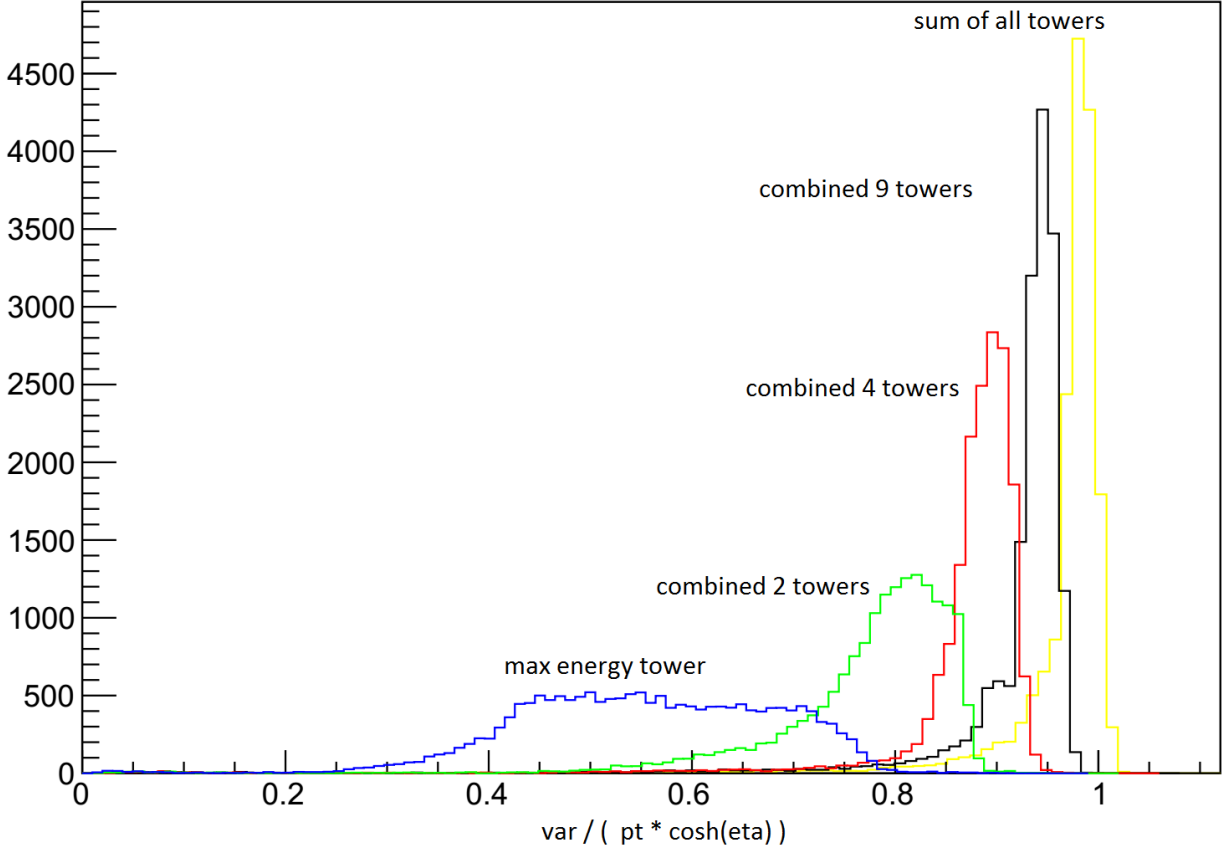
▶ Sam Peters

Overview

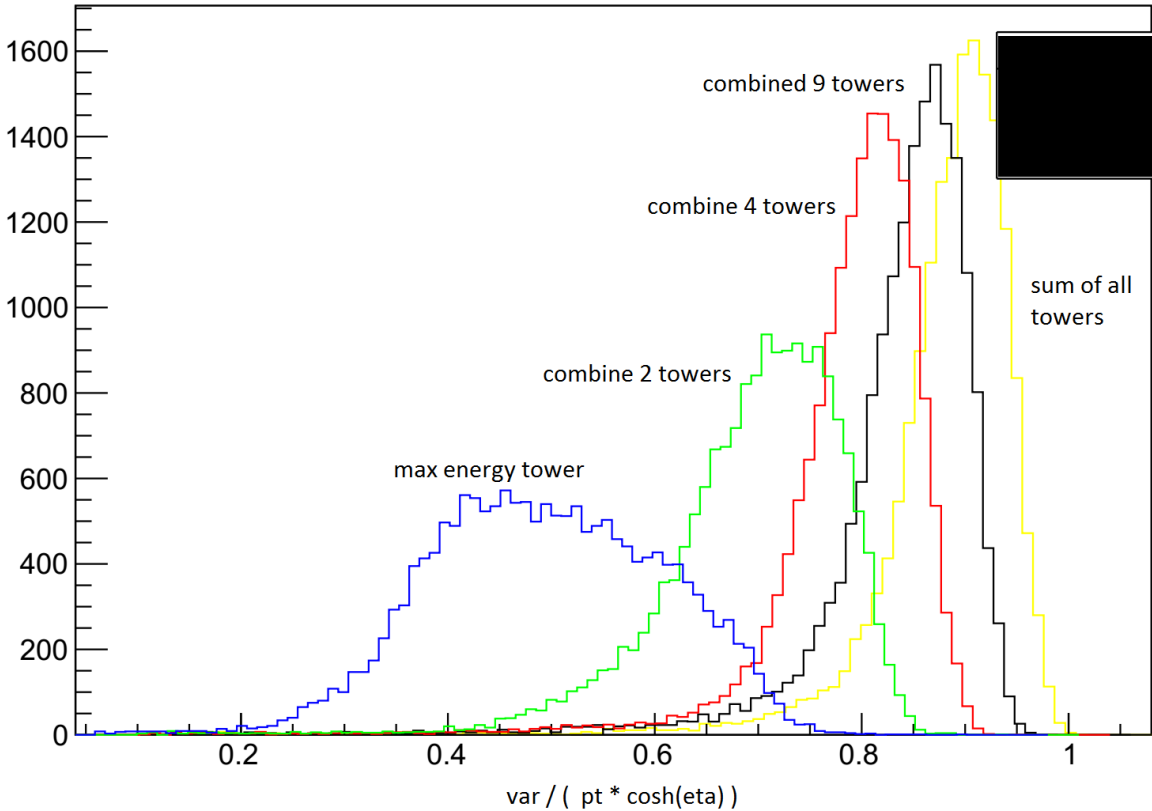
- ▶ Exploring the effect of including tungsten in the HGTD
- ▶ Reconstructing energy of electrons given HGTD information and clustering layer 1 & 2 of the EM calorimeter
- ▶ Use TMVA boosted decision tree regression to improve resolution
- ▶ Using RMS and interquartile range to quantify resolution ($\text{IQR} / 1.349$ to make comparable to a Gaussian sigma)

Where I was last time

100 GeV Si



100 GeV SiW



Regression using boosted decision trees

Variables

Without HGTD information: pt & eta

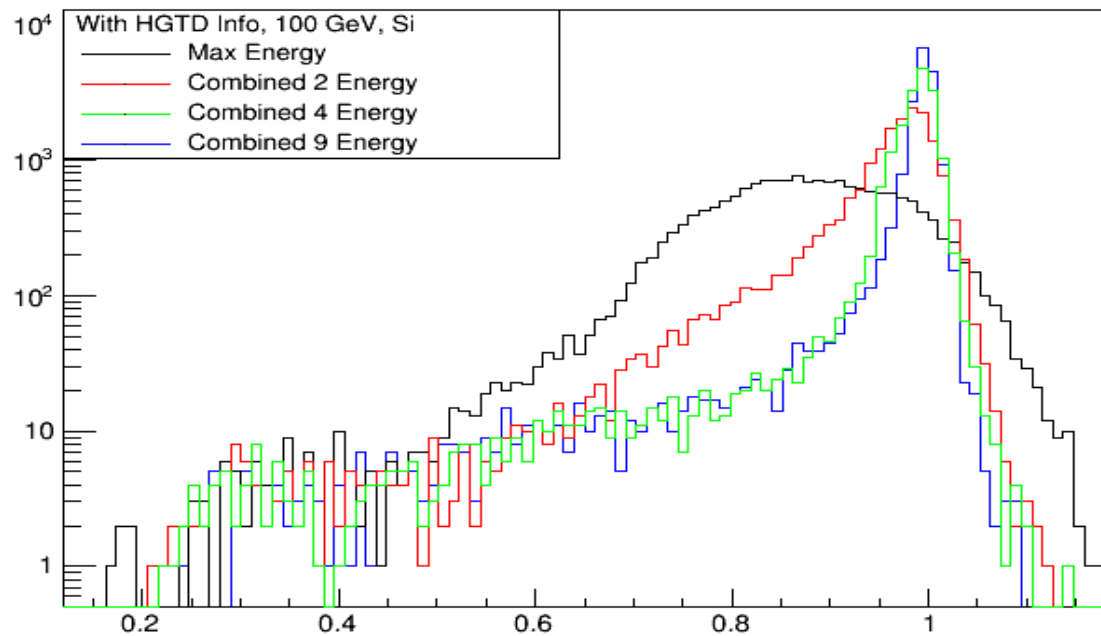
With HGTD information: pt, eta, number of hits, sum of all energy in HGTD*

Target

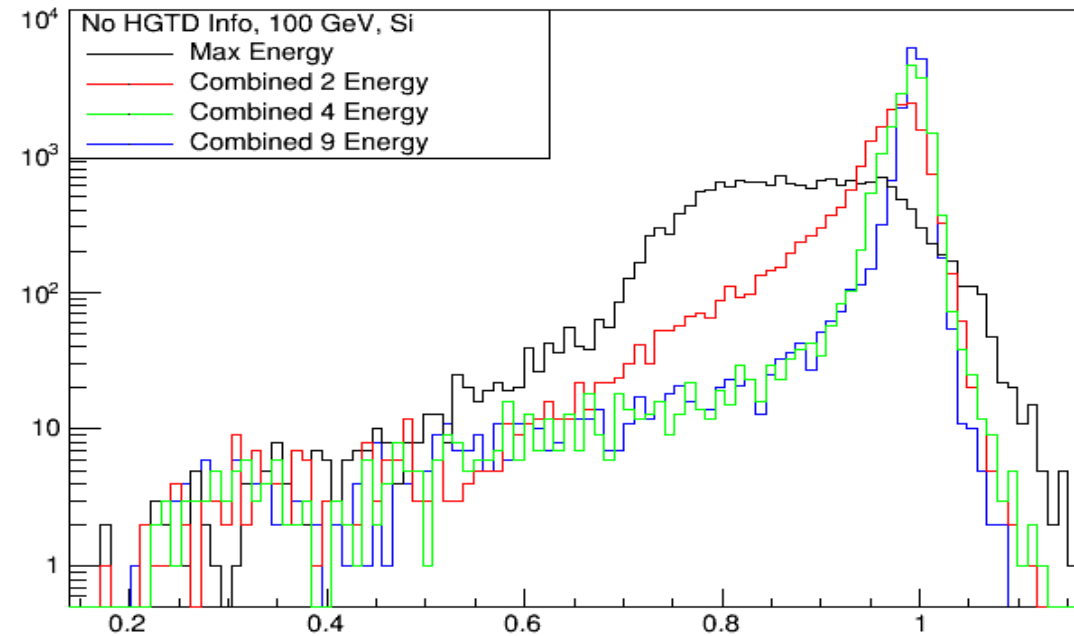
Energy / true energy for different clusters of the calorimeter

Samples trained with 20 - 100 GeV flat sample
Applied to 20 GeV & 100 GeV fixed samples

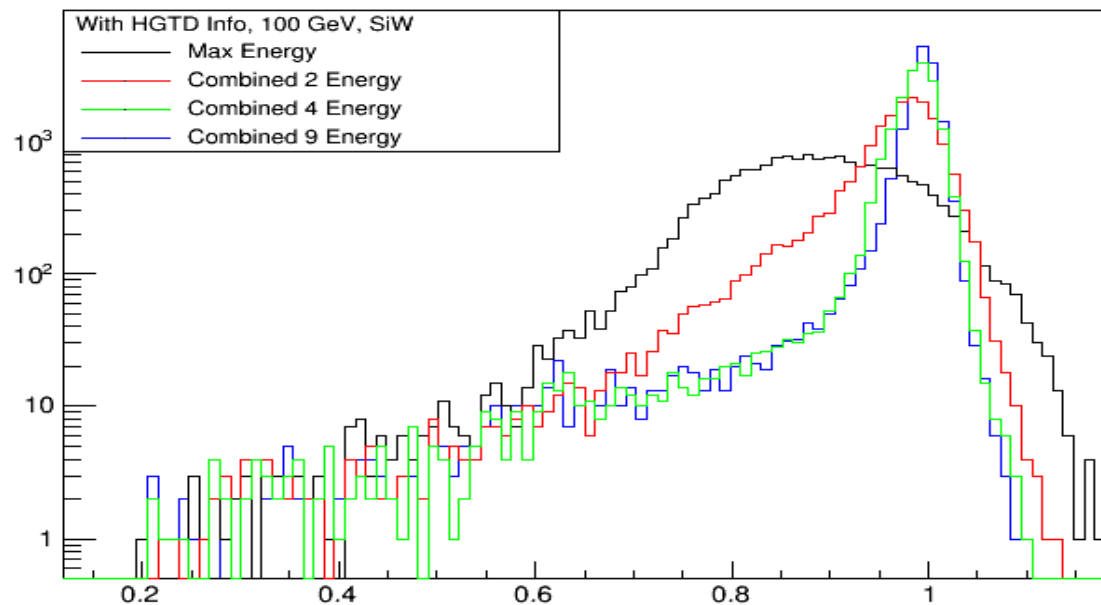
output_energy/(pt*cosh(eta)) {eta>2.5}



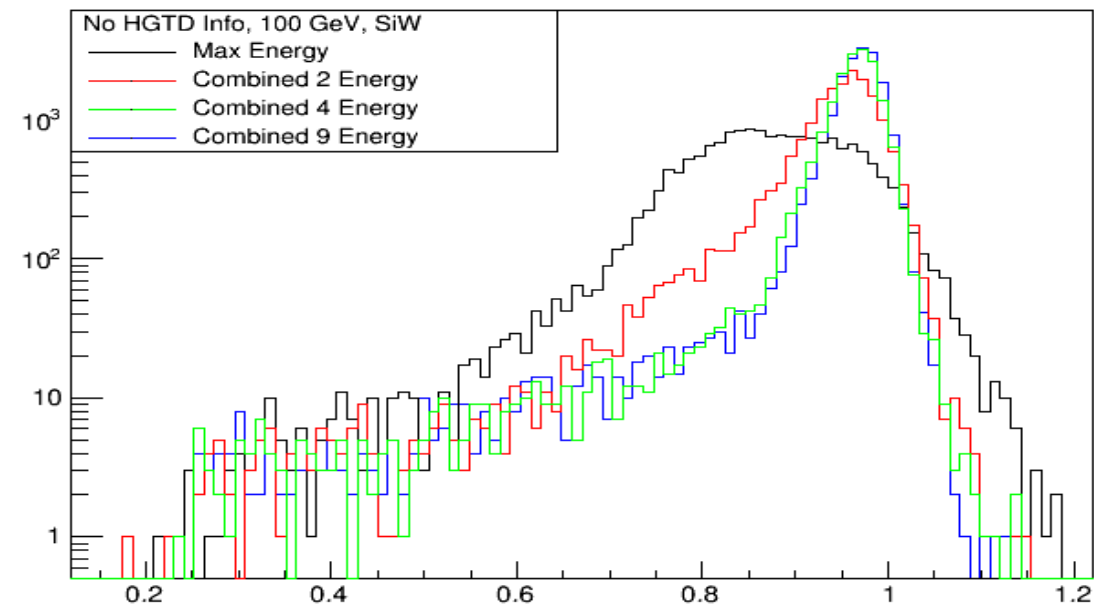
output_energy/(pt*cosh(eta)) {eta>2.5}



output_energy/(pt*cosh(eta)) {eta>2.5}

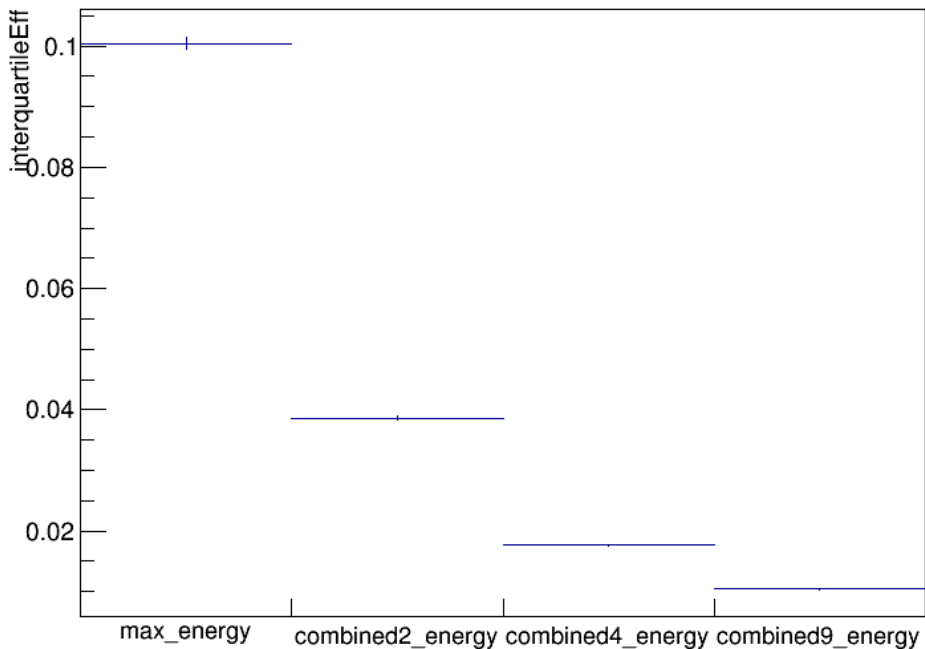


output_energy/(pt*cosh(eta)) {eta>2.5}



Need to compare resolutions

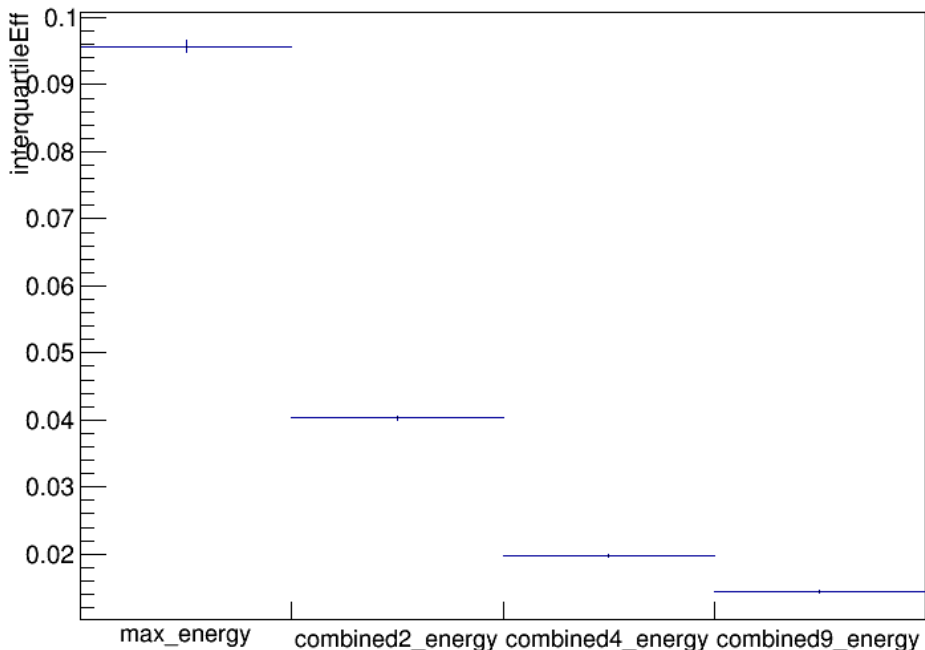
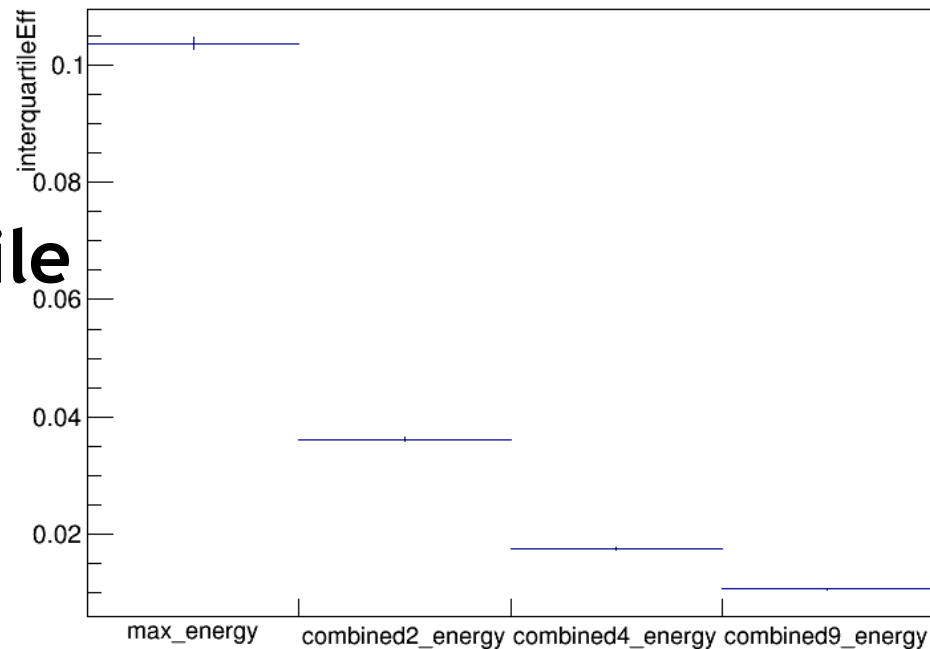
- Effective Interquartile Range (narrow as possible)
- Mean value (close to one as possible)
- RMS (minimize)



100 GeV
Effective
Interquartile

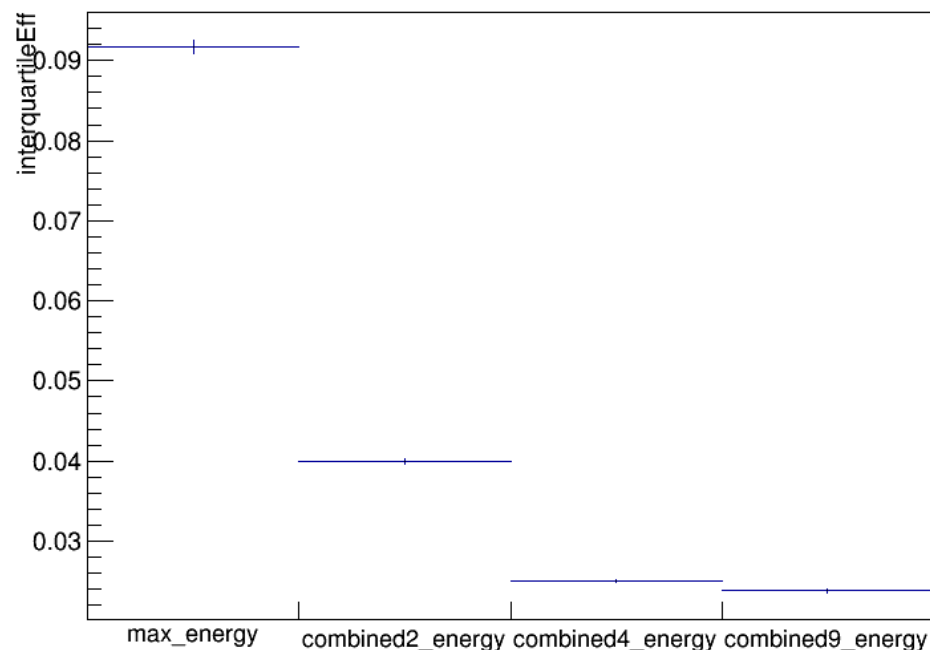
Si
 With HGTD

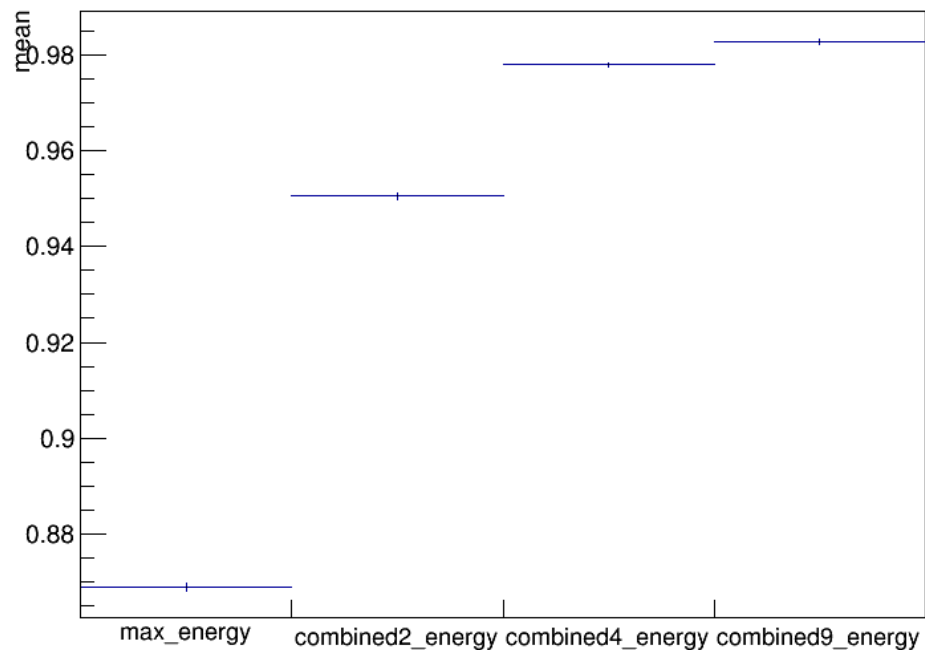
Si
 No HGTD



SiW
 No HGTD

SiW
 With HGTD

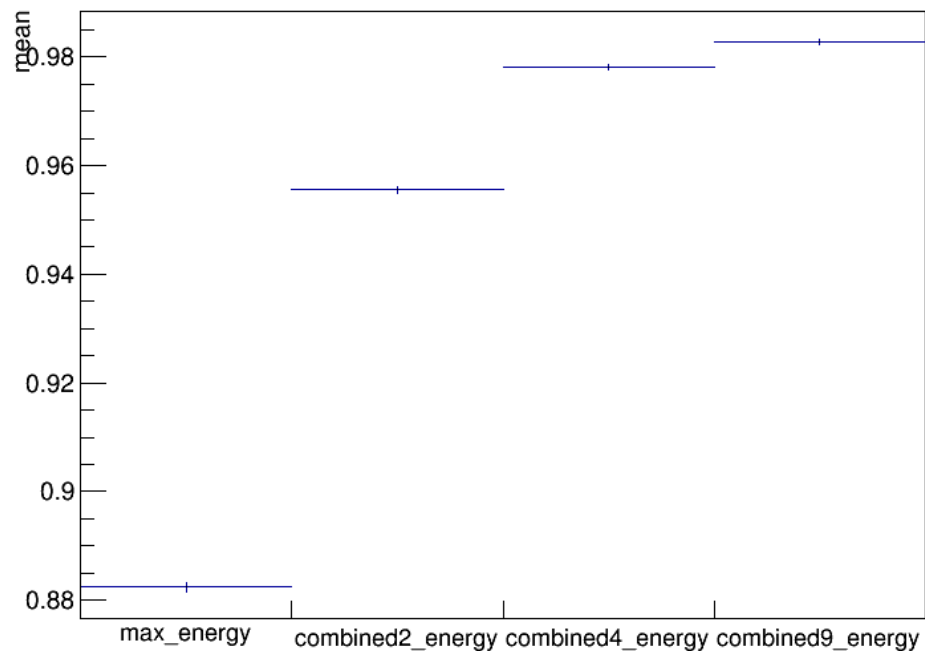
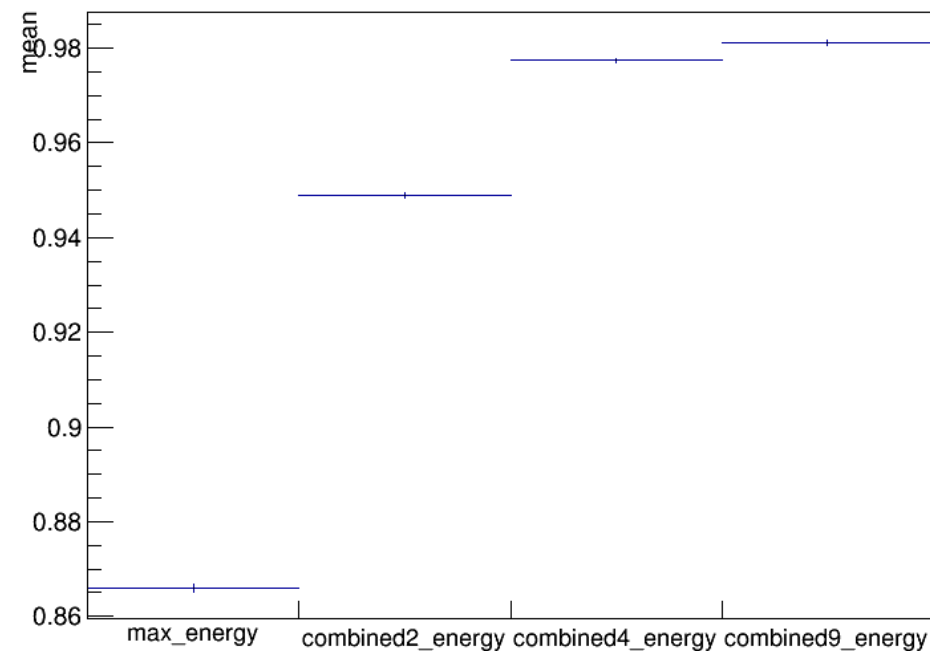




Si
With HGTD

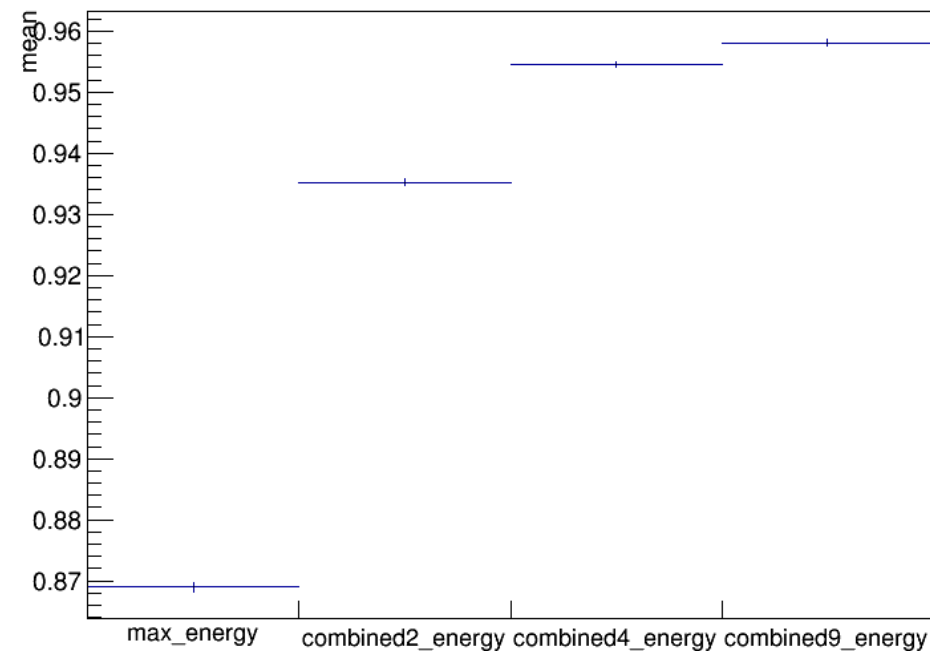
100 GeV Mean

Si
No HGTD



SiW
With HGTD

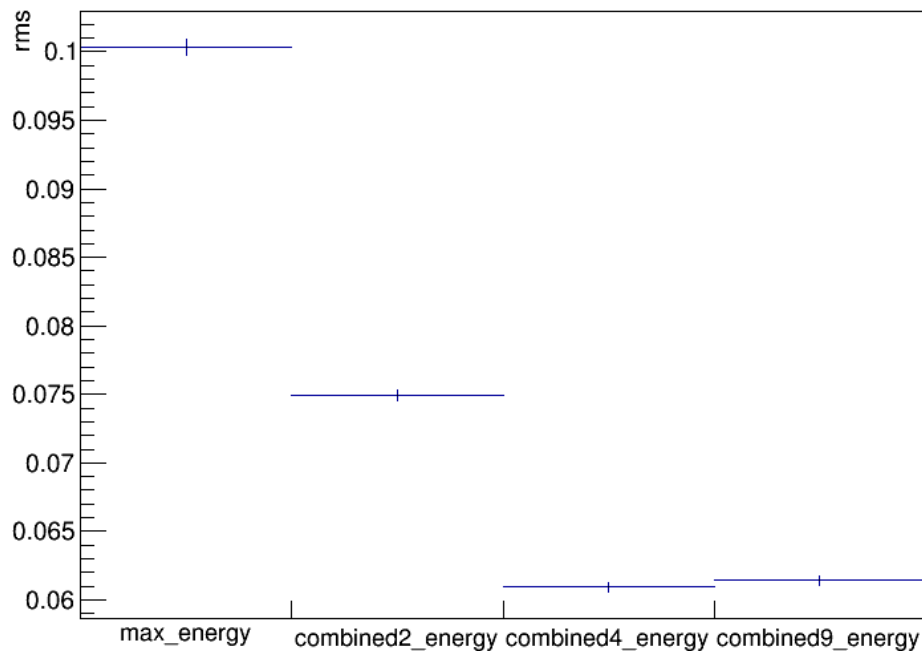
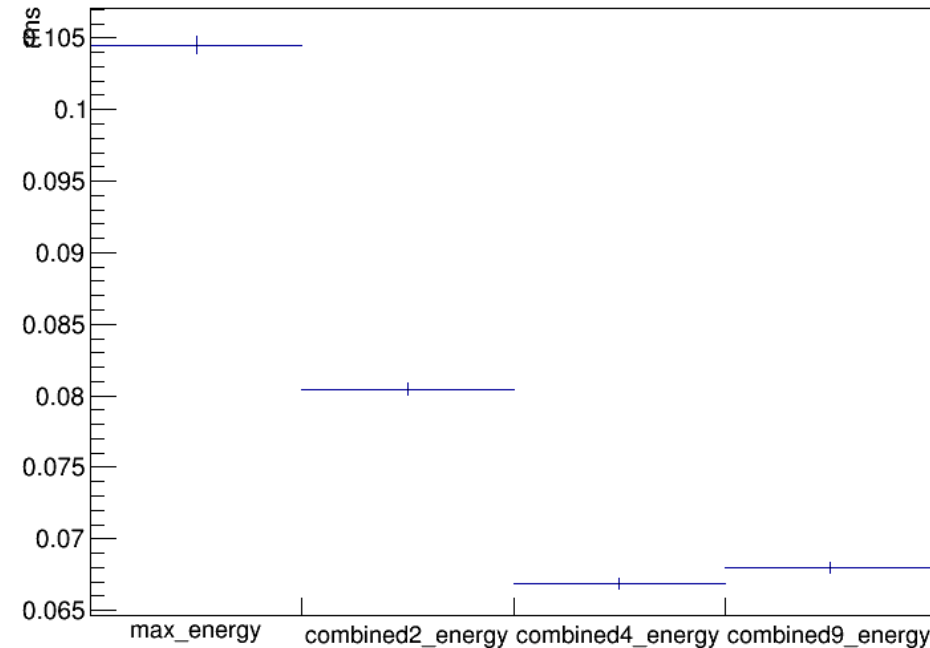
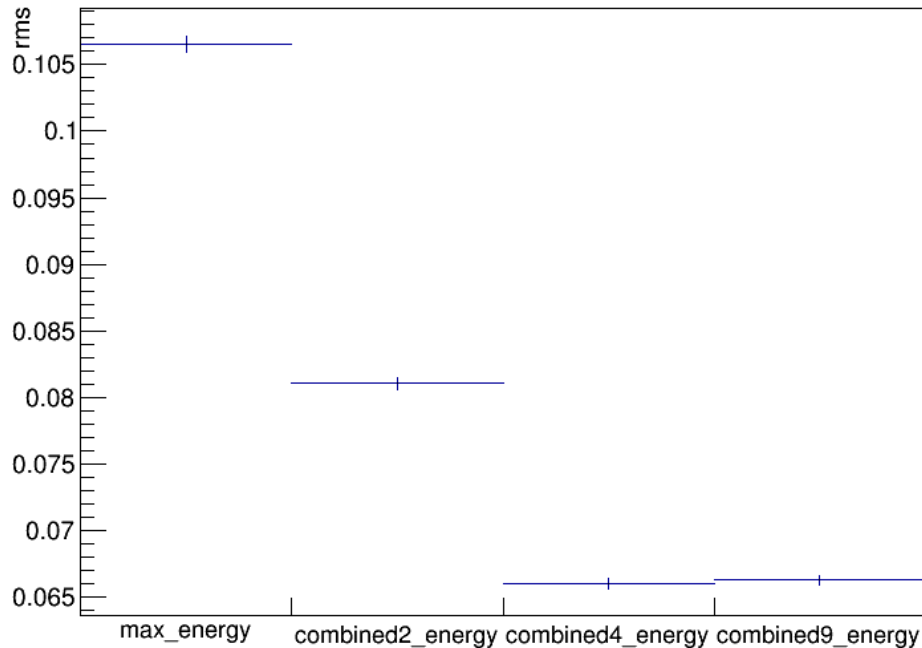
SiW
No HGTD



100 GeV RMS

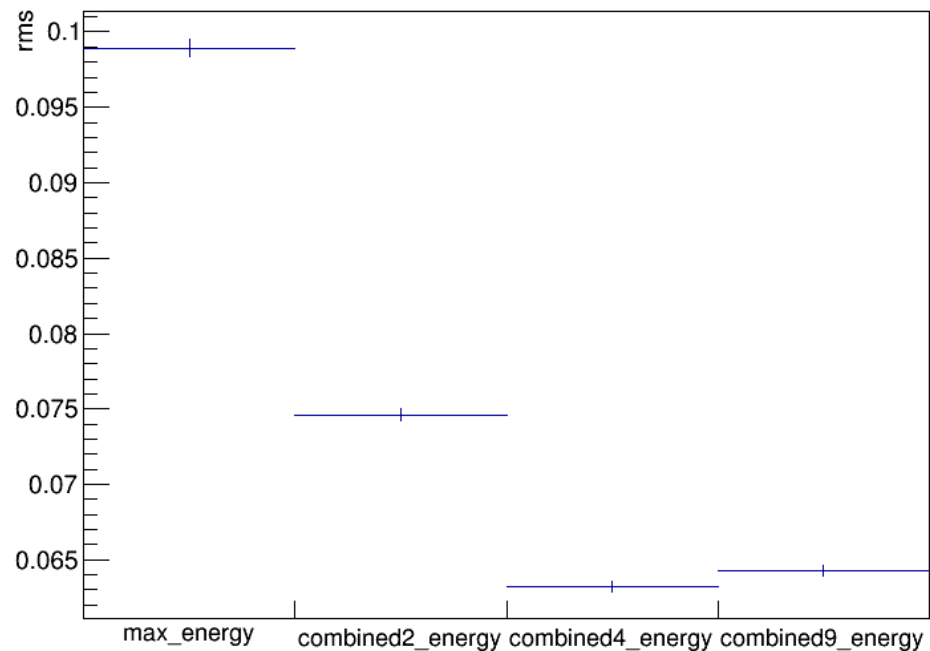
Si
No HGTD

Si
With HGTD



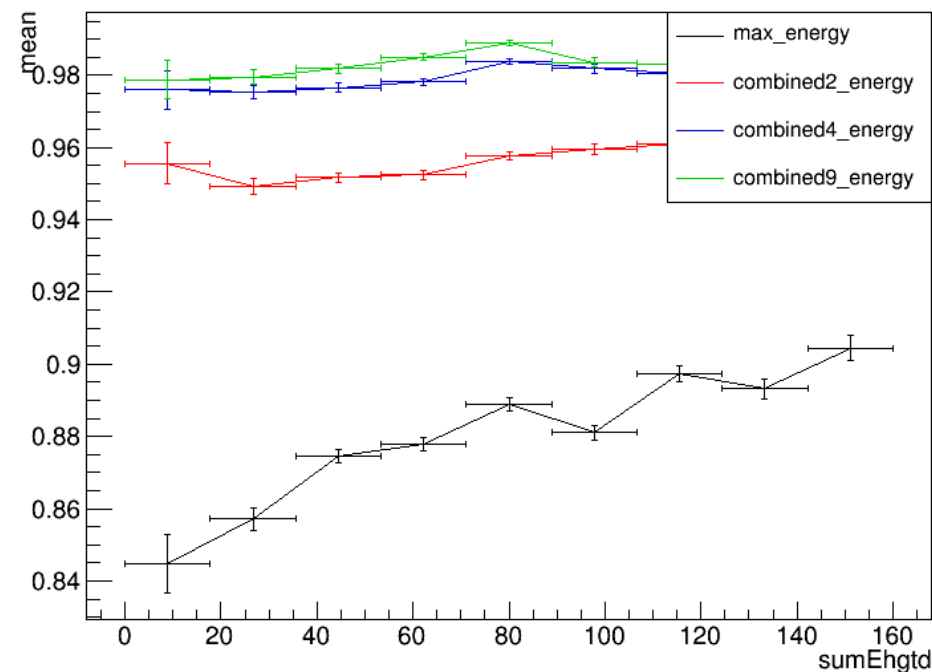
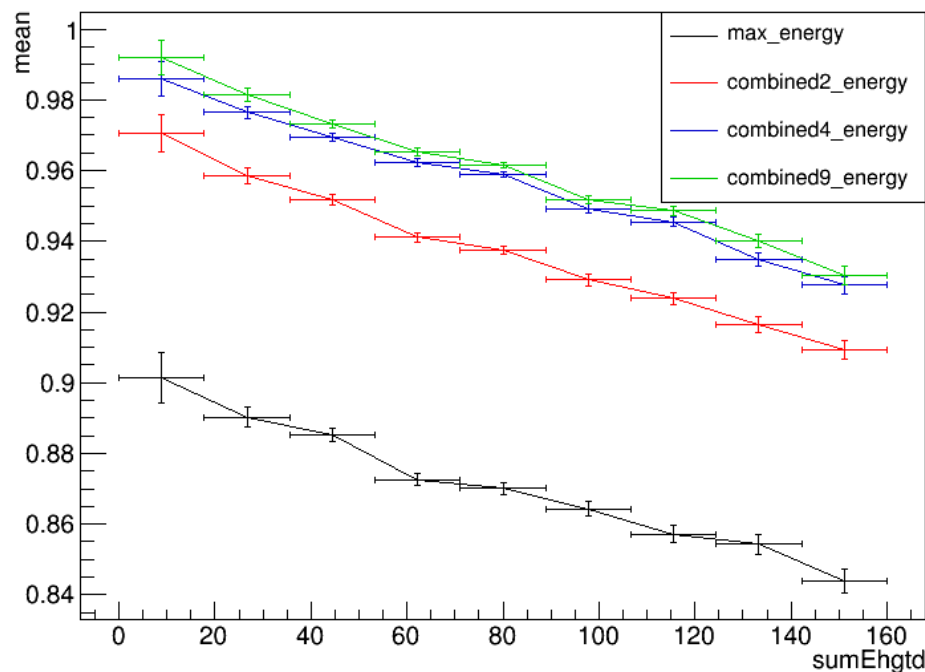
SiW
No HGTD

SiW
With HGTD

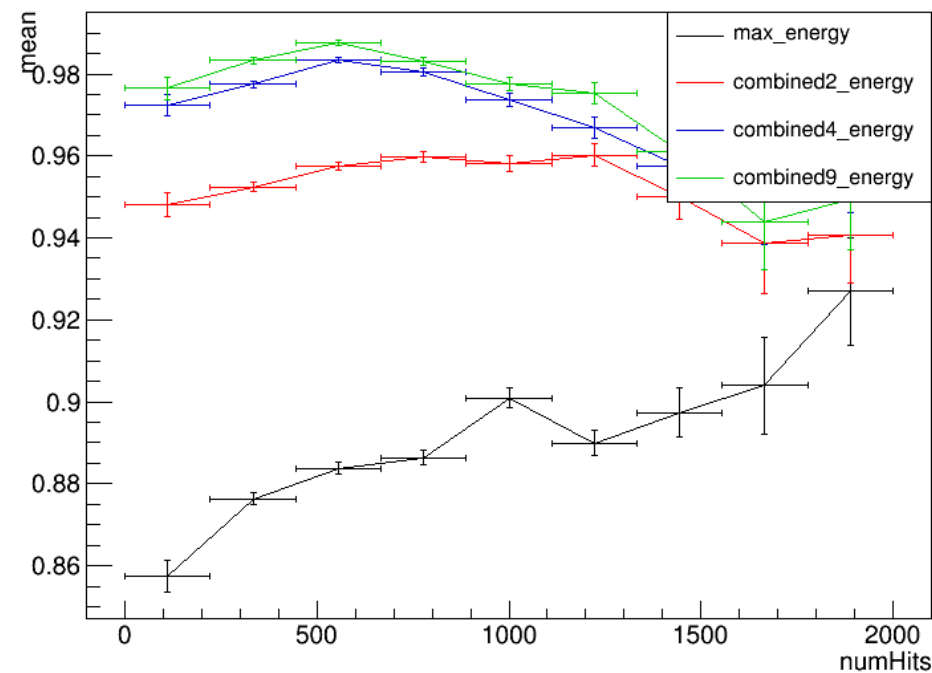
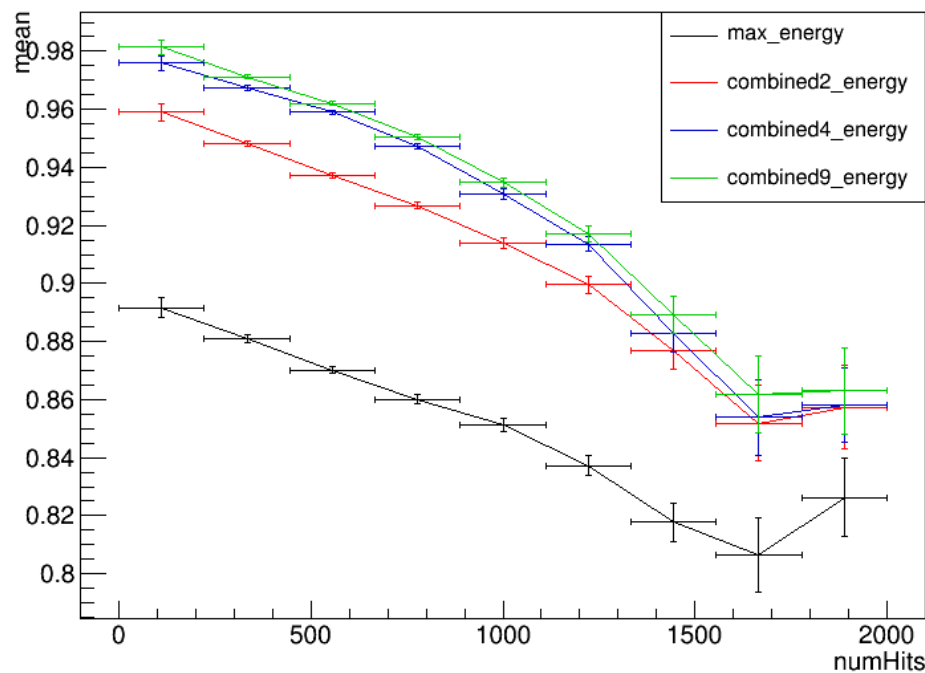


Why training with HGTD helps with resolution

100 GeV
SiW



No HGTD training → trained with HGTD



Conclusion

Including the HGTD information in training improves the resolution by quite a bit

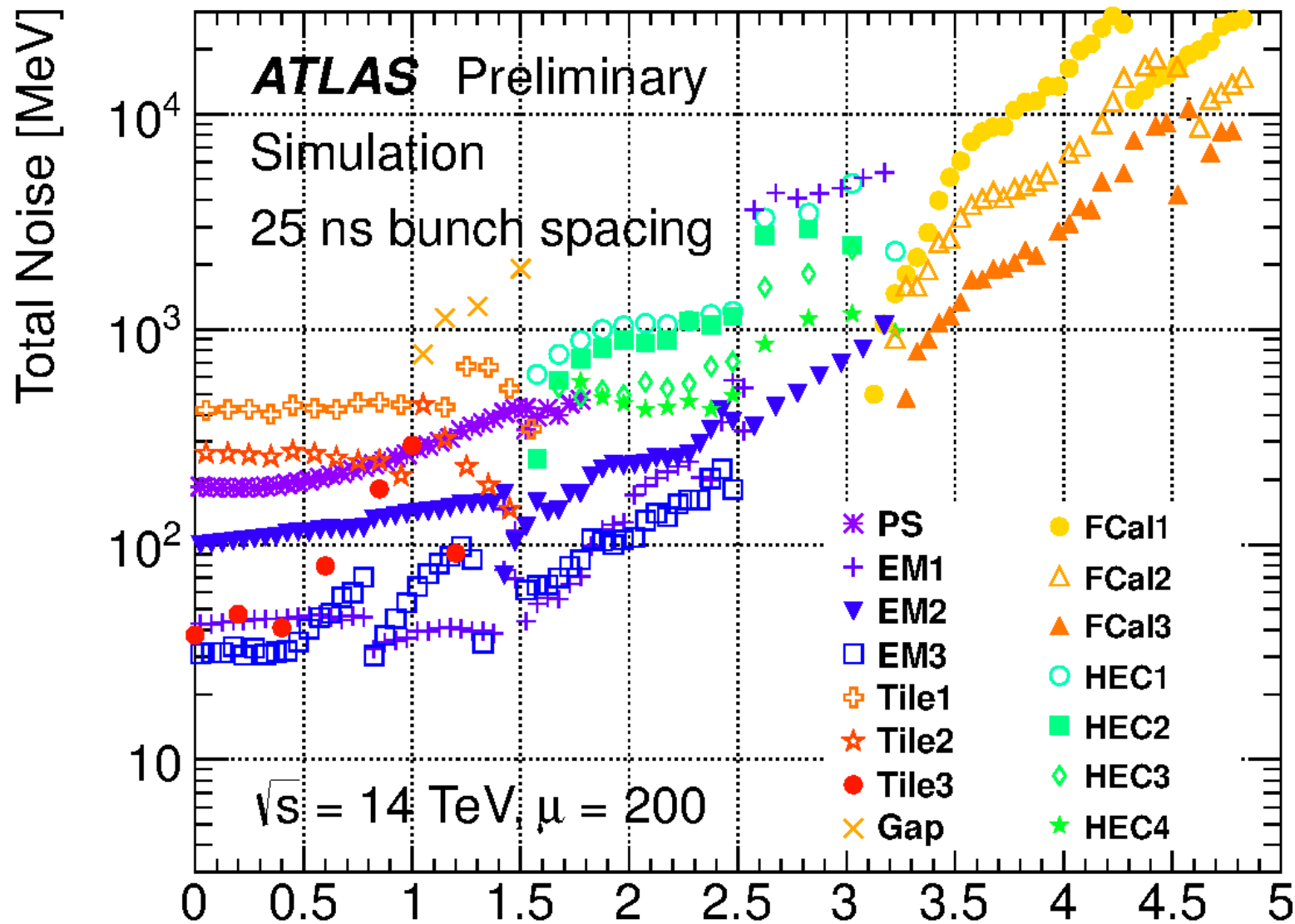
Improves mean by 0.02

Improves RMS by 0.005

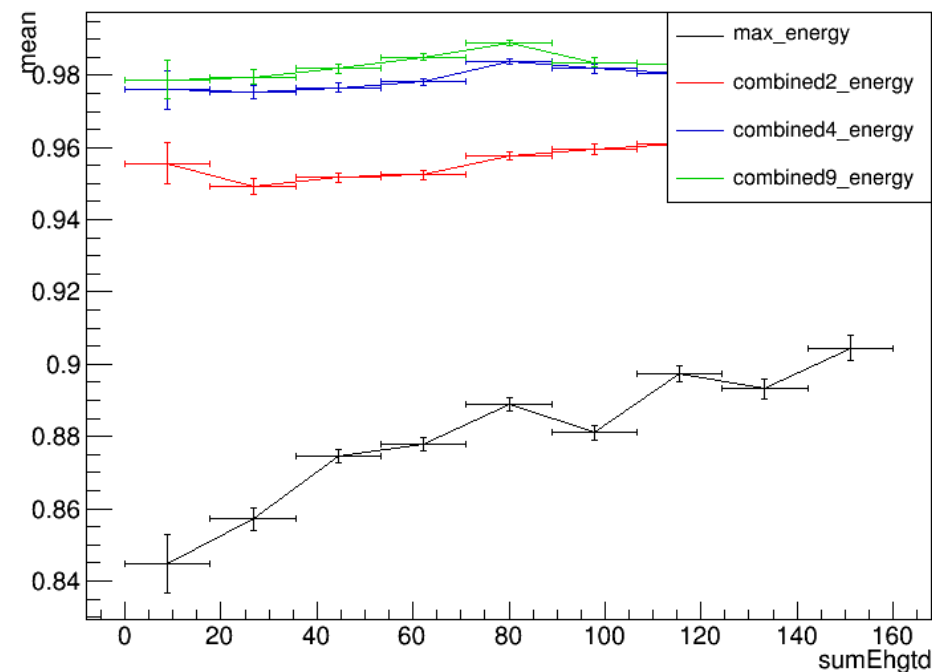
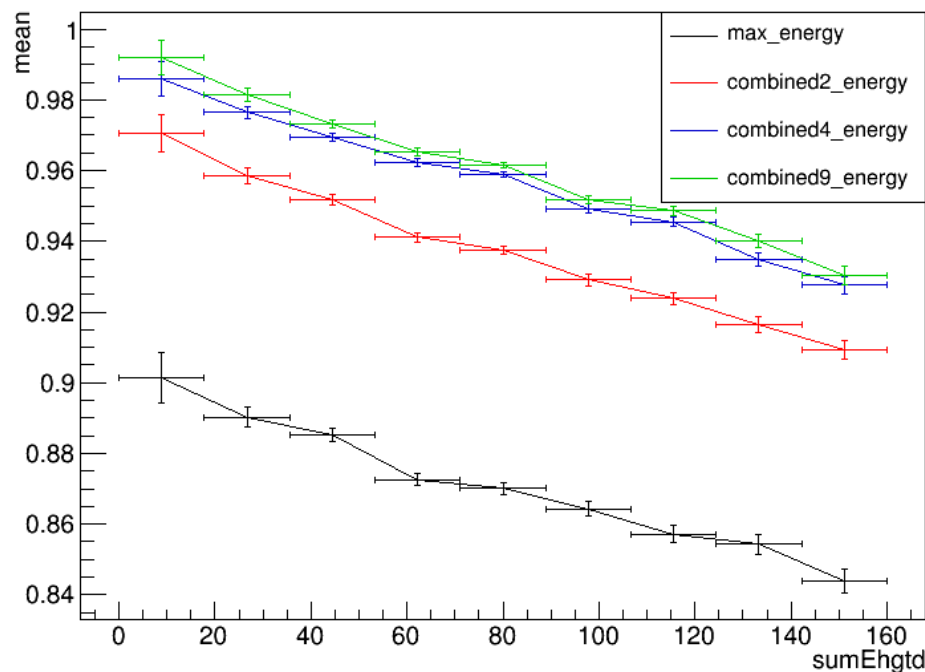
Improves interquartile range by 0.01

But wait, what about pileup?

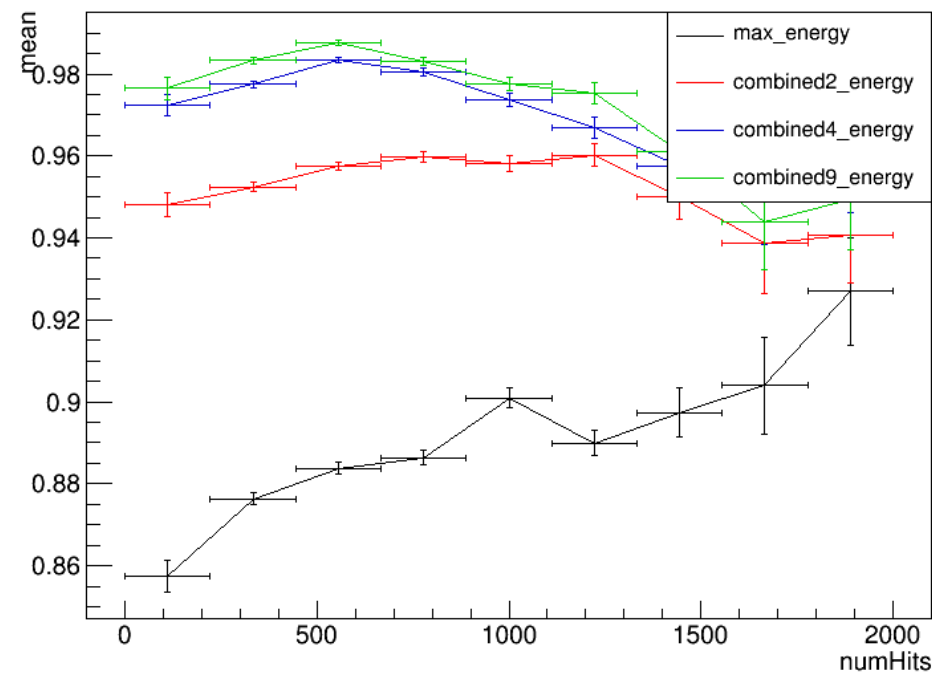
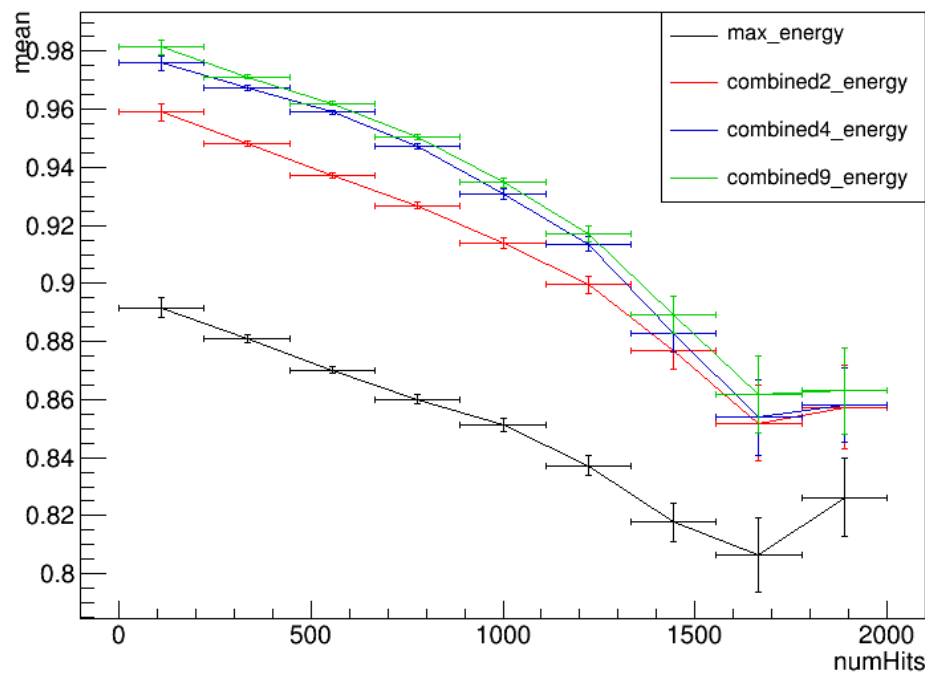
But wait, what about pileup?



100 GeV
SiW



No HGTD training → trained with HGTD



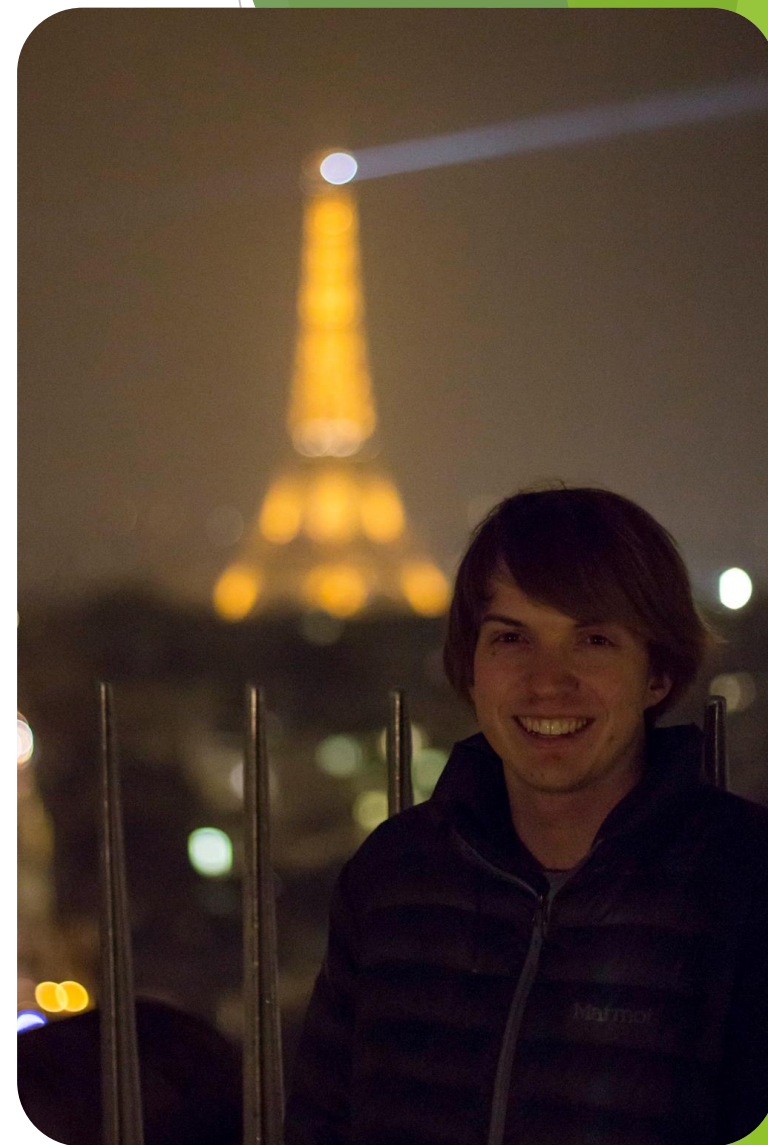
Next Steps

- Take pileup into consideration
- Cluster HGTD tiles instead of taking the sum of their energy



← Budapest

Mexico City →



Barcelona →

