

Energy Correction UHE

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Energy correction investigations

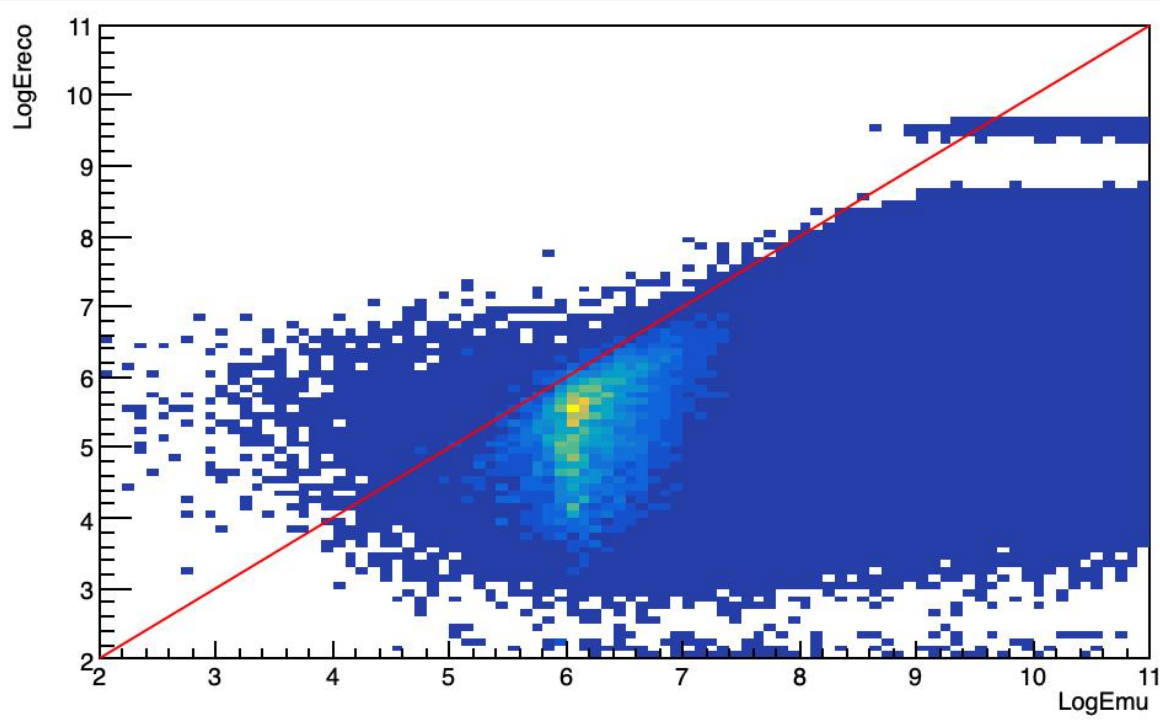
Checking the energy resolution for D0ARCA021 UHE production (used 81 processed runs)

Comparing with the energy resolution of full ARCA configuration (analysis 2020-2021, up to date sample)

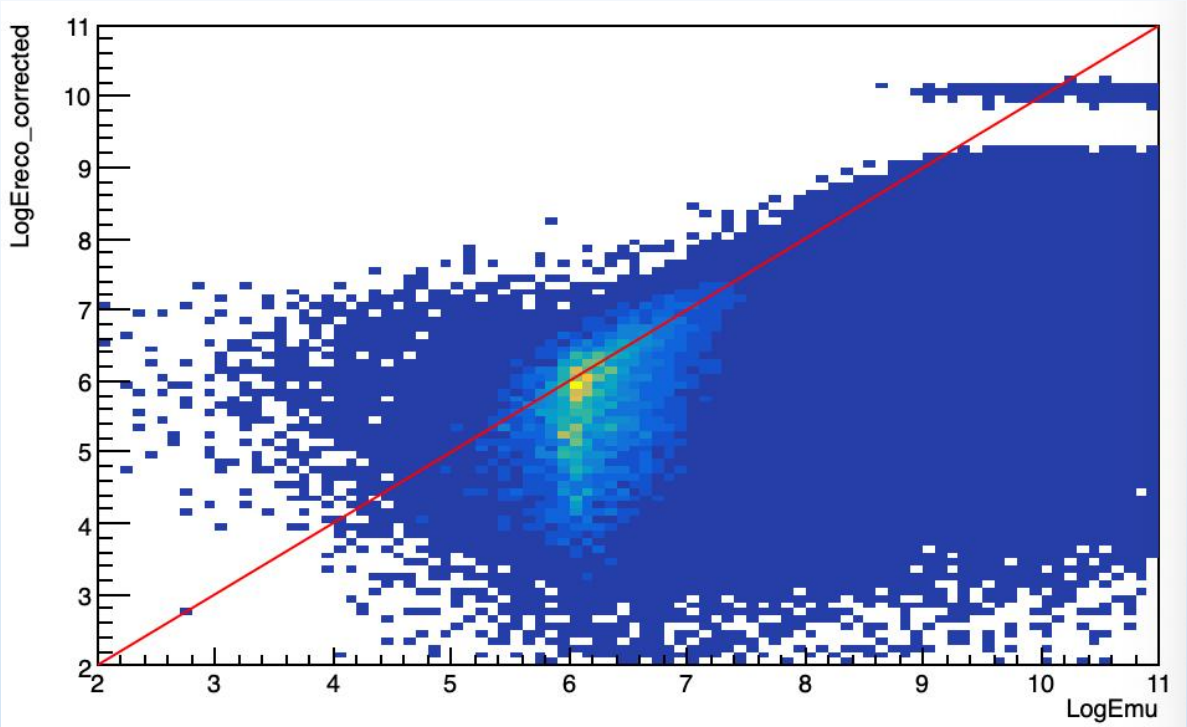
Comparing with energy resolution for D0ARCA021 UHE production
when changing the JEnergy roadwidth in 300m (used 5 processed runs)

Weighted cosmic flux - UHE sample

before correction



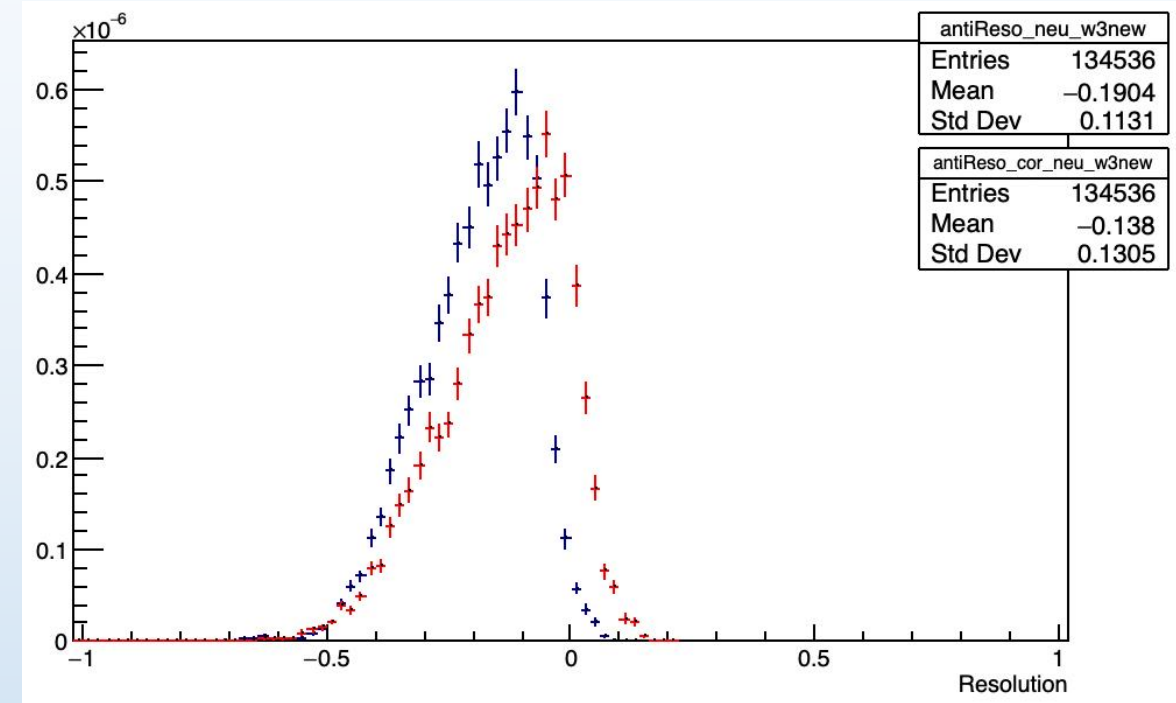
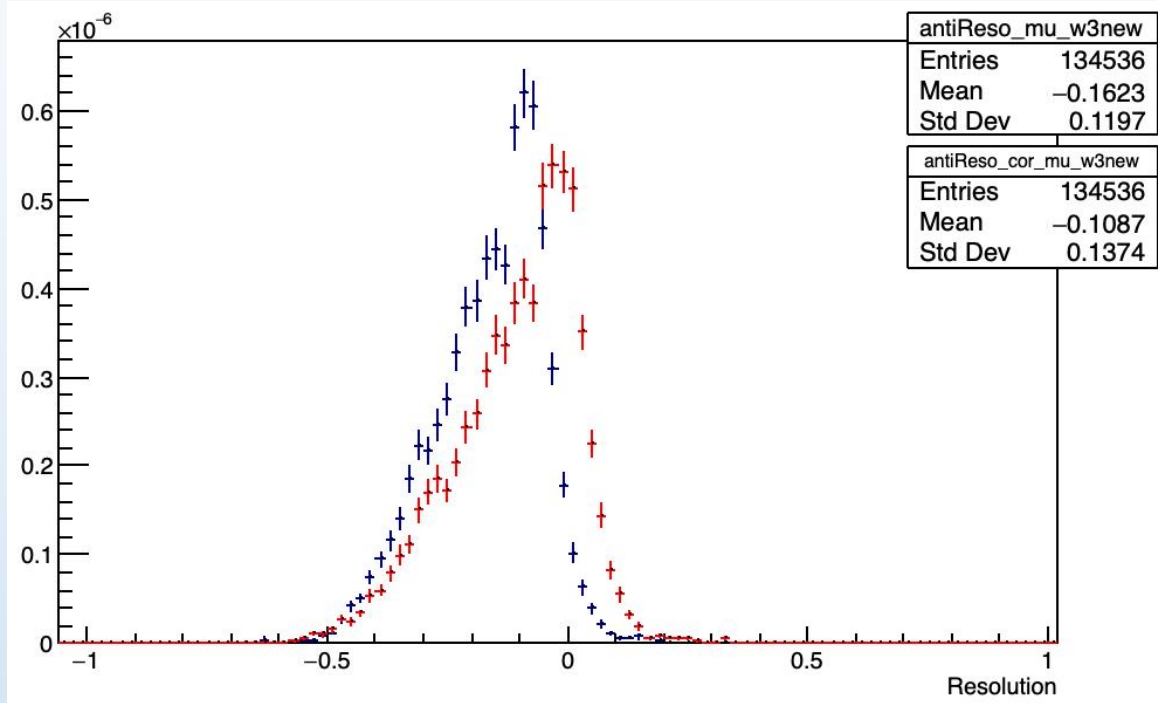
after correction



Weighted cosmic flux - Energy Resolution - UHE sample

$$\log\text{Eresolution_mu} = (\log\text{Ereco} - \log\text{E_mu}) / \log\text{E_mu};$$

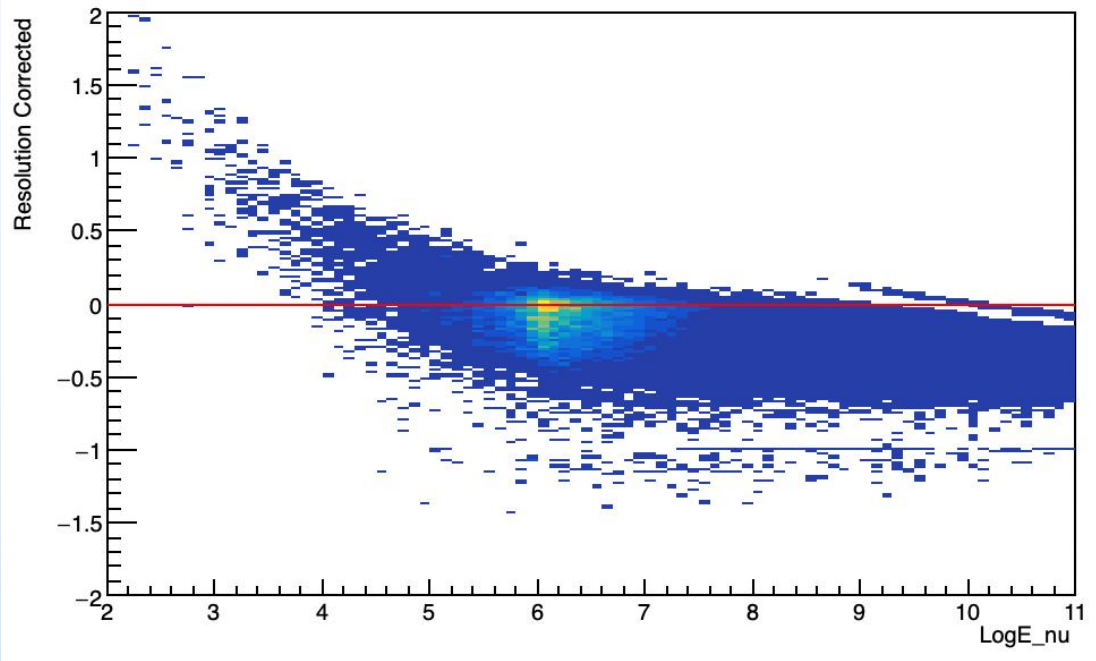
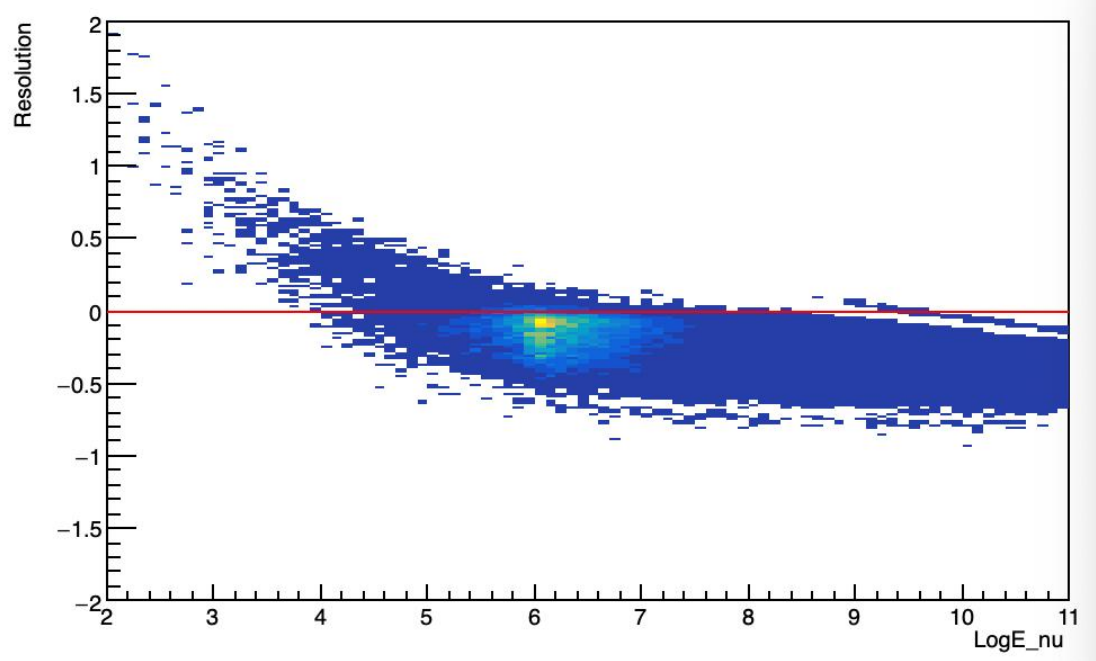
$$\log\text{Eresolution_neu} = (\log\text{Ereco} - \log\text{E_nu}) / \log\text{E_nu};$$



Before the energy correction: mean = 0.162 , std = 0.12

After the energy correction: mean = -0.109 , std = 0.14

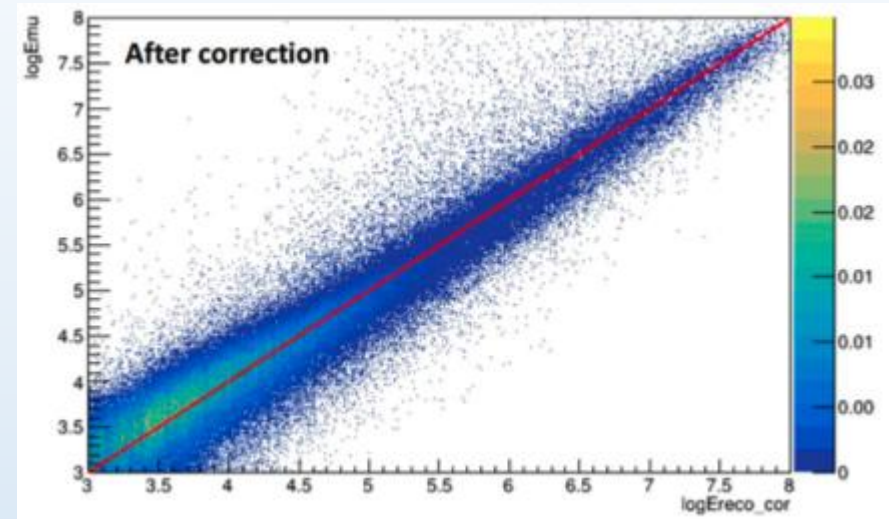
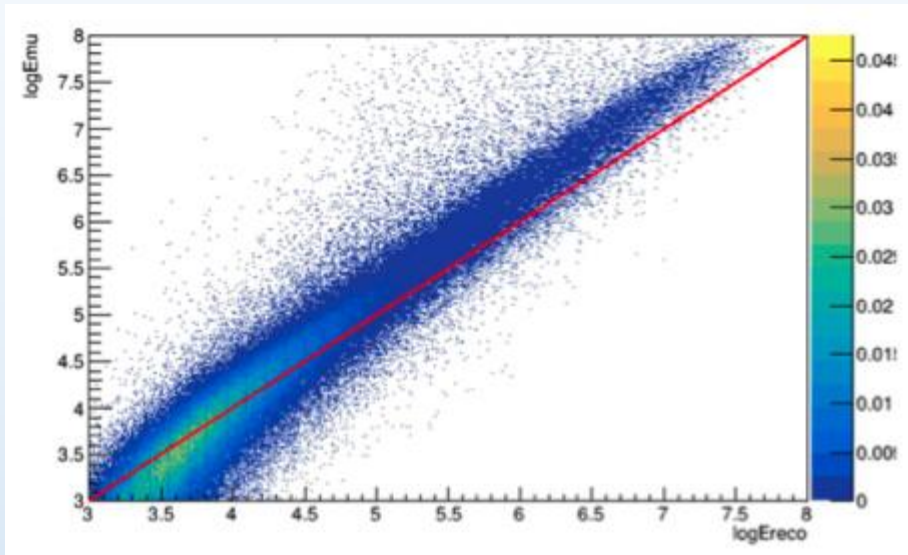
Resolution vs Energy - cosmic flux - UHE sample



Weighted cosmic flux - FULL ARCA SAMPLE

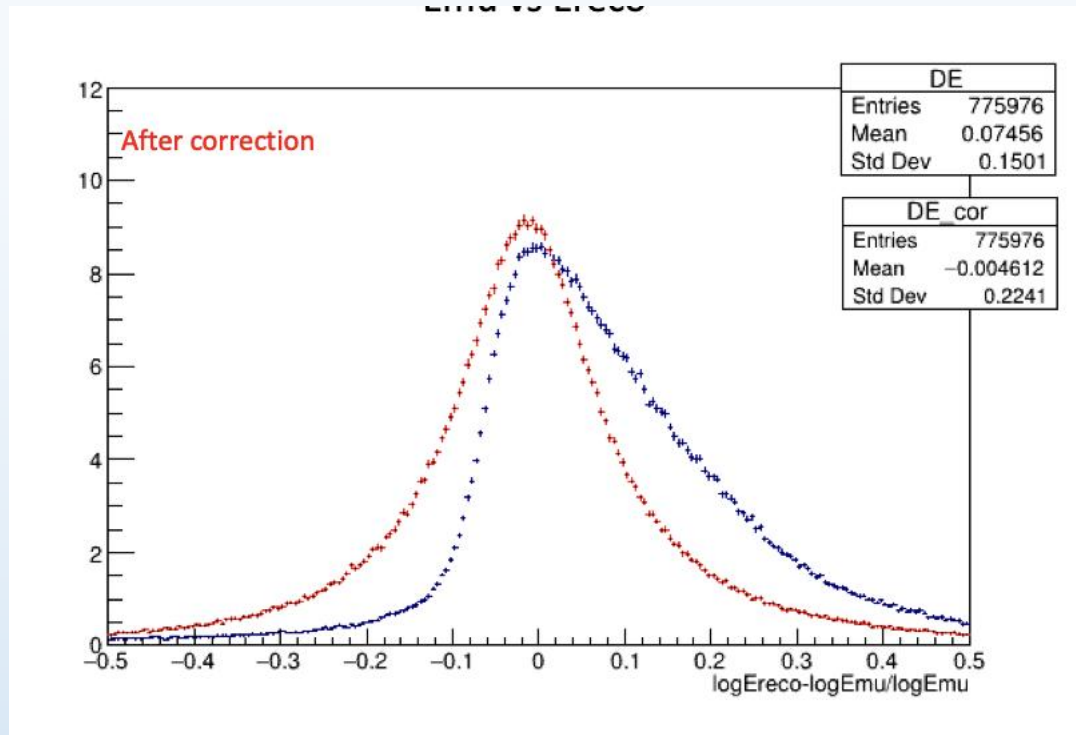
before correction

after correction



Before the energy correction, the reconstruction overestimates the true muon energy; in the D0ARCA021 production it underestimates it.

Energy resolution - Weighted cosmic flux - FULL ARCA SAMPLE

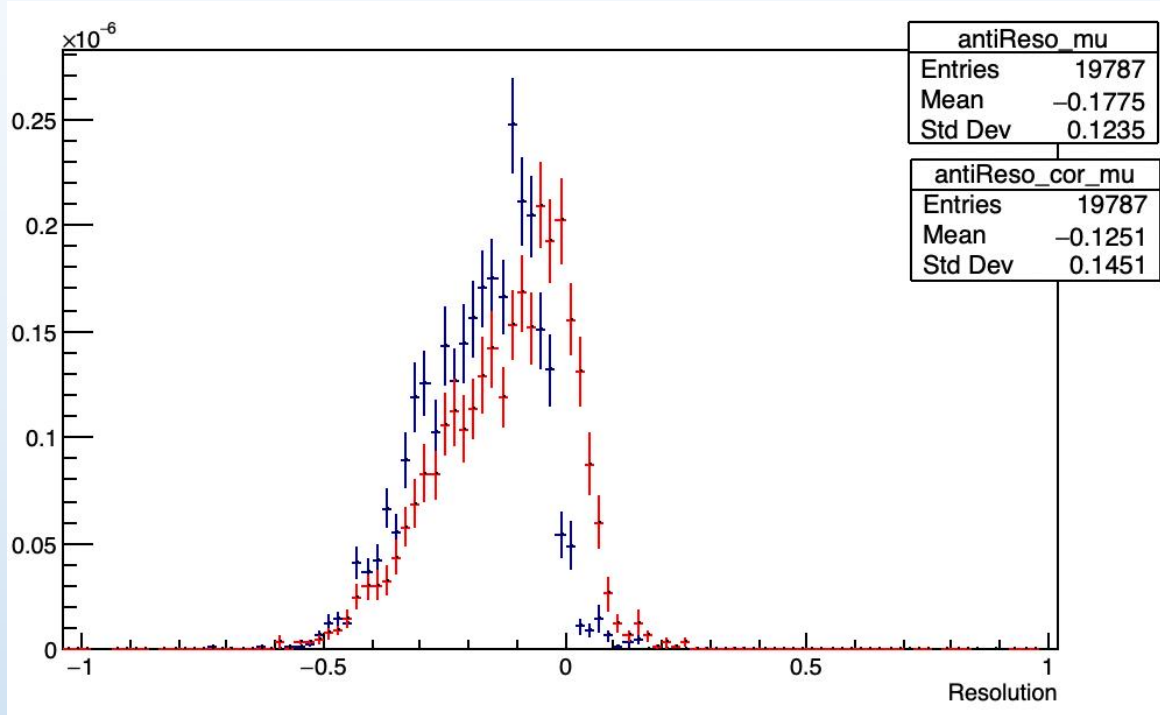


Before the energy correction: mean = 0.075 , std = 0.15

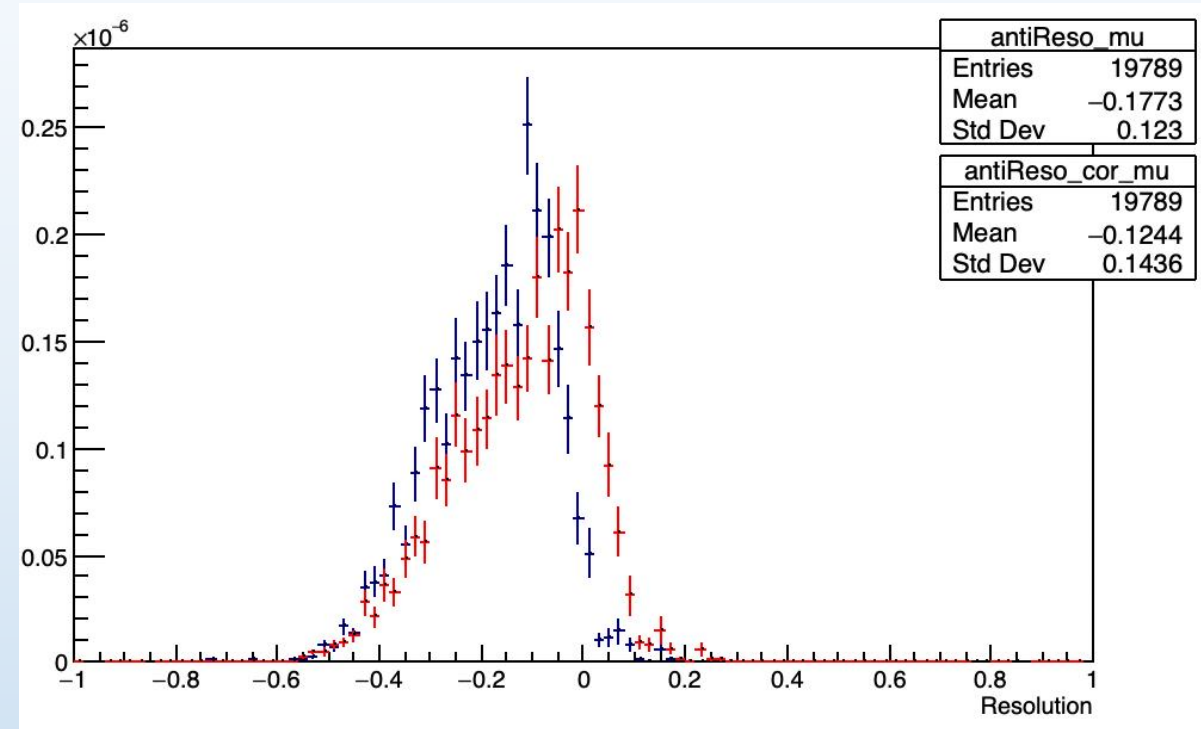
After the energy correction: mean = -0.005 , std = 0.22

Energy resolution - Normal files - Extended roadwidth

JEnergy R = 200m



JEnergy R = 300m

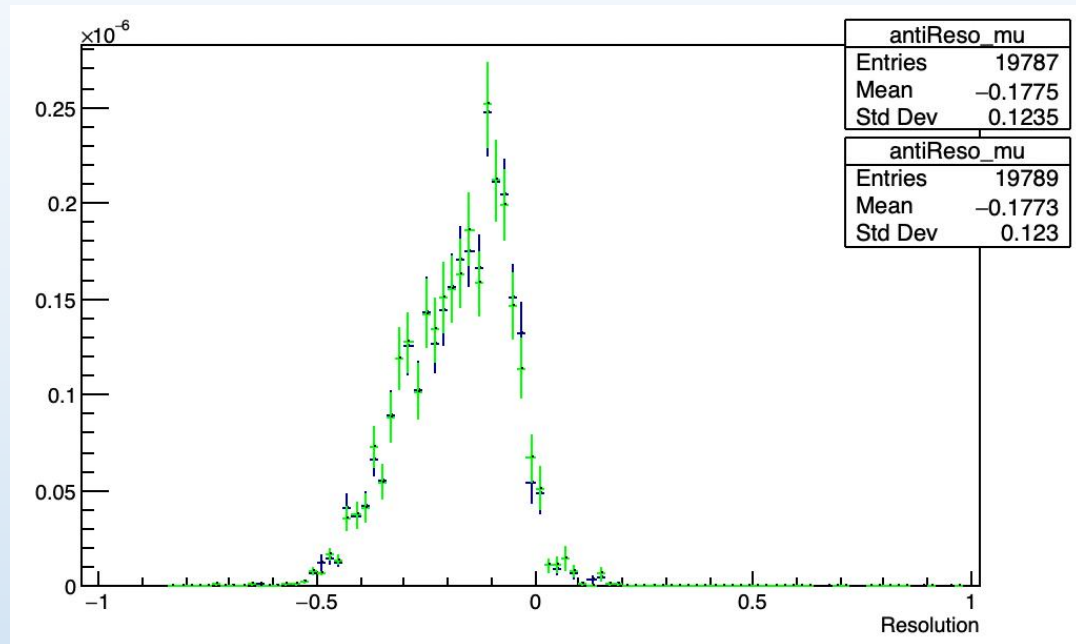


Before the energy correction

After the energy correction

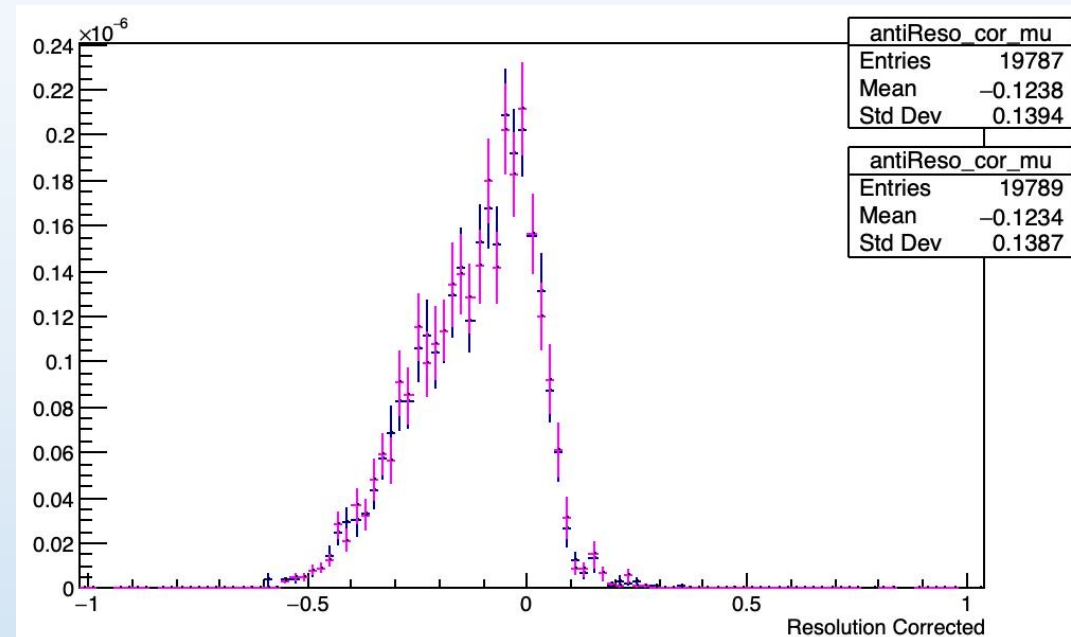
Energy resolution - Normal files - Extended roadwidth

before correction



JEnergy R = 200m
JEnergy R = 300m

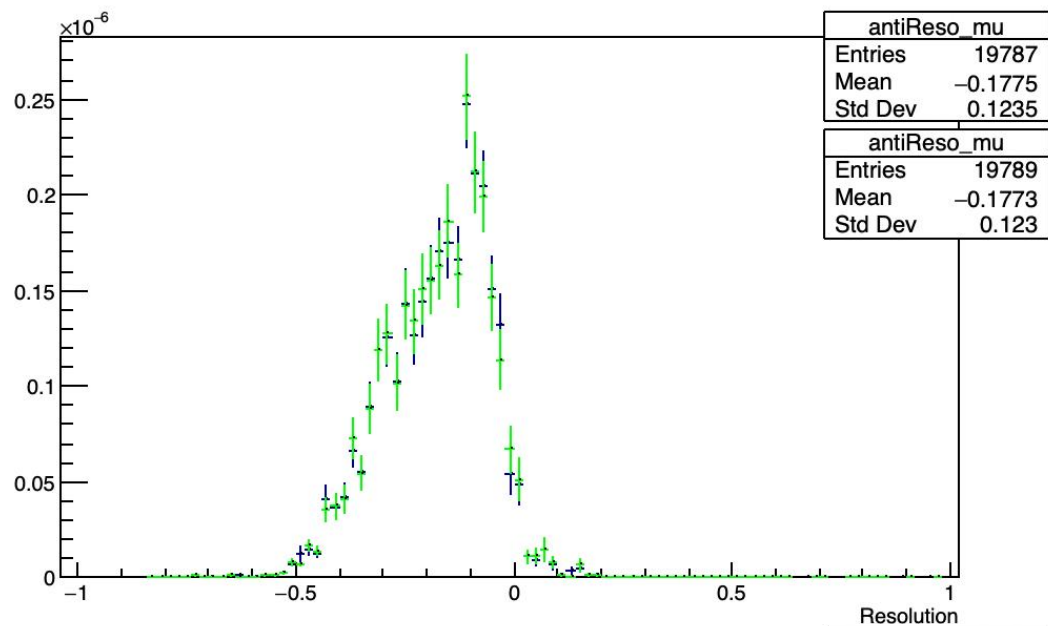
after correction



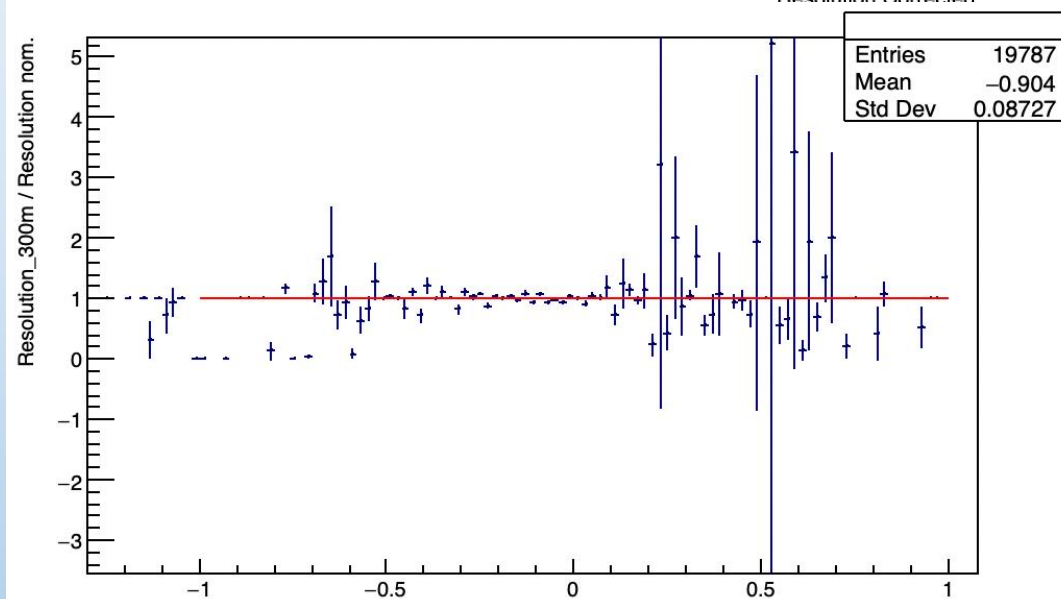
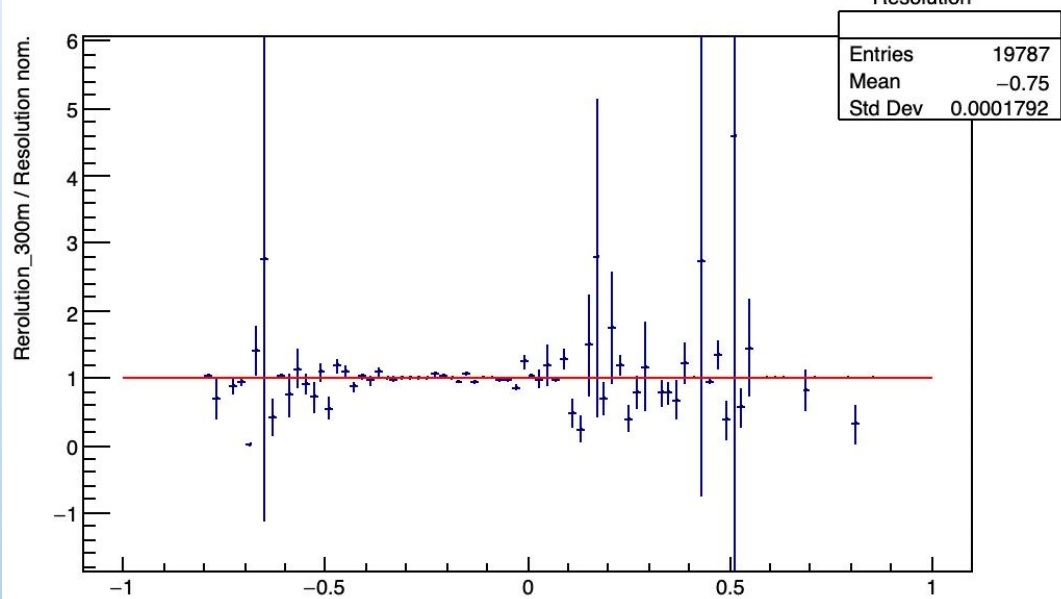
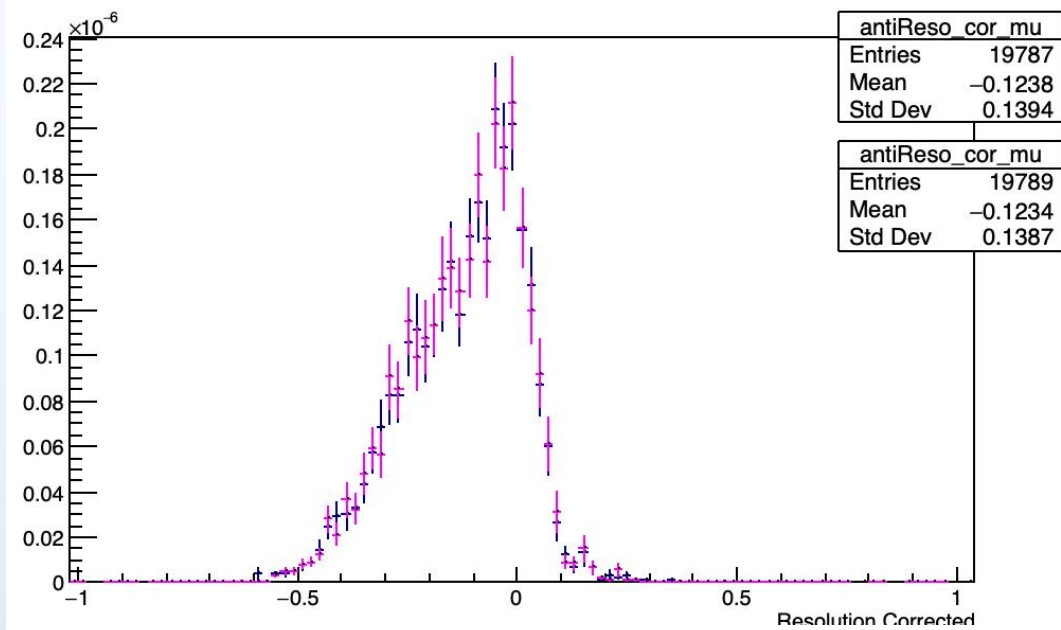
JEnergy R = 300m
JEnergy R = 300m

Energy resolution - Normal files - Extended roadwidth

before correction



after correction



Conclusions

Checking the energy resolution for D0ARCA021 UHE production (used 81 processed runs):

$$\log E_{\text{resolution}}_{\mu} = (\log E_{\text{reco}} - \log E_{\mu}) / \log E_{\mu} \sim 11\%$$

Comparing with the energy resolution of full ARCA configuration (analysis 2020-2021, up to date sample):

Optimization of the energy resolution. Worsening of std. deviation for both cases.

In full ARCA config. overestimation before correction while in D0ARCA021 underestimation of true energy.

Comparing with energy resolution for D0ARCA021 UHE production when changing the JEnergy roadwidth in 300m (used 12 processed runs):

Compatible results when increasing the JEnergy roadwidth in 300m.

Changing all steps roadwidths ? - Not for now. TBD in the next optimization studies.

Now:

jprefit R = 200m

jsimplex R = 200m

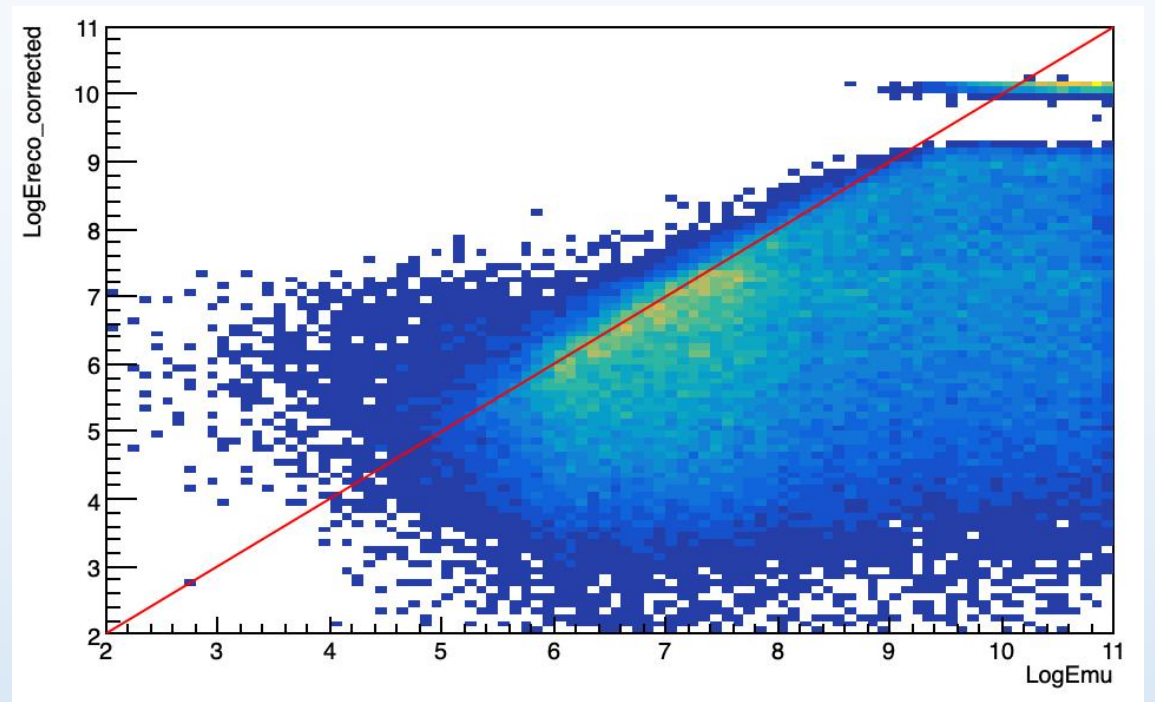
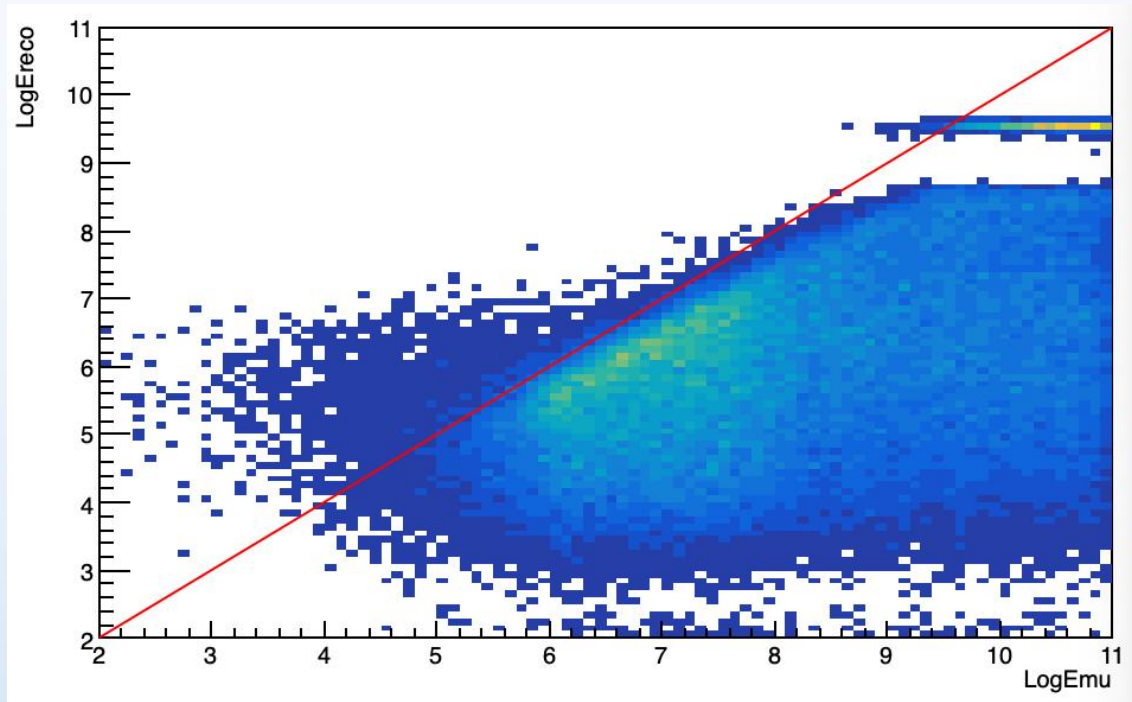
lgandalf R = 175 m

jstart R = 165m

jenergy R = 200m or 300m (tested)

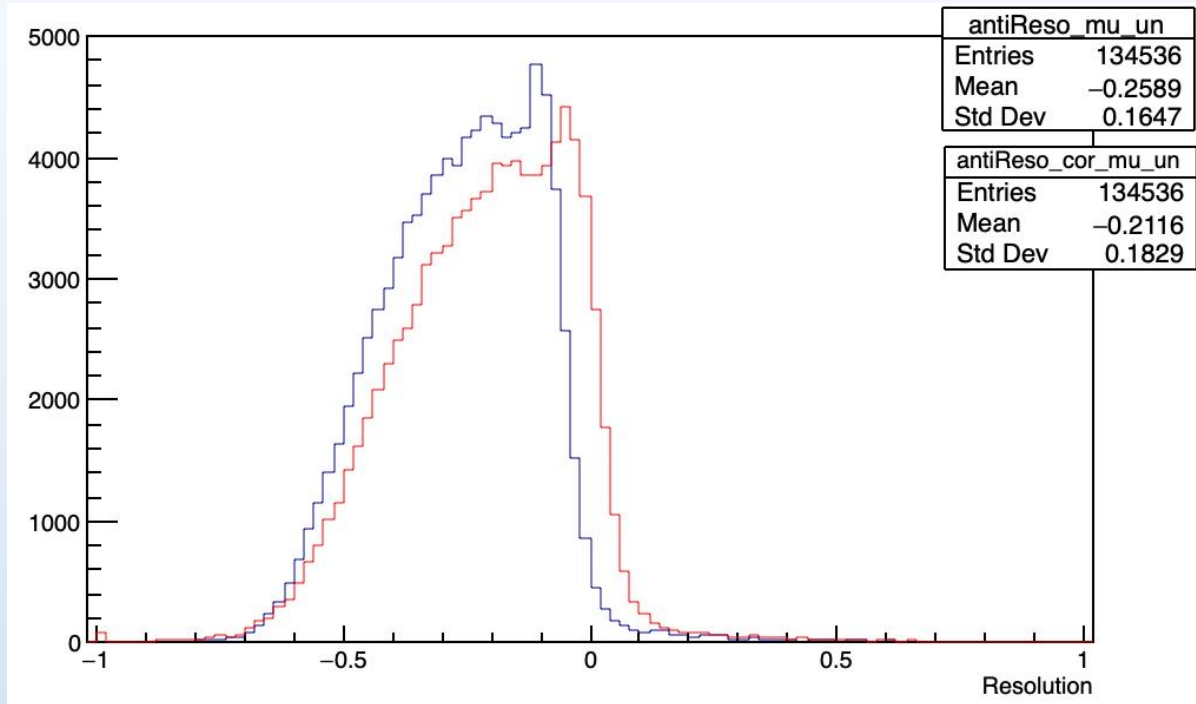
Backup

UnWeighted

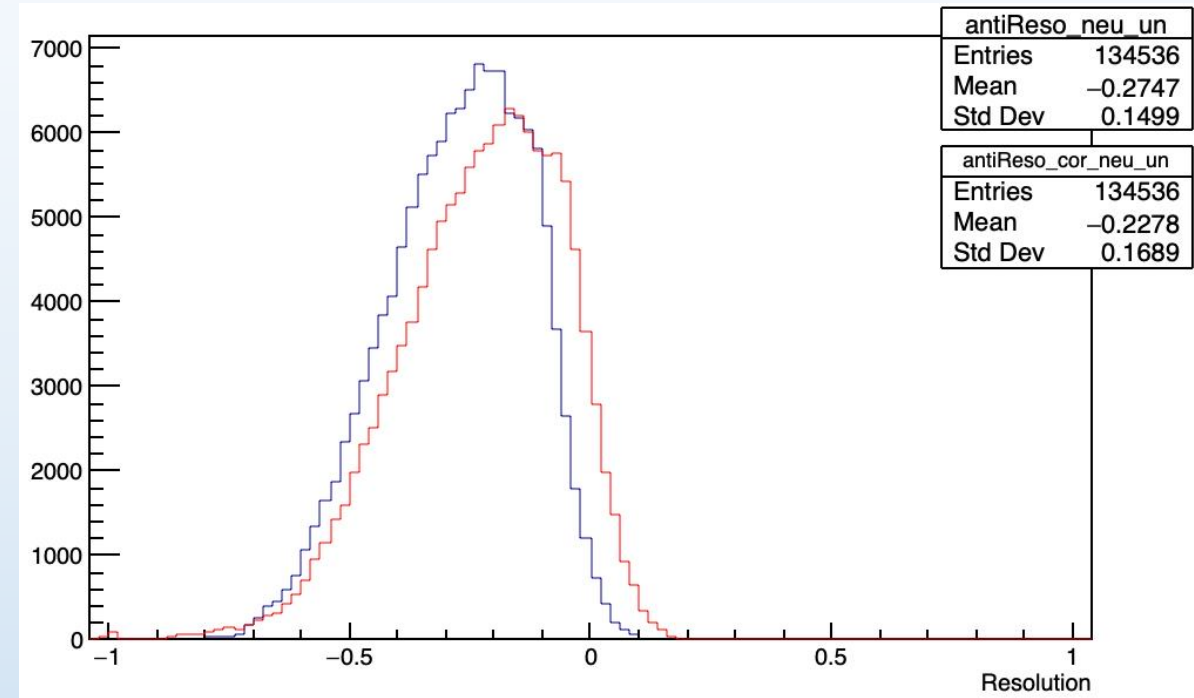


UnWeighted - Energy Resolution

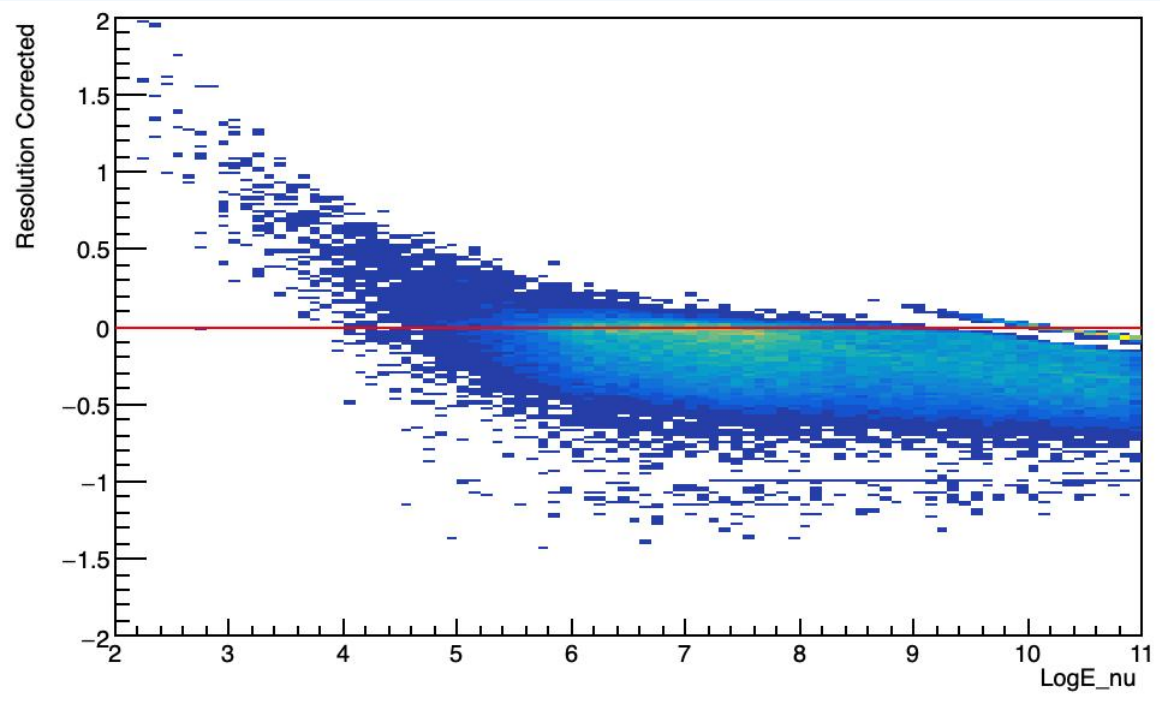
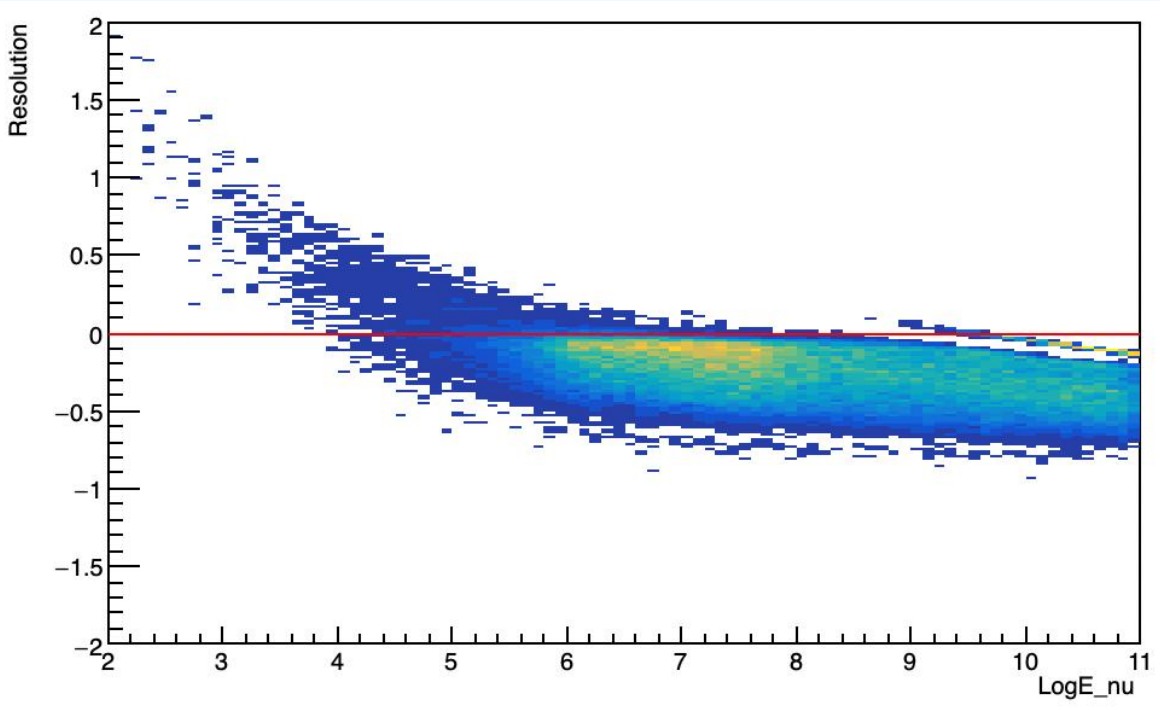
$$\text{logEresolution_mu} = (\text{logEreco} - \text{logE_mu}) / \text{logE_mu};$$



$$\text{logEresolution_neu} = (\text{logEreco} - \text{logE_nu}) / \text{logE_nu};$$

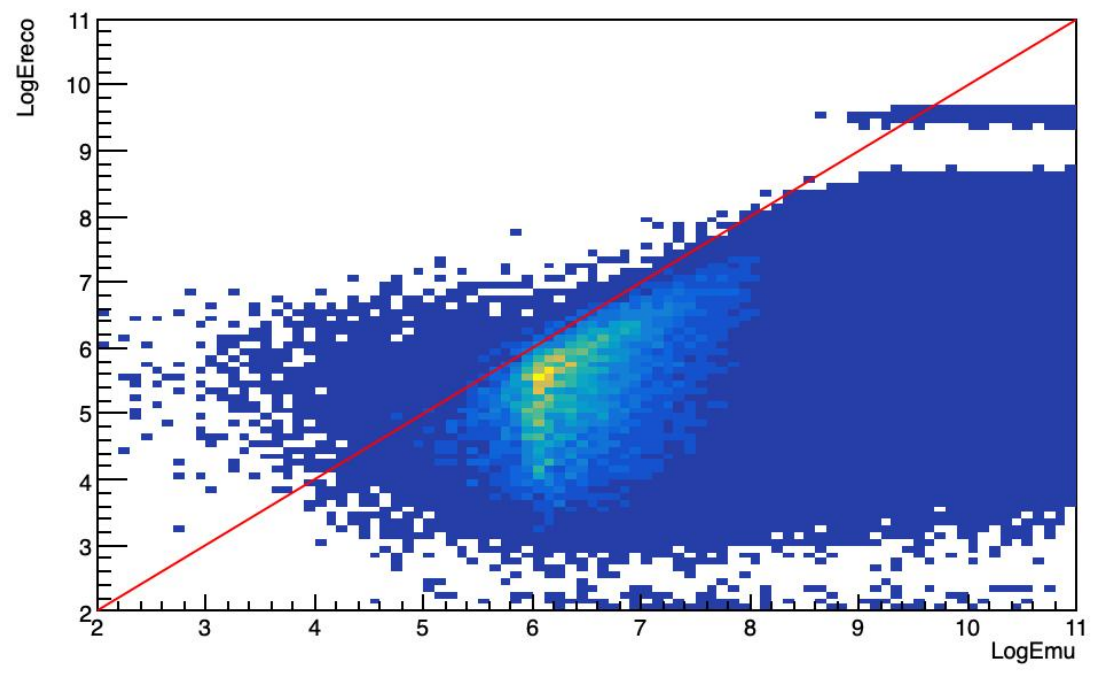


Resolution vs Energy - UnWeighted

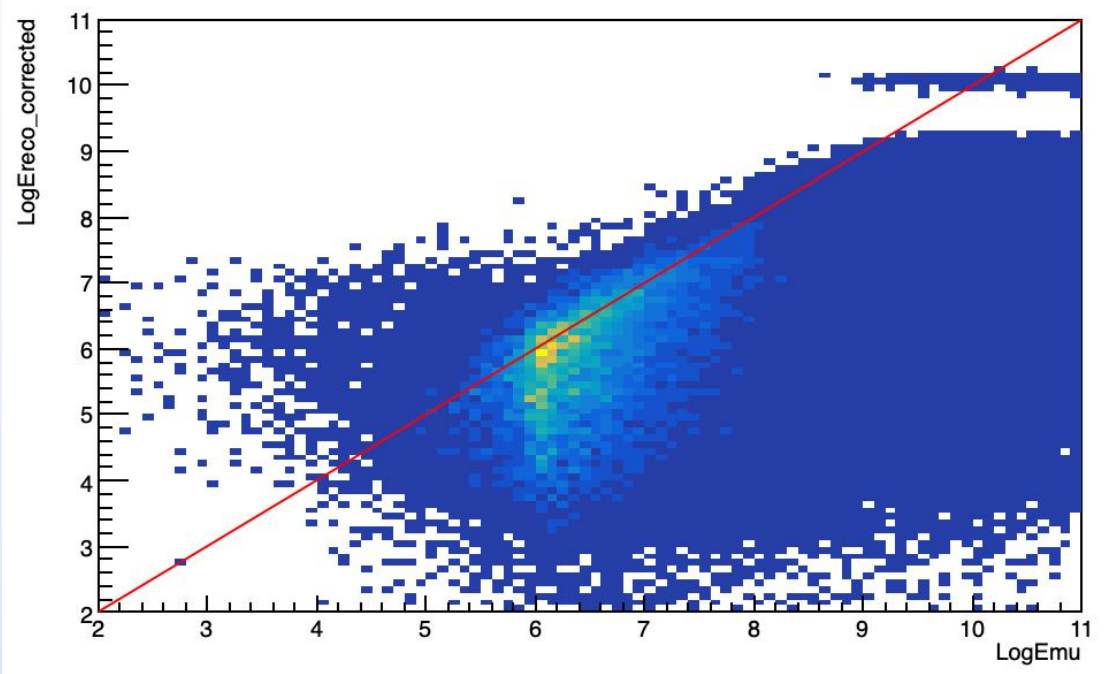


Weighted E^{-2}

before correction

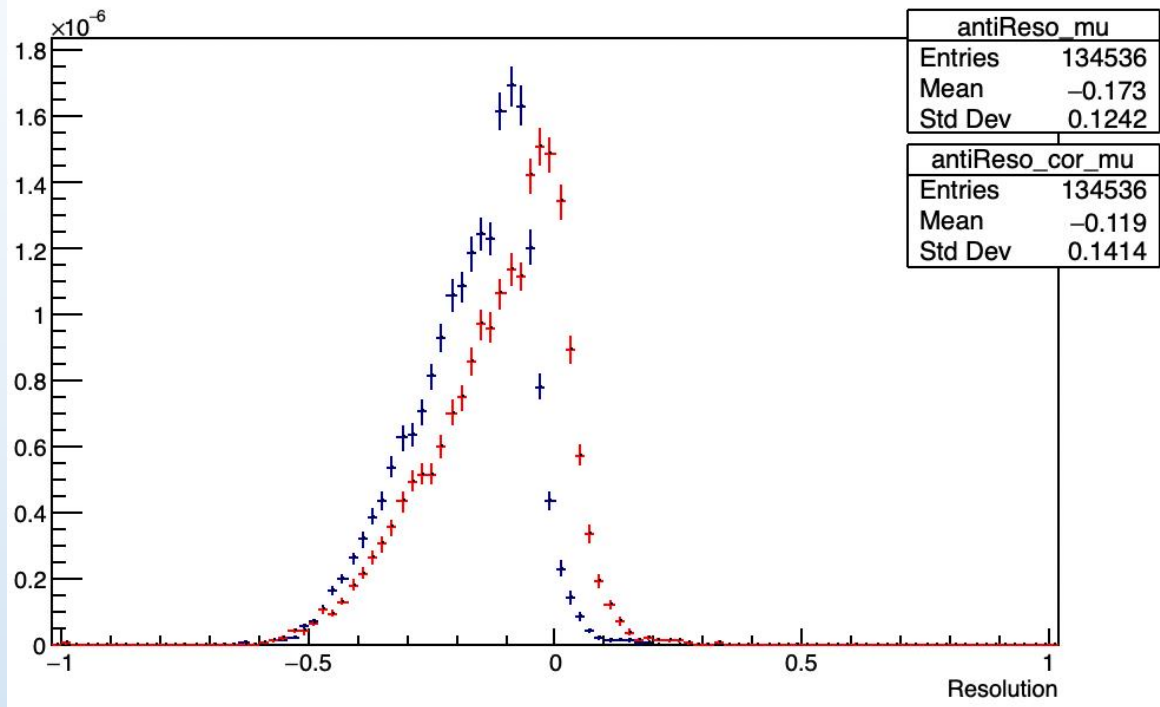


after correction

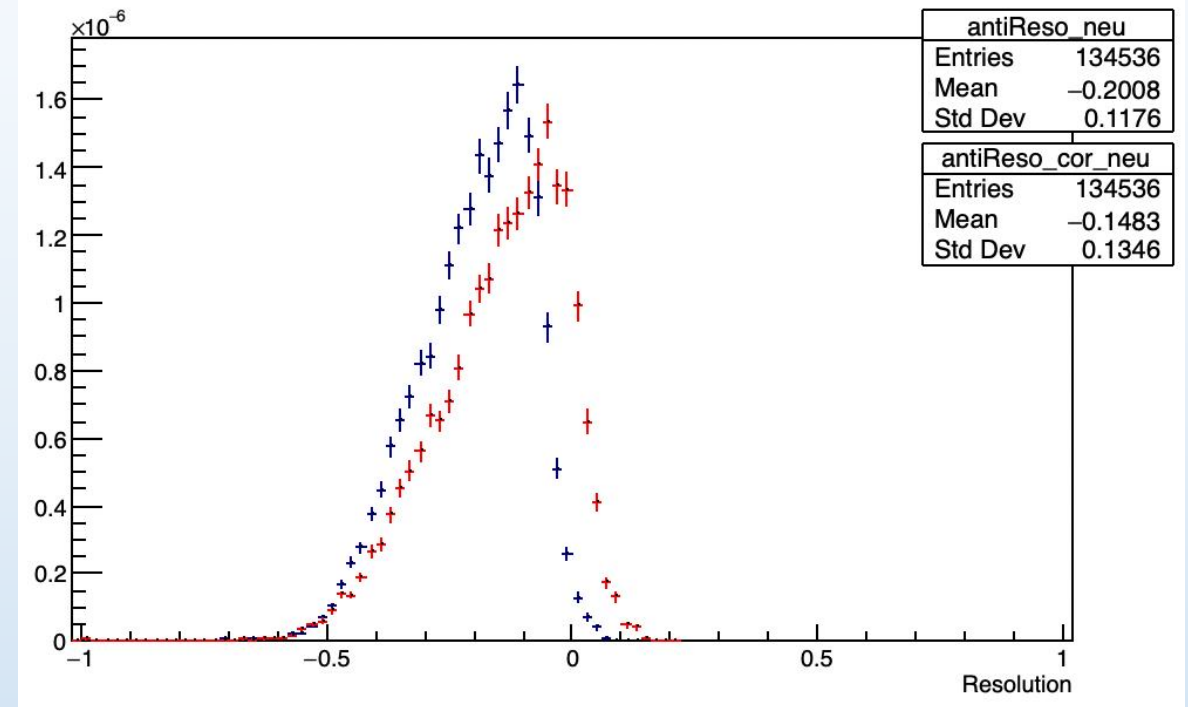


Weighted E^-2 - Energy Resolution

$$\logE_{\text{resolution_mu}} = (\logE_{\text{reco}} - \logE_{\text{mu}}) / \logE_{\text{mu}};$$



$$\logE_{\text{resolution_neu}} = (\logE_{\text{reco}} - \logE_{\text{nu}}) / \logE_{\text{nu}};$$



Resolution vs Energy - E^{-2}

