

ARCA115 DUs

Energy Studies – Deposited Energy Correction

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NCSR “Demokritos”

Astro Open Hour

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H.F.R.I.
Hellenic Foundation for
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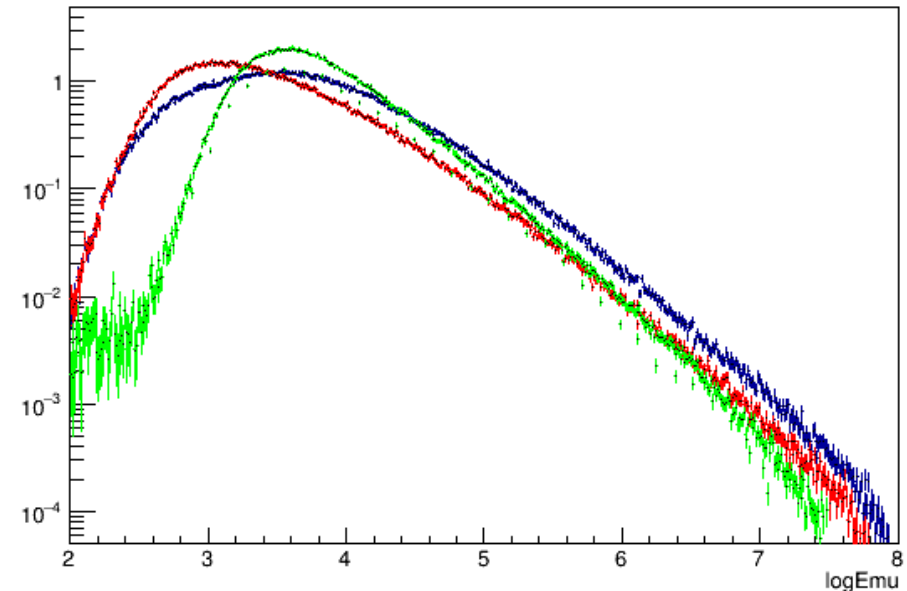


- Goals :
 - Energy studies and use of the deposited energy for the diffuse analysis
 - Correction function for the deposited energy

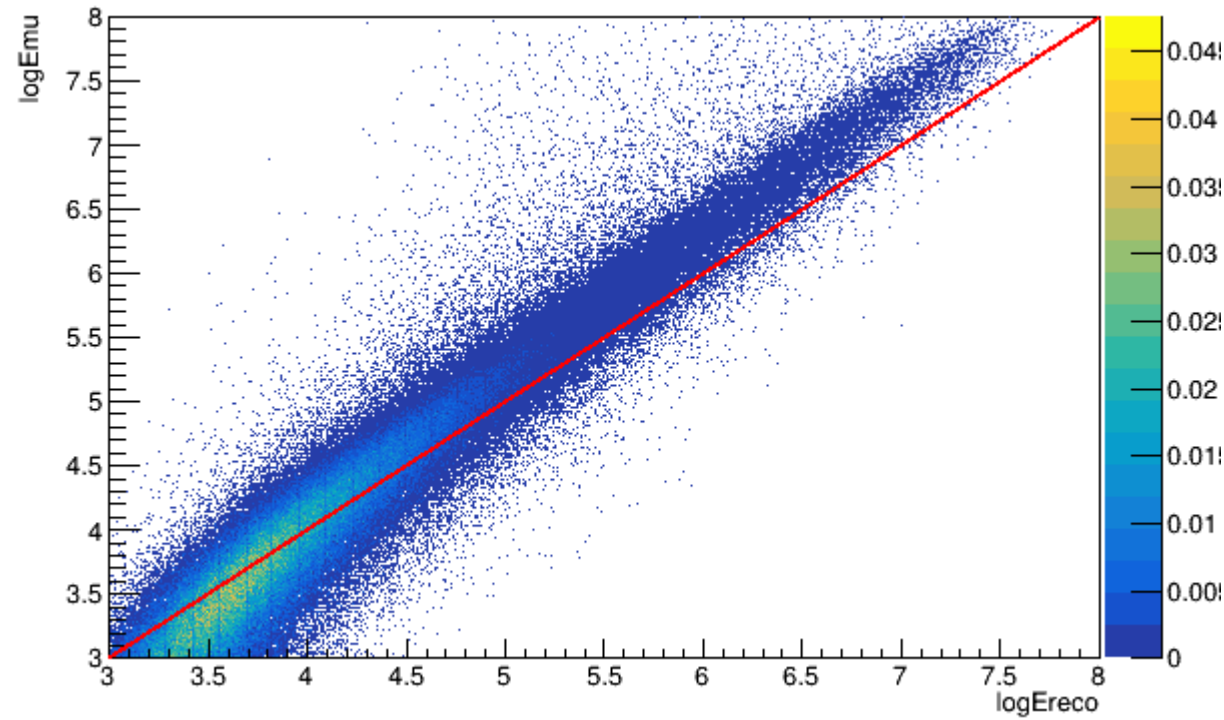
Starting with the old production (numuCC v5.1res, mupage v5.2)

Brief comparison with the new production (numuCC v6)

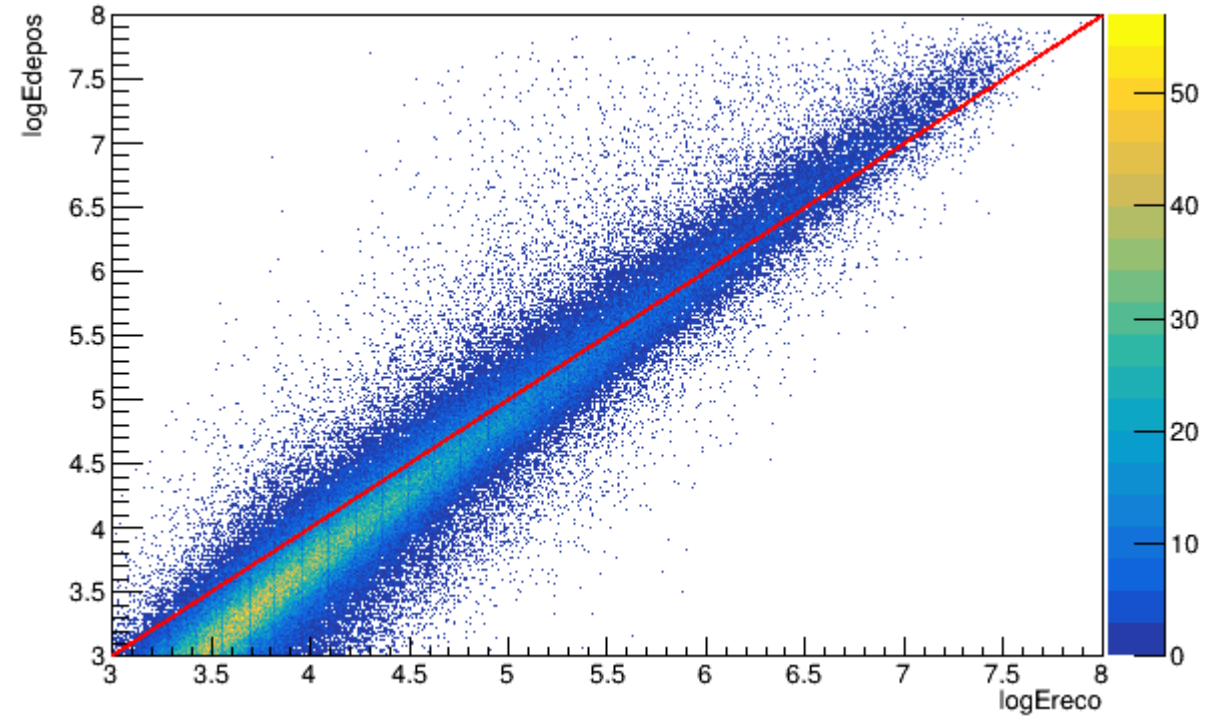
LogEmu
LogEdepos
LogEreco



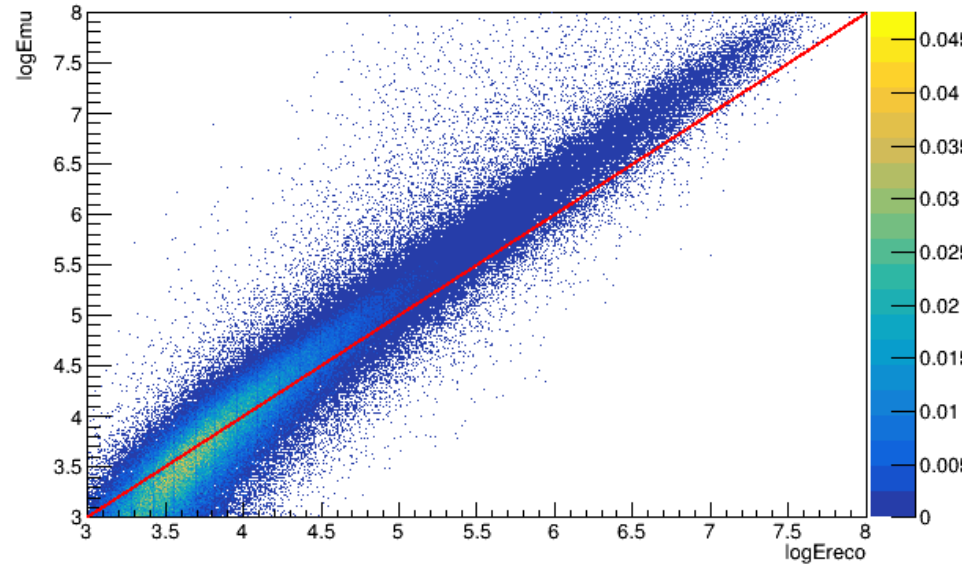
Emu vs Ereco



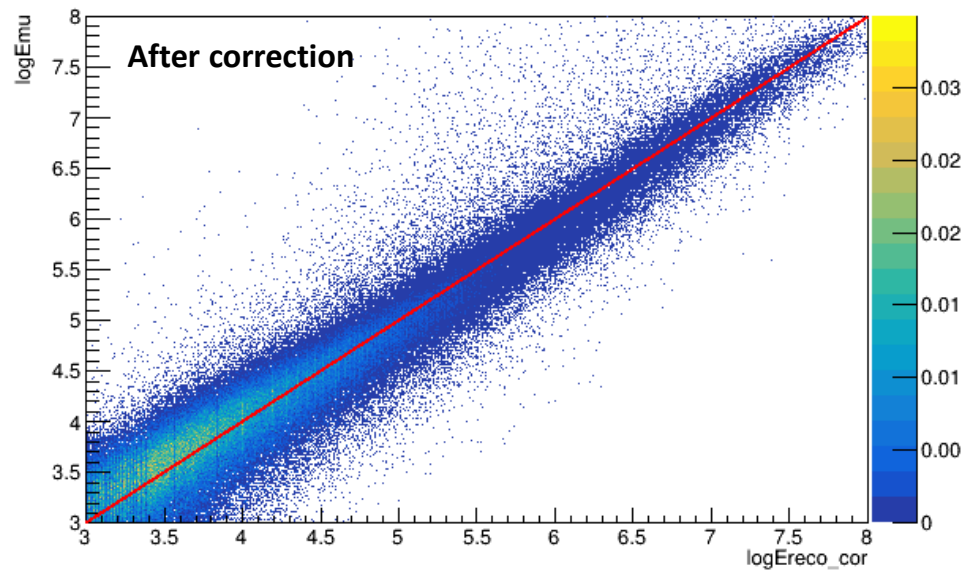
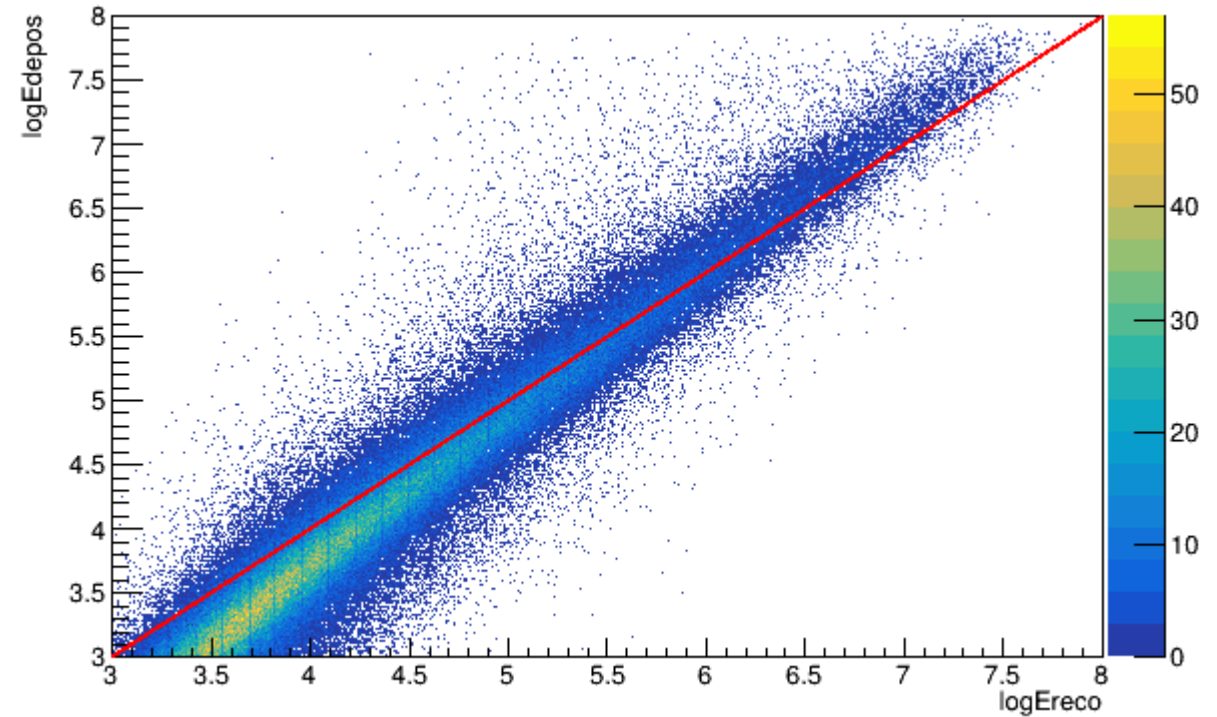
Edeposited vs Ereco



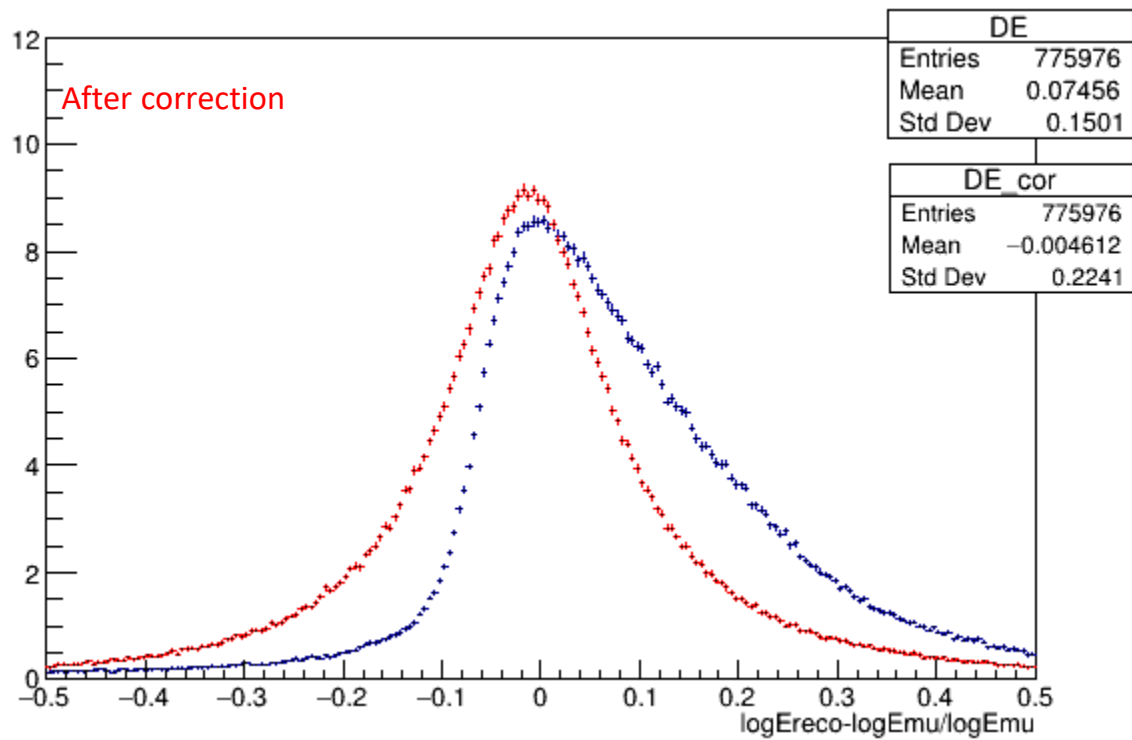
Emu vs Ereco



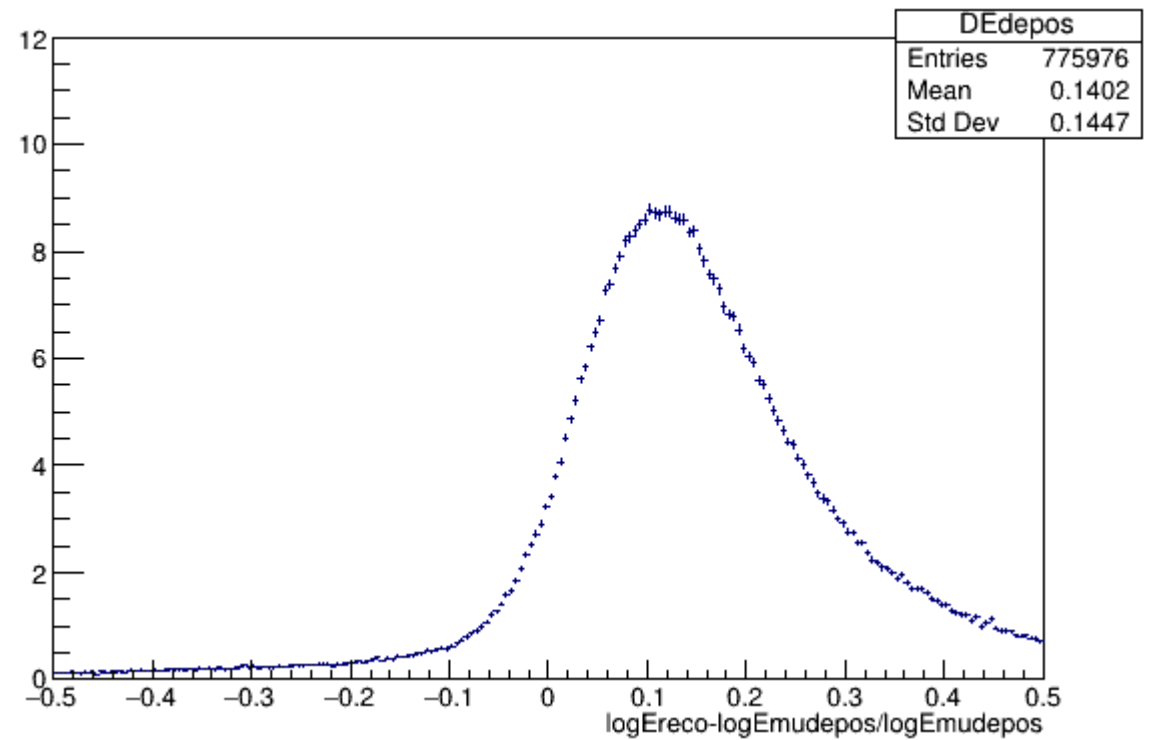
Edeposited vs Ereco



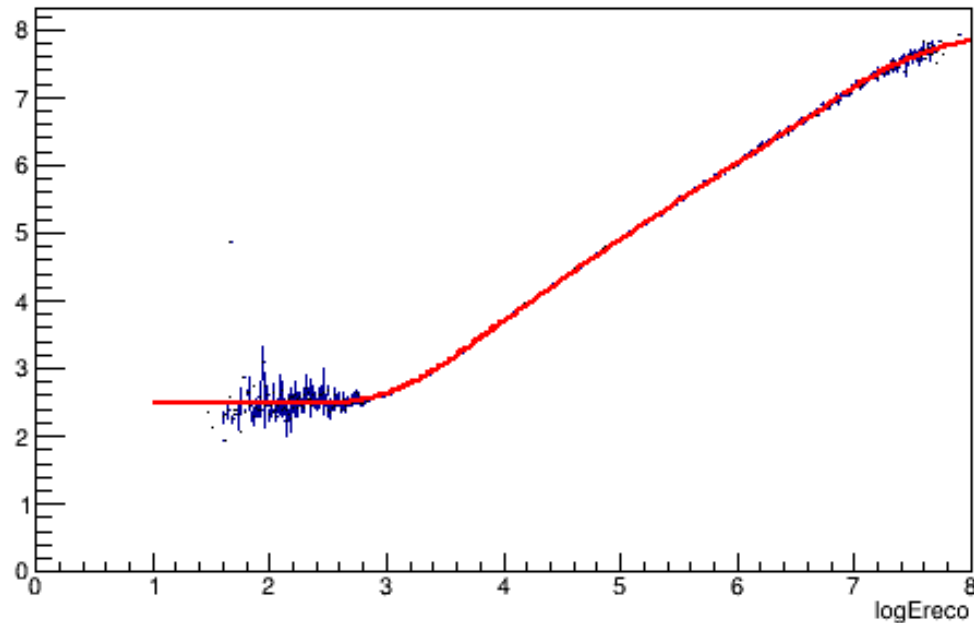
Emu vs Ereco



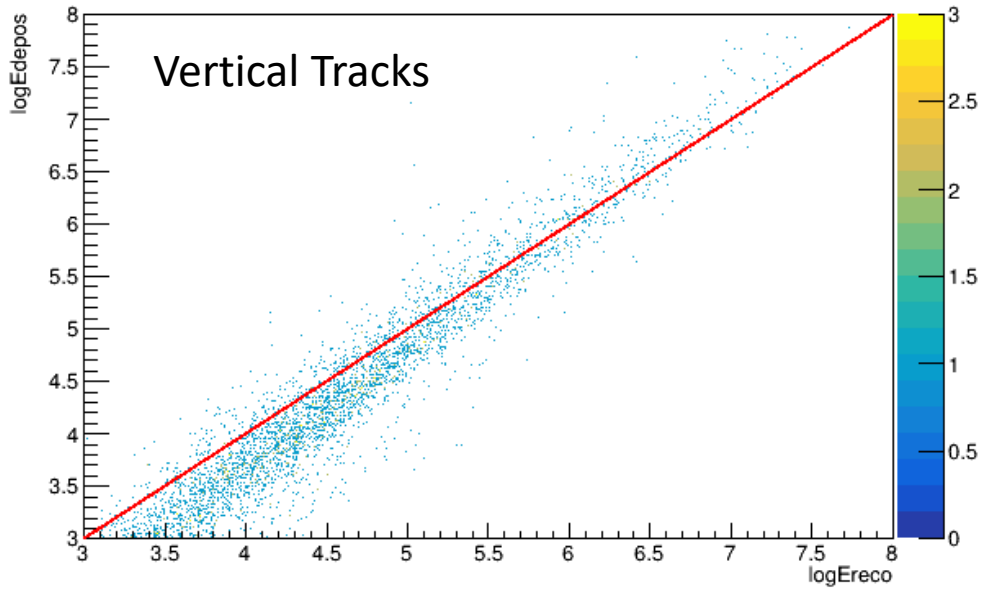
Edeposited vs Ereco



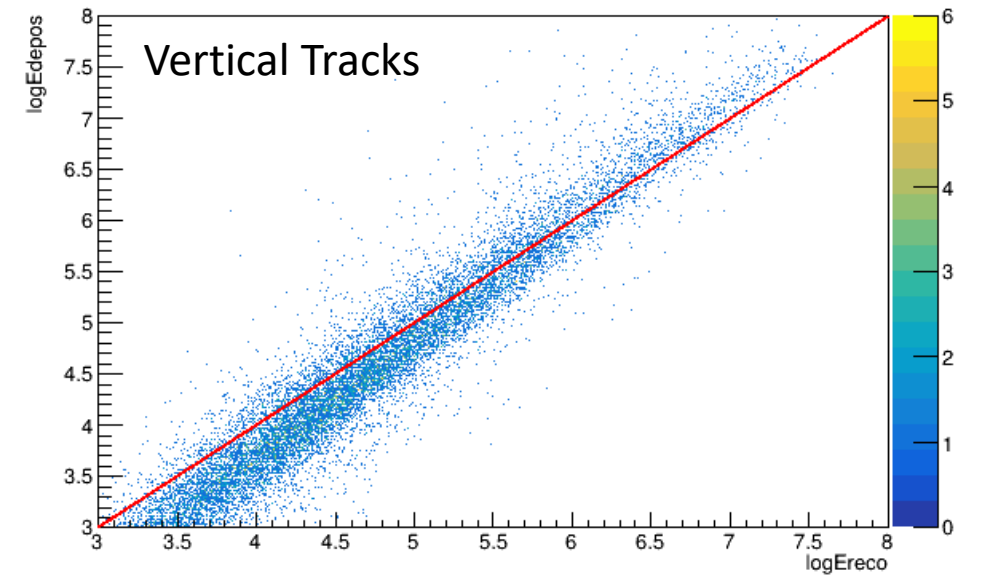
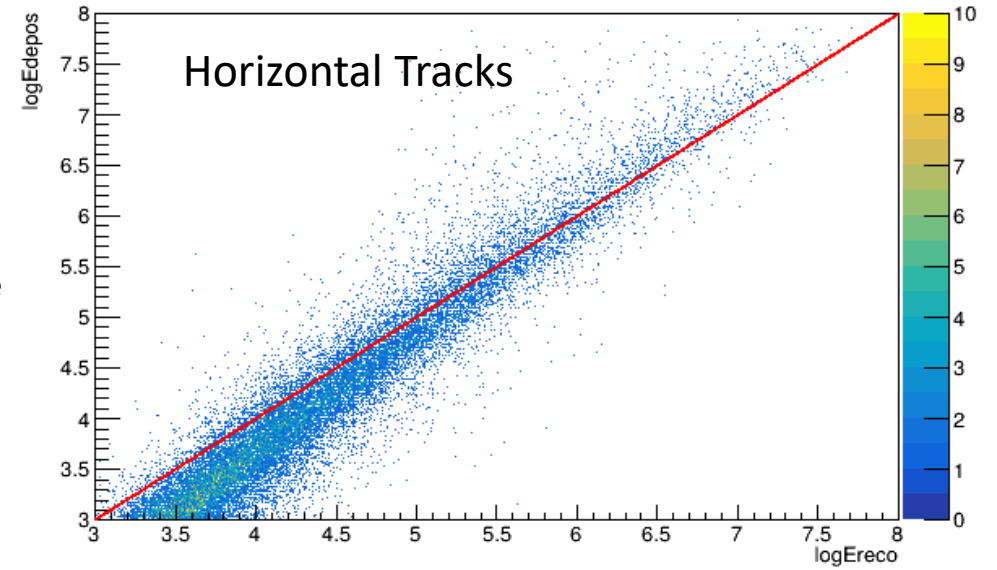
- Based on the position of the reconstructed vertex (reco vtx in/out)
- Based on the track direction (horizontal/vertical)
- **Finally, one function optimized for 4 different cases**



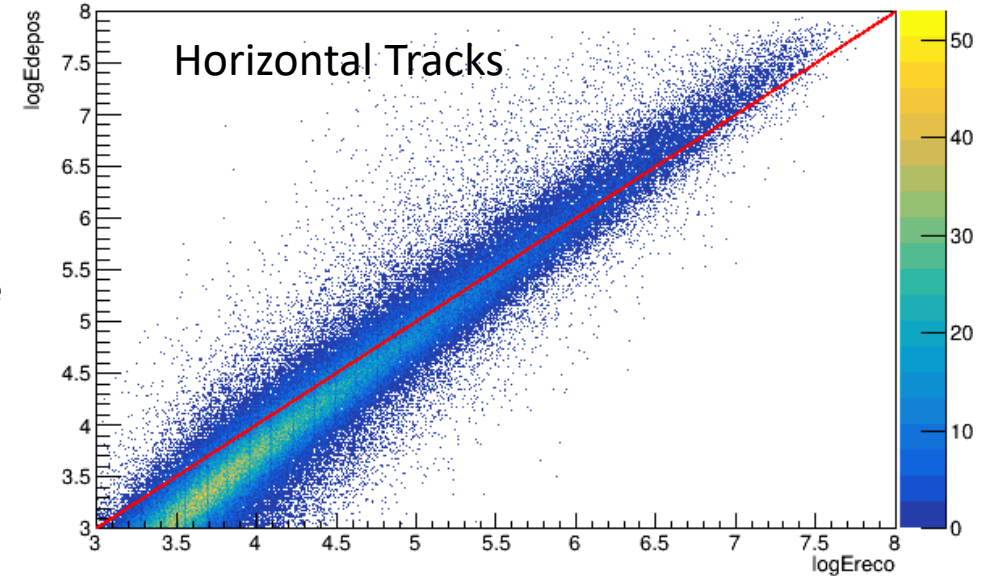
Deposited energy (different vertex positions)



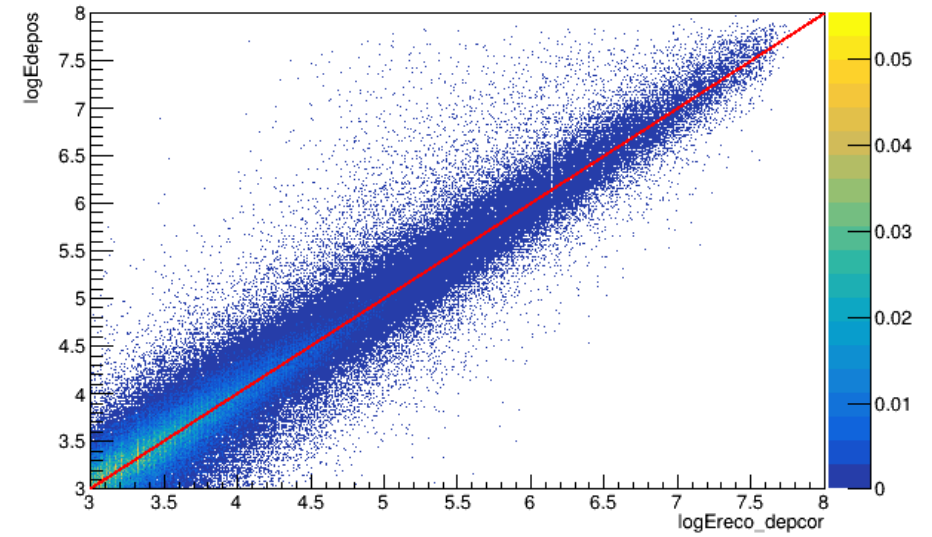
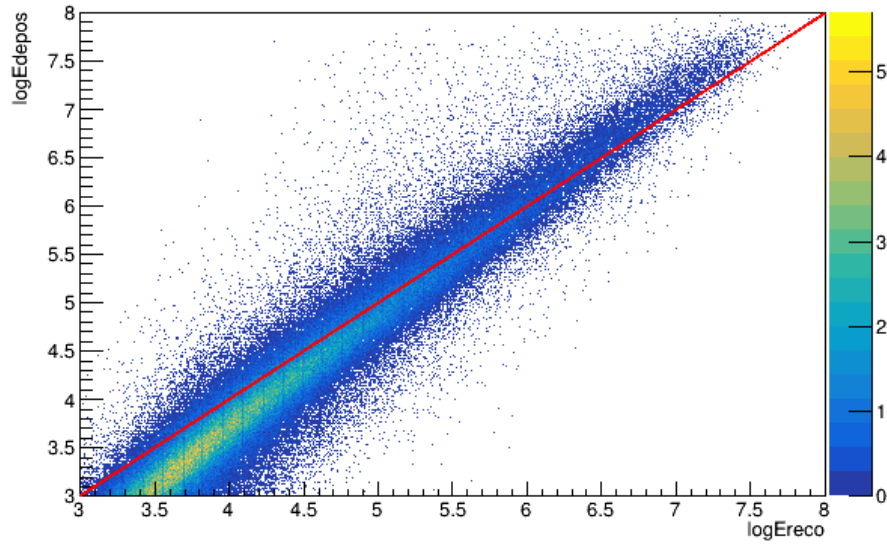
Vertex IN
the instrumented volume



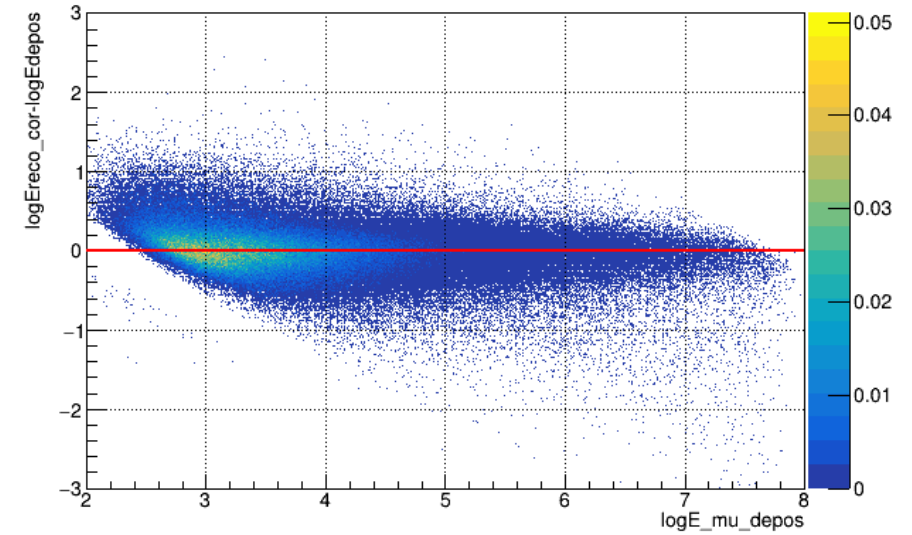
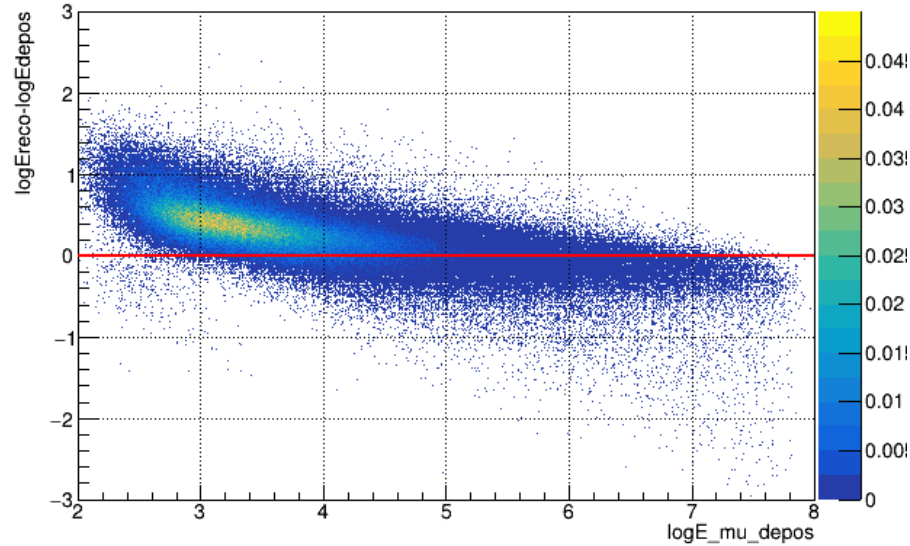
Vertex OUT
the instrumented volume



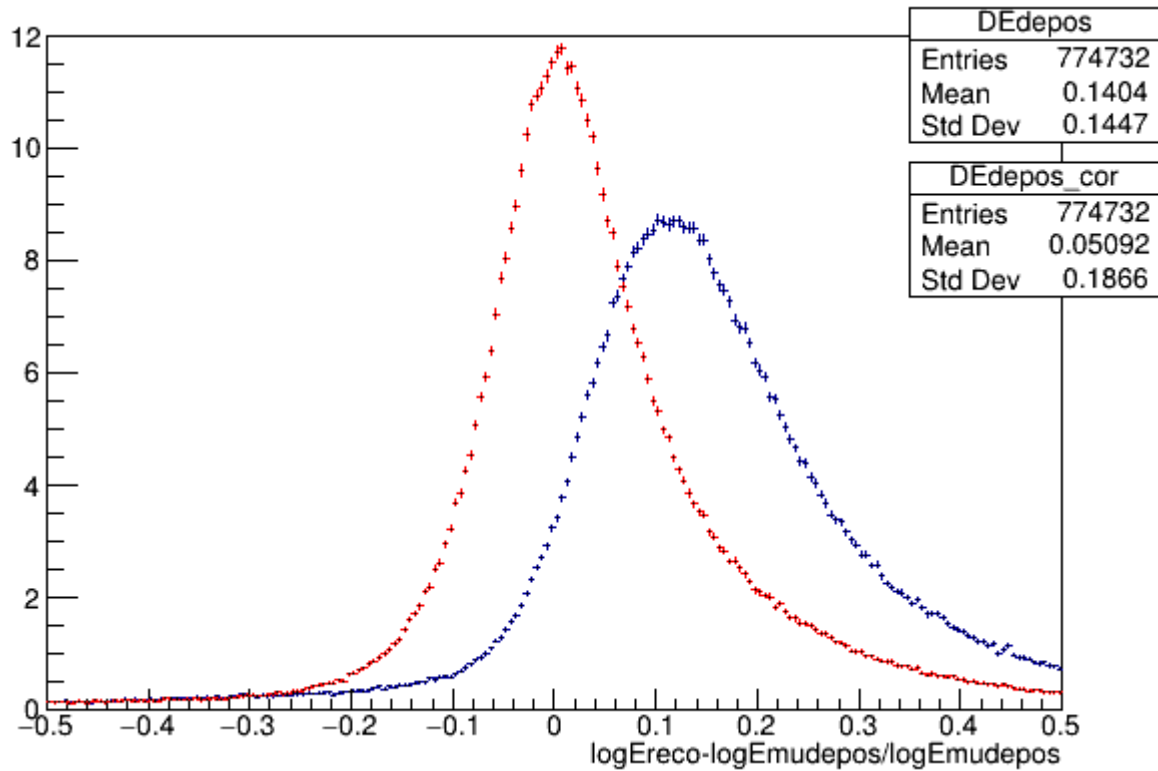
Deposited Energy (with correction)



After correction

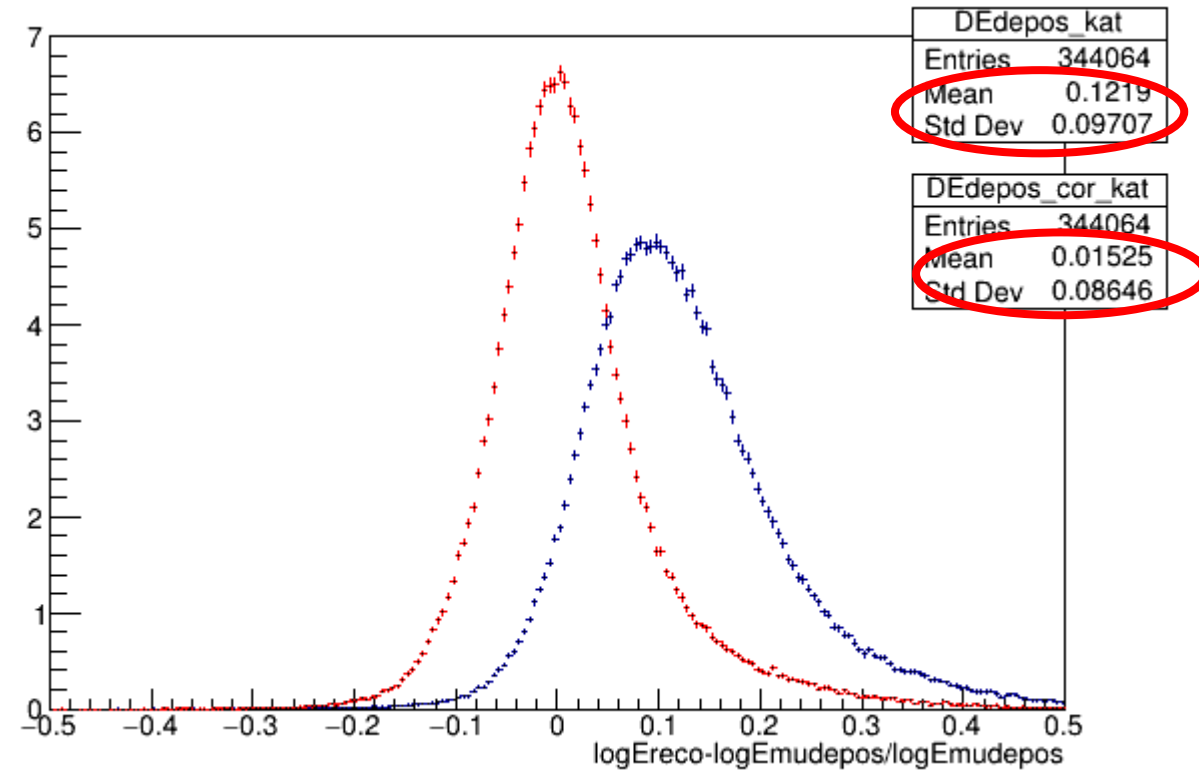


All Events, No energy cut



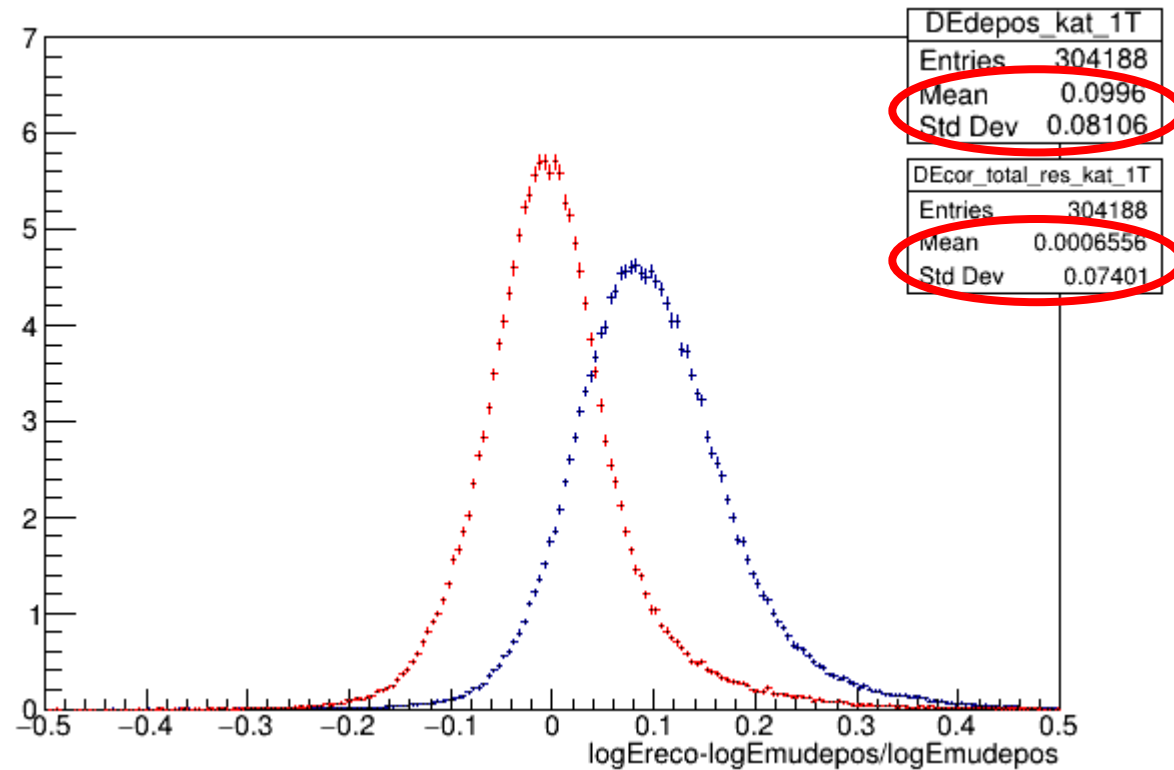
Edeposited Energy Resolution before/after correction

Loose Cuts Events, No energy cut



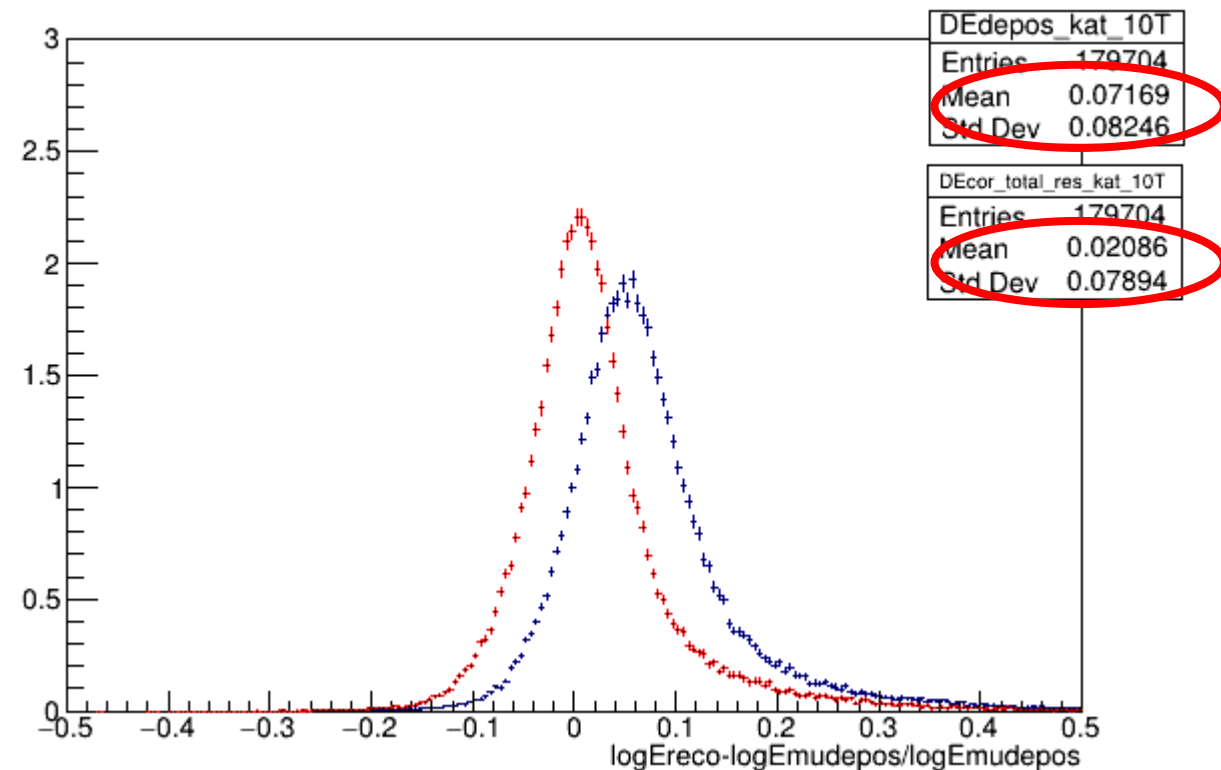
Edeposited Energy Resolution before/after correction

Loose Cuts Events, Energy cut: $\text{LogEmu} > 1 \text{ TeV}$

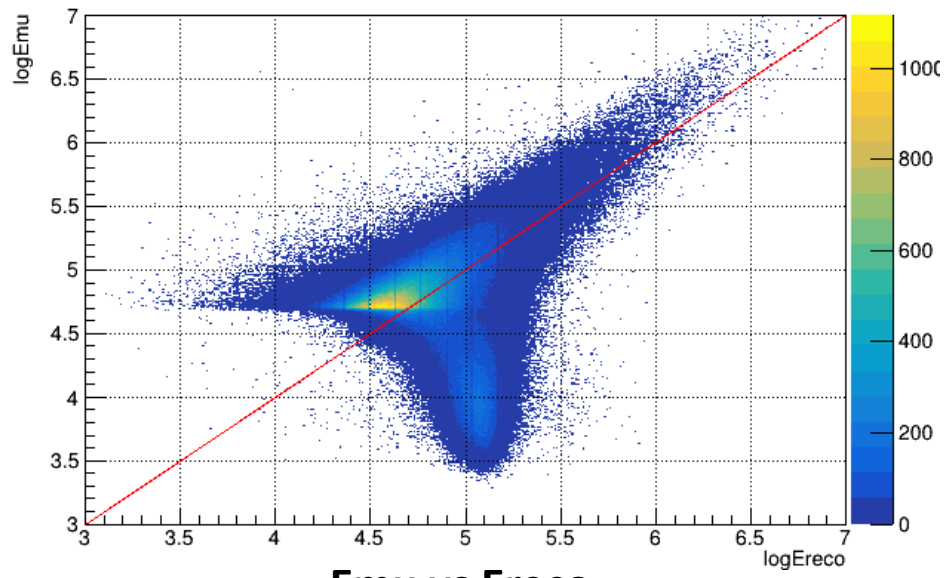


Edeposited Energy Resolution before/after correction

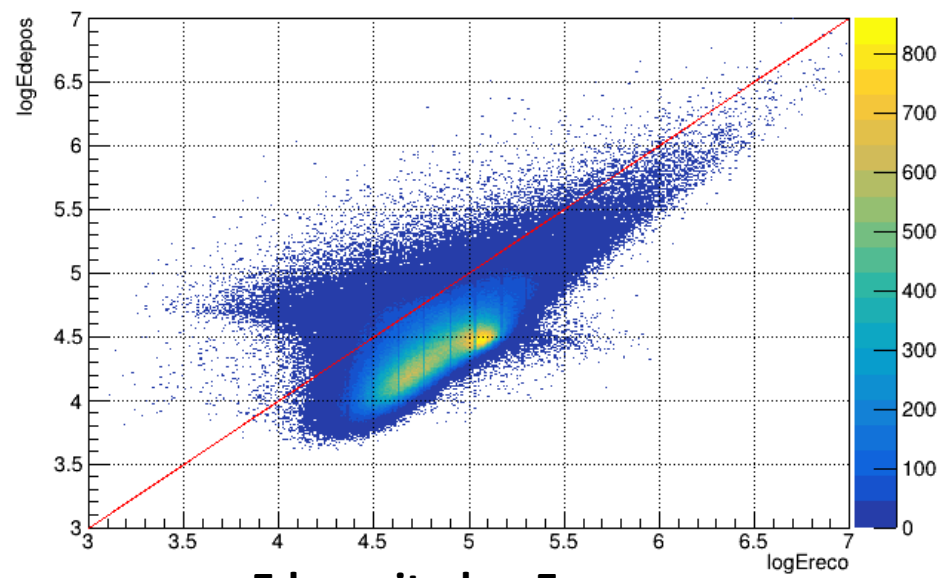
Loose Cuts Events, Energy cut: $\text{LogEreco} > 10 \text{ TeV}$



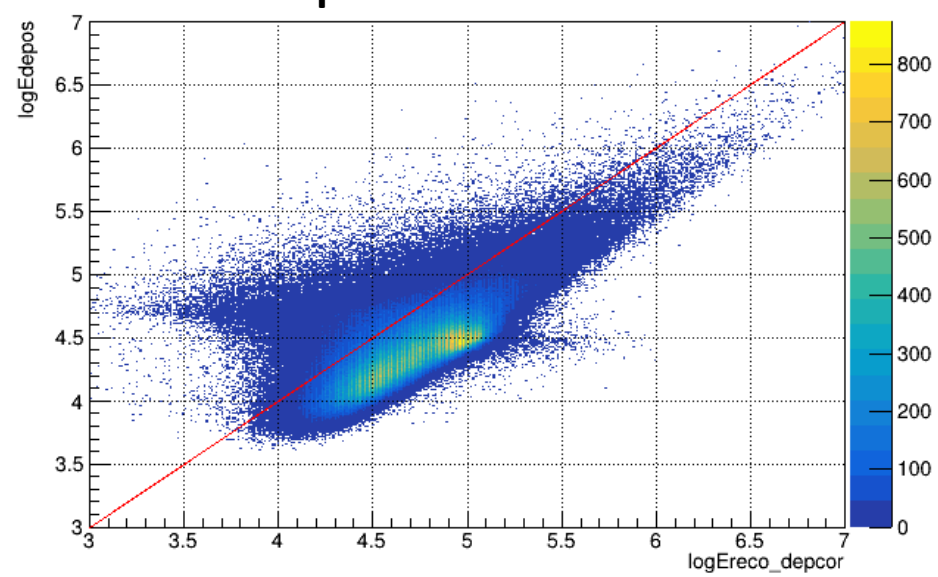
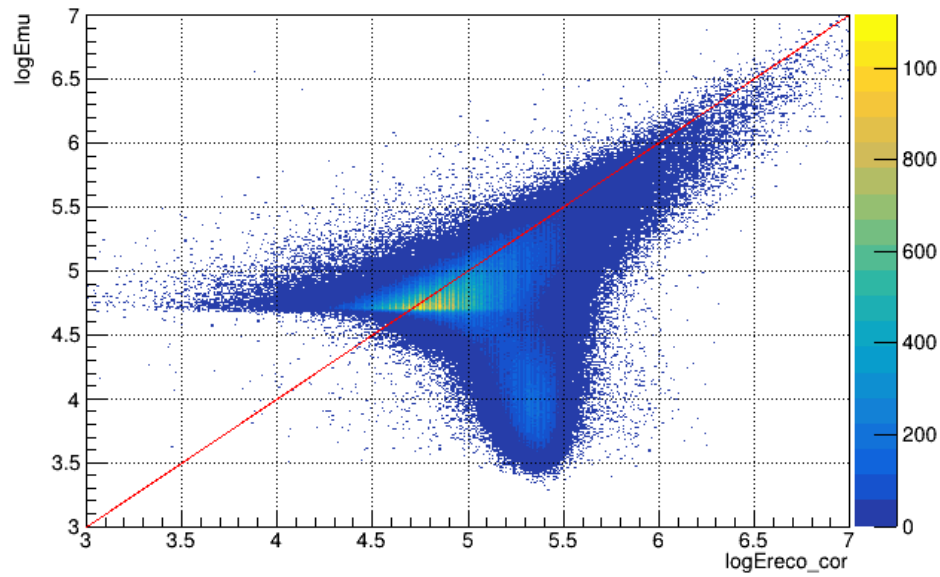
Edeposited Energy Resolution before/after correction



Emu vs Ereco



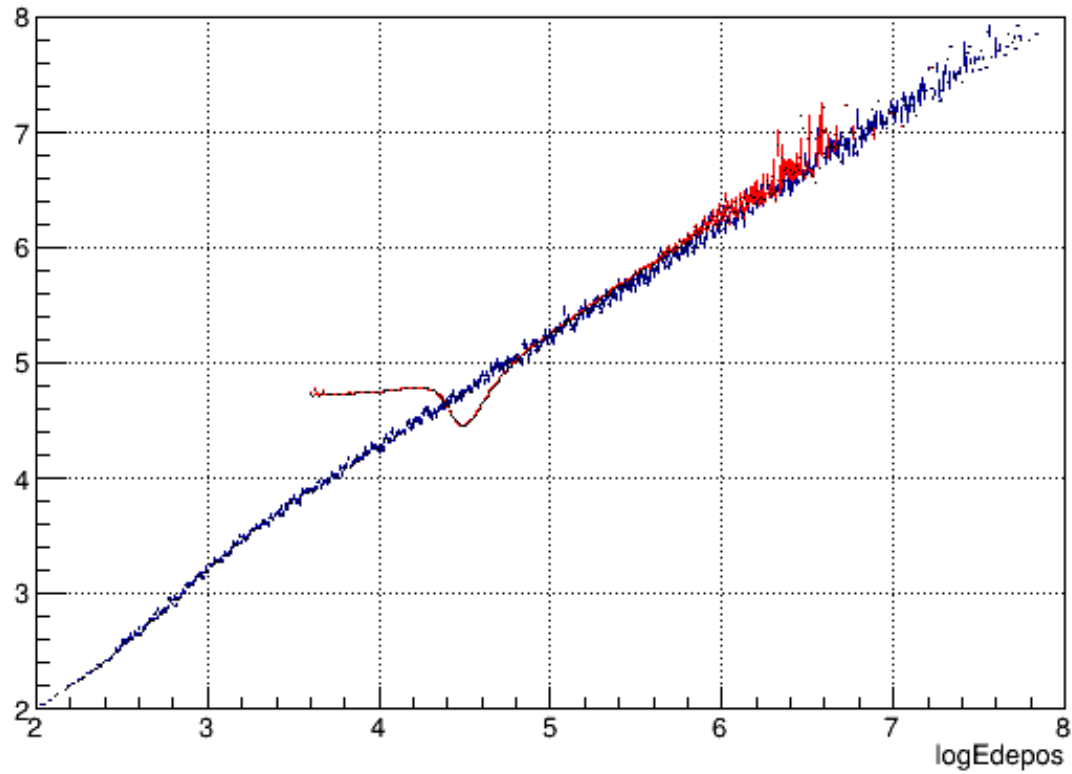
Edeposited vs Ereco



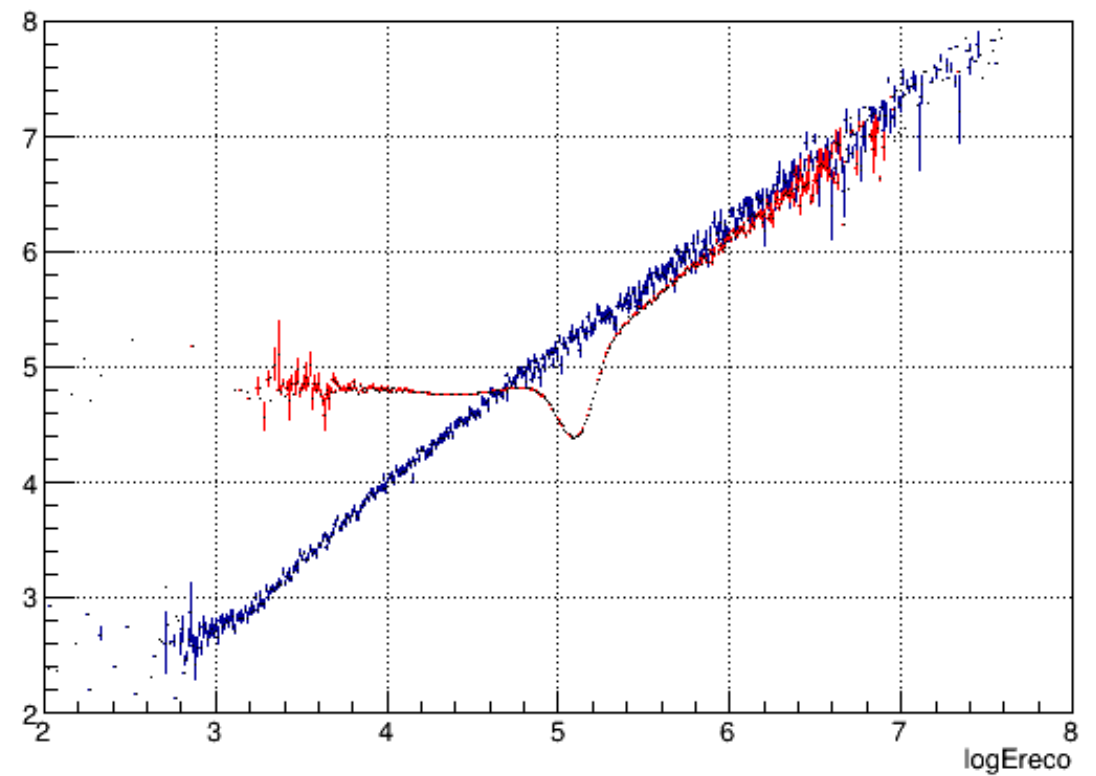
NumuCC

Atm.muons

Emu vs Edepos (true vtx out)



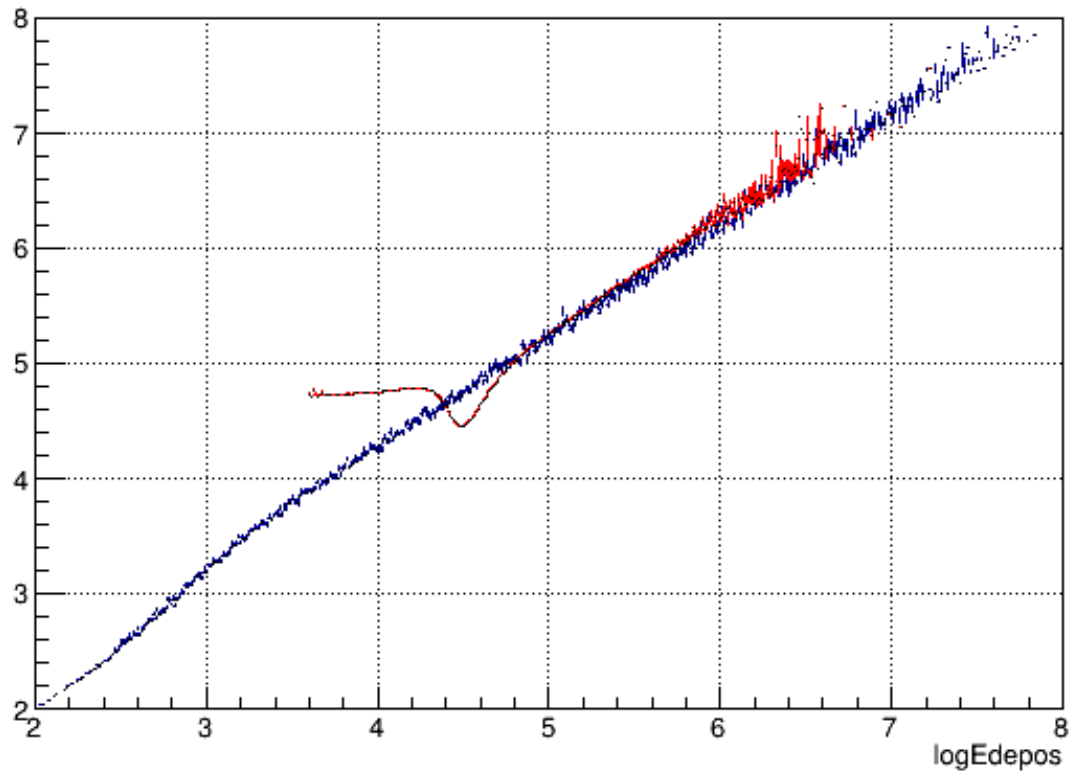
Emu vs Ereco (true vtx out)



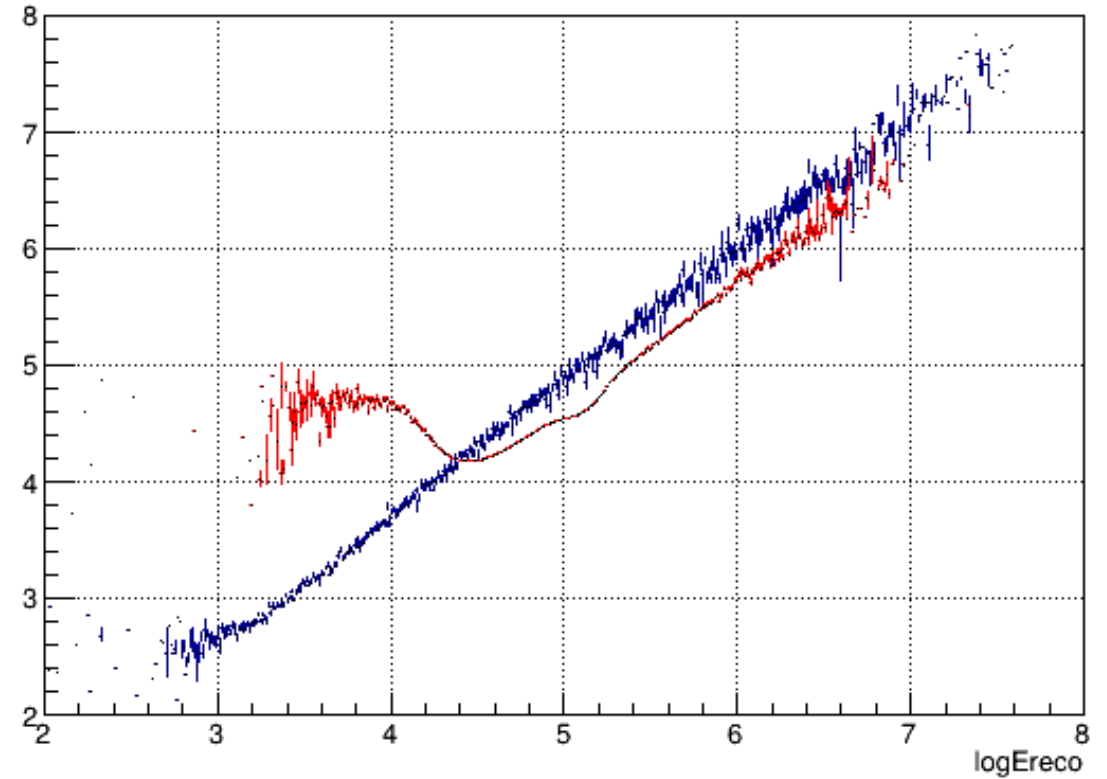
NumuCC

Atm.muons

Emu vs Edepos (true vtx out)

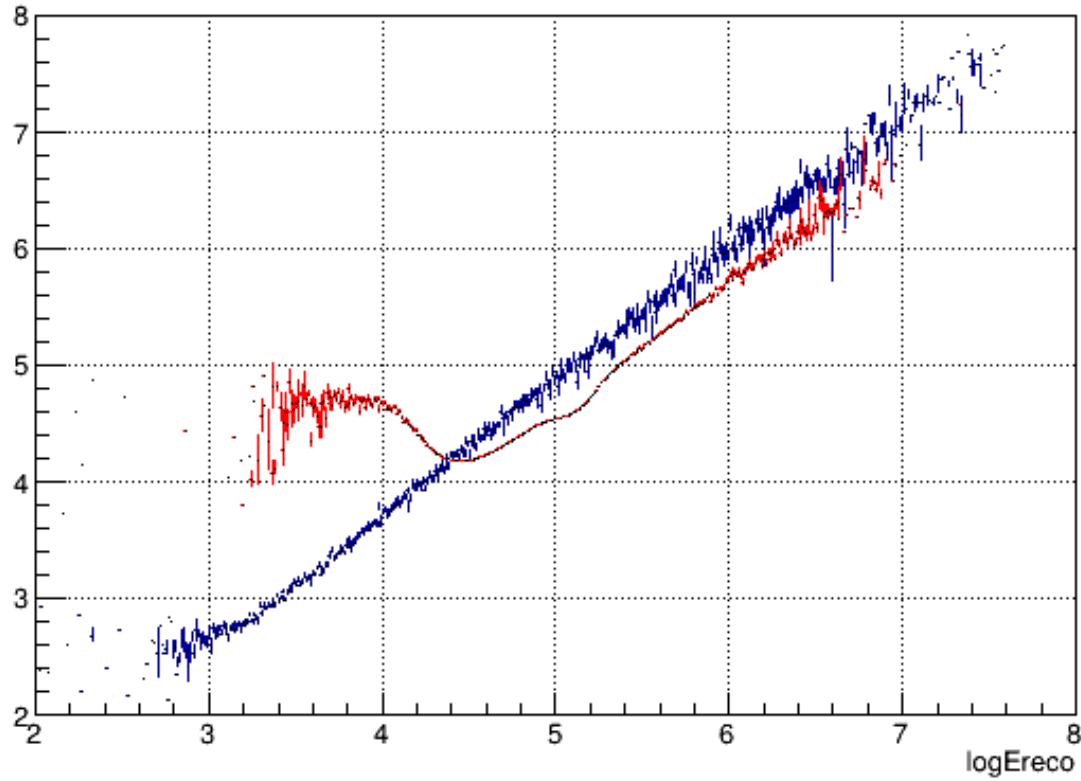


Edepos vs Ereco (true vtx out)



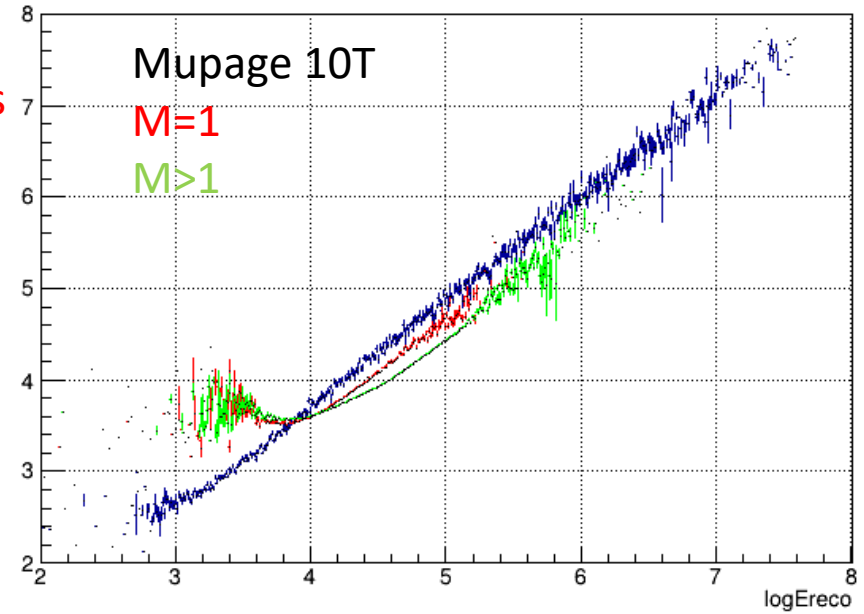
Edepos vs Ereco (true vtx out)

NumuCC
Atm.muons



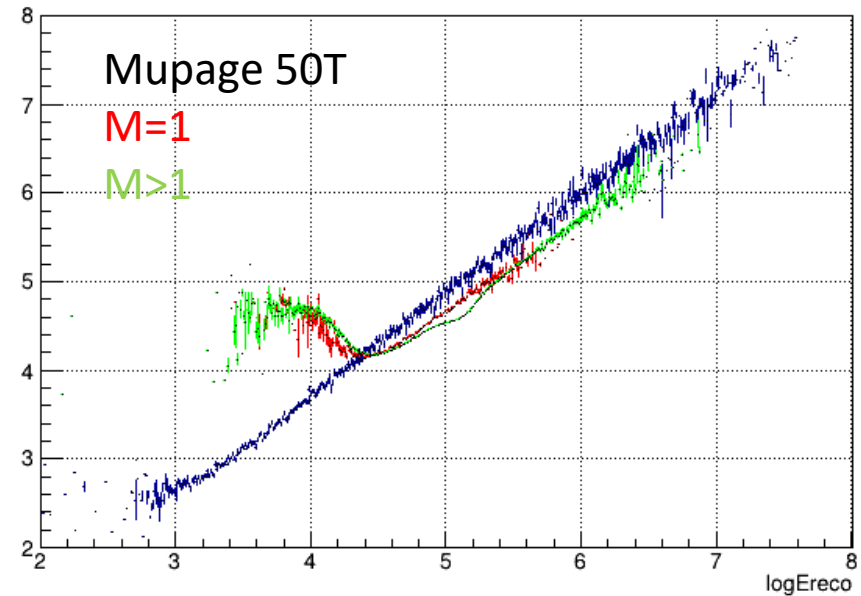
Mupage 10T

M=1
M>1



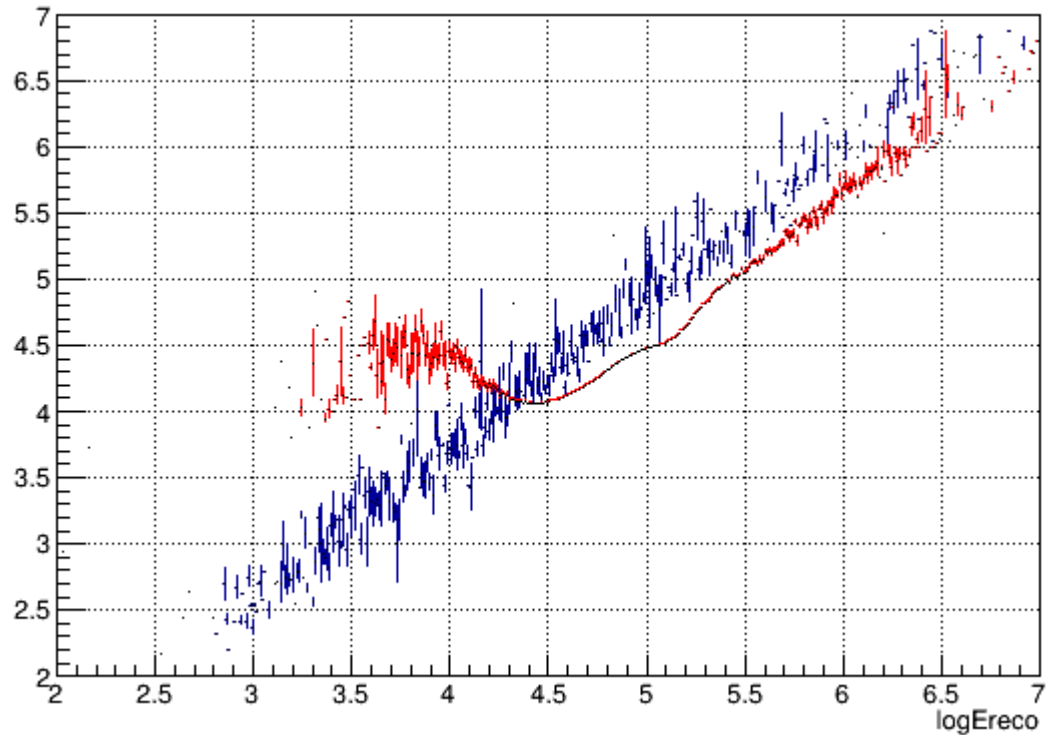
Mupage 50T

M=1
M>1

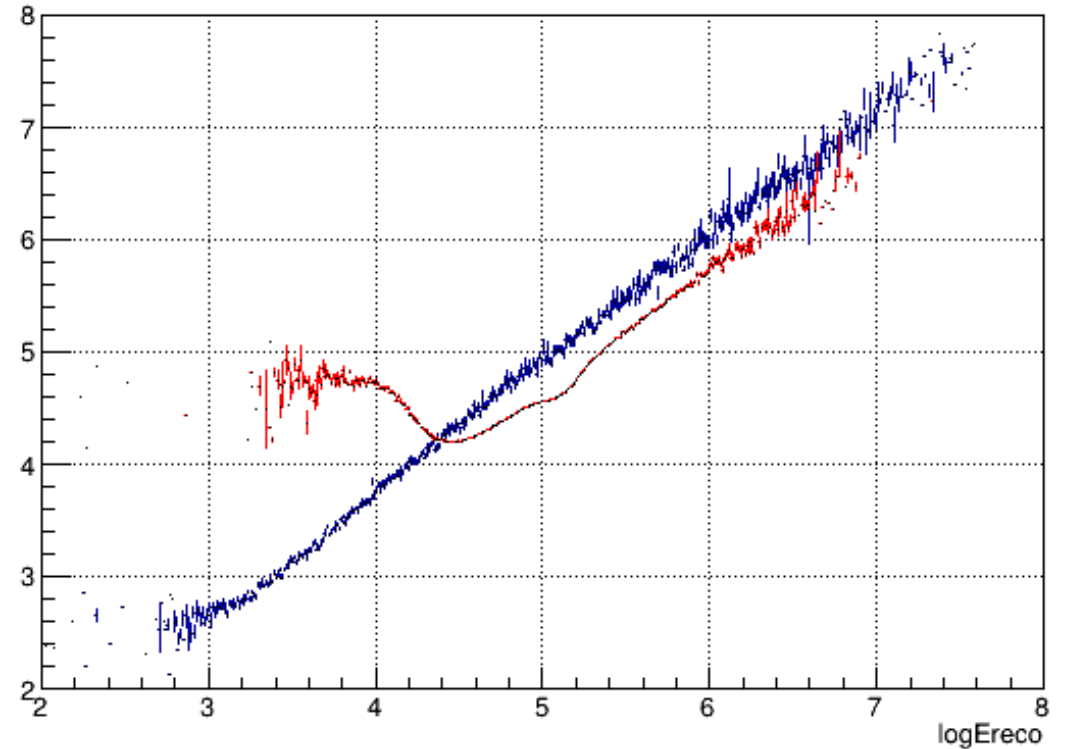


NumuCC
Atm.muons

Edepos vs Ereco (true vtx out) - VERTICAL

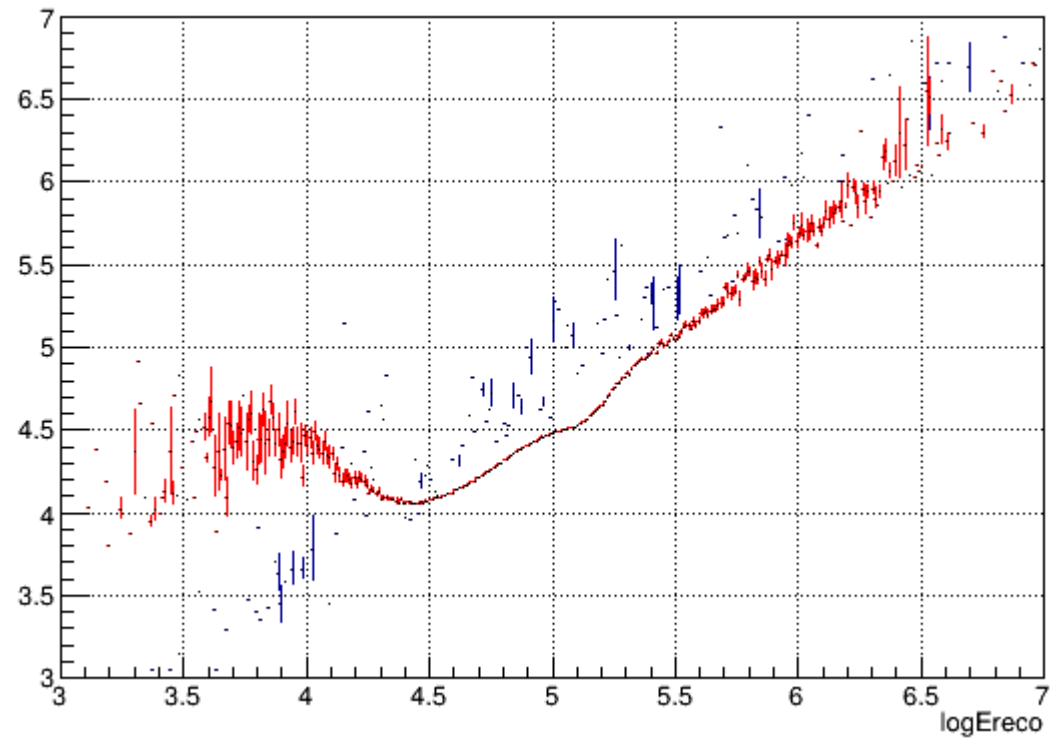


Edepos vs Ereco (true vtx out) - HORIZONTAL

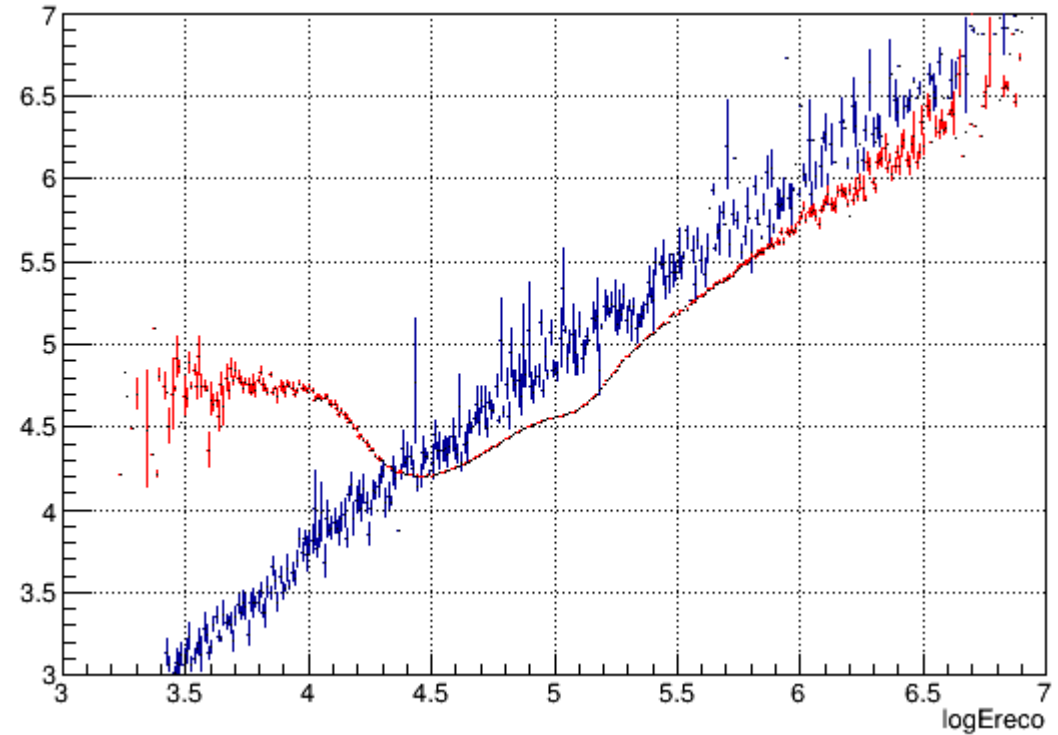


NumuCC
Atm.muons

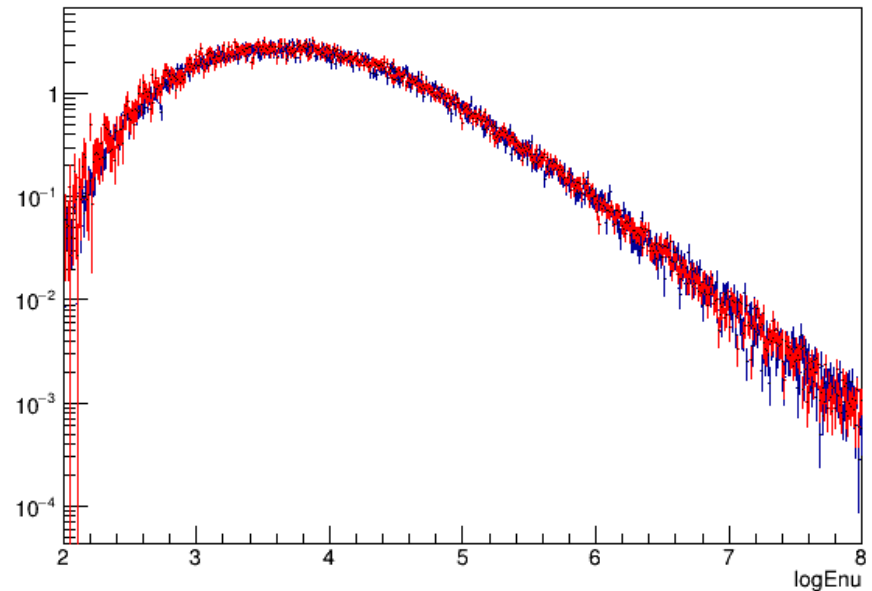
Edepos vs Eereco (true vtx out) – VERTICAL - LowY



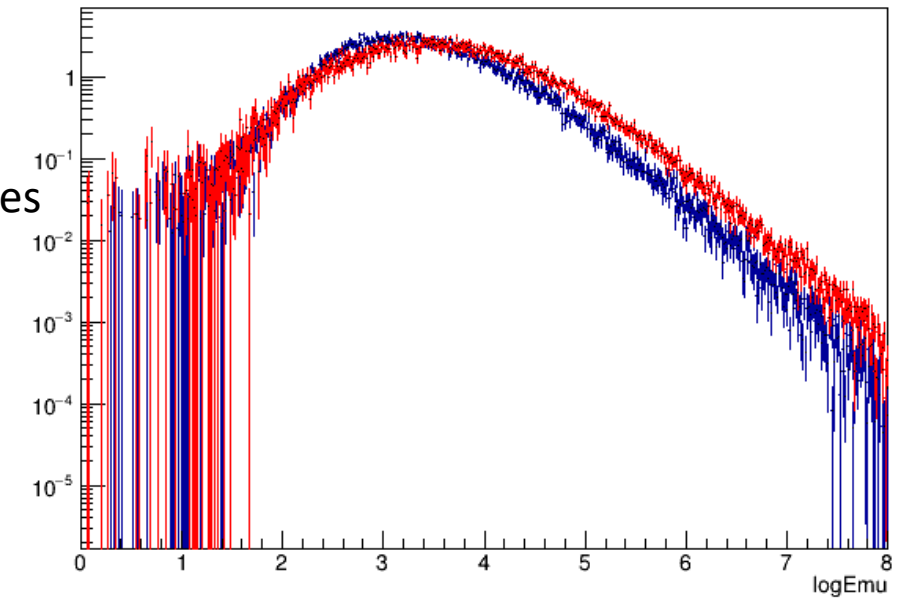
Edepos vs Eereco (true vtx out) – HOR - LowY



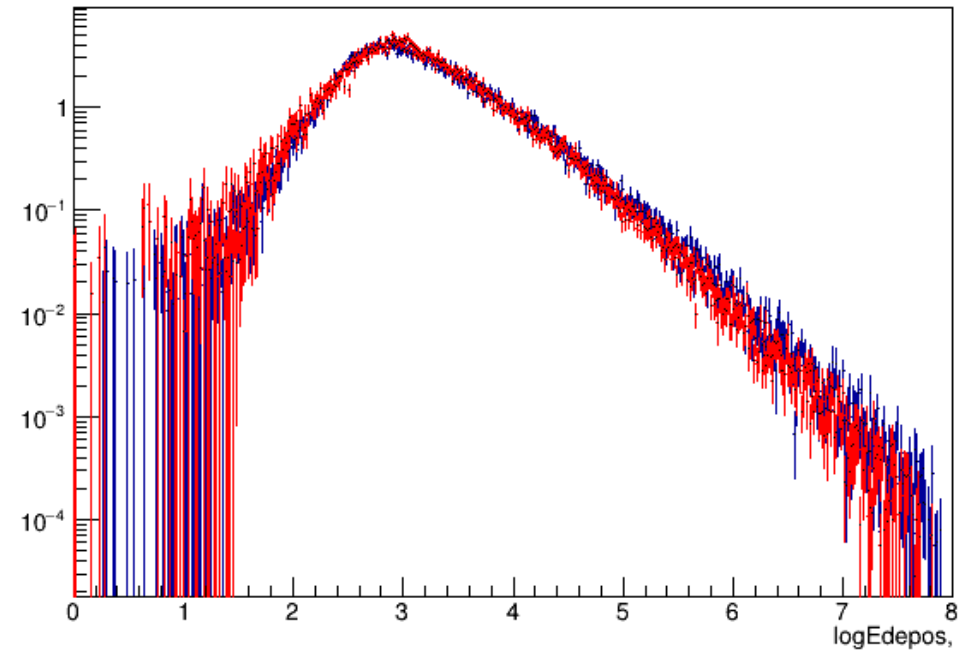
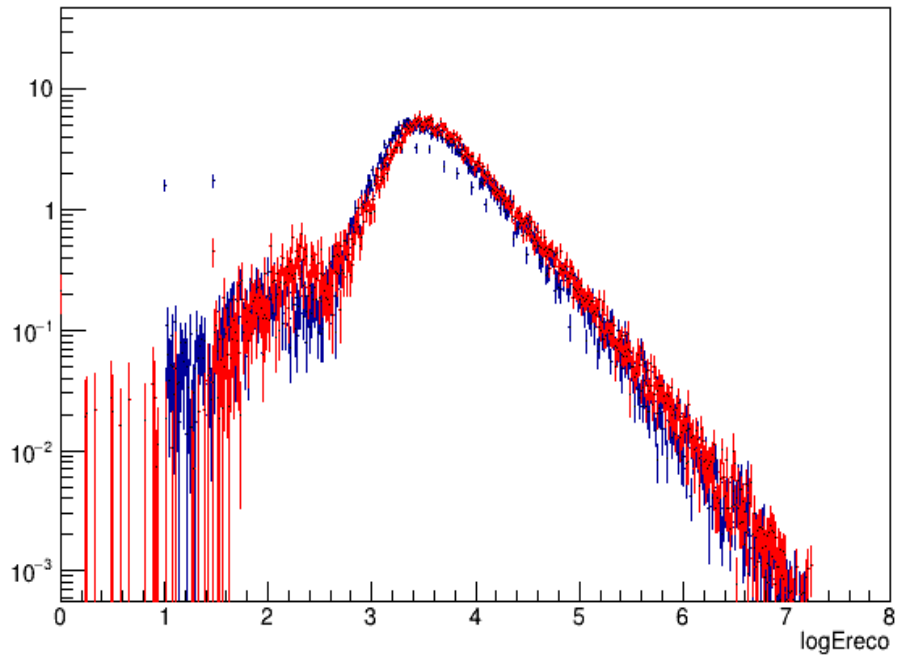
NumuCC v5.1 vs NumuCC v6



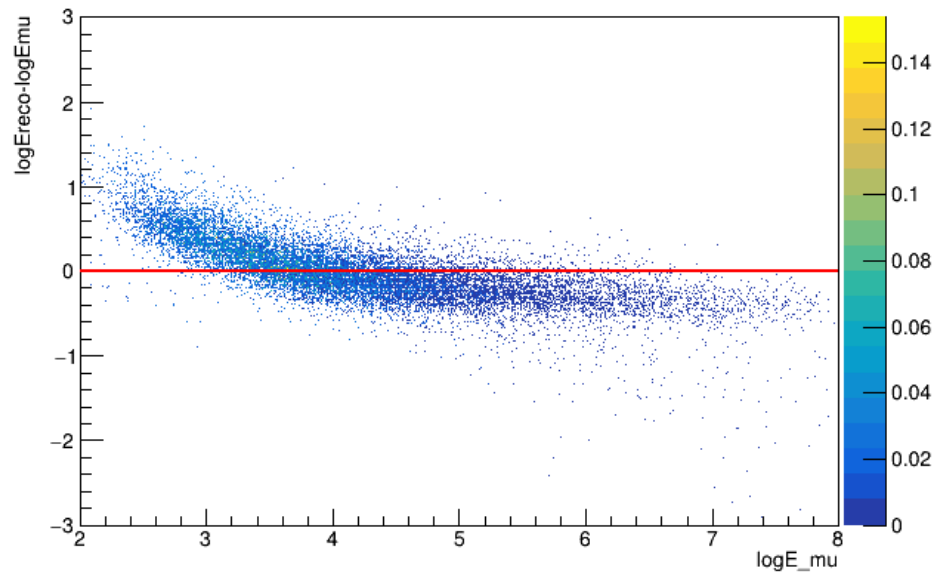
*Different shapes



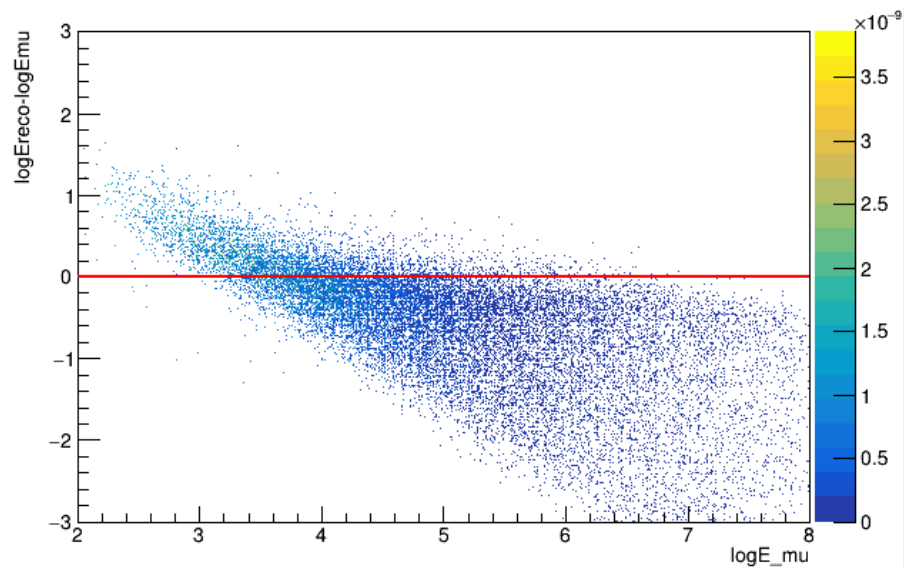
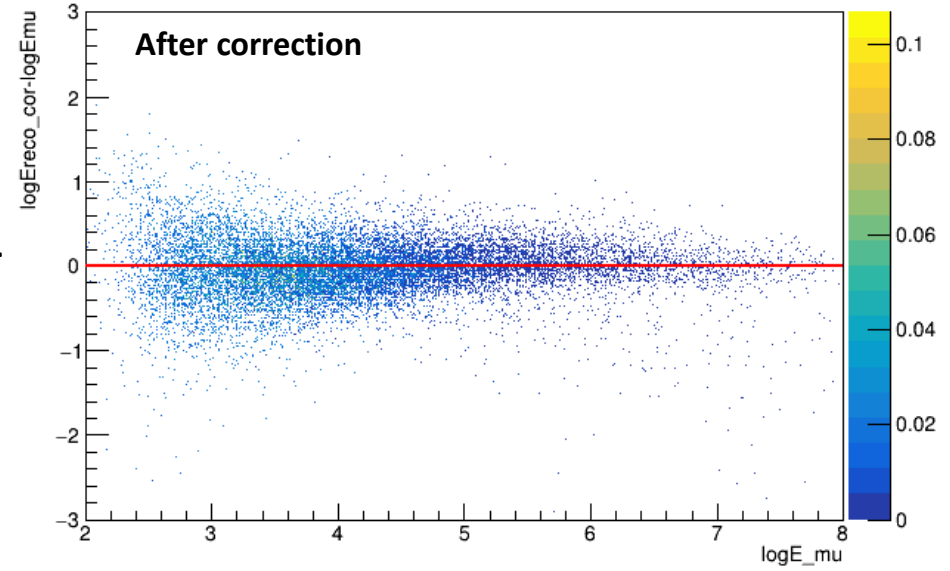
NumuCC v5.1
NumuCC v6



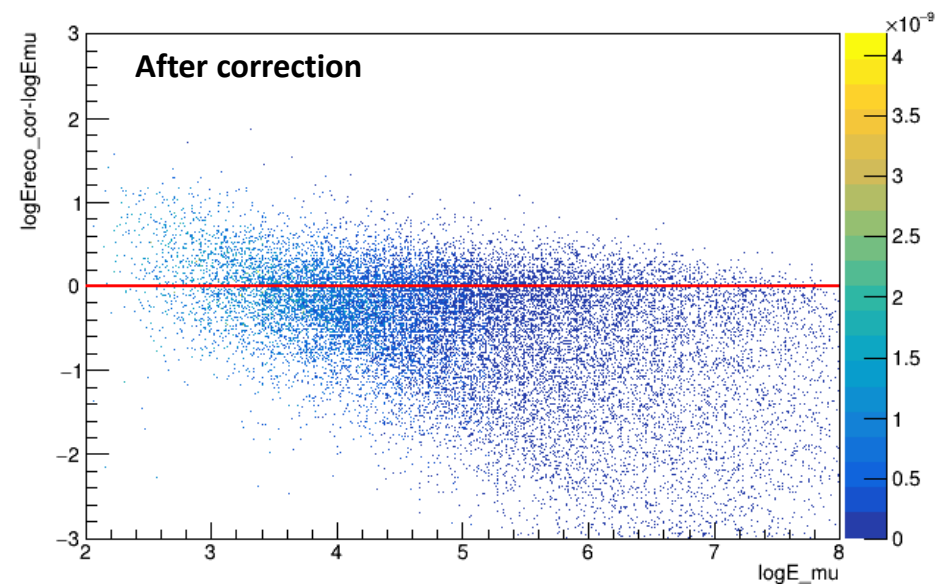
Energy Resolution vs E – Ereco/Emu



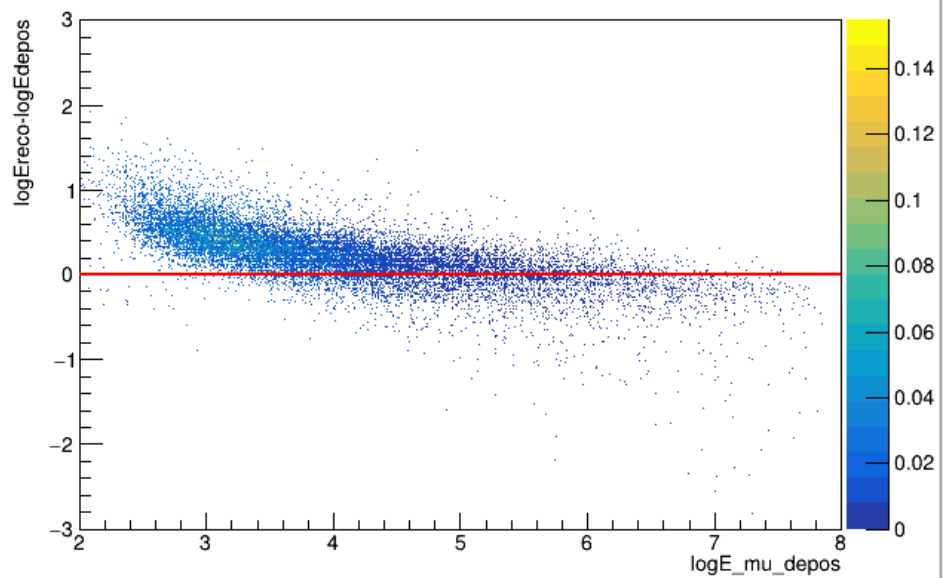
NumuCC v5.1



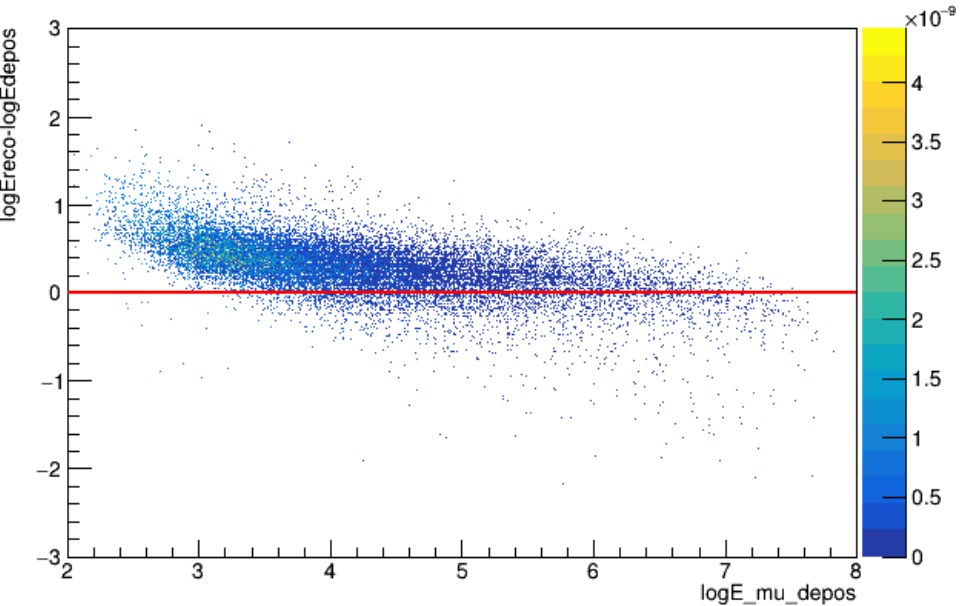
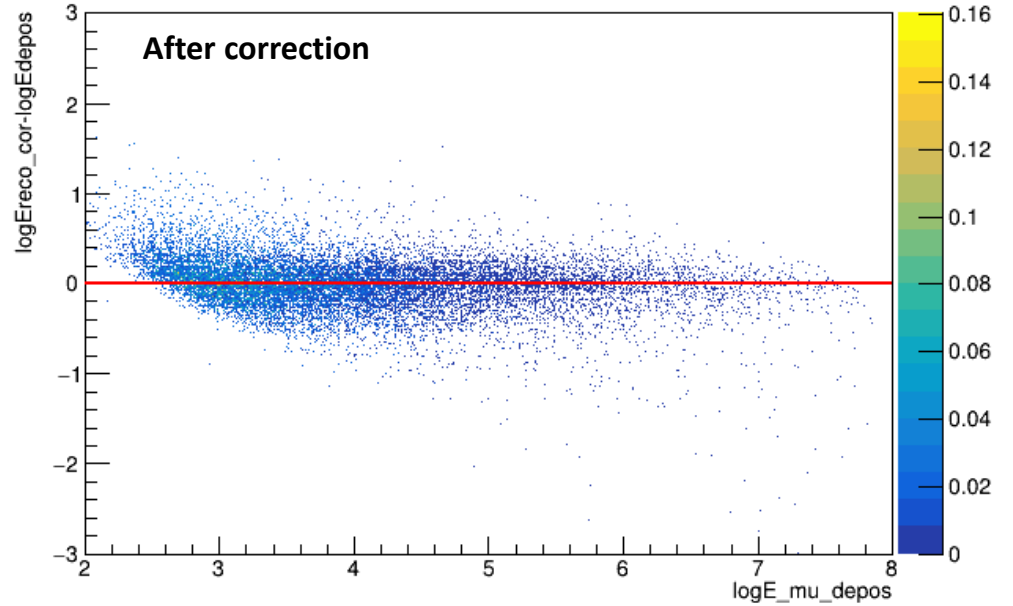
NumuCC v6



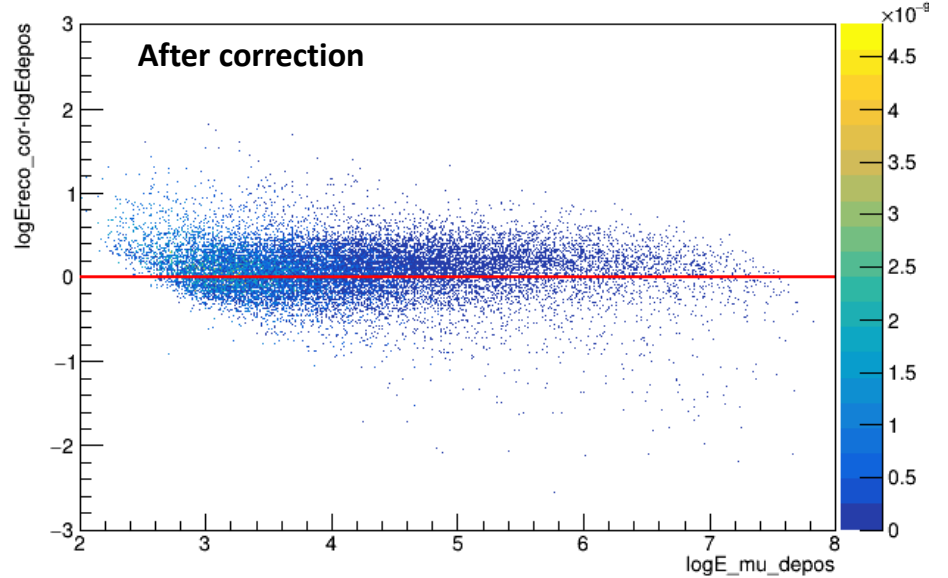
Energy Resolution vs E – Ereco/Edeposited



NumuCC v5.1

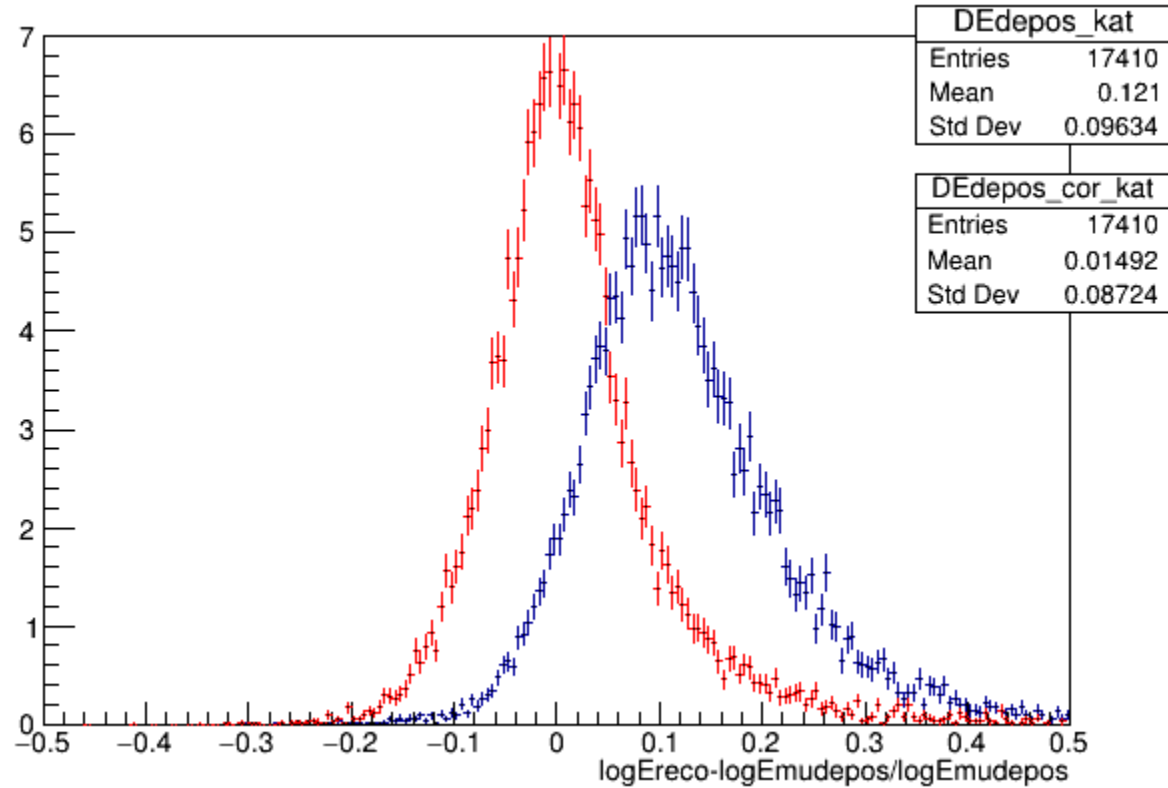


NumuCC v6

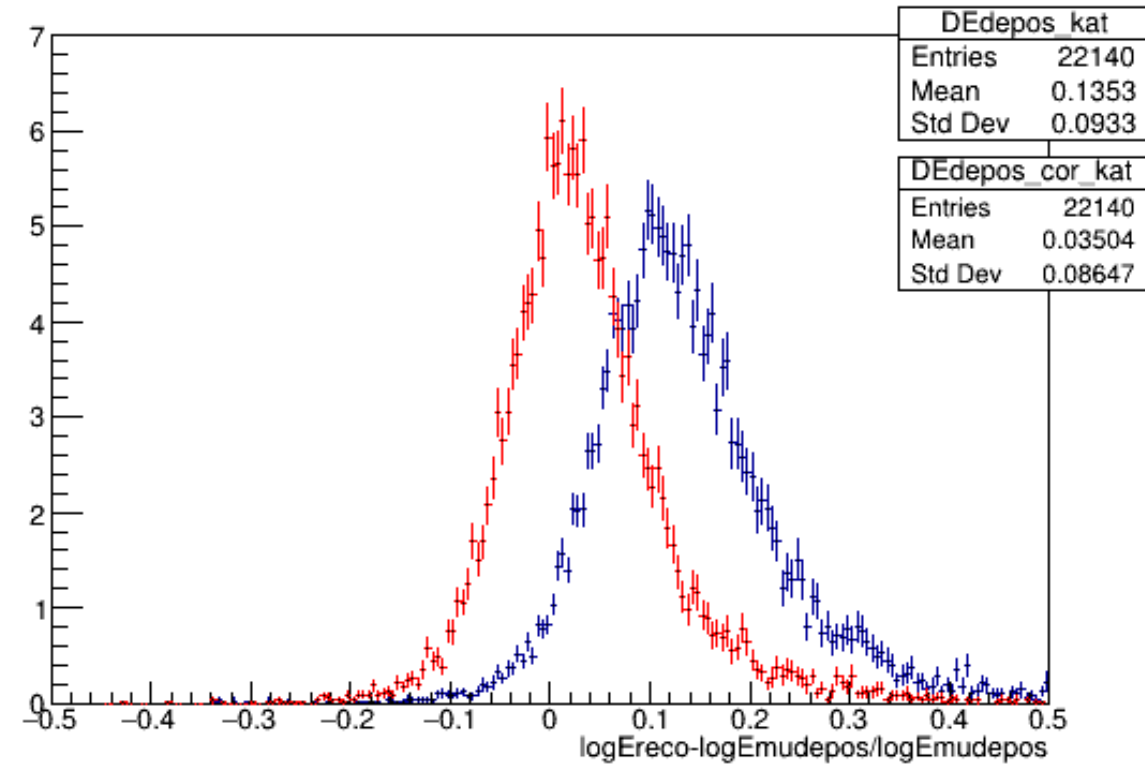


Loose Cuts Events, No energy cut

NumuCC v5.1



NumuCC v6



- First correction for the deposited energy produced
- Good performance (energy resolution)
 - Performs better for HE events
 - Performs better after loose cuts
- **Edeposited_vs_Ereco** different for the numuCC and mupage sample (still not understood. Would very much welcome suggestions !)
- Brief comparison of the v6 and v5.1res productions
 - Difference on the shape of the logEmu
 - The already derived correction seems to work but we need to refine it for the new MC