

Progress Update

Trevor Towstego
2-Ring ν_e CC1 π^+ Meeting
October 31, 2018

Kinematic Response Plots

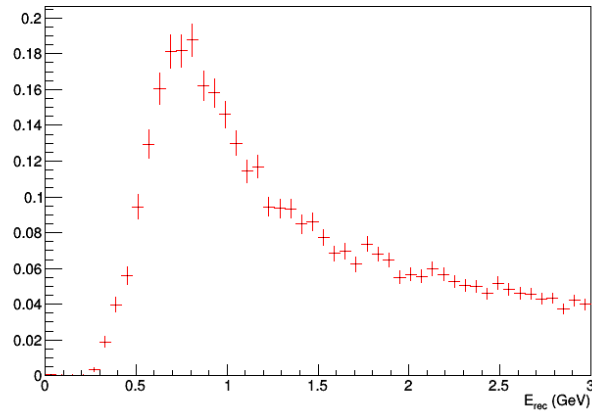
v1 trial 8 (best grid search architecture)

- Signal ($1e1\pi^{+/-}$):
 - $E_{\text{rec}}, E_{\nu}, E_{\text{res}}$
 - $p_e^{\text{rec}}, p_e^{\text{tru}}, p_e^{\text{res}}$
 - $p_{\pi}^{\text{rec}}, p_{\pi}^{\text{tru}}, p_{\pi}^{\text{res}}$
 - $\cos(\theta_{e\pi}^{\text{rec}}), \cos(\theta_{e\pi}^{\text{tru}}), \cos(\theta_{e\pi})^{\text{res}}$
- Background (not shown):
 - $E_{\text{rec}}, E_{\nu}, E_{\text{res}}$
 - p_e^{rec}
 - p_{π}^{rec}
 - $\cos(\theta_{e\pi}^{\text{rec}})$
- Stacked histograms (by final state particles)
 - $E_{\text{rec}}, E_{\nu}, E_{\text{res}}$
 - p_e^{rec}
 - p_{π}^{rec}
 - $\cos(\theta_{e\pi}^{\text{rec}})$
- 3 sets of plots (for each 0de and 1de):
 - FCFV cut
 - pre-BDT cuts
 - post-BDT

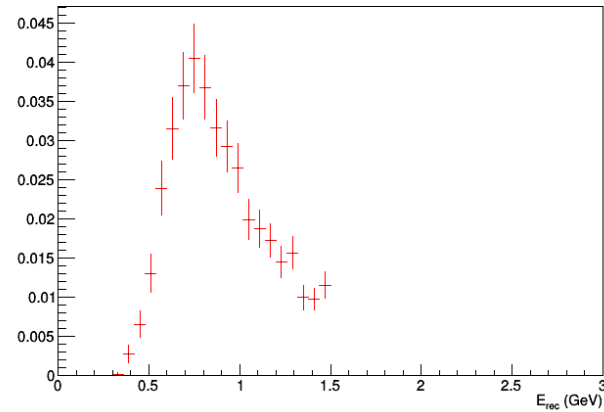
Signal E_{rec}

0de

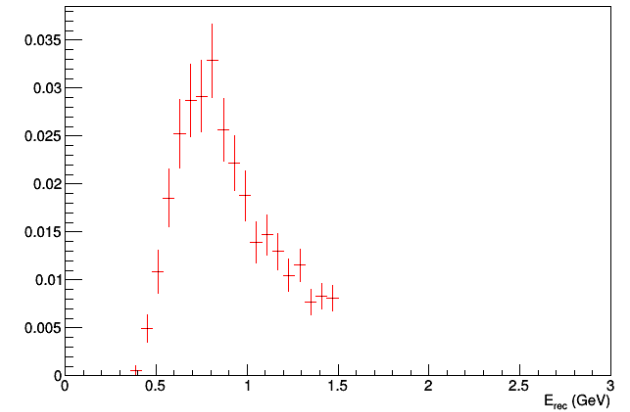
Sig E_{rec} FCFV events



Sig E_{rec} before BDT

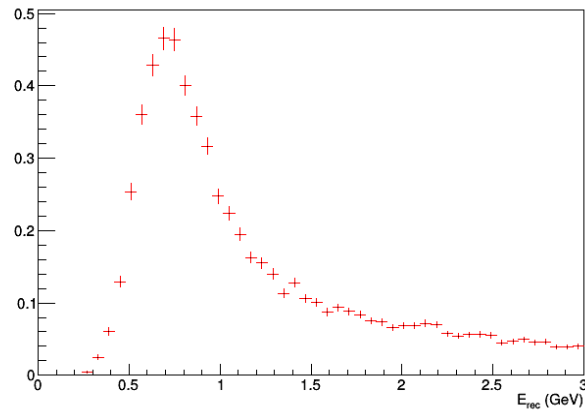


Sig E_{rec} after BDT

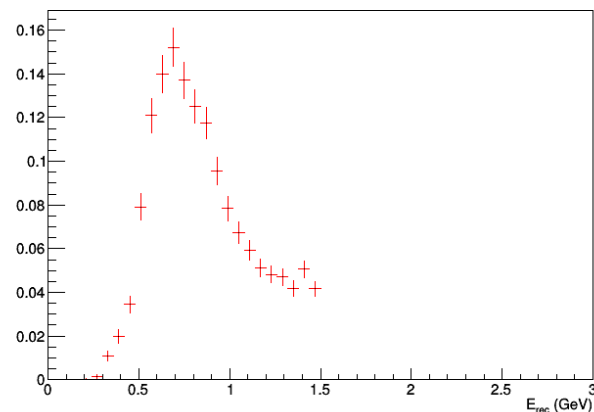


1de

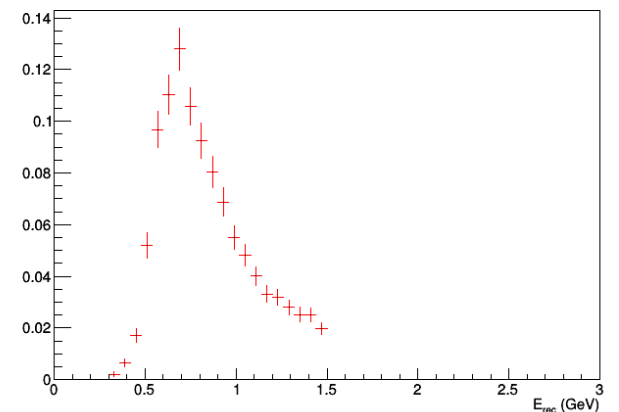
Sig E_{rec} FCFV events



Sig E_{rec} before BDT

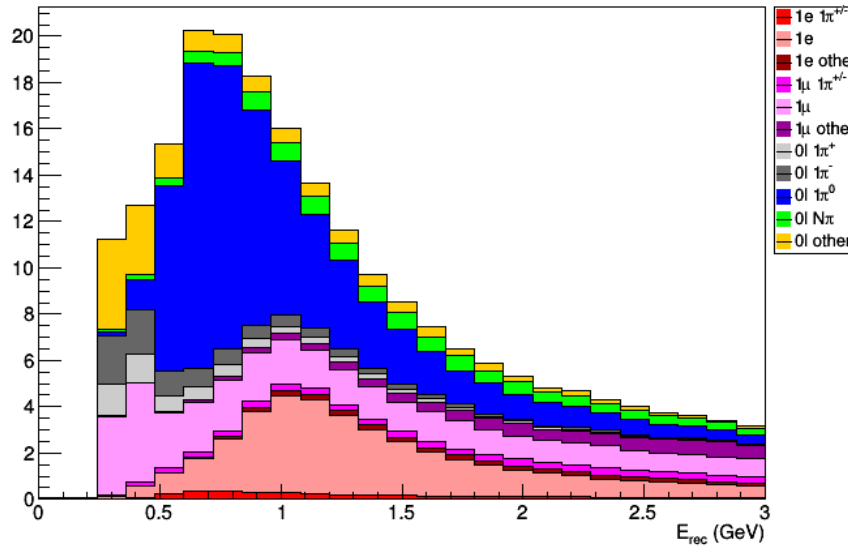


Sig E_{rec} after BDT

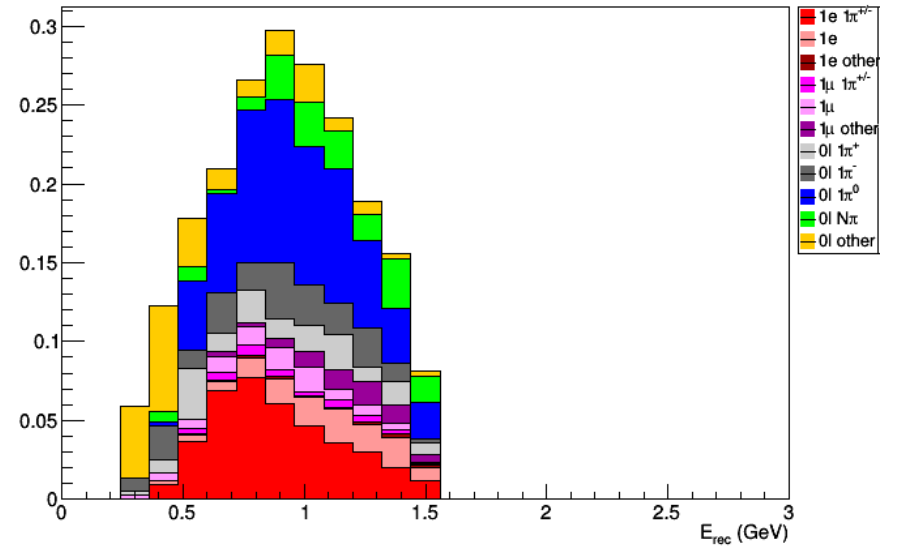


Stacked E_{rec} (0de)

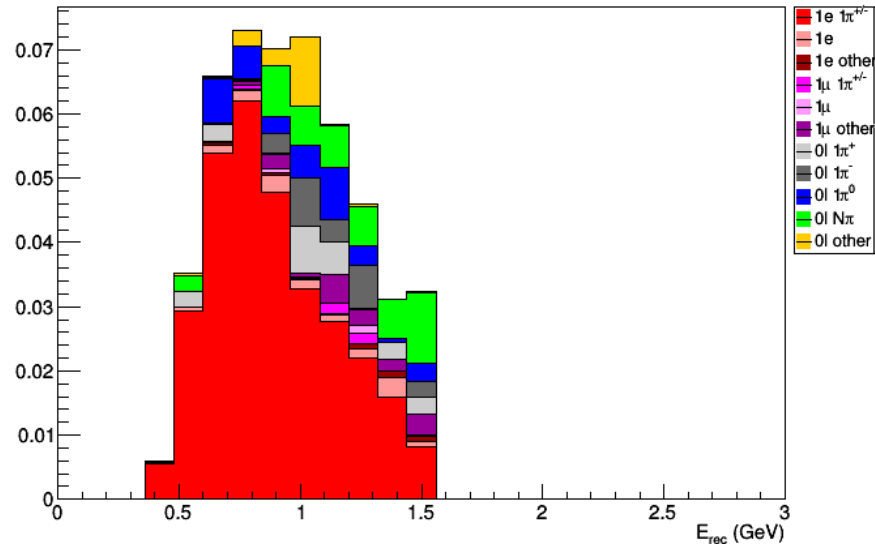
E_{rec} by Final State Particles (FCFV events)



E_{rec} by Final State Particles (before BDT)

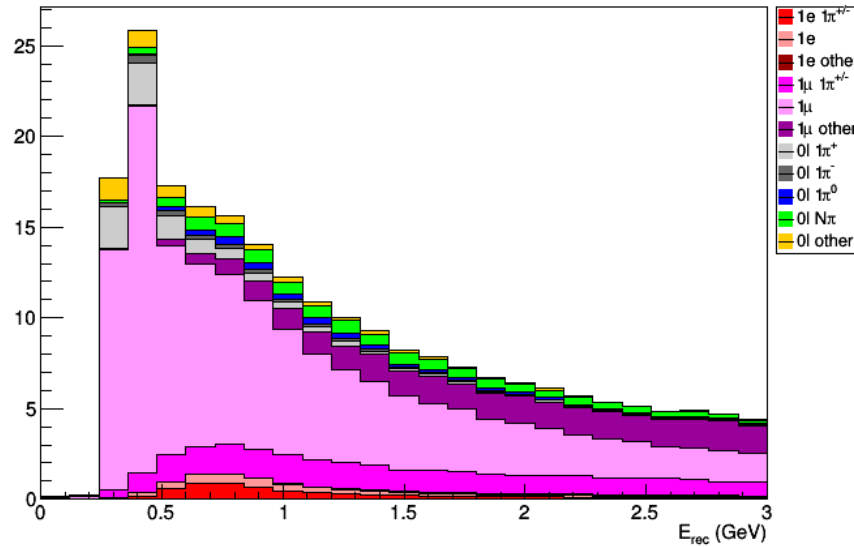


E_{rec} by Final State Particles (after BDT)

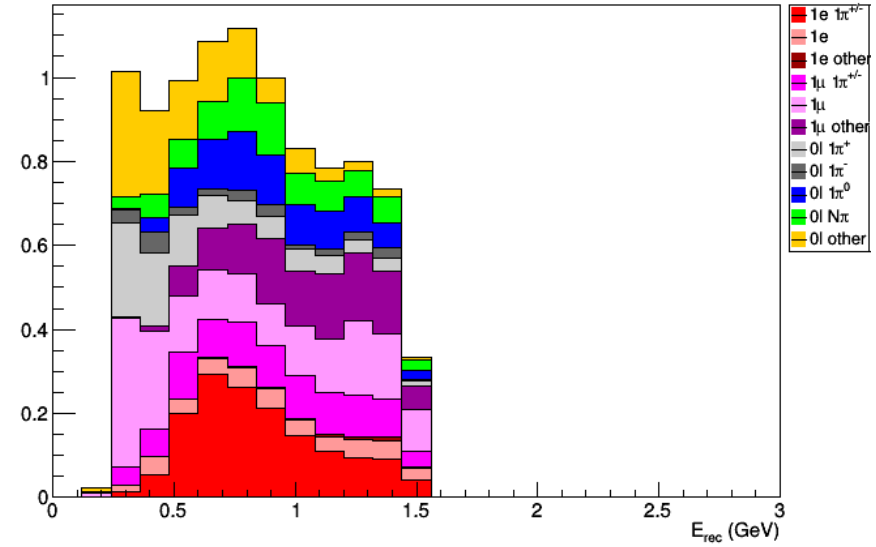


Stacked E_{rec} (1de)

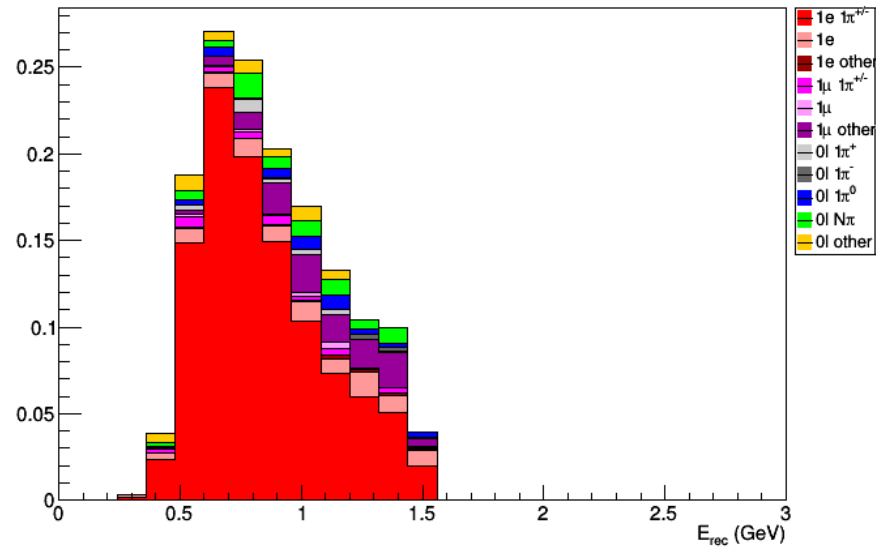
E_{rec} by Final State Particles (FCFV events)



E_{rec} by Final State Particles (before BDT)

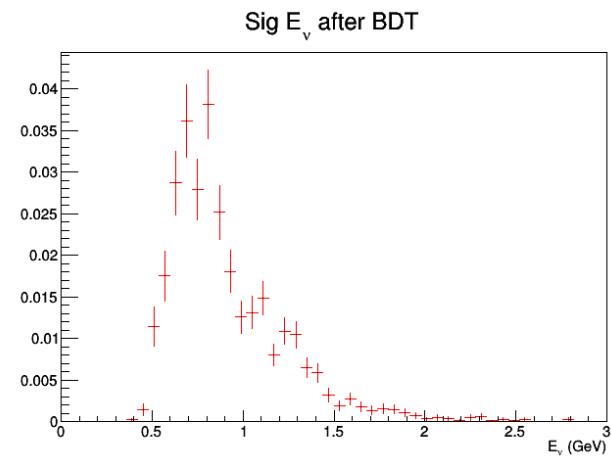
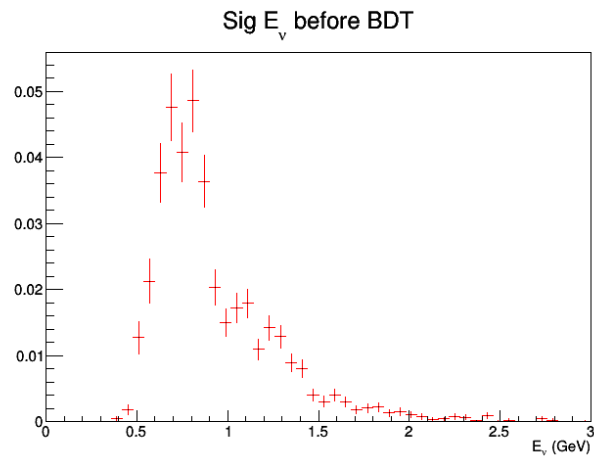
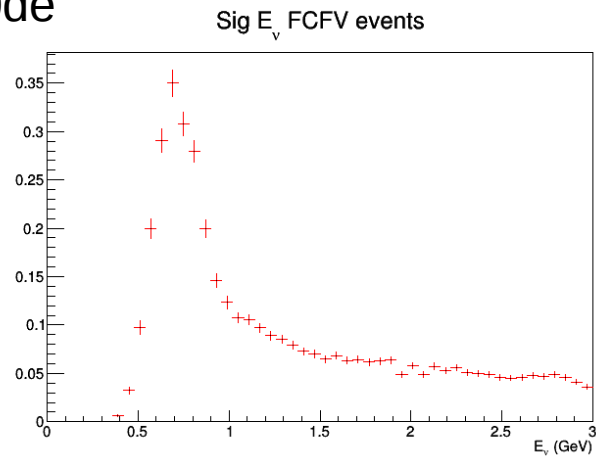


E_{rec} by Final State Particles (after BDT)

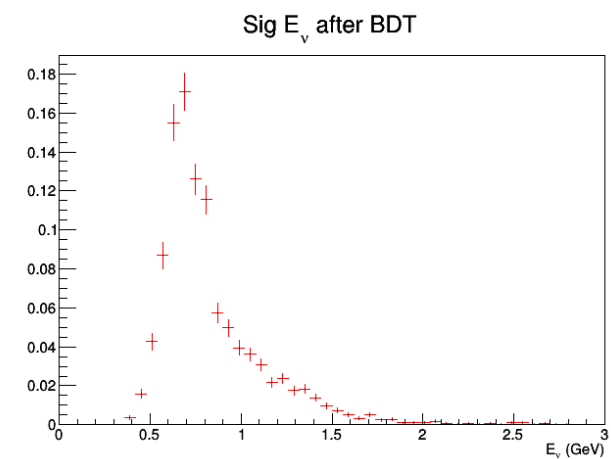
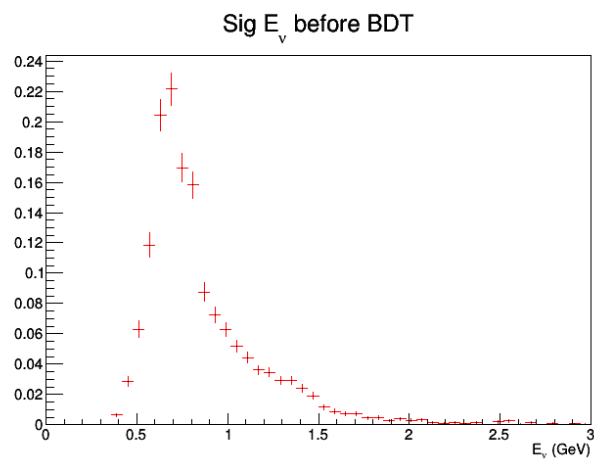
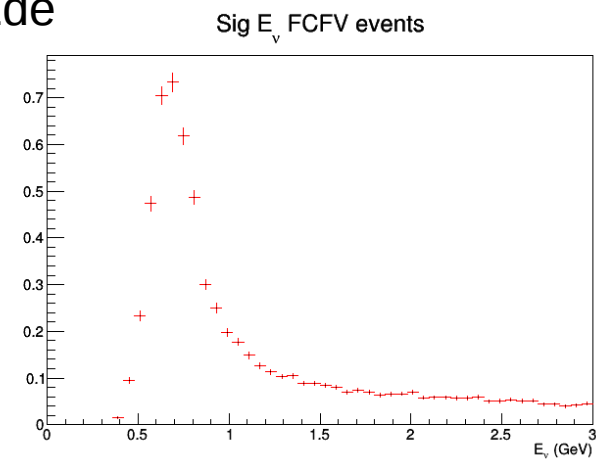


Signal E_ν

0de

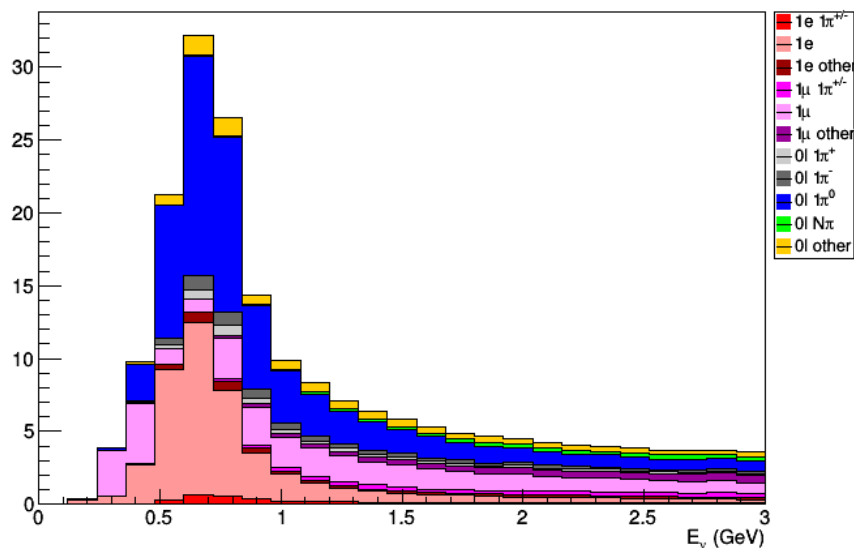


1de

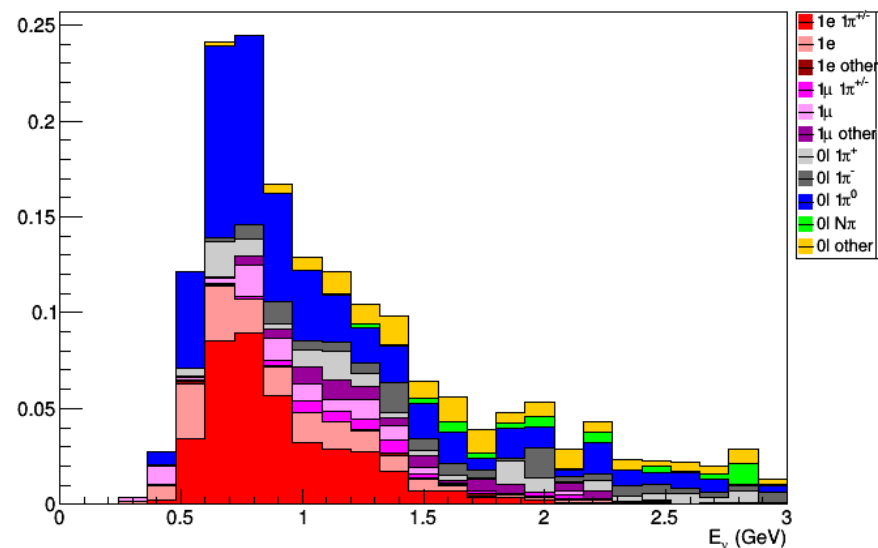


Stacked E_ν (0de)

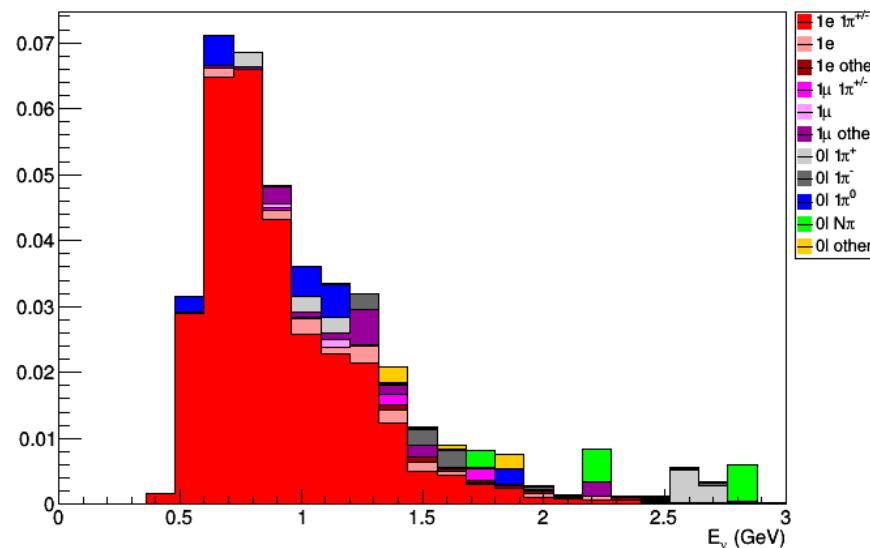
E_ν by Final State Particles (FCFV events)



E_ν by Final State Particles (before BDT)

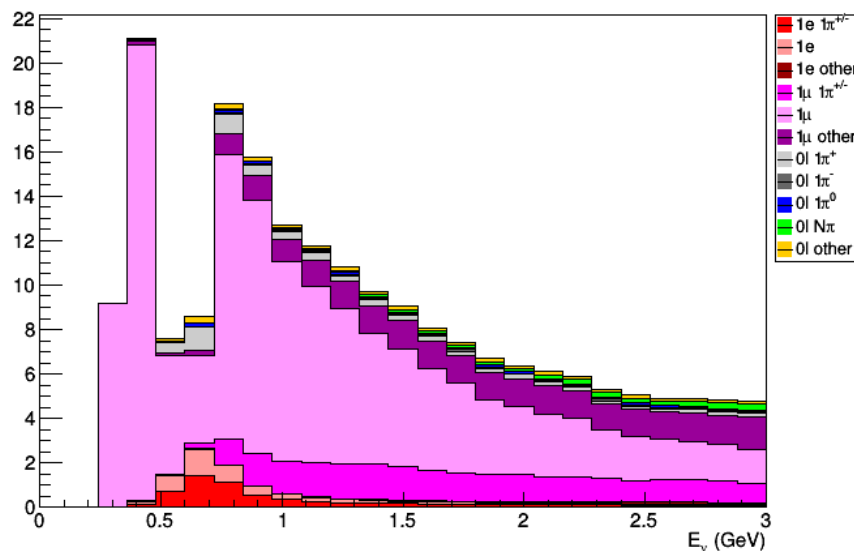


E_ν by Final State Particles (after BDT)

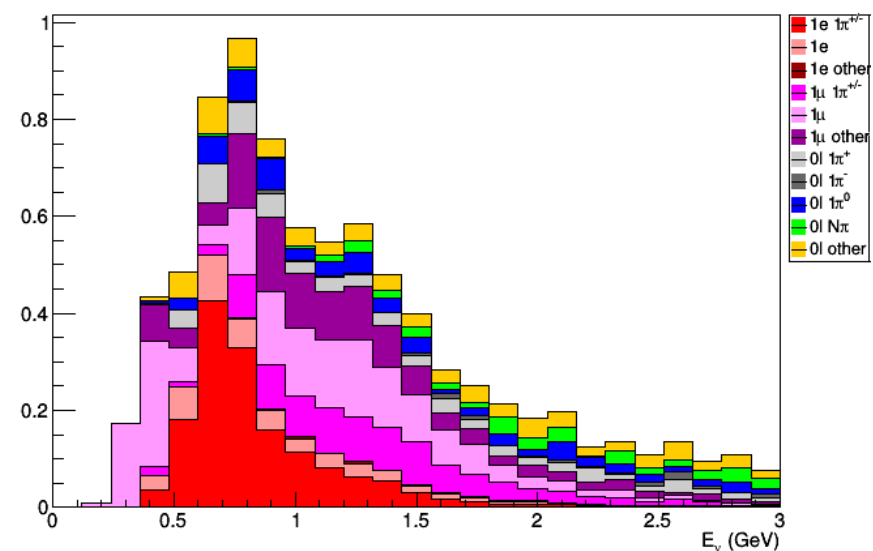


Stacked E_ν (1de)

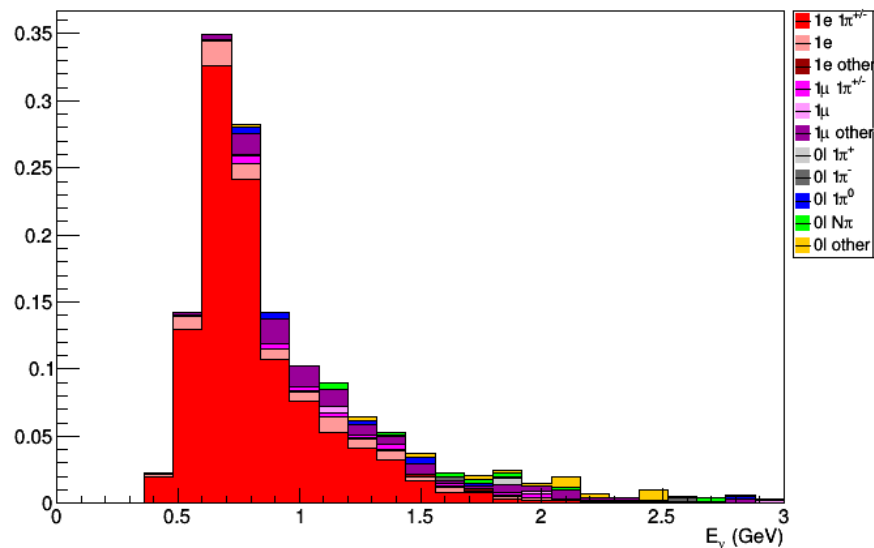
E_ν by Final State Particles (FCFV events)



E_ν by Final State Particles (before BDT)

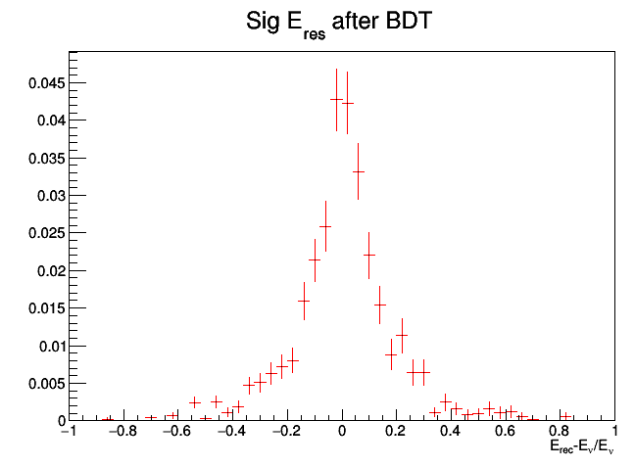
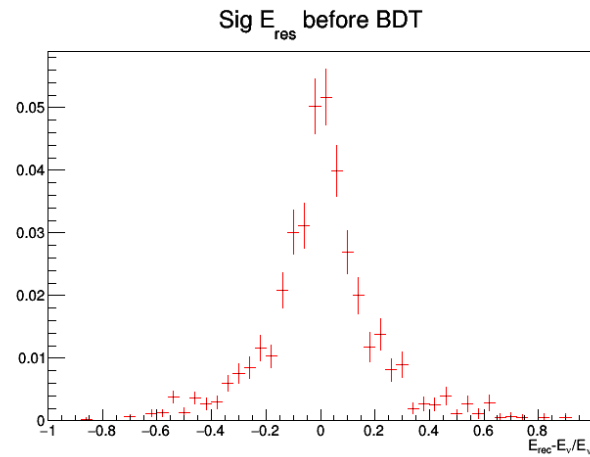
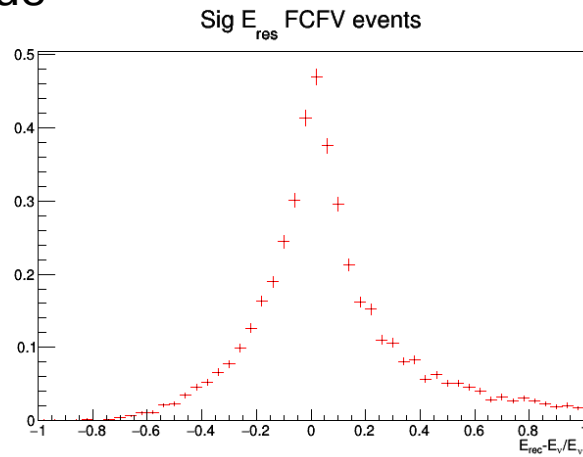


E_ν by Final State Particles (after BDT)

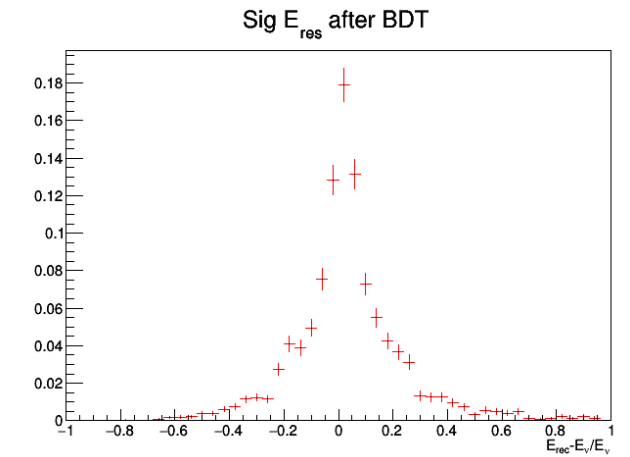
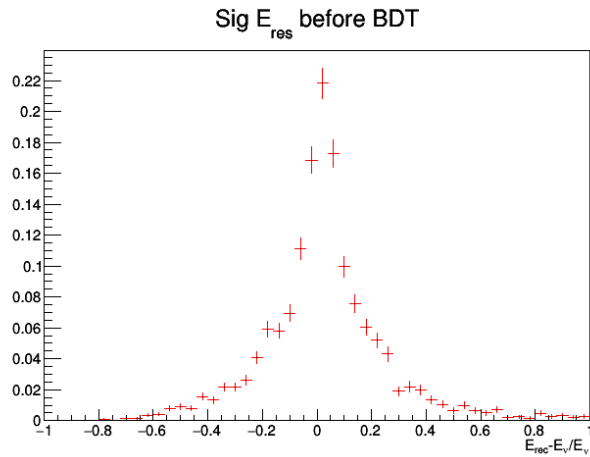
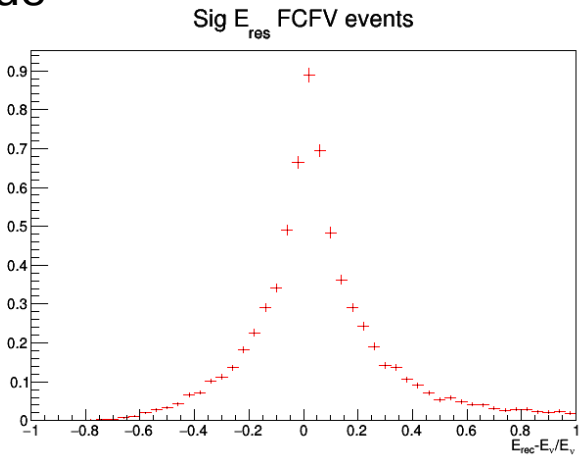


Signal E_{res}

0de

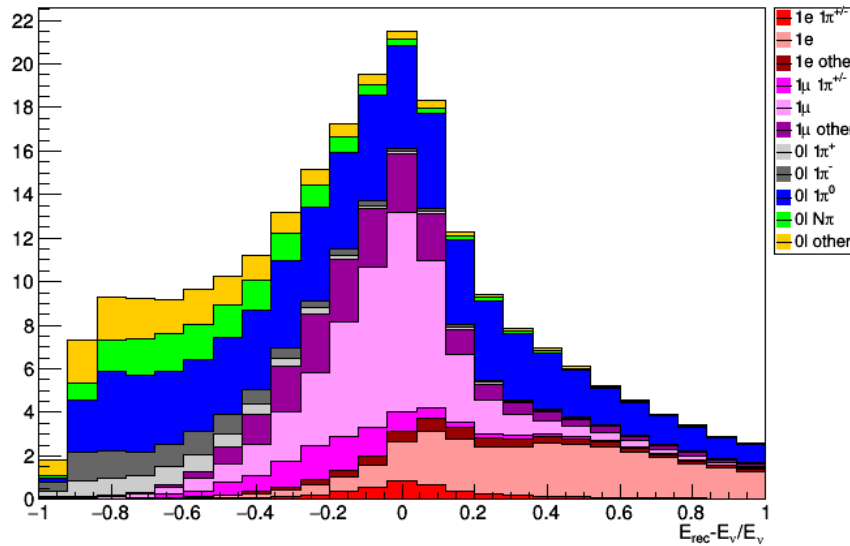


1de

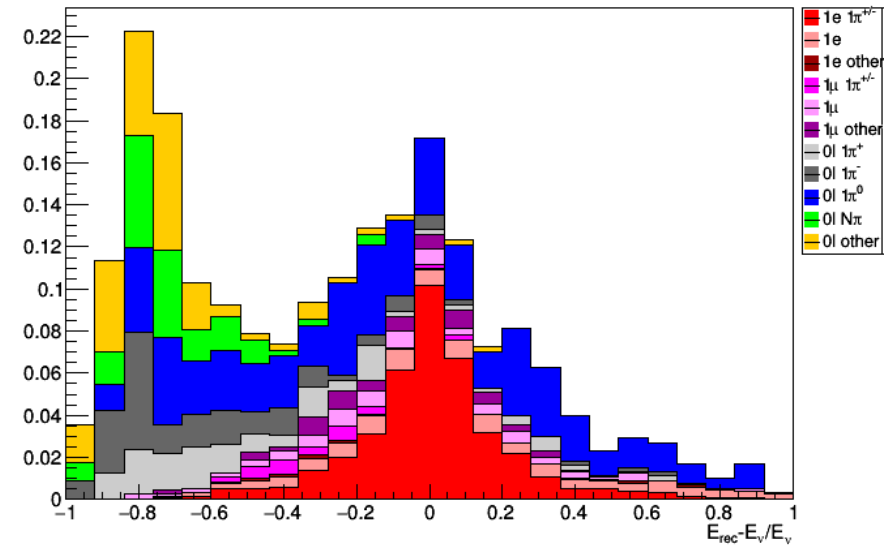


Stacked E_{res} (0de)

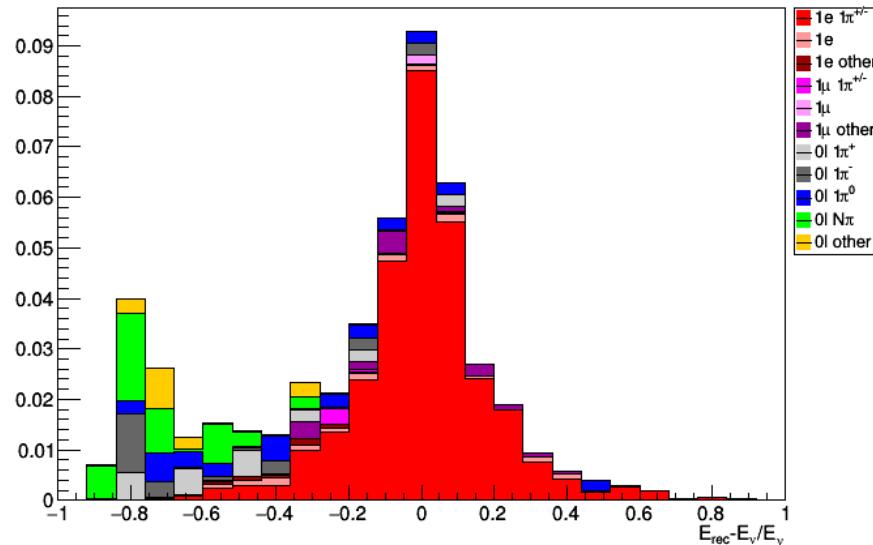
E_{res} by Final State Particles (FCFV events)



E_{res} by Final State Particles (before BDT)

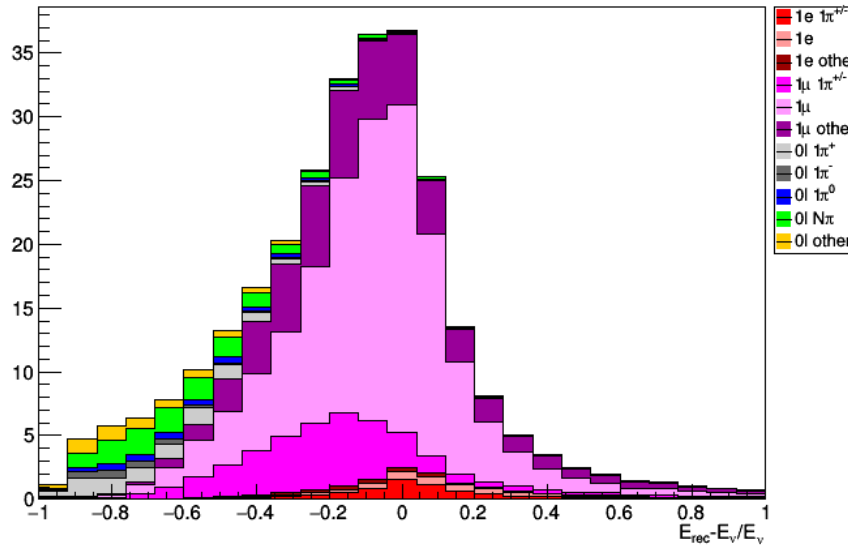


E_{res} by Final State Particles (after BDT)

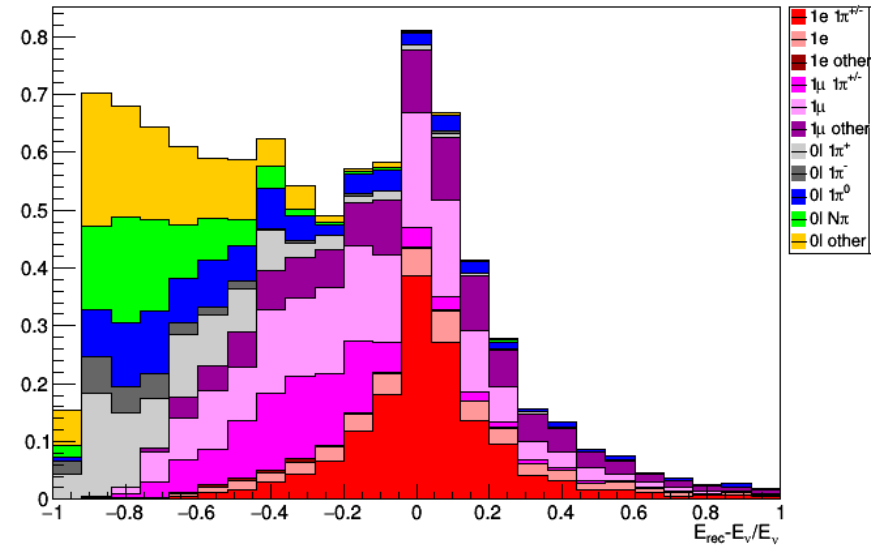


Stacked E_{res} (1de)

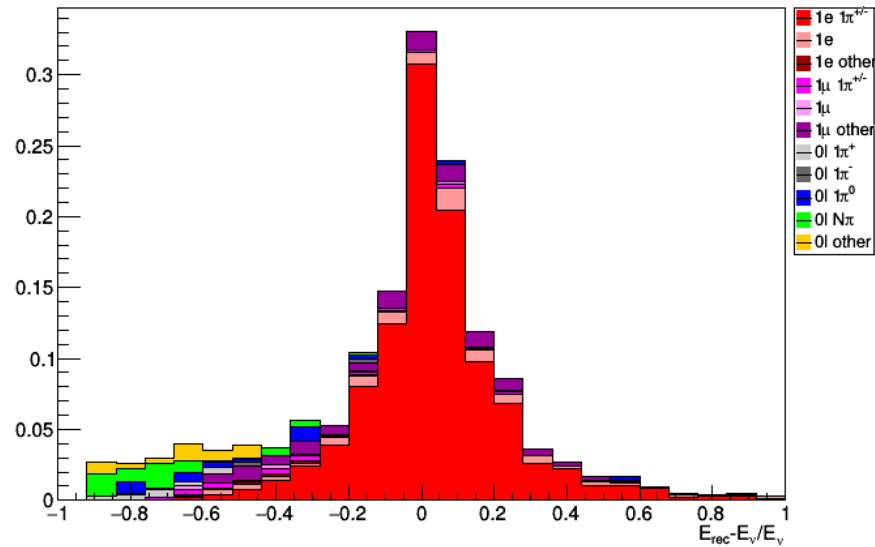
E_{res} by Final State Particles (FCFV events)



E_{res} by Final State Particles (before BDT)



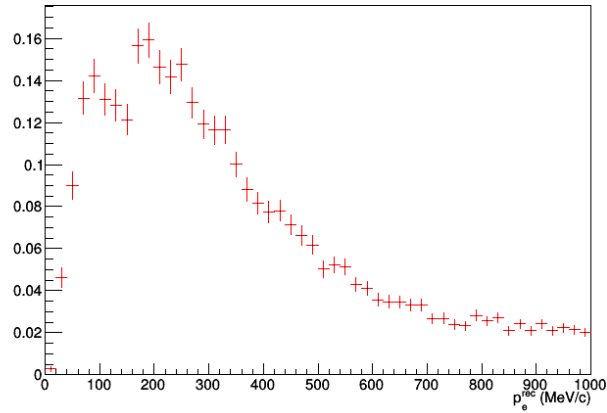
E_{res} by Final State Particles (after BDT)



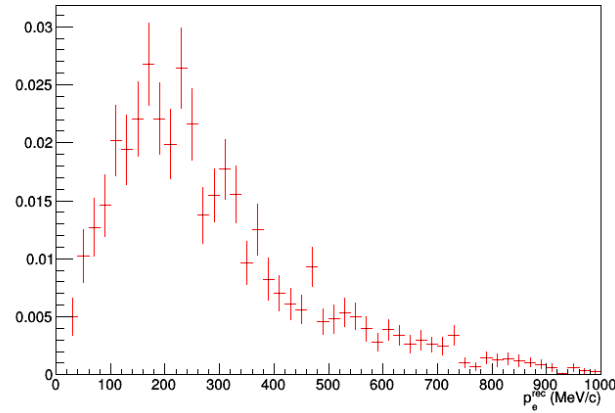
Signal p_e^{rec}

0de

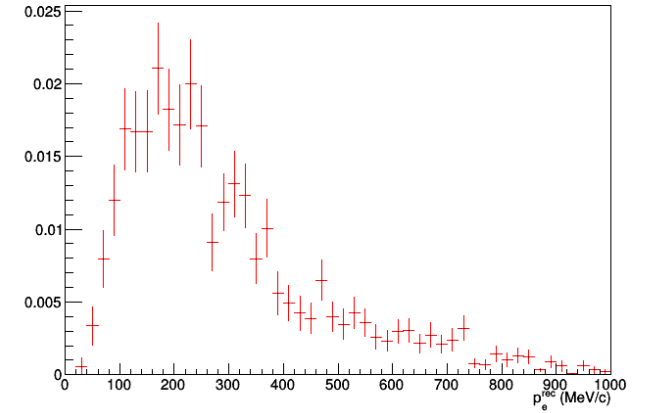
Sig p_e^{rec} FCFV events



Sig p_e^{rec} before BDT

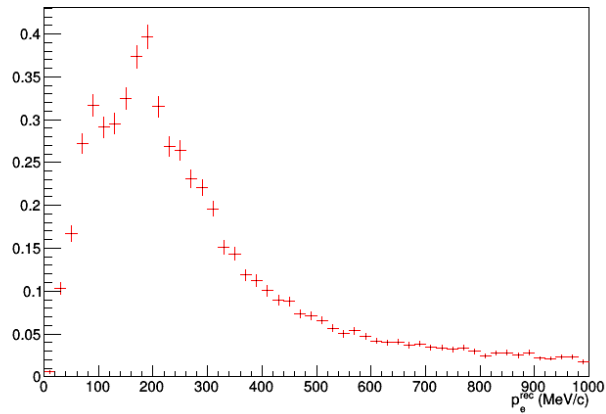


Sig p_e^{rec} after BDT

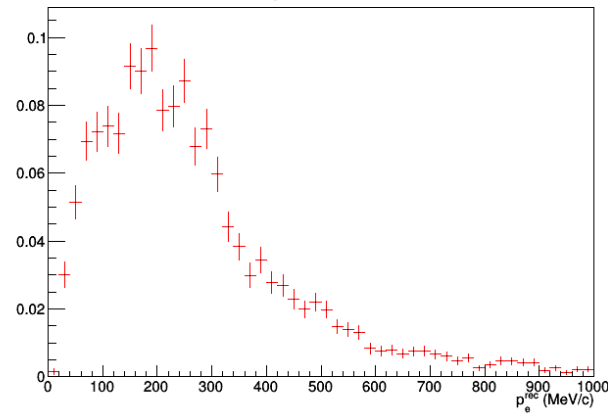


1de

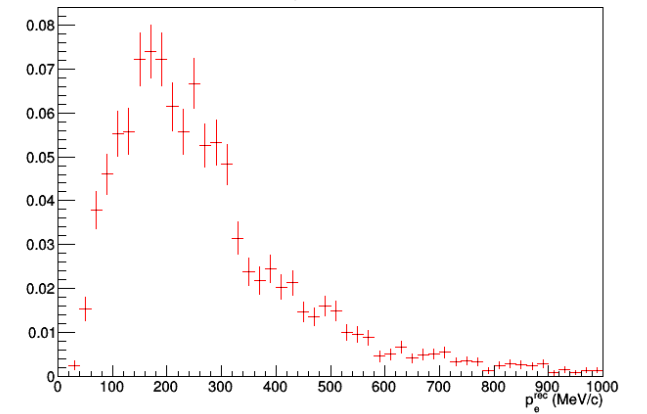
Sig p_e^{rec} FCFV events



Sig p_e^{rec} before BDT

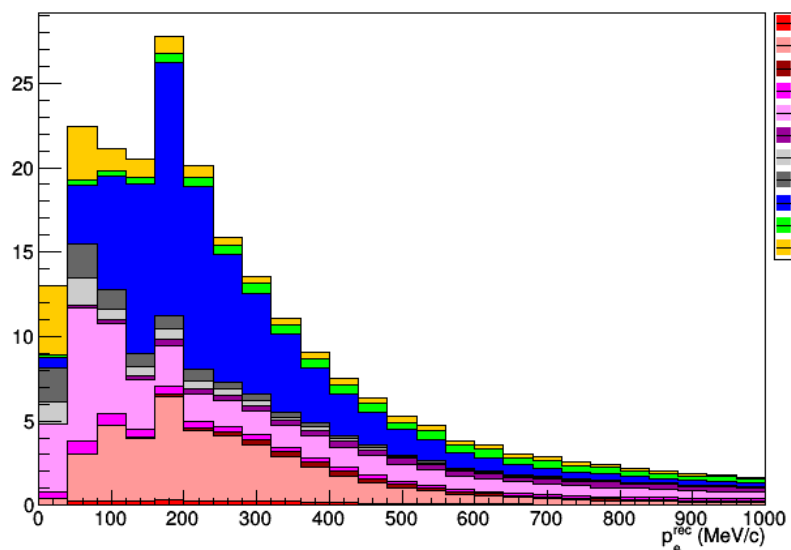


Sig p_e^{rec} after BDT

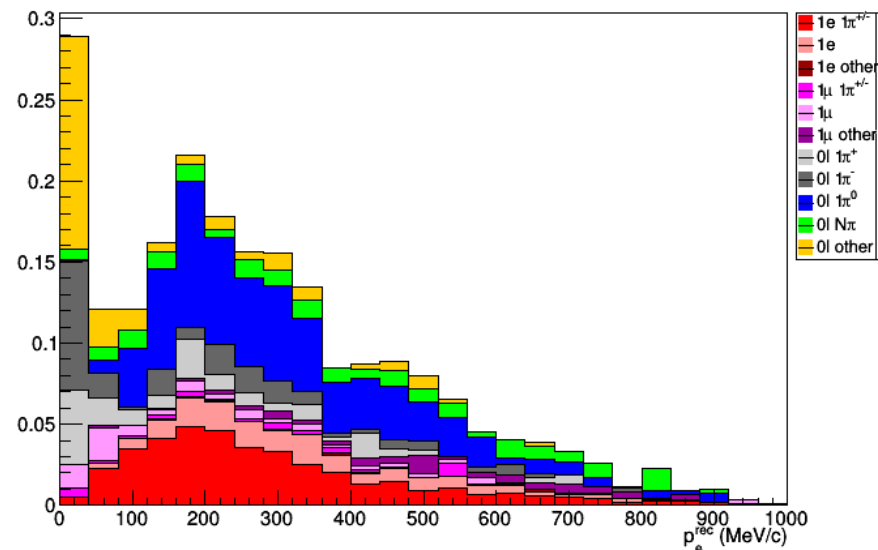


Stacked p_e^{rec} (0de)

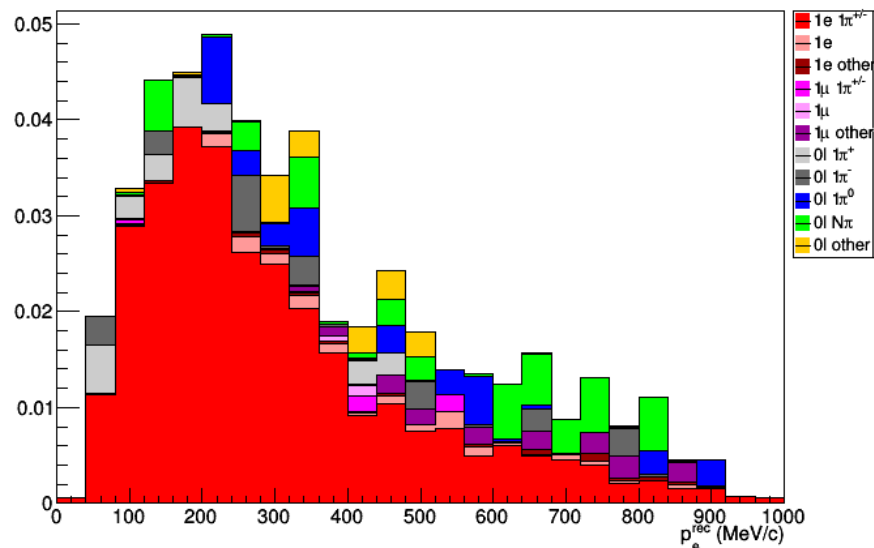
p_e^{rec} by Final State Particles (FCFV events)



p_e^{rec} by Final State Particles (before BDT)

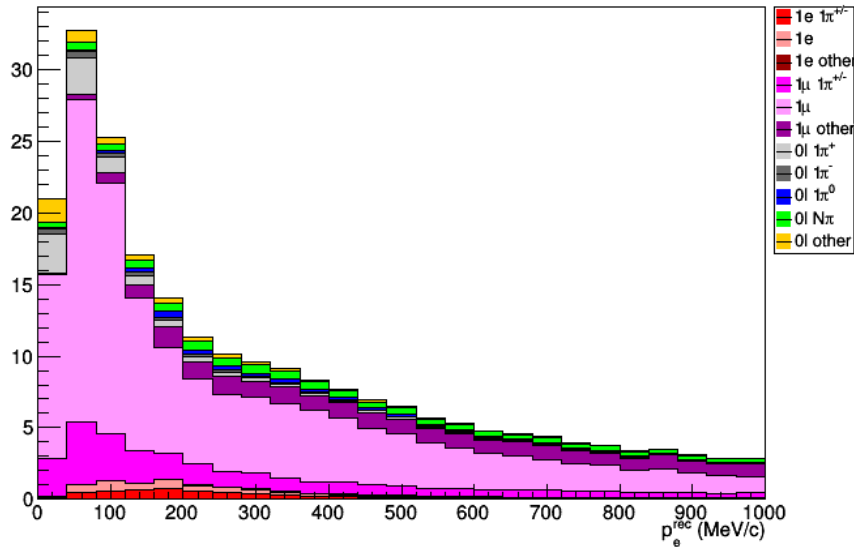


p_e^{rec} by Final State Particles (after BDT)

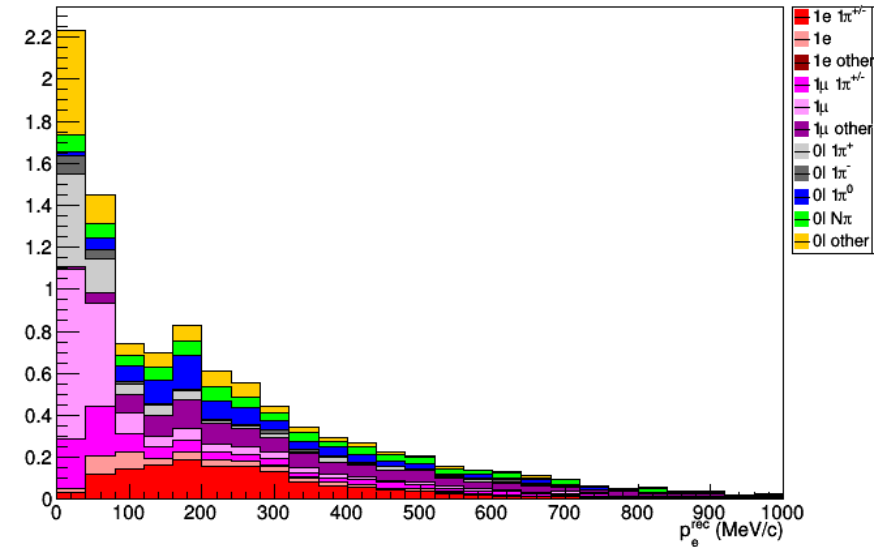


Stacked p_e^{rec} (1de)

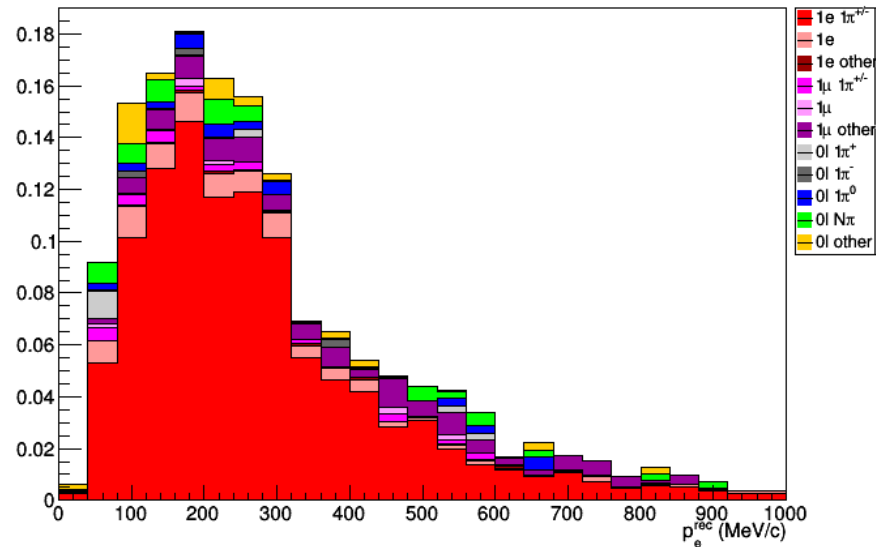
p_e^{rec} by Final State Particles (FCFV events)



p_e^{rec} by Final State Particles (before BDT)



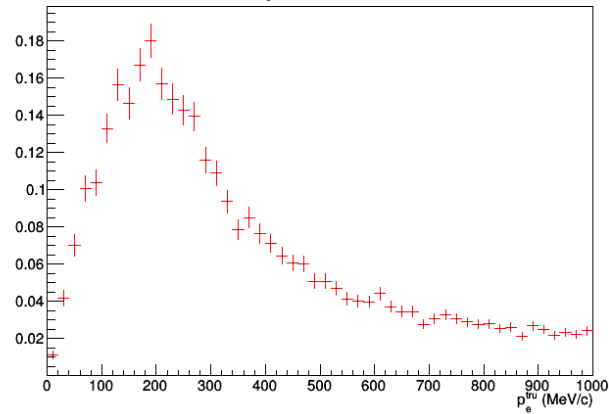
p_e^{rec} by Final State Particles (after BDT)



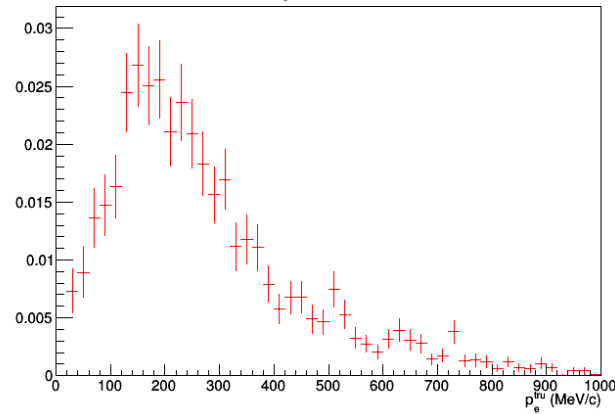
Signal p_e^{tru}

0de

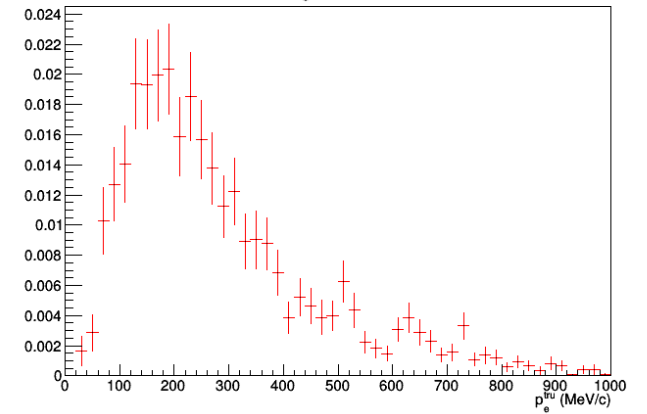
Sig p_e^{tru} FCFV events



Sig p_e^{tru} before BDT

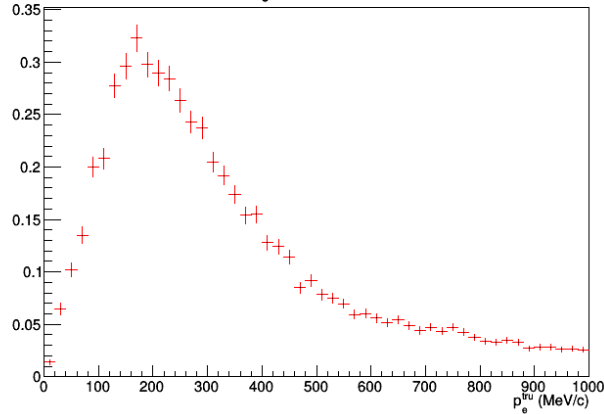


Sig p_e^{tru} after BDT

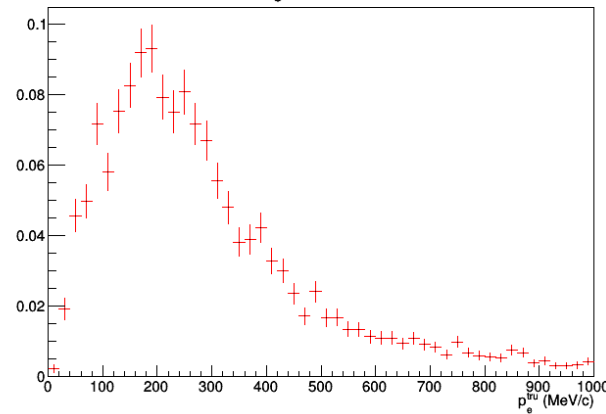


1de

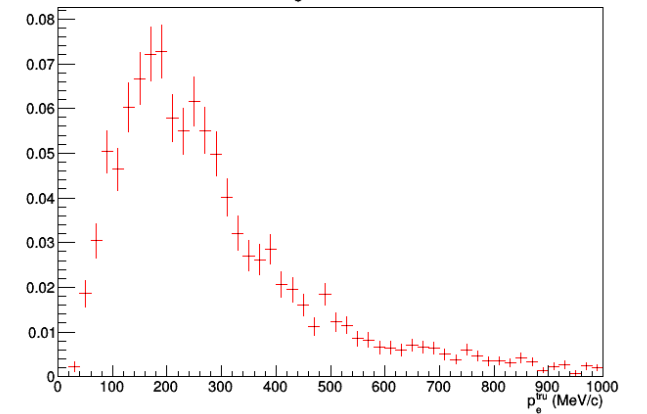
Sig p_e^{tru} FCFV events



Sig p_e^{tru} before BDT



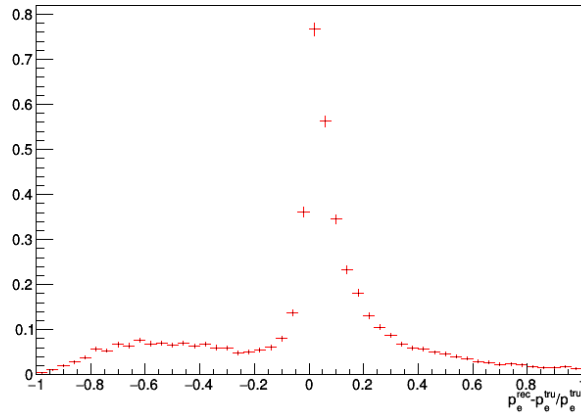
Sig p_e^{tru} after BDT



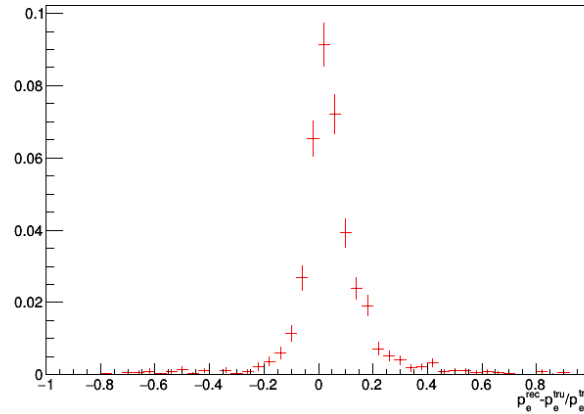
Signal p_e^{res}

0de

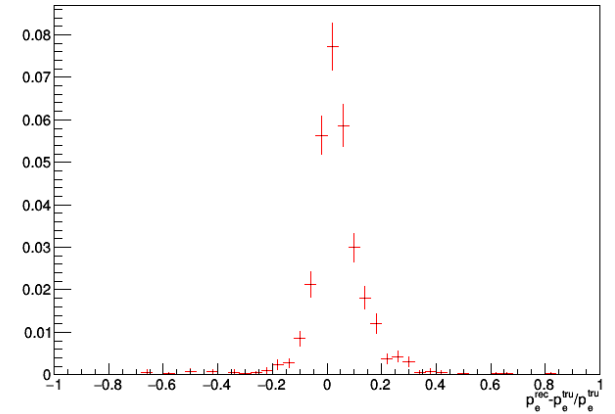
Sig p_e^{res} FCFV events



Sig p_e^{res} before BDT

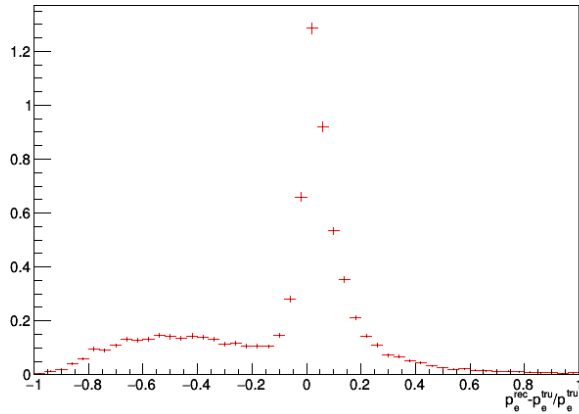


Sig p_e^{res} after BDT

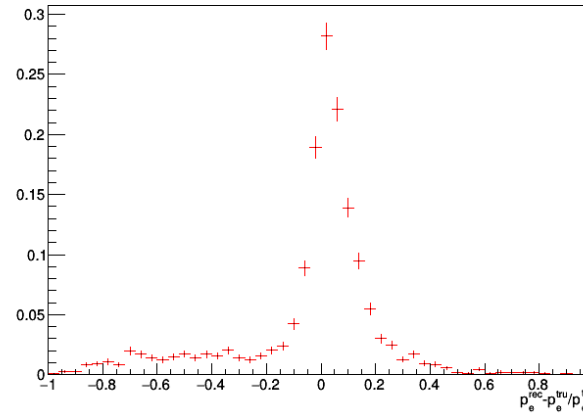


1de

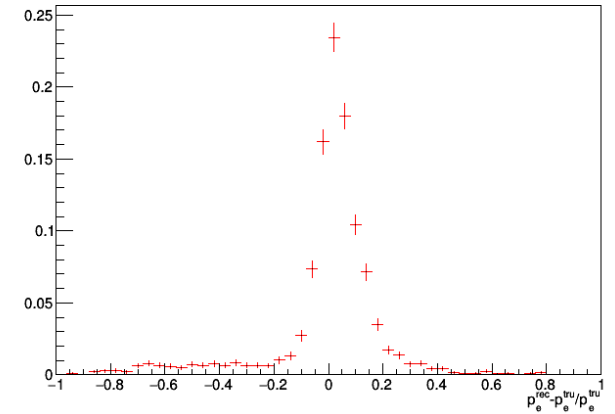
Sig p_e^{res} FCFV events



Sig p_e^{res} before BDT

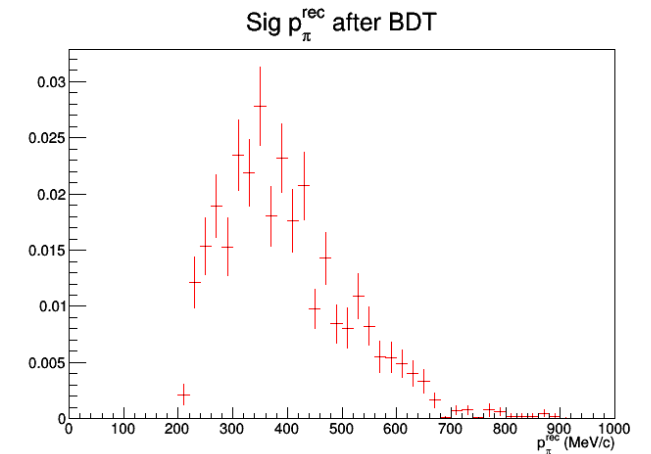
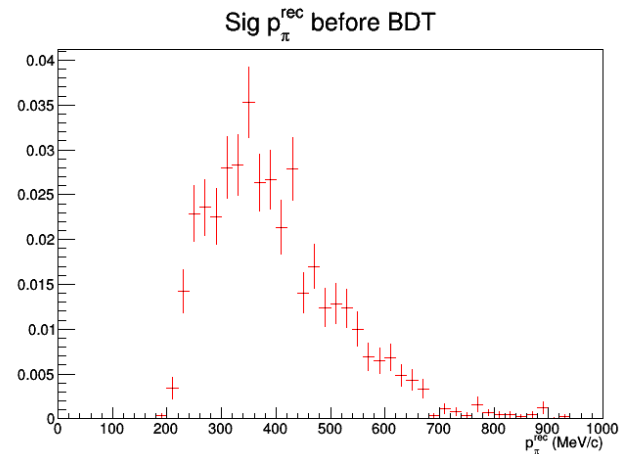
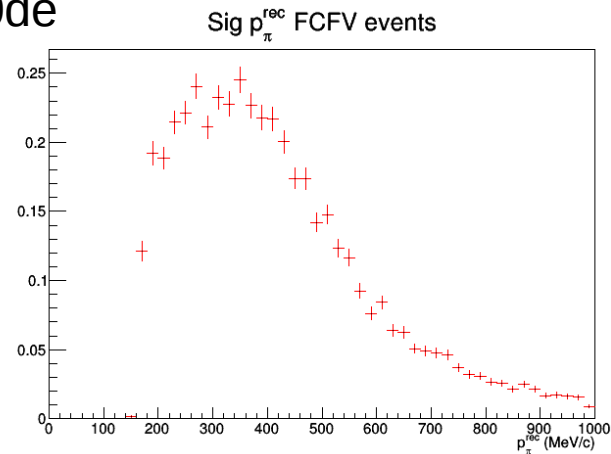


Sig p_e^{res} after BDT

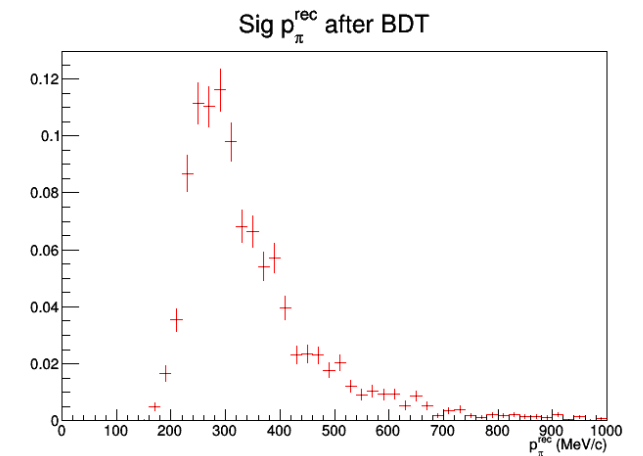
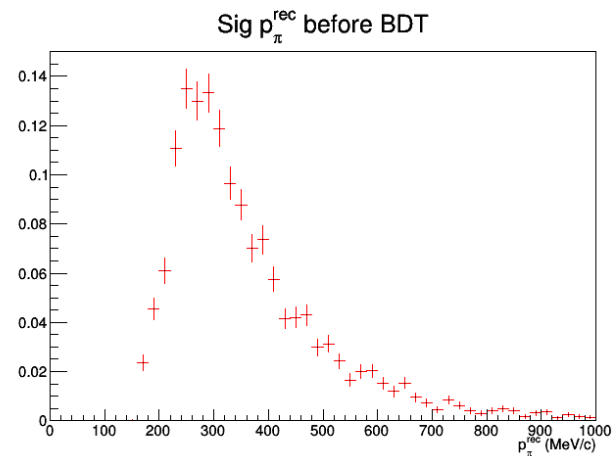
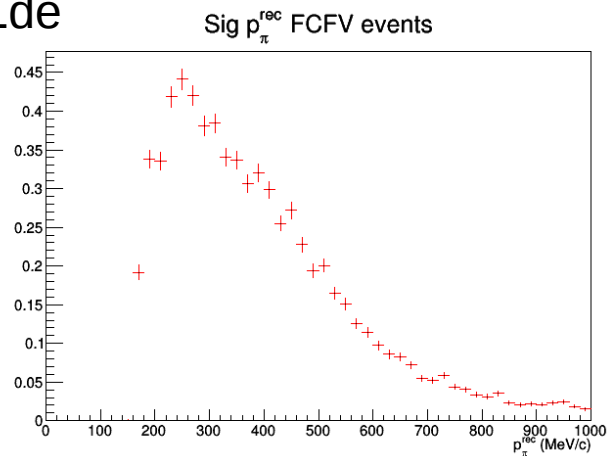


Signal p_{π}^{rec}

0de

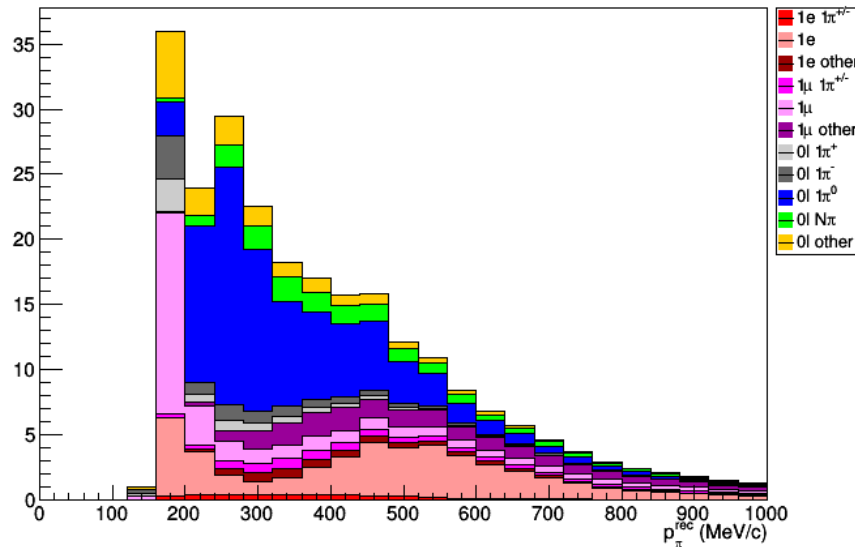


1de

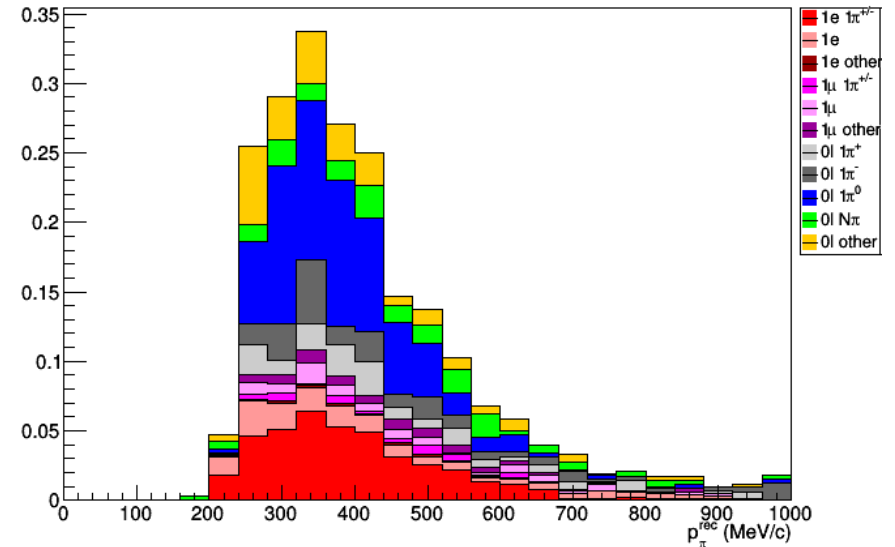


Stacked p_{π}^{rec} (0de)

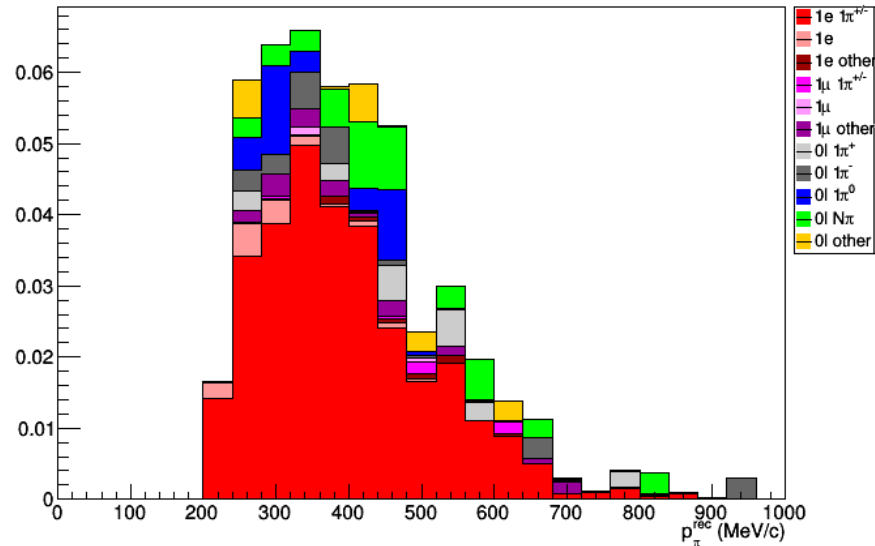
p_{π}^{rec} by Final State Particles (FCFV events)



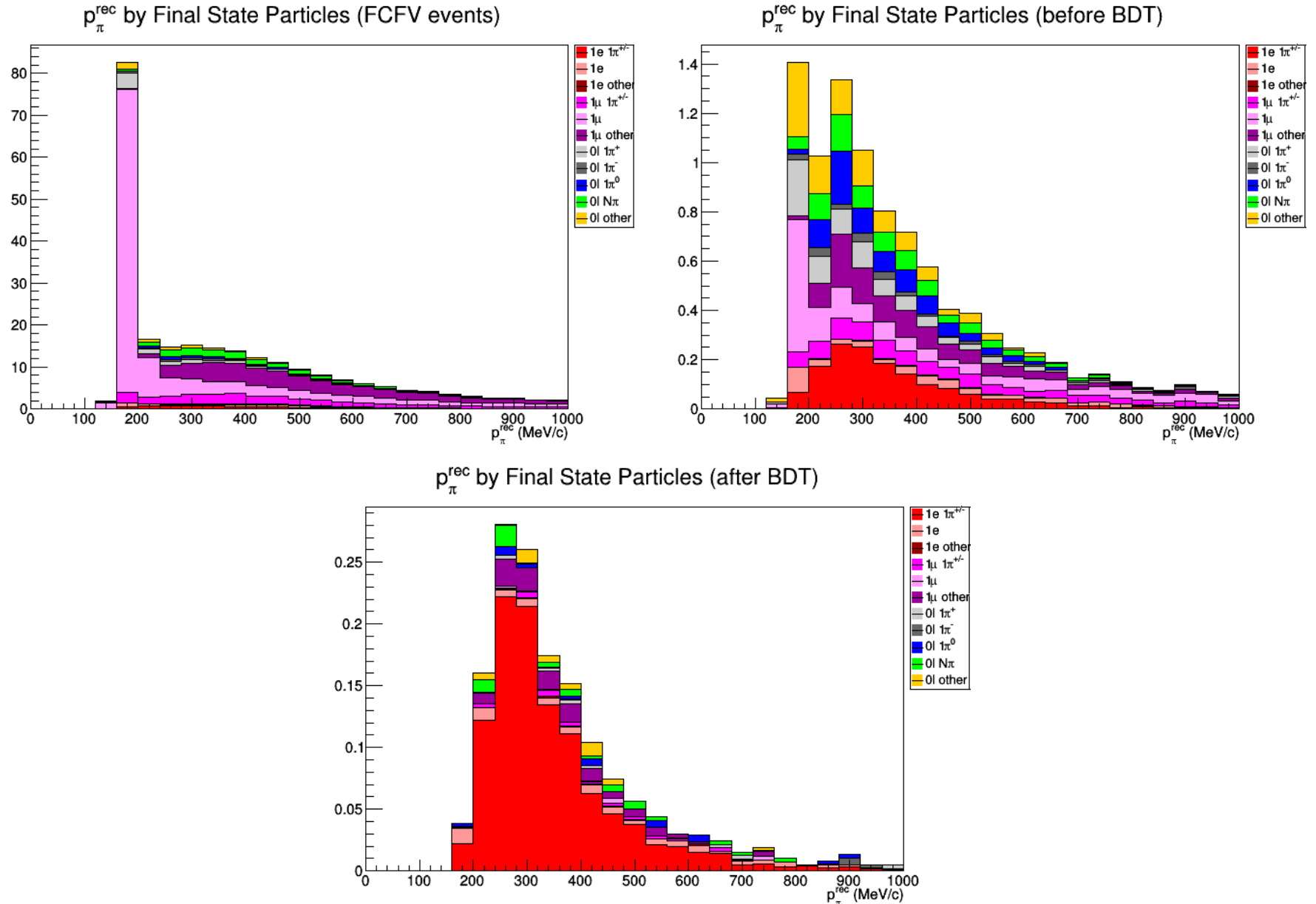
p_{π}^{rec} by Final State Particles (before BDT)



p_{π}^{rec} by Final State Particles (after BDT)



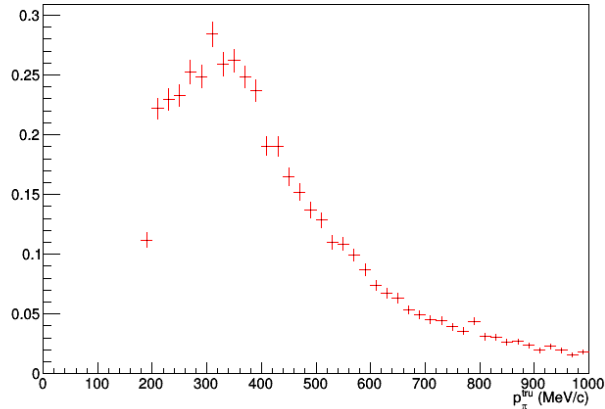
Stacked p_{π}^{rec} (1de)



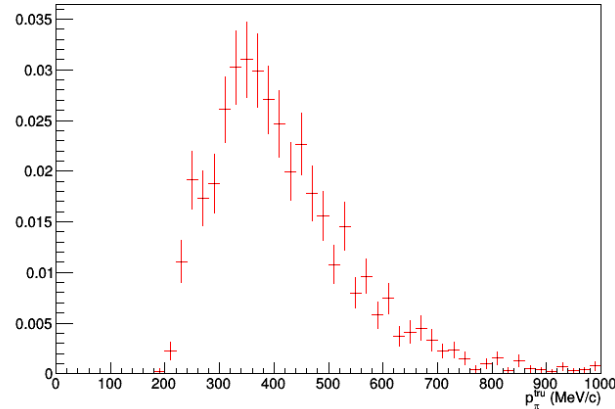
Signal p_{π}^{tru}

0de

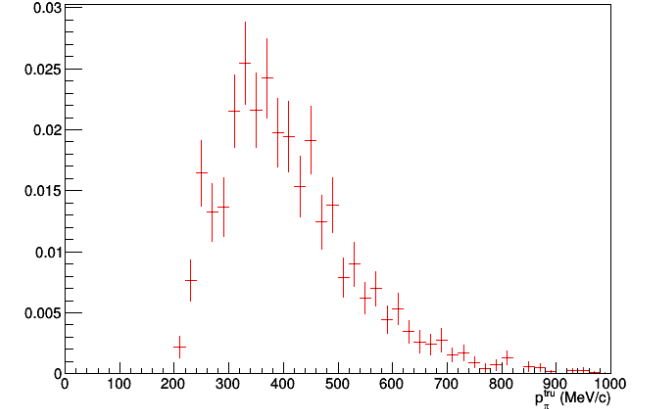
Sig p_{π}^{tru} FCFV events



Sig p_{π}^{tru} before BDT

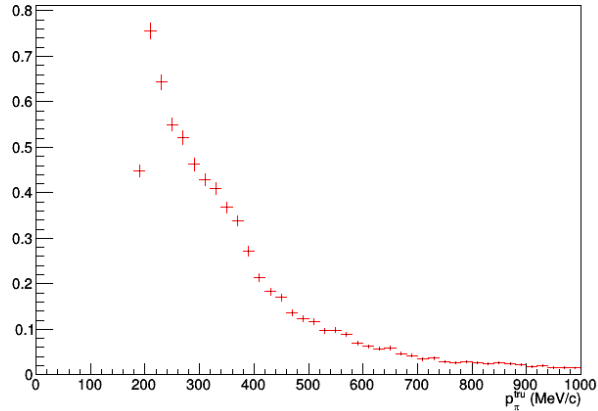


Sig p_{π}^{tru} after BDT

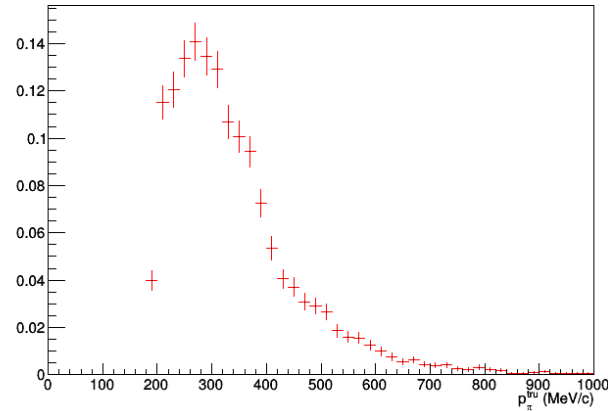


1de

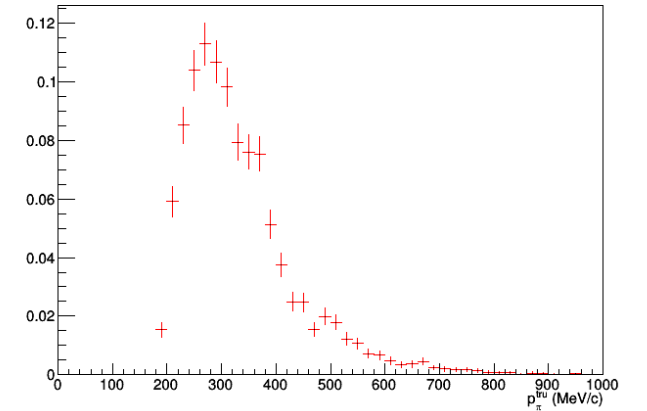
Sig p_{π}^{tru} FCFV events



Sig p_{π}^{tru} before BDT



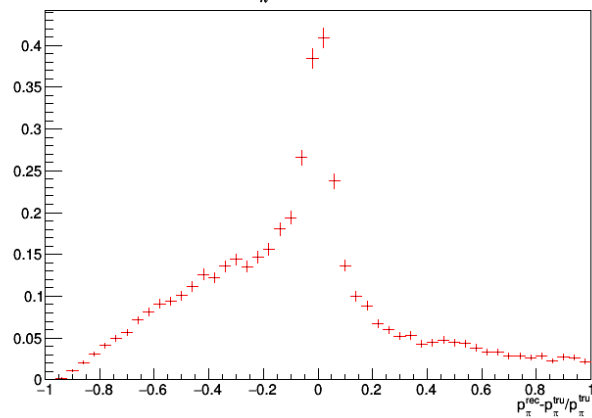
Sig p_{π}^{tru} after BDT



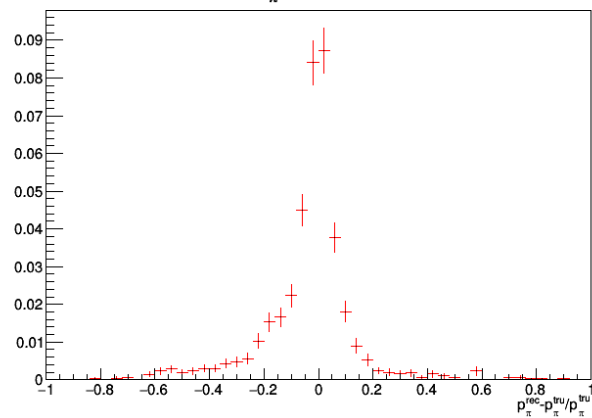
Signal p_{π}^{res}

0de

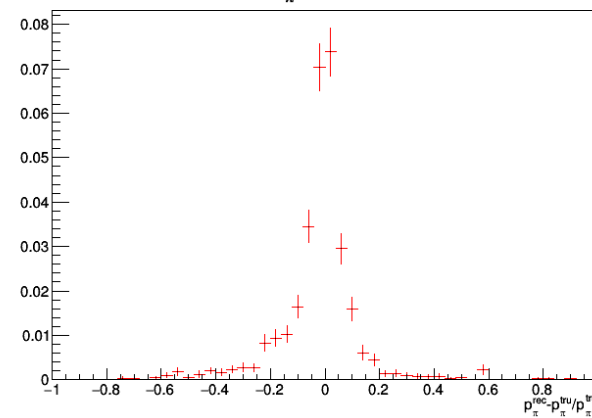
Sig p_{π}^{res} FCFV events



Sig p_{π}^{res} before BDT

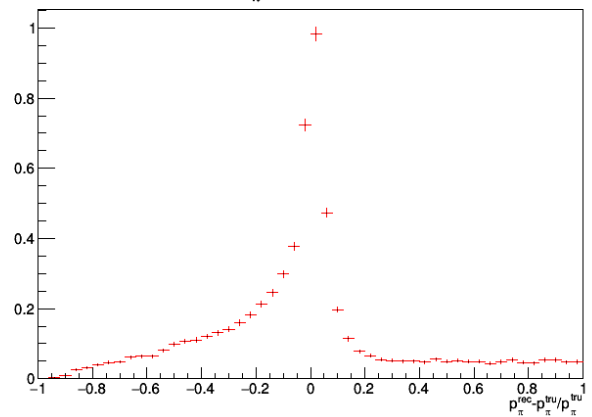


Sig p_{π}^{res} after BDT

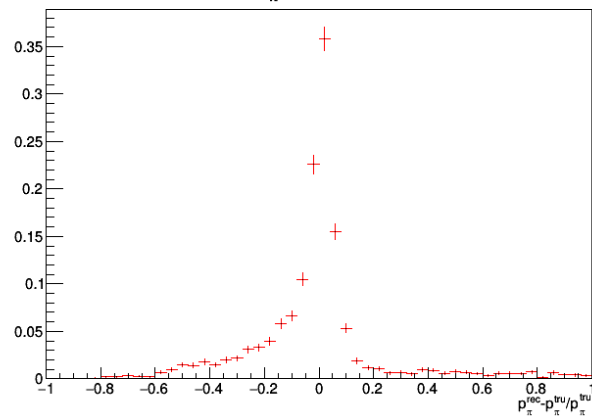


1de

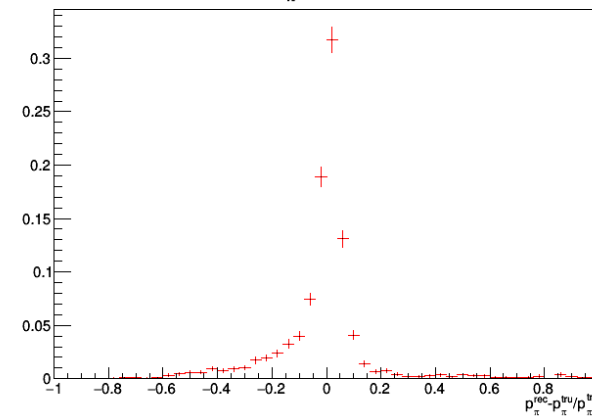
Sig p_{π}^{res} FCFV events



Sig p_{π}^{res} before BDT



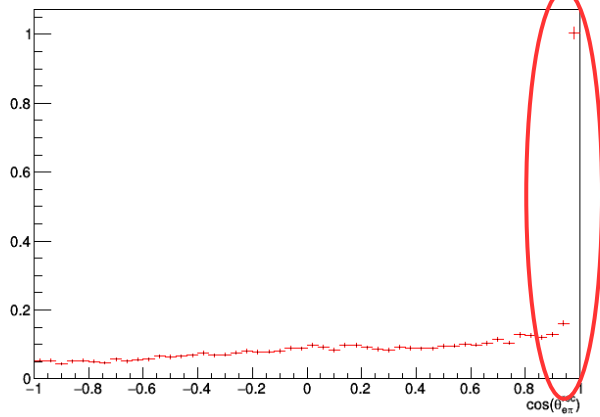
Sig p_{π}^{res} after BDT



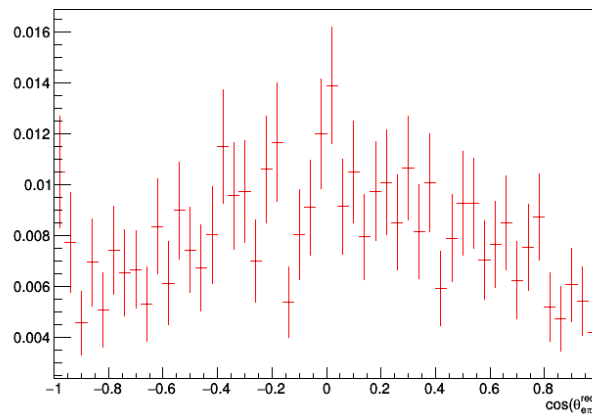
Signal $\cos(\theta_{e\pi}^{\text{rec}})$

0de

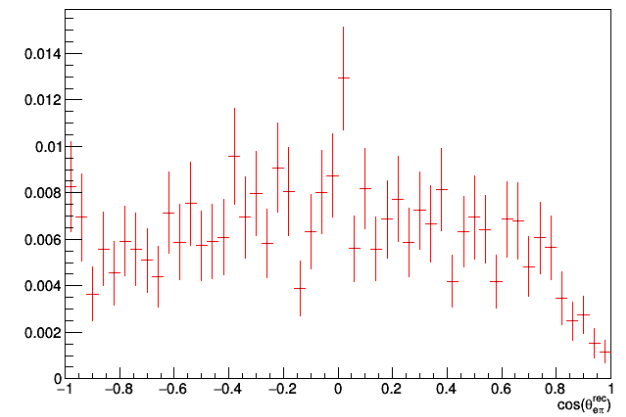
Sig $\cos(\theta_{e\pi}^{\text{rec}})$ FCFV events



Sig $\cos(\theta_{e\pi}^{\text{rec}})$ before BDT

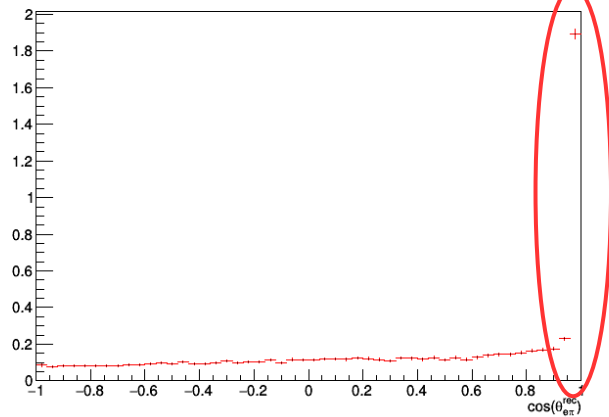


Sig $\cos(\theta_{e\pi}^{\text{rec}})$ after BDT

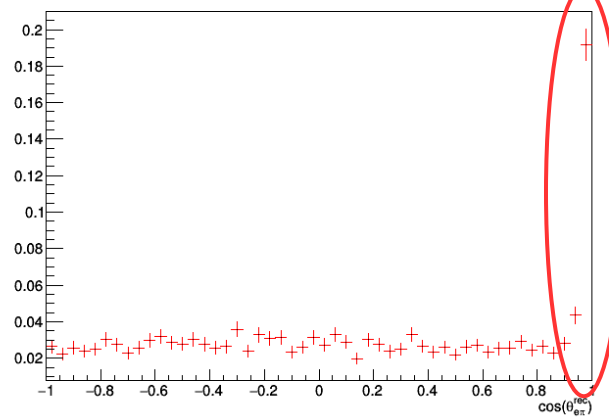


1de

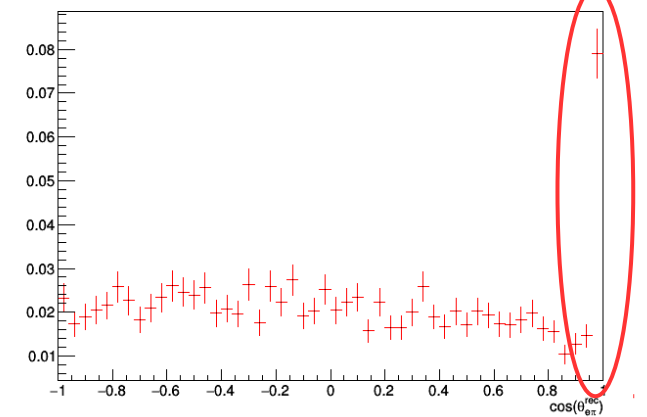
Sig $\cos(\theta_{e\pi}^{\text{rec}})$ FCFV events



Sig $\cos(\theta_{e\pi}^{\text{rec}})$ before BDT

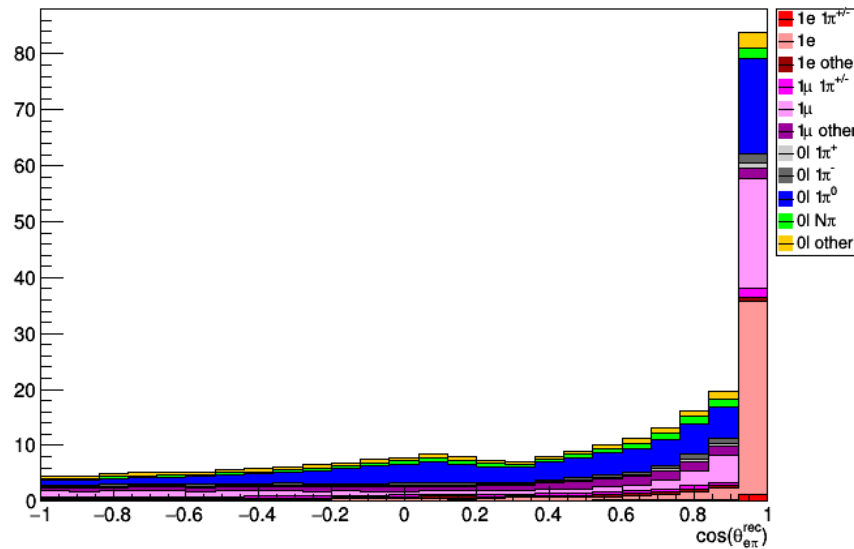


Sig $\cos(\theta_{e\pi}^{\text{rec}})$ after BDT

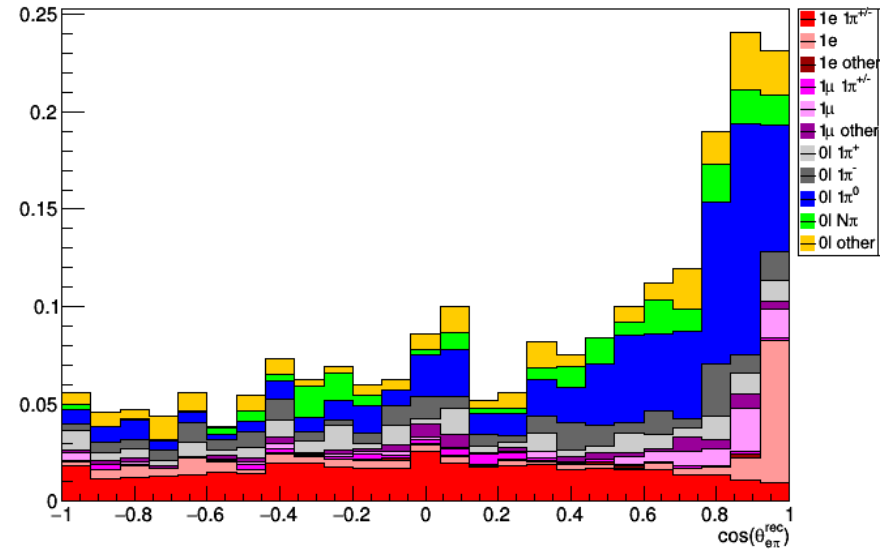


Stacked $\cos(\theta_{e\pi}^{\text{rec}})$ (0de)

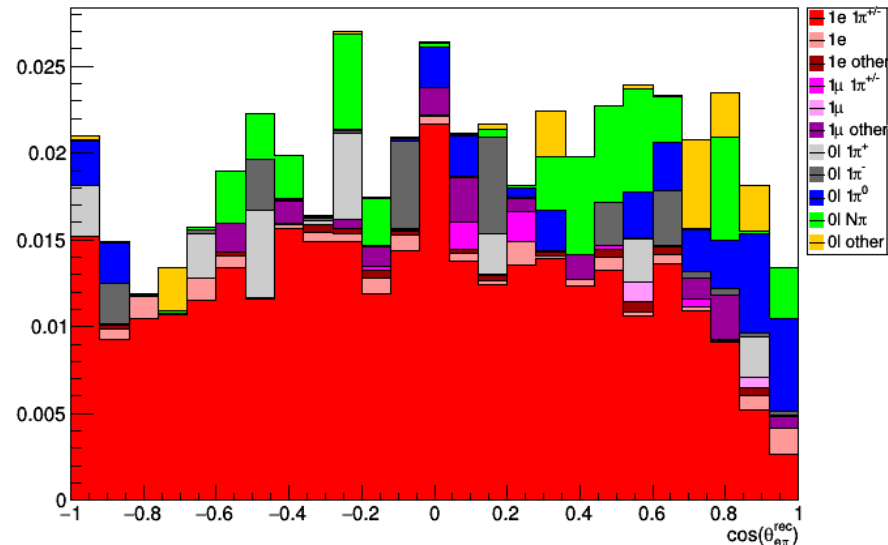
$\cos(\theta_{e\pi}^{\text{rec}})$ by Final State Particles (FCFV events)



$\cos(\theta_{e\pi}^{\text{rec}})$ by Final State Particles (before BDT)

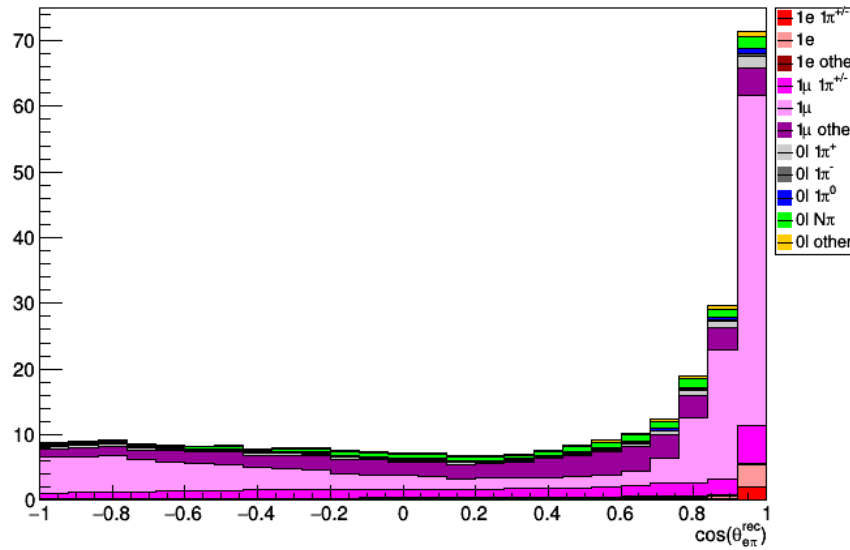


$\cos(\theta_{e\pi}^{\text{rec}})$ by Final State Particles (after BDT)

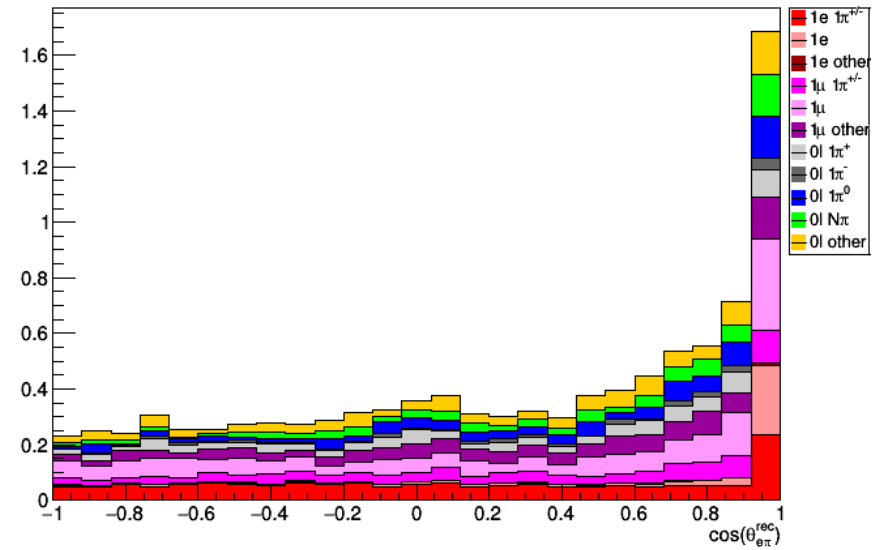


Stacked $\cos(\theta_{e\pi}^{\text{rec}})$ (1de)

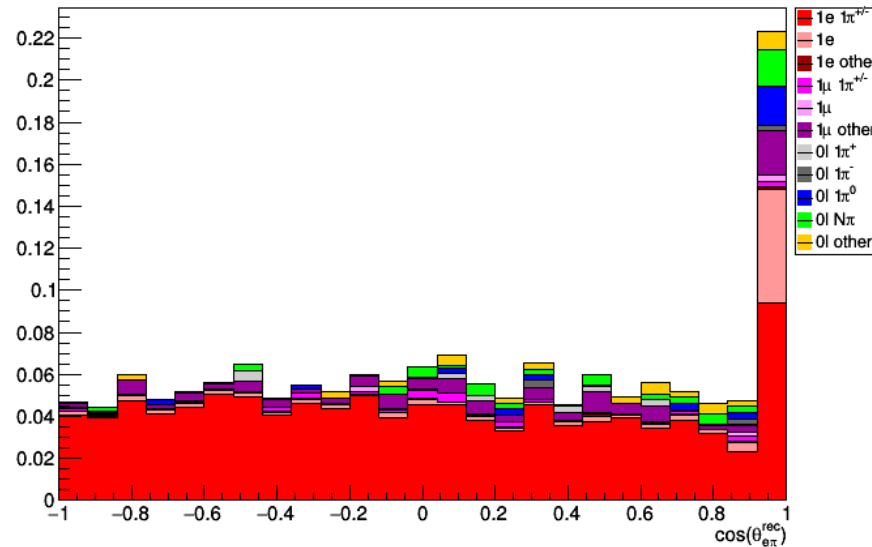
$\cos(\theta_{e\pi}^{\text{rec}})$ by Final State Particles (FCFV events)



$\cos(\theta_{e\pi}^{\text{rec}})$ by Final State Particles (before BDT)



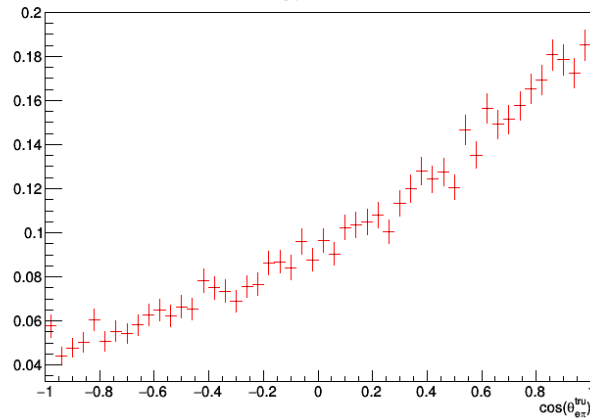
$\cos(\theta_{e\pi}^{\text{rec}})$ by Final State Particles (after BDT)



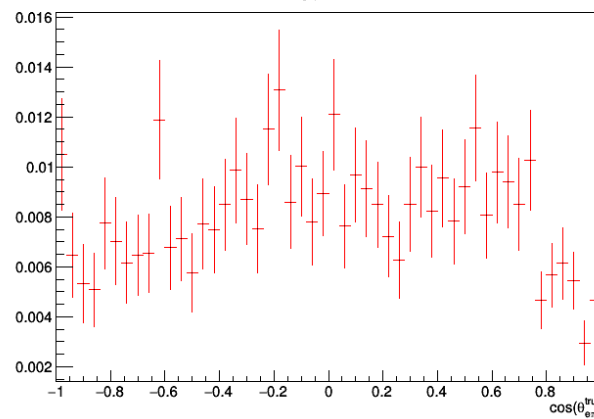
Signal $\cos(\theta_{e\pi}^{\text{tru}})$

0de

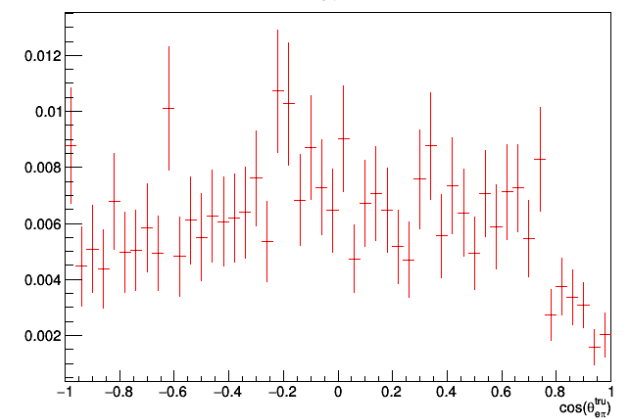
Sig $\cos(\theta_{e\pi}^{\text{tru}})$ FCFV events



Sig $\cos(\theta_{e\pi}^{\text{tru}})$ before BDT

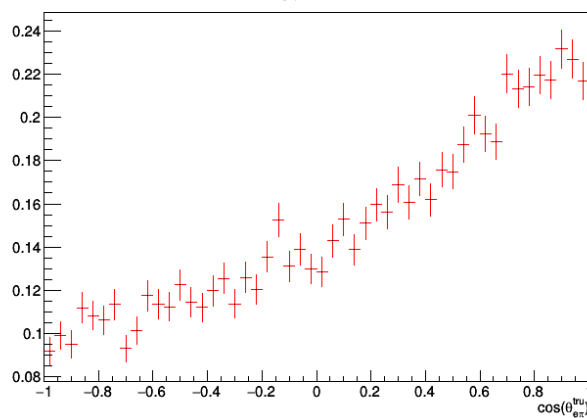


Sig $\cos(\theta_{e\pi}^{\text{tru}})$ after BDT

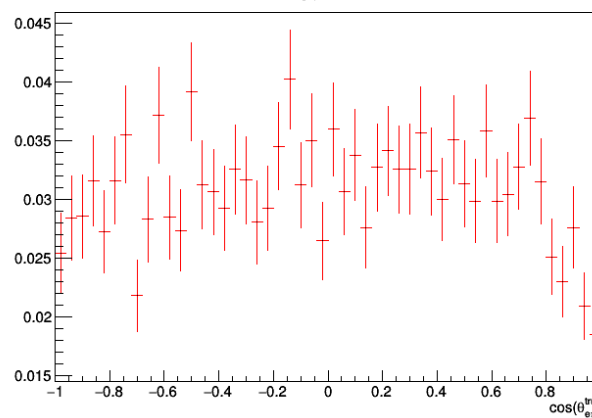


1de

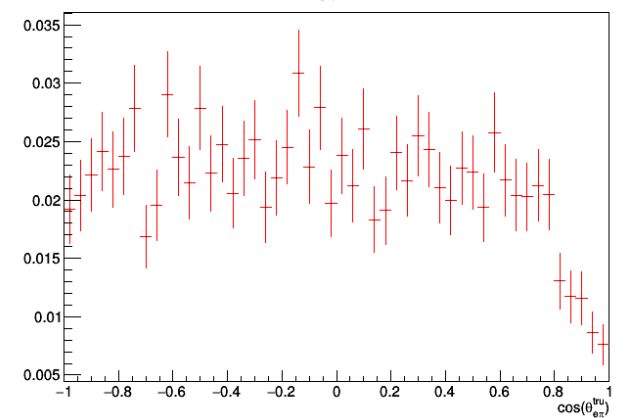
Sig $\cos(\theta_{e\pi}^{\text{tru}})$ FCFV events



Sig $\cos(\theta_{e\pi}^{\text{tru}})$ before BDT



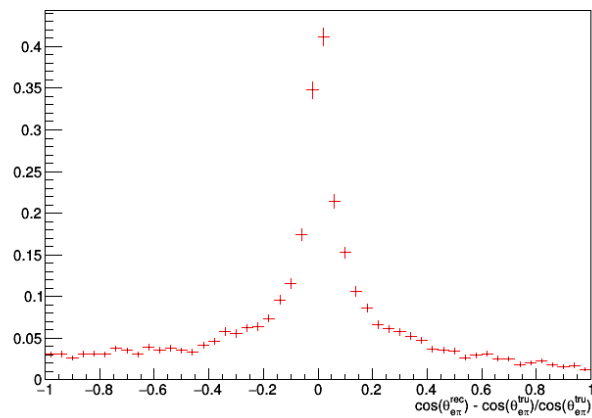
Sig $\cos(\theta_{e\pi}^{\text{tru}})$ after BDT



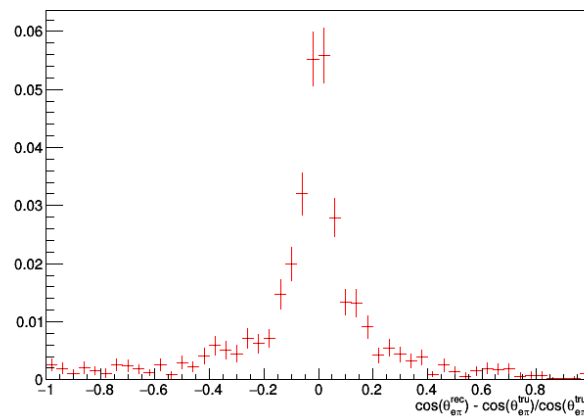
Signal $\cos(\theta_{e\pi})^{\text{res}}$

0de

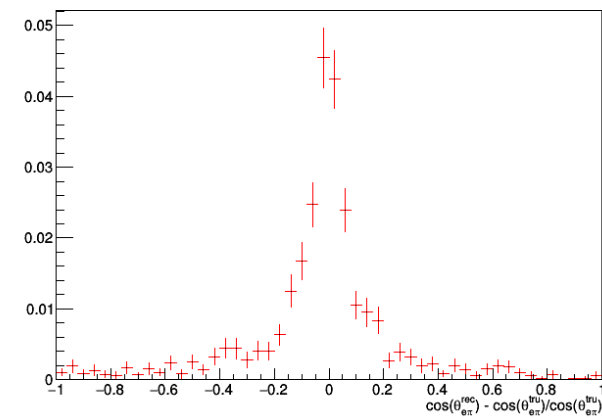
Sig $\cos(\theta_{e\pi})^{\text{res}}$ FCFV events



Sig $\cos(\theta_{e\pi})^{\text{res}}$ before BDT

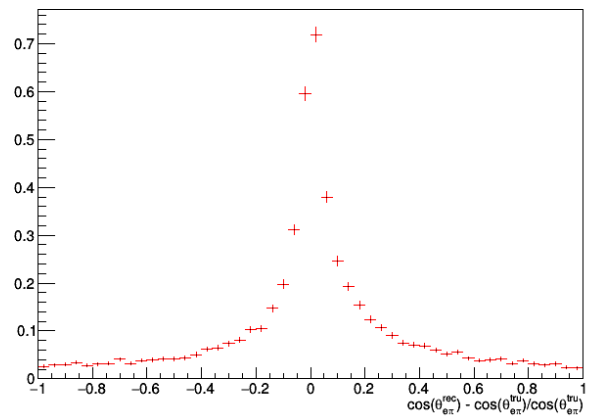


Sig $\cos(\theta_{e\pi})^{\text{res}}$ after BDT

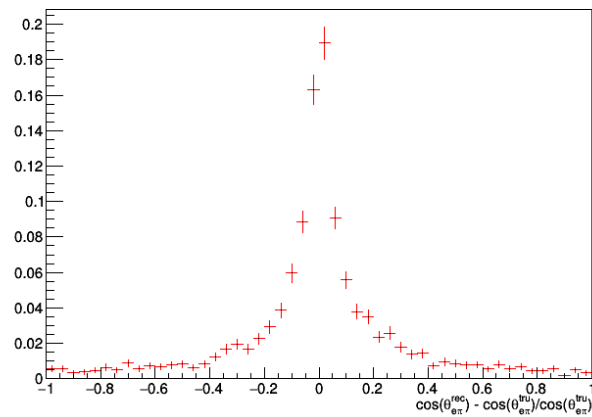


1de

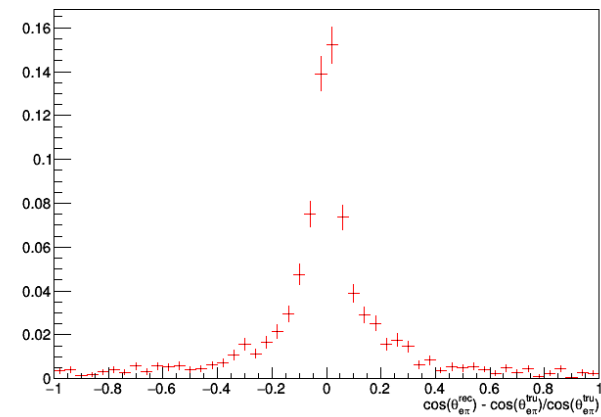
Sig $\cos(\theta_{e\pi})^{\text{res}}$ FCFV events



Sig $\cos(\theta_{e\pi})^{\text{res}}$ before BDT



Sig $\cos(\theta_{e\pi})^{\text{res}}$ after BDT



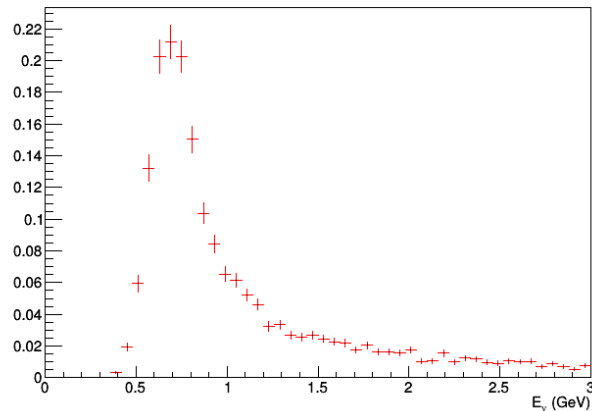
A closer look at $\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$

- For $\cos() > 0.95$, plot the signal:
 - E_{ν} , E_{res}
 - p_e^{tru} , p_e^{res}
 - p_{π}^{tru} , p_{π}^{res}
 - $\cos(\theta_{e\pi})^{\text{res}}$
- Only 1de plots are shown (0de plots are available)

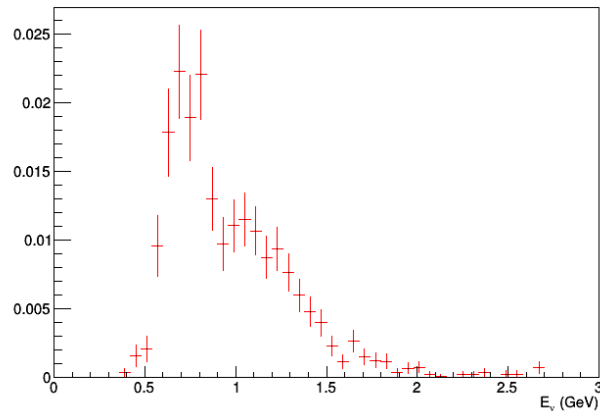
Signal E_ν (1de)

$$\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$$

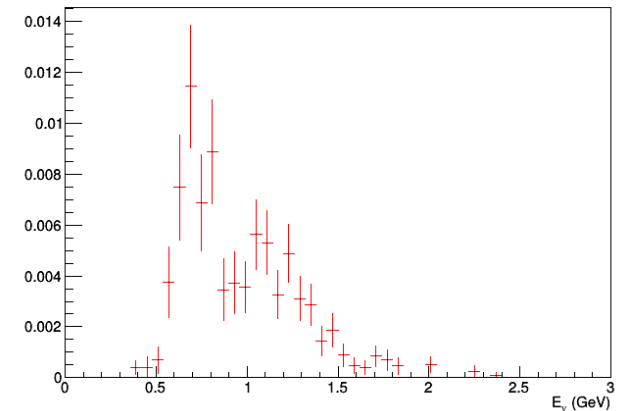
Sig E_ν ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) FCFV events



Sig E_ν ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) before BDT

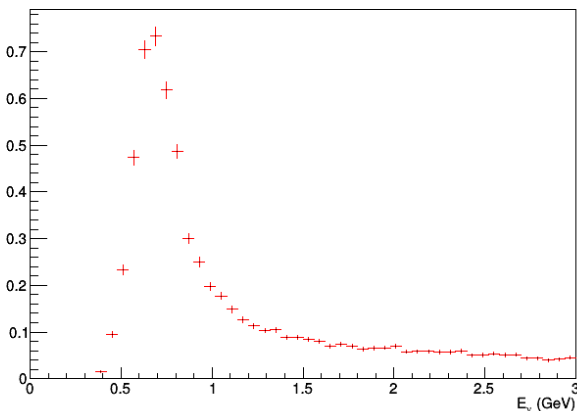


Sig E_ν ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) after BDT

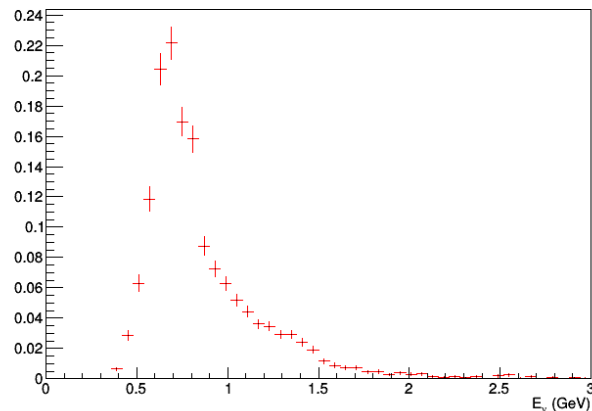


all events

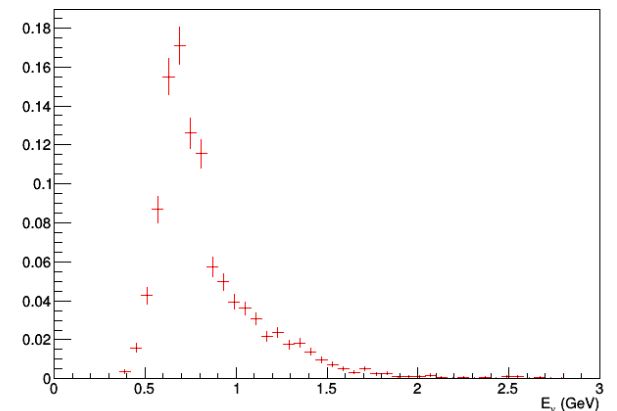
Sig E_ν FCFV events



Sig E_ν before BDT

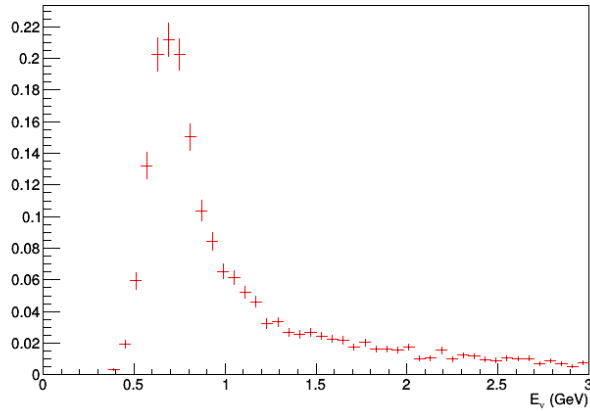


Sig E_ν after BDT

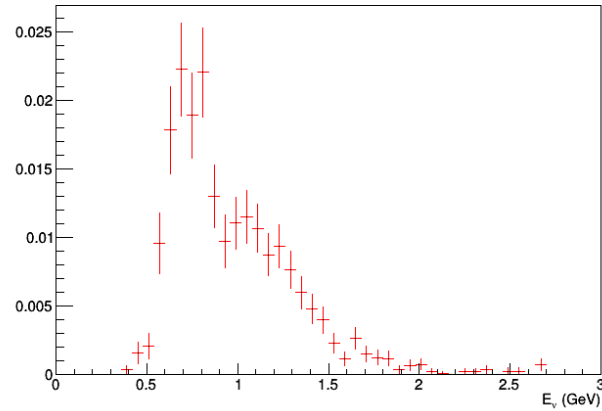


Signal E_ν , E_{res} (1de)

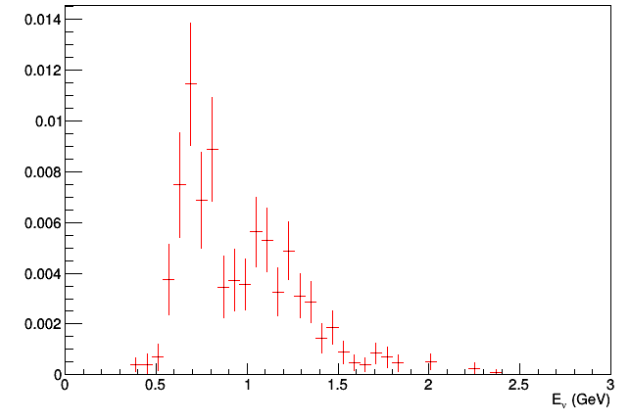
Sig E_ν ($\cos(\theta_{\pi^{\text{rec}}}) > 0.95$) FCFV events



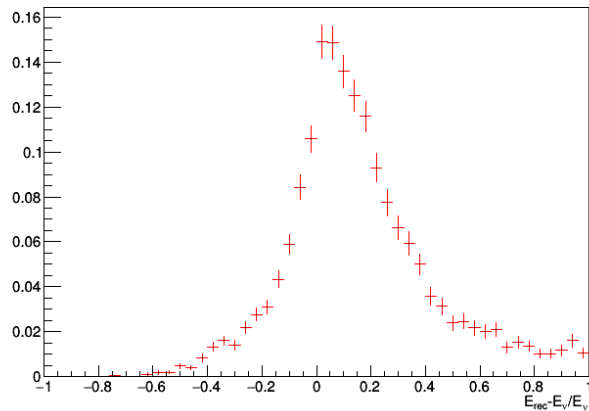
Sig E_ν ($\cos(\theta_{\pi^{\text{rec}}}) > 0.95$) before BDT



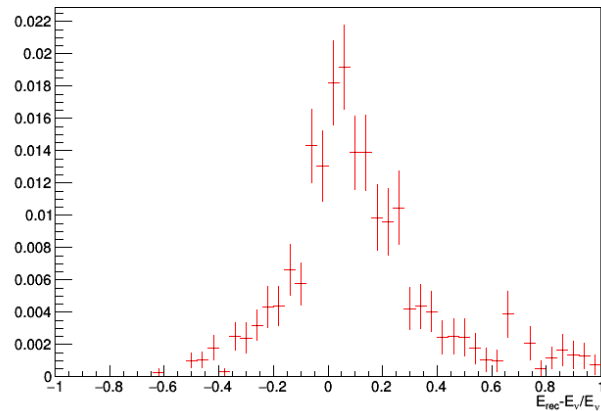
Sig E_ν ($\cos(\theta_{\pi^{\text{rec}}}) > 0.95$) after BDT



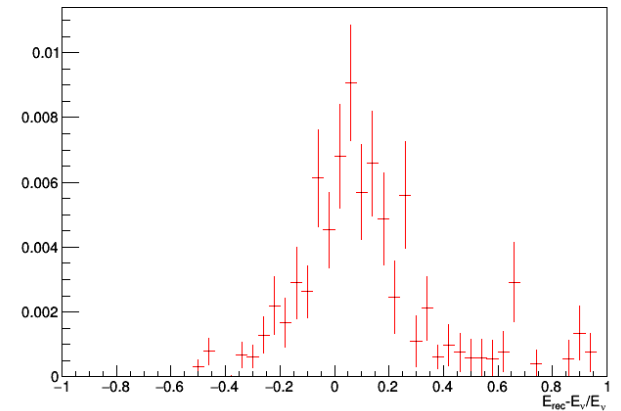
Sig E_{res} ($\cos(\theta_{\pi^{\text{rec}}}) > 0.95$) FCFV events



Sig E_{res} ($\cos(\theta_{\pi^{\text{rec}}}) > 0.95$) before BDT

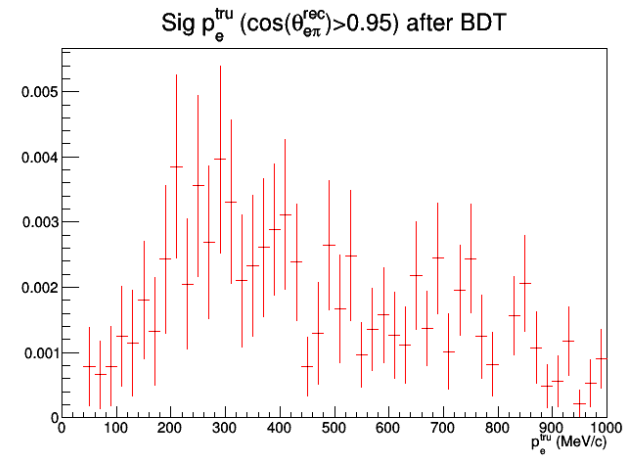
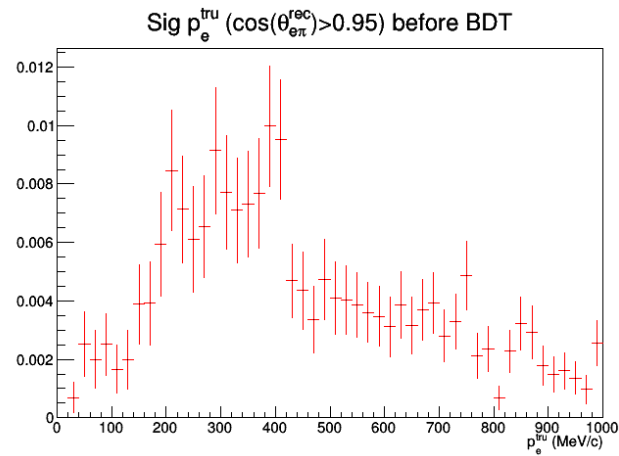
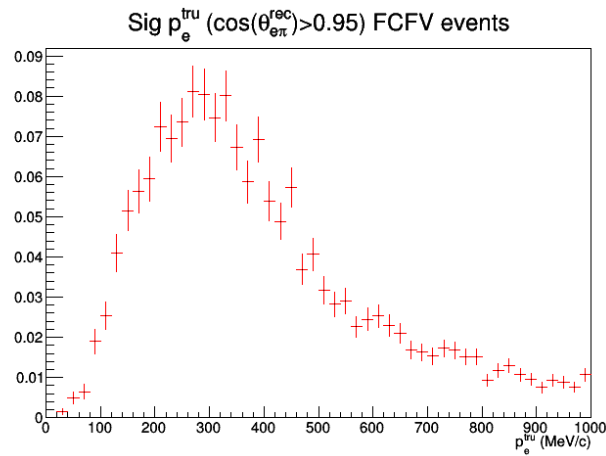


Sig E_{res} ($\cos(\theta_{\pi^{\text{rec}}}) > 0.95$) after BDT

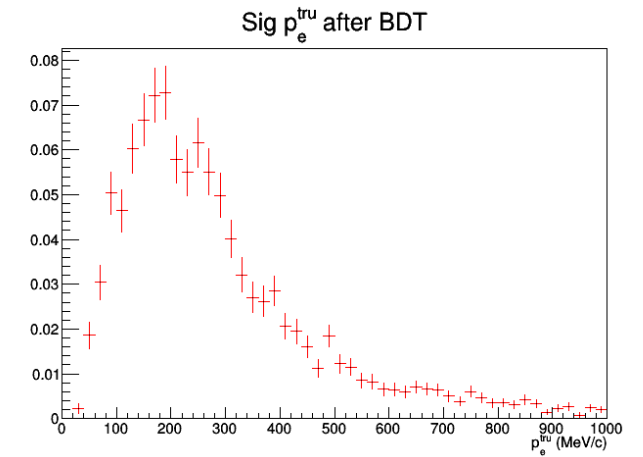
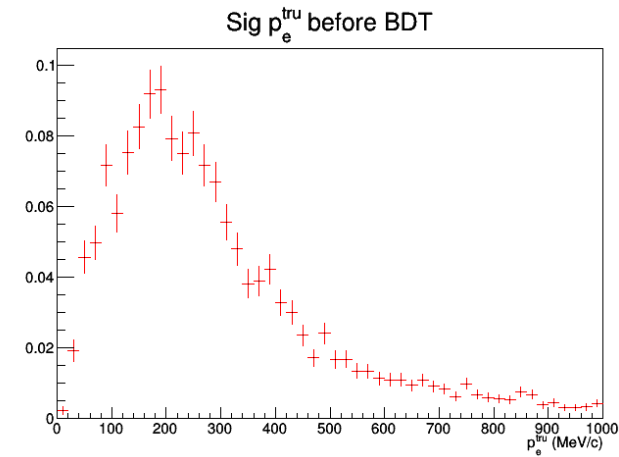
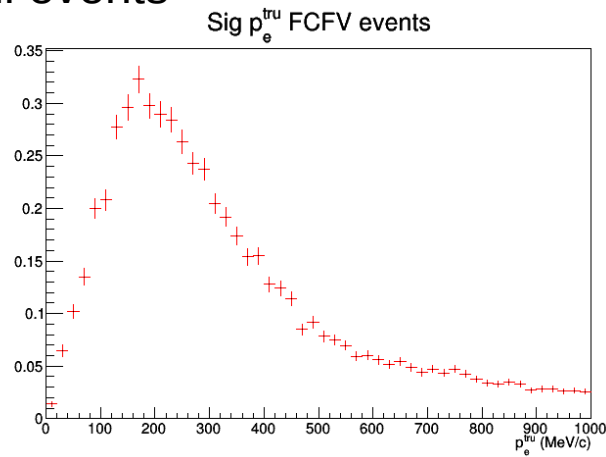


Signal p_e^{tru} (1de)

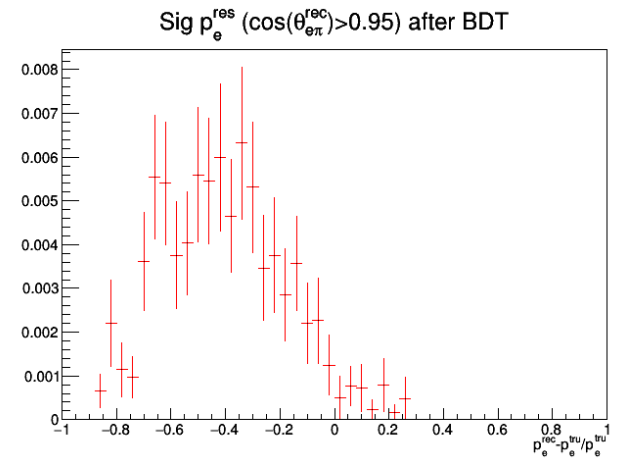
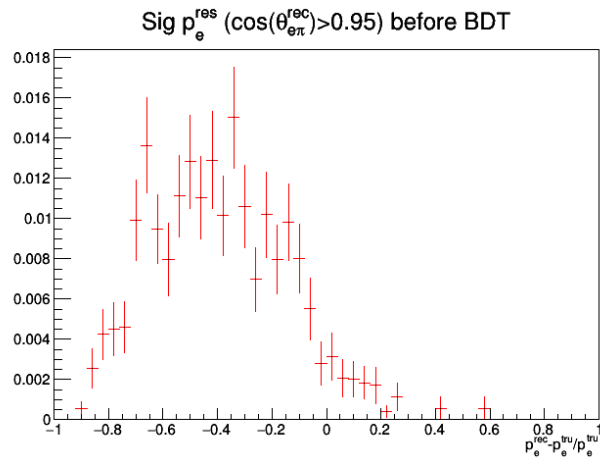
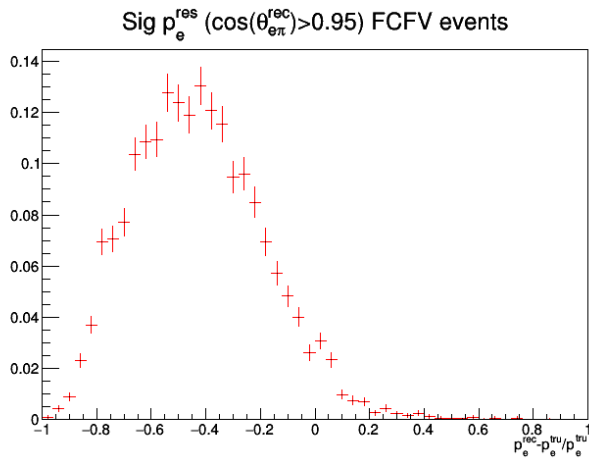
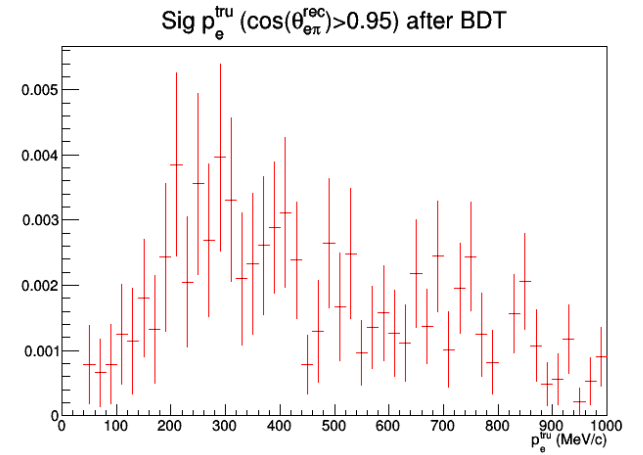
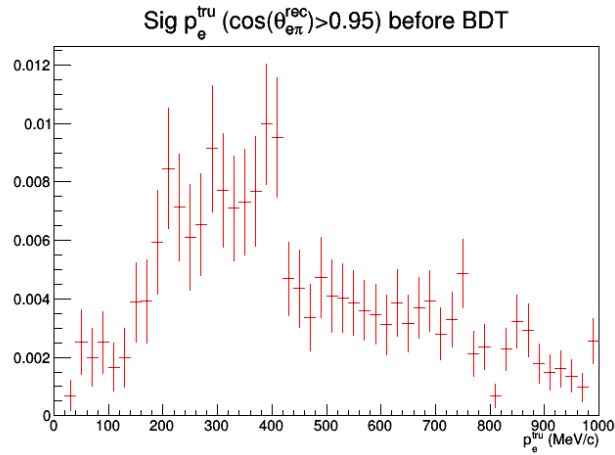
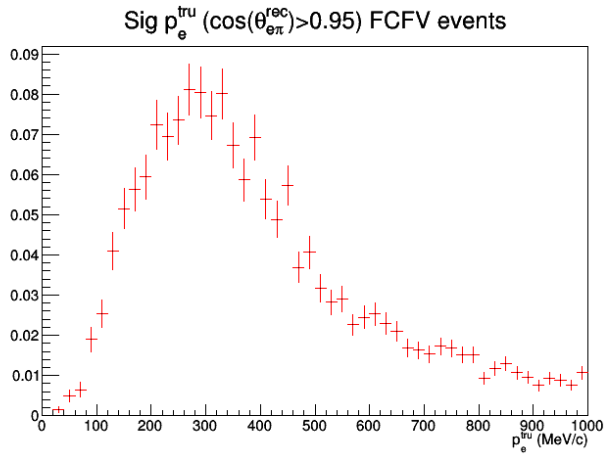
$\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$



all events



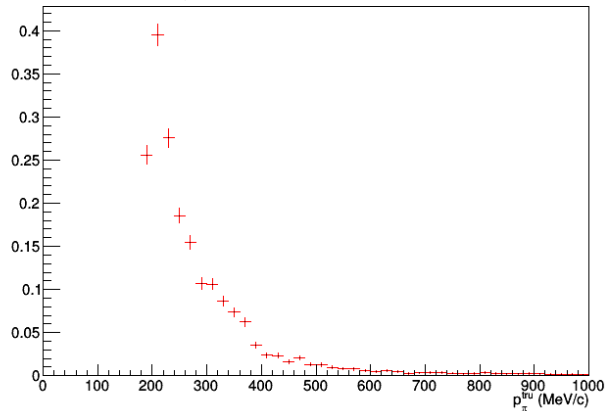
Signal p_e^{tru} , p_e^{res} (1de)



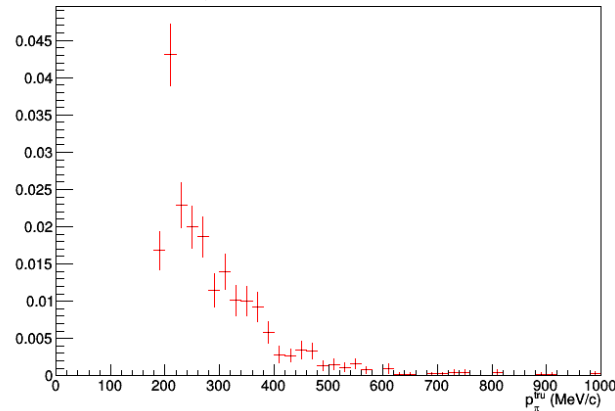
Signal $p_{\pi}^{\text{tru}}(1\text{de})$

$\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$

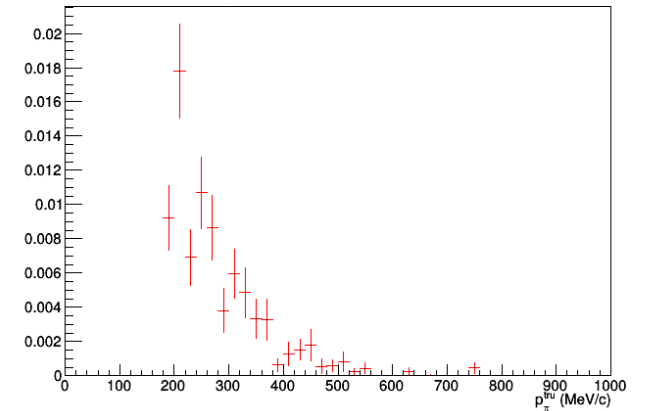
Sig $p_{\pi}^{\text{tru}}(\cos(\theta_{e\pi}^{\text{rec}}) > 0.95)$ FCFV events



Sig $p_{\pi}^{\text{tru}}(\cos(\theta_{e\pi}^{\text{rec}}) > 0.95)$ before BDT

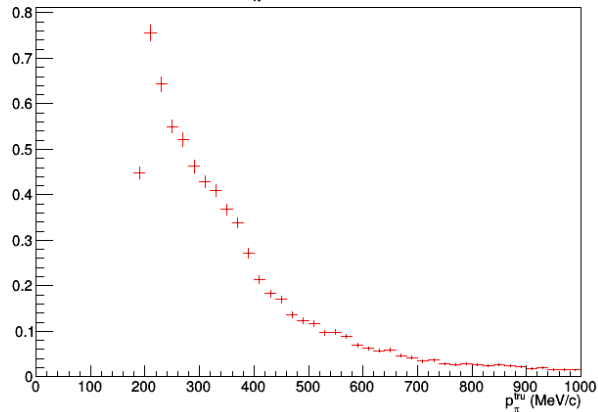


Sig $p_{\pi}^{\text{tru}}(\cos(\theta_{e\pi}^{\text{rec}}) > 0.95)$ after BDT

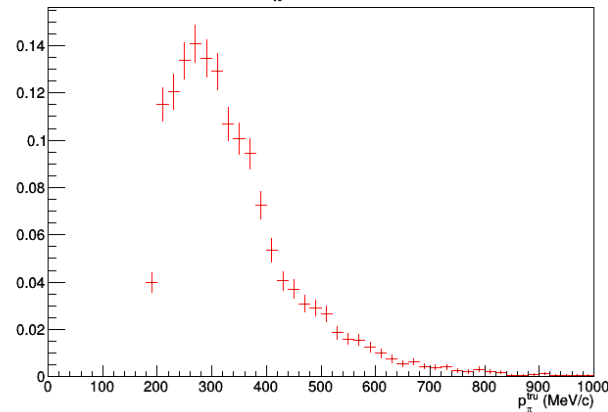


all events

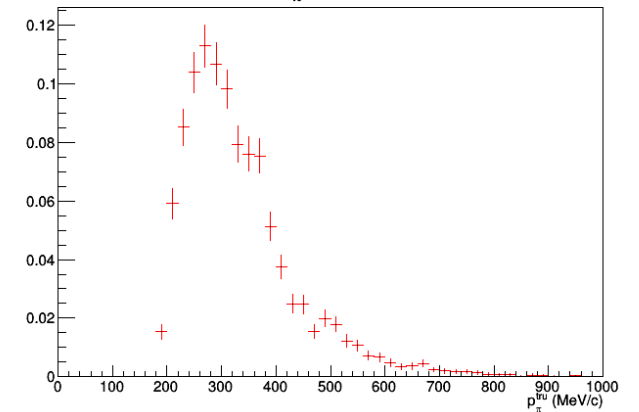
Sig p_{π}^{tru} FCFV events



Sig p_{π}^{tru} before BDT

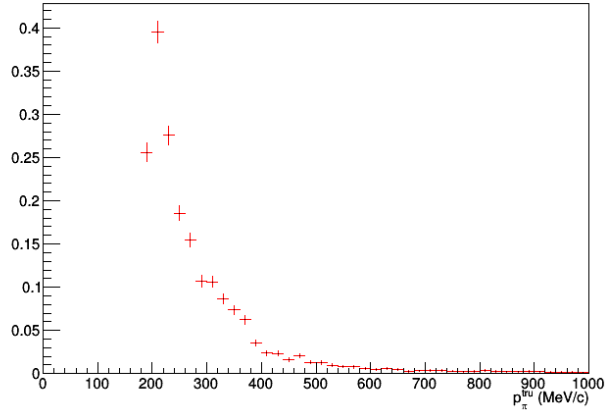


Sig p_{π}^{tru} after BDT

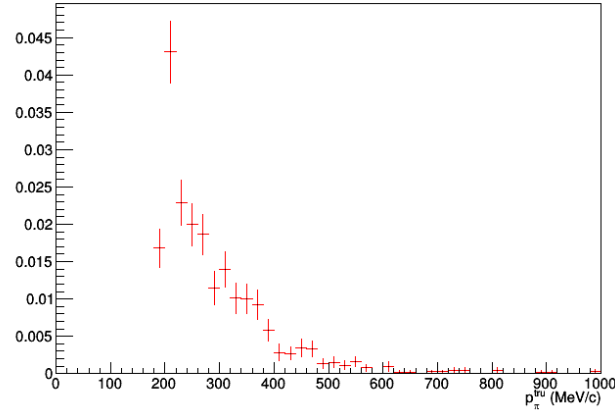


Signal p_{π}^{tru} , p_{π}^{res} (1de)

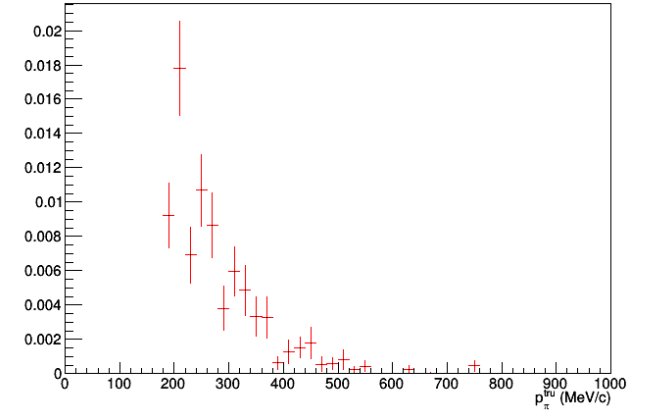
Sig p_{π}^{tru} ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) FCFV events



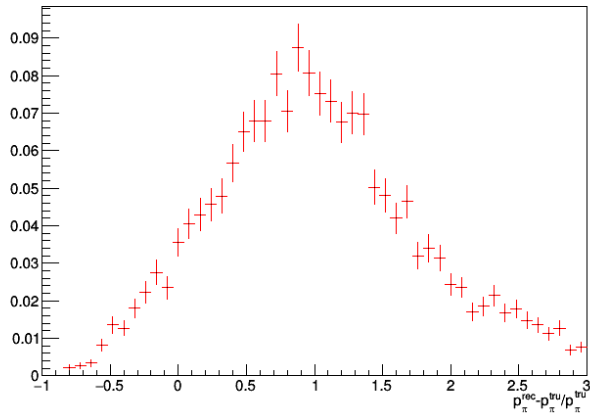
Sig p_{π}^{tru} ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) before BDT



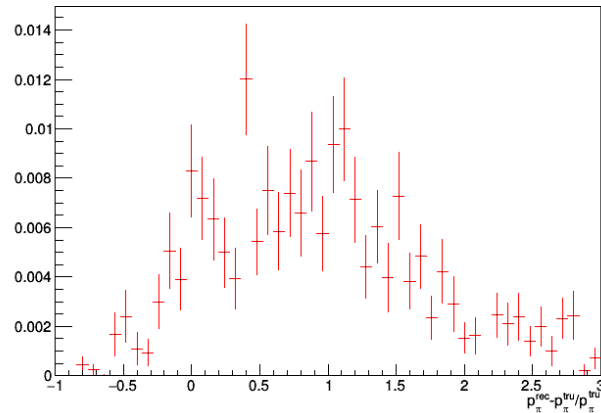
Sig p_{π}^{tru} ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) after BDT



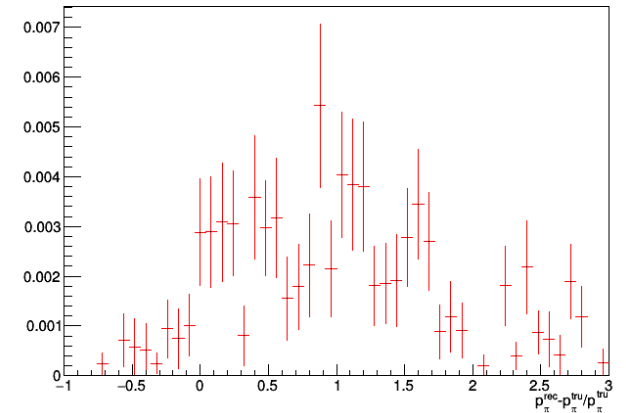
Sig p_{π}^{res} ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) FCFV events



Sig p_{π}^{res} ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) before BDT

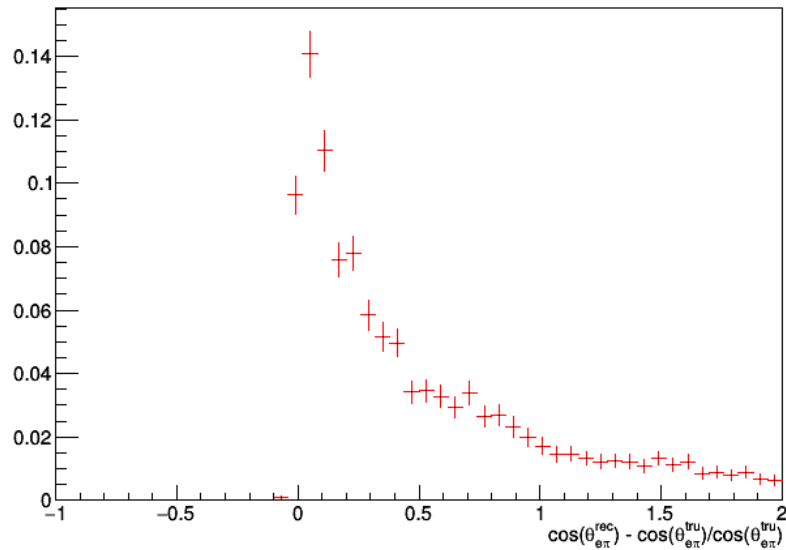


Sig p_{π}^{res} ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) after BDT

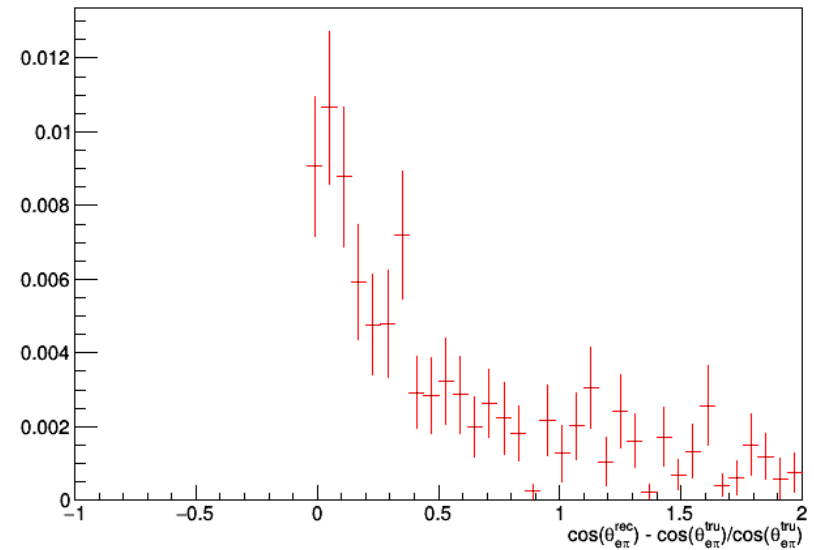


Signal $\cos(\theta_{e\pi})^{\text{res}}$ (1de)

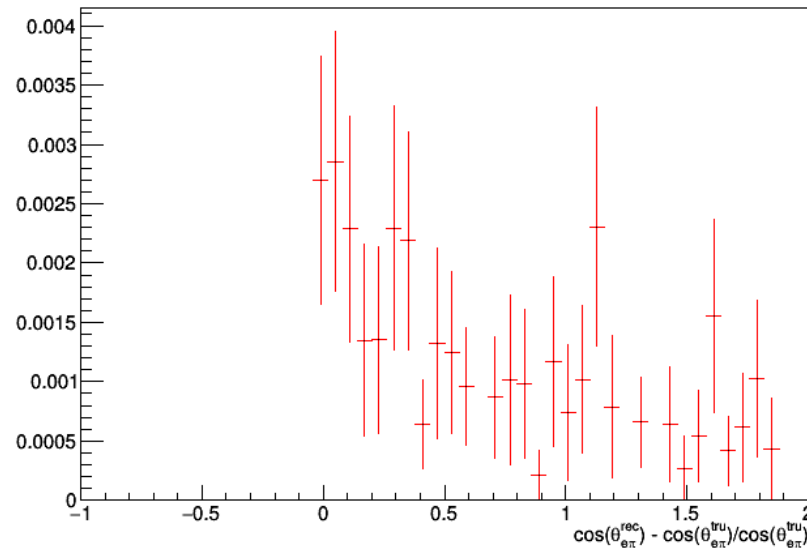
Sig $\cos(\theta_{e\pi})^{\text{res}}$ ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) FCFV events



Sig $\cos(\theta_{e\pi})^{\text{res}}$ ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) before BDT



Sig $\cos(\theta_{e\pi})^{\text{res}}$ ($\cos(\theta_{e\pi}^{\text{rec}}) > 0.95$) after BDT



Other Generators

- Trying to install NUWRO and GENIE
 - NUWRO
 - requires ROOT to be built with the PYTHIA6 library
 - not sure if this can be done on NEUT cluster – may have to re-install my own copy of ROOT
 - otherwise, installation and operation seems straightforward
 - GENIE
 - also requires that ROOT be built with PYTHIA6, as well as GSL
 - some more dependencies required – haven't look into it in detail yet