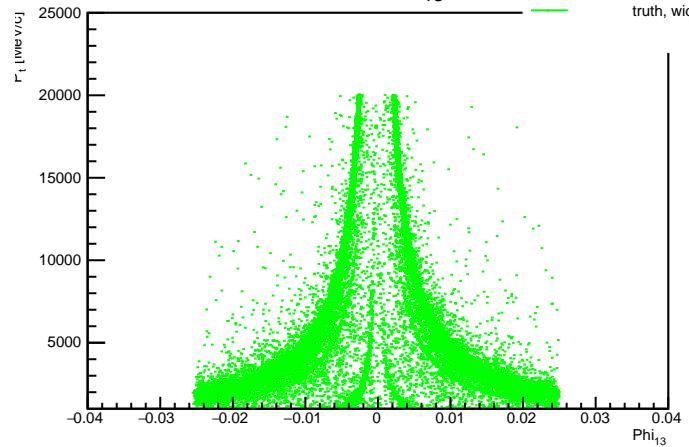
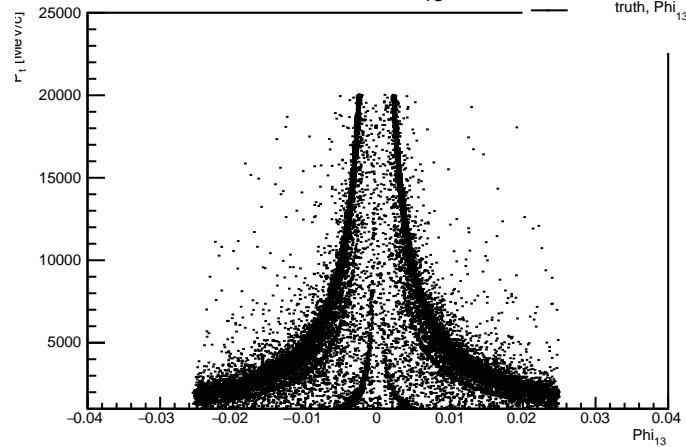
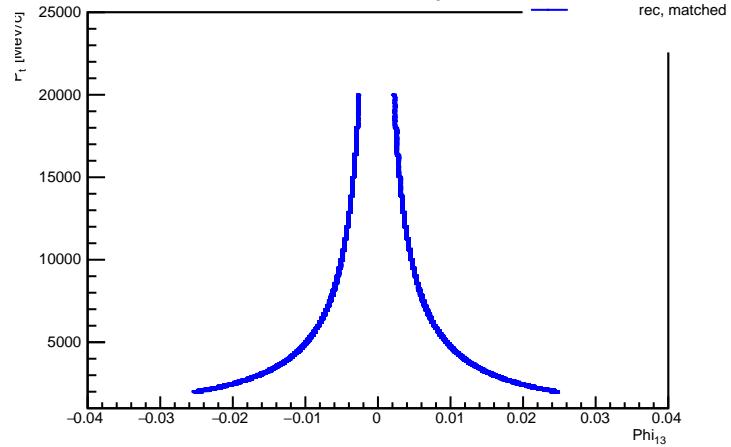


$P_t$  Vs  $\Phi_{13}$ 

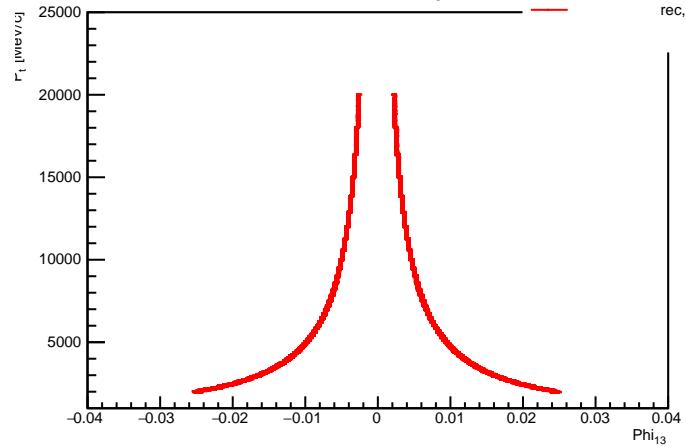
truth, wide cut

 $P_t$  Vs  $\Phi_{13}$ truth,  $\Phi_{13} < 0.02$  $P_t$  Vs  $\Phi_{13}$ 

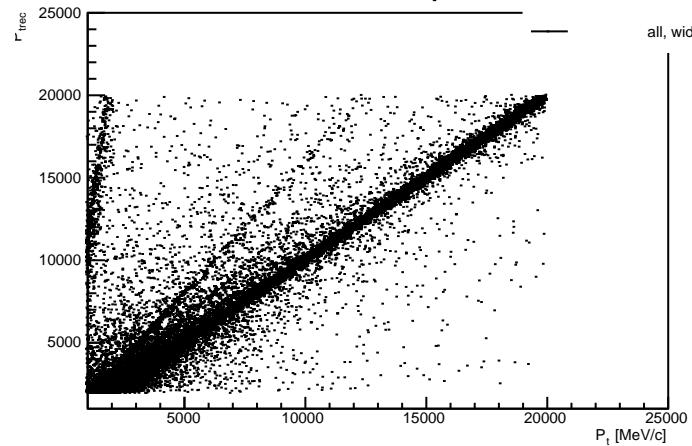
rec, matched

 $P_t$  Vs  $\Phi_{13}$ 

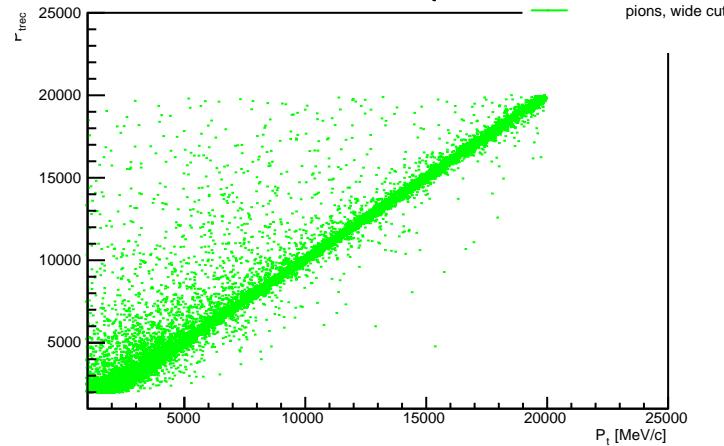
rec, fakes



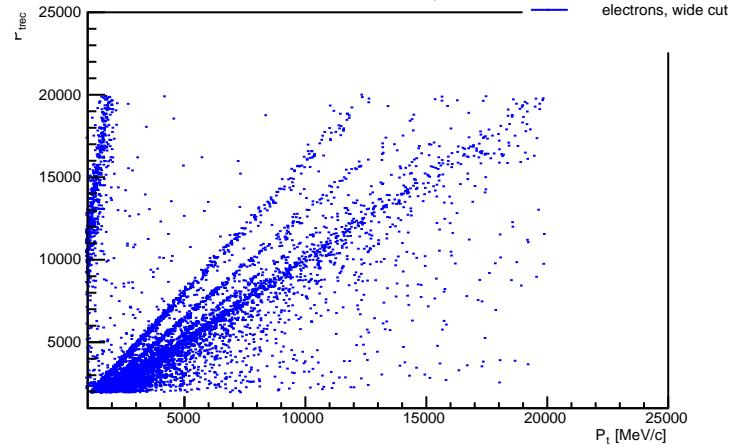
$P_{\text{trec}}$  Vs  $P_t$



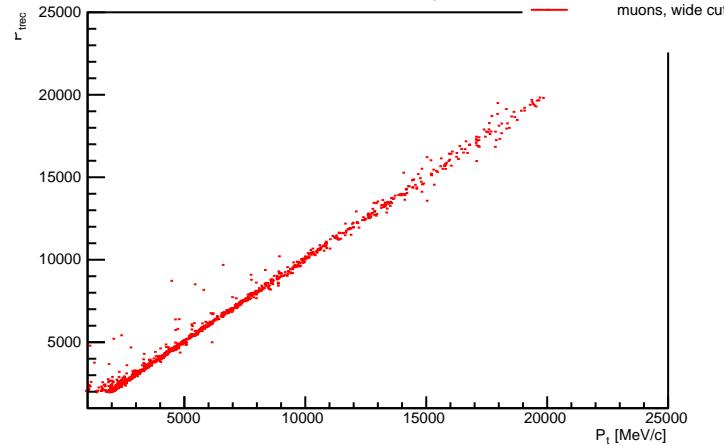
$P_{\text{trec}}$  Vs  $P_t$



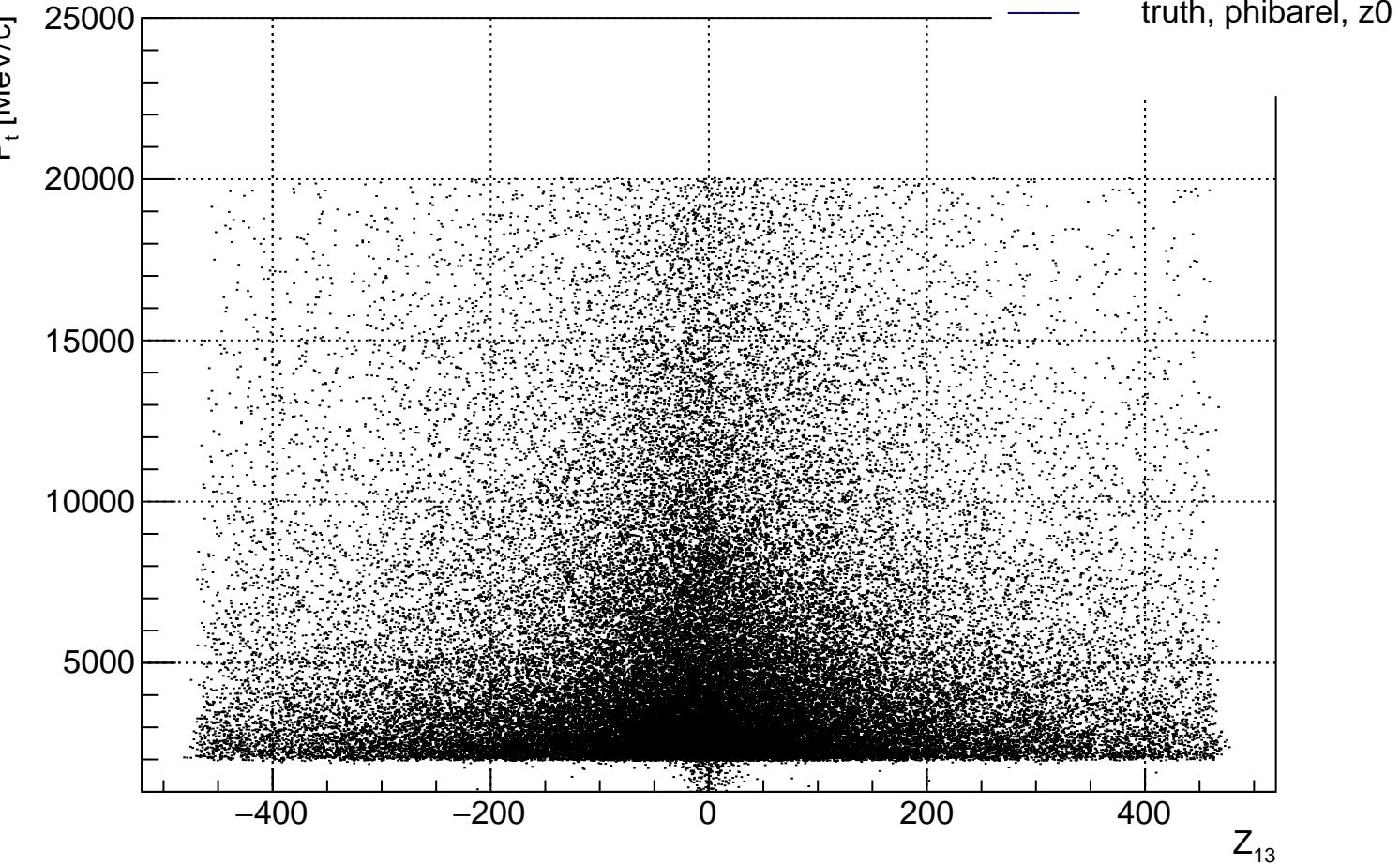
$P_{\text{trec}}$  Vs  $P_t$

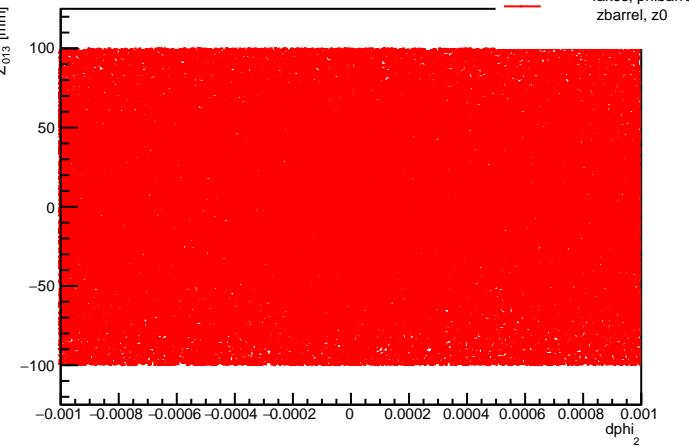
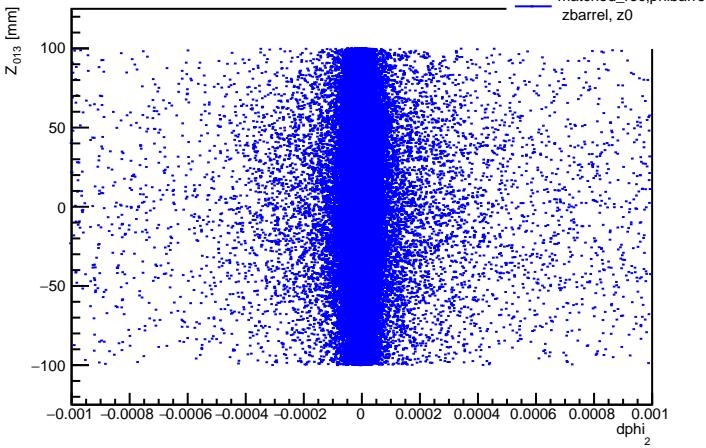
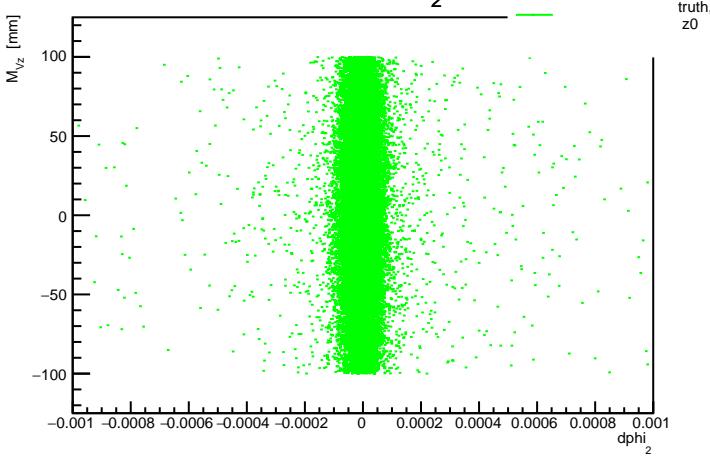
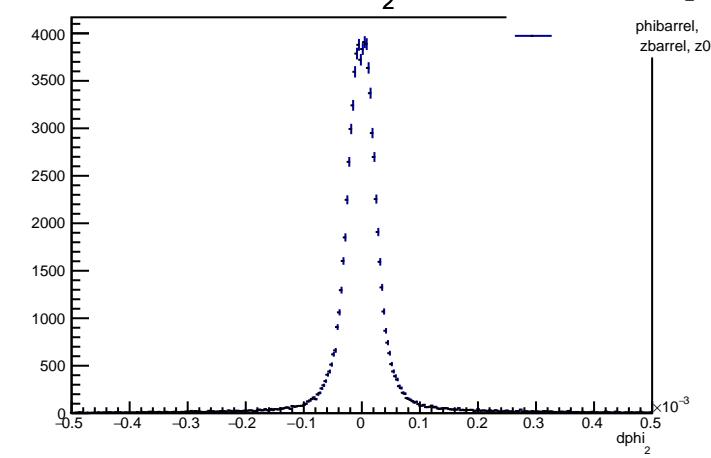


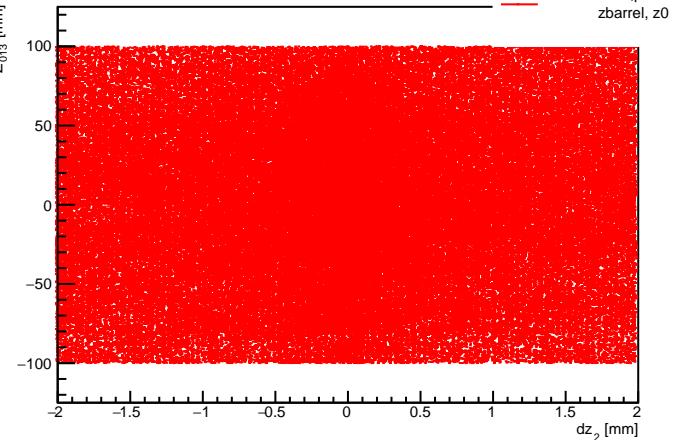
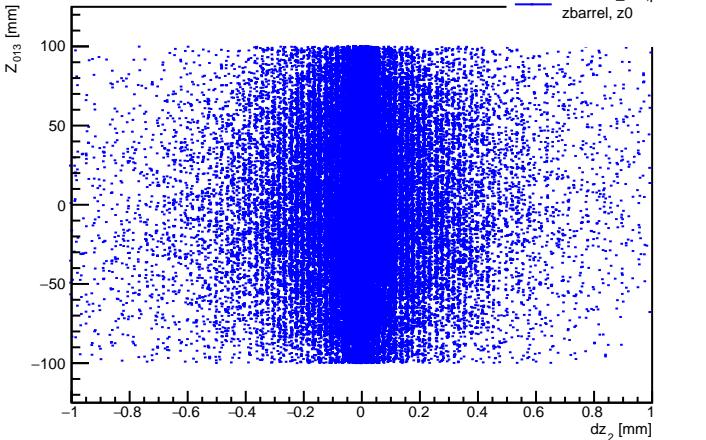
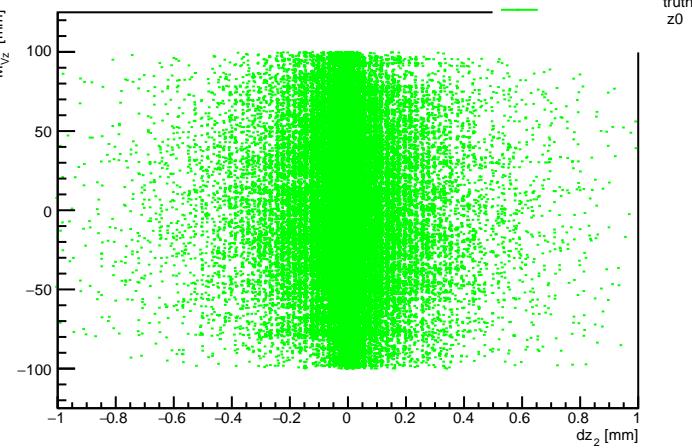
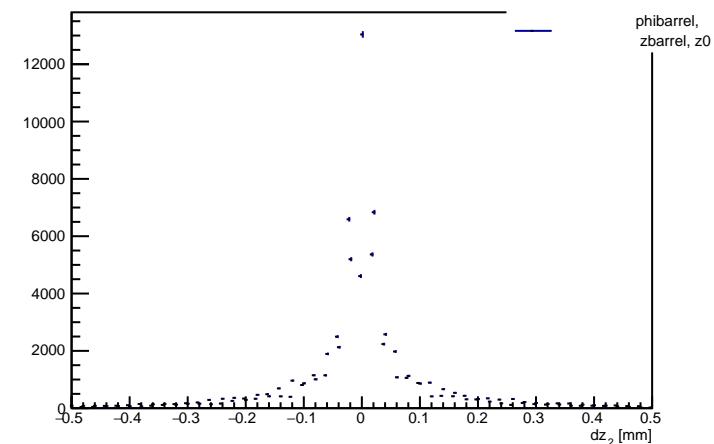
$P_{\text{trec}}$  Vs  $P_t$



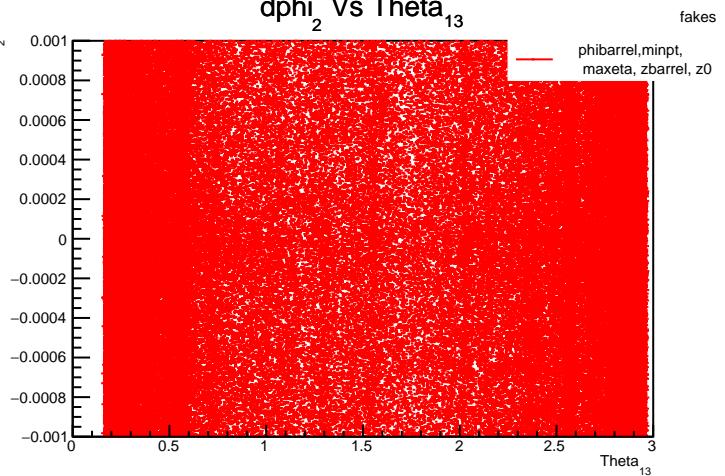
# $P_t$ Vs $Z_{13}$



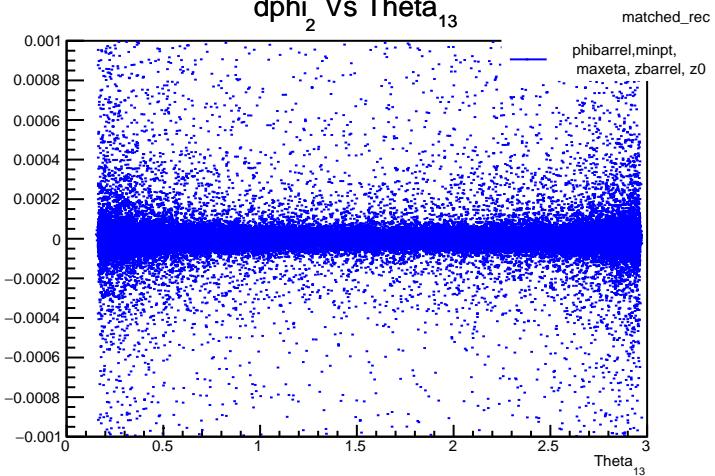
$Z_{013}$  Vs  $d\phi_i$  $Z_{013}$  Vs  $d\phi_i$  $M_{vz}$  Vs  $d\phi_i$  $d\phi_i$ 

$Z_{013}$  Vs  $dz_2$  $Z_{013}$  Vs  $dz_2$  $M_{vz}$  Vs  $dz_2$  $dz_2$ 

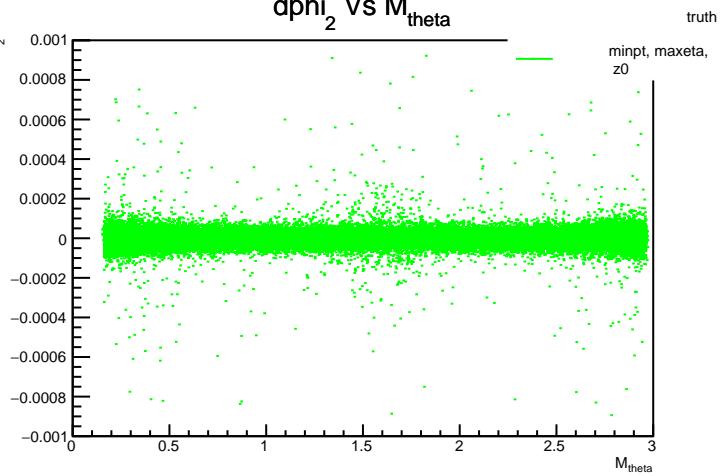
dphi<sub>2</sub> Vs Theta<sub>13</sub>



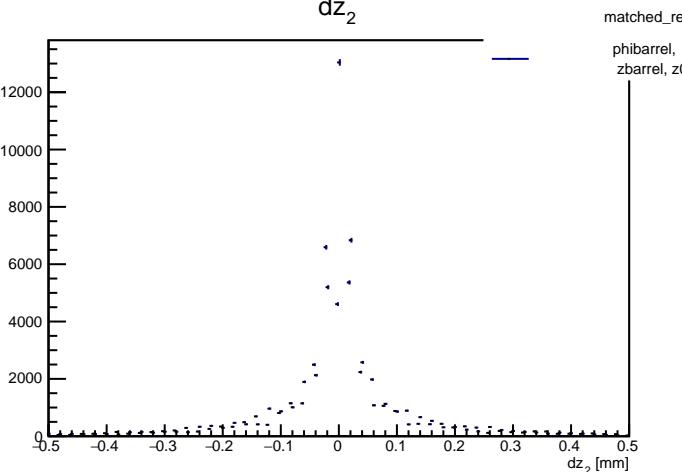
dphi<sub>2</sub> Vs Theta<sub>13</sub>



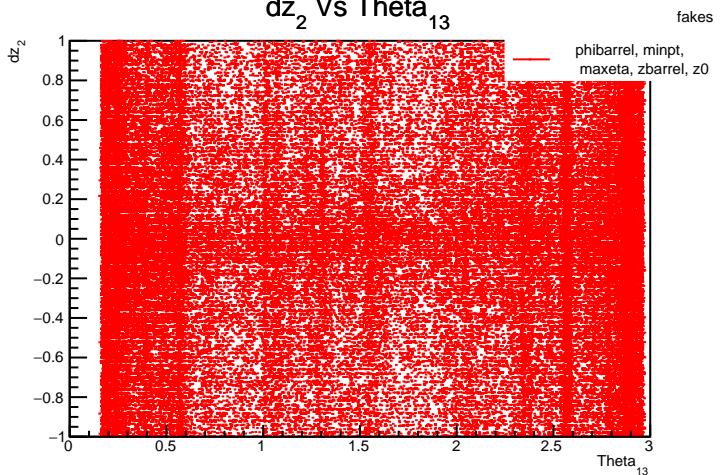
dphi<sub>2</sub> Vs M<sub>theta</sub>



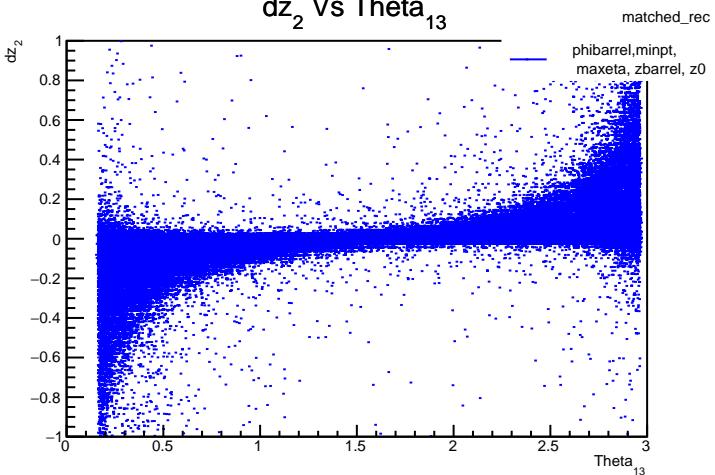
dz<sub>2</sub>



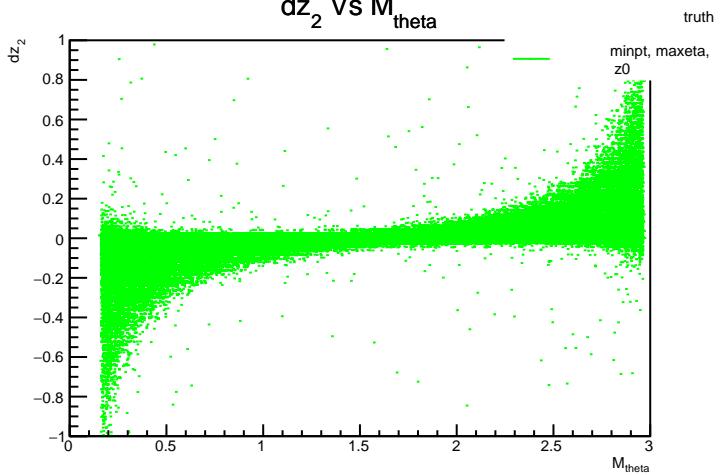
$dz_2$  Vs  $\Theta_{13}$



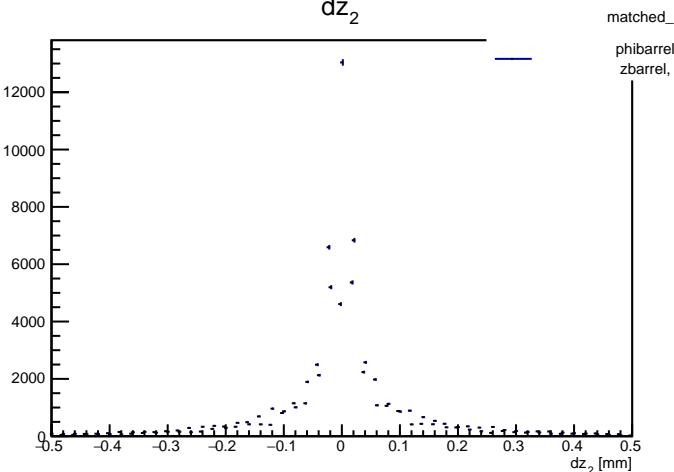
$dz_2$  Vs  $\Theta_{13}$



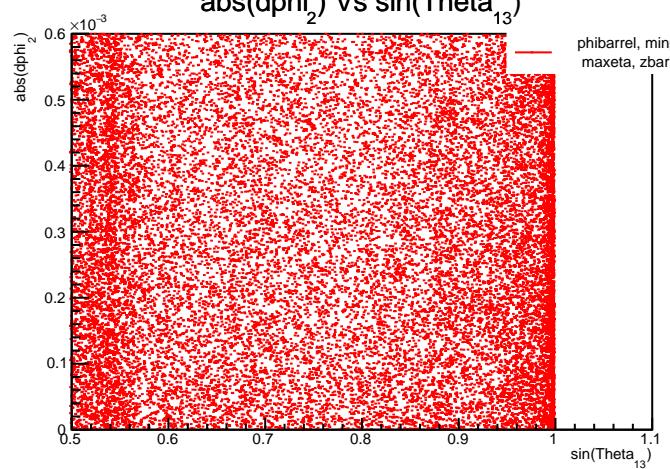
$dz_2$  Vs  $M_{\theta}$



$dz_2$



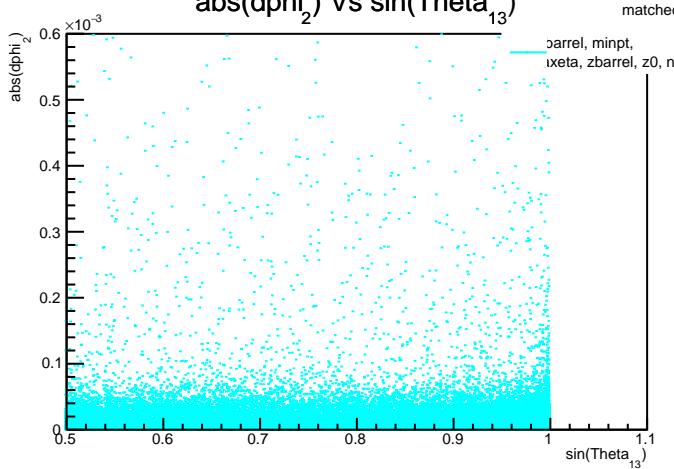
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(\Theta_{13})$



fakes

phibarrel, minpt,  
maxeta, zbarrel, z0

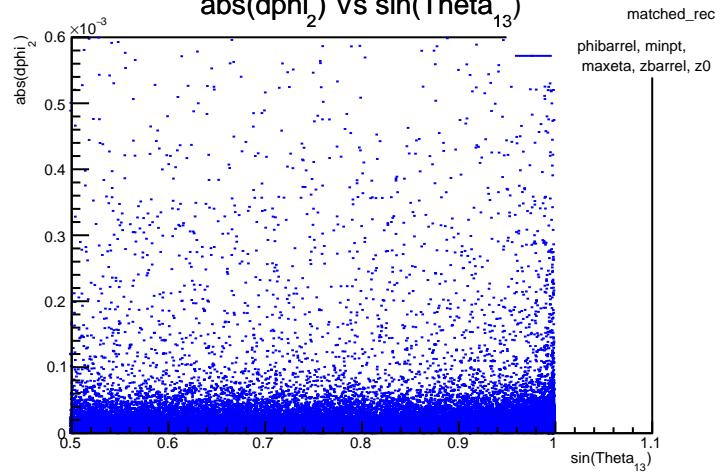
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(\Theta_{13})$



matched\_rec

barrel, minpt,  
ixeta, zbarrel, z0, no e's

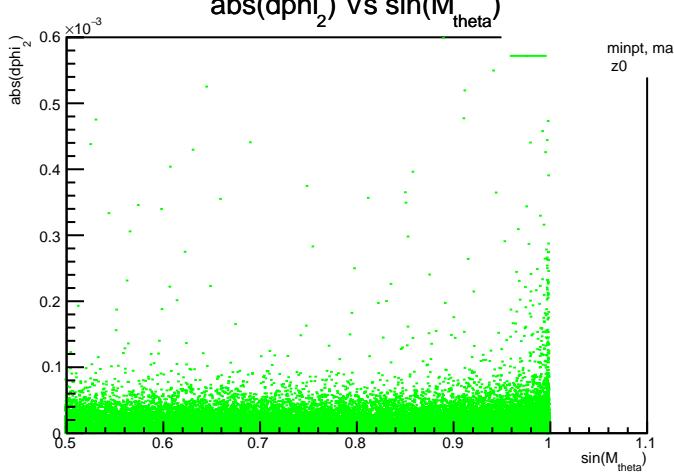
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(\Theta_{13})$



matched\_rec

phibarrel, minpt,  
maxeta, zbarrel, z0

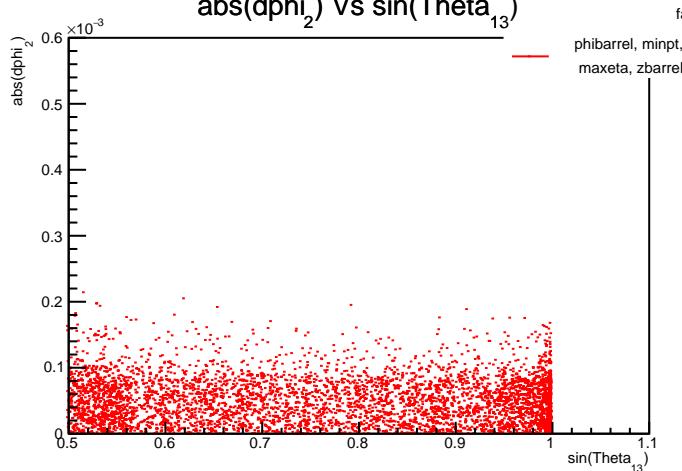
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(M_{\theta})$



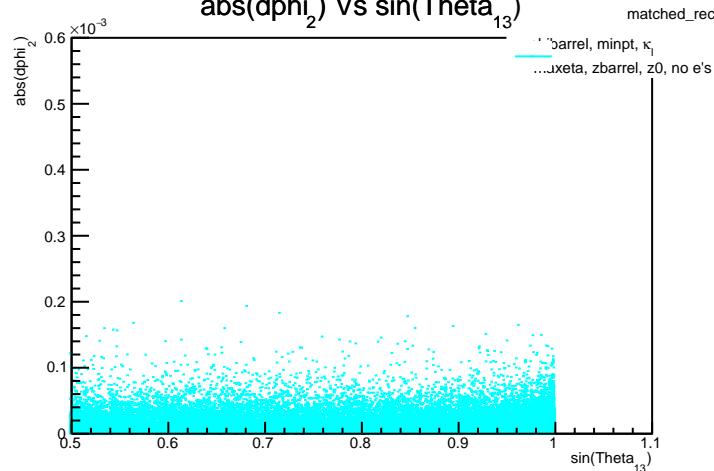
truth

minpt, maxeta,  
z0

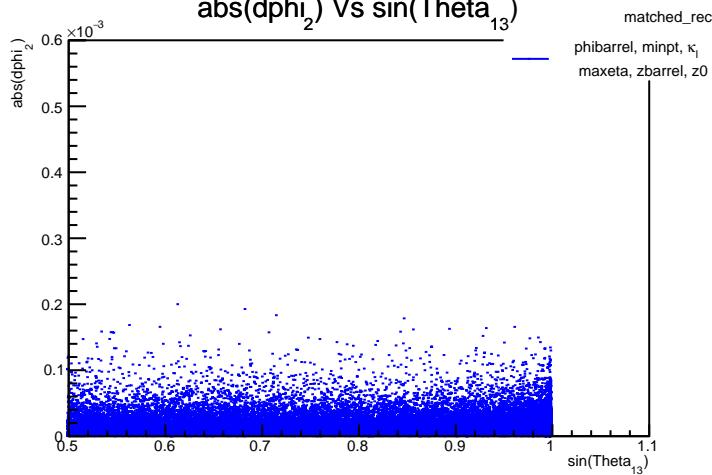
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(\Theta_{13})$



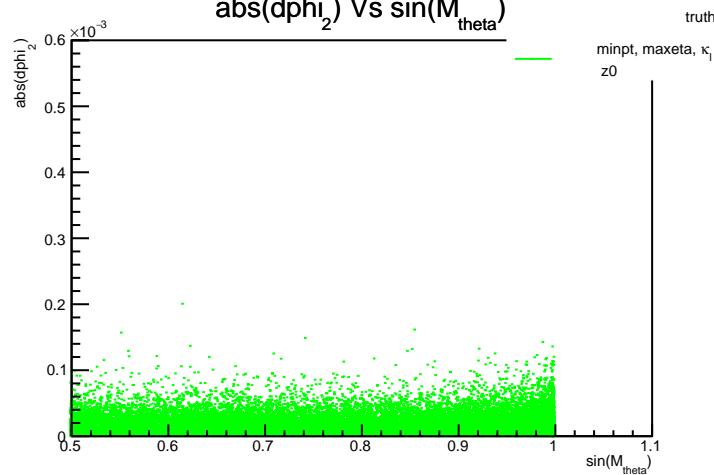
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(\Theta_{13})$

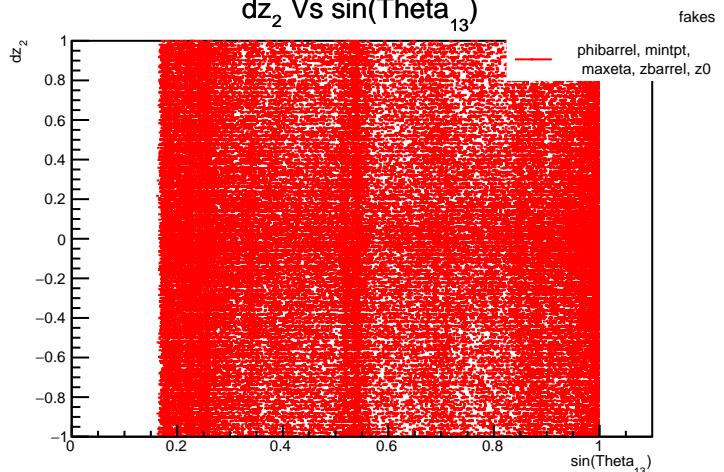
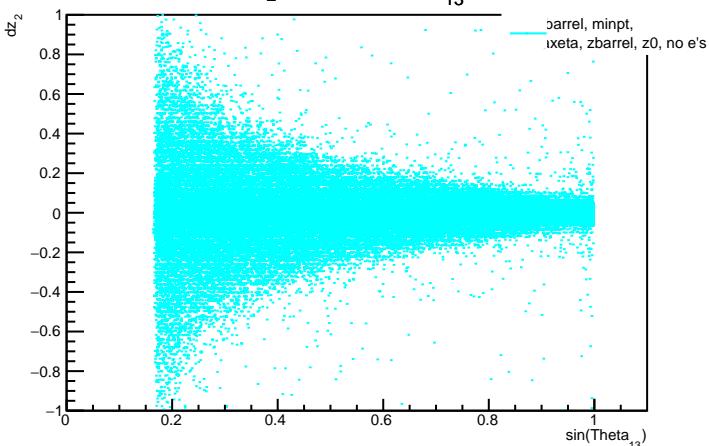
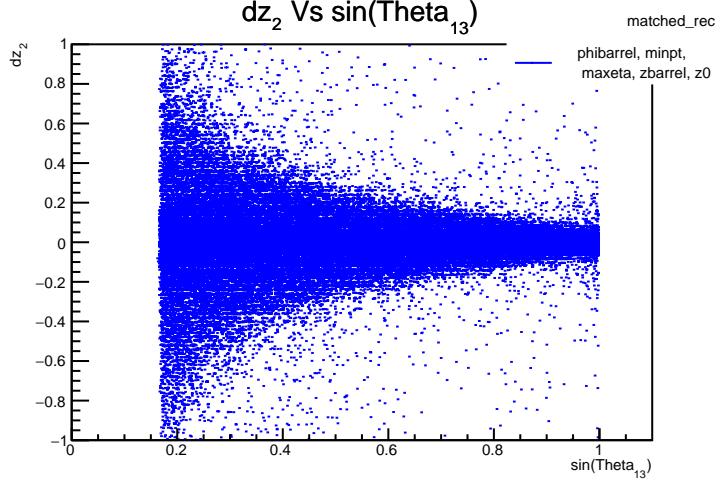
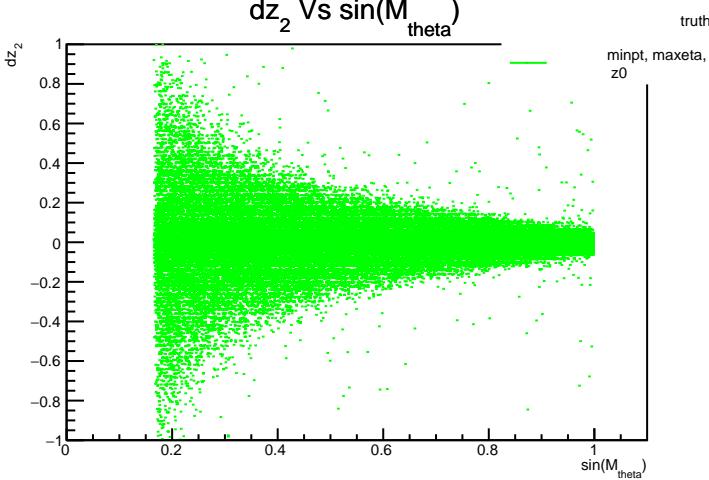


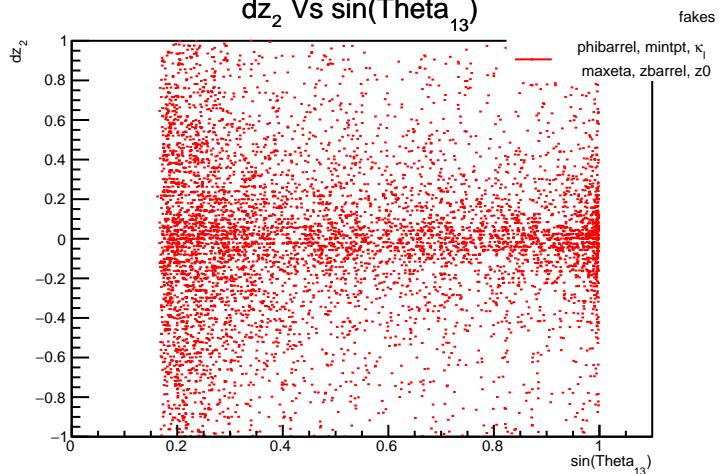
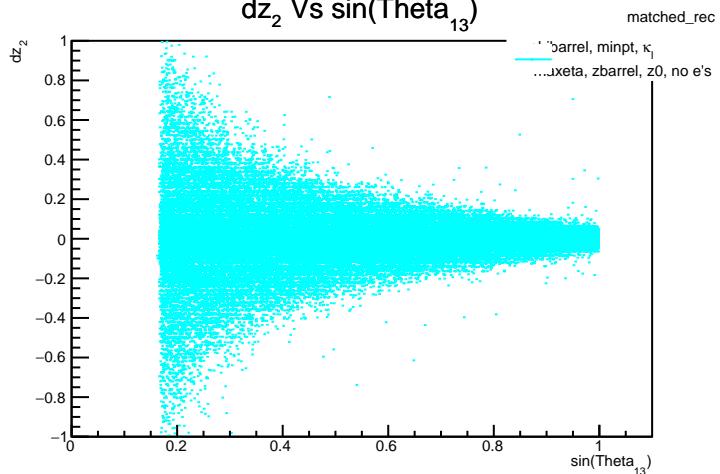
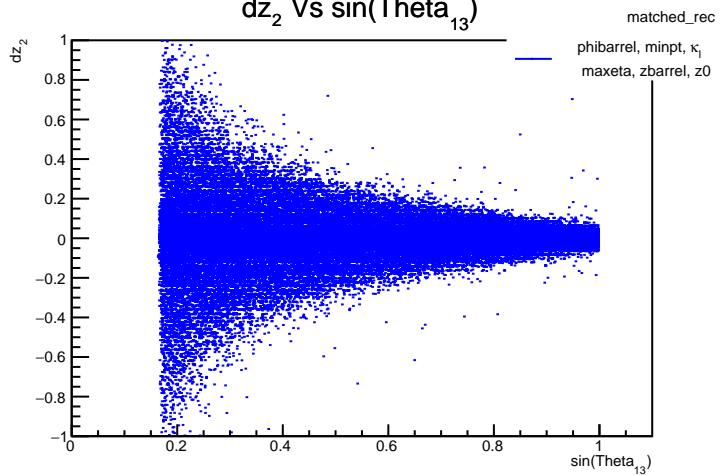
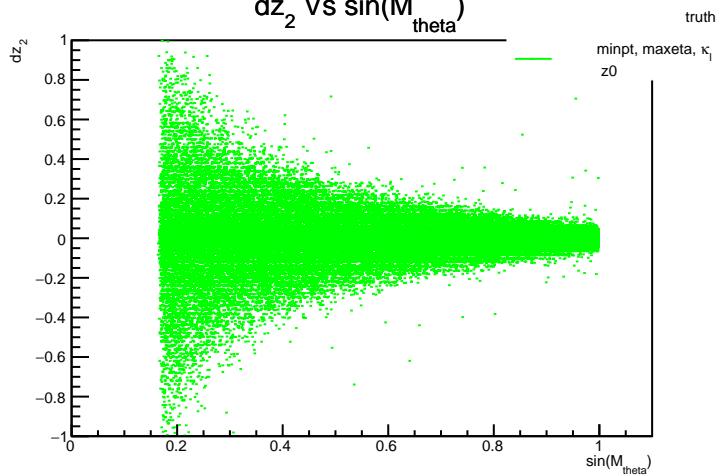
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(\Theta_{13})$



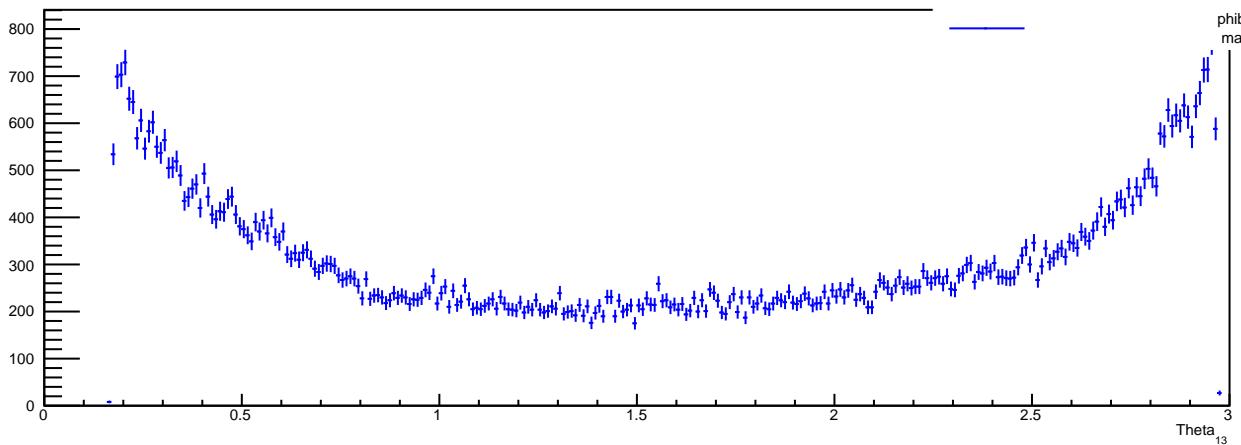
$\text{abs}(\text{dphi}_2)$  Vs  $\sin(M_{\theta})$



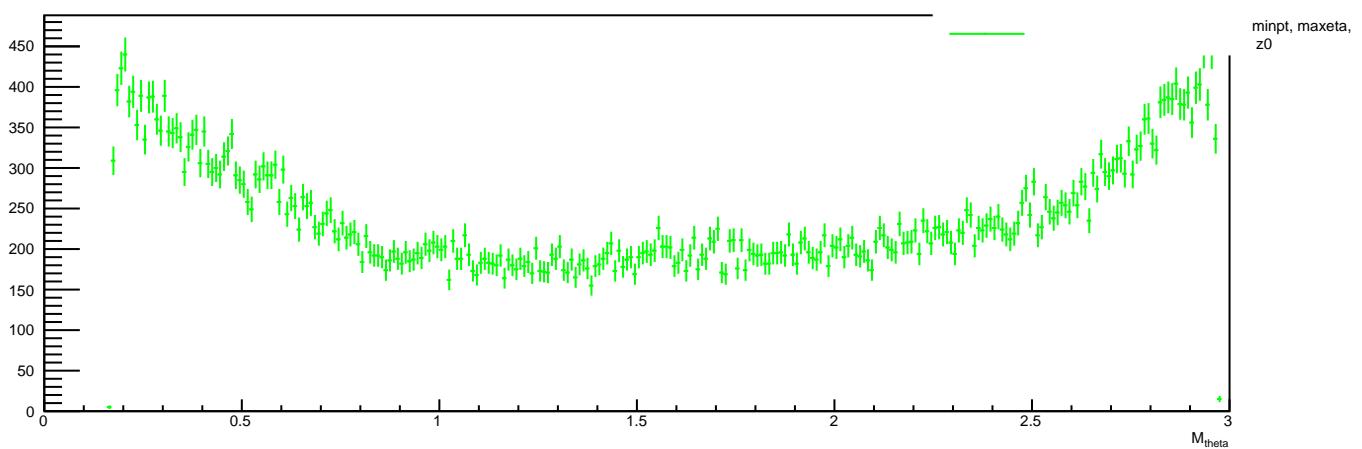
$dz_2$  Vs  $\sin(\Theta_{13})$  $dz_2$  Vs  $\sin(\Theta_{13})$  $dz_2$  Vs  $\sin(\Theta_{13})$  $dz_2$  Vs  $\sin(M_{\theta})$ 

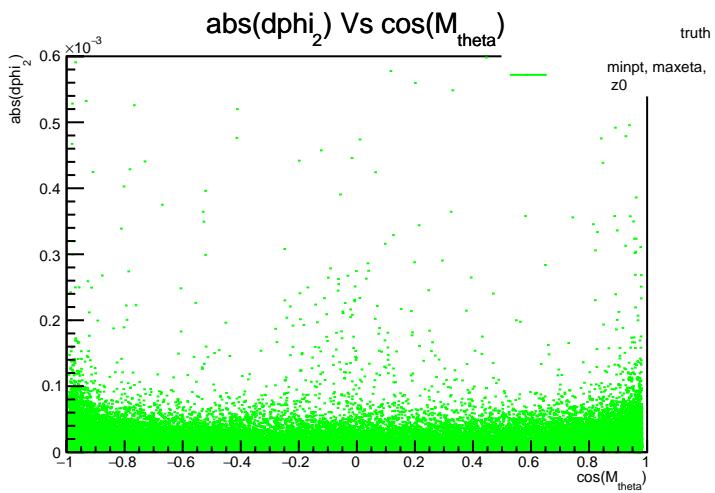
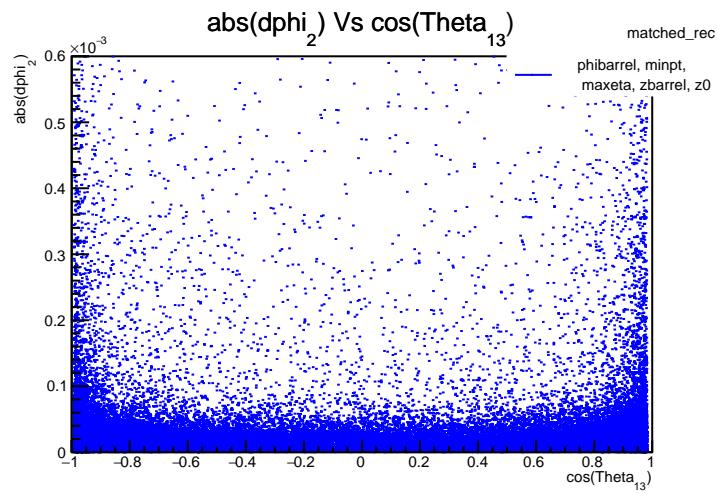
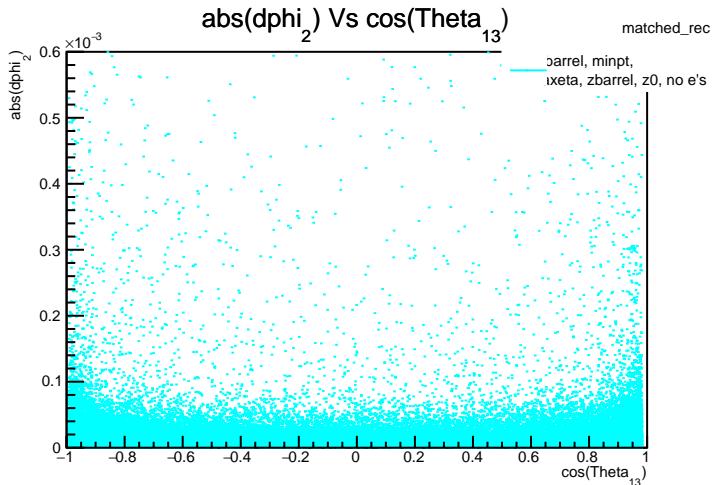
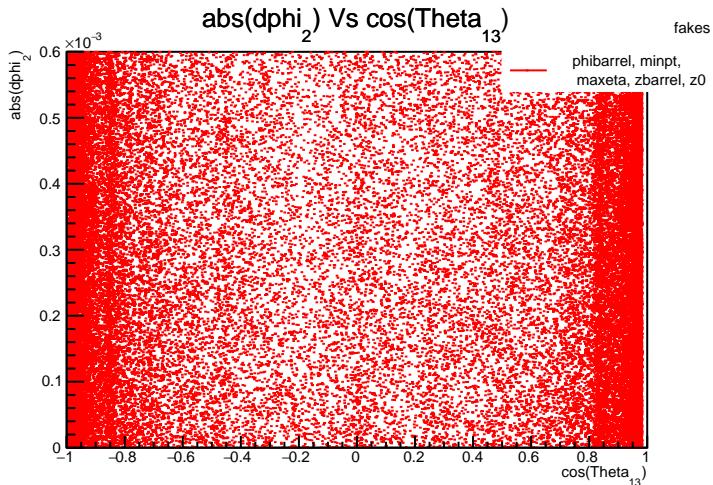
$dz_2$  Vs  $\sin(\Theta_{13})$  $dz_2$  Vs  $\sin(\Theta_{13})$  $dz_2$  Vs  $\sin(\Theta_{13})$  $dz_2$  Vs  $\sin(M_{\theta})$ 

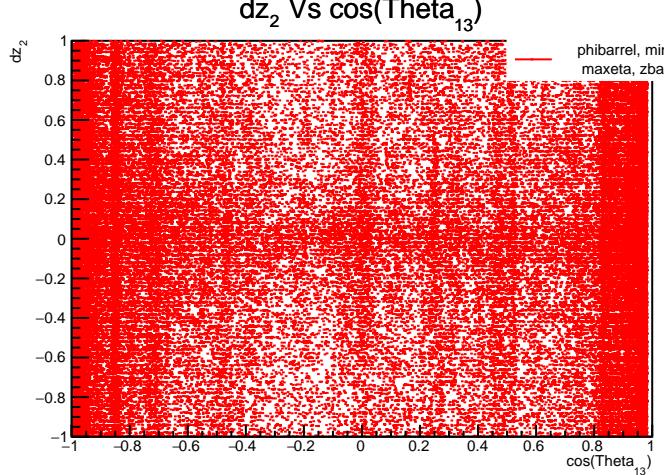
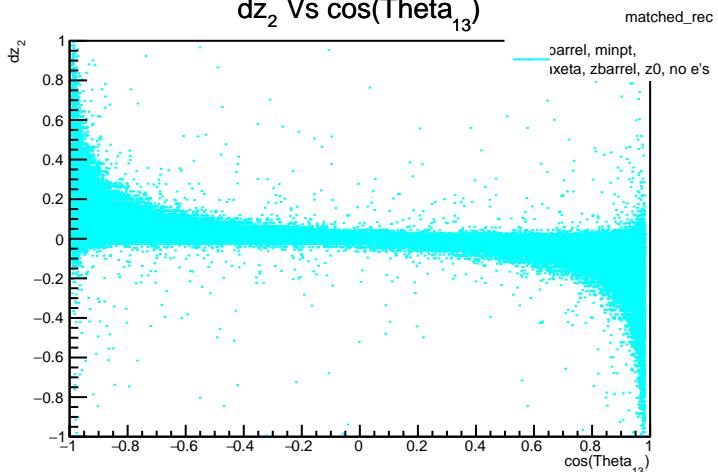
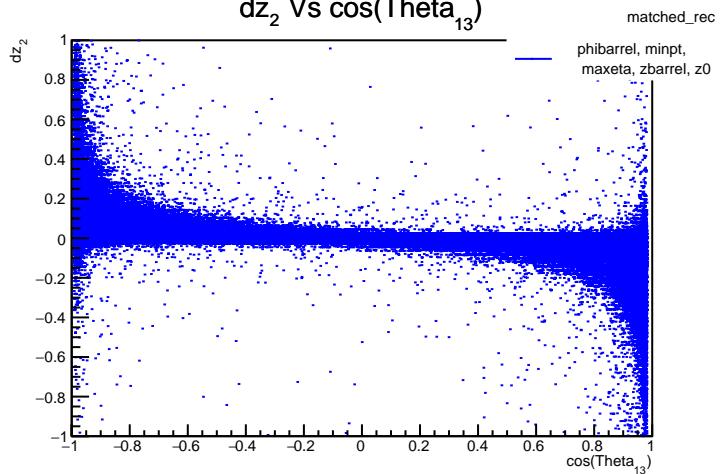
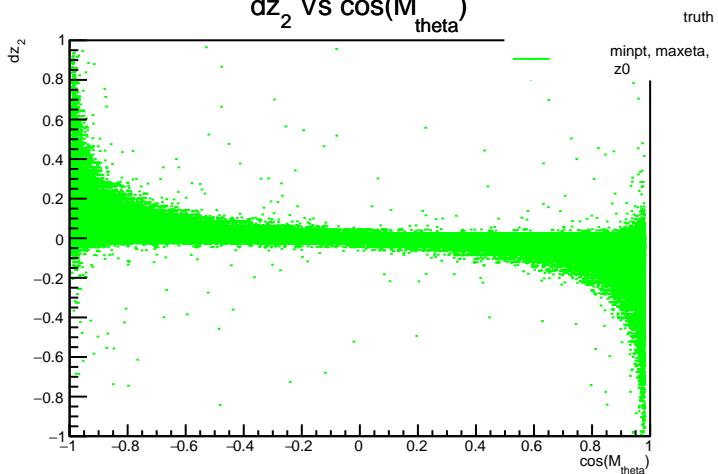
Theta<sub>13</sub>

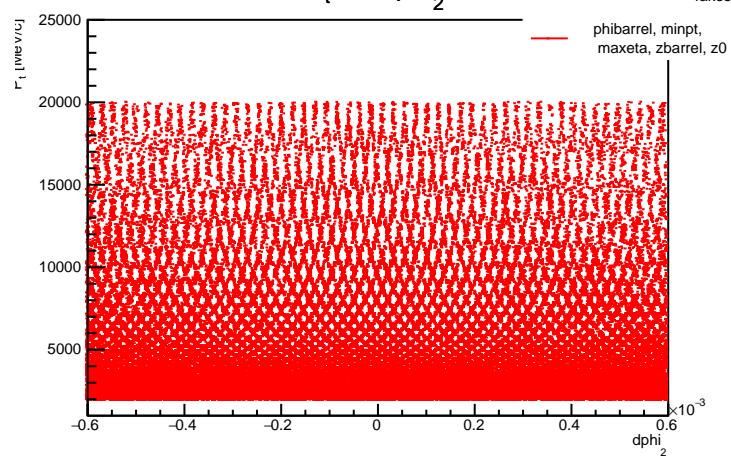
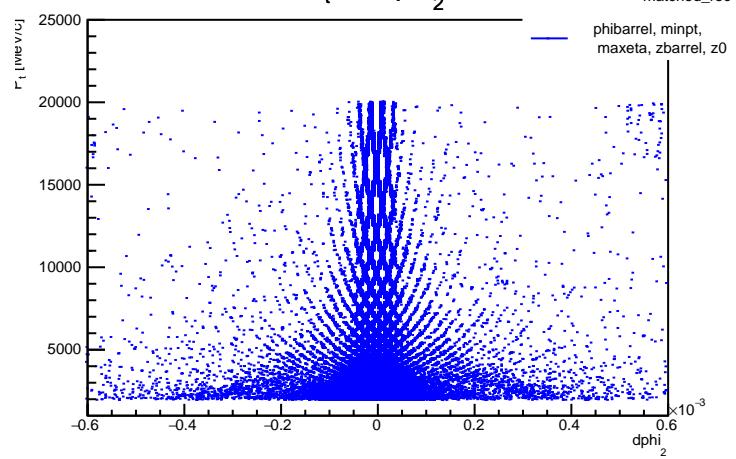
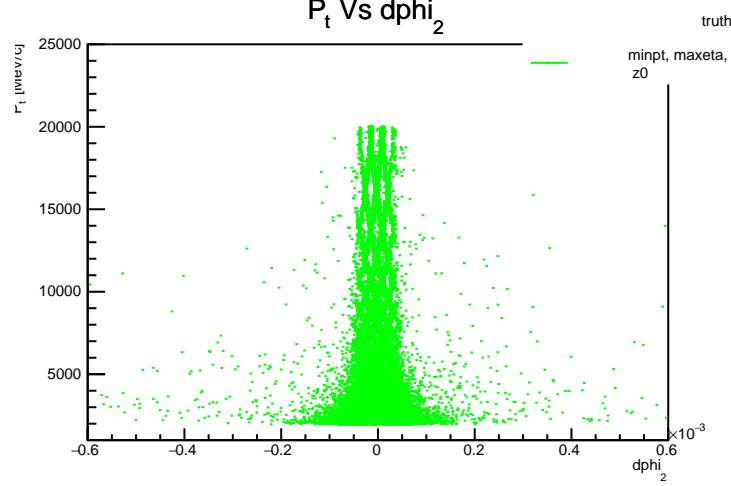
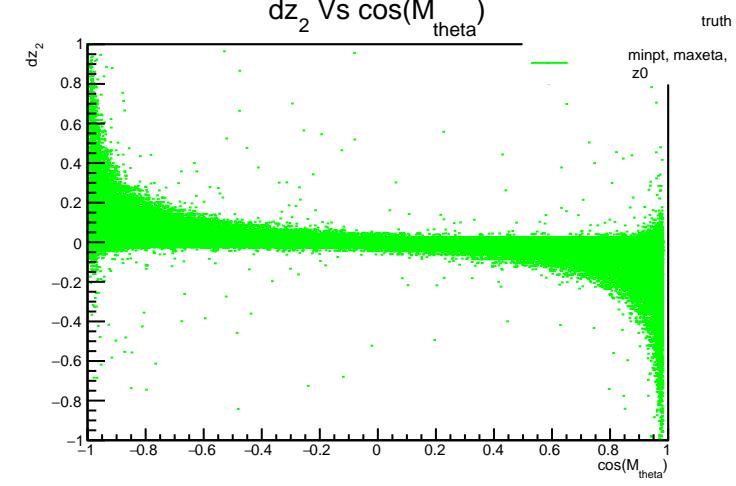


M<sub>theta</sub>



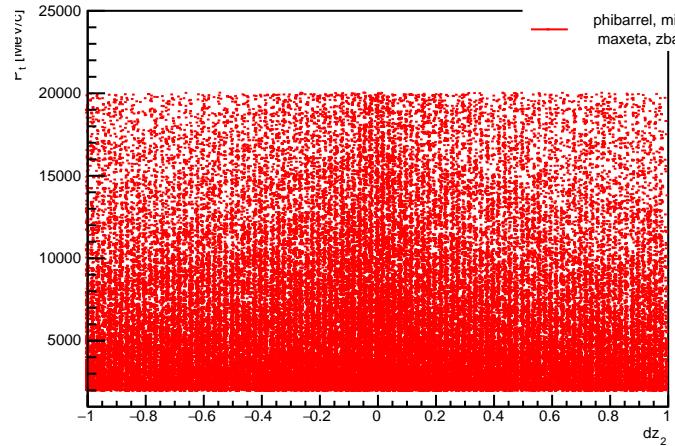


$dz_2$  Vs  $\cos(\Theta_{13})$  $dz_2$  Vs  $\cos(\Theta_{13})$  $dz_2$  Vs  $\cos(\Theta_{13})$  $dz_2$  Vs  $\cos(M_{\theta})$ 

$P_t$  Vs  $d\phi_{\gamma_2}$  $P_t$  Vs  $d\phi_{\gamma_2}$  $P_t$  Vs  $d\phi_{\gamma_2}$  $dz_2$  Vs  $\cos(M_{\theta})$ 

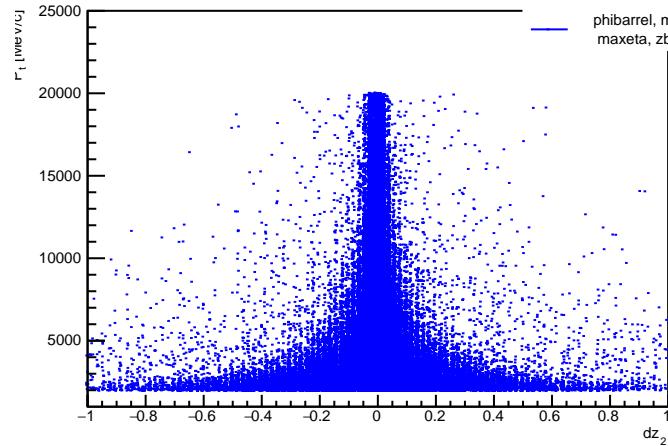
$P_t$  Vs  $dz_2$

fakes



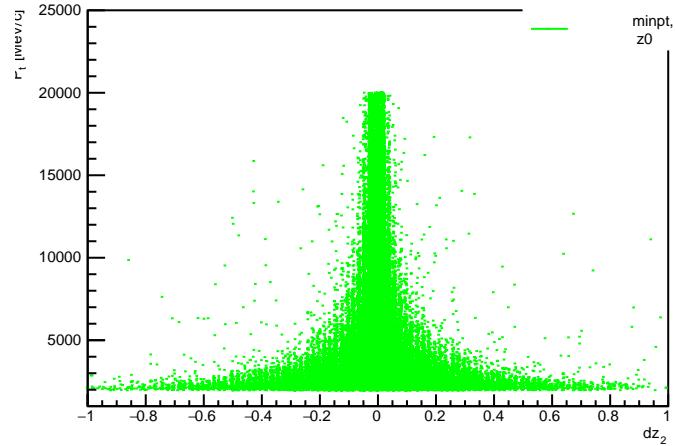
$P_t$  Vs  $dz_2$

matched\_rec



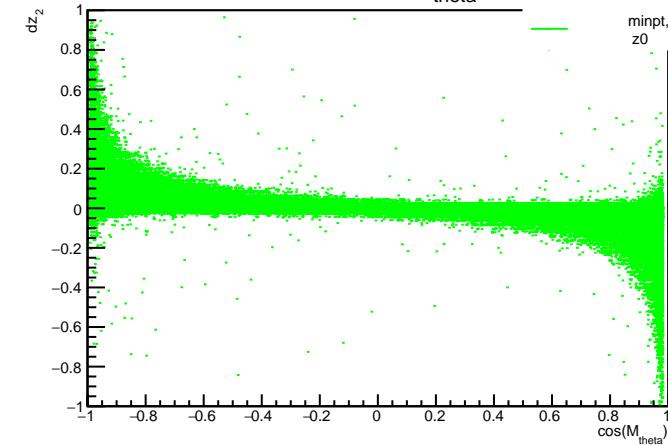
$P_t$  Vs  $dz_2$

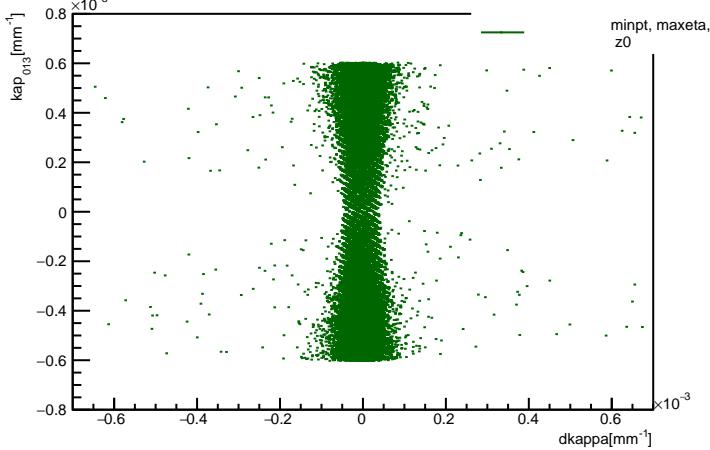
truth



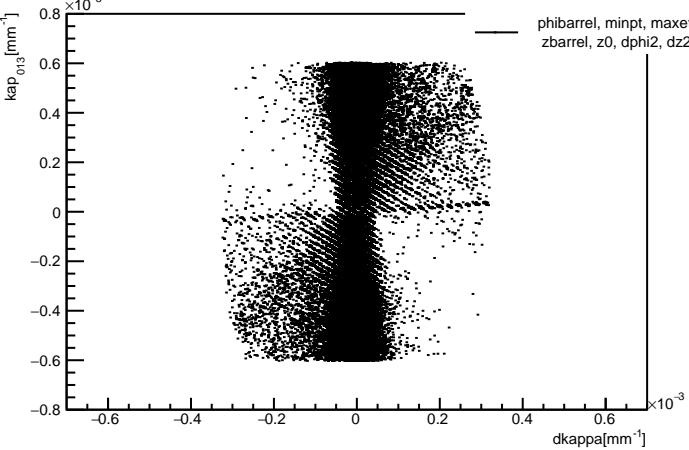
$dz_2$  Vs  $\cos(M_{\theta})$

truth

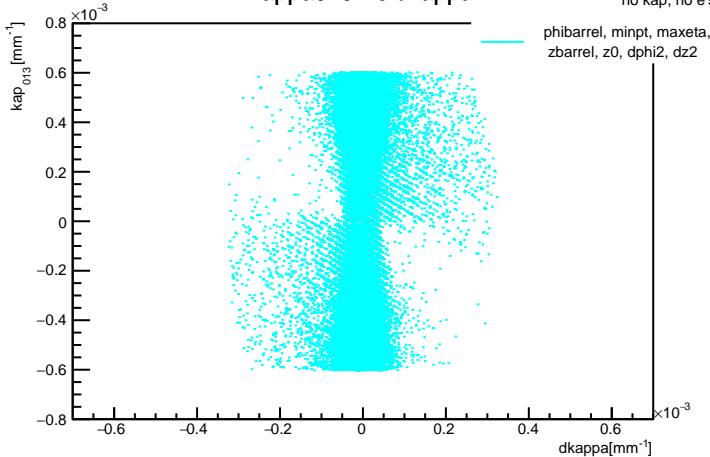


**kappa013 Vs dkappa**

truth no kap

minpt, maxeta,  
z0**kappa013 Vs dkappa**

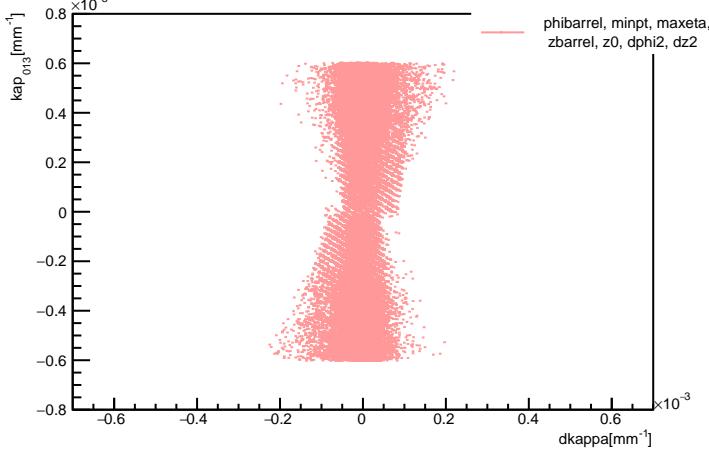
matched\_rec no kap

phibarrel, minpt, maxeta,  
zbarrel, z0, dphi2, dz2**kappa013 Vs dkappa**

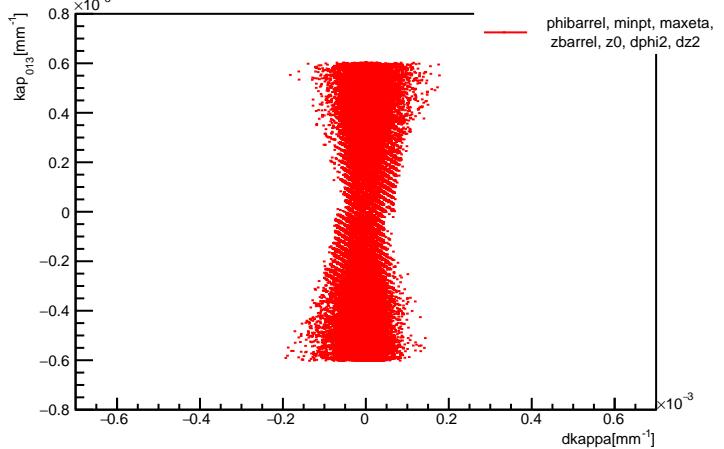
no kap, no e's

phibarrel, minpt, maxeta,  
zbarrel, z0, dphi2, dz2

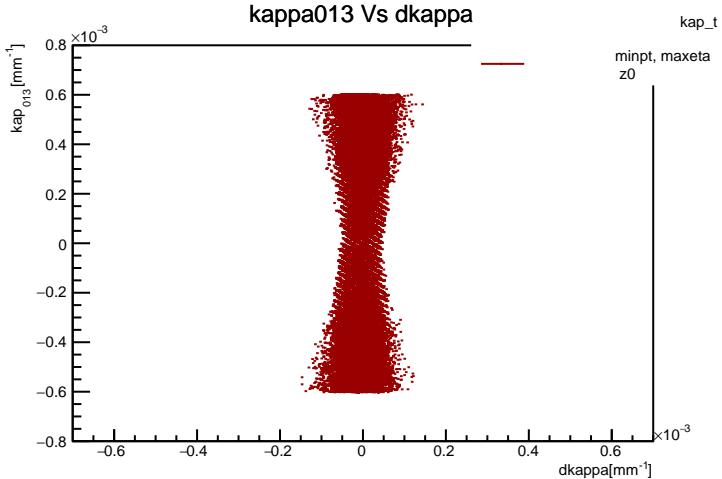
kappa013 Vs dkappa



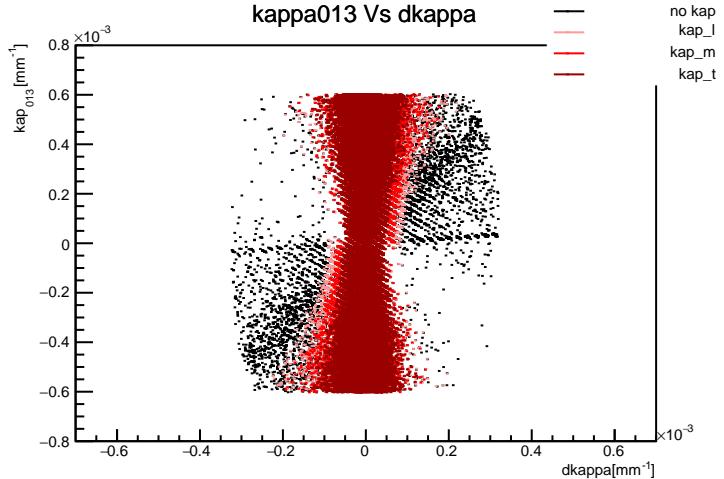
kappa013 Vs dkappa



kappa013 Vs dkappa

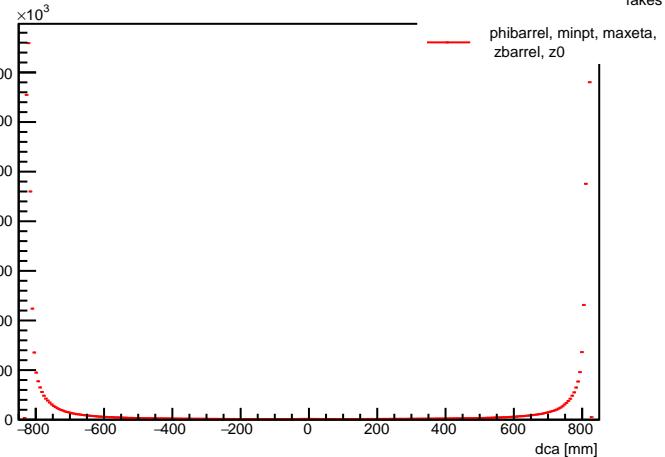


kappa013 Vs dkappa



dca

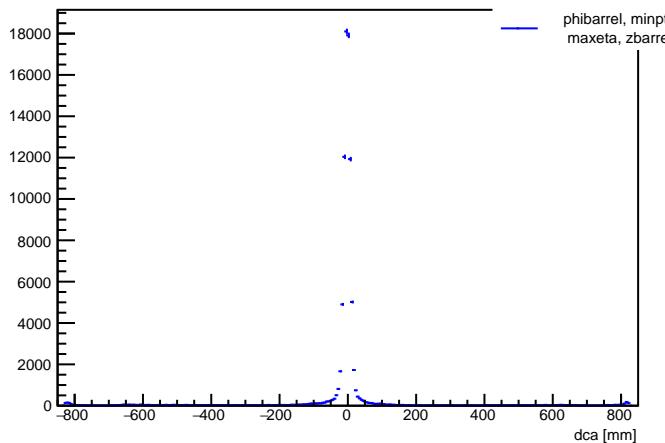
fakes



dca

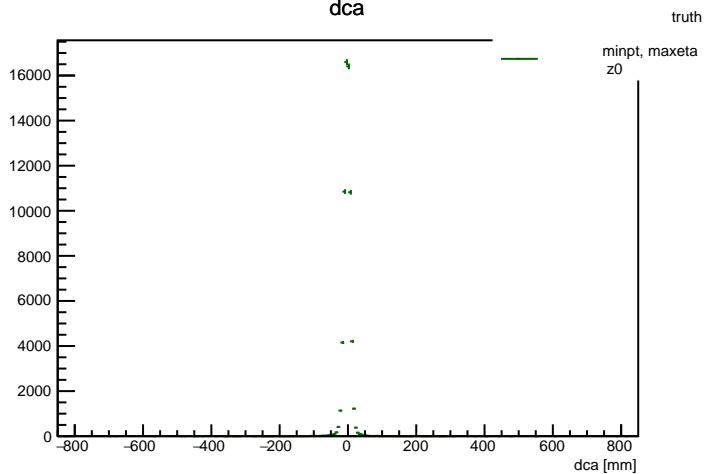
fakes

matched\_rec



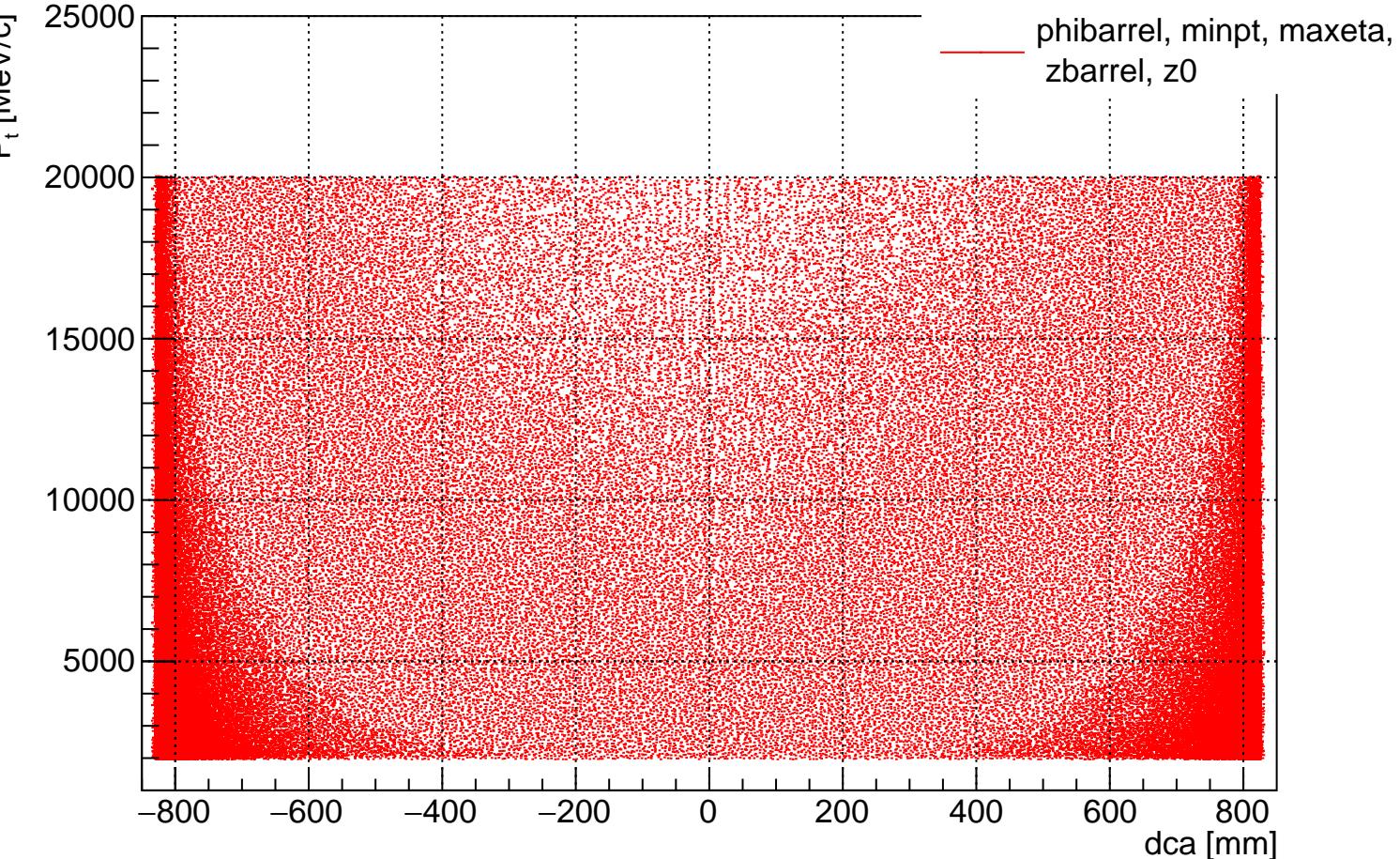
dca

truth

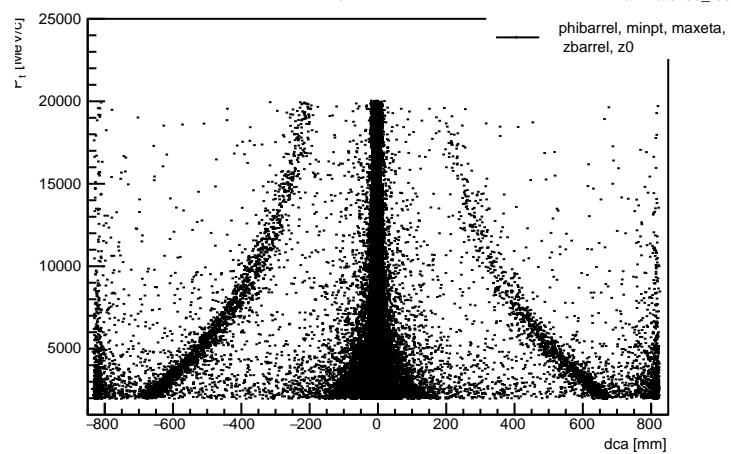


# $P_t$ Vs dca

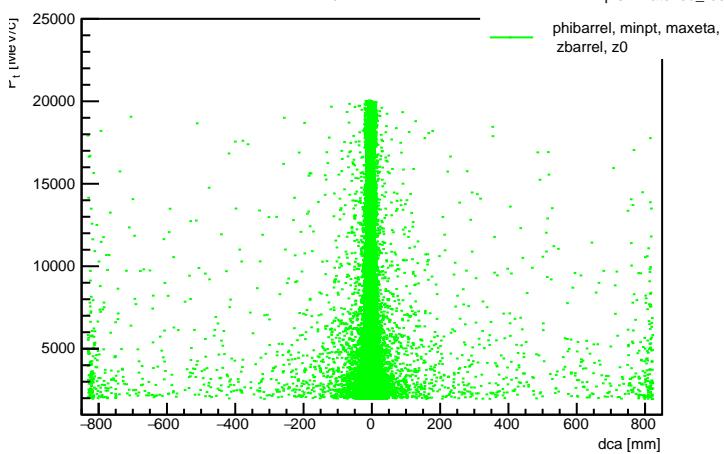
fakes



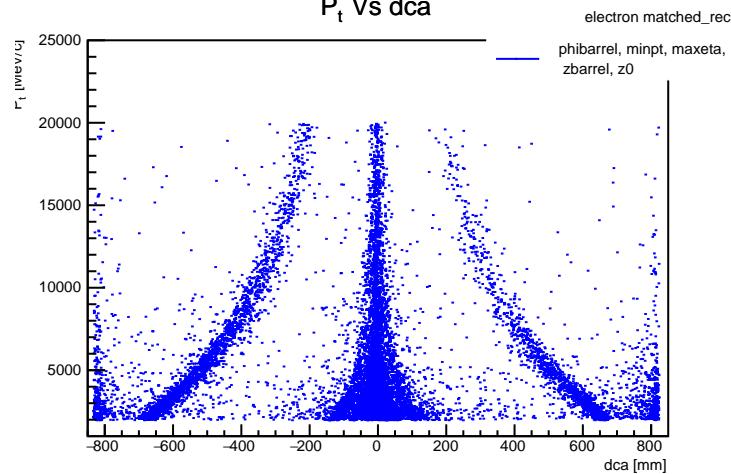
$P_t$  Vs dca



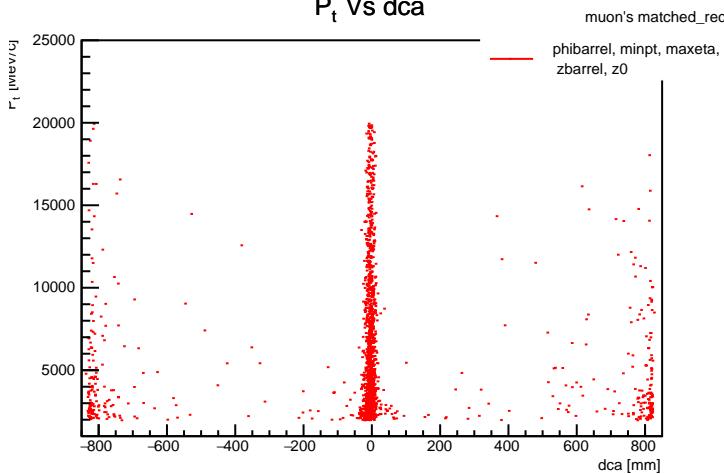
$P_t$  Vs dca



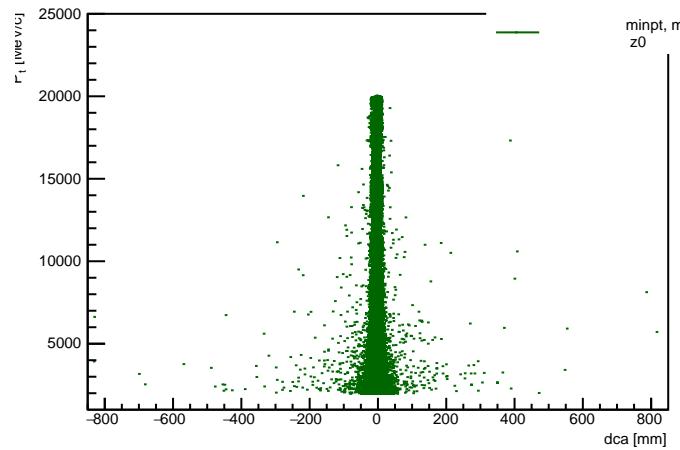
$P_t$  Vs dca



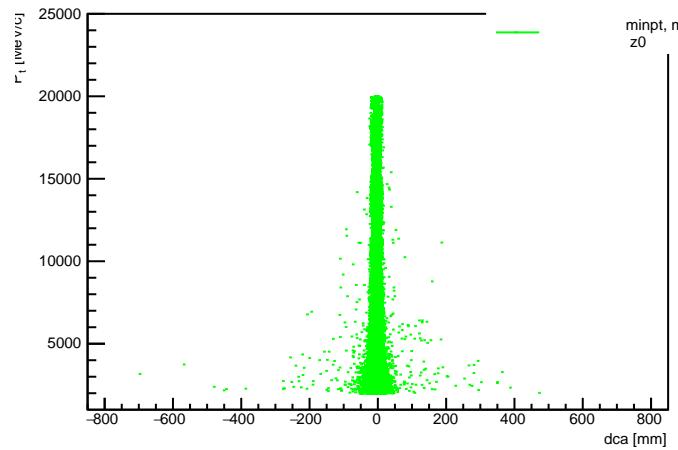
$P_t$  Vs dca



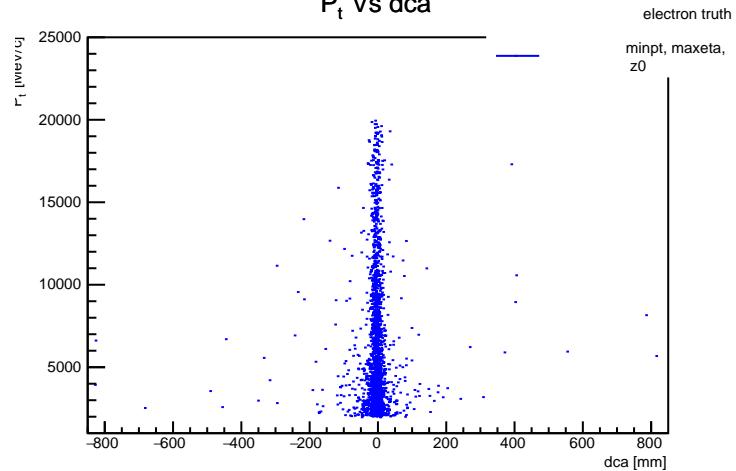
$P_t$  Vs dca



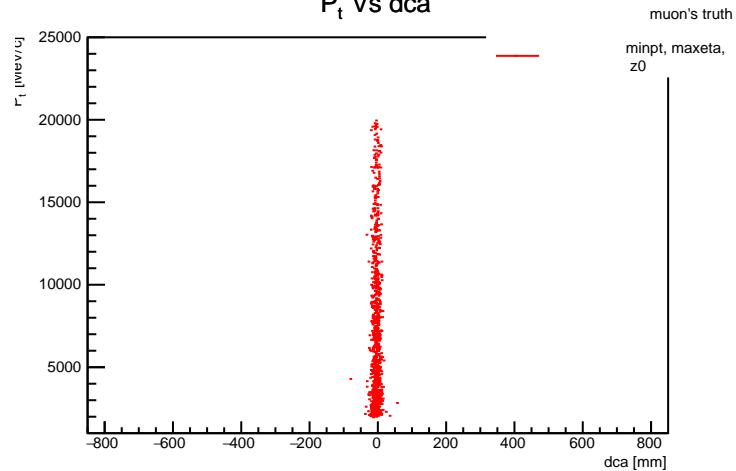
$P_t$  Vs dca



$P_t$  Vs dca



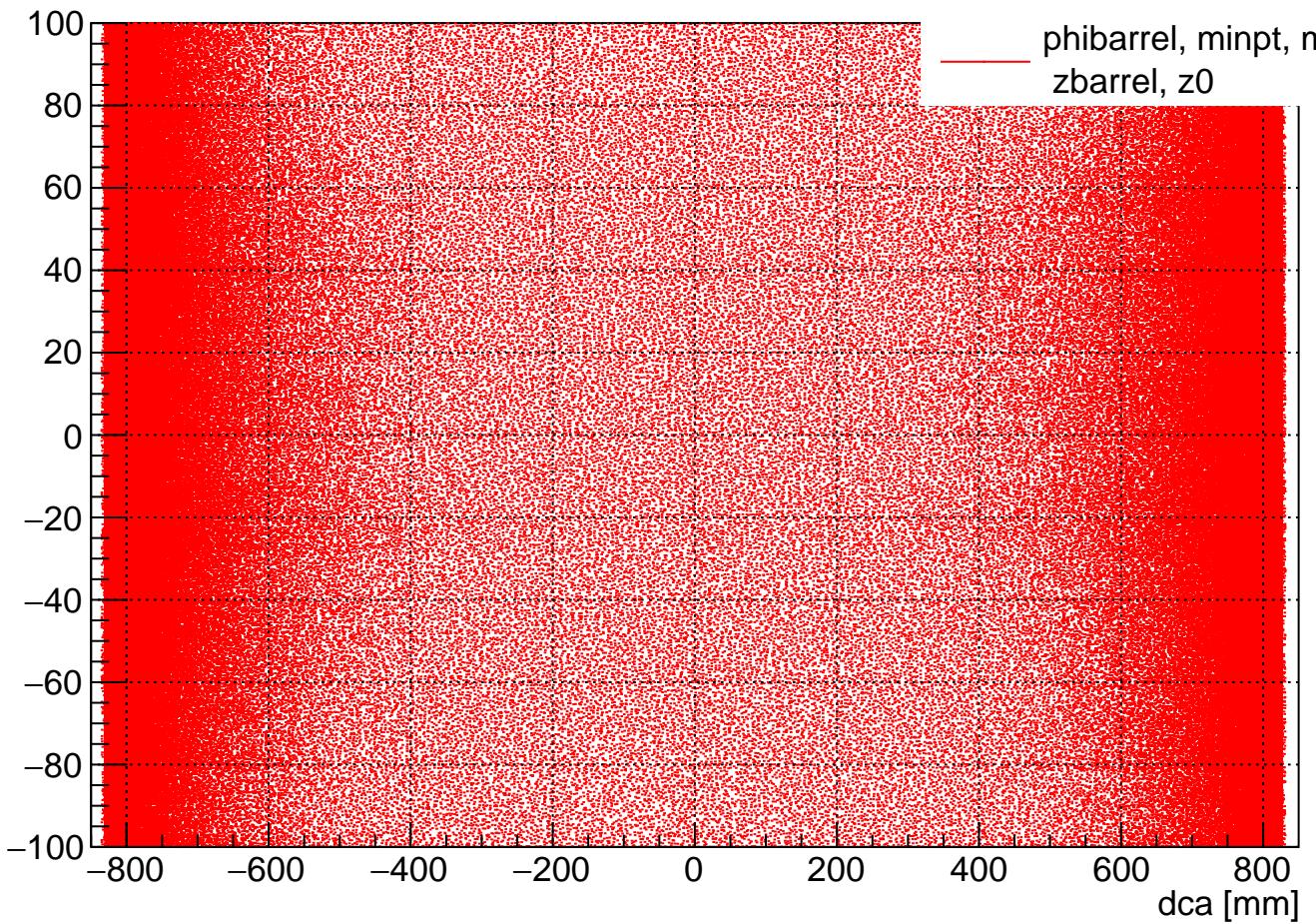
$P_t$  Vs dca

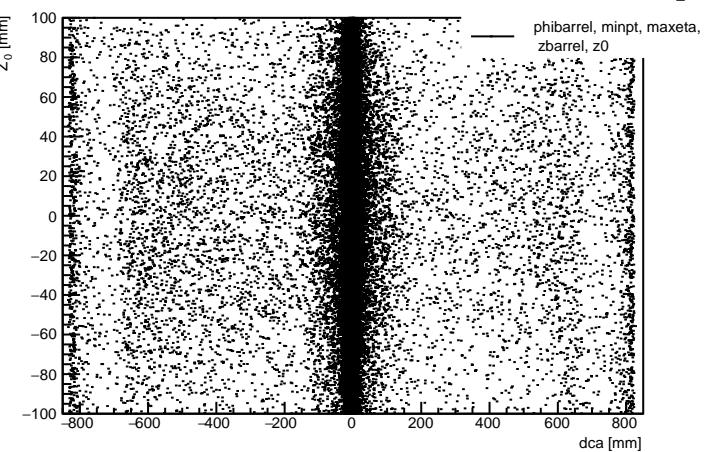
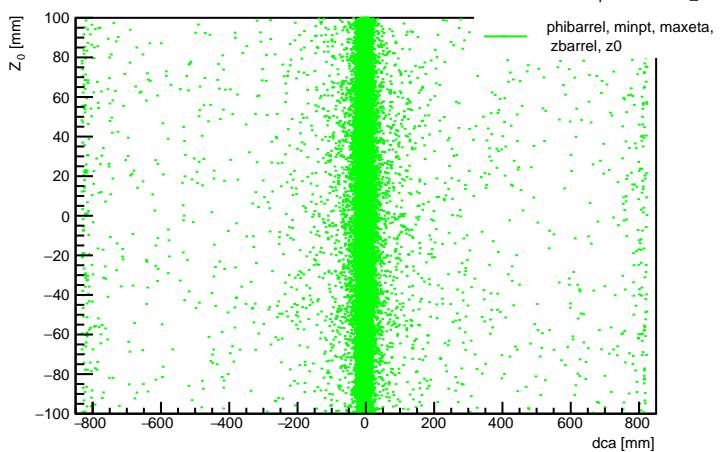
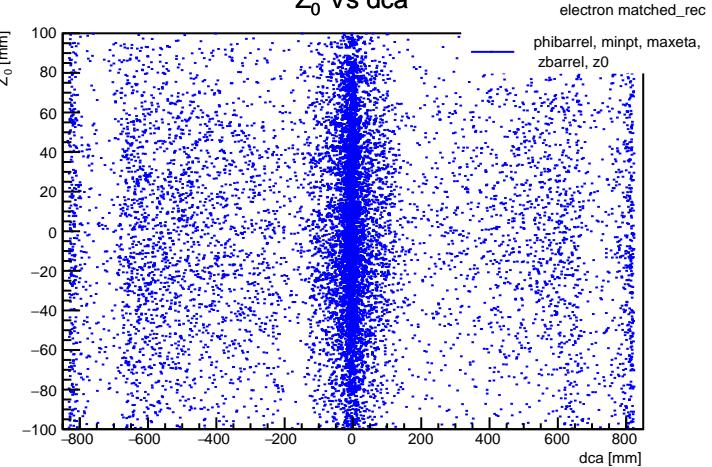
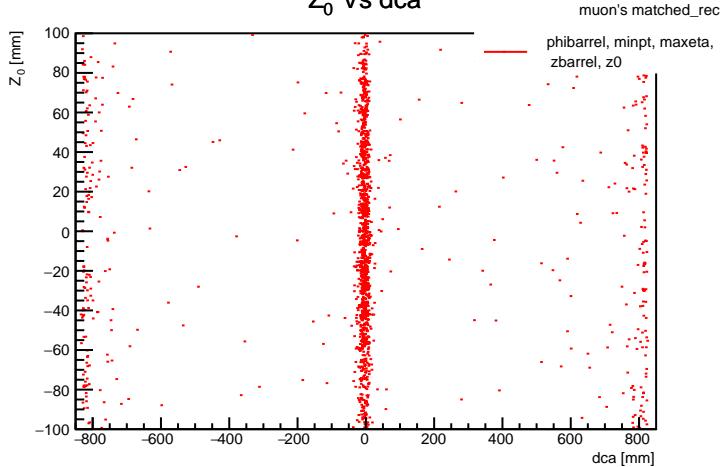


# $Z_0$ Vs dca

fakes

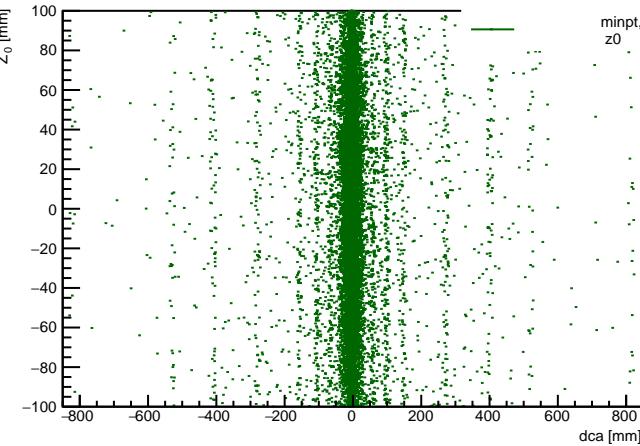
$Z_0$  [mm]



$Z_0$  Vs dca $Z_0$  Vs dca $Z_0$  Vs dca $Z_0$  Vs dca

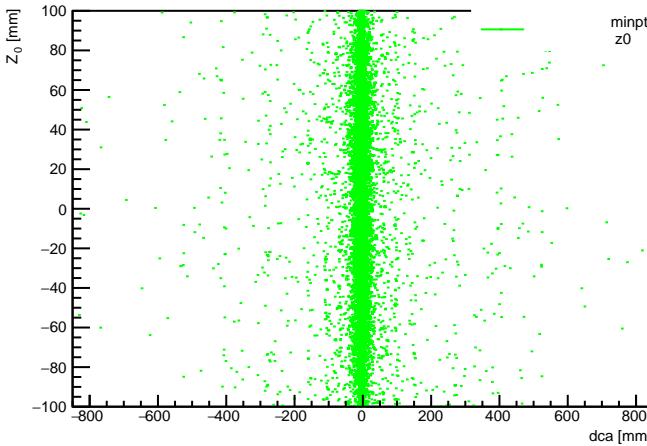
$Z_0$  Vs dca

all truth



$Z_0$  Vs dca

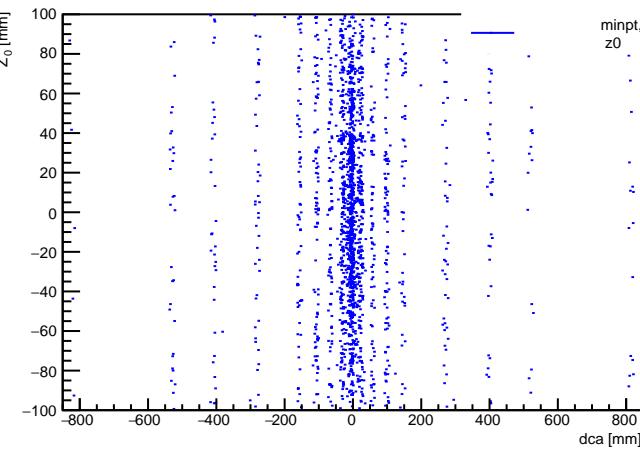
pion truth



$Z_0$  Vs dca

electron truth

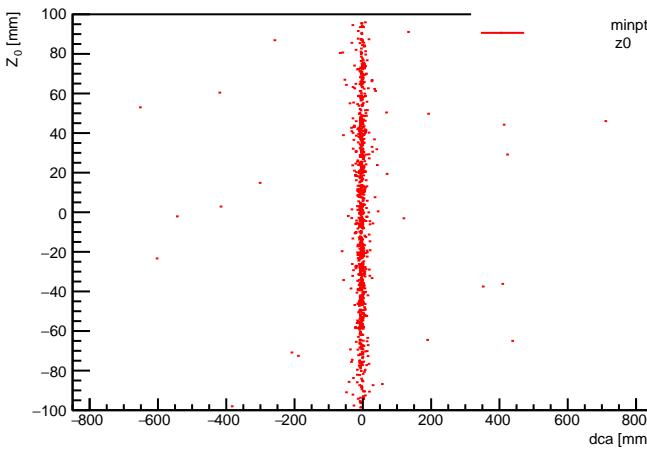
minpt, maxeta,  
 $z_0$



$Z_0$  Vs dca

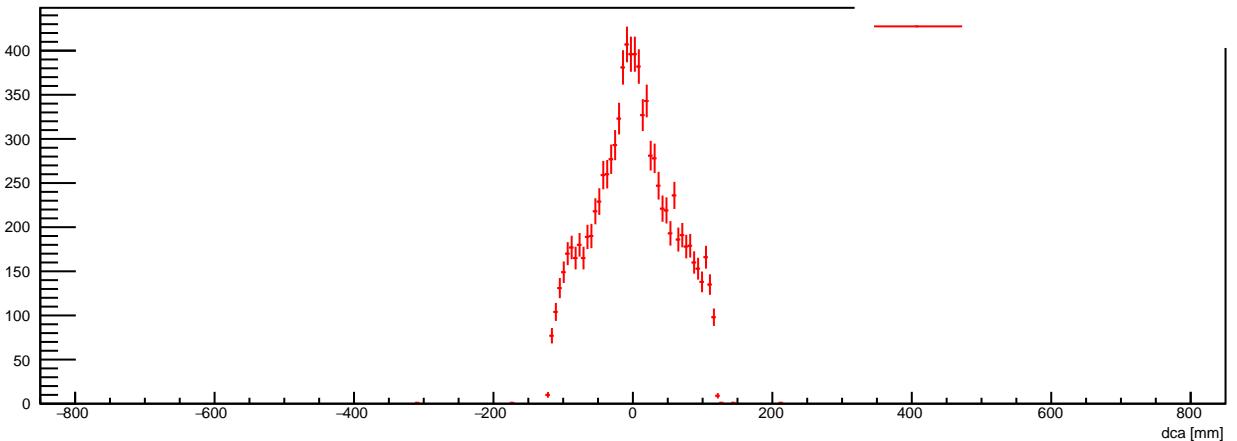
muon's truth

minpt, maxeta,  
 $z_0$



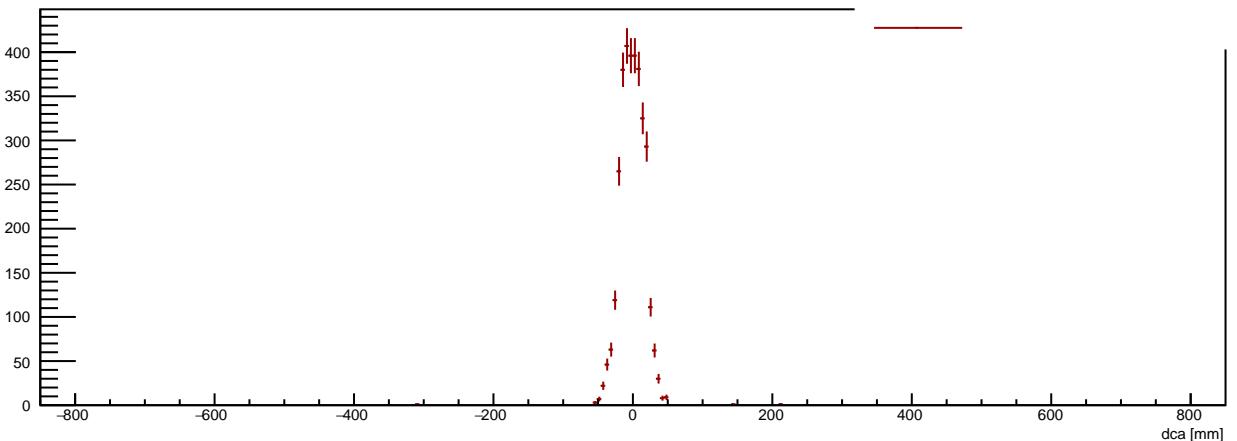
dca

fakes

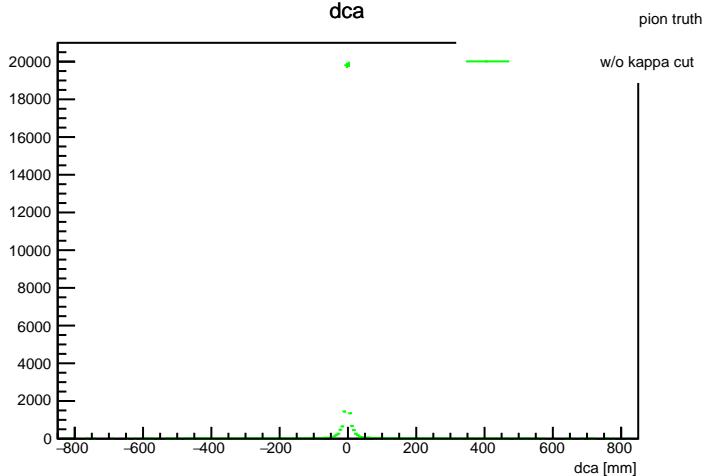


dca

fakes



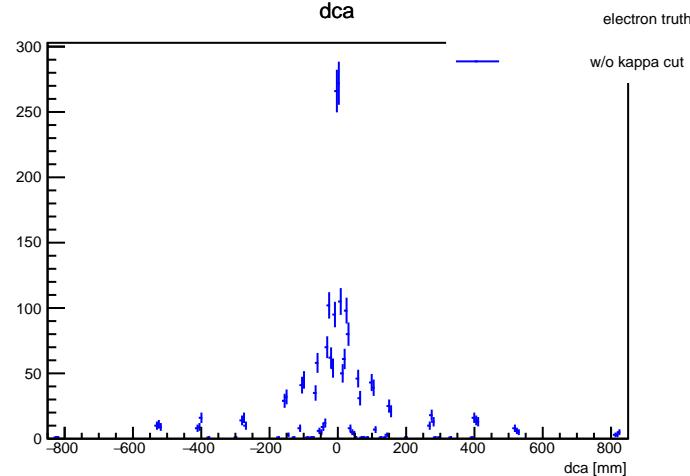
dca



pion truth

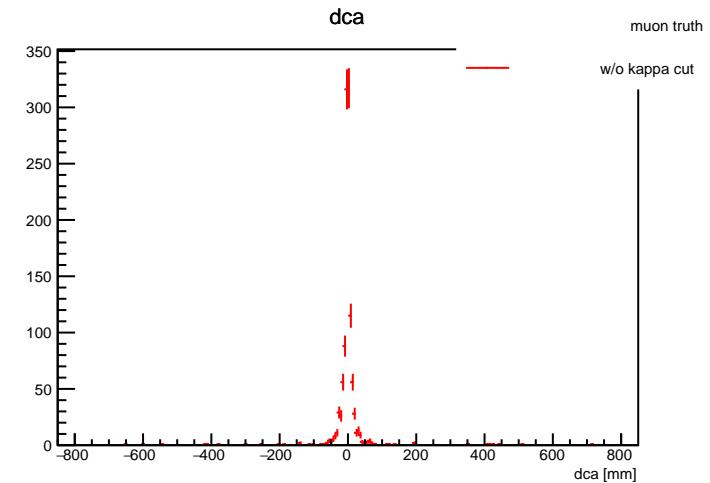
w/o kappa cut

dca



electron truth

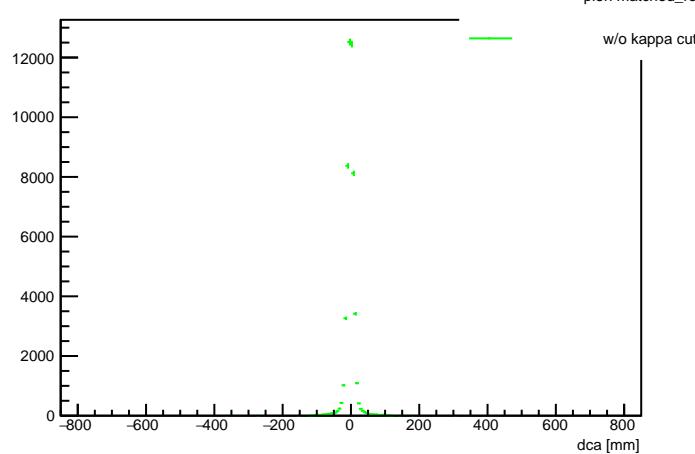
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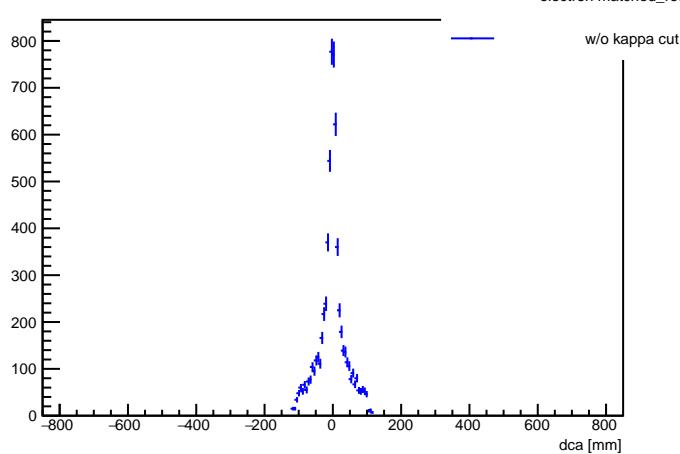
muon truth

w/o kappa cut

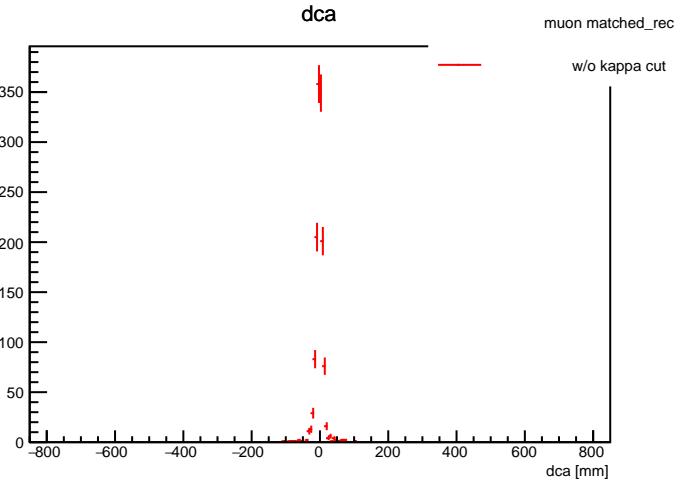
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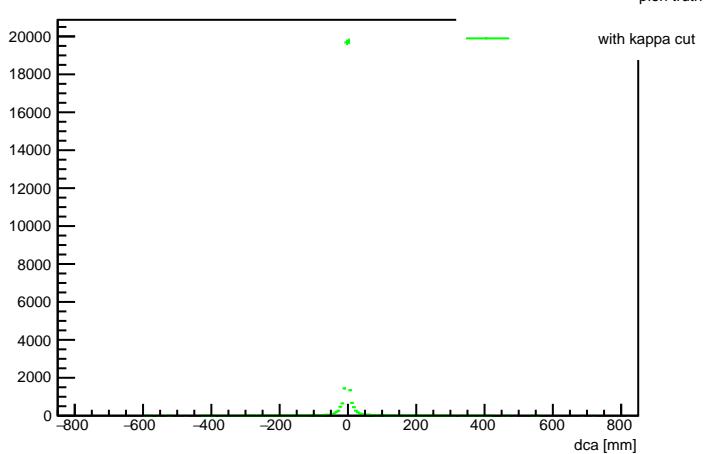
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dca

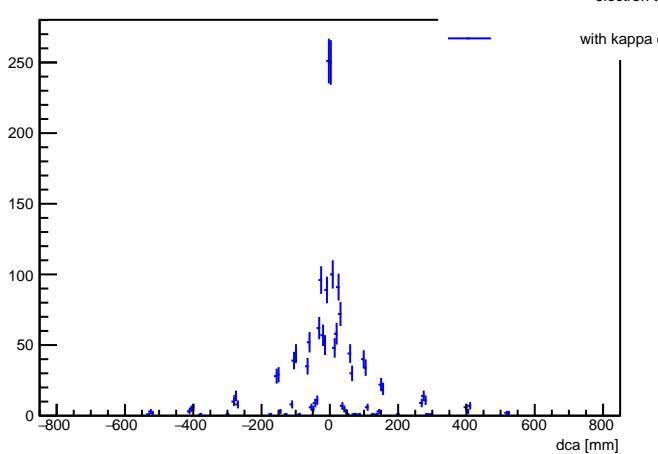


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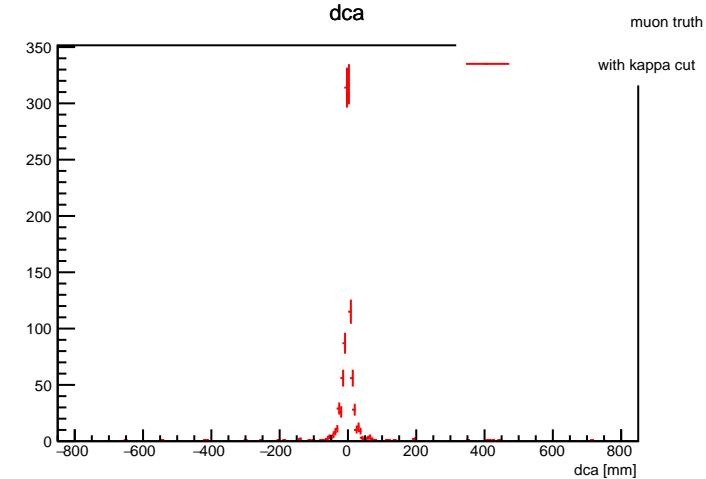
pion truth

dca



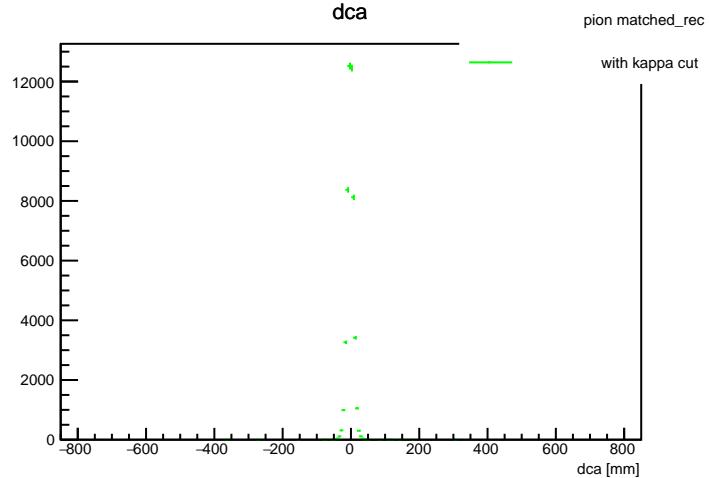
electron truth

dca

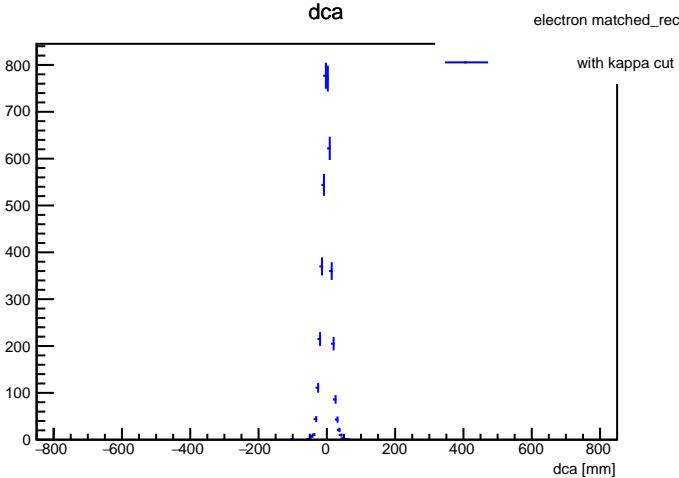


muon truth

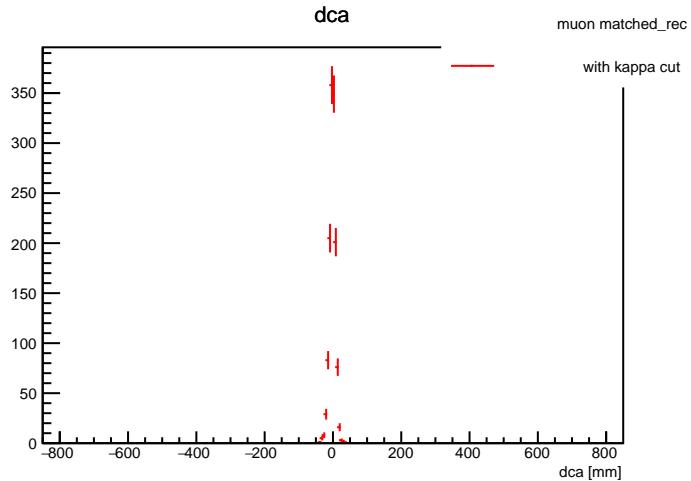
dca

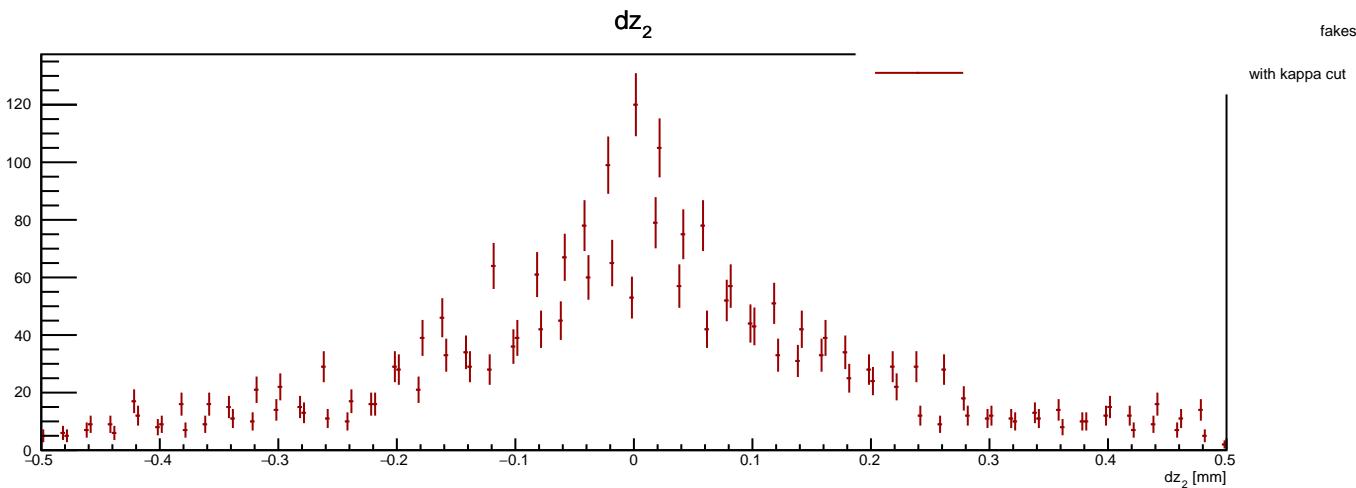
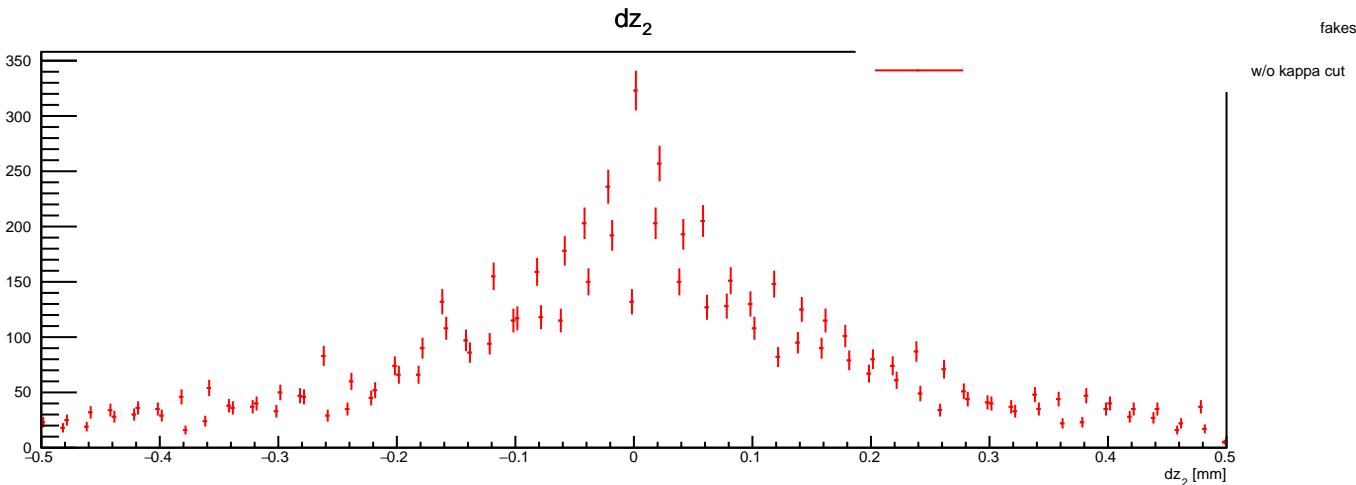


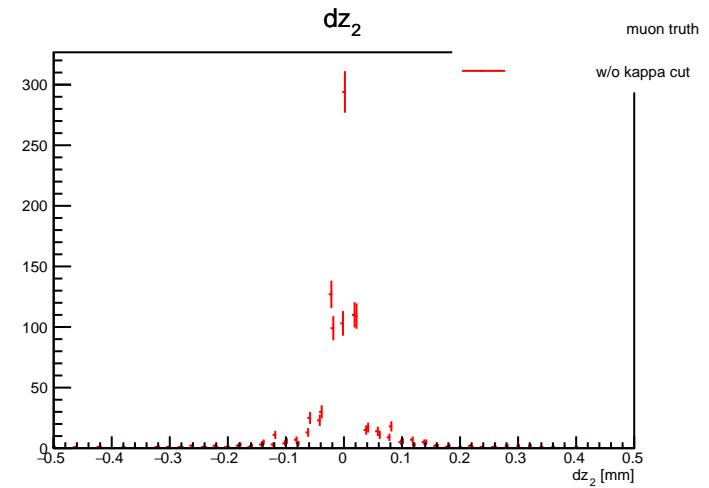
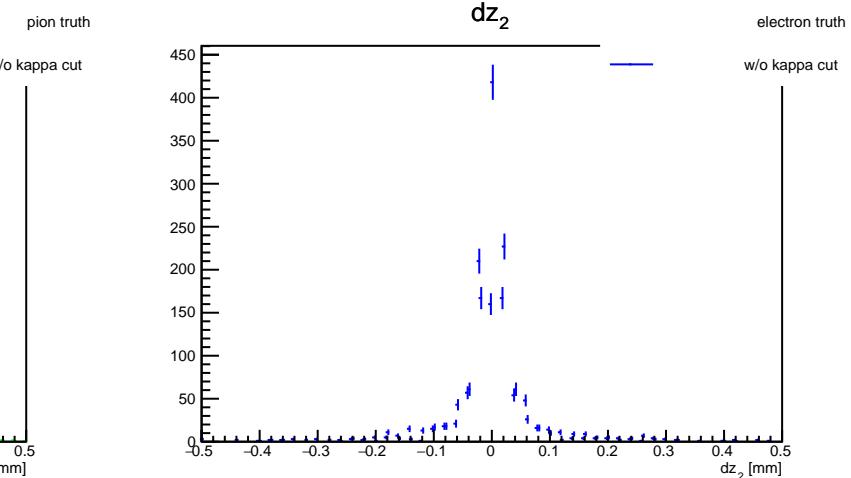
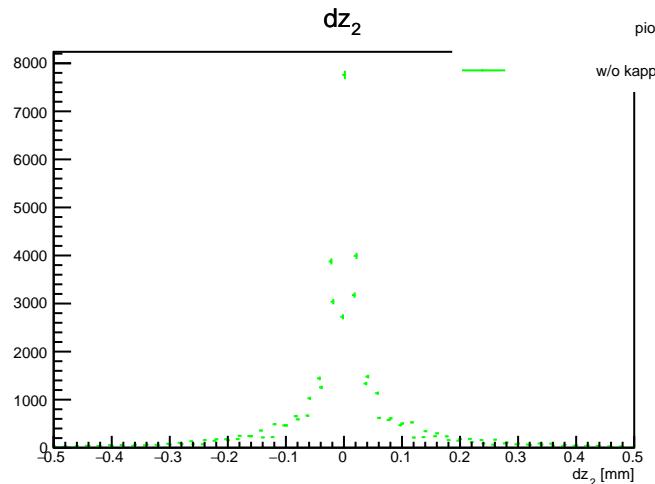
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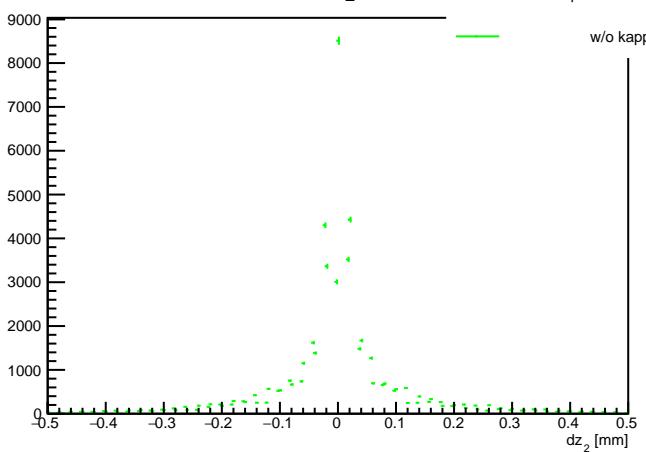


dca



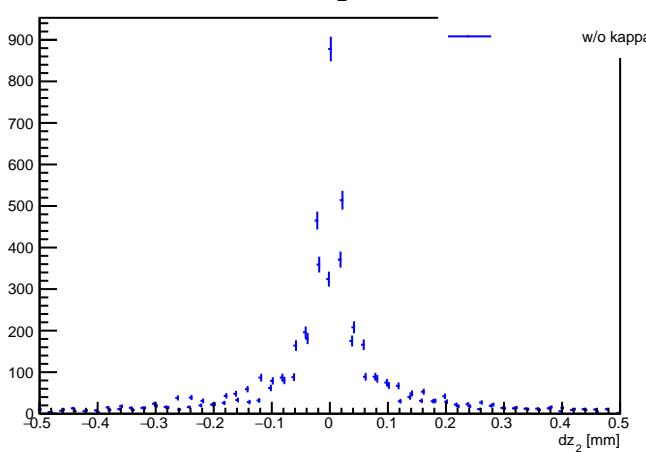




$dz_2$ 

pion matched\_rec

w/o kappa cut

 $dz_2$ 

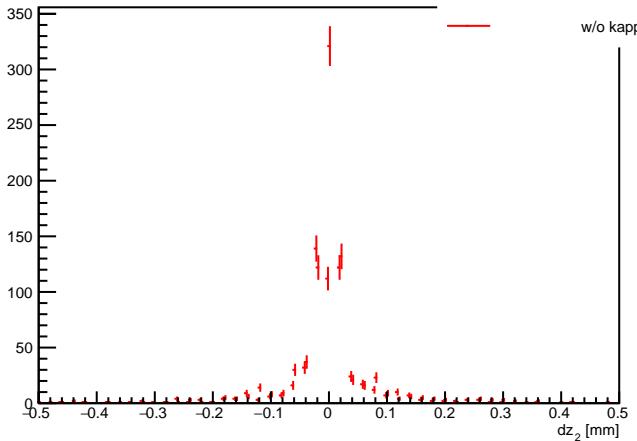
electron matched\_rec

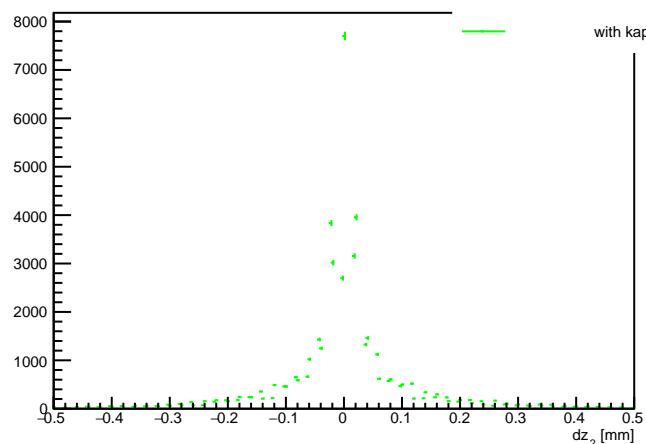
w/o kappa cut

 $dz_2$ 

muon matched\_rec

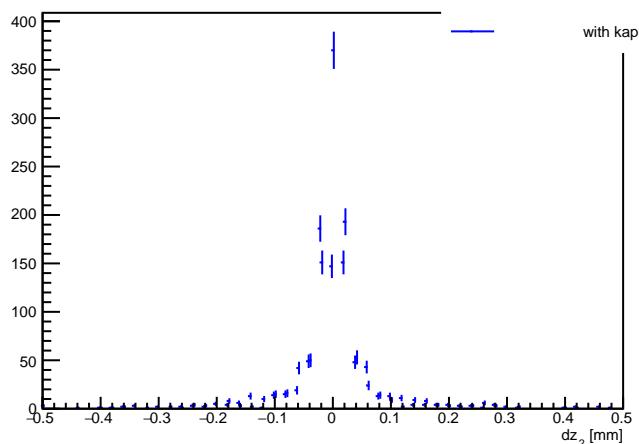
w/o kappa cut



$dz_2$ 

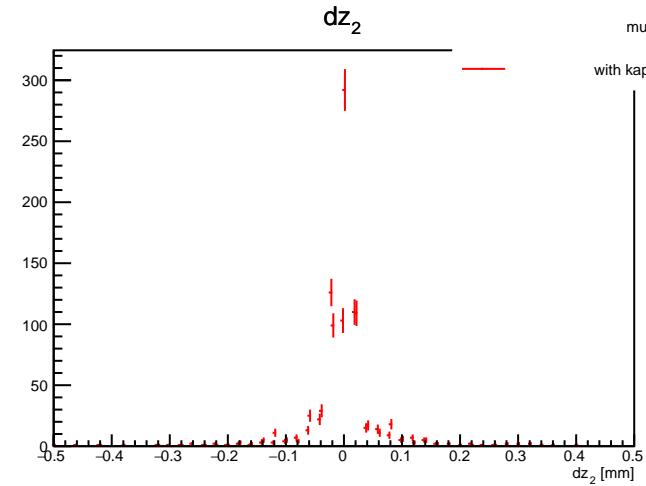
pion truth

with kappa cut

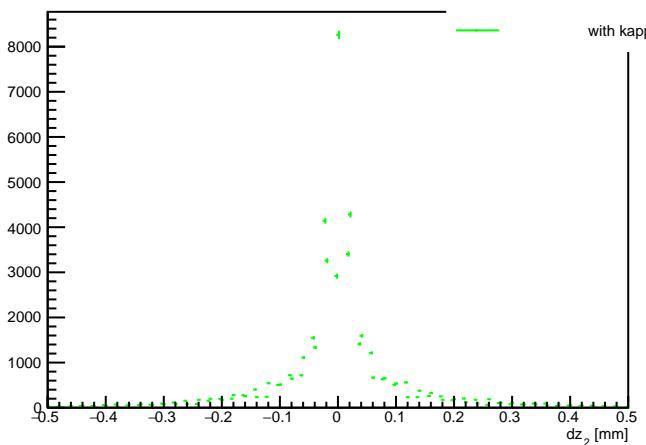
 $dz_2$ 

electron truth

muon truth

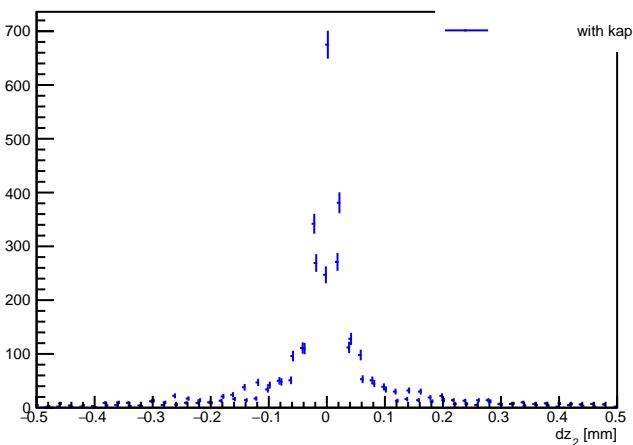


with kappa cut

$dz_2$ 

pion matched\_rec

with kappa cut

 $dz_2$ 

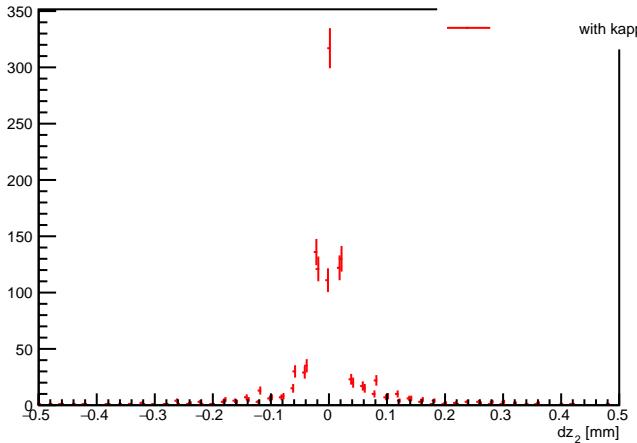
electron matched\_rec

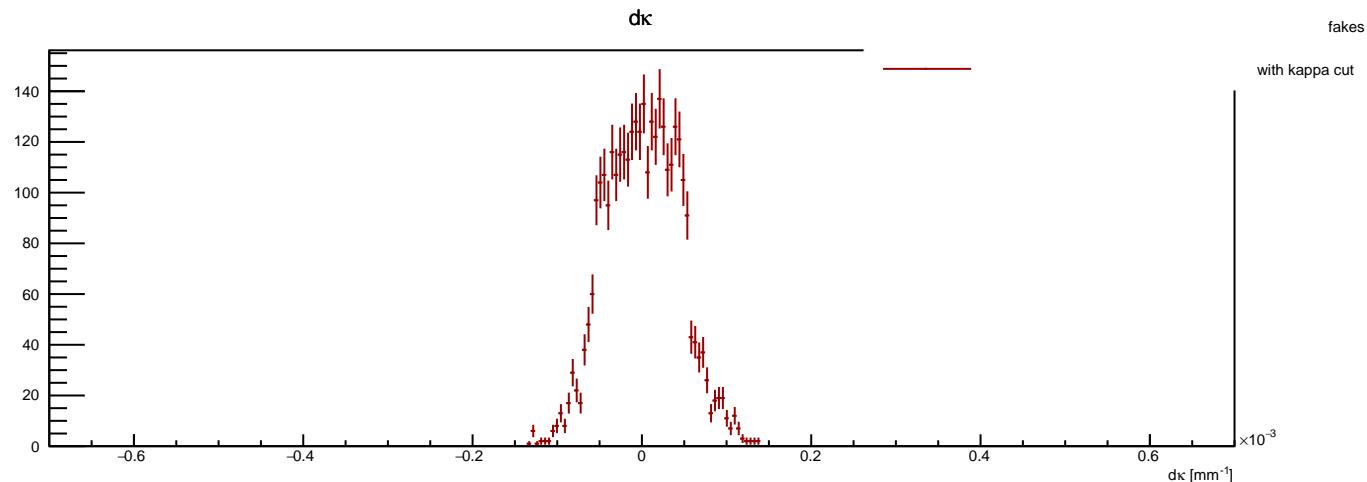
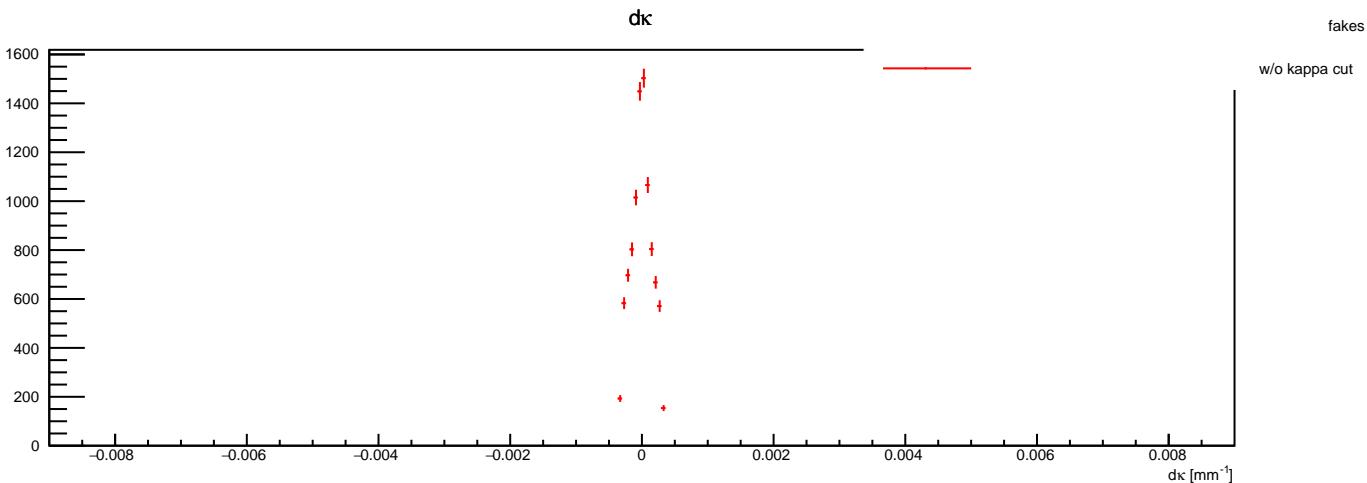
with kappa cut

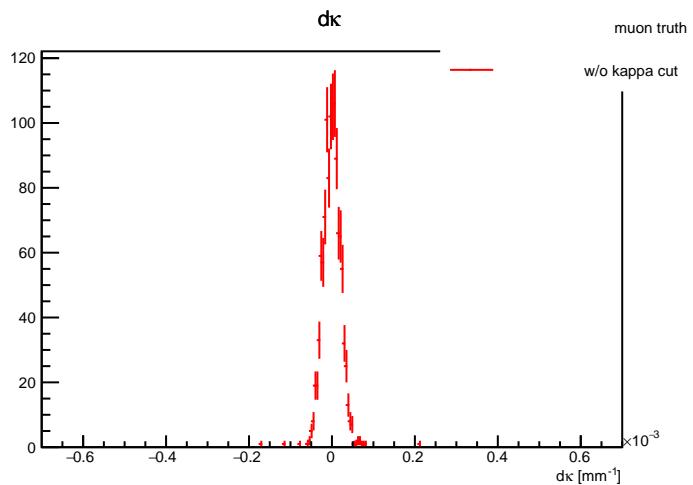
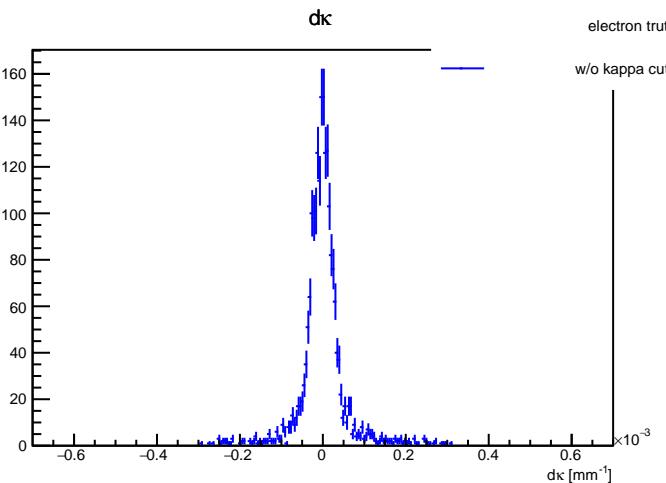
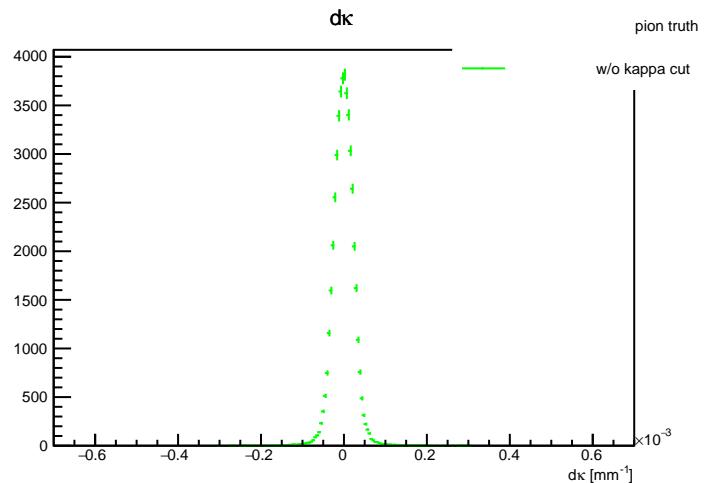
 $dz_2$ 

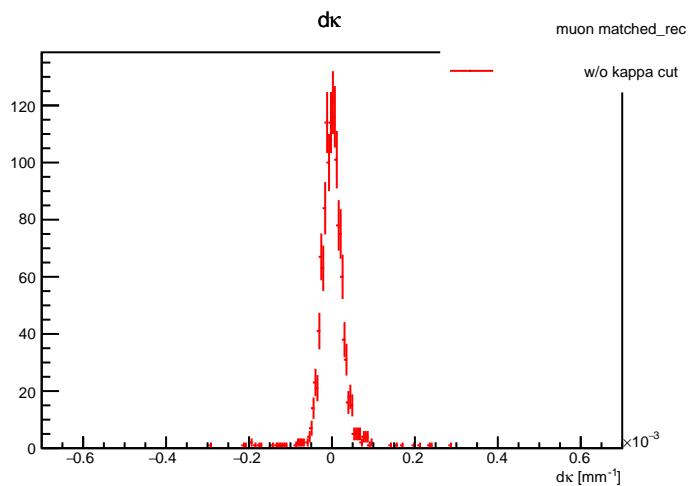
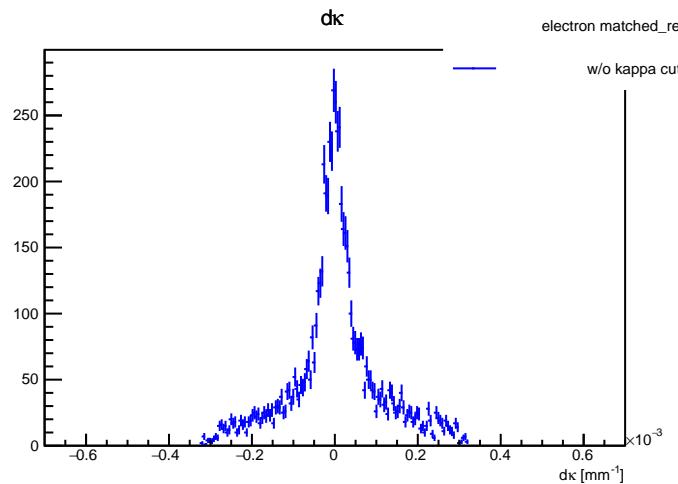
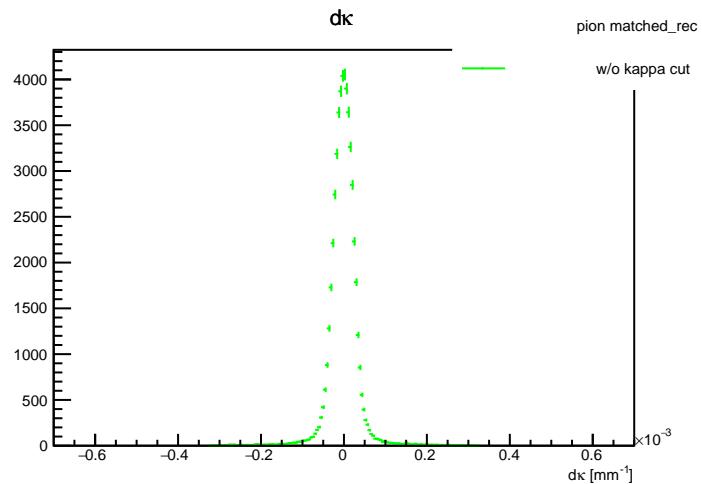
muon matched\_rec

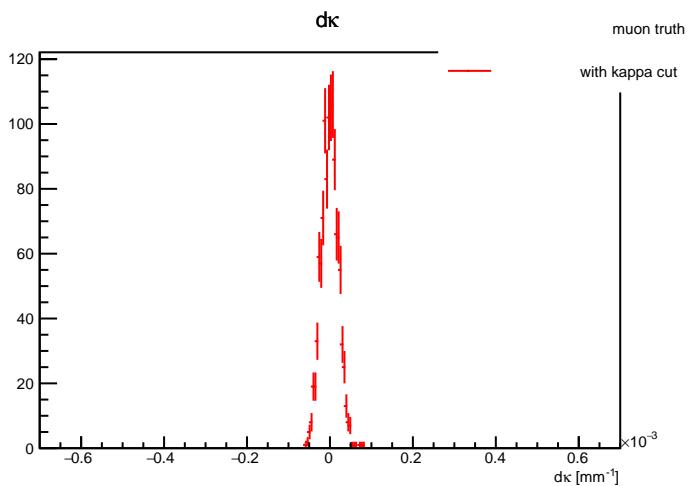
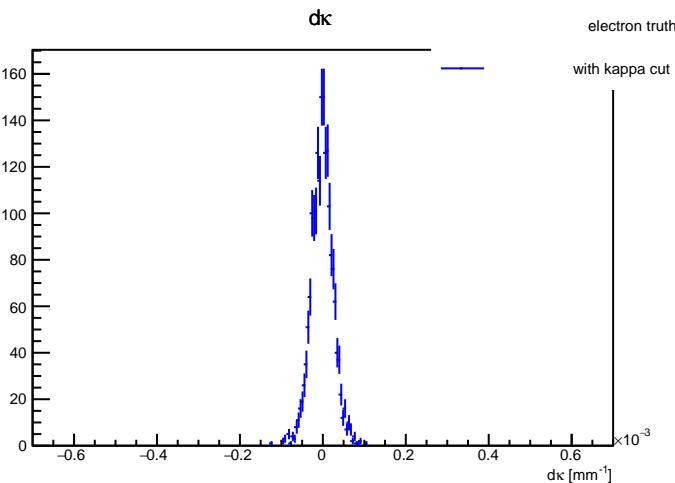
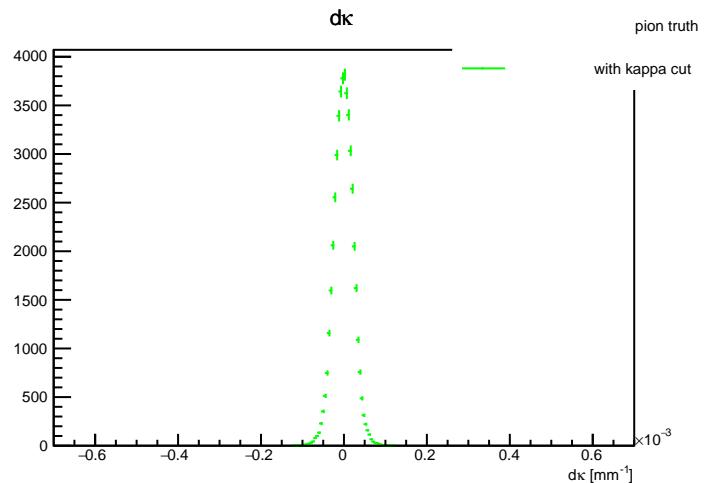
with kappa cut



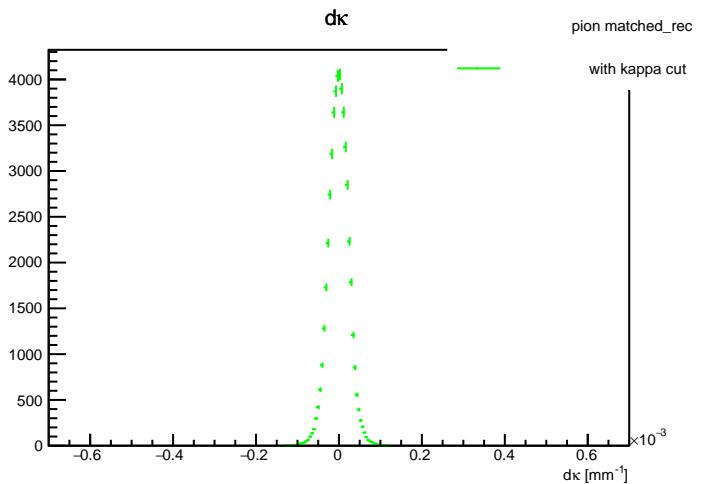








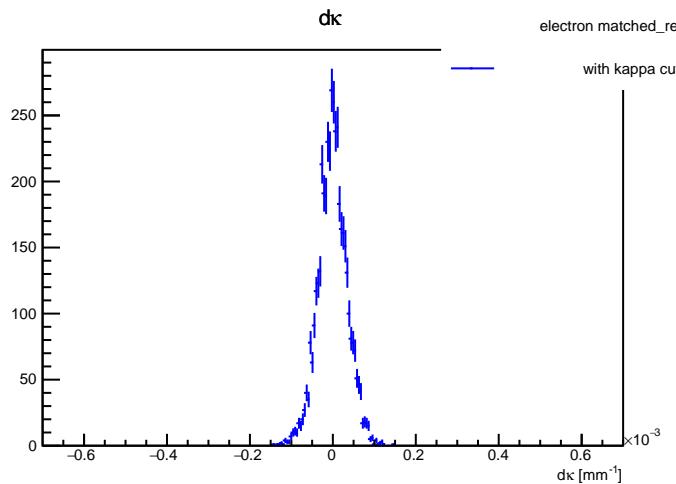
dk



pion matched\_rec

with kappa cut

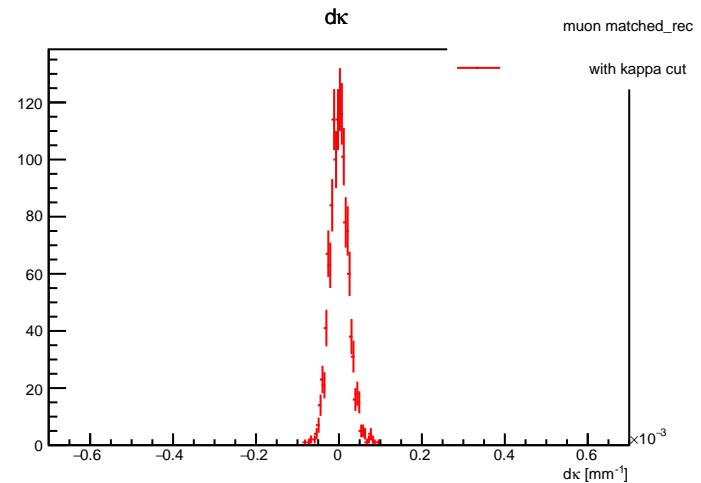
dk



electron matched\_rec

with kappa cut

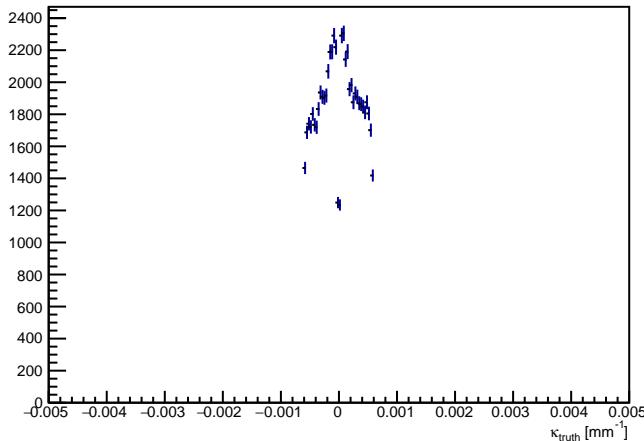
dk



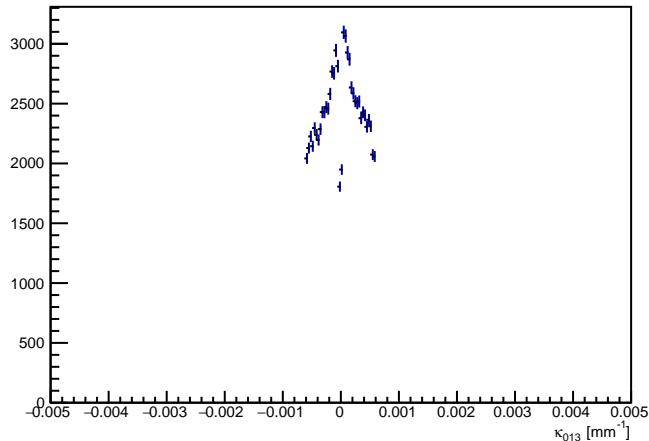
muon matched\_rec

with kappa cut

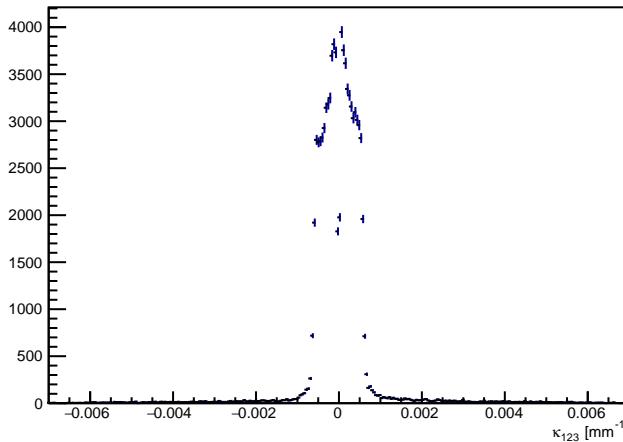
kappa truth



kappa rec with bml constraint

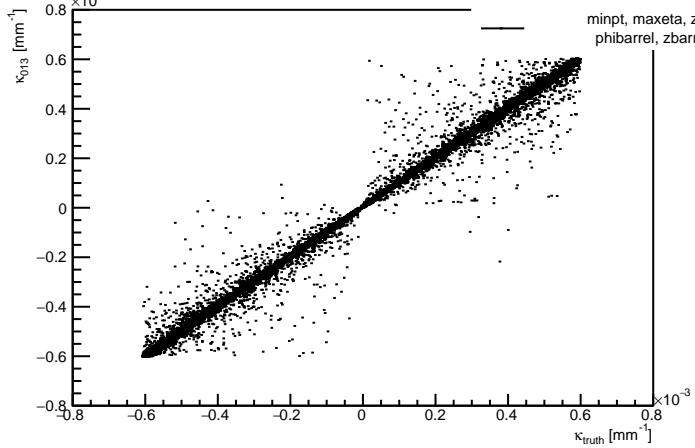


kappa rec w/o bml constraint

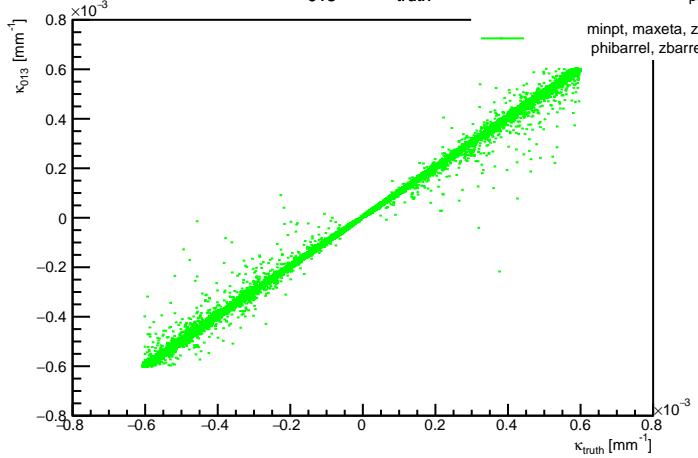


$\kappa_{013}$  Vs  $\kappa_{\text{truth}}$ 

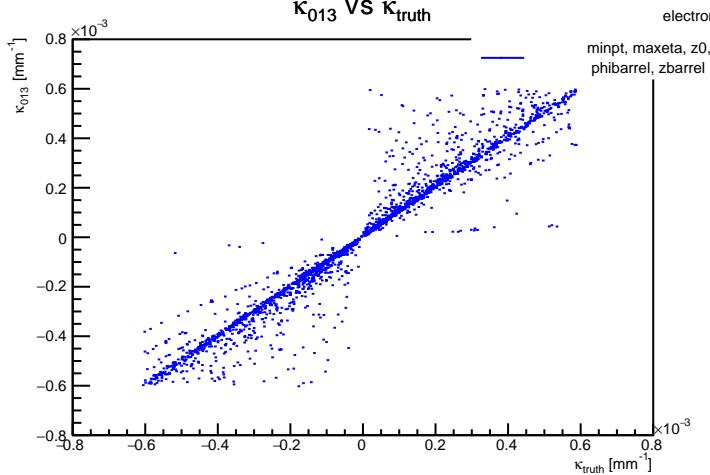
all

 $\kappa_{013}$  Vs  $\kappa_{\text{truth}}$ 

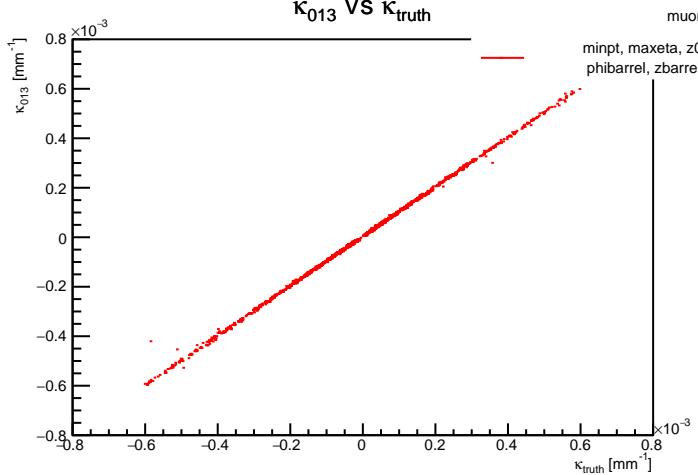
pion

 $\kappa_{013}$  Vs  $\kappa_{\text{truth}}$ 

electron

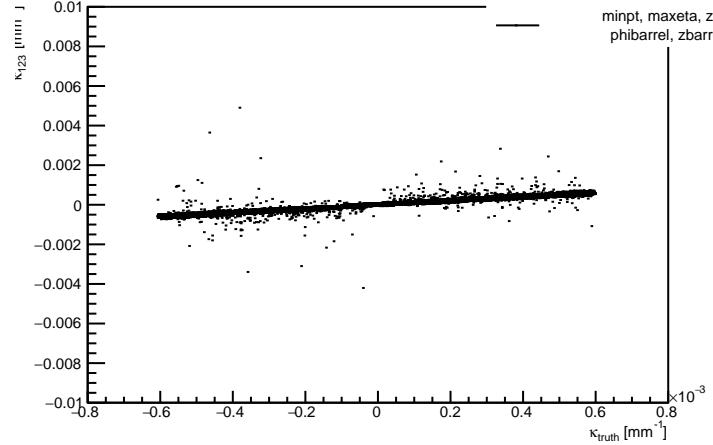
 $\kappa_{013}$  Vs  $\kappa_{\text{truth}}$ 

muon's

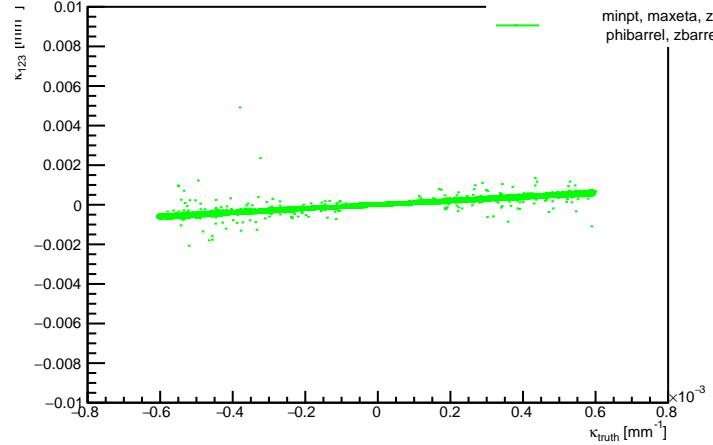


$\kappa_{123}$  Vs  $\kappa_{\text{truth}}$ 

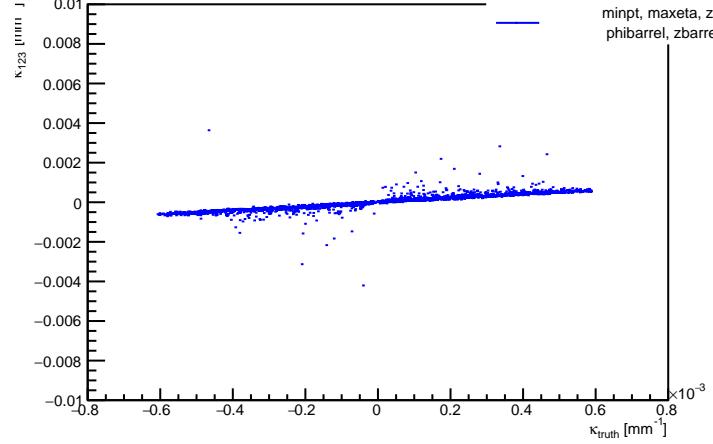
all

 $\kappa_{123}$  Vs  $\kappa_{\text{truth}}$ 

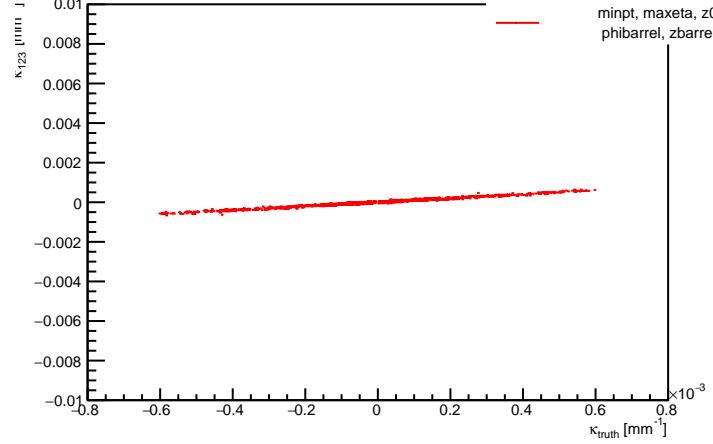
pion

 $\kappa_{123}$  Vs  $\kappa_{\text{truth}}$ 

electron

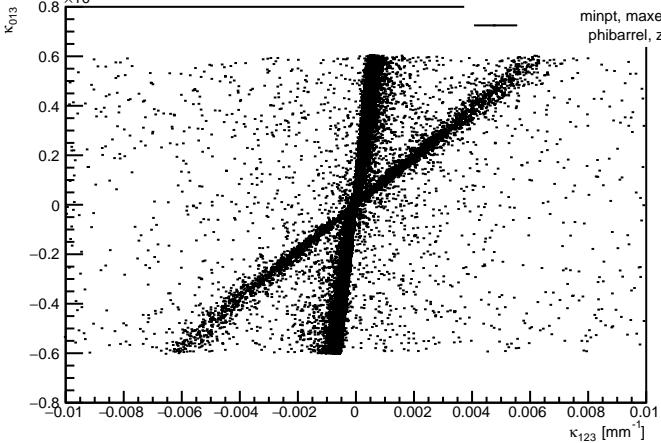
 $\kappa_{123}$  Vs  $\kappa_{\text{truth}}$ 

muon's

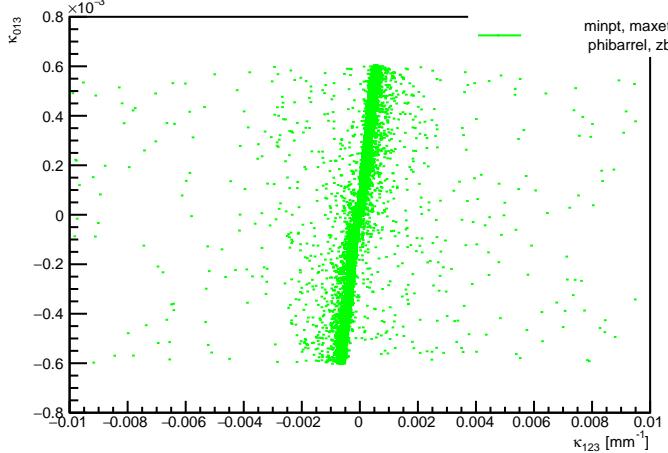


$\kappa_{013}$  Vs  $\kappa_{123}$ 

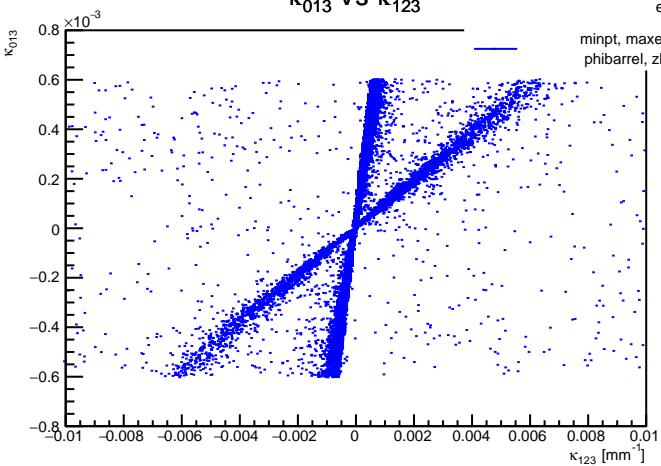
all

 $\kappa_{013}$  Vs  $\kappa_{123}$ 

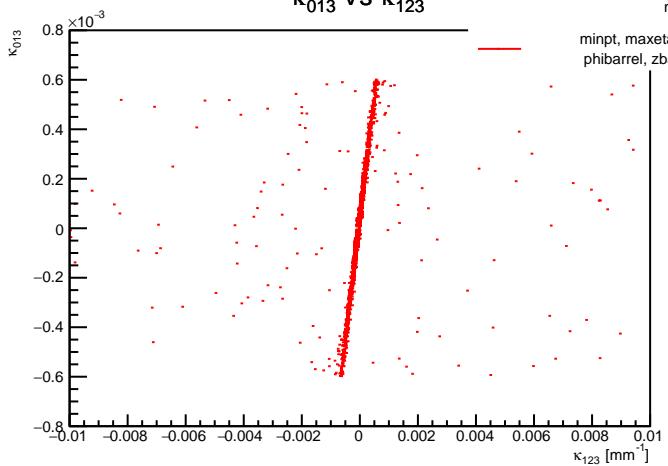
pion

 $\kappa_{013}$  Vs  $\kappa_{123}$ 

electron

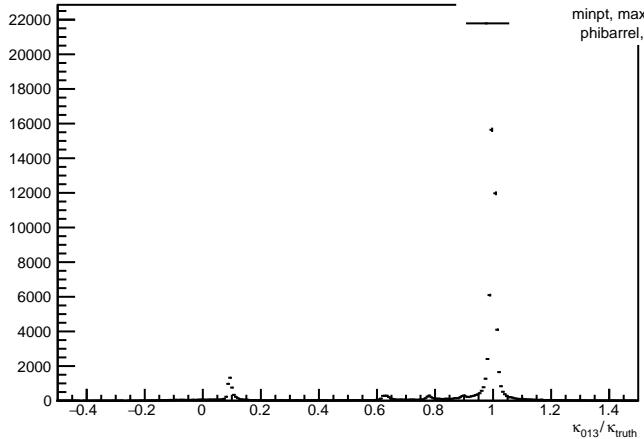
 $\kappa_{013}$  Vs  $\kappa_{123}$ 

muon's

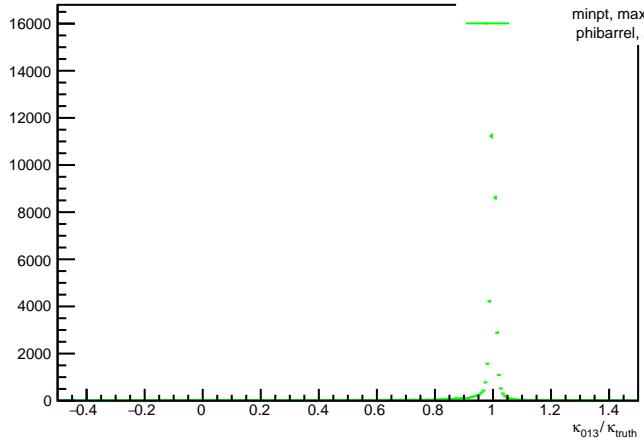


$\kappa_{013}/\kappa_{\text{truth}}$ 

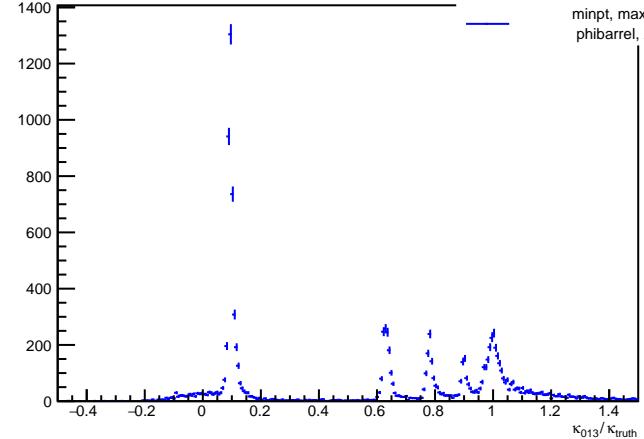
all

 $\kappa_{013}/\kappa_{\text{truth}}$ 

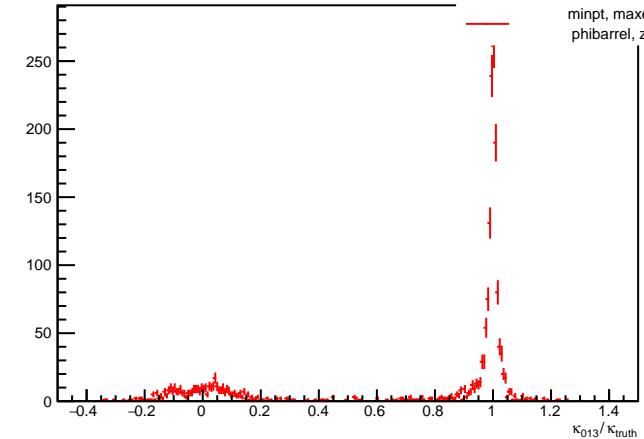
pion

 $\kappa_{013}/\kappa_{\text{truth}}$ 

electron

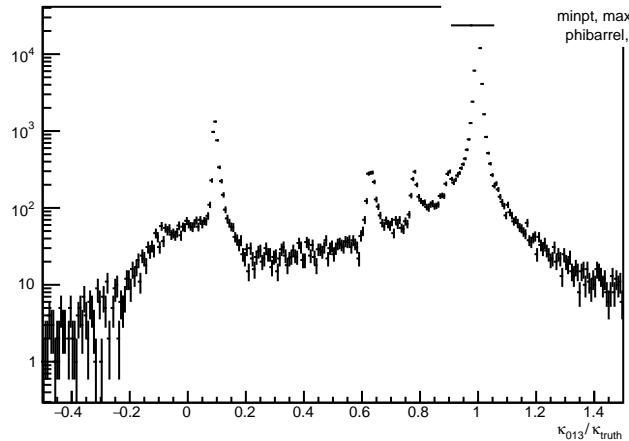
 $\kappa_{013}/\kappa_{\text{truth}}$ 

muon's

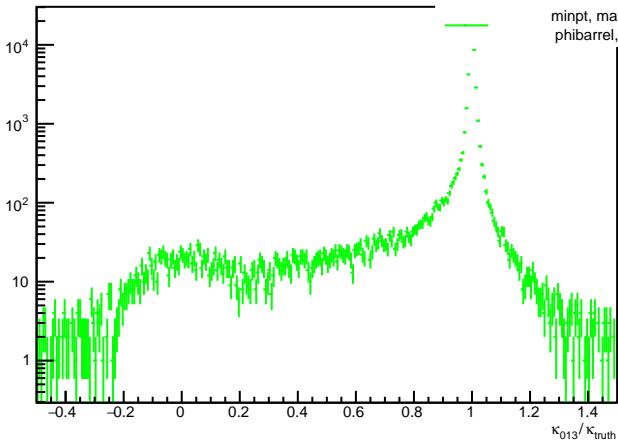


$\kappa_{013}/\kappa_{\text{truth}}$ 

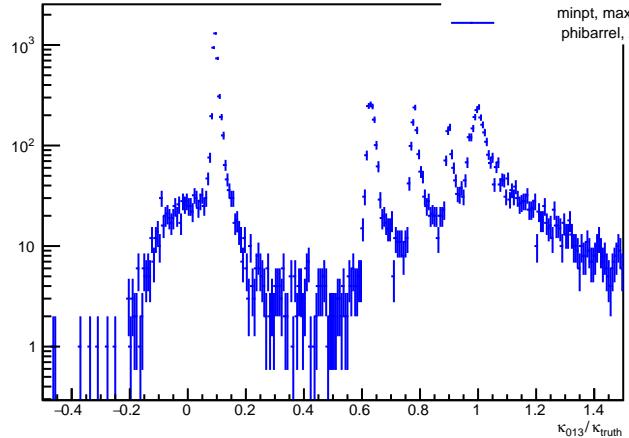
all

 $\kappa_{013}/\kappa_{\text{truth}}$ 

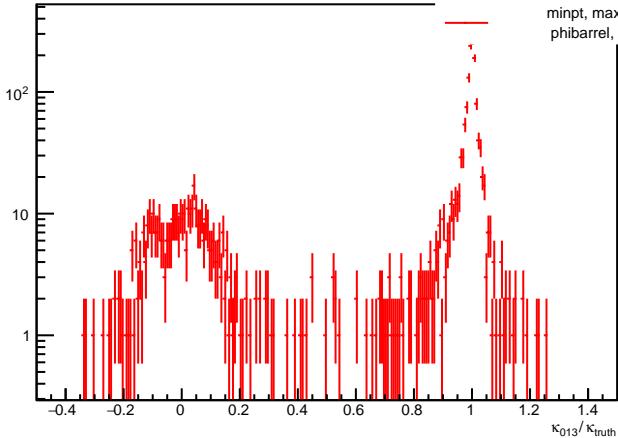
pion

 $\kappa_{013}/\kappa_{\text{truth}}$ 

electron

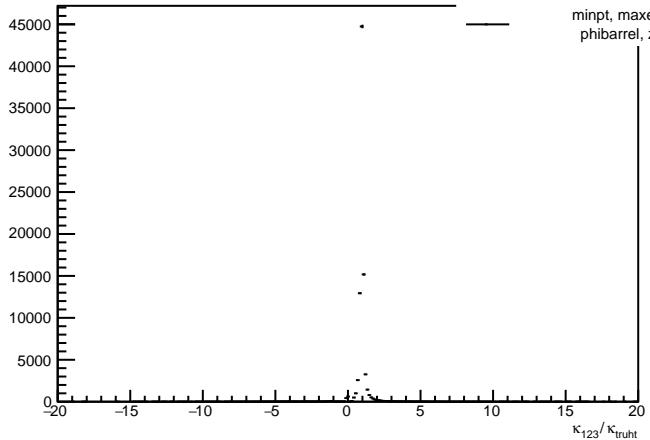
 $\kappa_{013}/\kappa_{\text{truth}}$ 

muon's

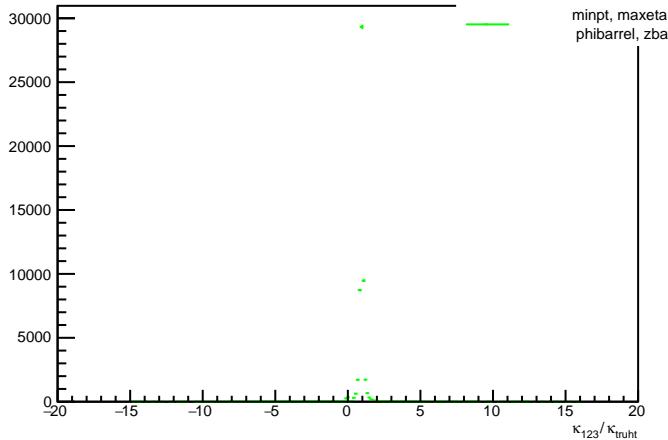


$\kappa_{123}/\kappa_{\text{truth}}$ 

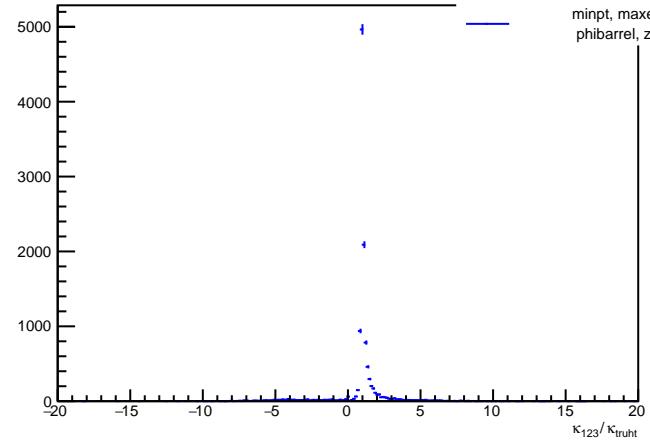
all

 $\kappa_{123}/\kappa_{\text{truth}}$ 

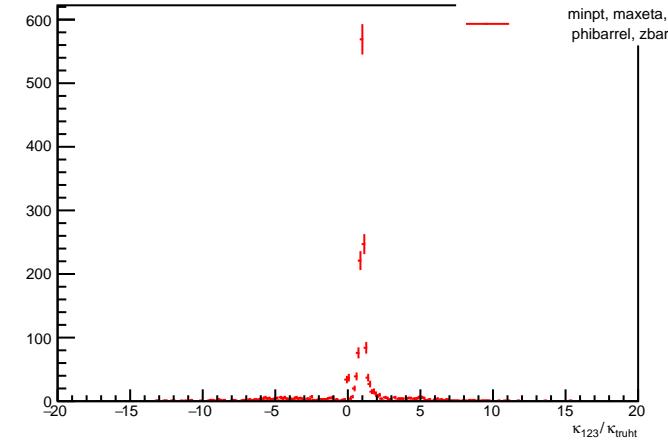
pion

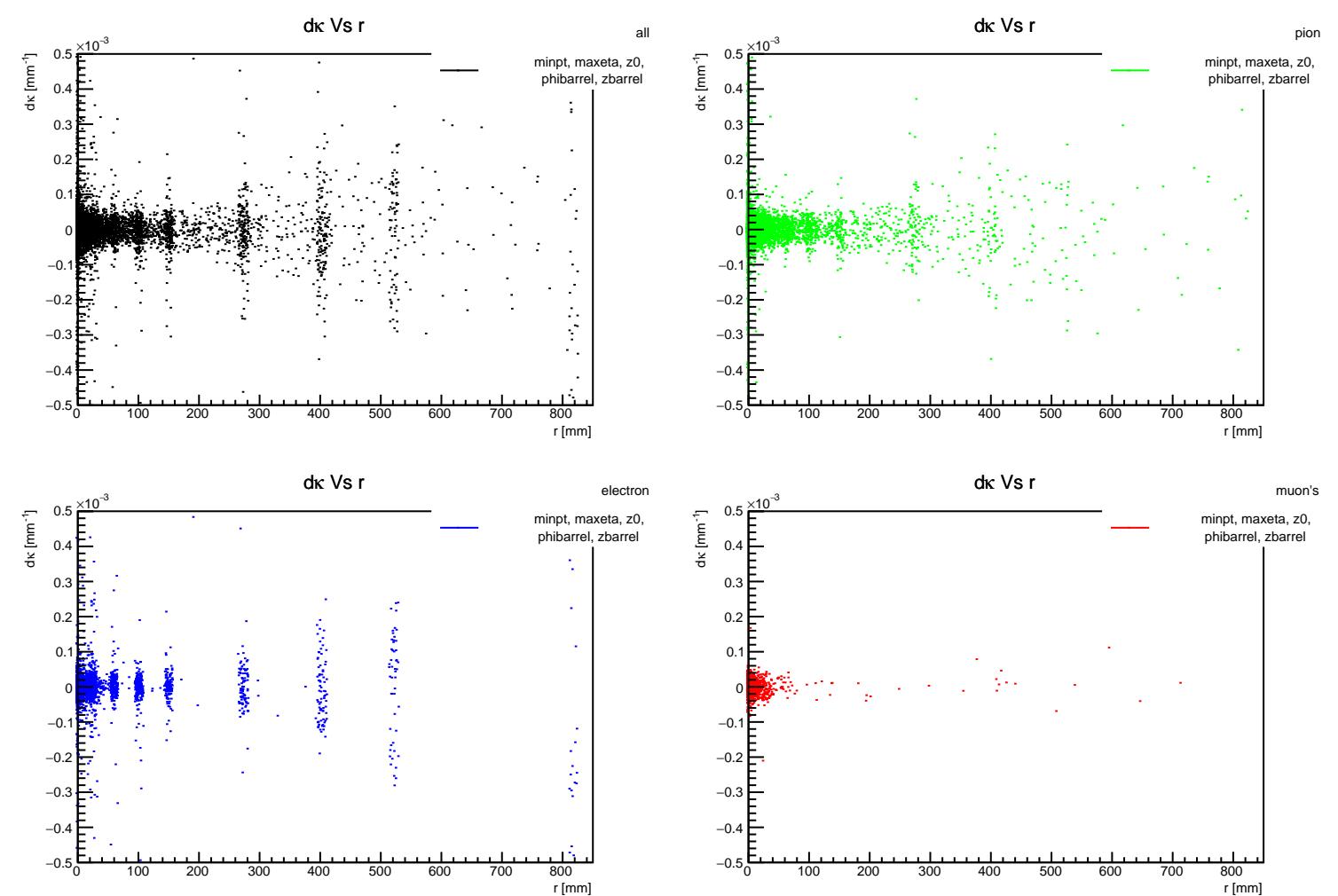
 $\kappa_{123}/\kappa_{\text{truth}}$ 

electron

 $\kappa_{123}/\kappa_{\text{truth}}$ 

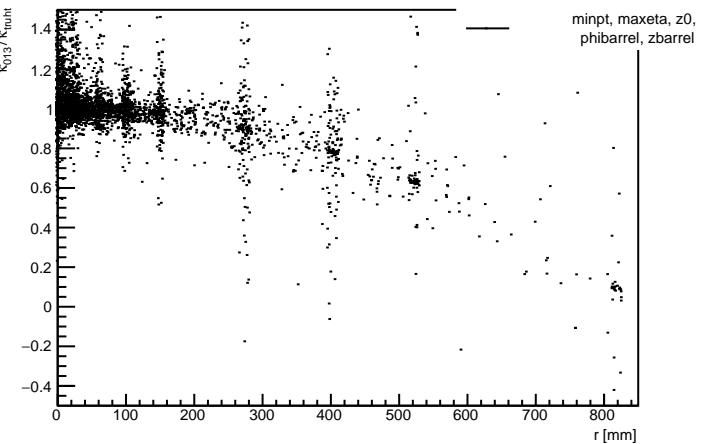
muon's



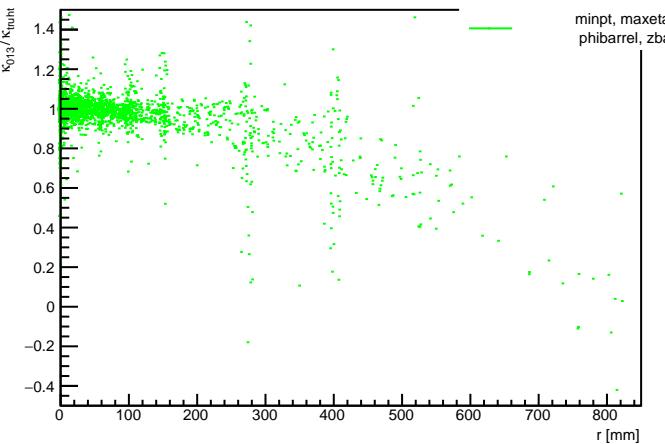


$\kappa_{013}/\kappa_{\text{truth}}$  Vs  $r$ 

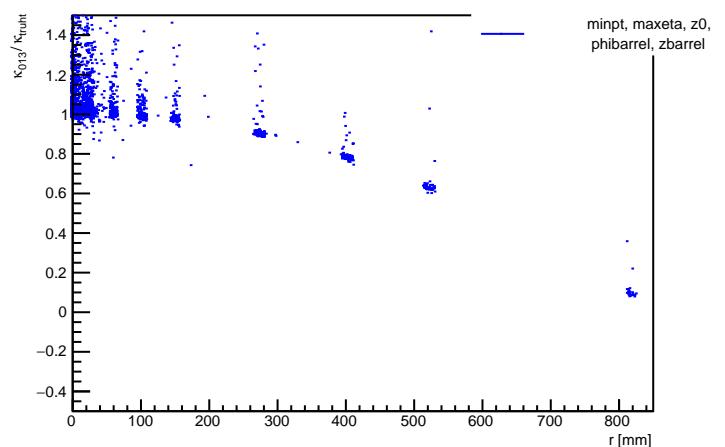
all

 $\kappa_{013}/\kappa_{\text{truth}}$  Vs  $r$ 

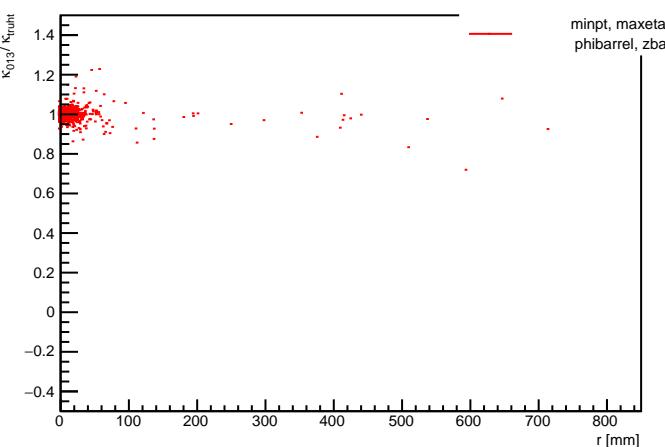
pion

 $\kappa_{013}/\kappa_{\text{truth}}$  Vs  $r$ 

electron

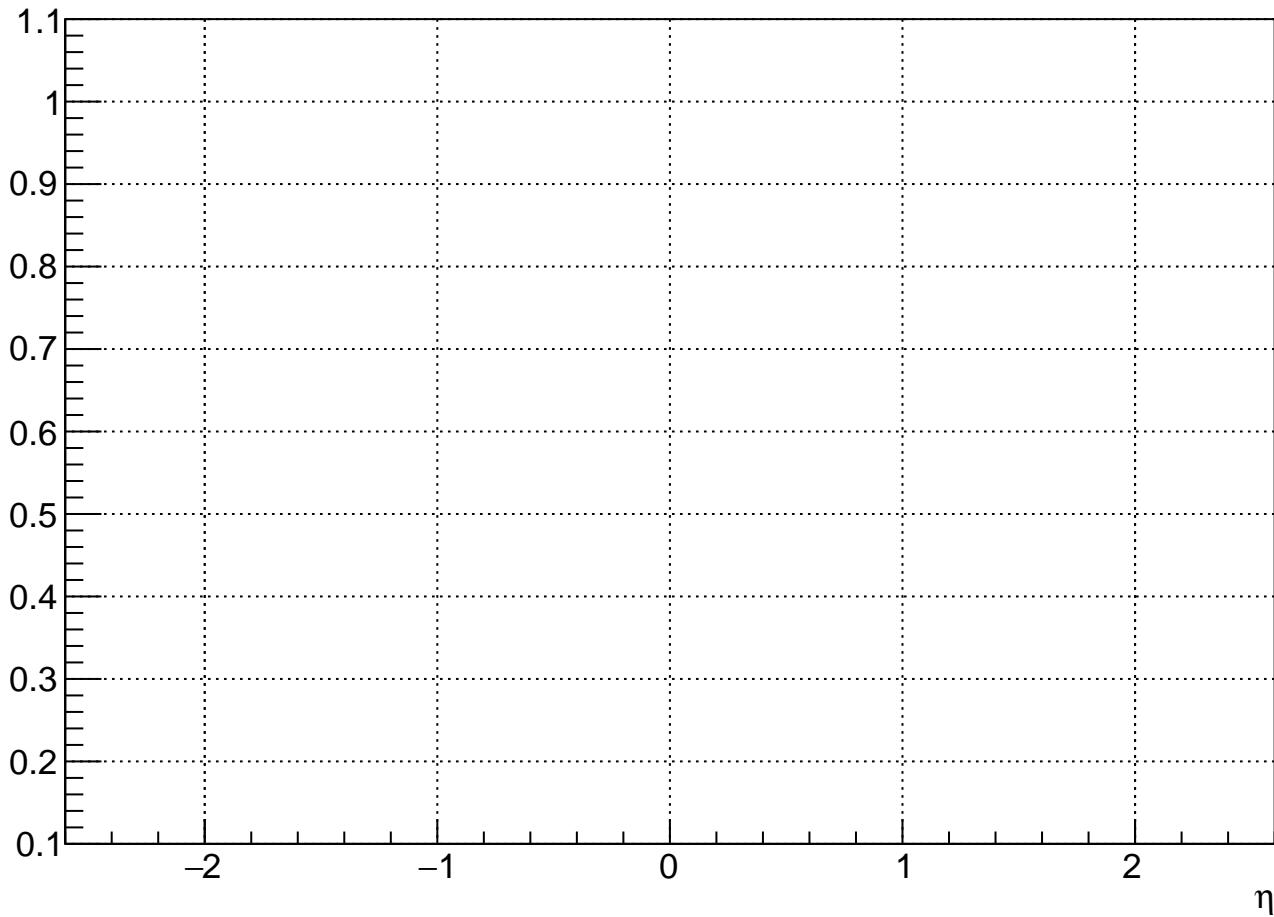
 $\kappa_{013}/\kappa_{\text{truth}}$  Vs  $r$ 

muon's



# Purity vs $\eta$

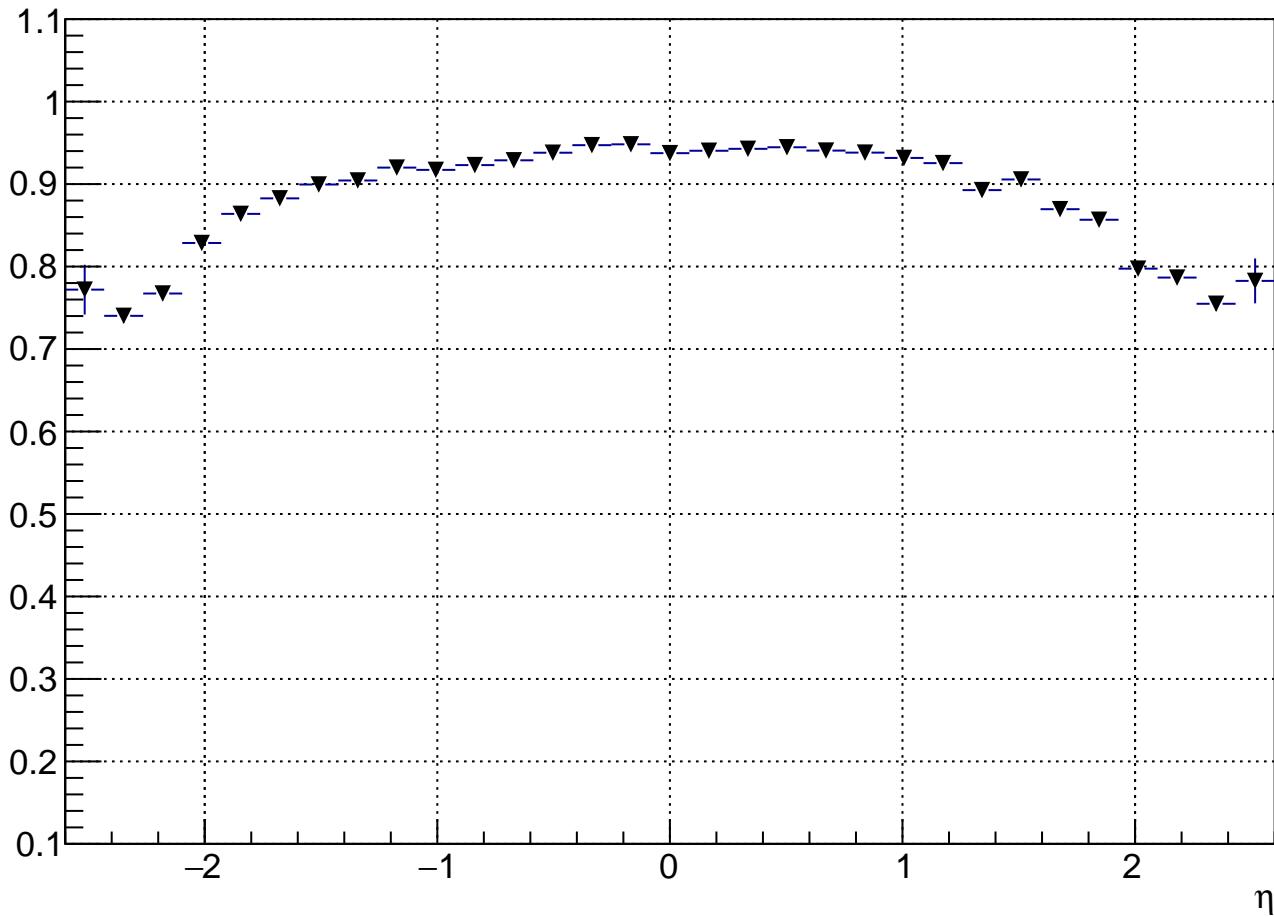
Purity



$\eta$

# Purity vs $\eta$

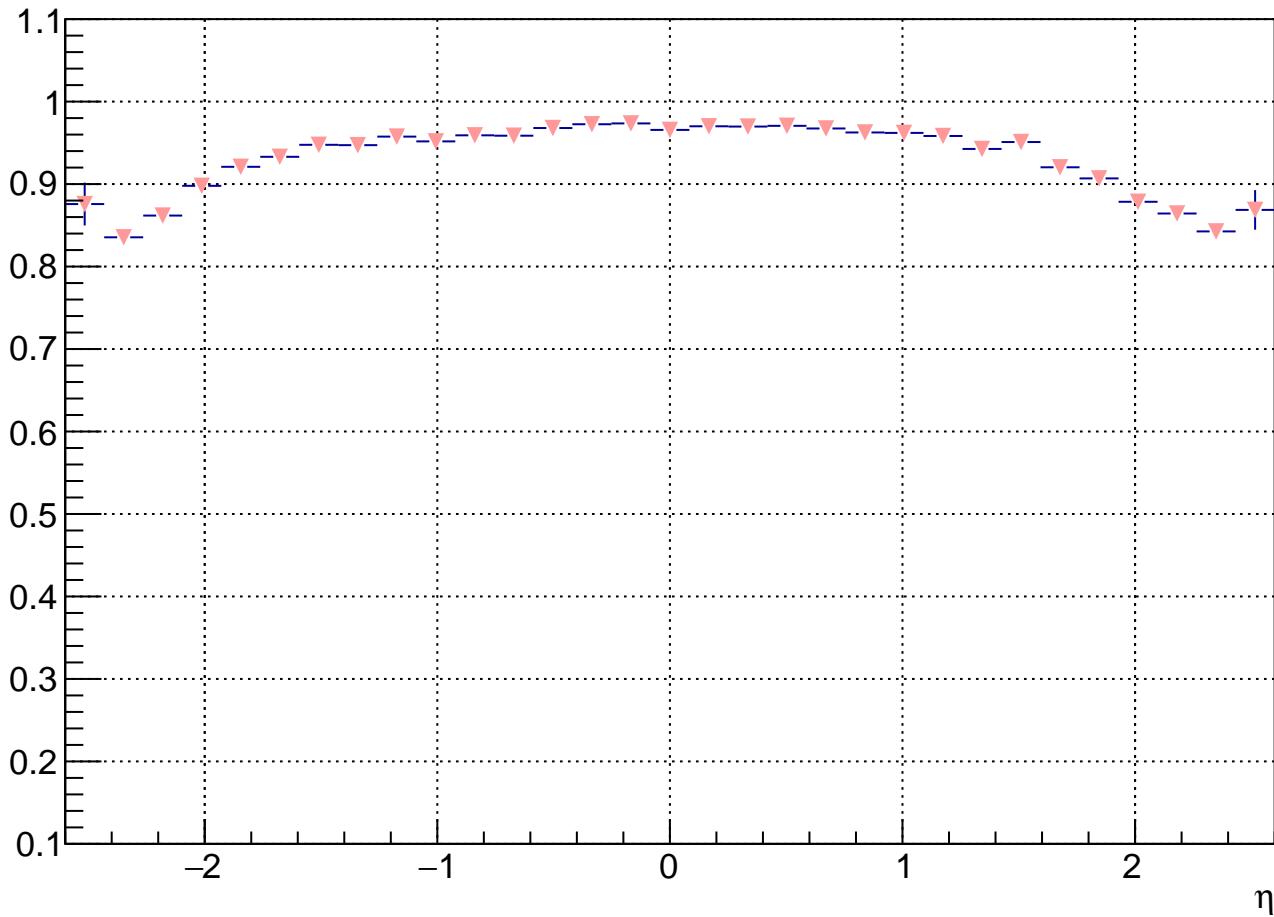
Purity



$\eta$

# Purity vs $\eta$

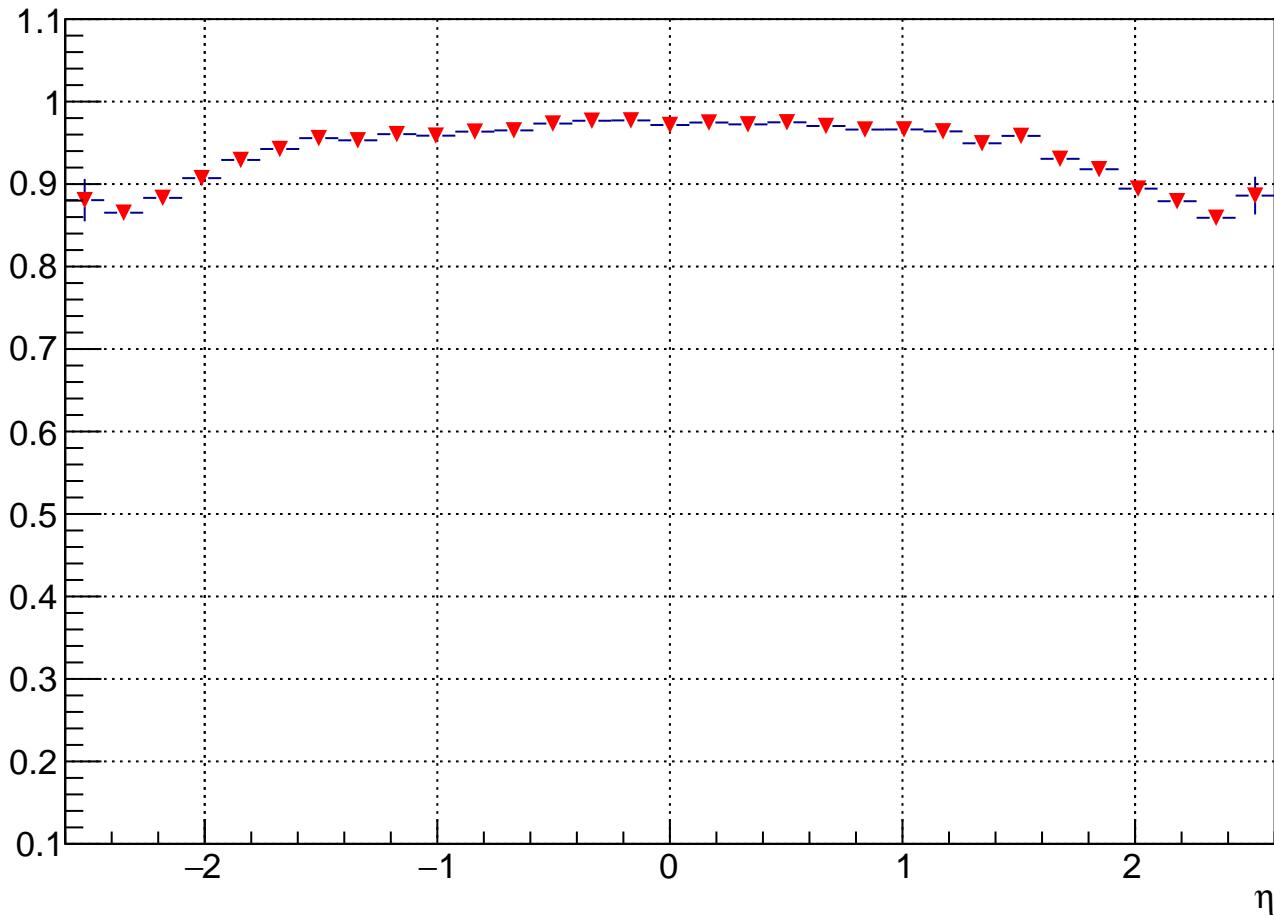
Purity



$\eta$

# Purity vs $\eta$

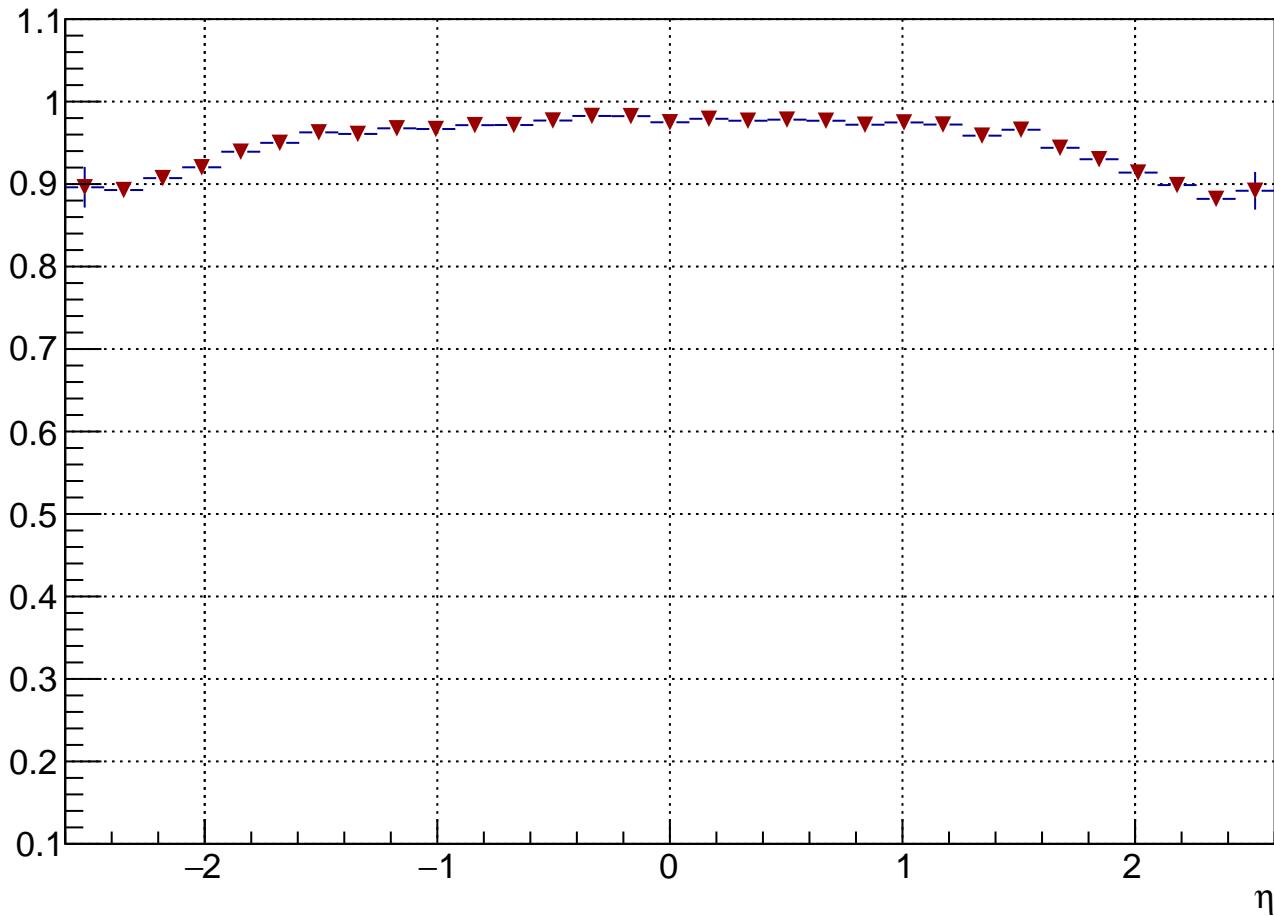
Purity



$\eta$

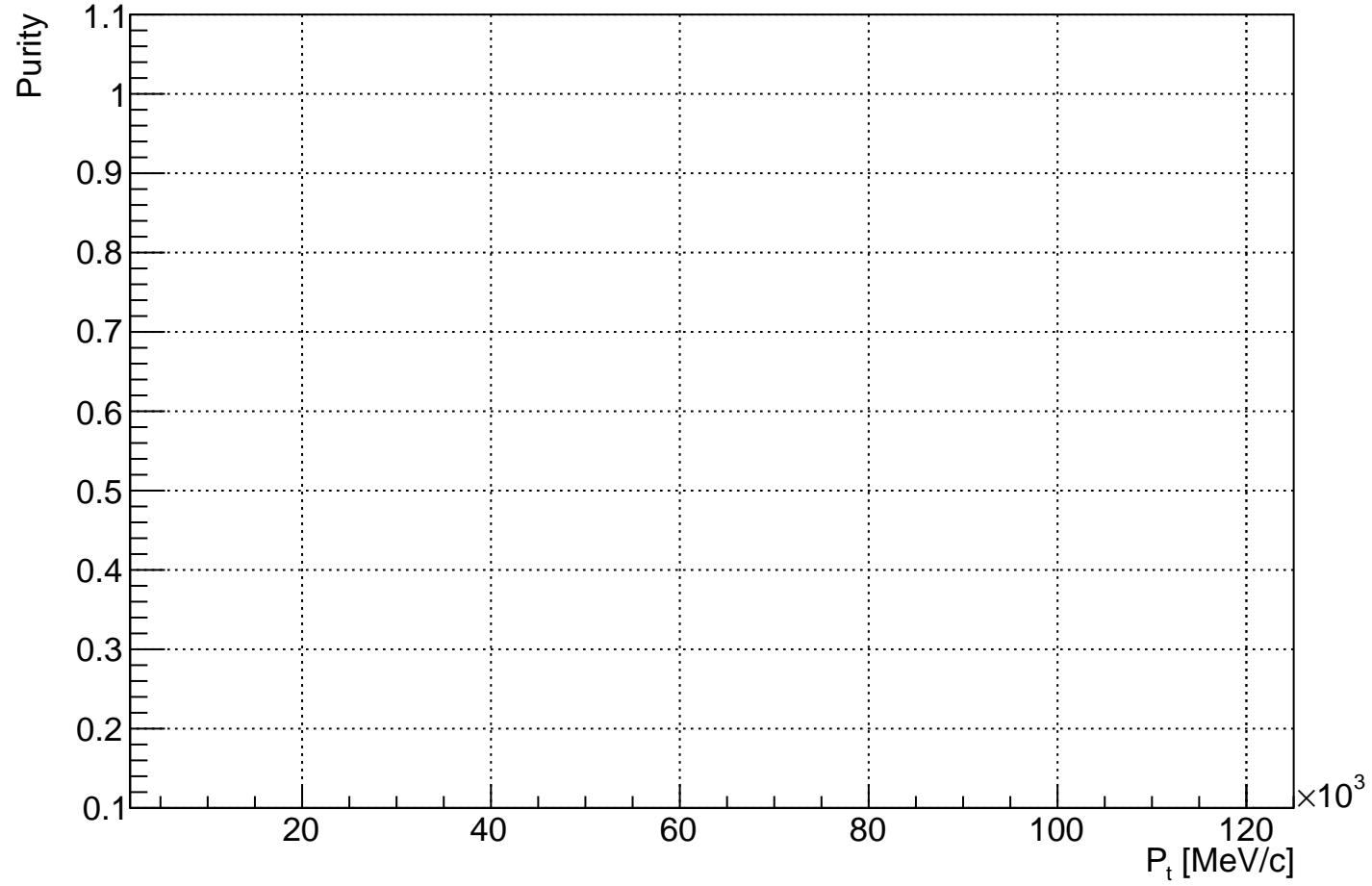
# Purity vs $\eta$

Purity

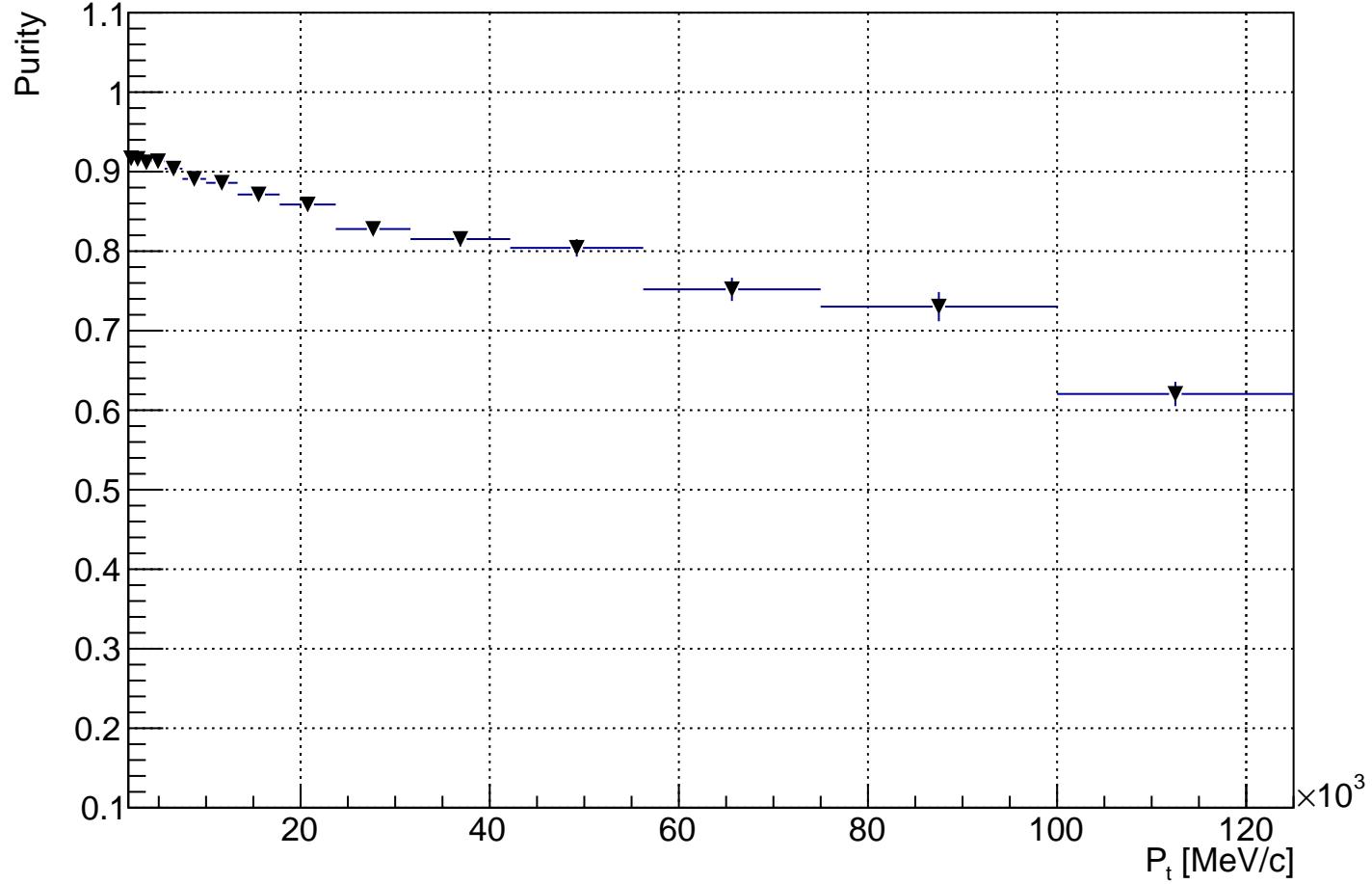


$\eta$

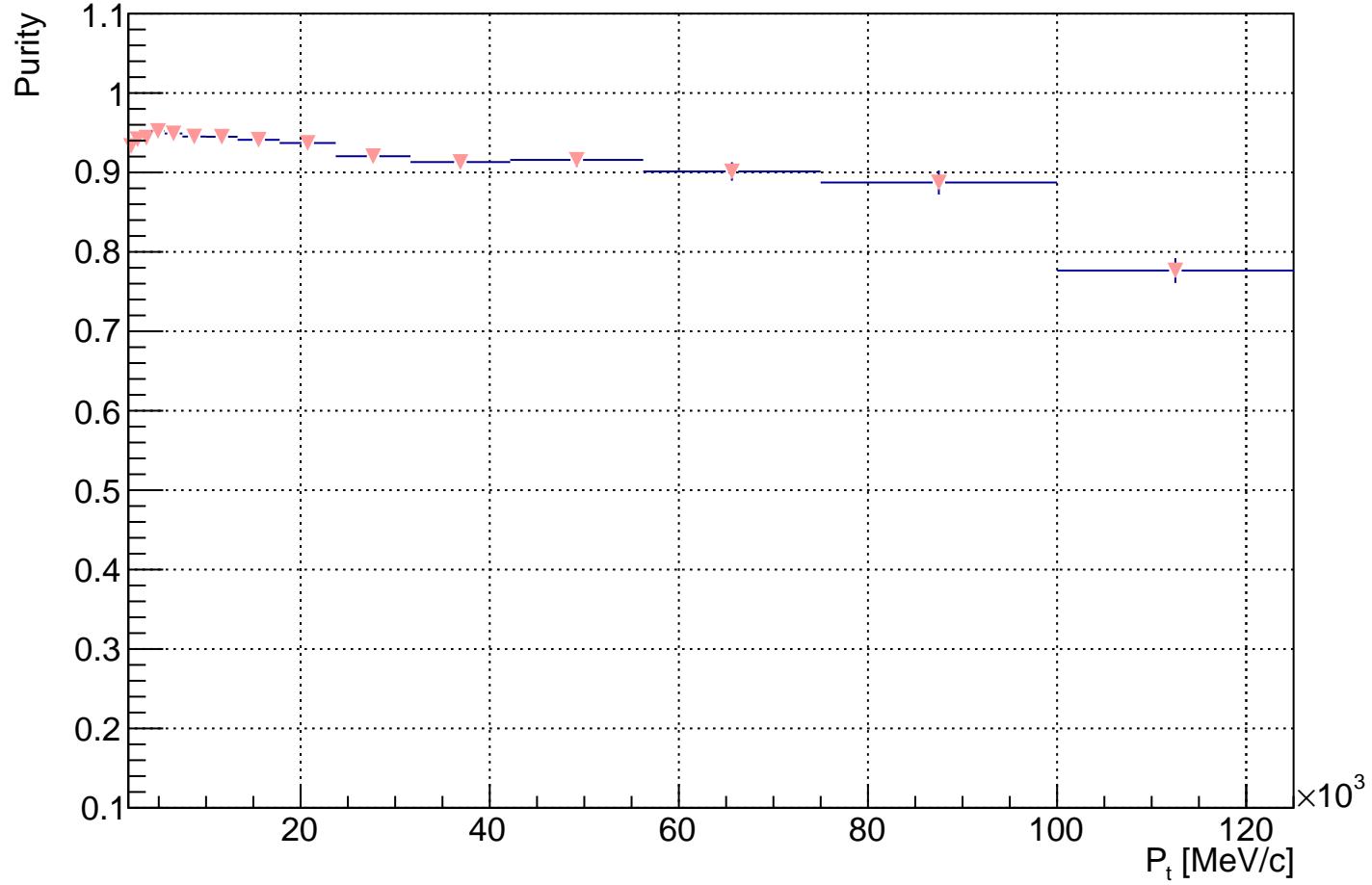
# Purity vs $P_t$



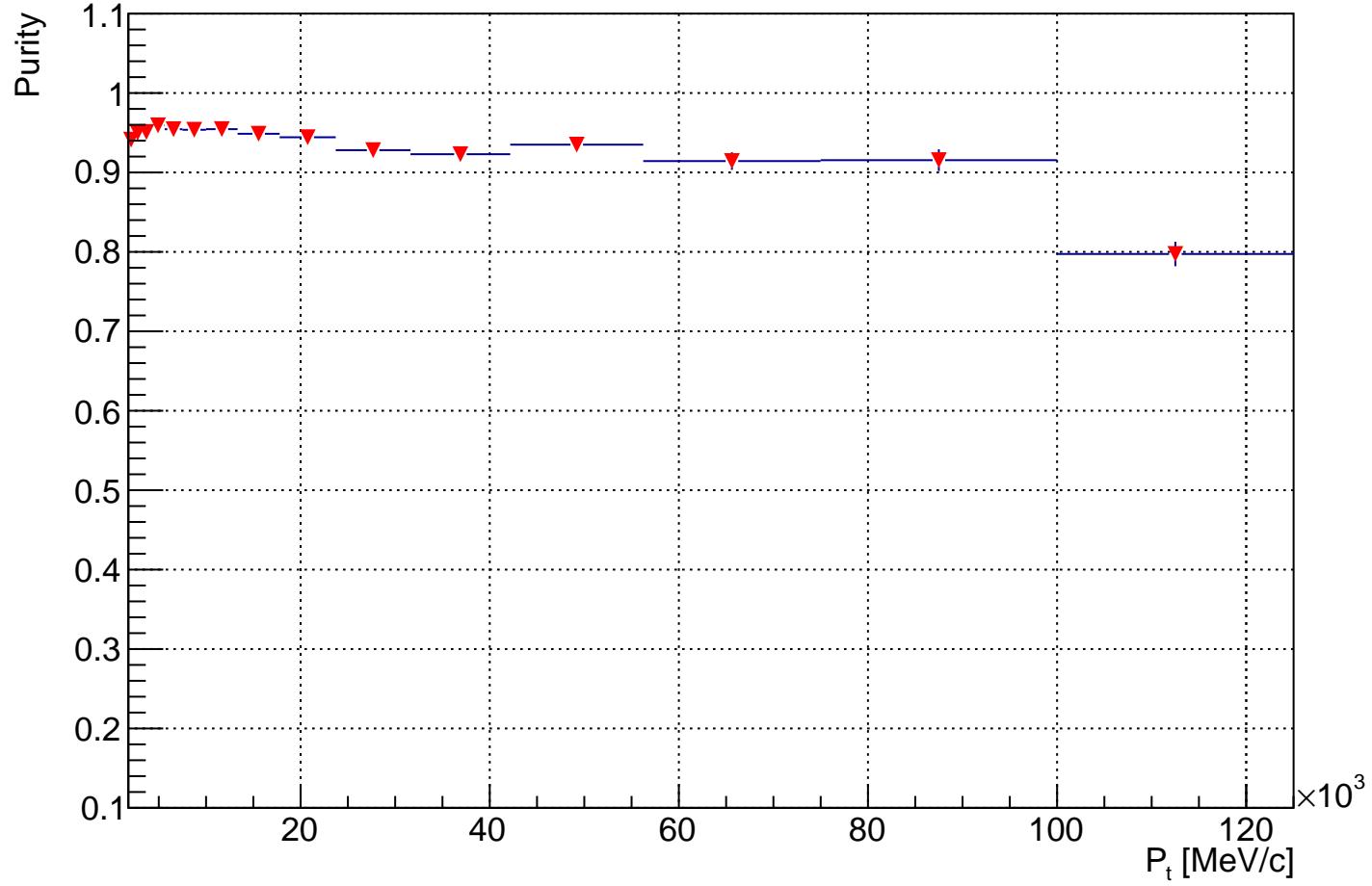
# Purity vs $P_t$



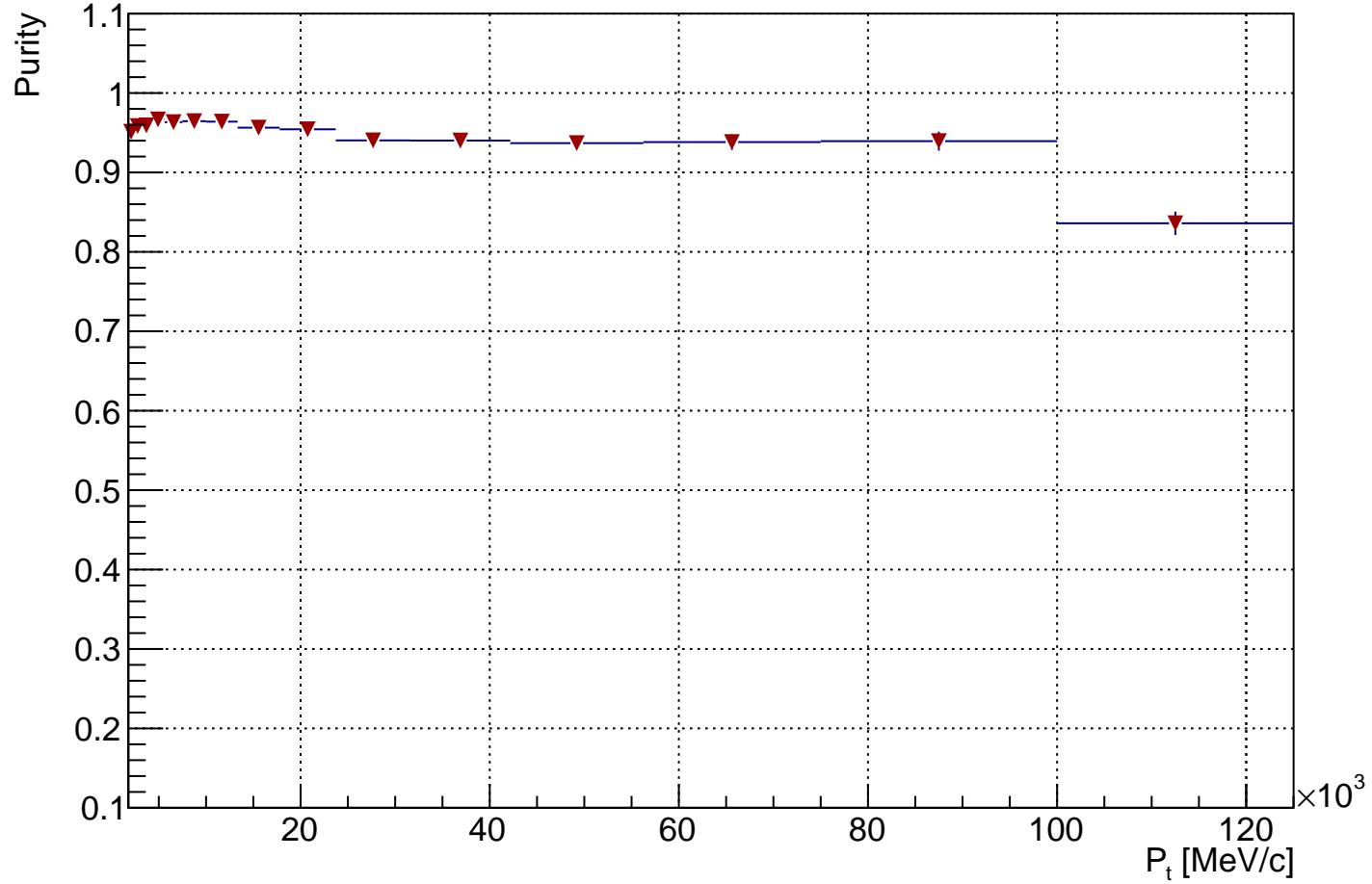
# Purity vs $P_t$



# Purity vs $P_t$

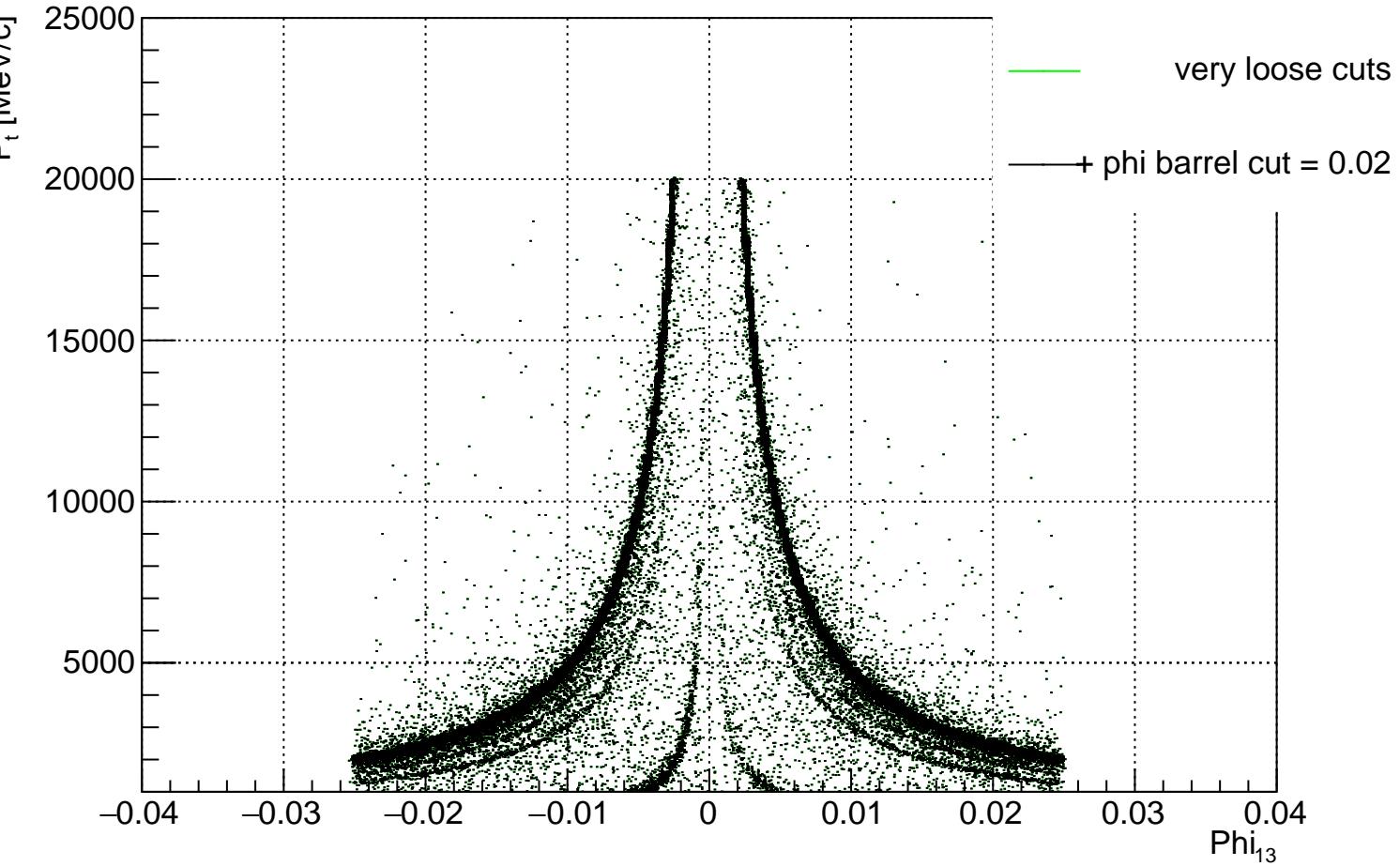


# Purity vs $P_t$

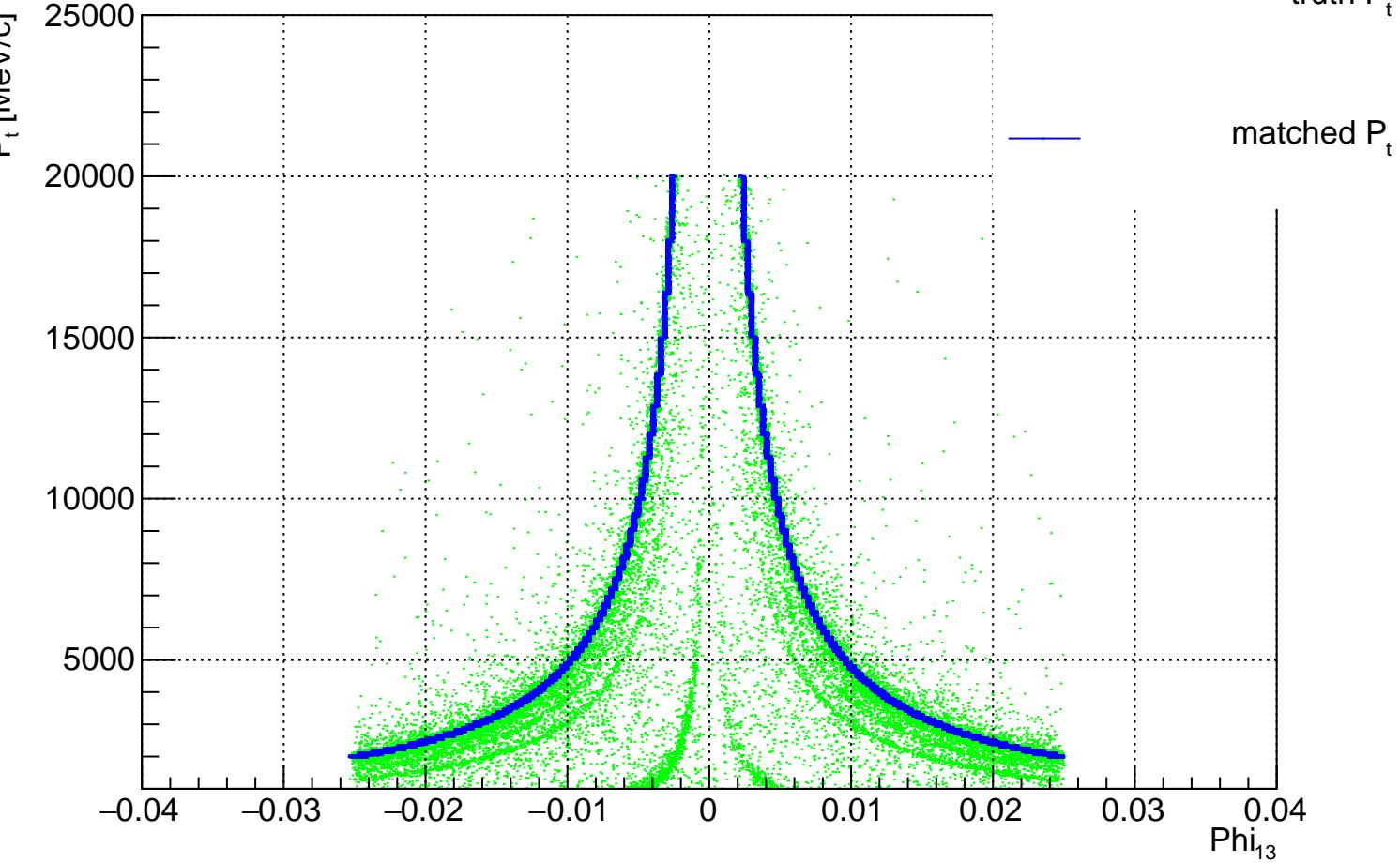


# $P_t$ Vs $\Phi_{13}$

truth  $P_t$

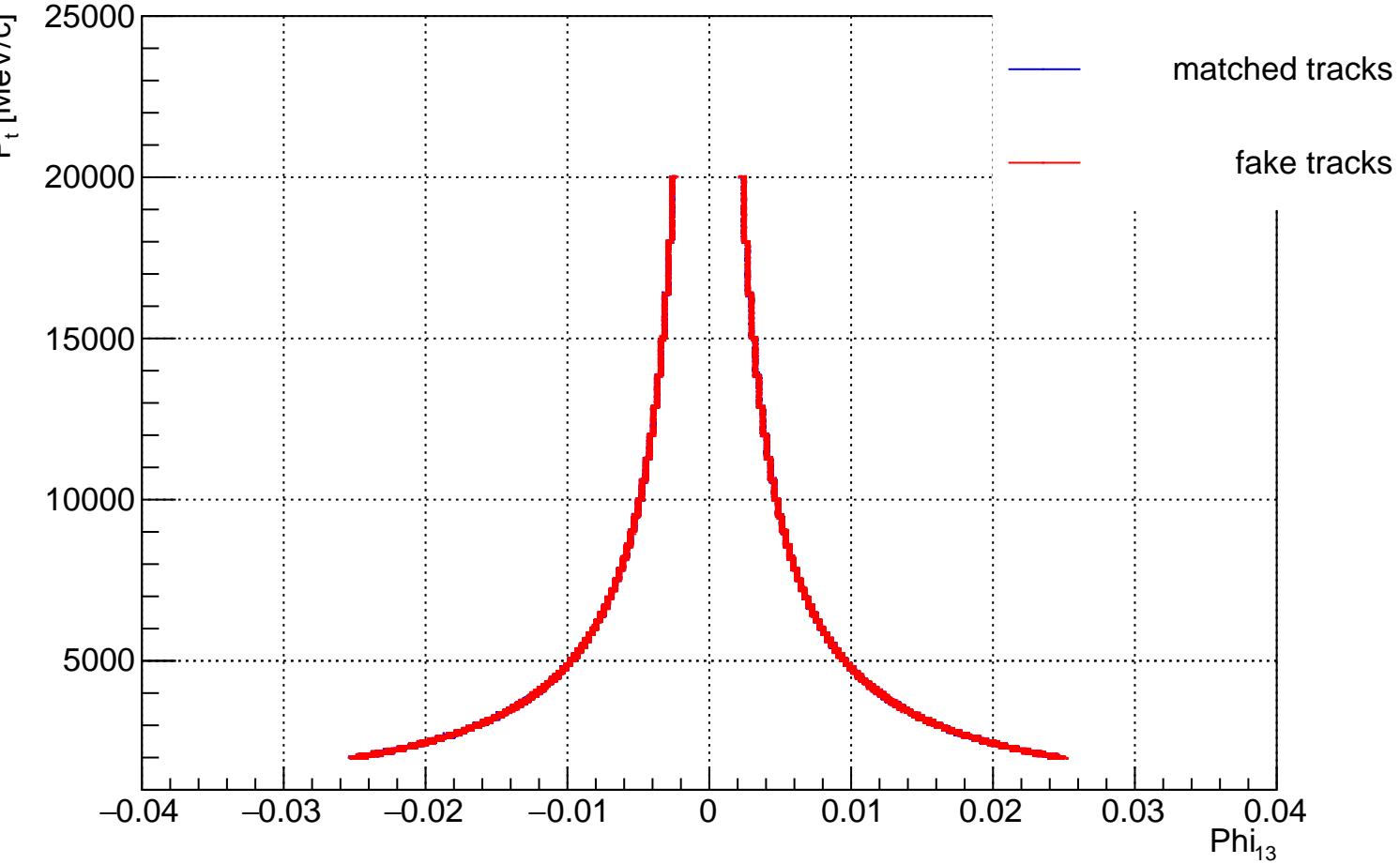


# $P_t$ Vs $\Phi_{13}$

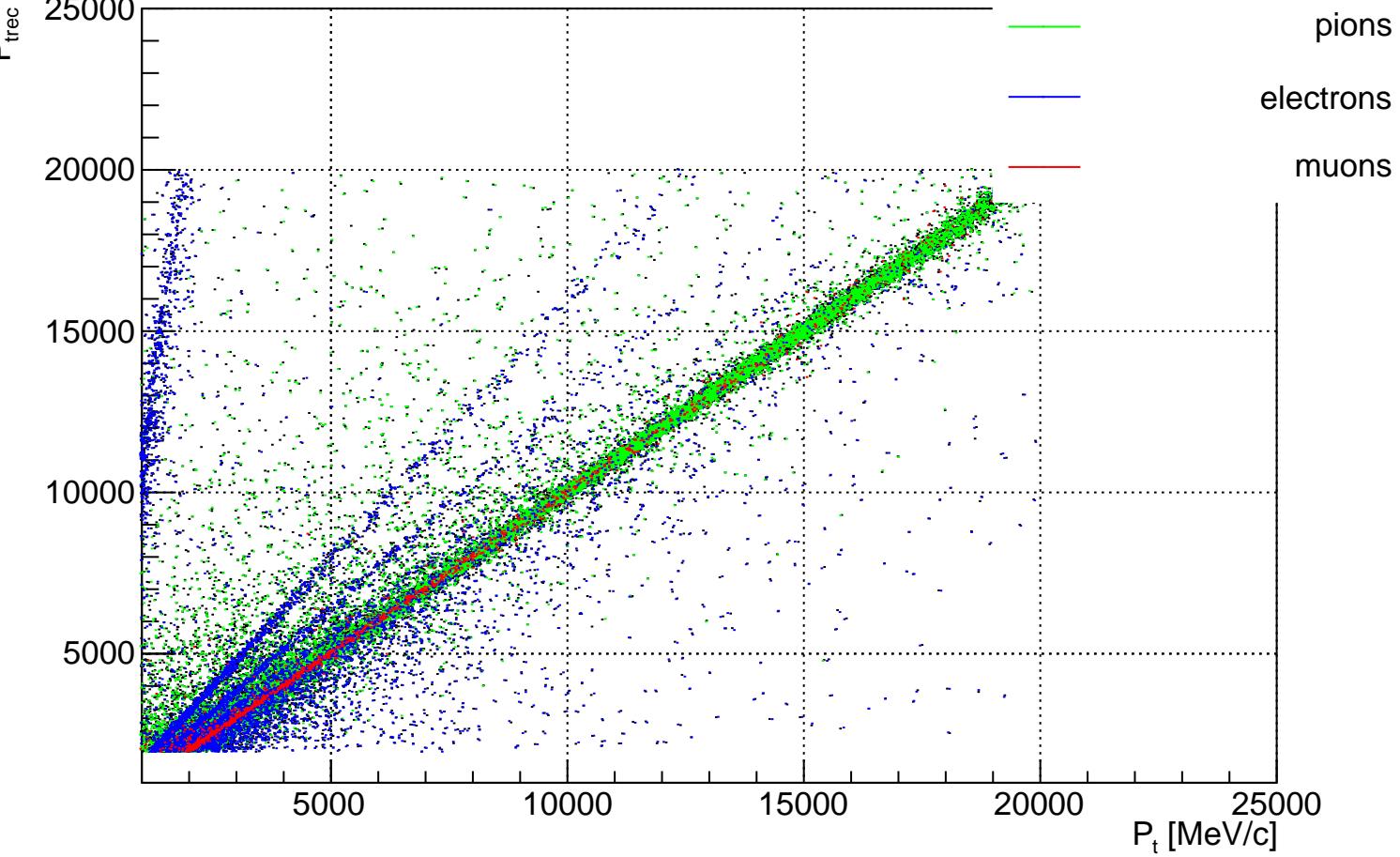


# $P_t$ Vs $\Phi_{13}$

rec  $P_t$

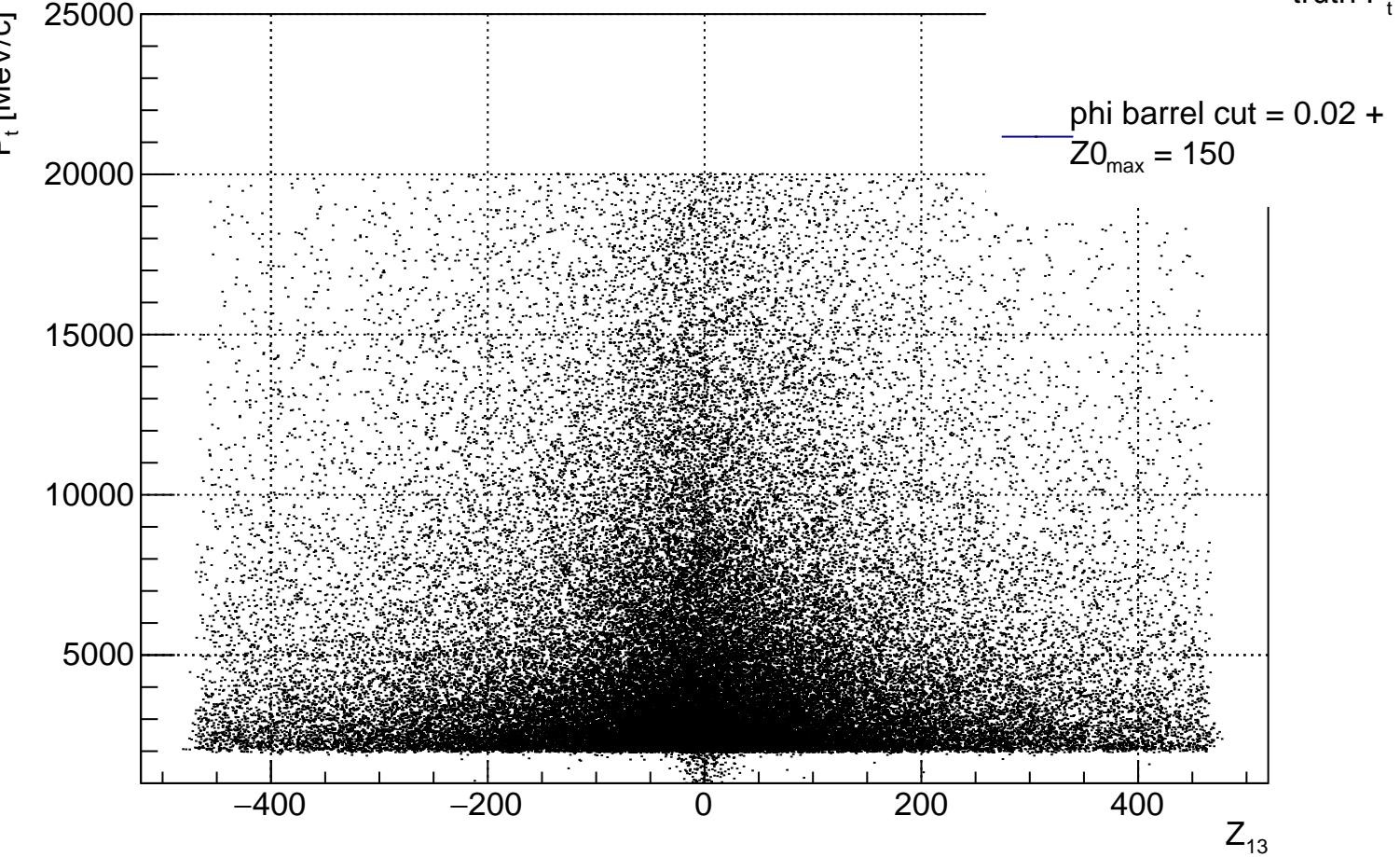


# $P_{\text{trec}}$ Vs $P_t$



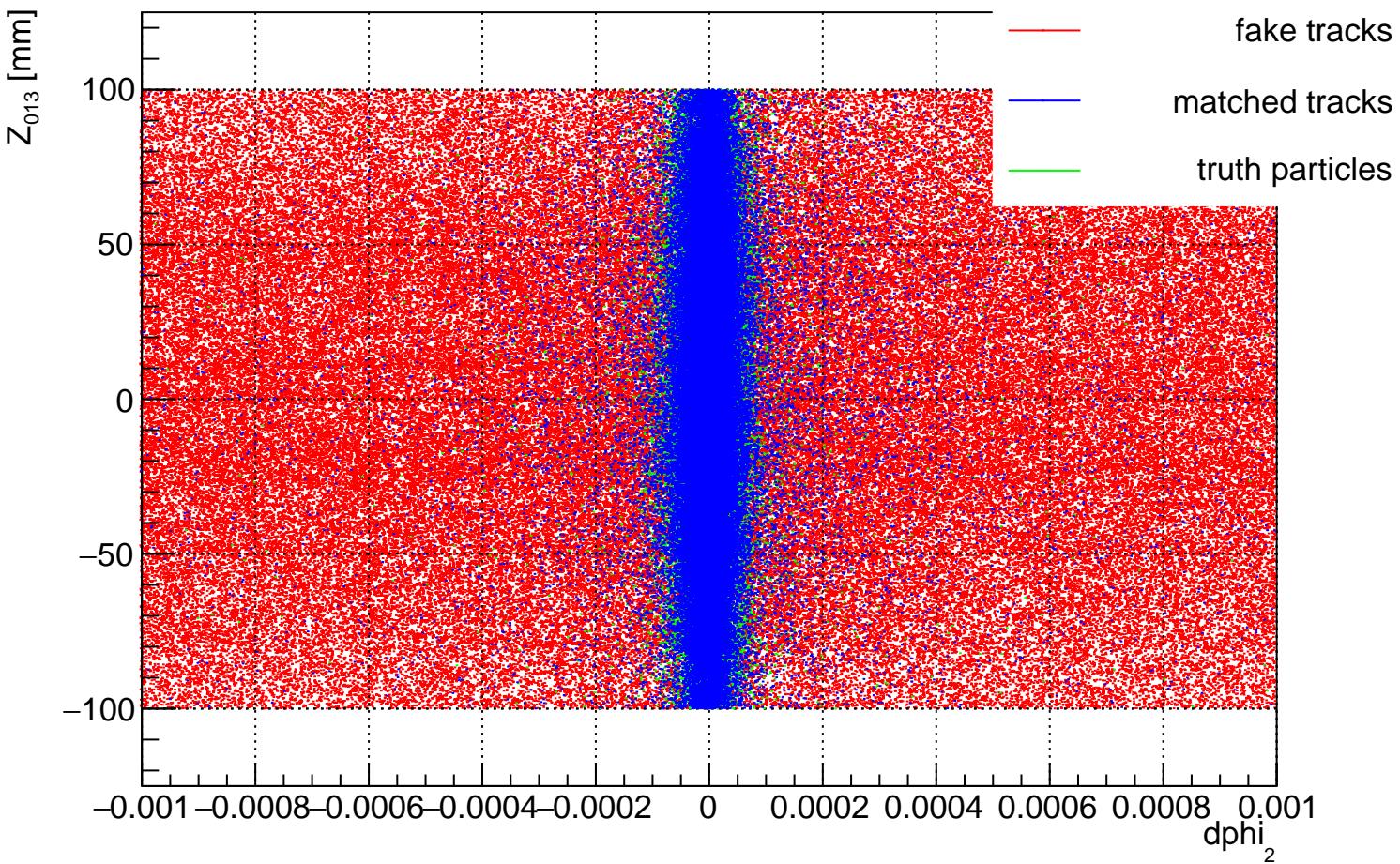
# $P_t$ Vs $Z_{13}$

truth  $P_t$



# $Z_{013}$ Vs $d\phi_i$

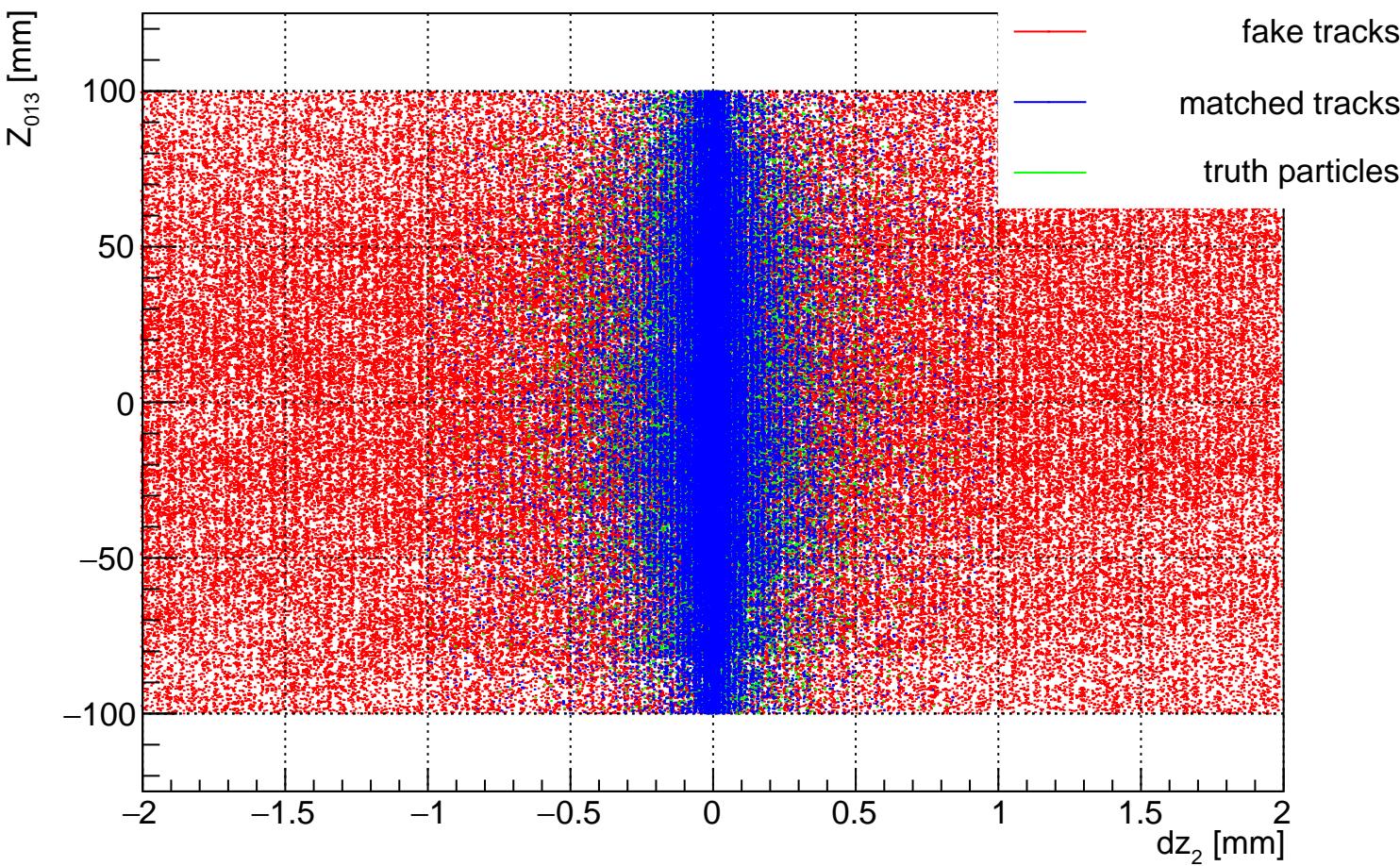
$\phi$  Barrel = 0.02 +  
 $Z_{\text{barrel}} = 160 + Z_0_{\max} = 150$



# $Z_{013}$ Vs $dz_2$

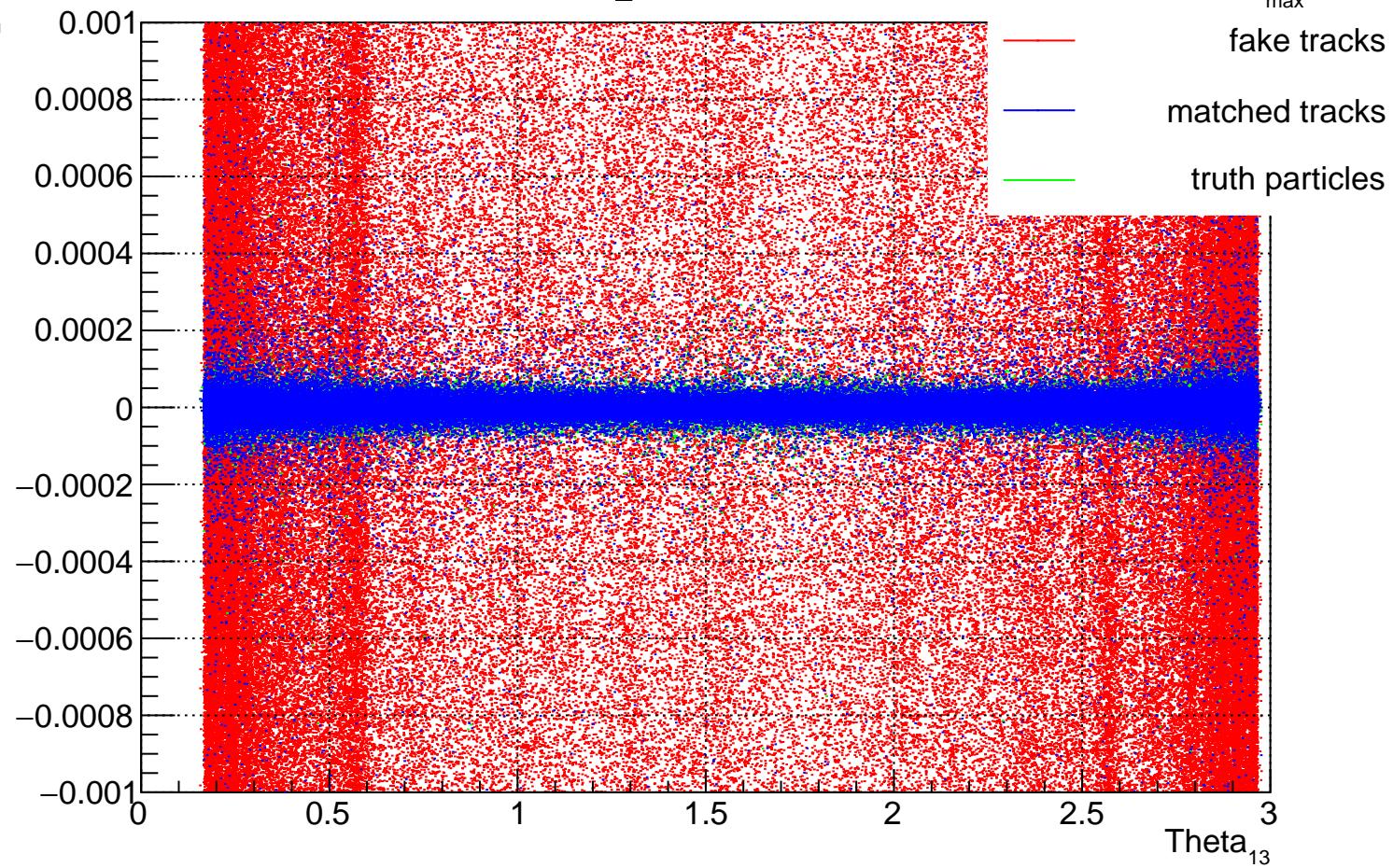
$\phi$  Barrel = 0.02 +  
 $Z_{\text{barrel}} = 160 + Z_{0_{\text{max}}} = 150$

- fake tracks
- matched tracks
- truth particles



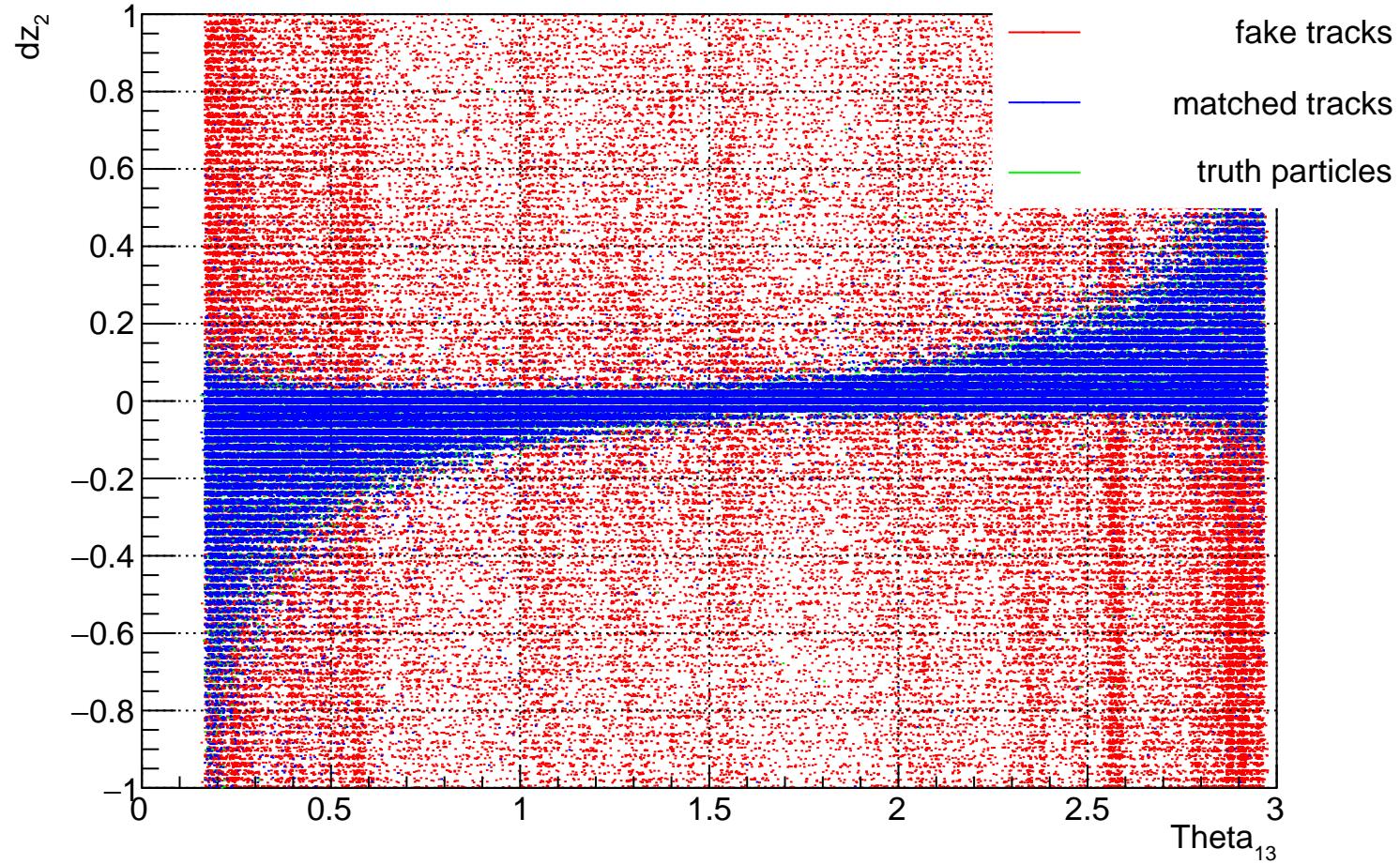
# $d\phi_{2}$ Vs $\Theta_{13}$

$\phi$  Barrel = 0.02 +  
 $Z_{\text{barrel}} = 160 + Z_0^{\text{max}} = 150$



# $dz_2$ Vs $\Theta_{13}$

$\phi$  Barrel = 0.02 +  
 $Z_{\text{barrel}} = 160 + Z_0^{\text{max}} = 150$



# $\text{abs}(\text{dphi}_2)$ Vs $\sin(\Theta_{13})$

$\phi$  Barrel = 0.02 +  
 $Z_{\text{barrel}} = 160 + Z_0^{\text{max}} = 150$   
fake tracks

matched tracks

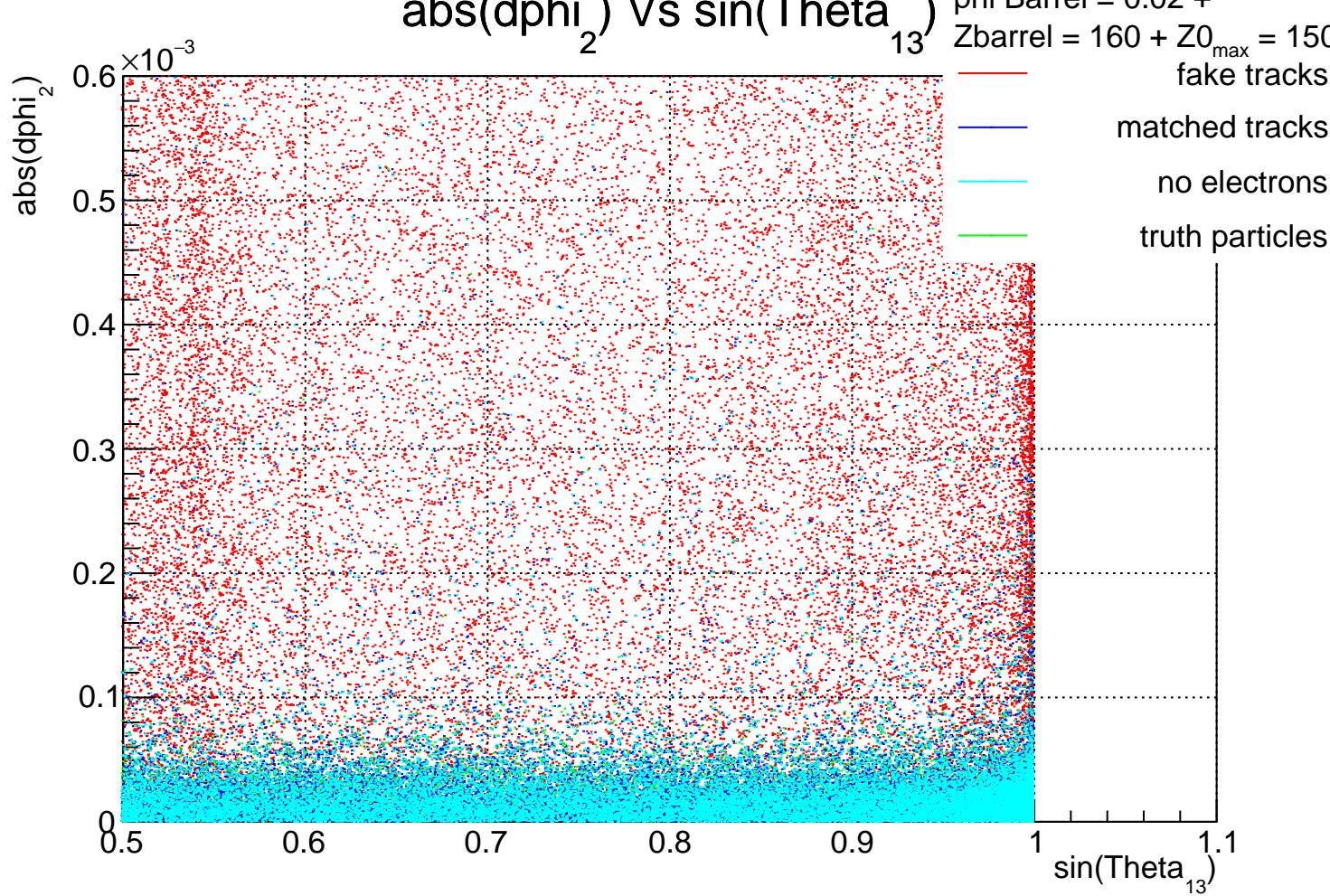
no electrons

truth particles

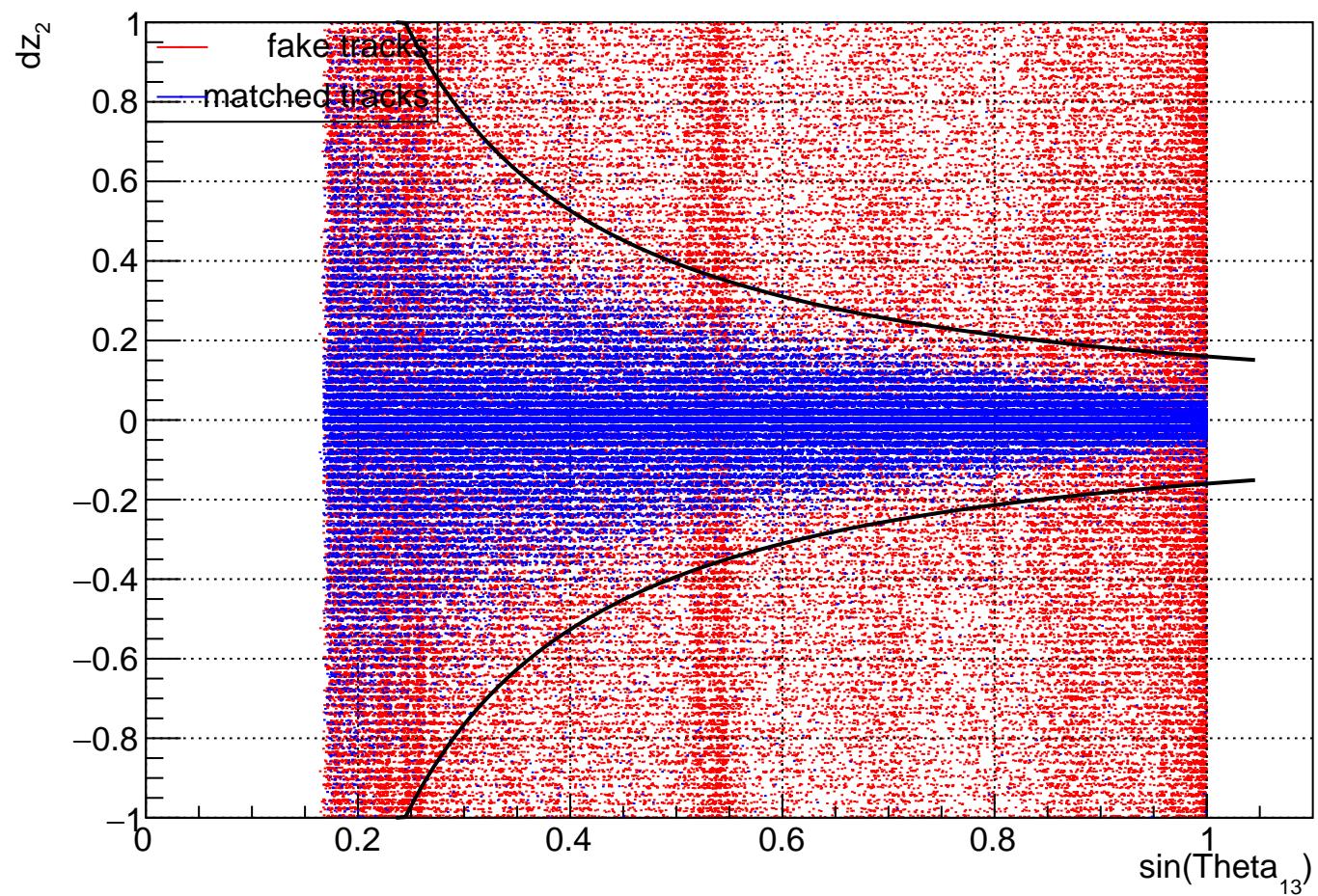
$\text{abs}(\text{dphi}_2) \times 10^{-3}$

0.6  
0.5  
0.4  
0.3  
0.2  
0.1  
0

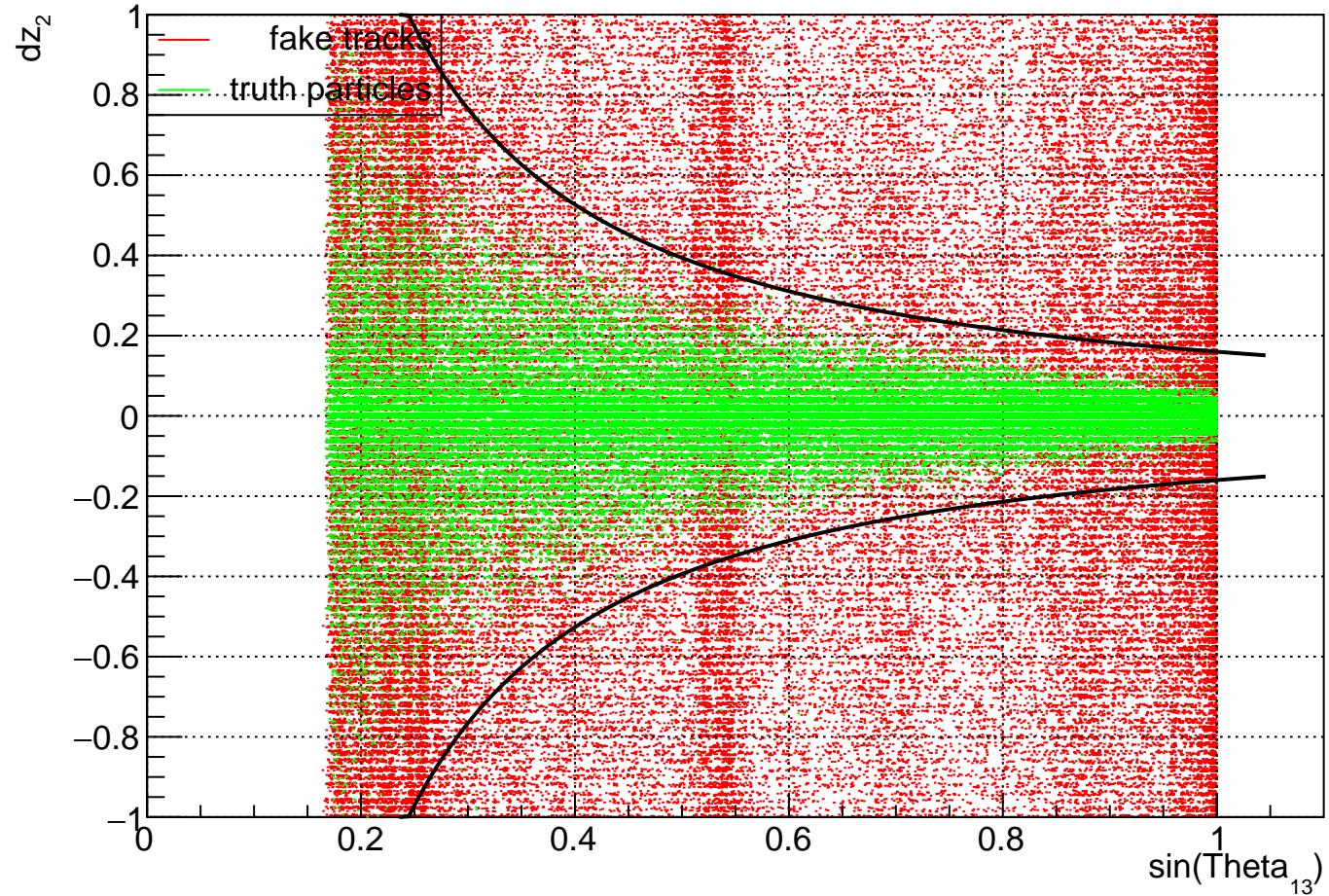
0.5 0.6 0.7 0.8 0.9 1 1.1  
 $\sin(\Theta_{13})$



# $dz_2$ Vs $\sin(\Theta_{13})$

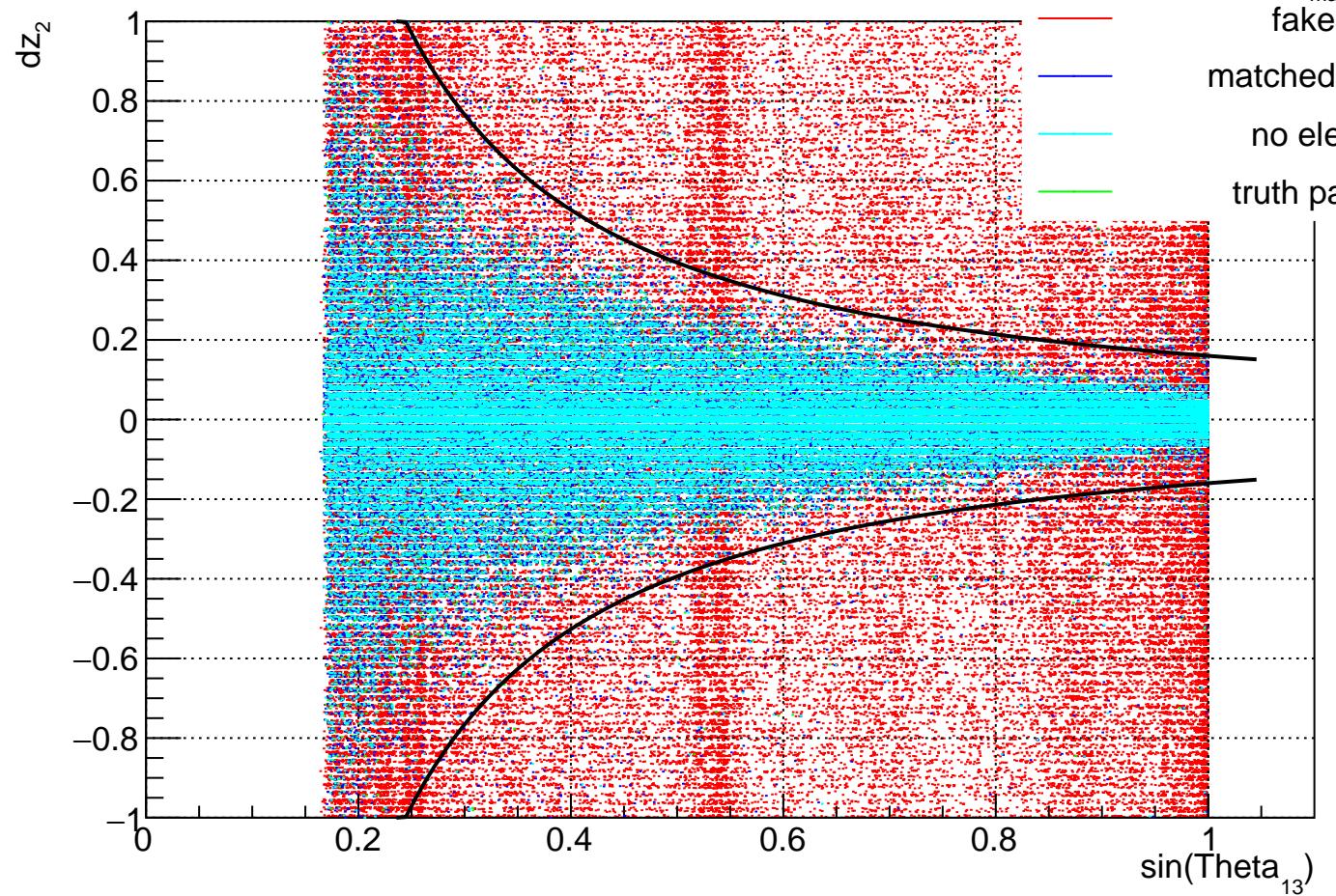


# $dz_2$ Vs $\sin(\Theta_{13})$



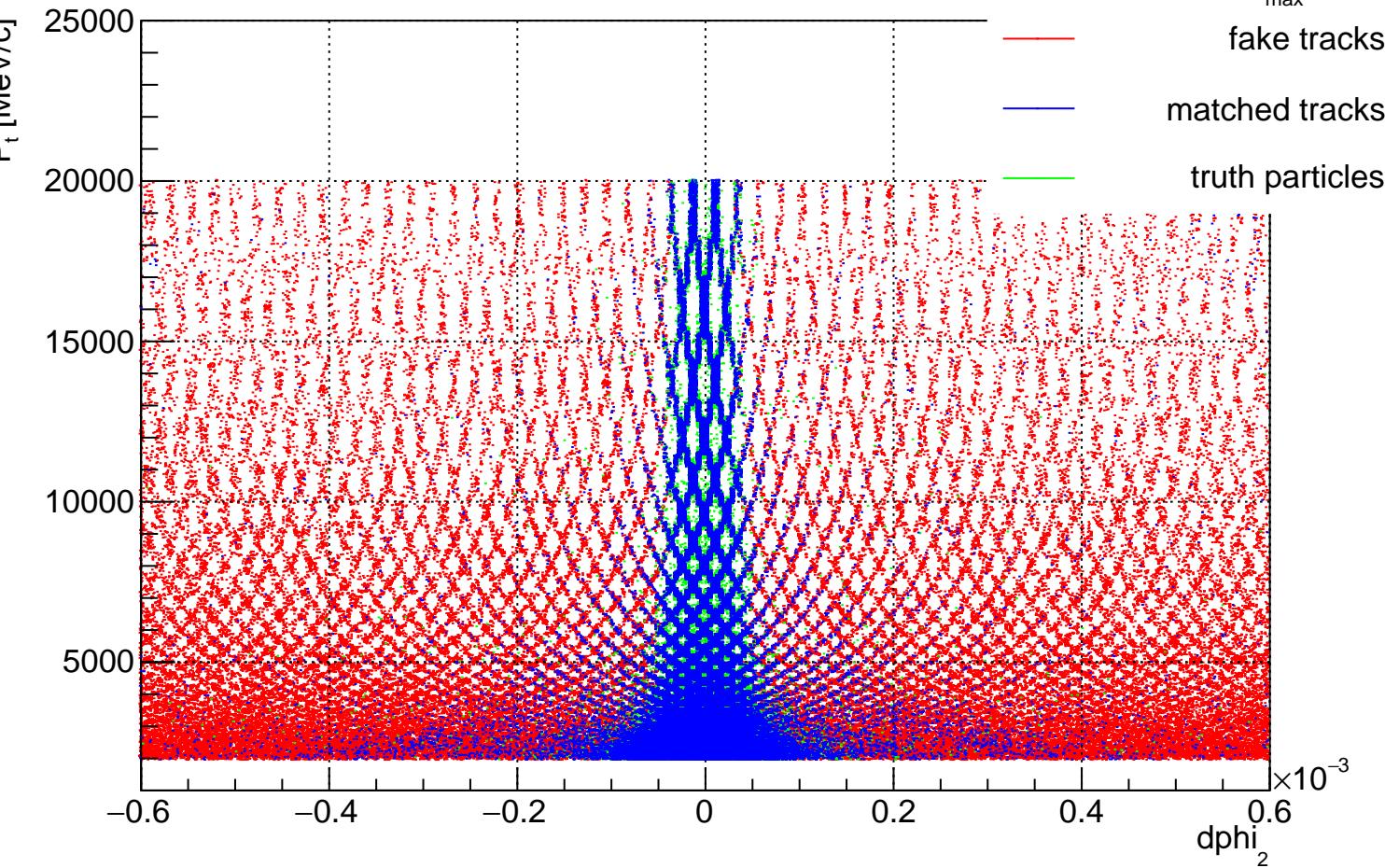
# $dz_2$ Vs $\sin(\Theta_{13})$

$\phi$  Barrel = 0.02 +  
 $Z_{\text{barrel}} = 160 + Z_0^{\max} = 150$   
fake tracks  
matched tracks  
no electrons  
truth particles



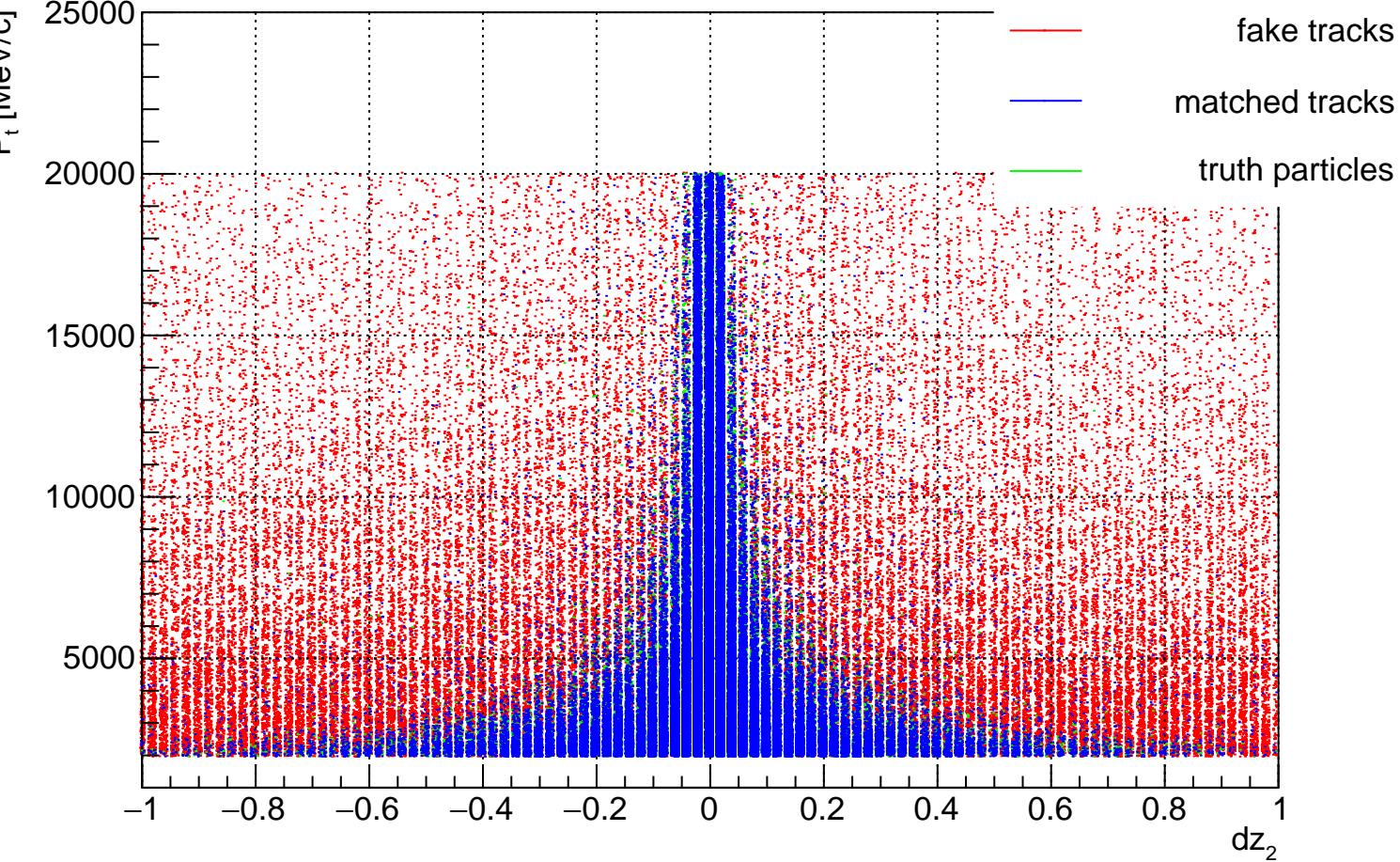
# $P_t$ Vs $d\phi_{2}$

phi Barrel = 0.02 +  
Zbarrel = 160 +  $Z_0_{max} = 150$



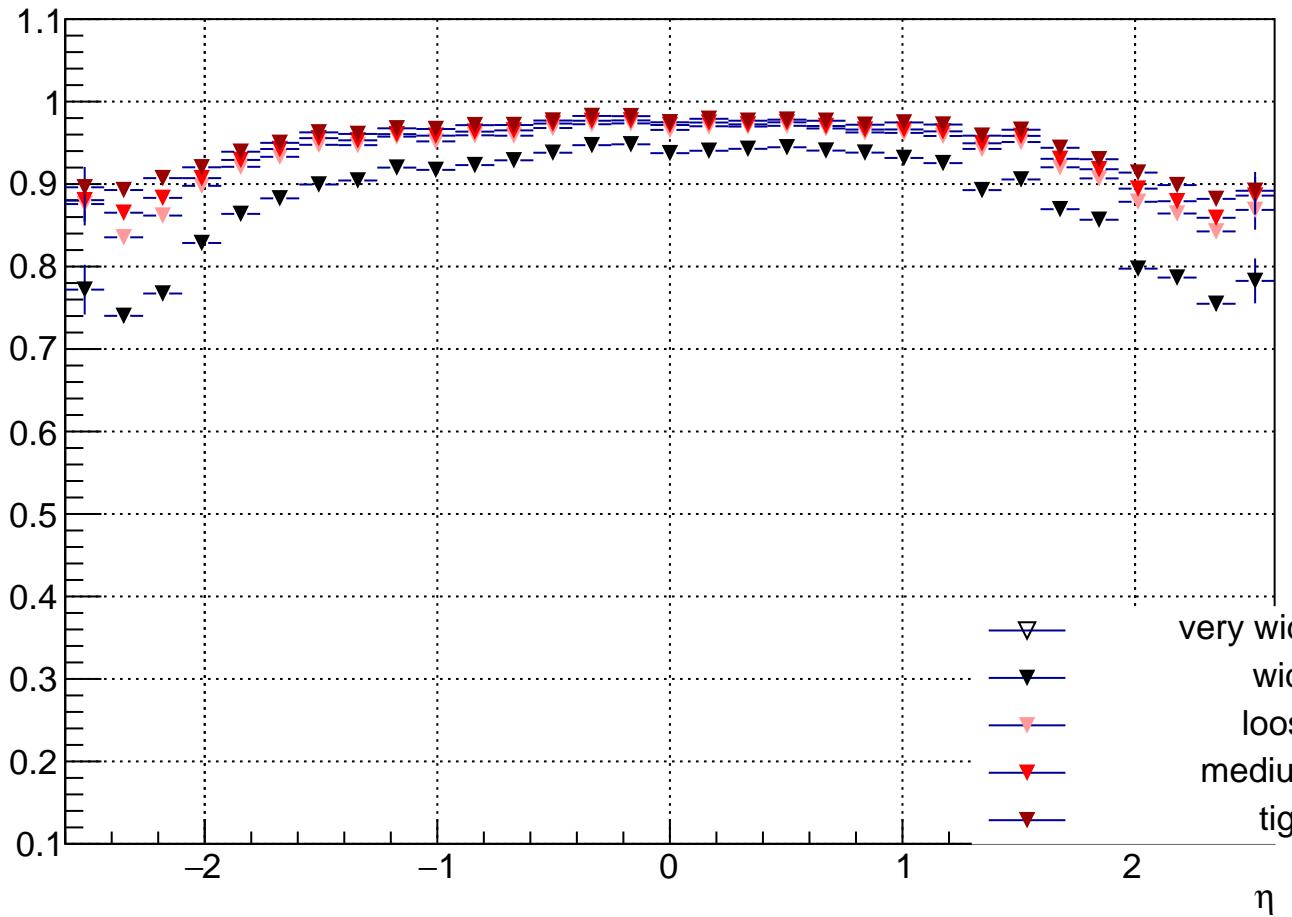
# $P_t$ Vs $dz_2$

phi Barrel = 0.02 +  
Zbarrel = 160 +  $Z_0_{\max} = 150$



# Purity vs $\eta$

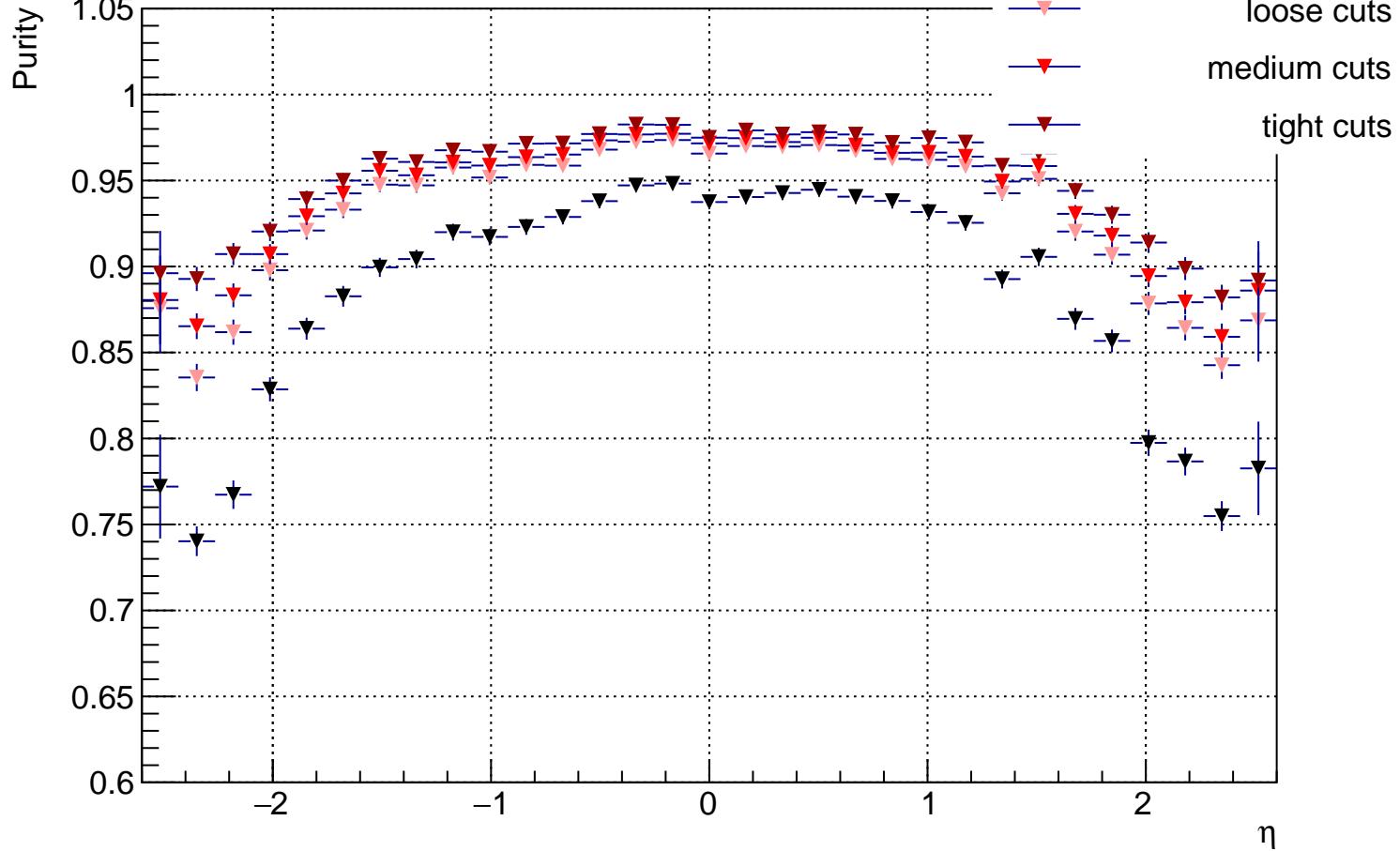
Purity



very wide cuts  
wide cuts  
loose cuts  
medium cuts  
tight cuts

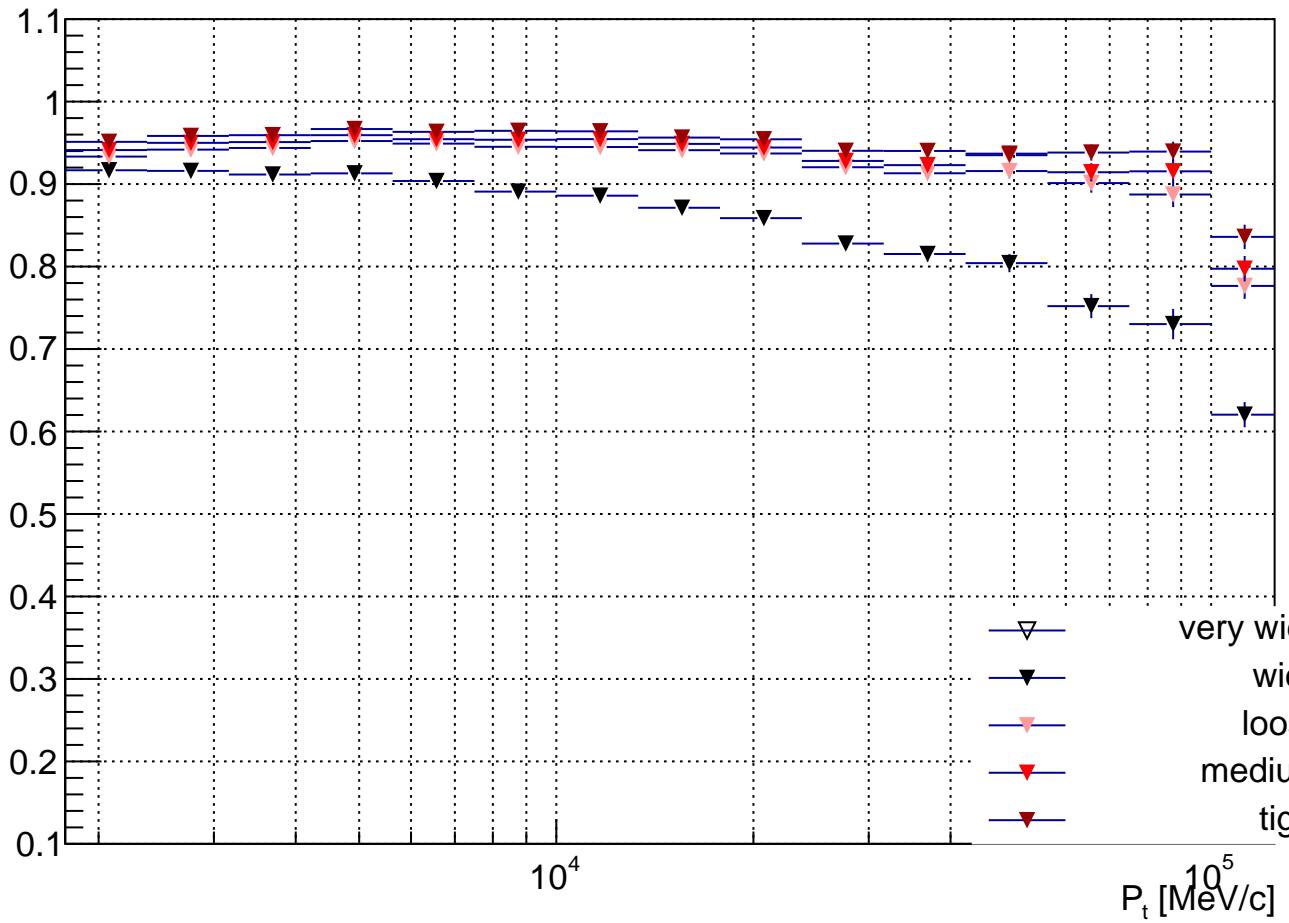
$\eta$

# Purity vs $\eta$



# Purity vs $P_t$

Purity



# Purity vs $P_t$

