Progress Update

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What I've been working on

- Grid search results for v1 (trial 8 variables)
  - Working on visualization of data
    - FOM average value and spread in values collapsed to 1D on each grid search variable
- Grid search for v0 currently running (trial 9 variables)
- Statistical error in FOM
- BDT event mode breakdown
- Kinematics before/after BDT

Pre-BDT cuts	
v1	**v0**
- FCFV - not 1Re/1Re1de - possible 2Repi • 0 de: 2Reπ, 2Rπe, and 3Reππ sub-samples • 1 de: 1Re, 2Ree, 2Reπ, 2Rπe, 2Rμe, and 3Reππ sub-samples - 1/2 sub-events - E_{rec}(1e,1π) < 1.5 GeV	- FCFV - not 1Re/1Re1de - 1/2 sub-events - E_{rec}(1e,1π) < 1.5 GeV

	BDT variables								
	1R v 1R nll	1R v 2R nll	2R v 2R nll	2R v 3R nll	3R v 3R nll	3R v 4R nll	1R+2R kinematics	E_{rec}, towall e, towall π, p_{low}, $m_{\pi 0}$, (*d2se*)	1R+2R+ 3R fit indices
Trial 8	■	■	■	■	■		■	■	■
Trial 9	■	■	■	■	■	■	■	■	■

BDT event breakdown

v1, trial 8, NTrees=10000, MaxDepth=7, MinNodeSize=0.05, NCuts=50

(best performing BDT architecture for both 0de and 1de)

0de											
	1e1π$^{+/-}$	**1e**	**1e other**	**1μ1π$^{+/-}$**	**1μ**	**1μ other**	**0l$^{+/-}$ 1π^{+}**	**0l$^{+/-}$ 1π^{-}**	**0l$^{+/-}$ 1π^{0}**	**0l$^{+/-}$ Nπ**	**0l$^{+/-}$ other**
FCFV (0de)	5.08	46.83	6.66	11.13	47.24	24.92	7.53	10.63	83.37	16.81	17.60
BDT in	0.79	0.32	0.03	0.07	0.16	0.14	0.34	0.41	1.22	0.36	0.46
BDT out	0.60	0.03	0.01	0.01	0.00	0.03	0.05	0.05	0.07	0.10	0.03
1de											
	1e1π$^{+/-}$	**1e**	**1e other**	**1μ1π$^{+/-}$**	**1μ**	**1μ other**	**0l$^{+/-}$ 1π^{+}**	**0l$^{+/-}$ 1π^{-}**	**0l$^{+/-}$ 1π^{0}**	**0l$^{+/-}$ Nπ**	**0l$^{+/-}$ other**
FCFV (1de)	7.48	5.24	2.68	38.78	148.00	60.21	10.26	3.33	4.58	15.24	6.31
BDT in	3.08	0.89	0.09	1.94	3.60	2.37	1.79	0.51	1.79	1.61	2.23
BDT out	2.15	0.19	0.02	0.06	0.02	0.24	0.04	0.02	0.08	0.13	0.09

0de				
	sig	**bkg**	**FOM**	**δFOM**
FCFV (0de)	5.08	272.72		
BDT in	0.79	3.51		
BDT out	0.60	0.37	0.611	0.019

1de				
	sig	**bkg**	**FOM**	**δFOM**
FCFV (1de)	7.48	294.57		
BDT in	3.08	16.82		
BDT out	2.15	0.90	1.230	0.019

To Compare: Cuts-Based Selection

0de											
	1e1$\pi^{+/-}$	**1e**	**1e other**	**1μ1$\pi^{+/-}$**	**1μ**	**1μ other**	**0l$^{+/-}$ 1π^{+}**	**0l$^{+/-}$ 1π^{-}**	**0l$^{+/-}$ 1π^{0}**	**0l$^{+/-}$ Nπ**	**0l$^{+/-}$ other**
FCFV	13.08	52.30	10.20	90.54	216.44	136.26	19.53	15.01	88.74	39.20	25.13
eπ-like	5.40	2.35	0.24	1.20	1.37	4.95	0.99	0.65	2.20	1.77	0.71
0 decay e	1.26	0.61	0.08	0.13	0.20	1.22	0.33	0.38	1.54	0.59	0.21
E_{rec}<1.5 GeV	0.70	0.24	0.02	0.05	0.09	0.11	0.18	0.20	1.07	0.23	0.13
1de											
	1e1$\pi^{+/-}$	**1e**	**1e other**	**1μ1$\pi^{+/-}$**	**1μ**	**1μ other**	**0l$^{+/-}$ 1π^{+}**	**0l$^{+/-}$ 1π^{-}**	**0l$^{+/-}$ 1π^{0}**	**0l$^{+/-}$ Nπ**	**0l$^{+/-}$ other**
FCFV	13.08	52.30	10.20	90.54	216.44	136.26	19.53	15.01	88.74	39.20	25.13
eπ-like	5.40	2.35	0.24	1.20	1.37	4.95	0.99	0.65	2.20	1.77	0.71
1 decay e	4.14	1.74	0.16	1.05	1.17	3.71	0.66	0.27	0.66	1.17	0.50
E_{rec}<1.5 GeV	2.71	0.75	0.03	0.56	0.78	0.69	0.50	0.17	0.31	0.51	0.44

0de			
	sig	**bkg**	**FOM**
FCFV	13.08	693.36	
eπ-like	5.40	16.43	
1 decay e	1.26	5.28	
E_{rec}<1.5 GeV	0.70	2.32	0.611

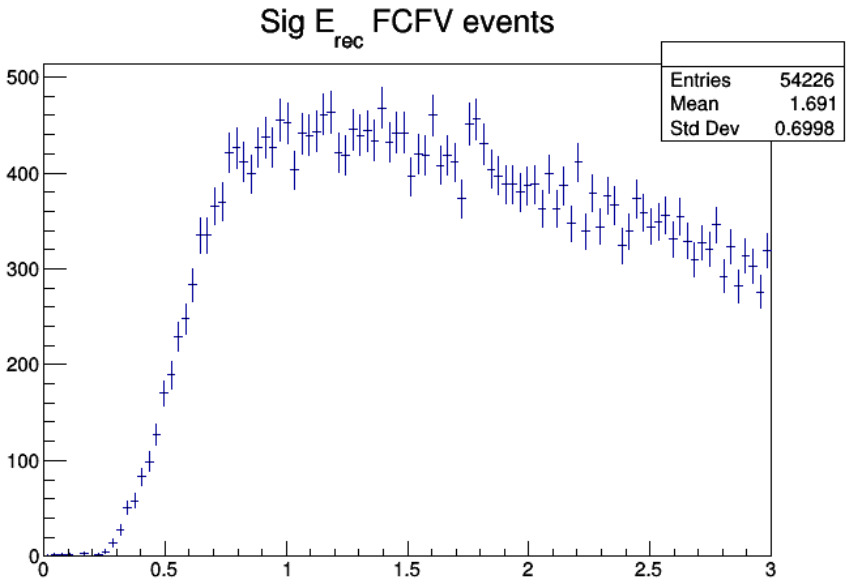
1de			
	sig	**bkg**	**FOM**
FCFV	13.08	693.36	
eπ-like	5.40	16.43	
1 decay e	4.14	11.09	
E_{rec}<1.5 GeV	2.71	4.73	1.230

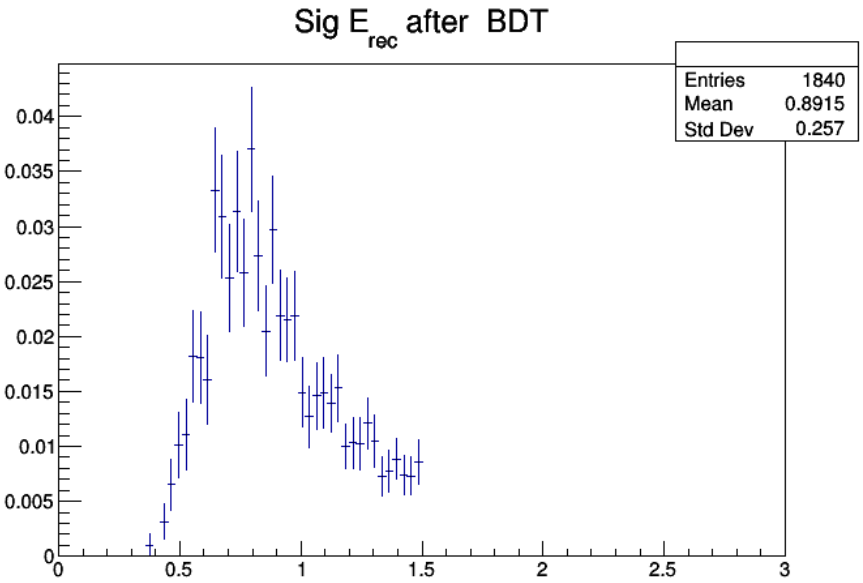
Kinematic Response Plots

- E_{rec}, $p_{e,rec}$, $p_{\pi,rec}$ so far
- Still to do: $\theta_{e\pi,rec}$, truth E, p, and θ

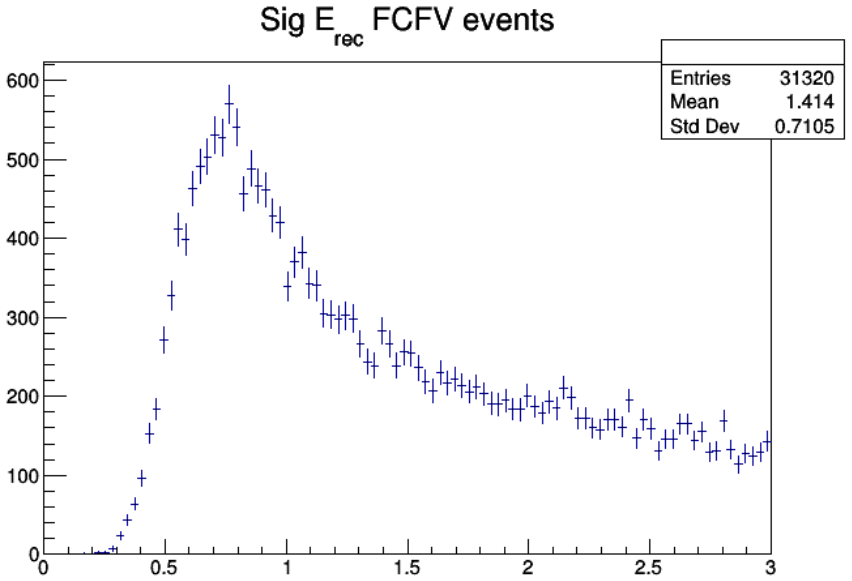
E_{rec}

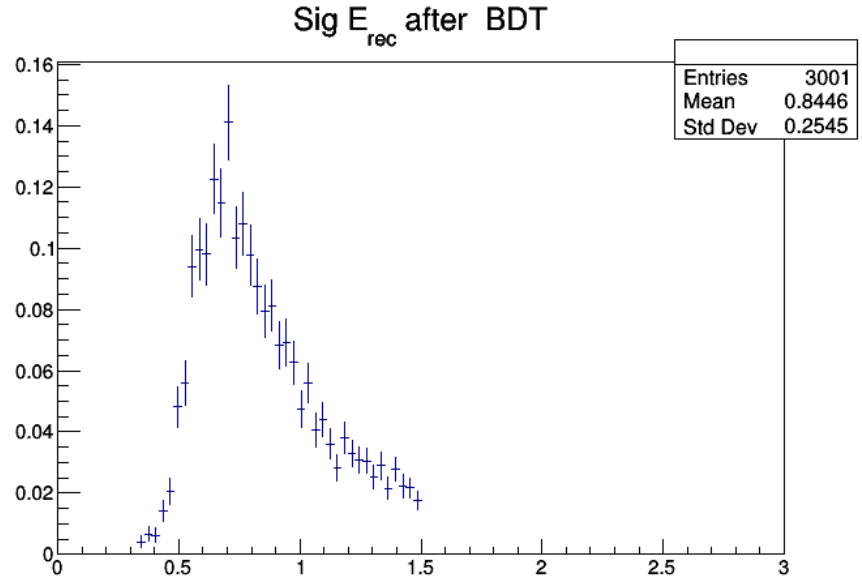
0de


Sig E_rec FCFV events
Entries 54226
Mean 1.691
Std Dev 0.6998


Sig E_rec after BDT
Entries 1840
Mean 0.8915
Std Dev 0.257

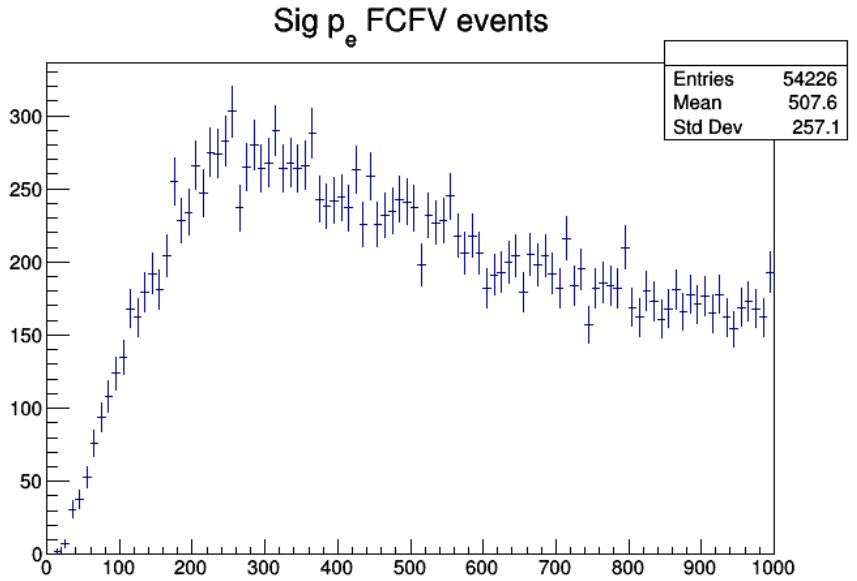
1de

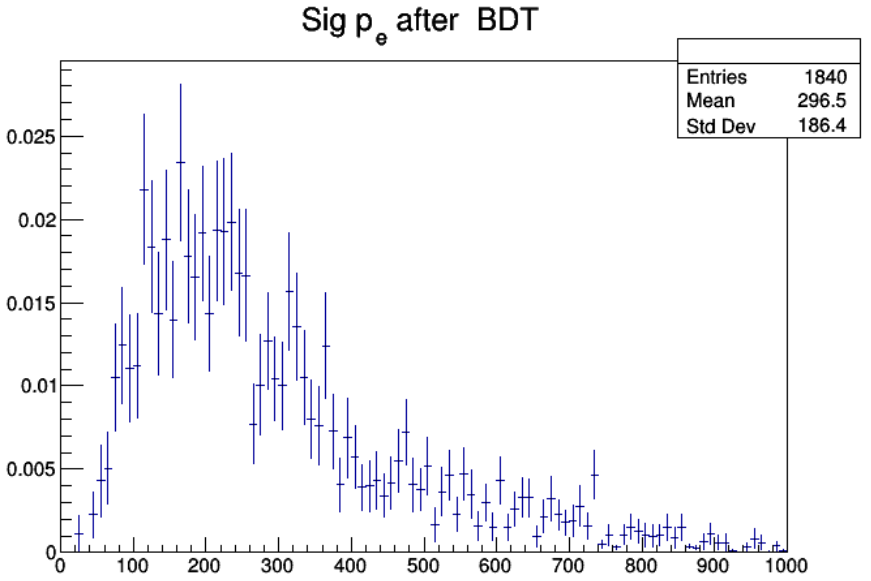

Sig E_rec FCFV events
Entries 31320
Mean 1.414
Std Dev 0.7105


Sig E_rec after BDT
Entries 3001
Mean 0.8446
Std Dev 0.2545

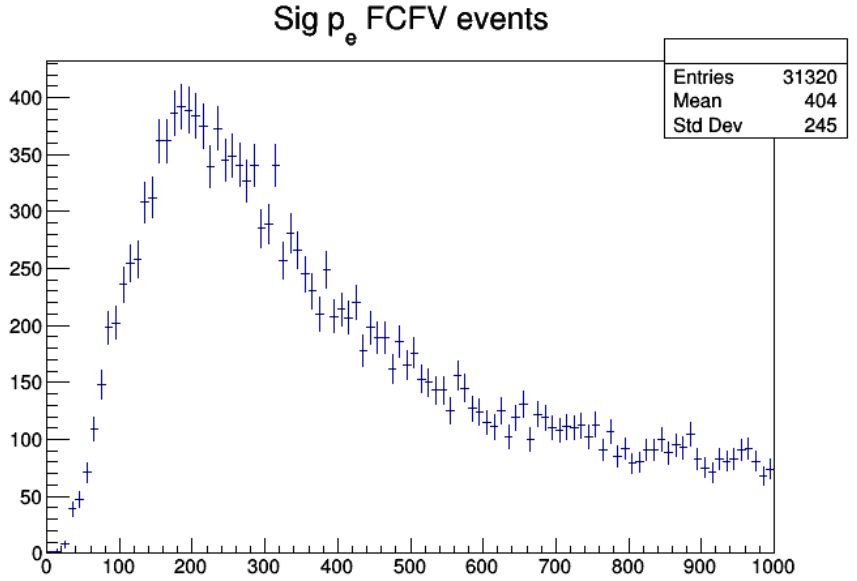
$p_{e,rec}$

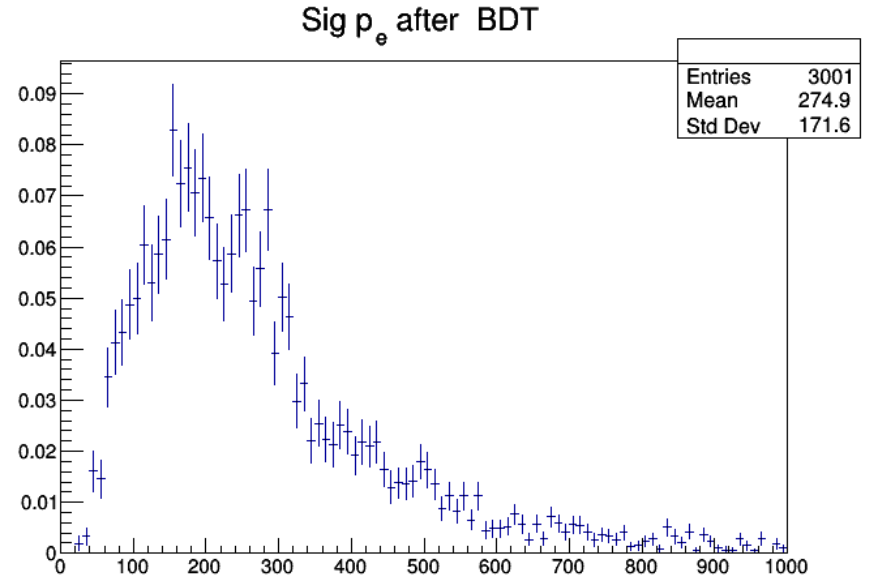
0de





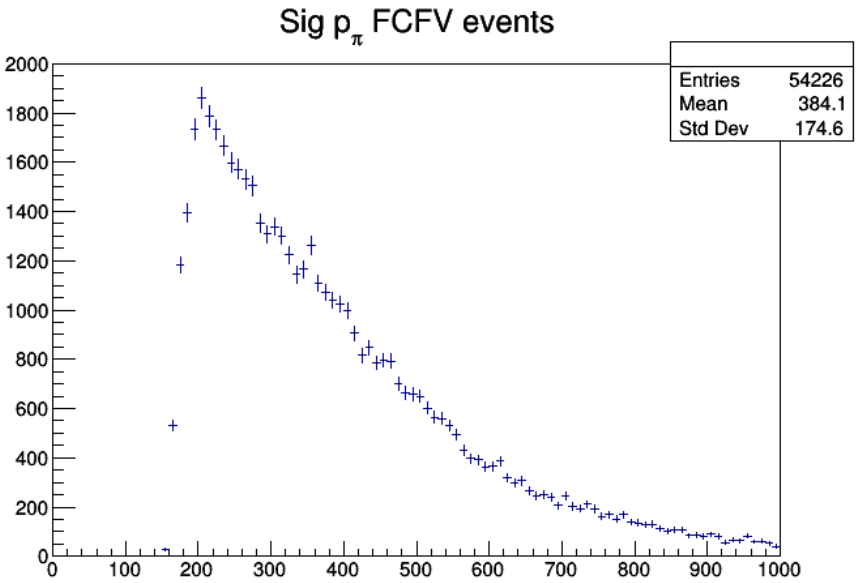
1de

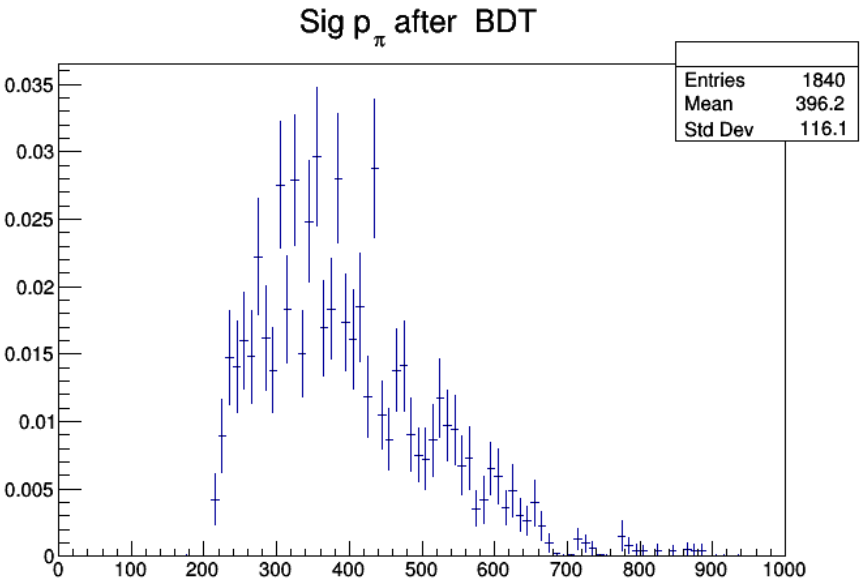
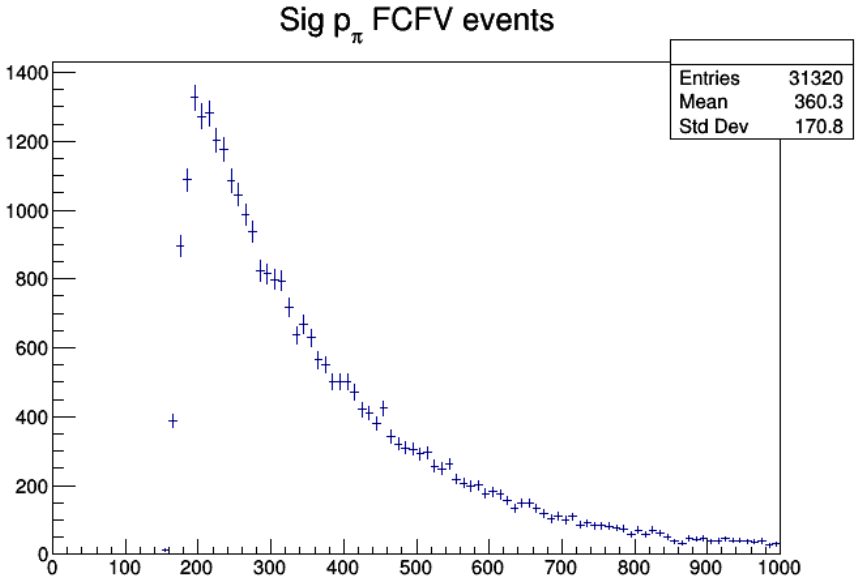
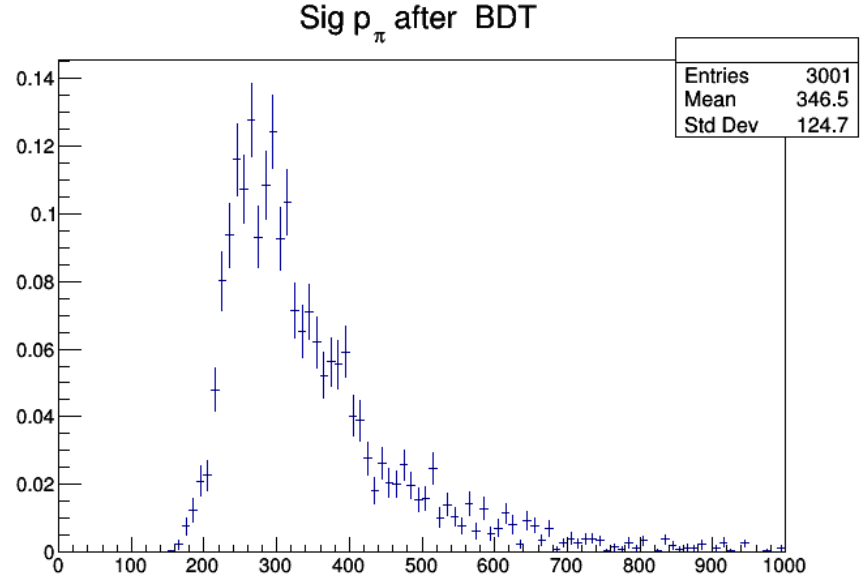




$p_{\pi,rec}$

0de





1de