Semi-tauonic Update

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Wednesday, April 25, 18

Miscellaneous

- Signal selection scripts have been updated.
- Simple plotting scripts added
- Hadronic FEI skims of generic MC samples are almost ready
  - First run on background FEI skimmed samples: waiting for results.
- Trouble with the validation scripts of cocktail modes.
  - Validation scripts were failing. It took some time to fix. Currently there is an open pull request.
  - Due to low statistics, the validation scripts no longer use FEI. Instead, the generated B_{tag} hadronic mode is reconstructed directly for more statistics.
  - Absence of certain D0 modes is also apparent in the scripts, but I am currently waiting on updated results with more statistics.
  - Validation scripts need monitoring and update constantly. Any volunteers?
- Decided on MC10 samples:
  - Will combine cocktail modes into one file.

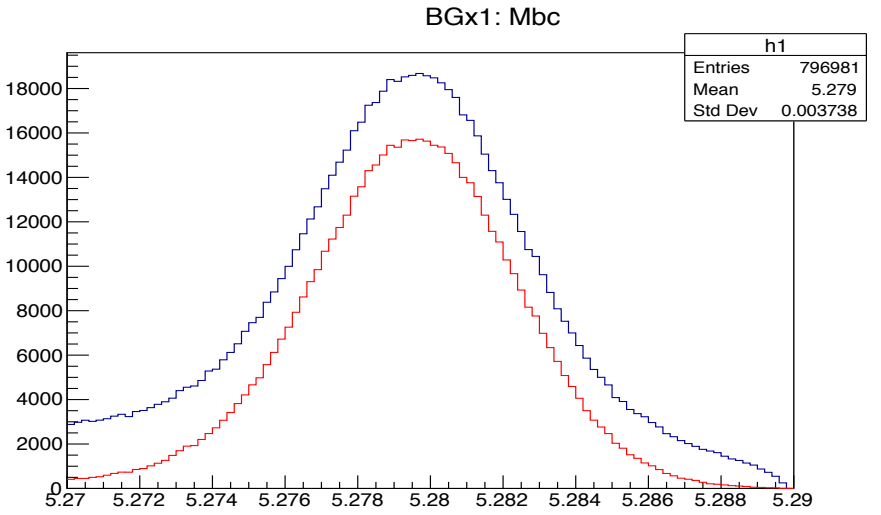
Signal Selection:

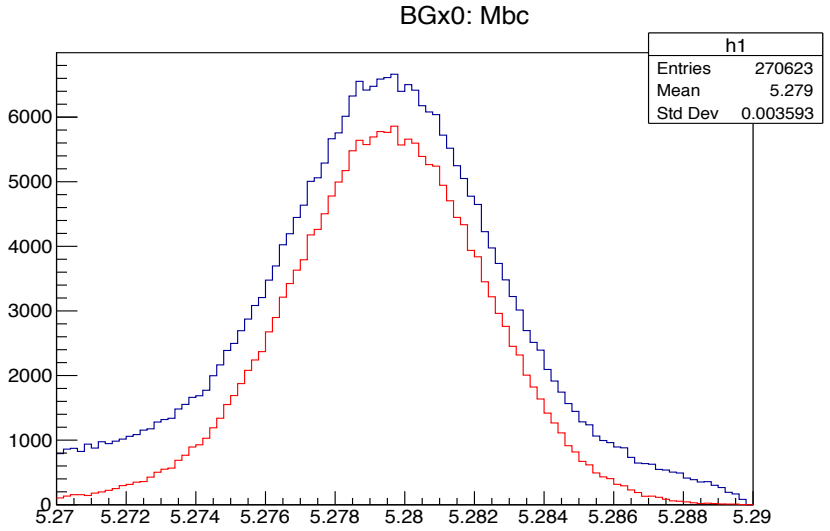
- Start with FEI skimmed signal MC samples:
  - This is cocktail MC: 12,700,000 BGx1 events and 4000000 BGx0 events.
  - Truth-matched using mcPDG variable.
  - Efficiency=

    surviving events/total generated events

- Btag cuts:
  - Mbc>5.27 GeV/c
  - -0.1<DeltaE<0.1 GeV
  - signalProbability>0.001

- Btag efficiency:
  - 6.3% BGx1, avg 1.39 candidates/evt
  - 6.77% BGx0 , avg 1.37 candidates/evt



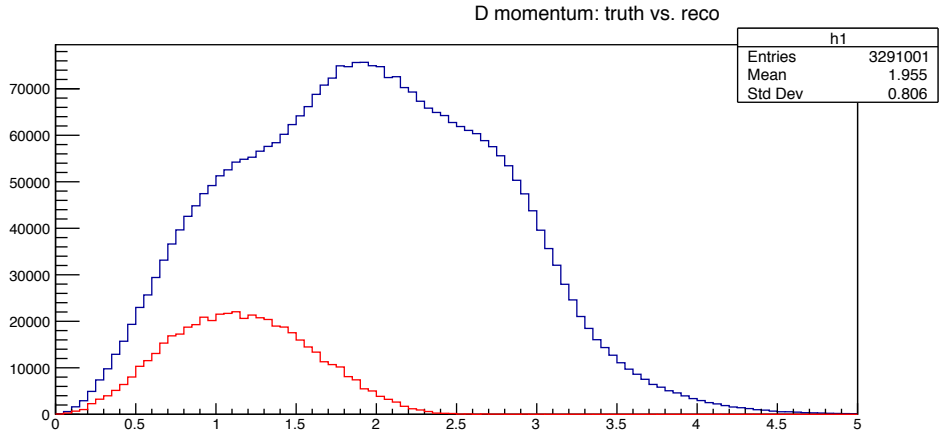


$D^{+/0}$ reconstruction

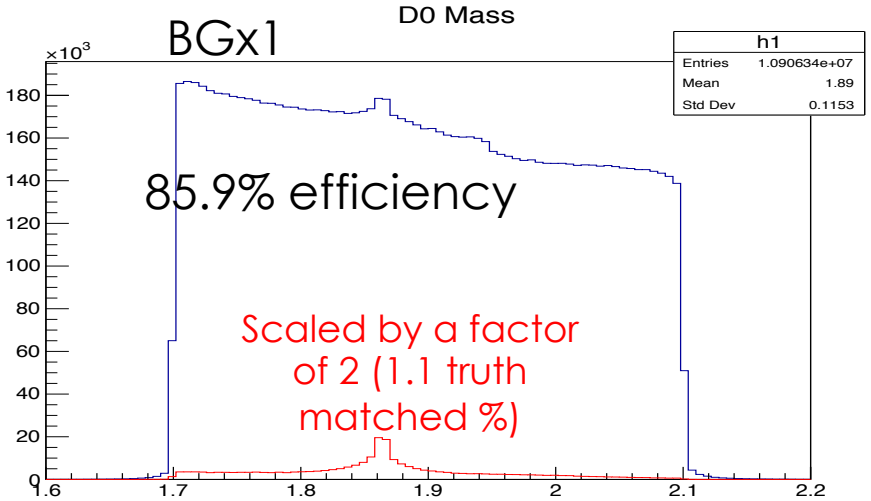
#	Decay	BF
1	$D^+ \rightarrow K^-\pi^+\pi^+$	8.98 +/- 0.28%
2	$D^+ \rightarrow K^-\pi^+\pi^+\pi^0$	5.98 +/- 0.23 %
3	$D^+ \rightarrow K_s^0\pi^+$	1.47 +/- 0.08 %
4	$D^+ \rightarrow K_s^0\pi^+\pi^-\pi^+$	2.97 +/- 0.11 %
5	$D^+ \rightarrow K_s^0\pi^+\pi^0$	7.05 +/- 0.27 %
6	$D^+ \rightarrow K_s^0 K^+$	1.05%
7	$D^0 \rightarrow K^-\pi^+$	3.89 +/- 0.04 %
8	$D^0 \rightarrow K_s^0\pi^0$	1.19 +/- 0.04 %
9	$D^0 \rightarrow K^-\pi^+\pi^0$	14.2 +/- 0.5 %
10	$D^0 \rightarrow K^-\pi^+\pi^-\pi^+$	8.11 +/- 0.15 %
11	$D^0 \rightarrow K_s^0\pi^+\pi^-$	2.75 +/- 0.18%
12	$D^0 \rightarrow K_s^0\pi^+\pi^-\pi^0$	5.1 +/- 0.6%

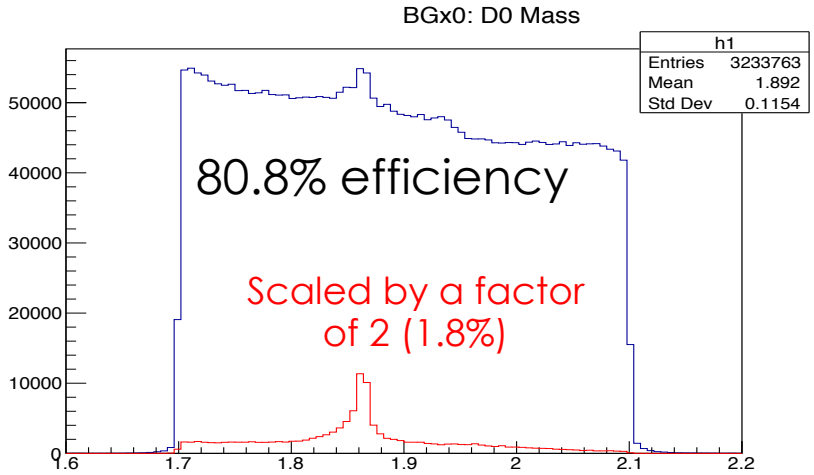
- pi+:95eff , pionID>0.232 and p_T>0.1
- K+:85eff , kaonID > 0.517 and p_T>0.1and 0.3<pCMS<2.8
- pi0 → gamma gamma, E_{gamma}>50 MeV
- and 0.12<InvM<0.15
- Ks0:all →pi+ pi-, 0.45<M<0.55 GeV/c^2

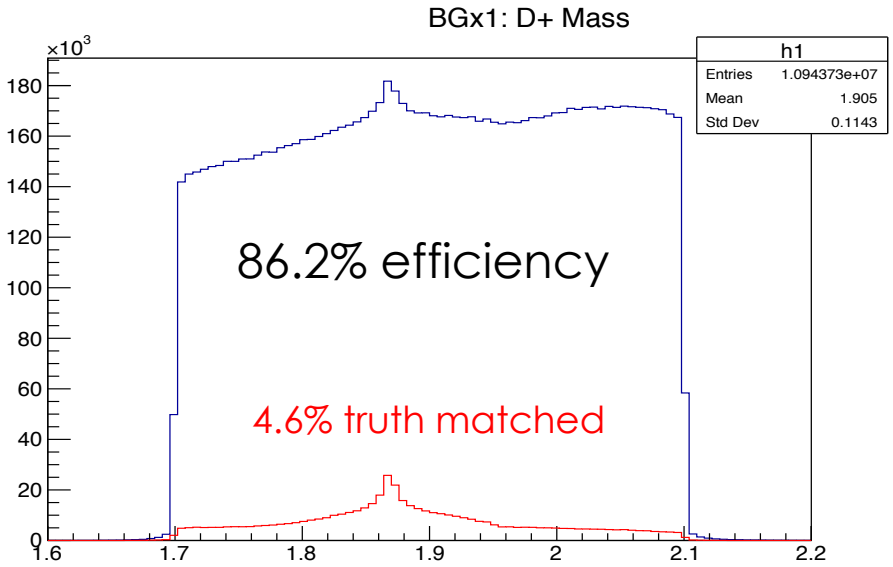
D candidates are reconstructed a loose mass cut: 1.7<M<2.1GeV/c^2
And momentum <3.0 GeV/c

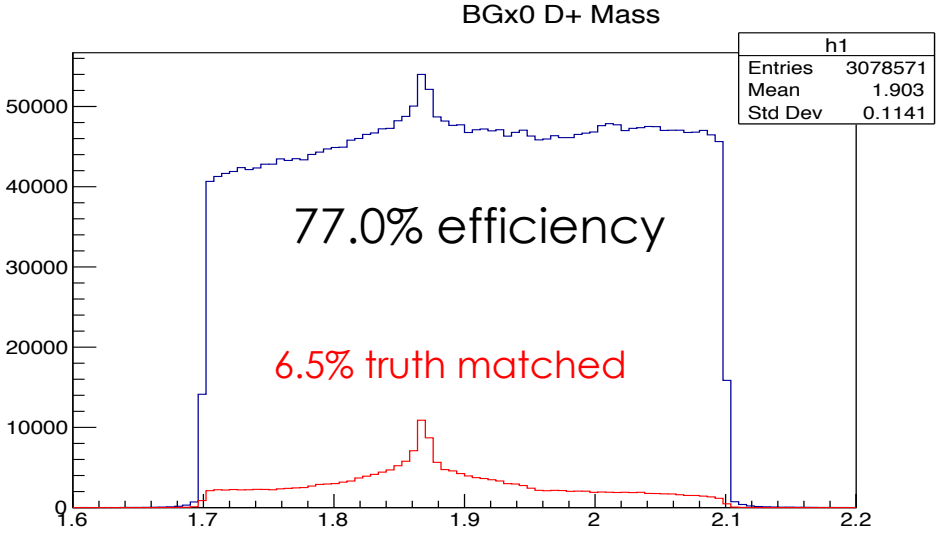


$D^{+/0}$ reconstruction

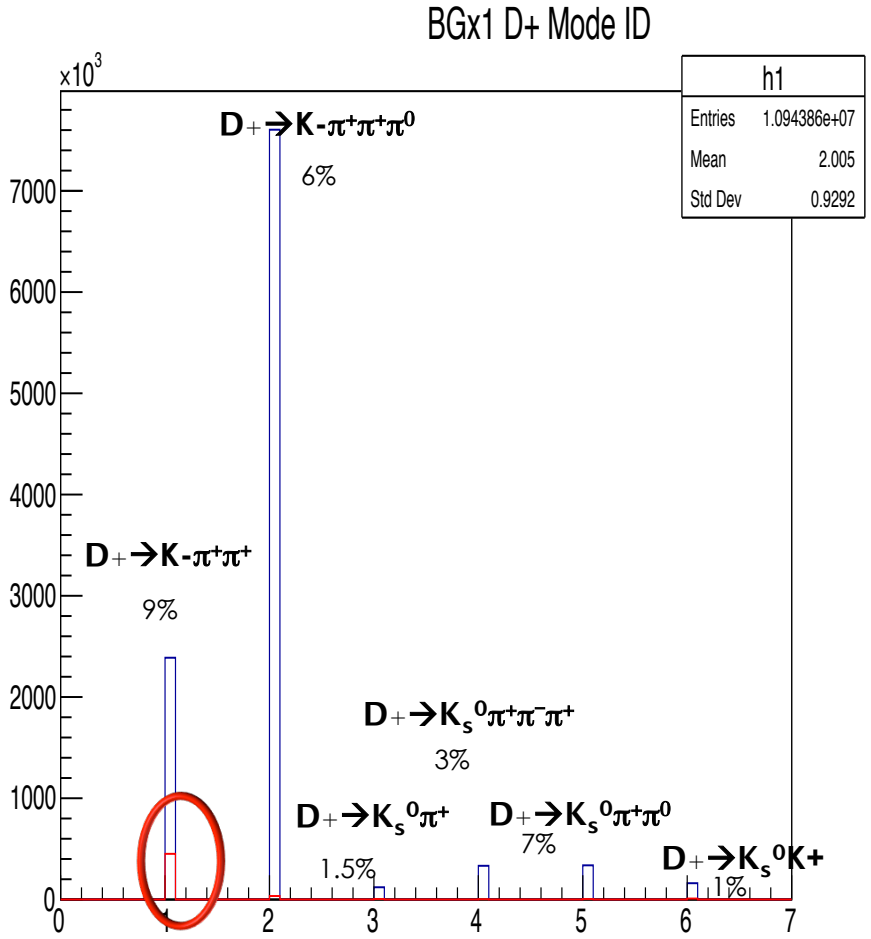


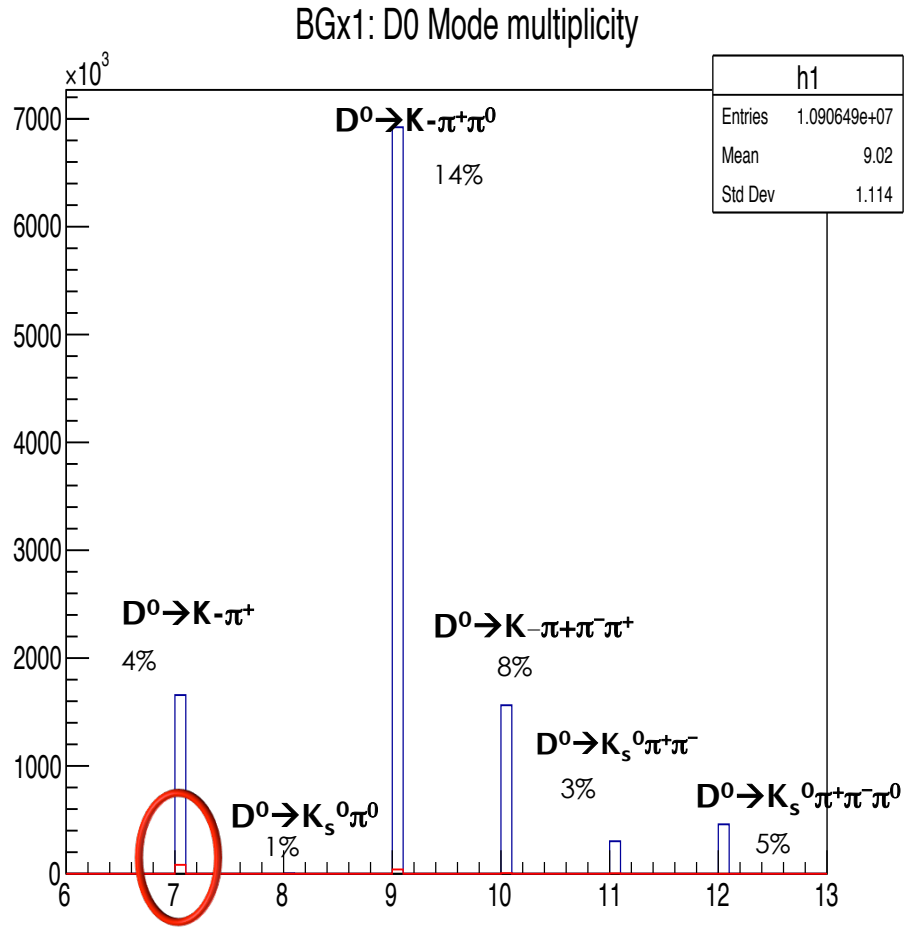






Mode abundancy:

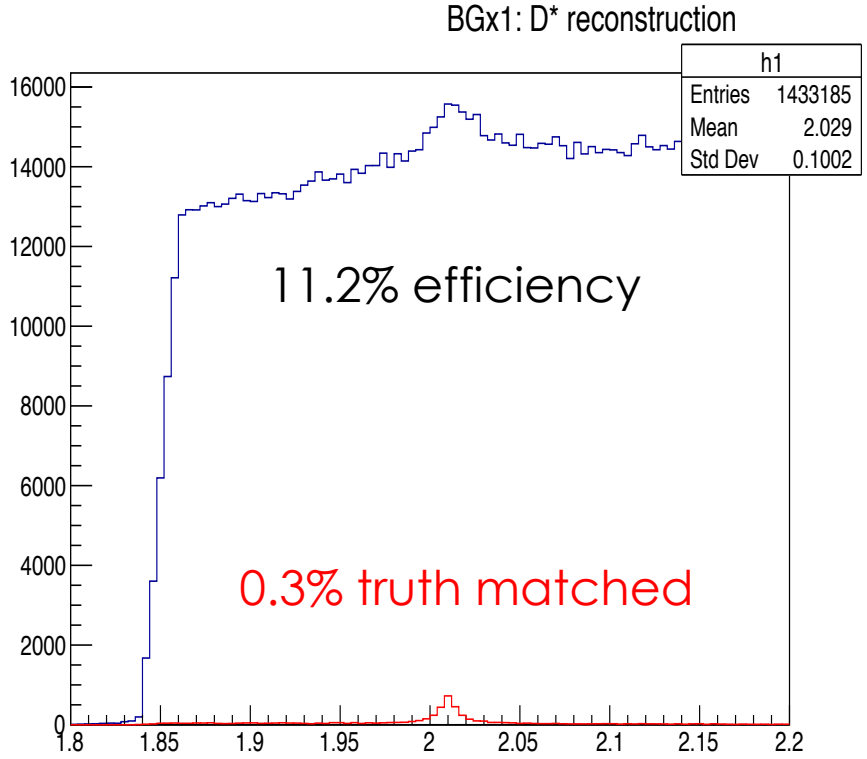


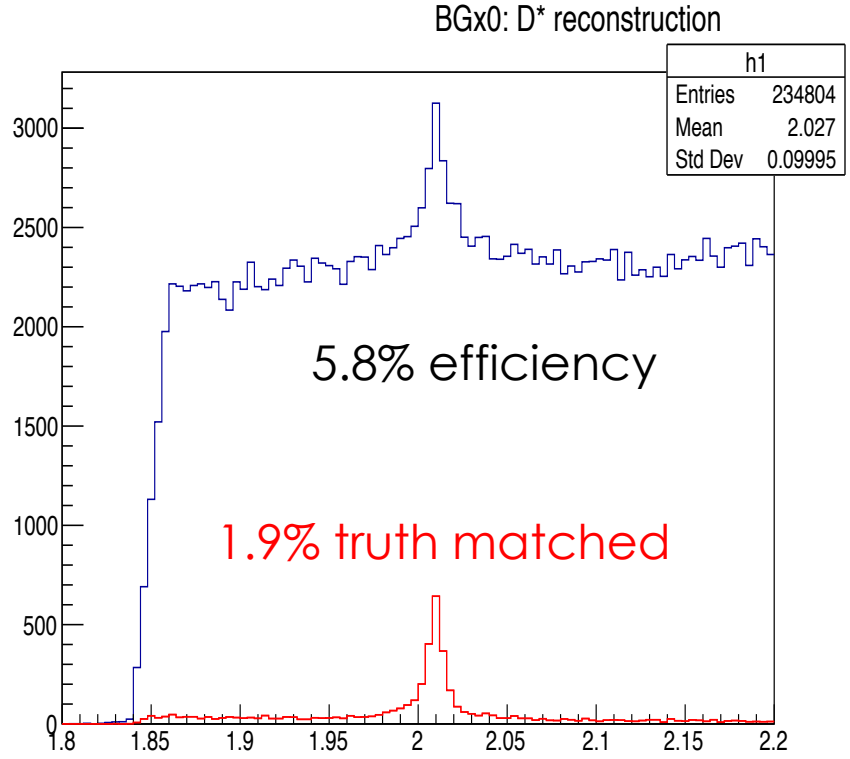


Same pattern with BGx0 samples

D* reconstruction

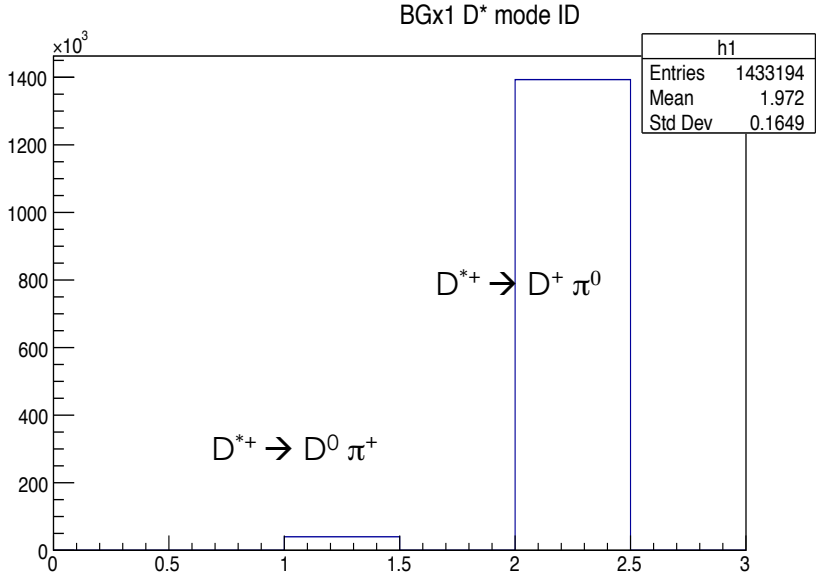
1. $D^{*+} \rightarrow D^0 \pi^+$ 60<p<250 MeV
2. $D^{*+} \rightarrow D^+ \pi^0$ 60<p<250 MeV

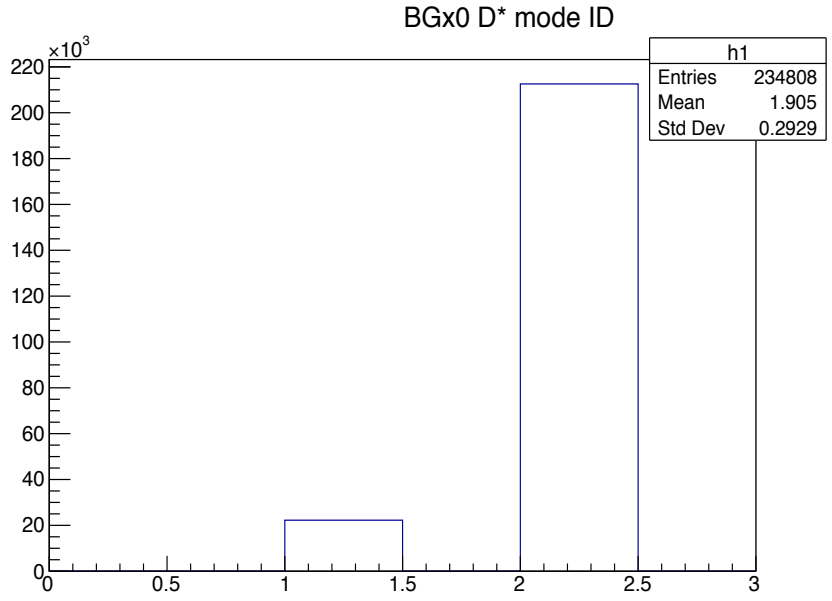


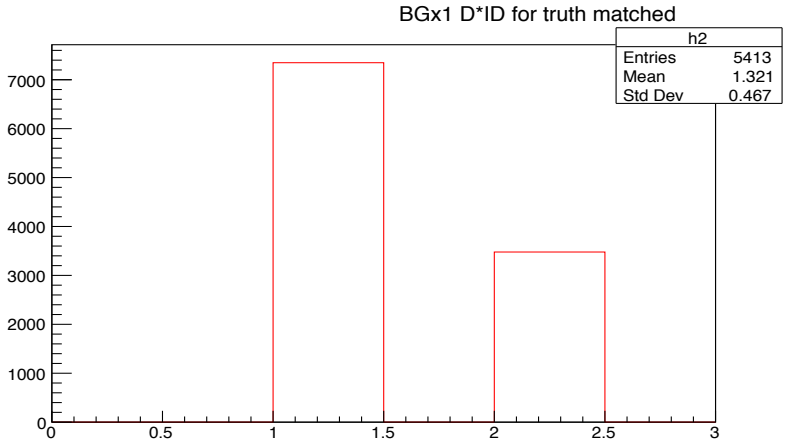


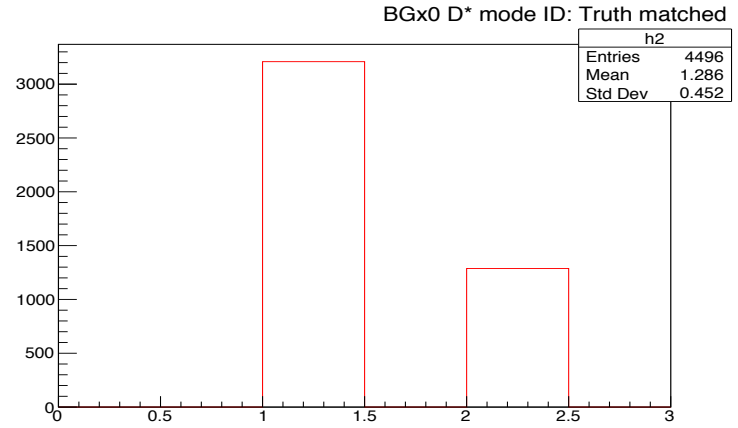
BGx0 reconstruction is better by a factor of ~6

D* Mode abundancy:



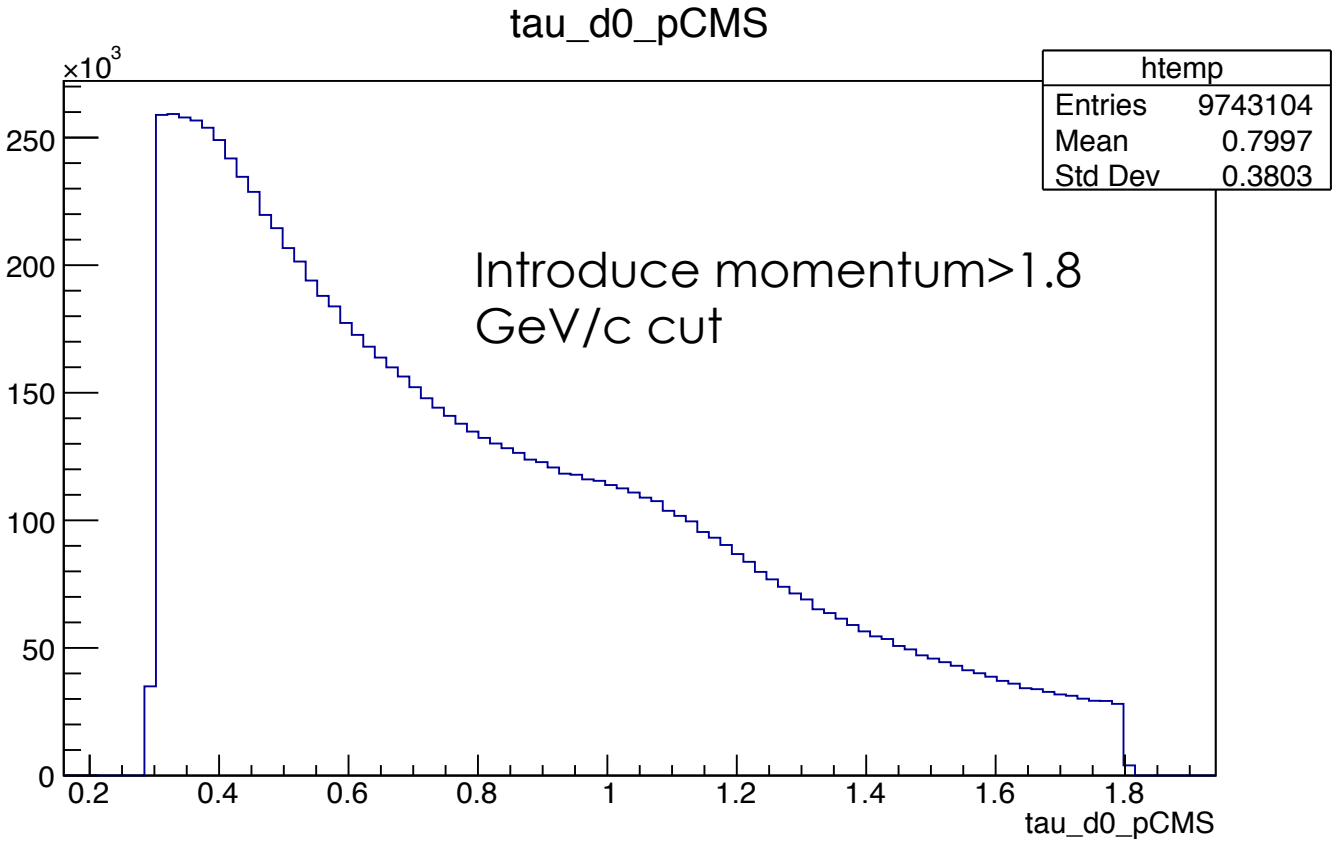




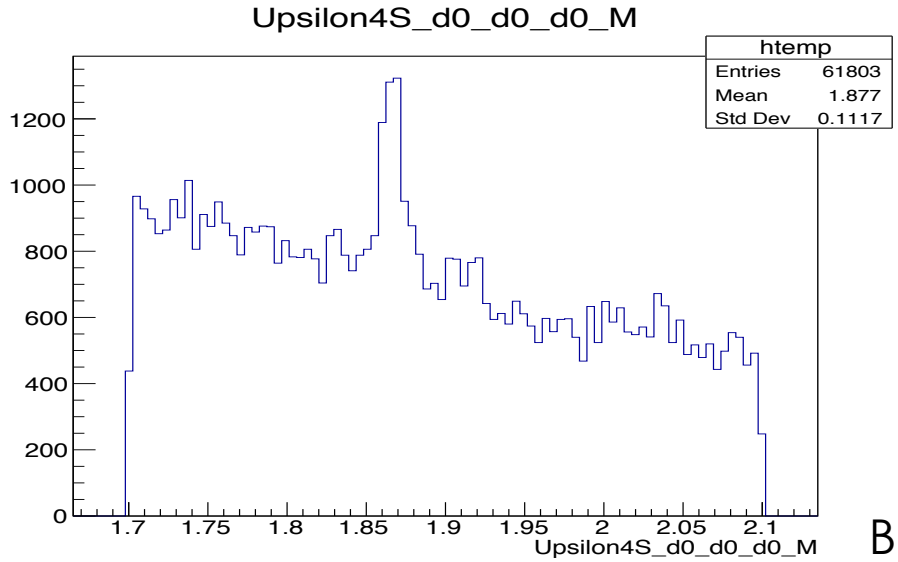


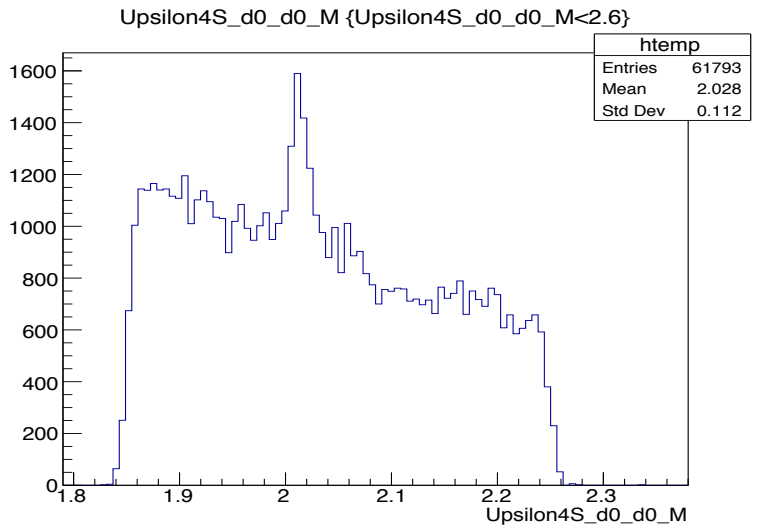
Y(4S)

- Combine D* candidate with lepton:
  - m+: 90eff with 0.3<p<2.8 GeV/c and muon ID>0.438
  - e+:90eff with 0.3<p<2.8 GeV/c and electronID> 0.597

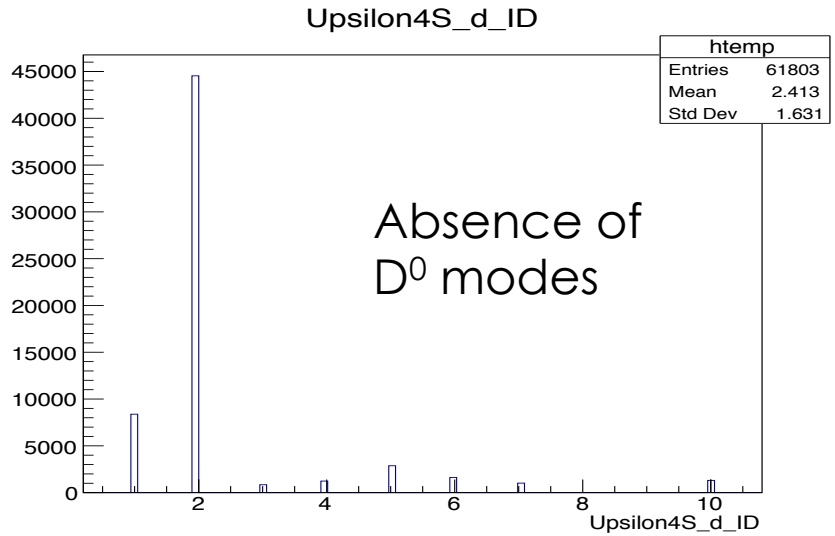


Y(4S) $D^{(*)}$ candidates

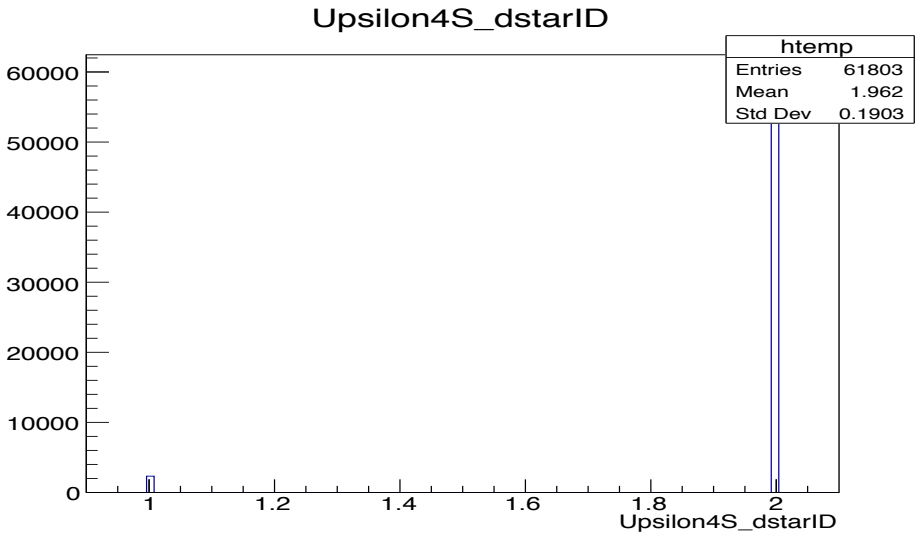




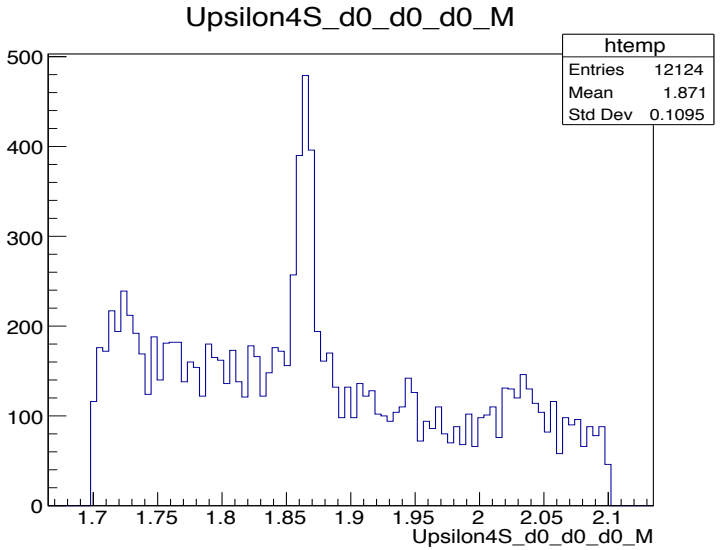
BGx1



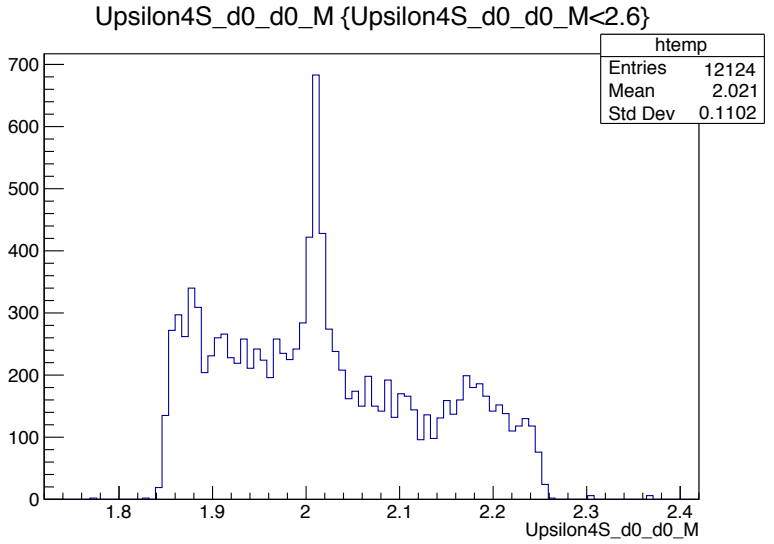
Absence of D^0 modes

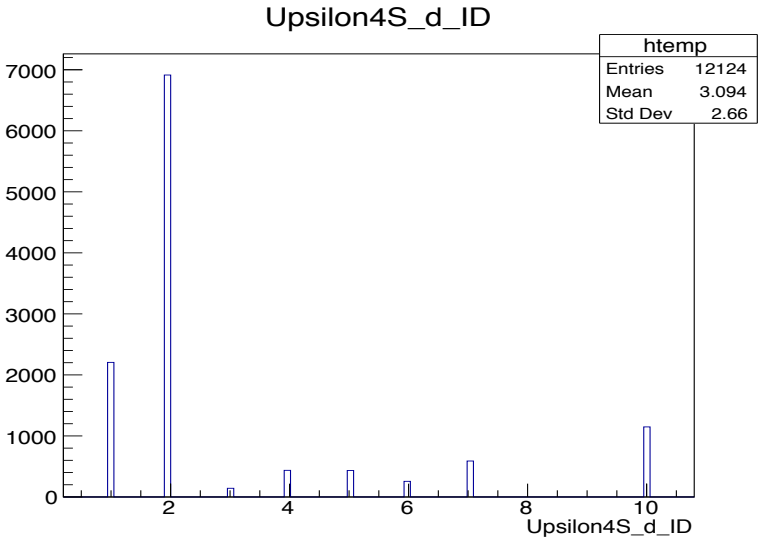


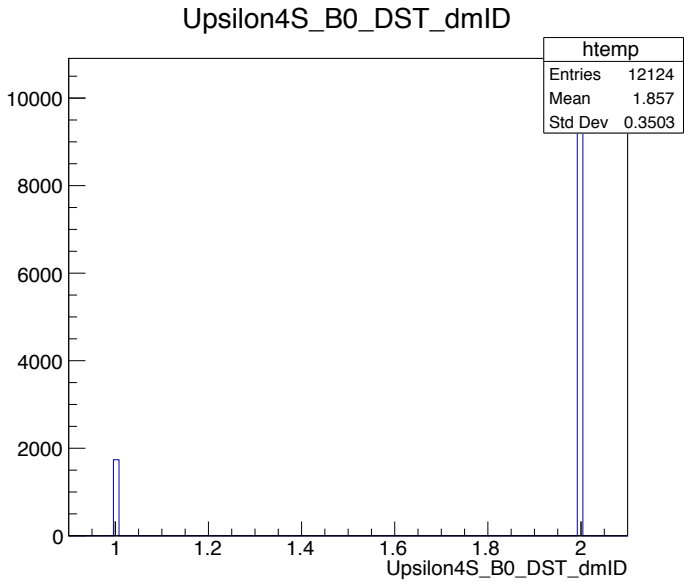
Y4S D(*) candidates



BGx0

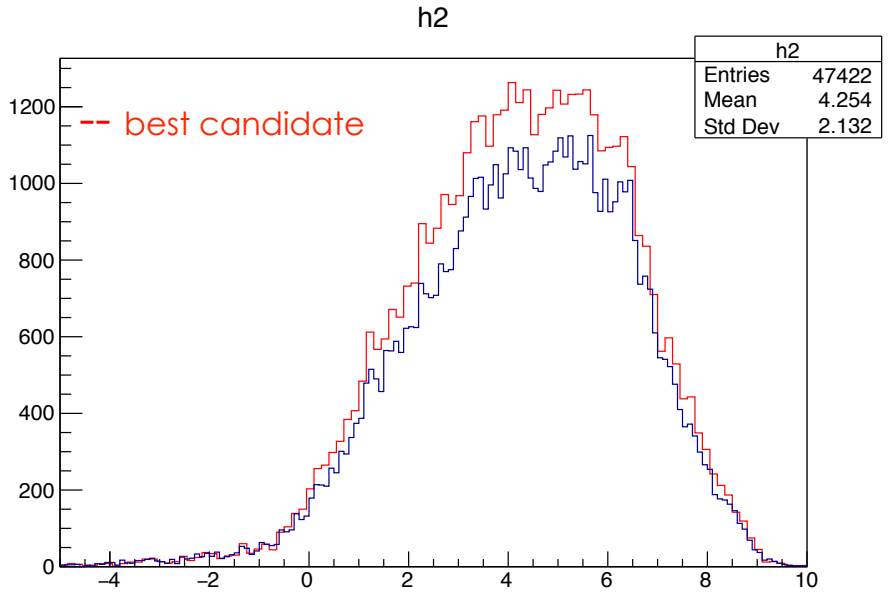




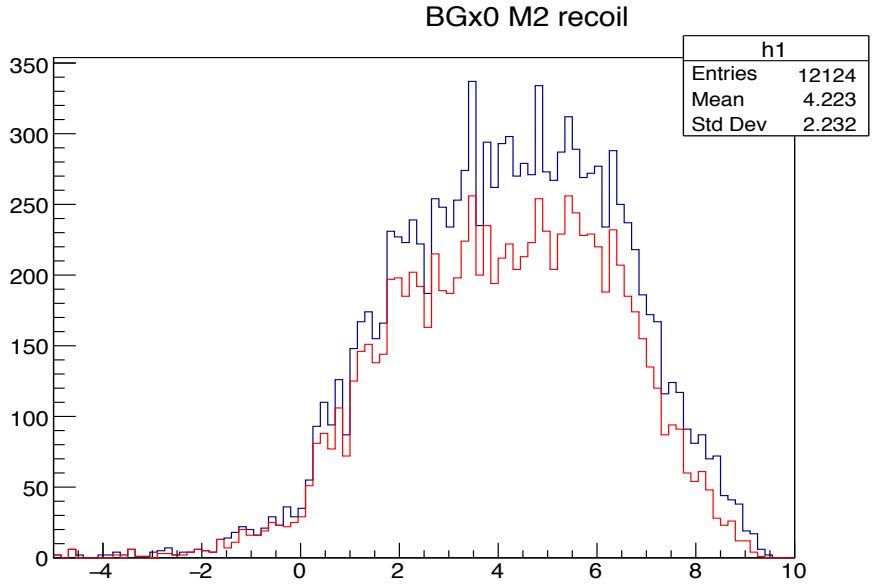


Y4S M2 recoil

- Select Y(4S) with Btag with highest signal probability candidate

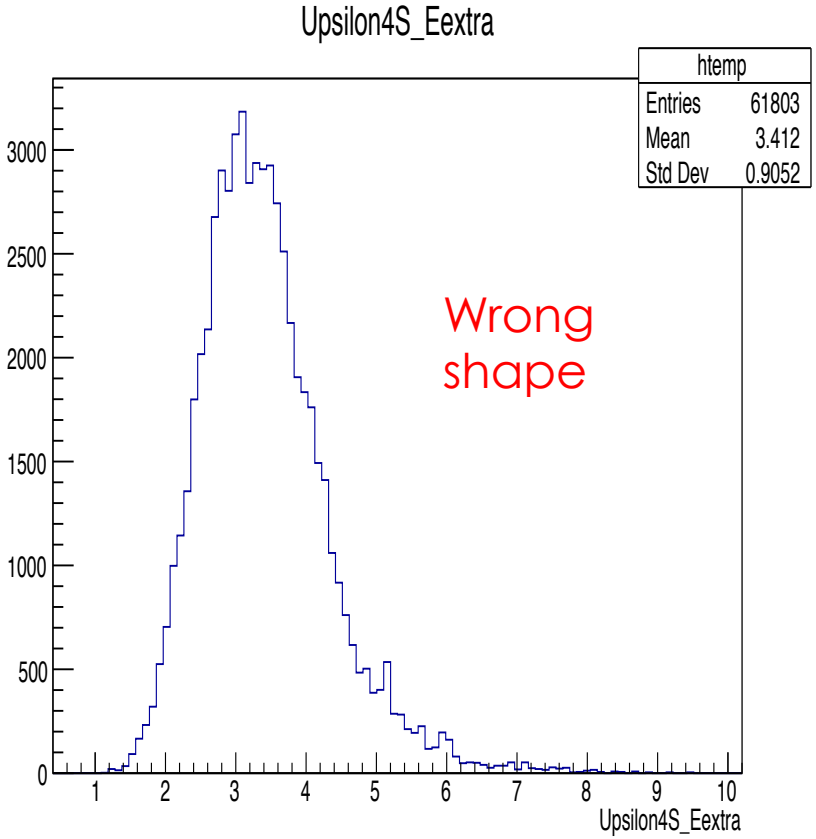


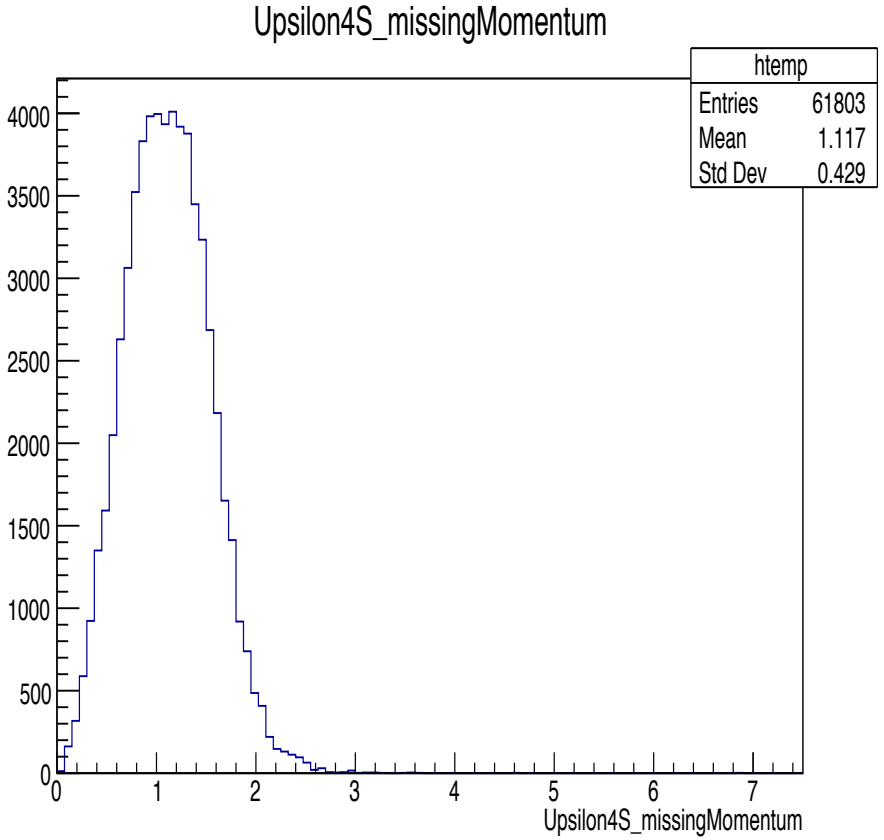
Efficiency: 0.0037



Efficiency: 0.00241

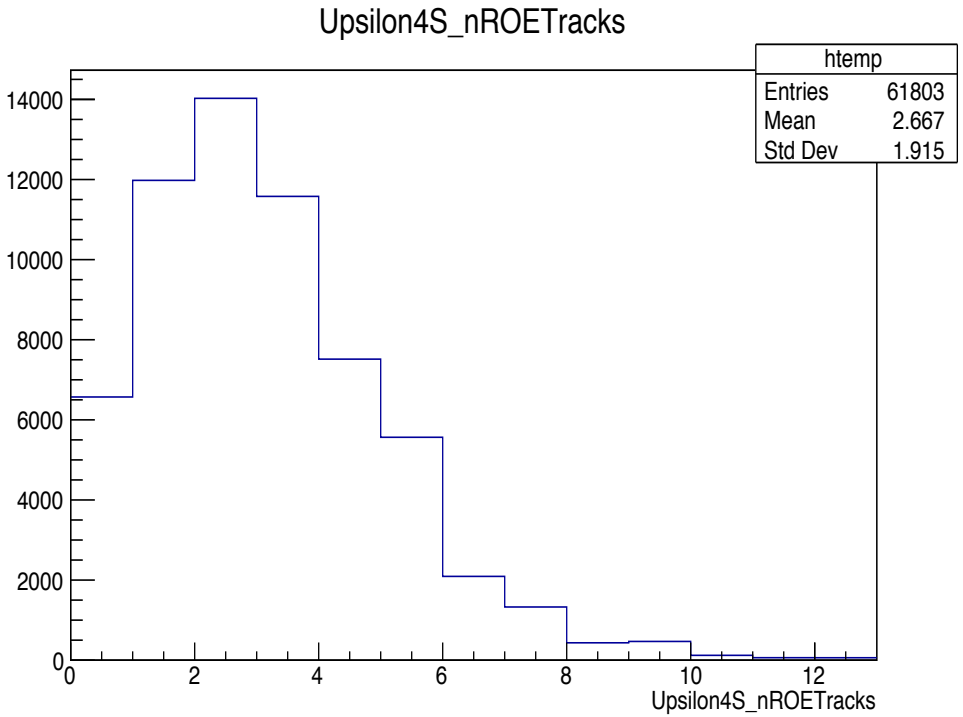
Y4S missing Energy

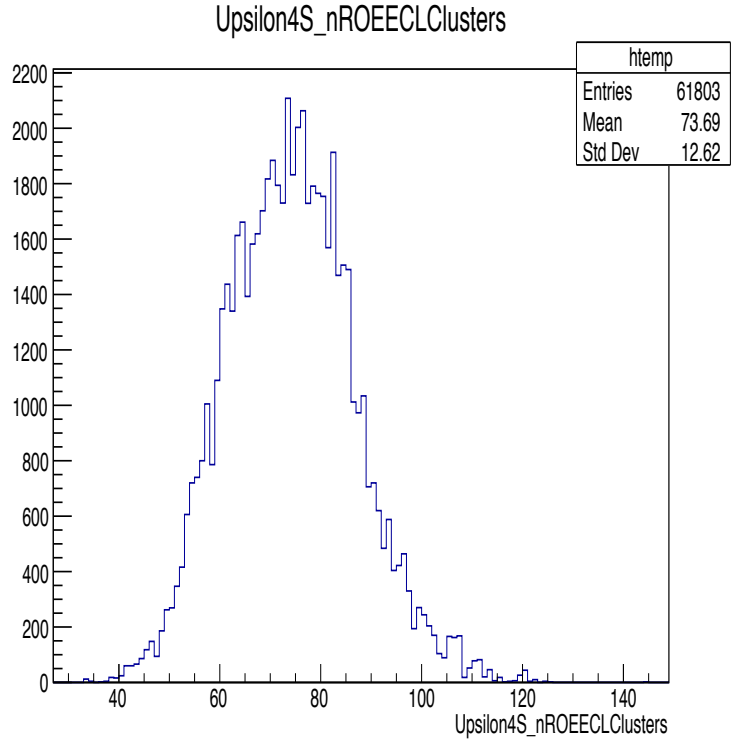




ROE

ROETracks = ('ROETracks', '', 'pt>0.05 and -2< dr < 2 and -4.0<dz < 4.0')
ROEclusters = ('ROEclusters', '', 'abs(clusterTiming)<clusterErrorTiming and E>0.05')

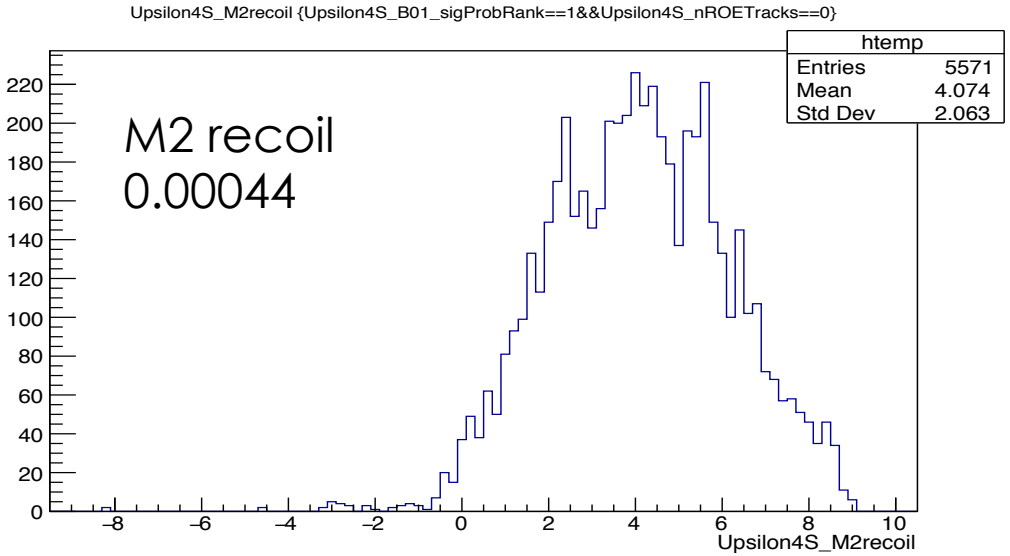


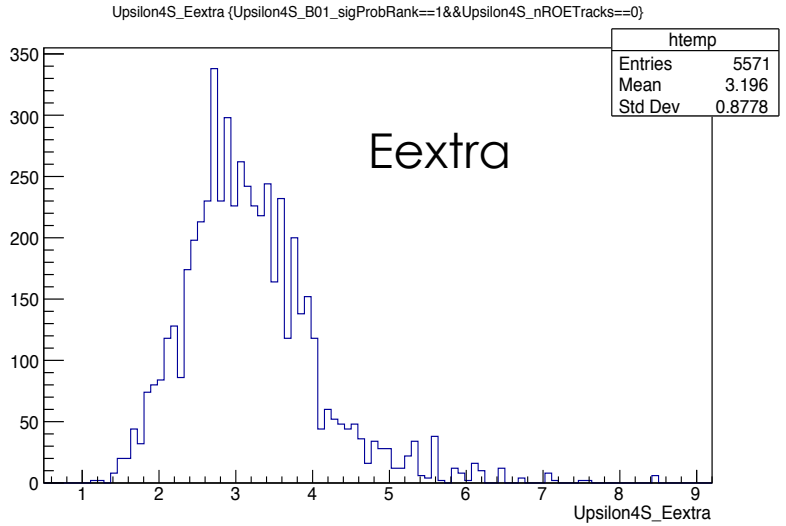


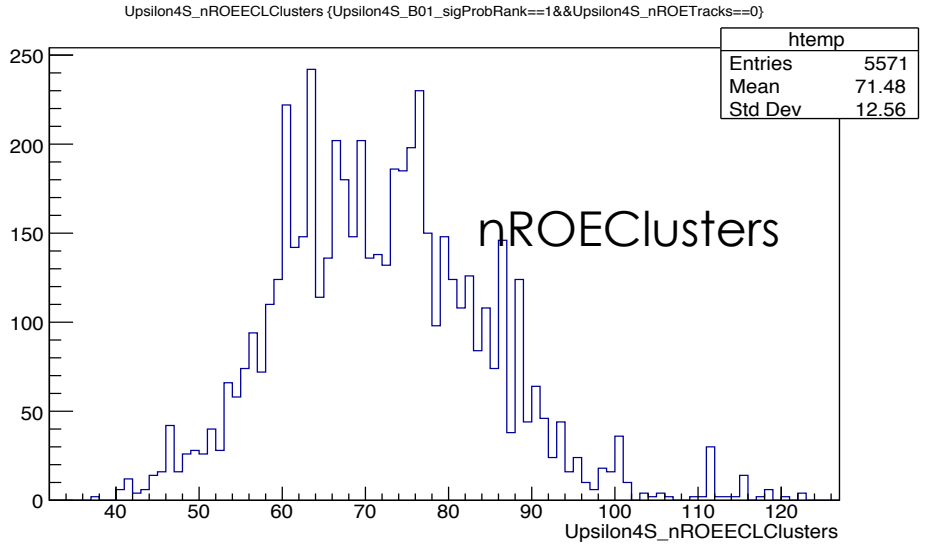
To do:

- Improve best Y(4S) candidate selection:
  - Tighter D mass cuts
  - Tighter D* mass cuts
  - Some best Bsig selection.
- Cut on ROE tracks and ROE clusters in a proper manner.
- Ensure proper nTuple tools are written out .
  - Introduce q2 variable in module
- Better event-based tuple:
  - Write out Btag, D, D*, and lepton kinematics.
  - Write out all continuum suppression variables.
  - Write out all event based values.
- Test on full background generic samples.

ROE Tracks ==0


Upsilon4S_M2recoil {Upsilon4S_B01_sigProbRank==1&&Upsilon4S_nROETracks==0}
htemp
Entries 5571
Mean 4.074
Std Dev 2.063
M2 recoil
0.00044
Upsilon4S_M2recoil


Upsilon4S_Eextra {Upsilon4S_B01_sigProbRank==1&&Upsilon4S_nROETracks==0}
htemp
Entries 5571
Mean 3.196
Std Dev 0.8778
Eextra
Upsilon4S_Eextra


Upsilon4S_nROEECLClusters {Upsilon4S_B01_sigProbRank==1&&Upsilon4S_nROETracks==0}
htemp
Entries 5571
Mean 71.48
Std Dev 12.56
nROEClusters
Upsilon4S_nROEECLClusters