FCNC ttbar Zqt
Status

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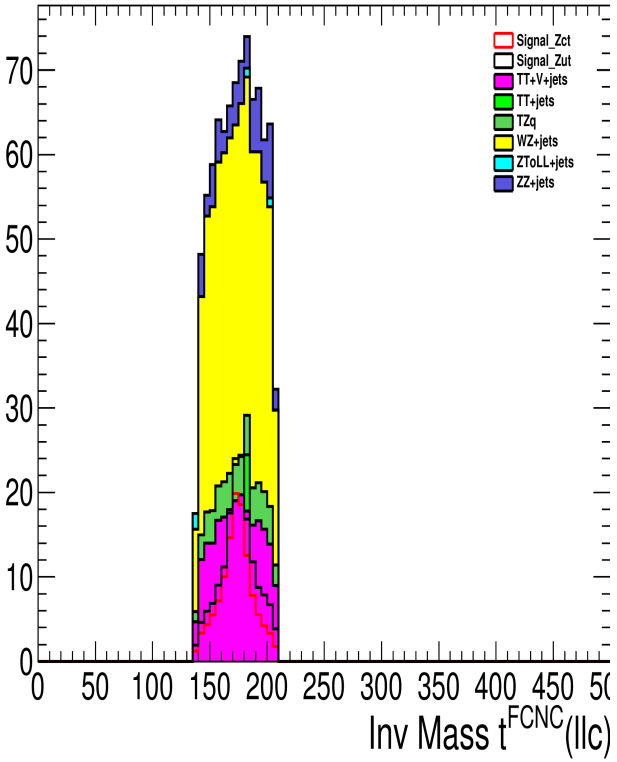
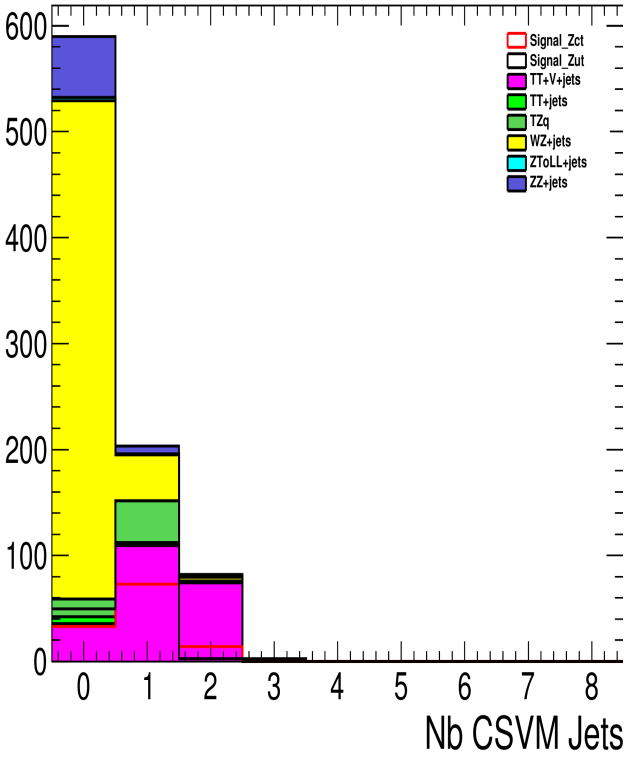
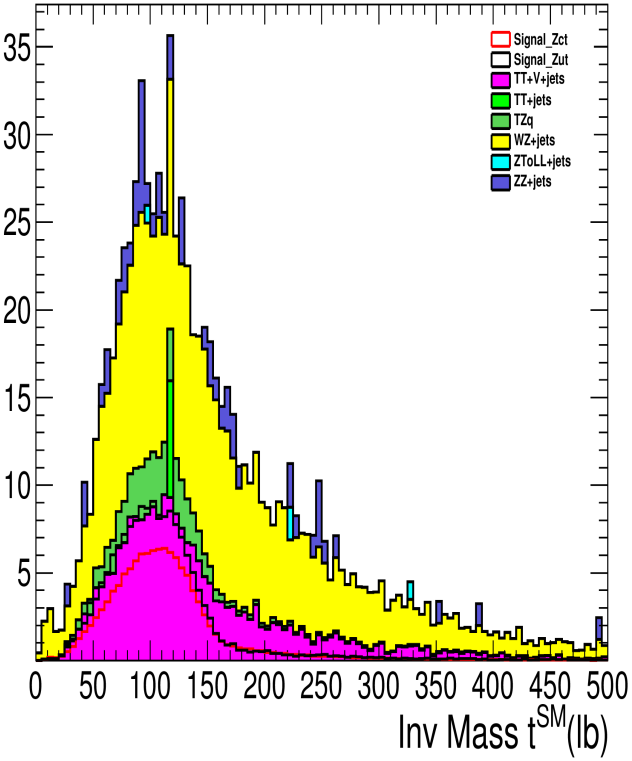
	Initial	3 leptons	At least 2 jets	At least 1 CSVL	At least 1 OSSF pair	Inv Mass Z	Inv Mass top
NEW2-TTto3L-Kappa-zct	2.13e+03 ± 1.05	256 ± 0.36	146 ± 0.271	117 ± 0.242	117 ± 0.242	111 ± 0.236	79.3 ± 0.2
NEW2-TTto3L-Kappa-zut	2.13e+03 ± 1.02	256 ± 0.348	143 ± 0.26	108 ± 0.225	107 ± 0.225	103 ± 0.22	80 ± 0.194
tZ-Kappa-zct	372 ± 0.482	52.1 ± 0.18	11.8 ± 0.0858	9.66 ± 0.0776	9.61 ± 0.0773	8.82 ± 0.0741	2.43 ± 0.0389
tZ-Kappa-zut	3.17e+03 ± 4.08	375 ± 1.41	83.7 ± 0.664	65.6 ± 0.588	65.2 ± 0.586	58.6 ± 0.556	11.6 ± 0.247
TTdilep WToLNu madspin	1.93e+03 ± 7.6	147 ± 2.1	87.2 ± 1.62	79.9 ± 1.55	61.8 ± 1.36	15.4 ± 0.679	8.49 ± 0.505
TTdilep ZToLL madspin	803 ± 2.54	208 ± 1.29	127 ± 1.01	117 ± 0.969	108 ± 0.933	81.4 ± 0.809	31.8 ± 0.506
TTdilep madspin	6.78e+06 ± 3.44e+03	145 ± 15.6	41.7 ± 8.34	31.7 ± 7.27	20 ± 5.78	6.67 ± 3.34	1.67 ± 1.67
TTsemilep HToZZ madspin2	267 ± 0.34	2.64 ± 0.0339	2.52 ± 0.0331	2.28 ± 0.0315	2.24 ± 0.0312	1.67 ± 0.027	1.04 ± 0.0213
TTsemilep ZToLL madspin 1	1.68e+03 ± 5.3	108 ± 1.35	84.2 ± 1.19	75.2 ± 1.12	73.6 ± 1.11	63 ± 1.03	25.3 ± 0.652
TTsemilep ZToLL madspin 2	1.68e+03 ± 5.3	110 ± 1.36	85 ± 1.19	74.4 ± 1.12	72.4 ± 1.1	62.6 ± 1.03	25.7 ± 0.657
WZToLLLNu	2.57e+05 ± 60.5	1.52e+04 ± 15.4	1.98e+03 ± 5.53	579 ± 2.99	577 ± 2.99	517 ± 2.83	171 ± 1.63
ZToLL50-3Jets sm-no masses	6.28e+06 ± 3.39e+03	33.3 ± 7.85	9.25 ± 4.14	1.85 ± 1.85	1.85 ± 1.85	1.85 ± 1.85	1.85 ± 1.85
ZToLL50-4Jets sm-no masses	2.16e+06 ± 1.49e+03	6.05 ± 2.47	5.04 ± 2.25	2.02 ± 1.43	2.02 ± 1.43	2.02 ± 1.43	2.02 ± 1.43
ZZToLLLL sm-no masses	3.59e+04 ± 135	2.74e+03 ± 37.3	236 ± 10.9	74.2 ± 6.14	73.6 ± 6.12	67.6 ± 5.86	27.4 ± 3.73
TZq madspin trilep	2.31e+03 ± 2.12	249 ± 0.694	77.9 ± 0.388	63.6 ± 0.351	63.4 ± 0.35	58.2 ± 0.335	17.7 ± 0.185

Coupling	Signal	Background	S/√S+B	S/√S+B+(0.3xWZ)²
Zut	80 + 12 = 92	314 (WZ = 171)	4.57	1.67
Zct	79 + 2 = 81	314 (WZ = 171)	4.08	1.47

MVA variables

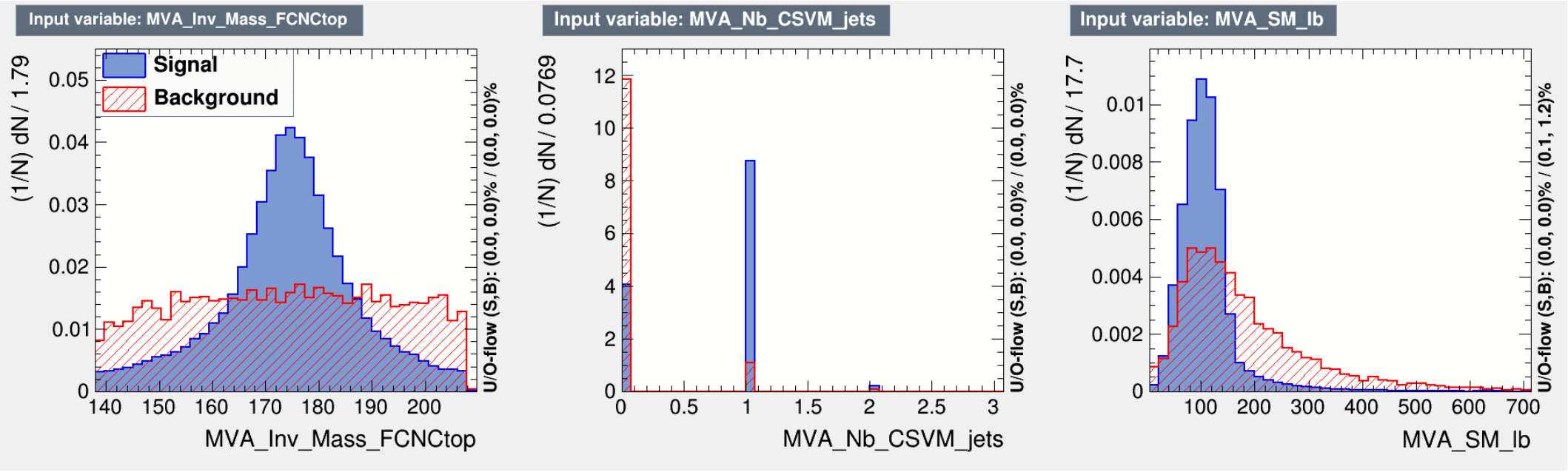




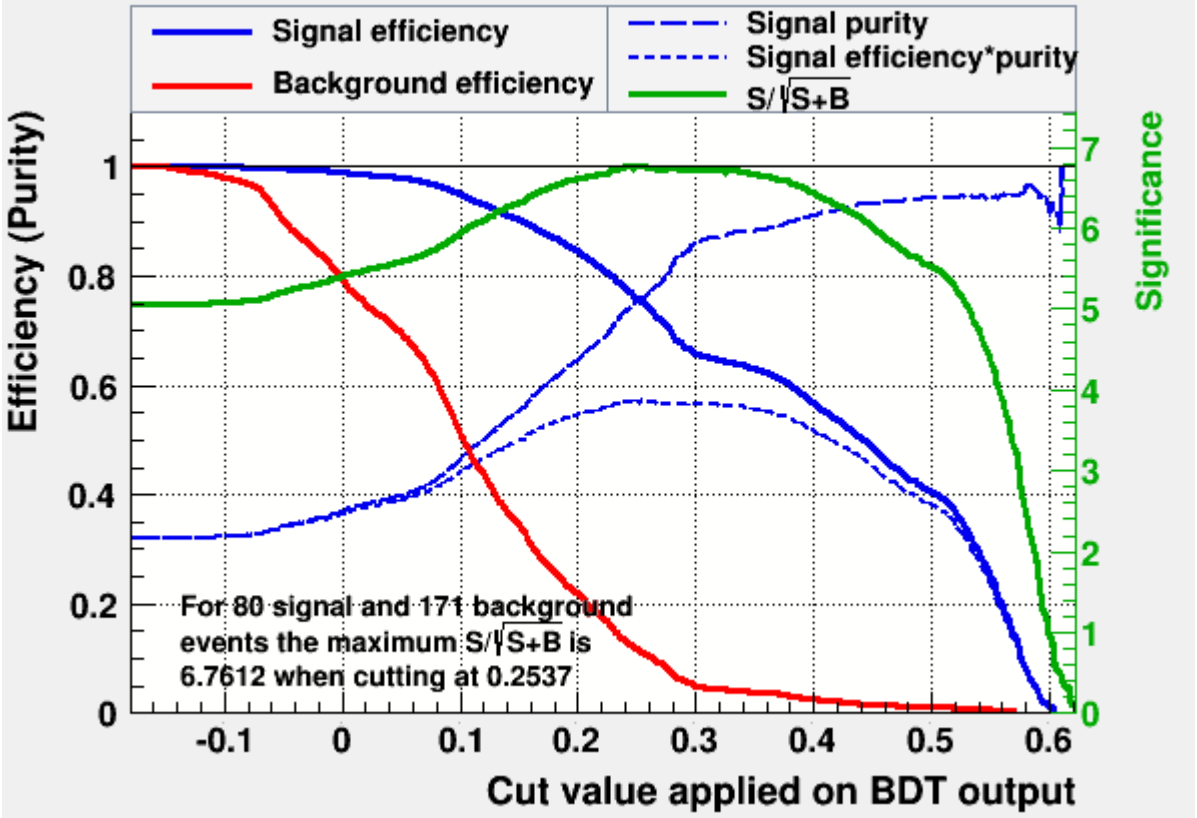


Training for ttbar Zut with WZ

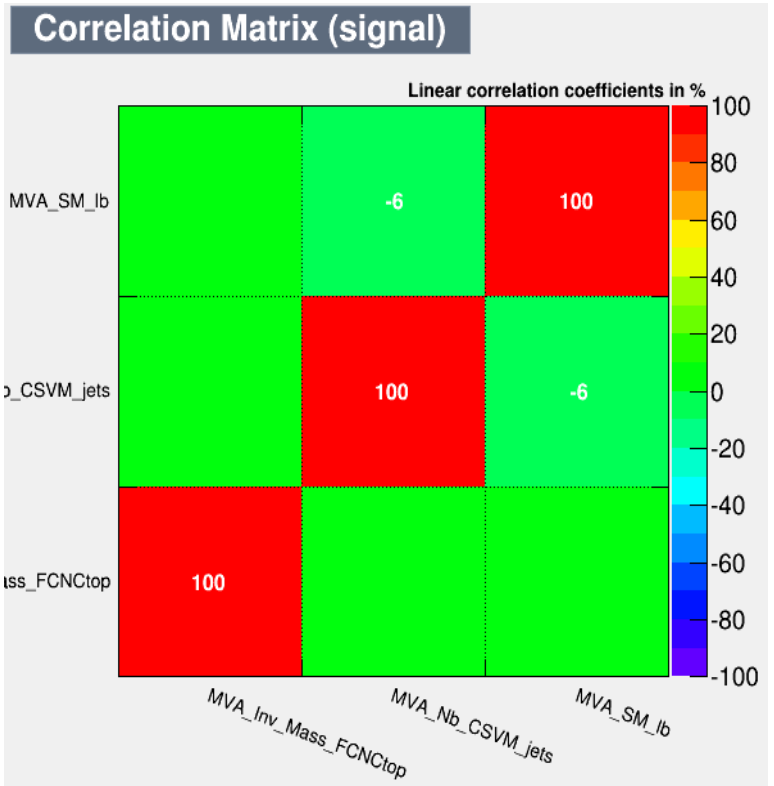
- Variables in order of importance:
  - Invariant mass top (FCNC side)
  - Nb CSVM jets
  - Invariant mass lb (SM side)



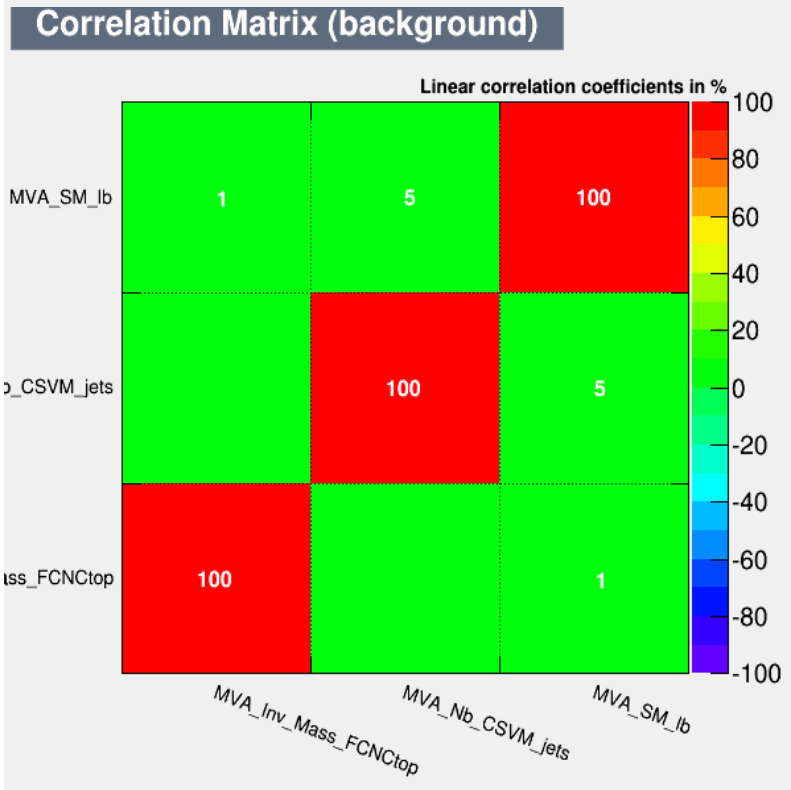
Cut efficiencies and optimal cut value

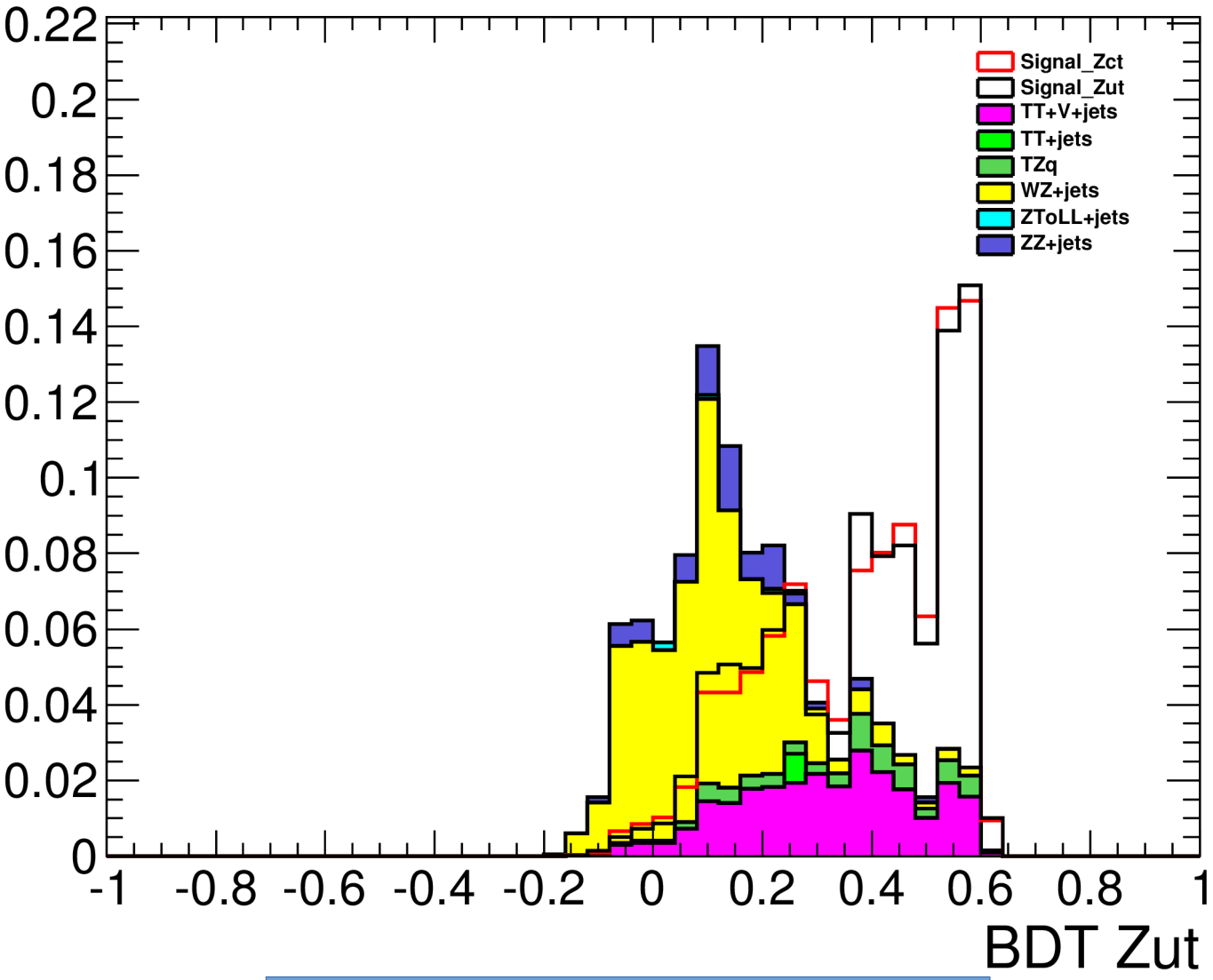


Correlation Matrix (signal)



Correlation Matrix (background)

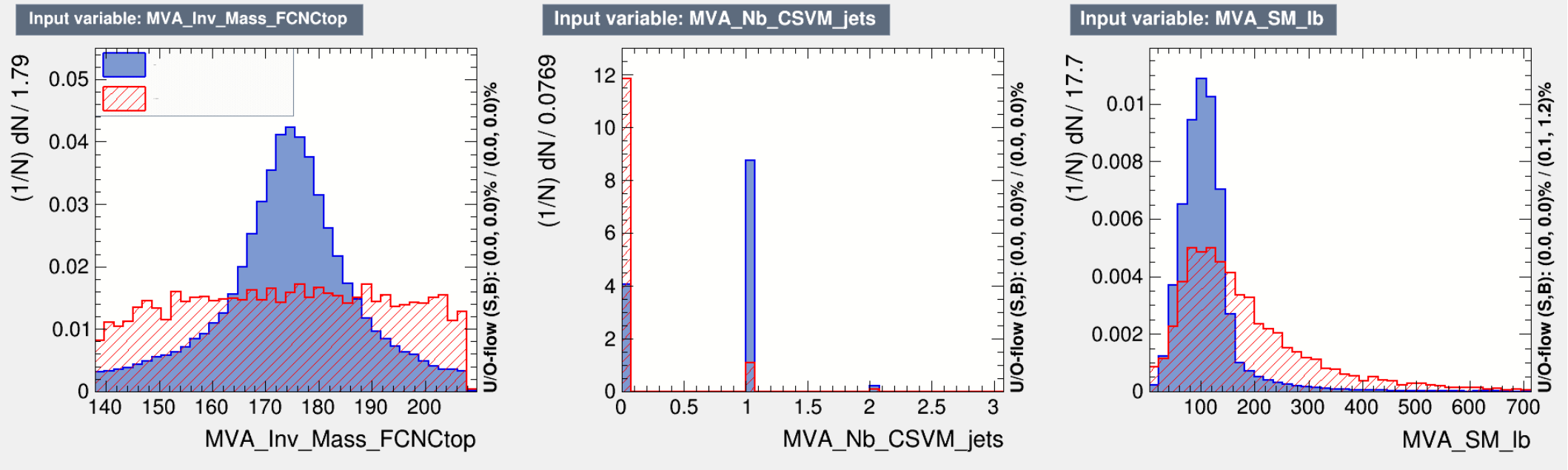


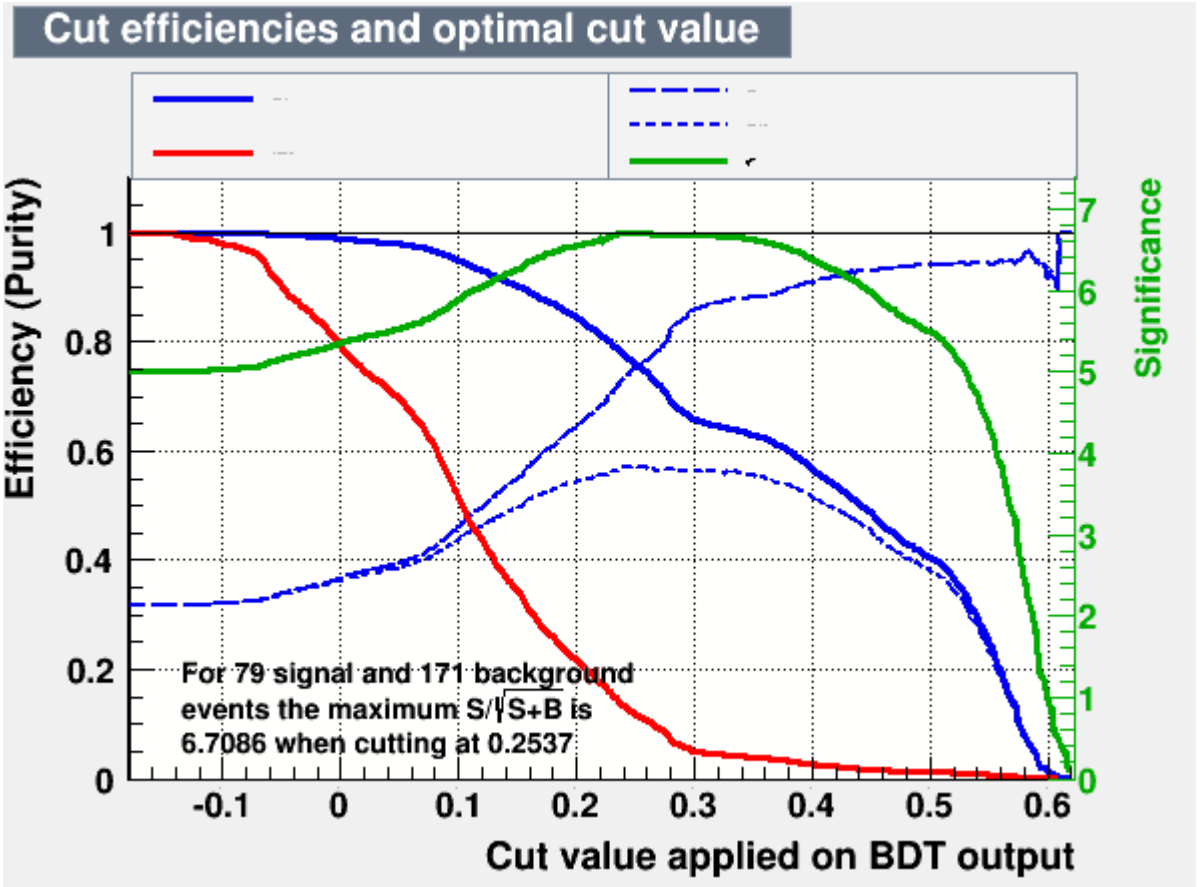


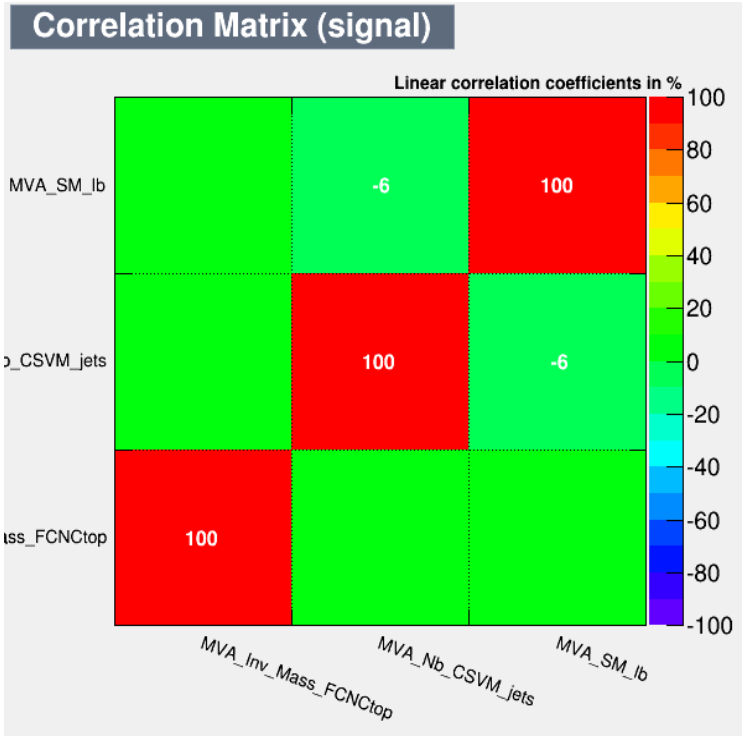
Cut on 0.32 gives S/√S+B = 6.15
On the cut:
S: 103 B: 178 WZ: 31

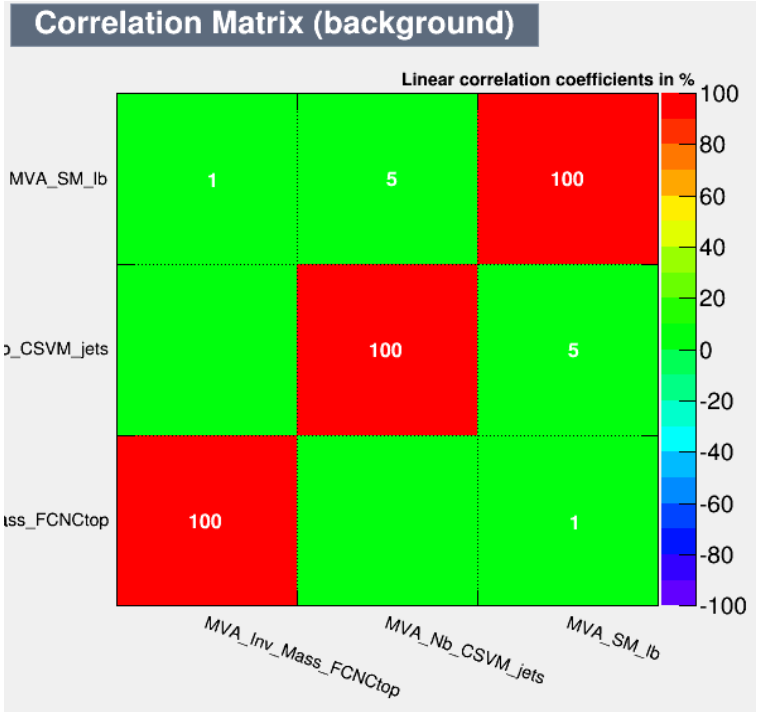
Training for ttbar Zct with WZ

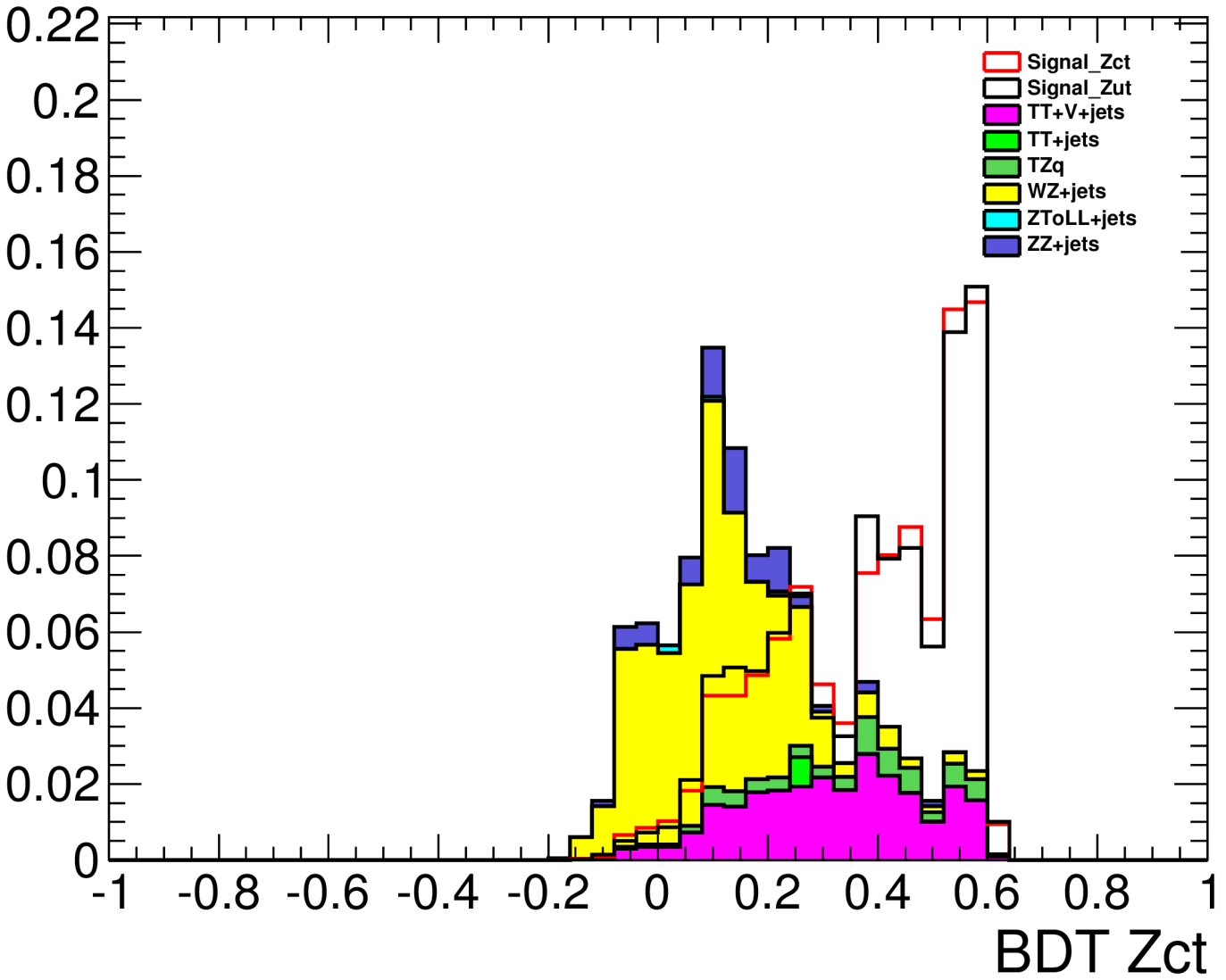
- Variables in order of importance:
  - Invariant mass top (FCNC side)
  - Nb CSVM jets
  - Invariant mass lb (SM side)




Cut efficiencies and optimal cut value
Efficiency (Purity)
Significance
Cut value applied on BDT output
For 79 signal and 171 background
events the maximum S/√S+B is
6.7086 when cutting at 0.2537


Correlation Matrix (signal)
Linear correlation coefficients in %
MVA_SM_lb
CSVM_jets
ass_FCNCtop
MVA_Inv_Mass_FCNCtop
MVA_Nb_CSVM_jets
MVA_SM_lb


Correlation Matrix (background)
Linear correlation coefficients in %
MVA_SM_lb
CSVM_jets
ass_FCNCtop
MVA_Inv_Mass_FCNCtop
MVA_Nb_CSVM_jets
MVA_SM_lb



Cut on 0.32 gives S/√S+B = 4.83
On the cut:
S: 77 B: 178 WZ: 31

tuZ	**# Signal**	**# Background**	**Significance**	**Significance including systematic uncertainties**
Cut and count	92	314	$S/\sqrt{(S+B)}$ = **4.57**	$S/\sqrt{[S+B+\sum(\text{syst. Shift})^2]}$ = **1.67**
MVA cut and count	103	178	$S/\sqrt{(S+B)}$ = **6.15**	$S/\sqrt{[S+B+\sum(\text{syst. Shift})^2]}$ = **5.37**

tcZ	**# Signal**	**# Background**	**Significance**	**Significance including systematic uncertainties**
Cut and count	81	314	$S/\sqrt{(S+B)}$ = **4.08**	$S/\sqrt{[S+B+\sum(\text{syst. Shift})^2]}$ = **1.47**
MVA cut and count	77	178	$S/\sqrt{(S+B)}$ = **4.83**	$S/\sqrt{[S+B+\sum(\text{syst. Shift})^2]}$ = **4.17**