

# Status of 4Top analysis

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# Top pt reweighting([Link](#))

- We are in Case3.1 : we should check the top pt distribution in CR.
  - If no discrepancy, then no need to reweight
  - If discrepancy is observed, a reweighting should be derived from CR and monitor other distribution.
  - Not recommend to use the function from Top PAG unless the Top region is the CR which is close to SR and no overlap with SR.
  - Note that using the TOP PAG NNLO-NLO corrections as an alternative is only supported if the corrections are proven to improve the data-MC agreement in the control region for all of the distributions of interest
- What other 4top analysis are doing?
  - 1L and OS2L : reweighting function from Top PAG
  - SS2L : no  $t\bar{t}$  background.
- Our case?
  - There must be overlap between our SR and the so-called "Top region".

- What I am doing is quite clear from the view of technique.
  - Tag  $t\bar{t} + b\bar{b}$  at generator level
  - Scale up ttbb and scale down other processes
  - A dedicated ttbb sample should be used to model the kinematics?
  - Just find a mistake and resubmit my jobs.
  - It will be nice if we can have a flag for ttbb events in our ntuple.  
Otherwise, matching the event number is time consuming.
- What others are doing?
  - 1L/OS2L people do the same thing
  - They also assign an uncertainty of 15% based on the measurement.

# Cutflow

no reweighting

category	data	signal	$t\bar{t}$	SingleTop	TTX	SM Higgs	HH	QCD	total bkg	(data-bkg)/bkg
1Tau+0L	13942	9.474	6276.168	0.262	104.929	57.190	0.027	7285.375	13723.952	0.016
1Tau+1L	2026	7.694	2329.306	0.651	65.438	35.281	0.003	2.359	2433.039	-0.167
1Tau+2L	78	1.843	62.112	0.555	19.325	6.488	0.002	0.000	88.482	-0.118
1Tau+3L	3	0.146	0.000	0.006	1.934	0.394	0.000	0.000	2.333	0.286
2Tau+0L	275	0.507	246.776	0.391	13.155	6.846	0.000	1.418	268.585	0.024
2Tau+1L	19	0.260	22.571	0.136	6.427	3.524	0.000	0.000	32.659	-0.418
2Tau+2L	1	0.031	0.271	0.004	0.729	0.354	0.000	0.000	1.358	-0.264

top pt reweighting

category	data	signal	$t\bar{t}$	SingleTop	TTX	SM Higgs	HH	QCD	total bkg	(data-bkg)/bkg
1Tau+0L	13942	9.474	6072.162	0.262	104.929	57.190	0.027	7285.375	13519.945	0.031
1Tau+1L	2026	7.694	2256.471	0.651	65.438	35.281	0.003	2.359	2360.204	-0.142
1Tau+2L	78	1.843	60.202	0.555	19.325	6.488	0.002	0.000	86.573	-0.099
1Tau+3L	3	0.146	0.000	0.006	1.934	0.394	0.000	0.000	2.333	0.286
2Tau+0L	275	0.507	239.342	0.391	13.155	6.846	0.000	1.418	261.152	0.053
2Tau+1L	19	0.260	22.024	0.136	6.427	3.524	0.000	0.000	32.111	-0.408
2Tau+2L	1	0.031	0.260	0.004	0.729	0.354	0.000	0.000	1.348	-0.258

- Data is lower in low  $N_{\text{jet}}$  and low  $N_{\text{bjet}}$  region.
- Systematic uncertainty could cover this?
  - Exp : JER, JES
  - Theo : PS, QCD scale
- Do we have plan to run systematic samples?

# Variables

- event level : Njet, Nbjeta, MET, HT, Ntop
- tau/leptons : pT, eta
- jet : pT, eta, bscore, sum of bscore
- top : pT, eta, mass, score
- minDeltaR : (tau,lep),(tau,jet),(lep,jet)
- invMass?

# Remind myself

- Whether overlap removal will remove the jet that forms a resolved top.
- Event weight of data is not 1?

# Plots

① 1Tau+0L

② 1Tau+1L

③ 1Tau+2L

④ 1Tau+3L

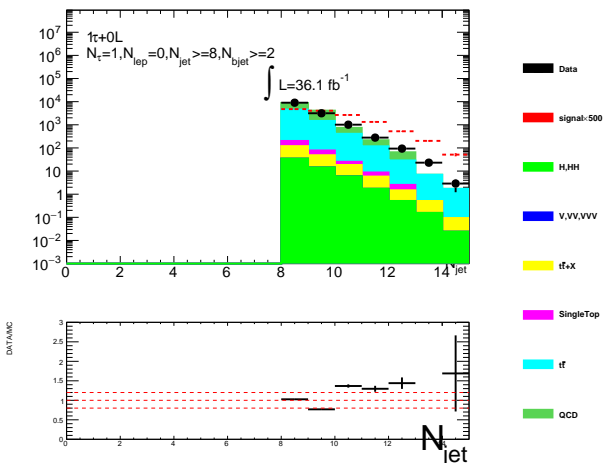
⑤ 2Tau+0L

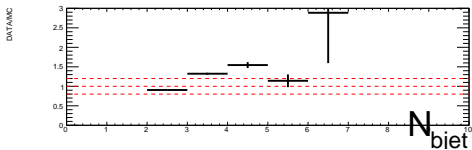
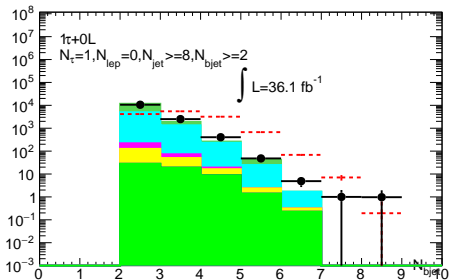
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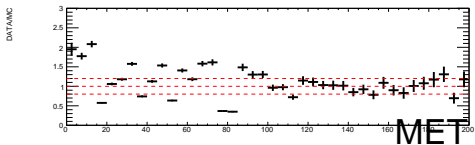
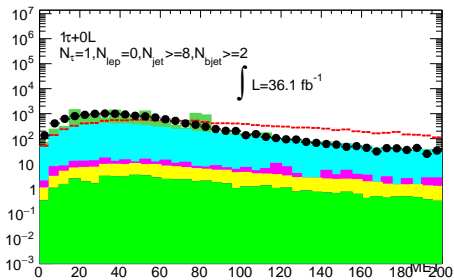
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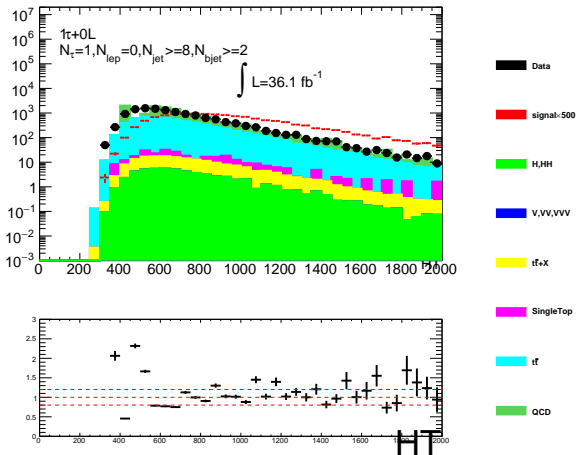


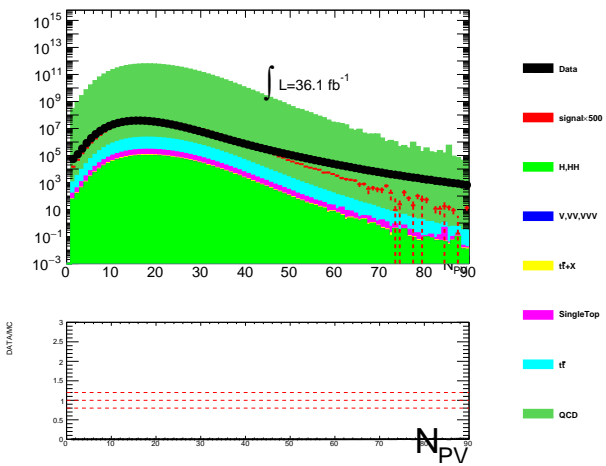
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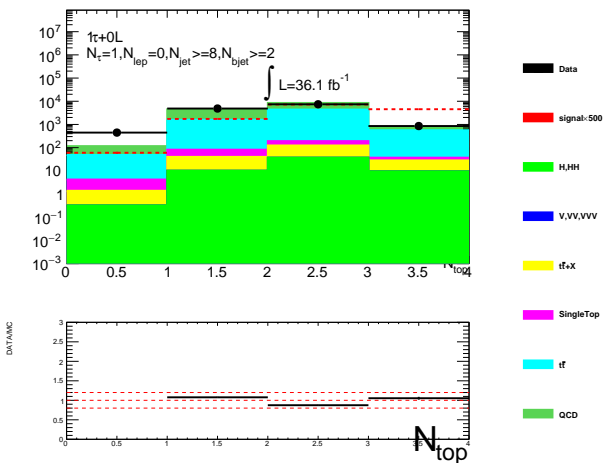


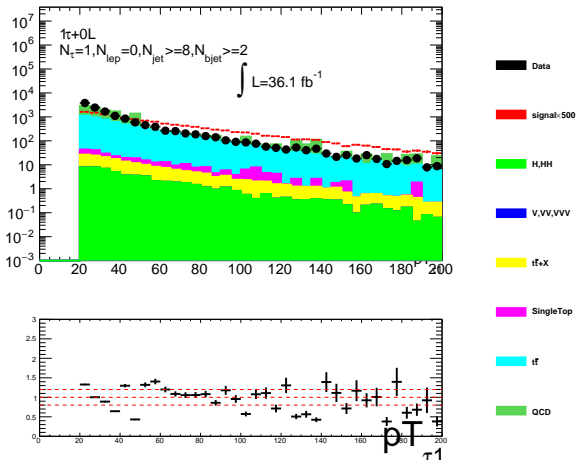




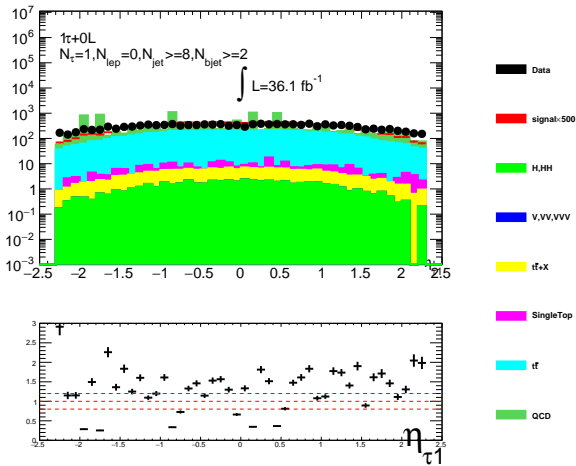


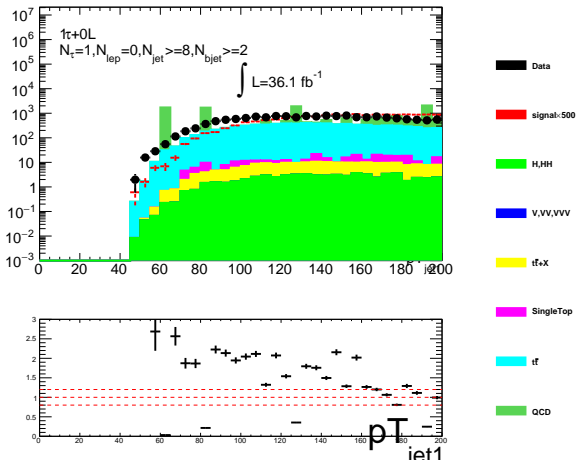


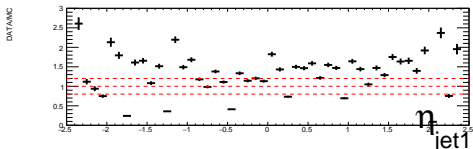
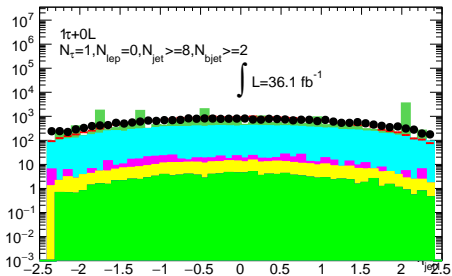


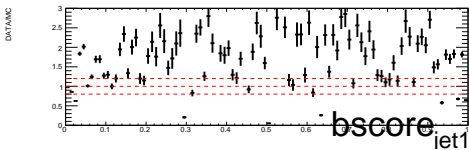
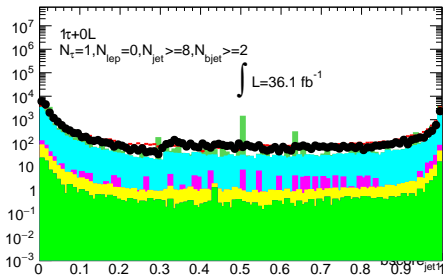


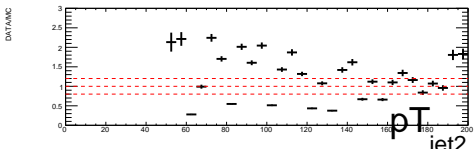
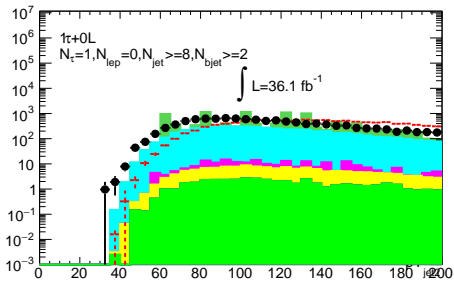


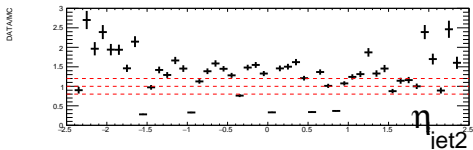
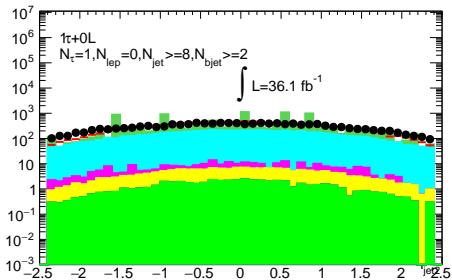


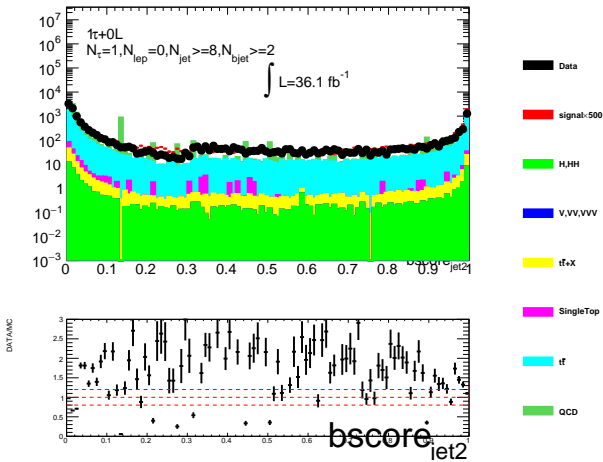


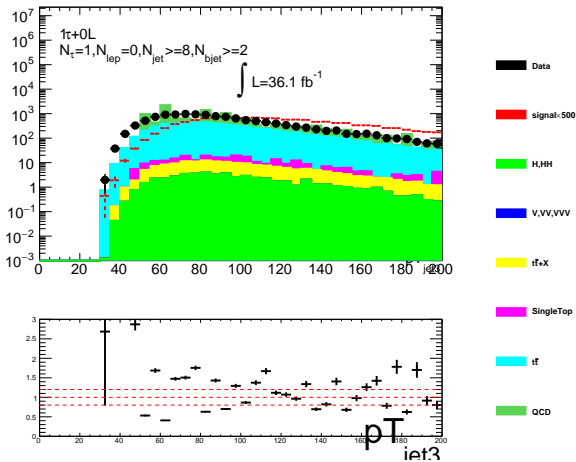




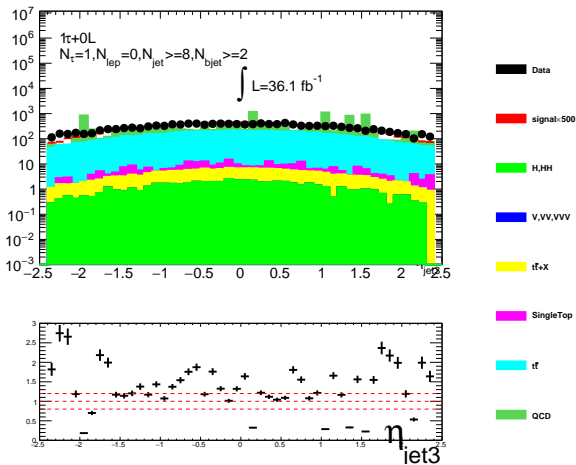


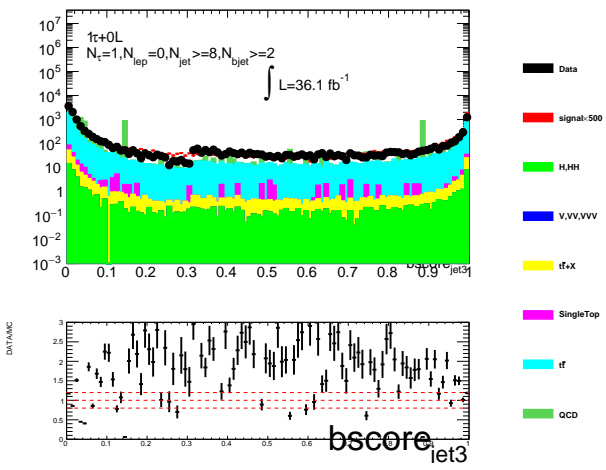


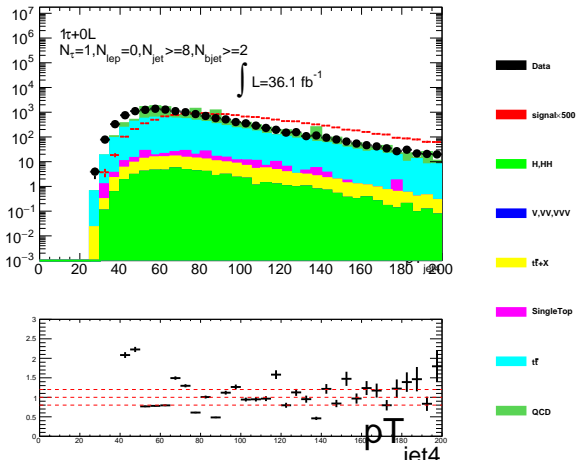


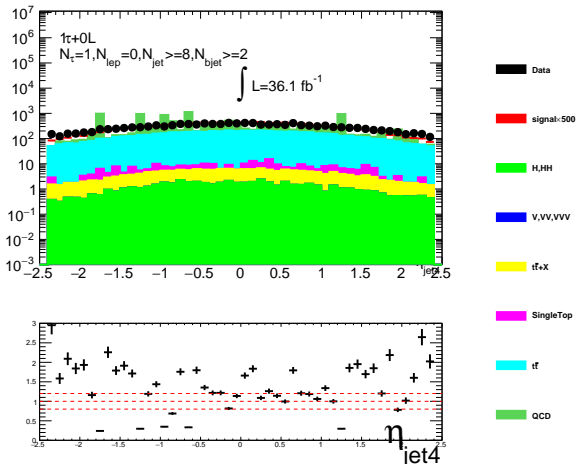


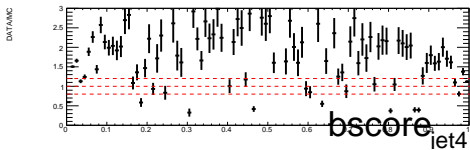
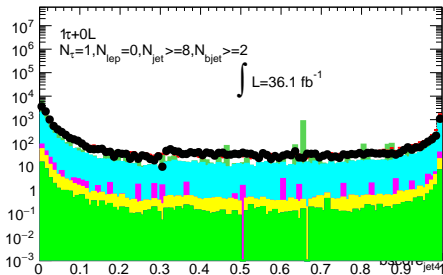


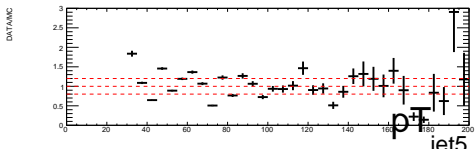
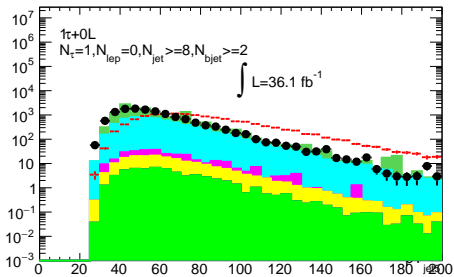


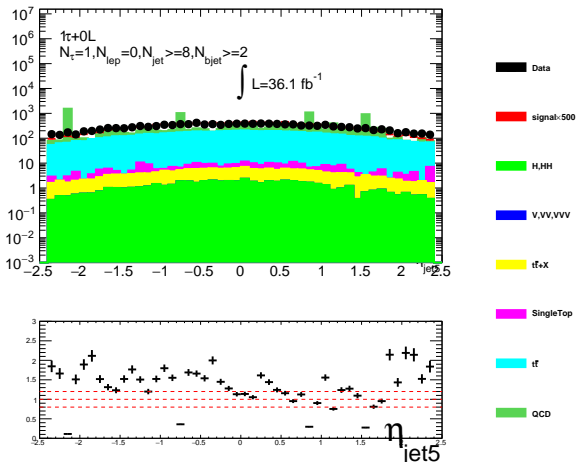


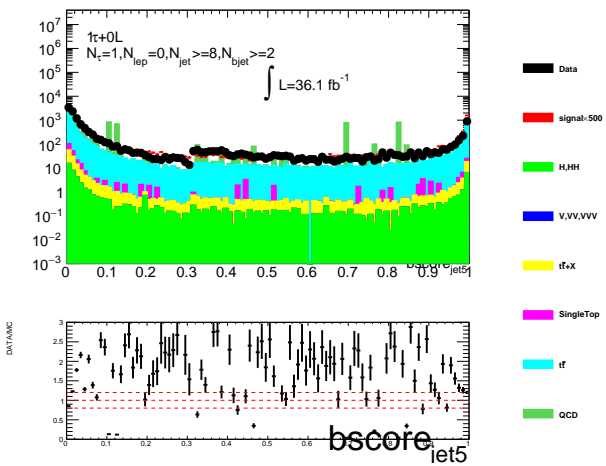




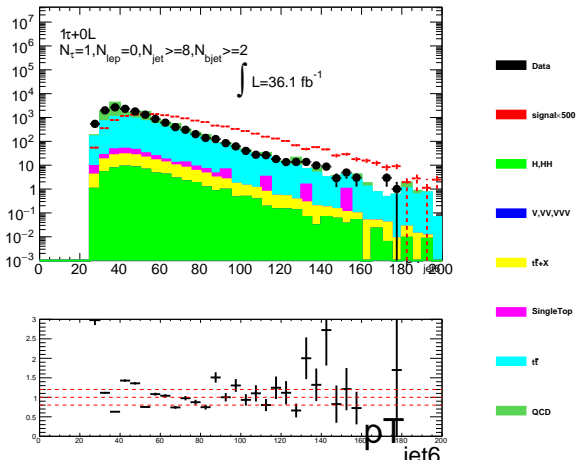


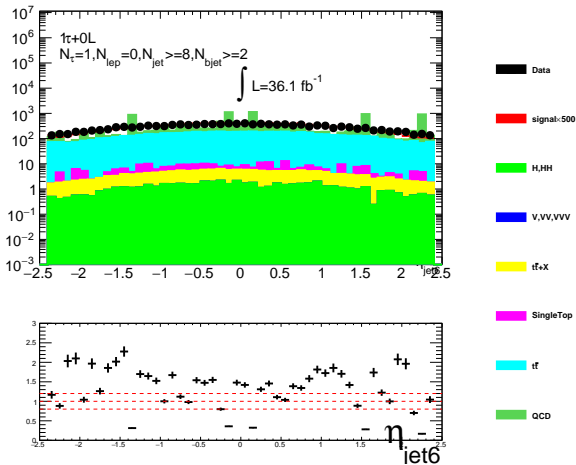


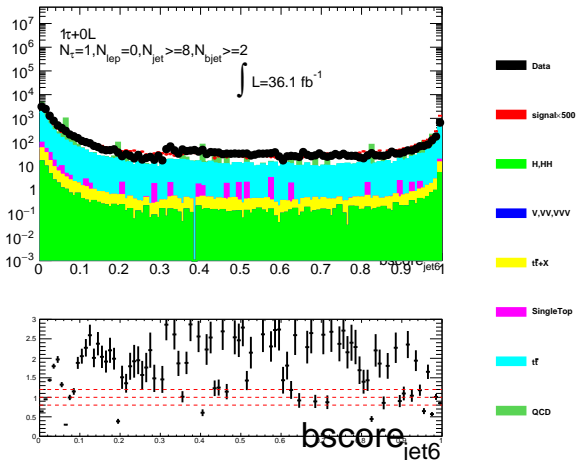


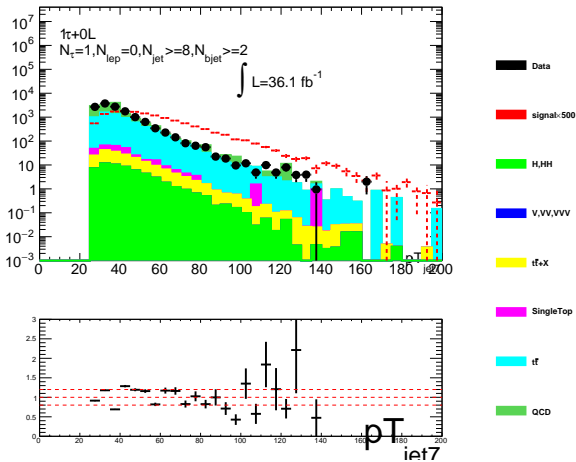


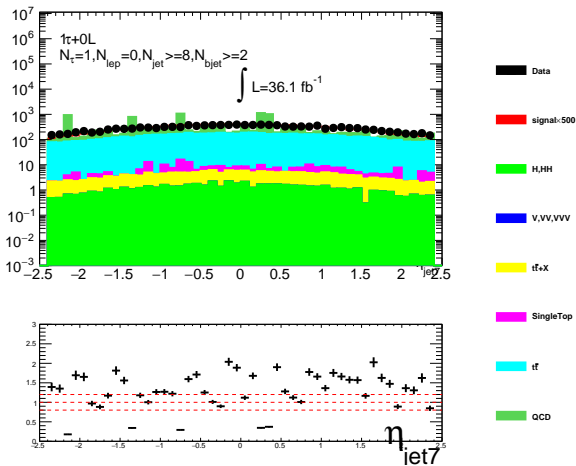


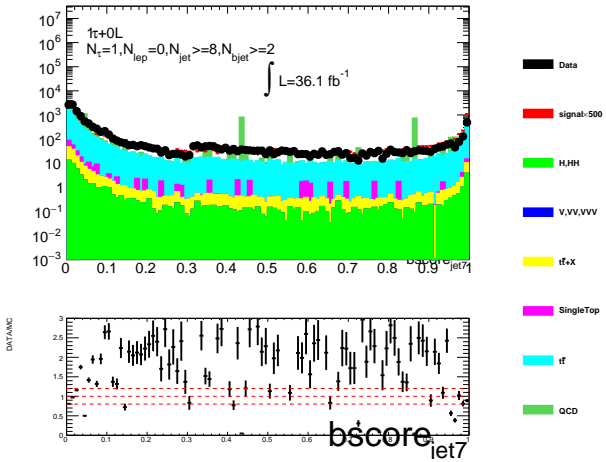


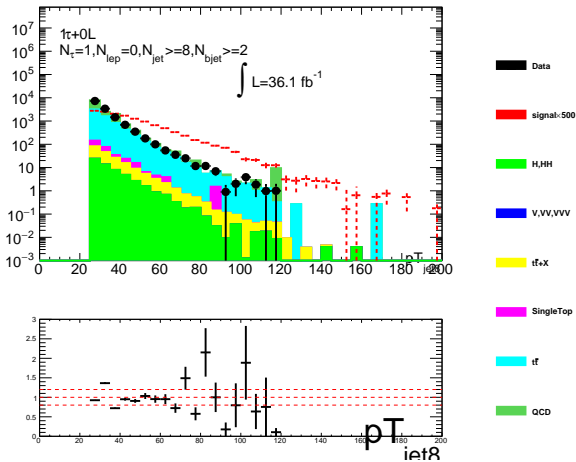


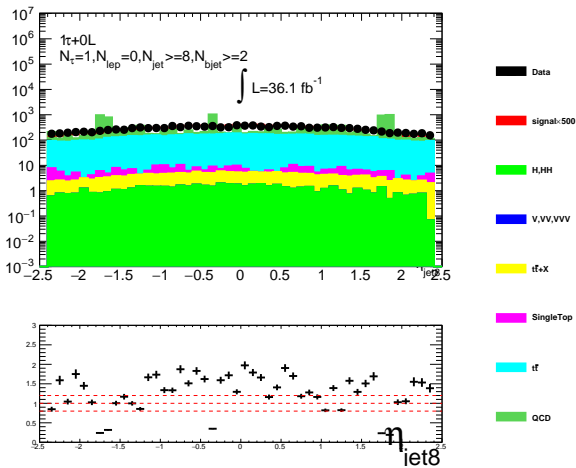




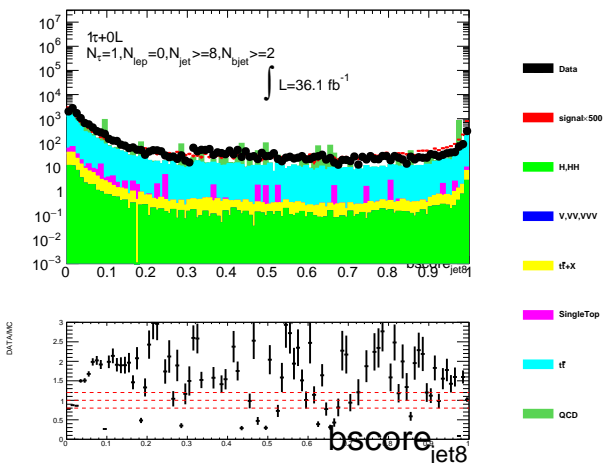


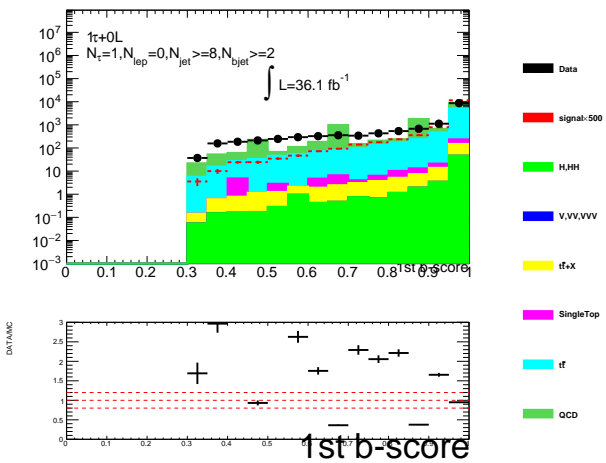


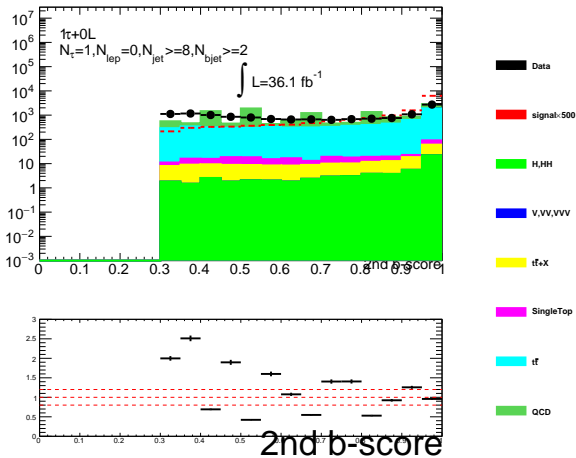


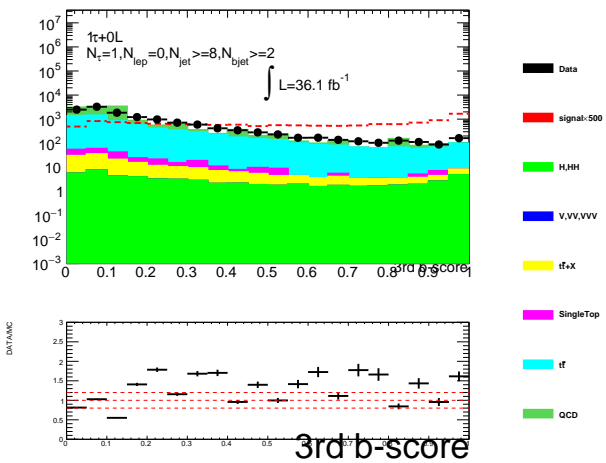


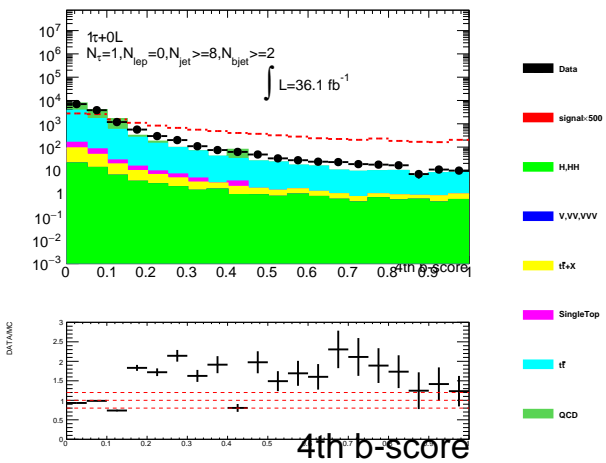


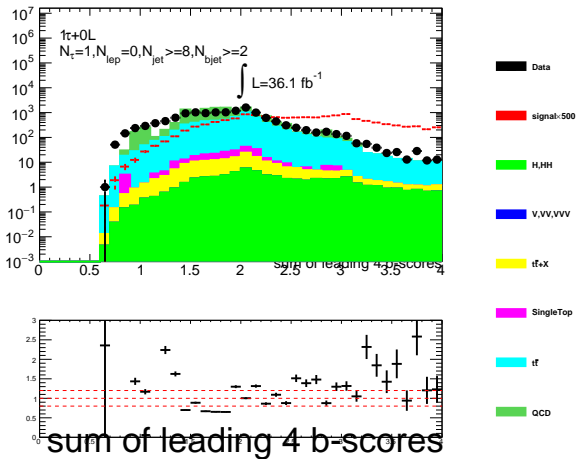


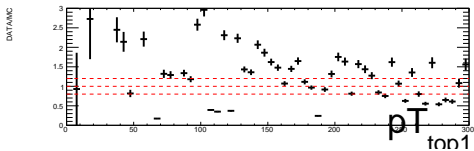
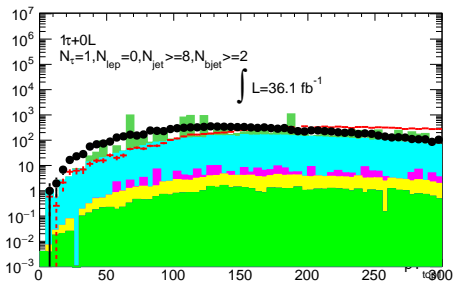


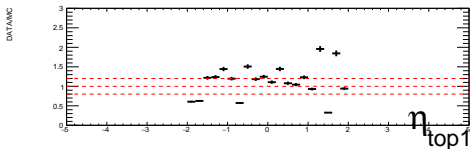
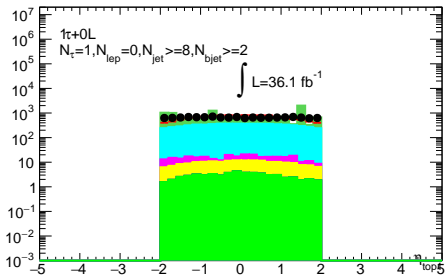




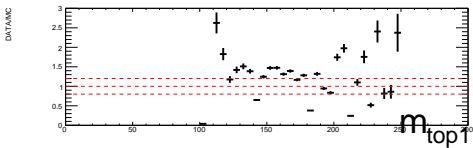
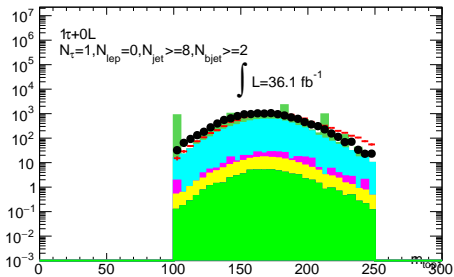


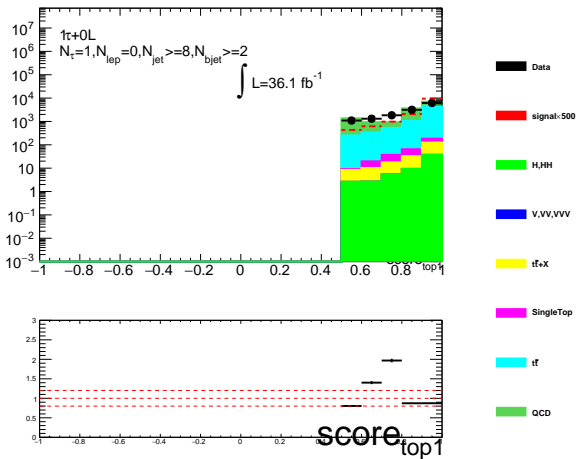


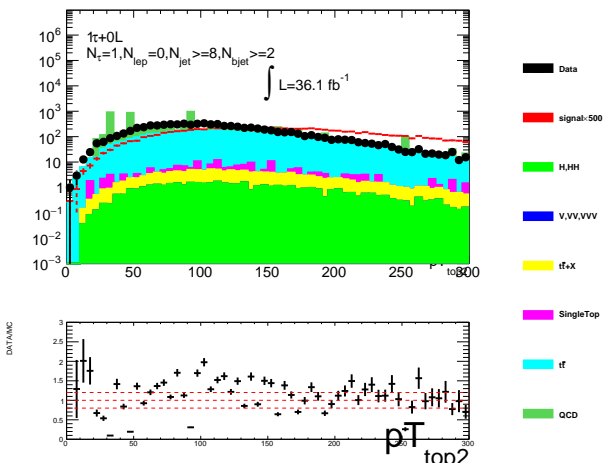


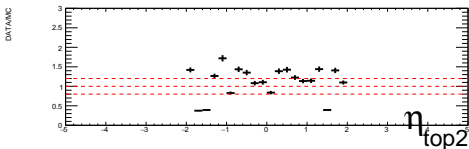
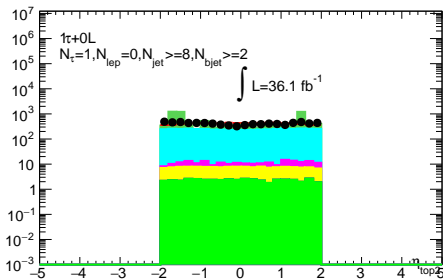


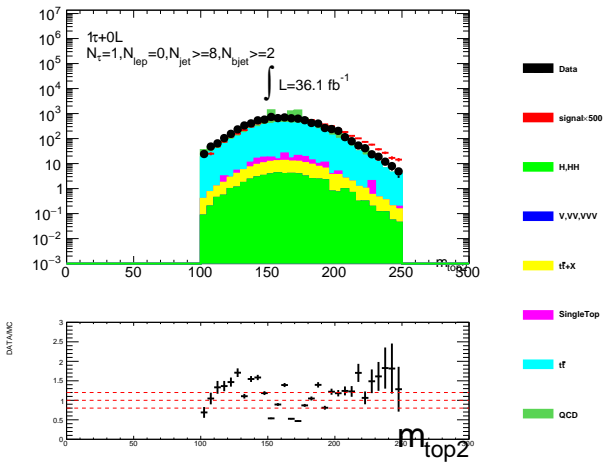


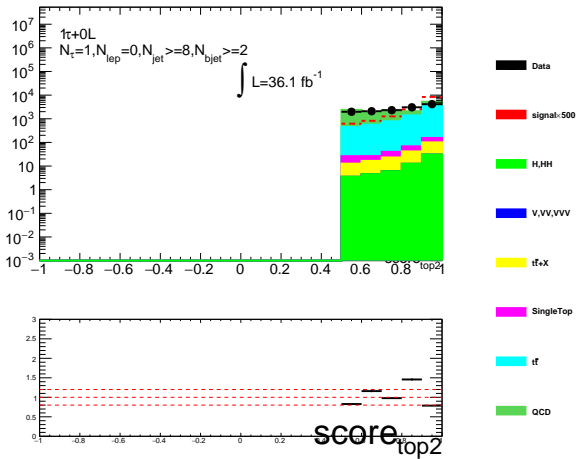


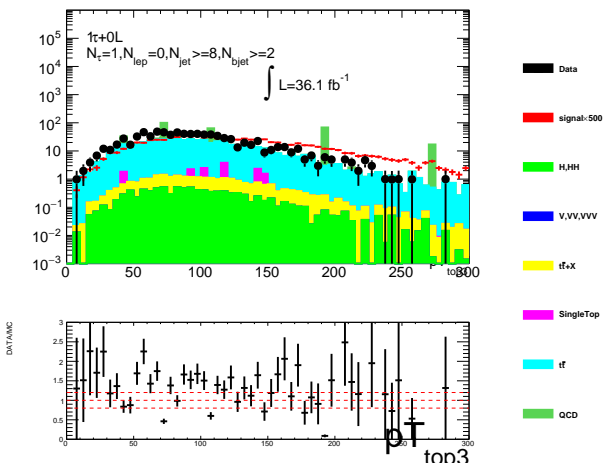


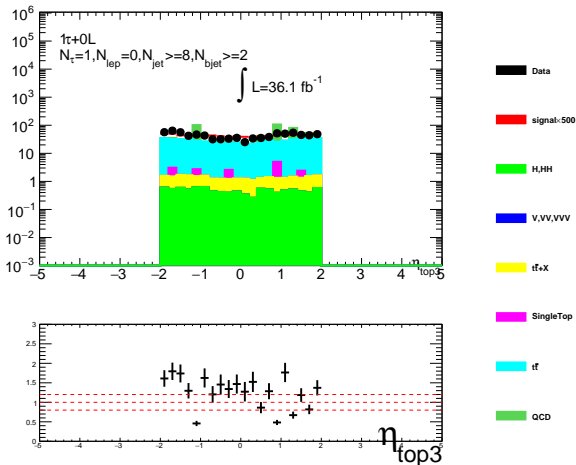




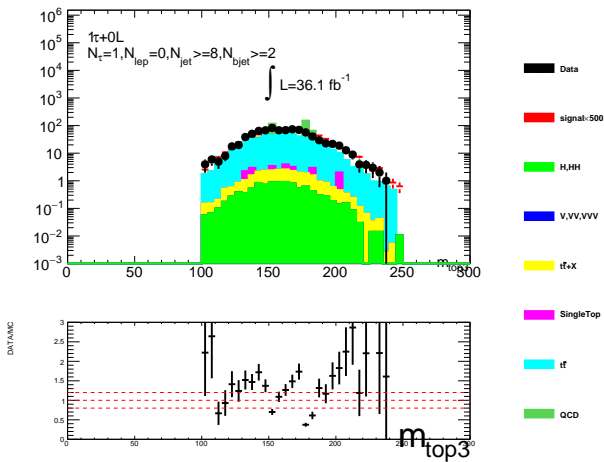


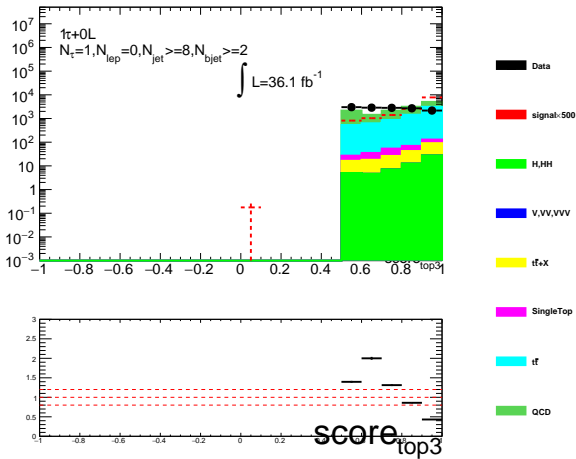


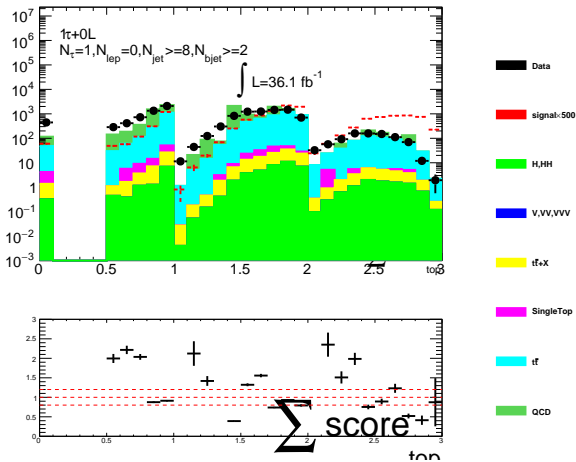


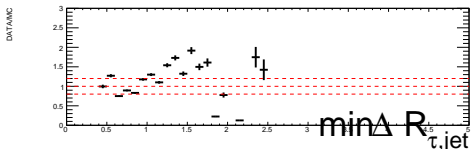
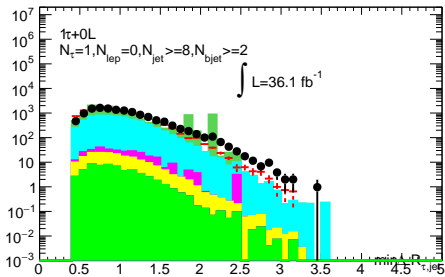


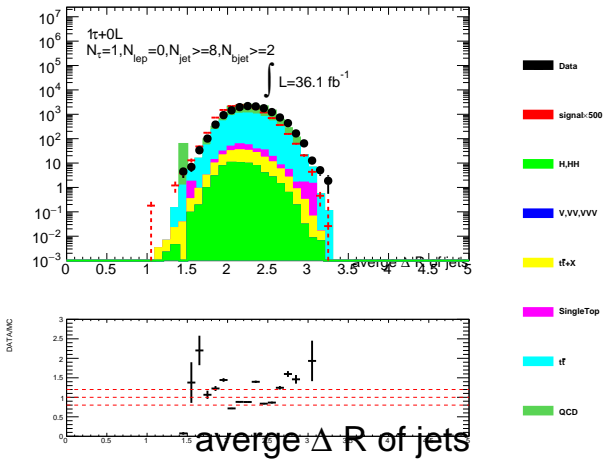




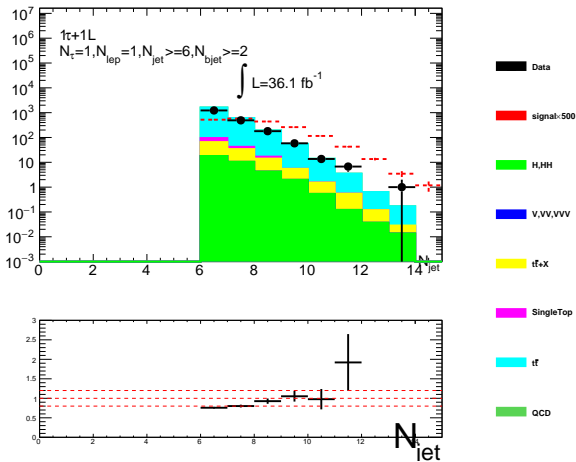


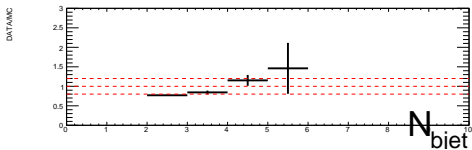
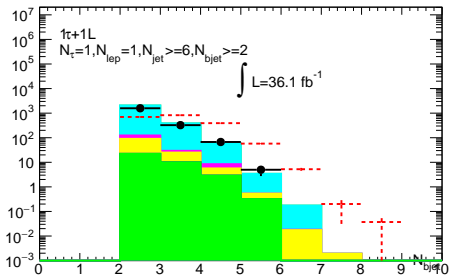




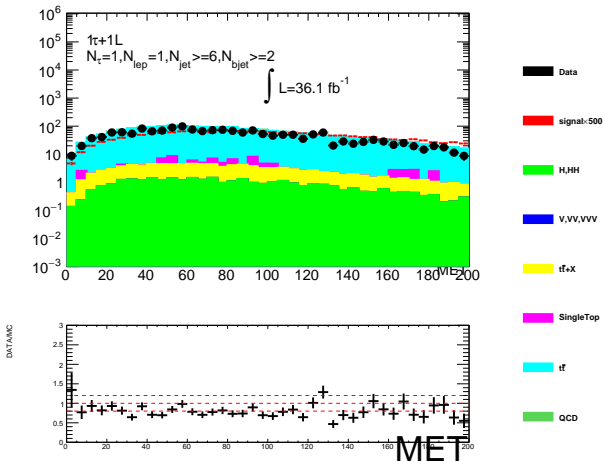


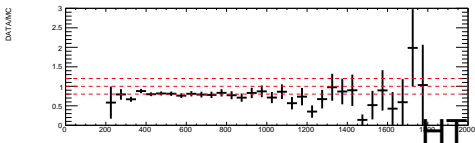
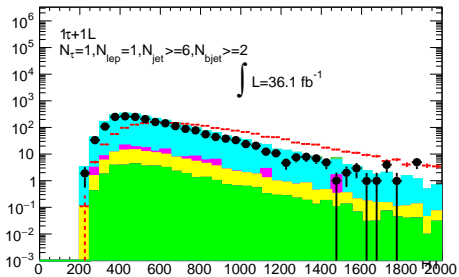
1Tau+1L

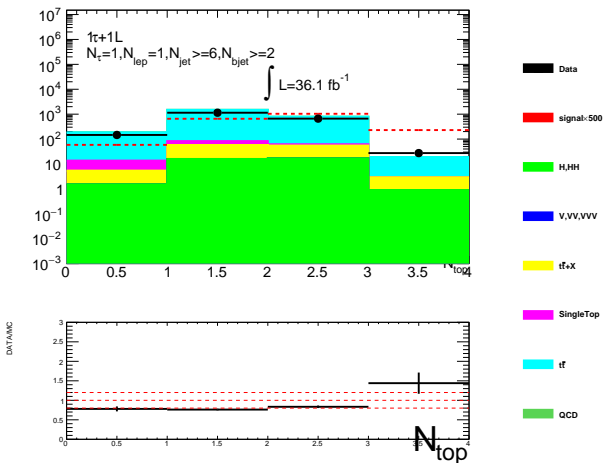


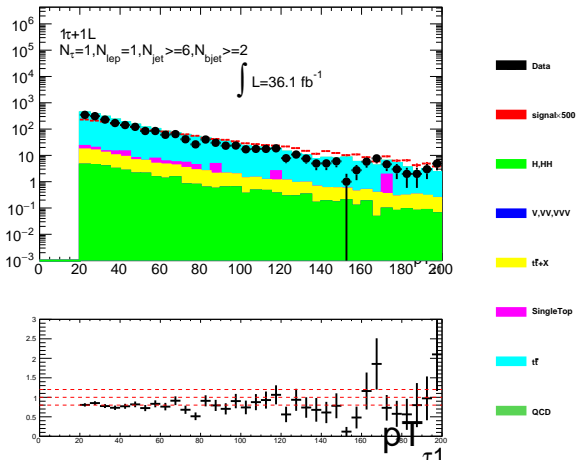


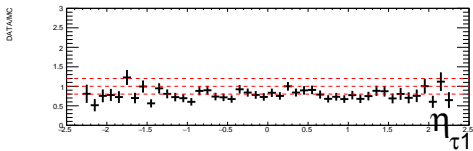
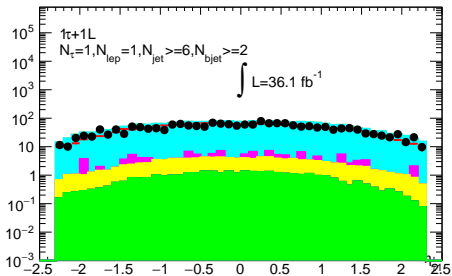


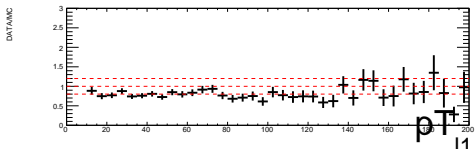
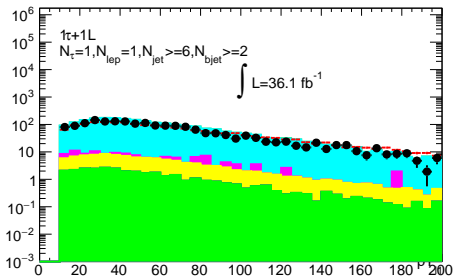


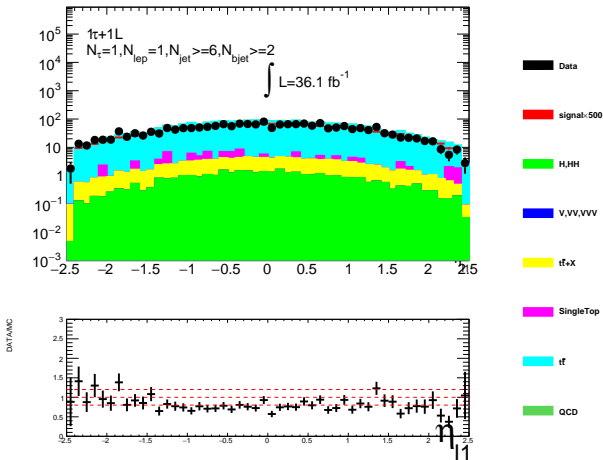


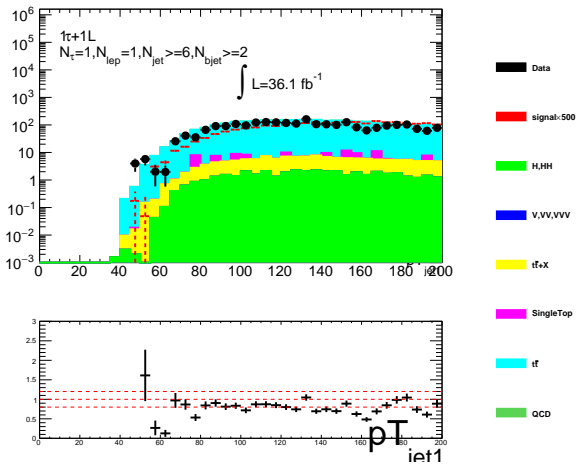




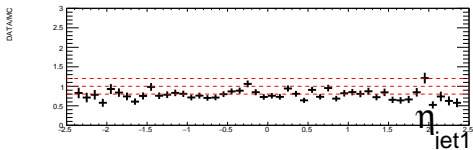
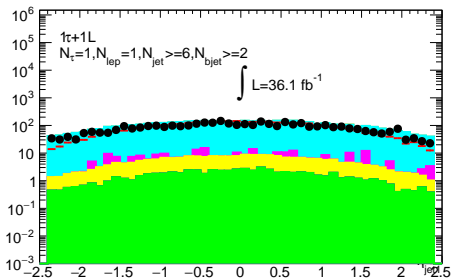


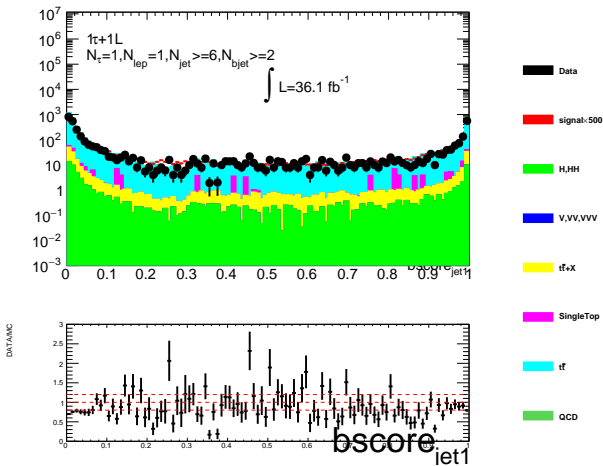


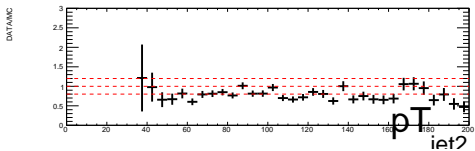
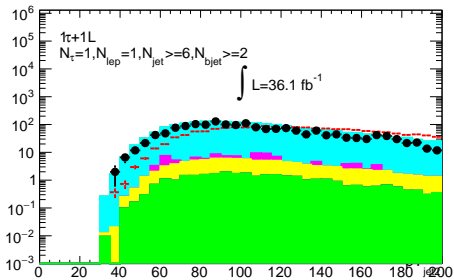


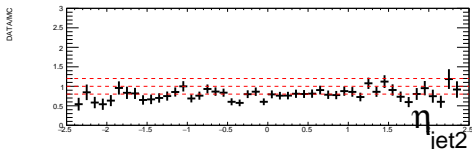
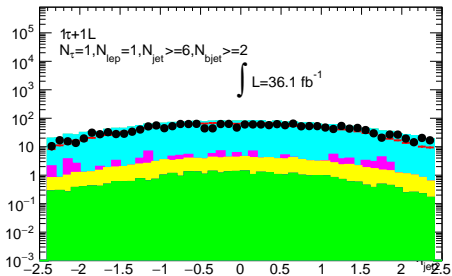


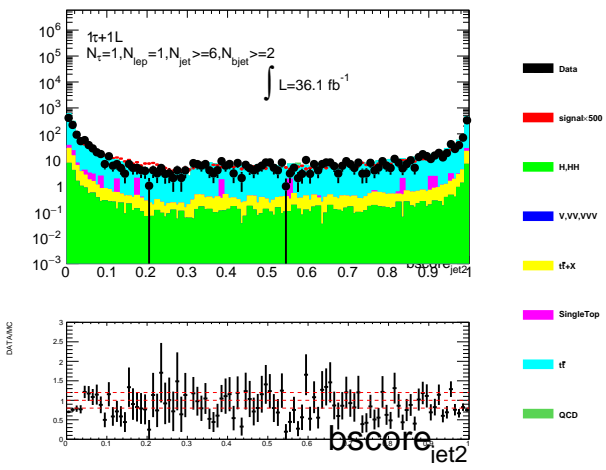


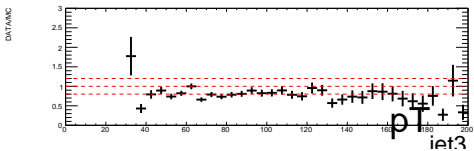
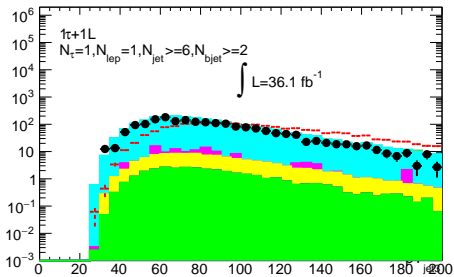


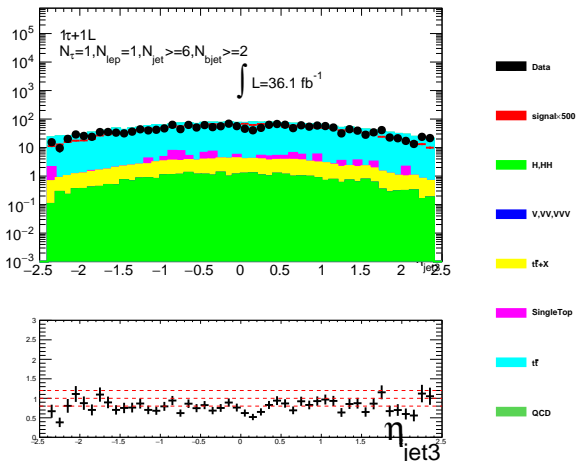


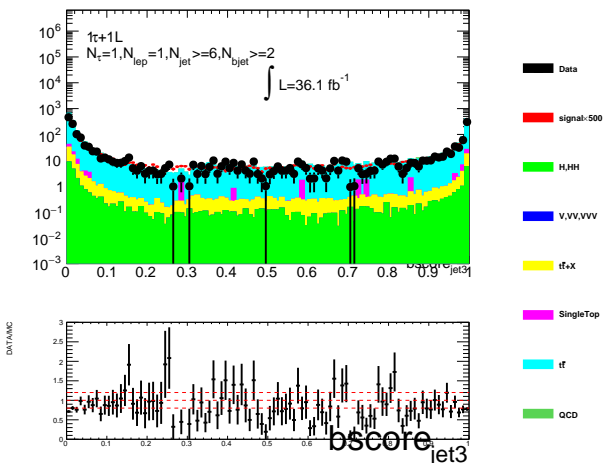




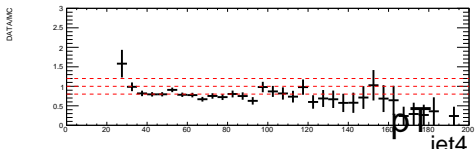
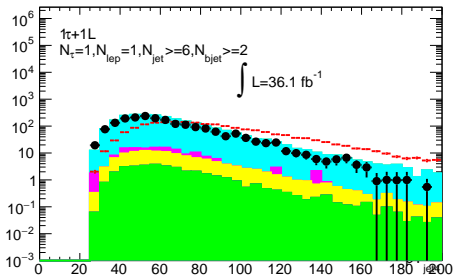


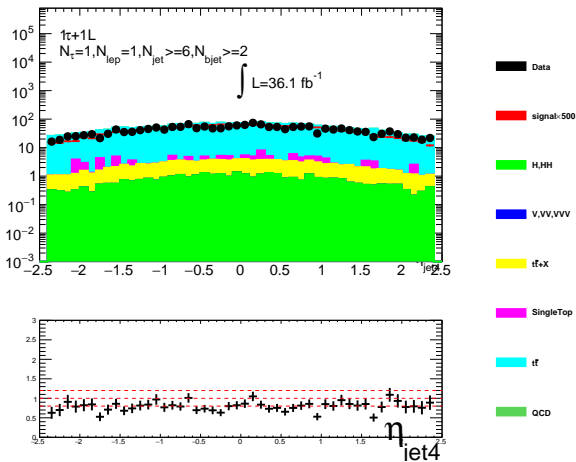


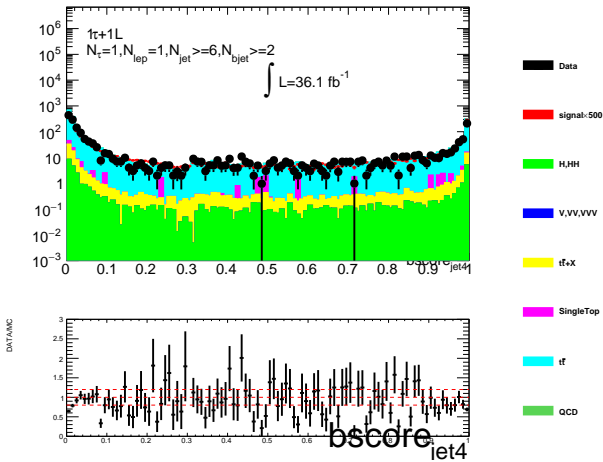


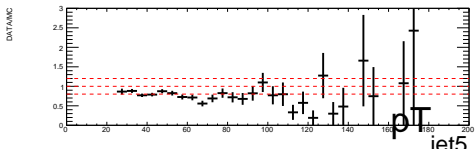
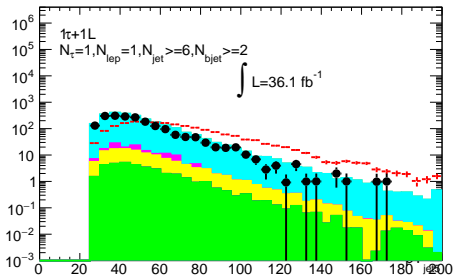


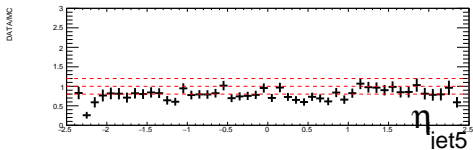
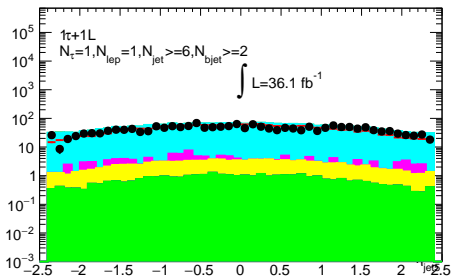


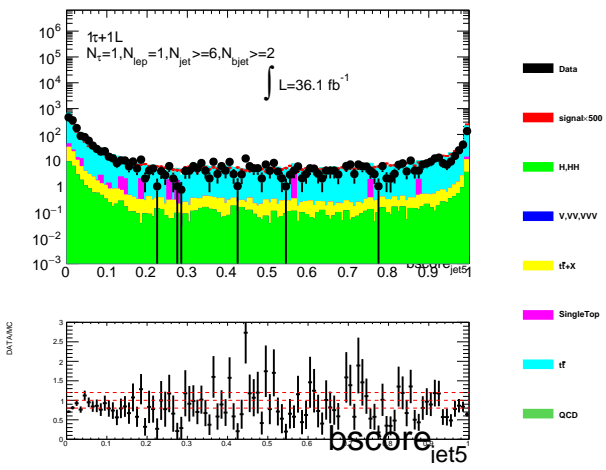


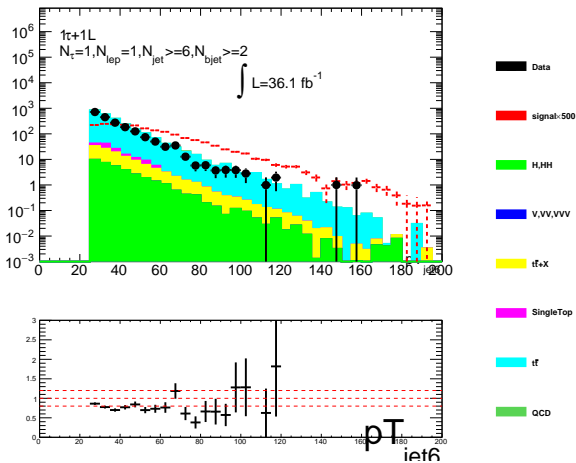


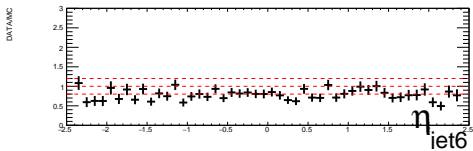
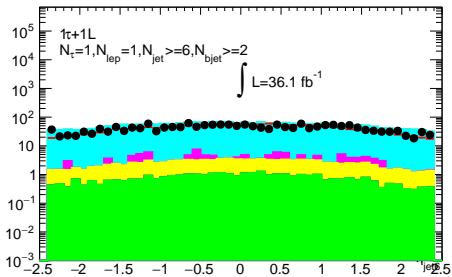




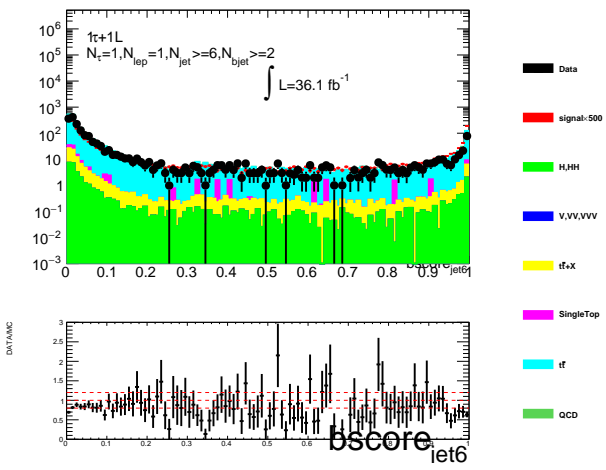


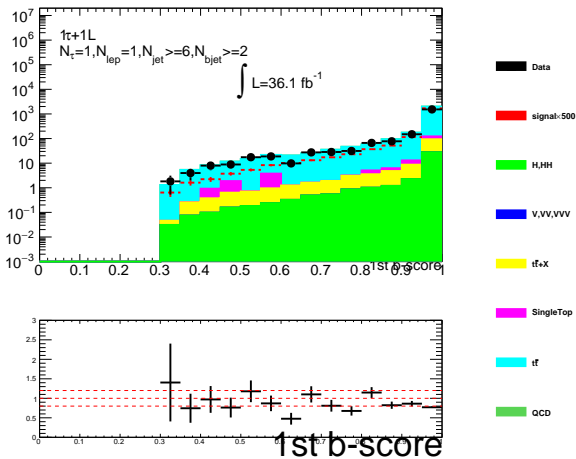


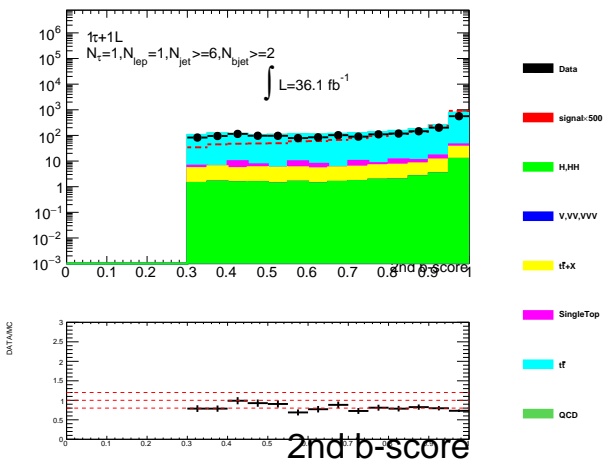


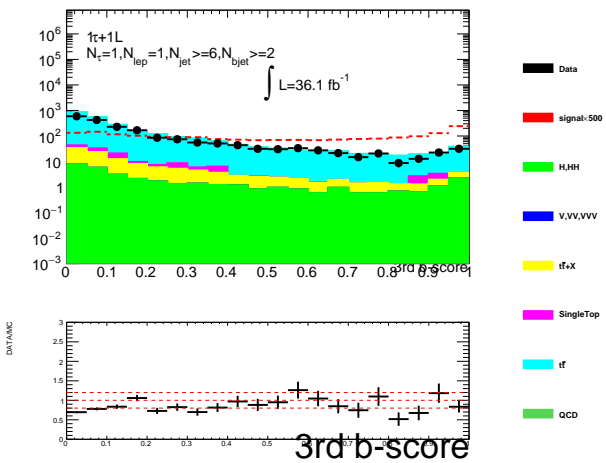


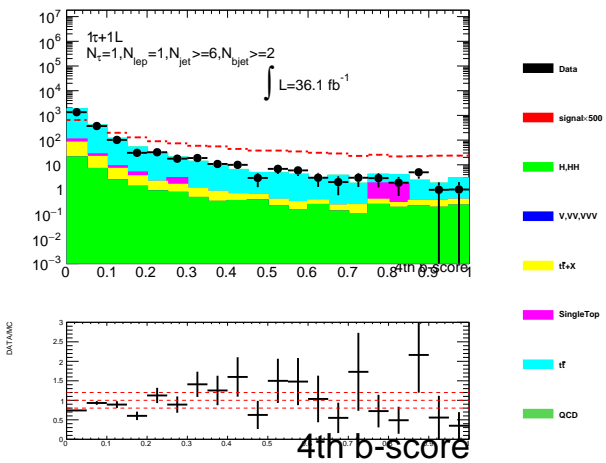


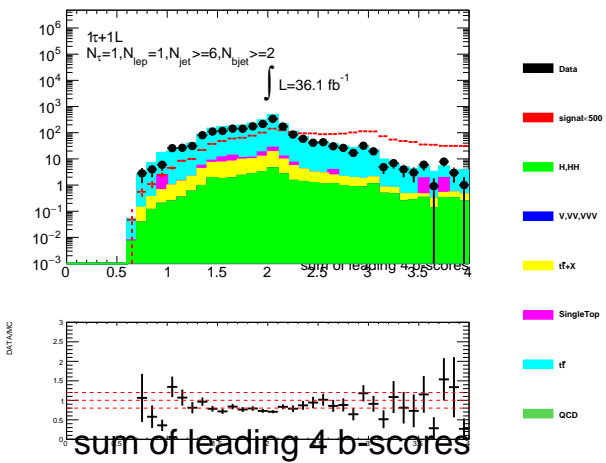




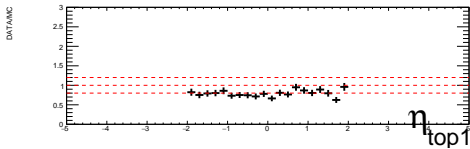
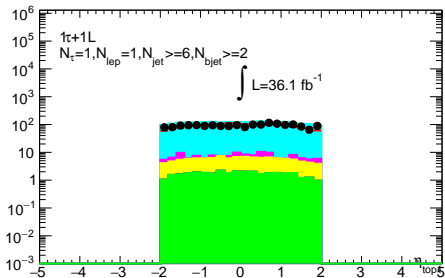




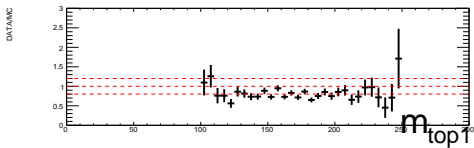
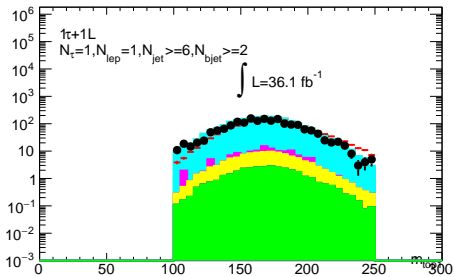


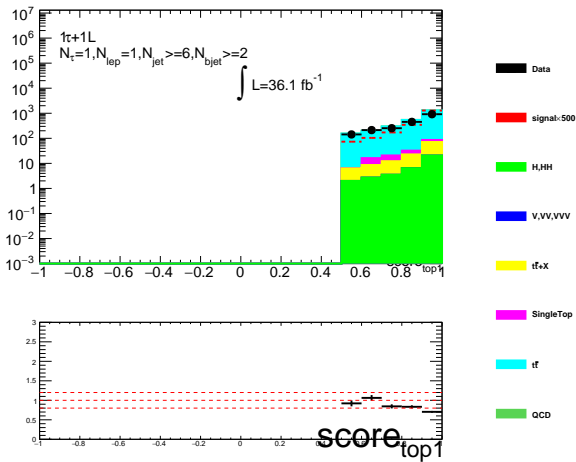


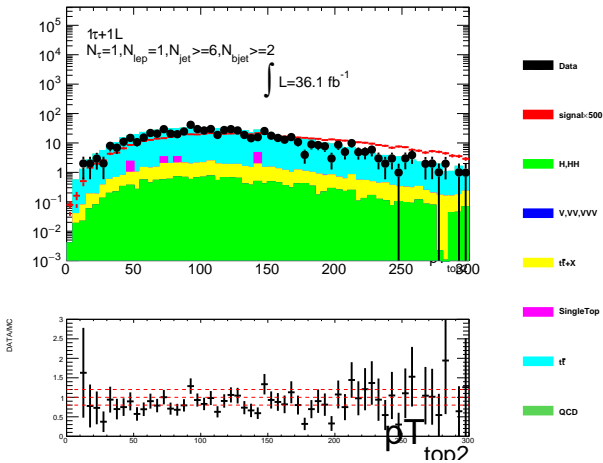


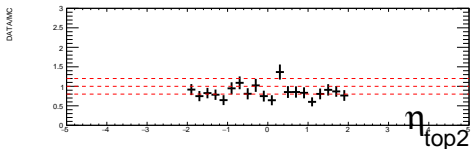
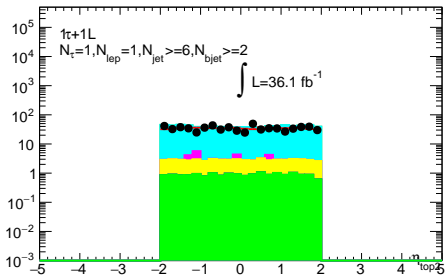


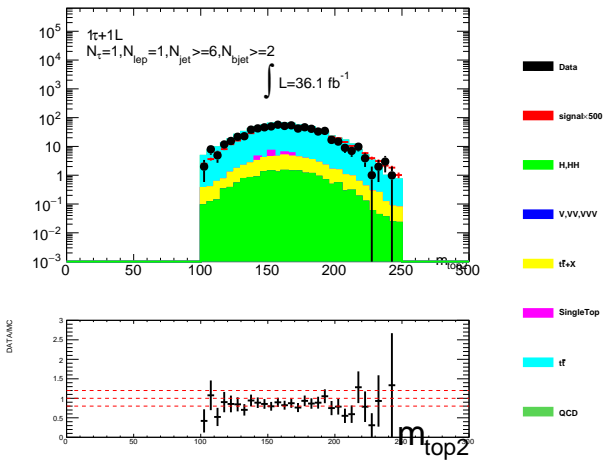


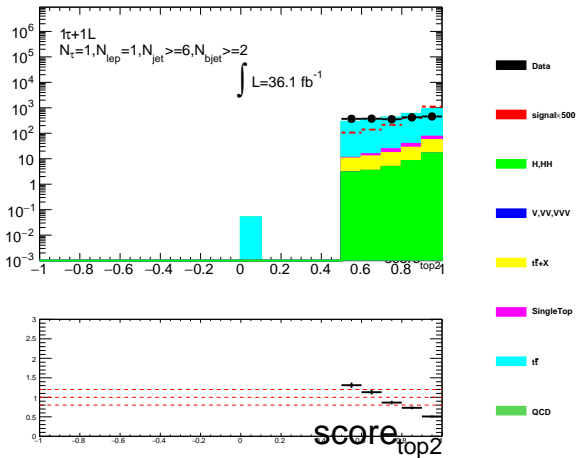


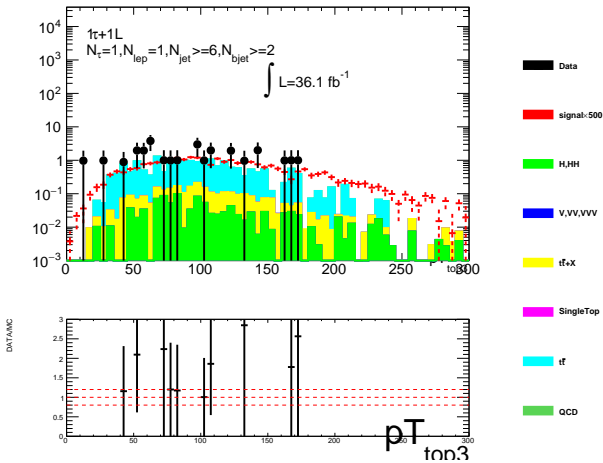


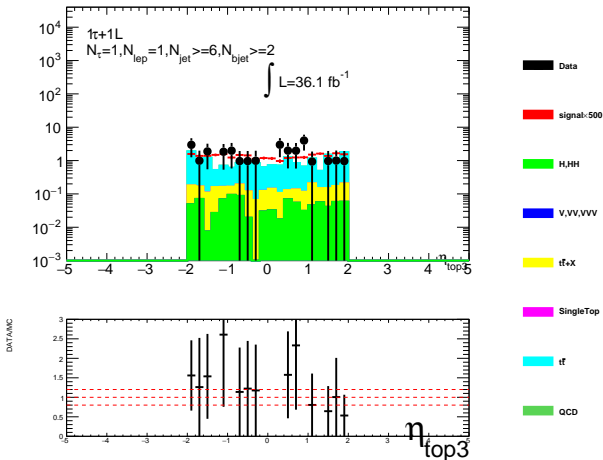




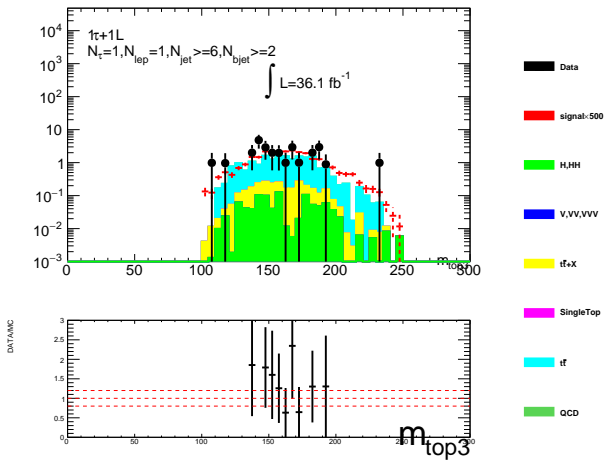


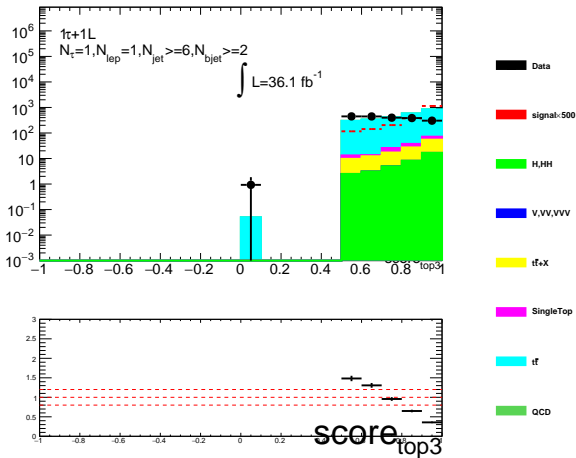


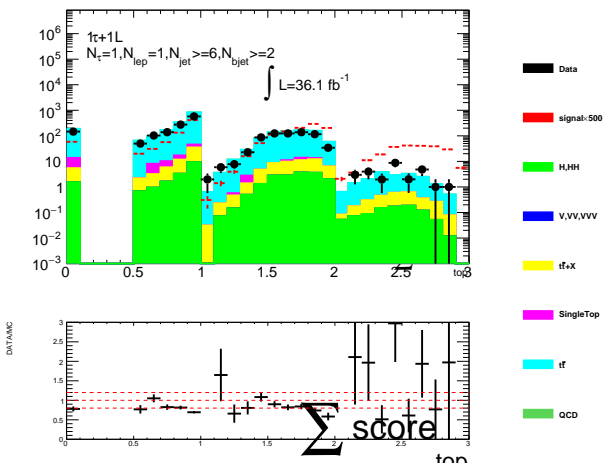


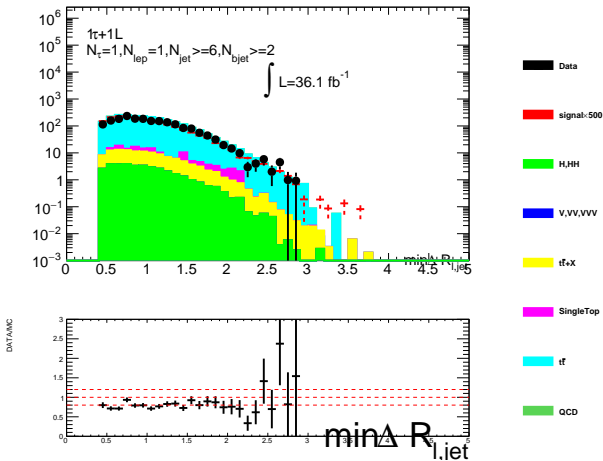


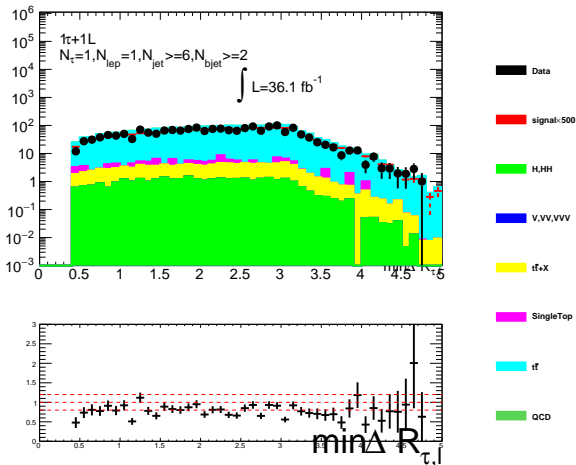


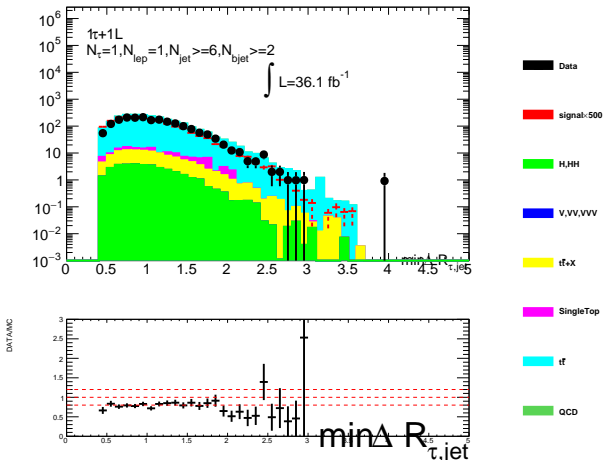


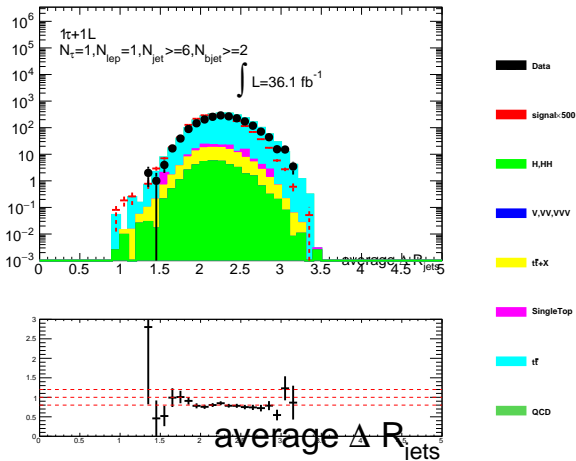


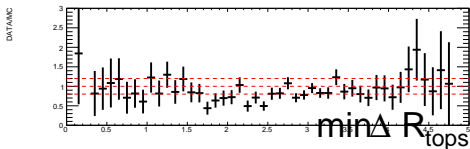
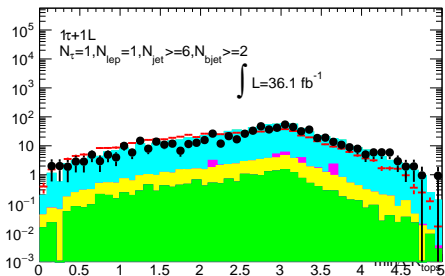




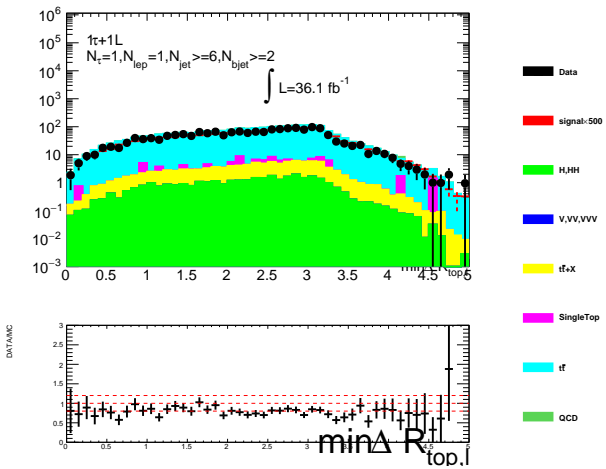




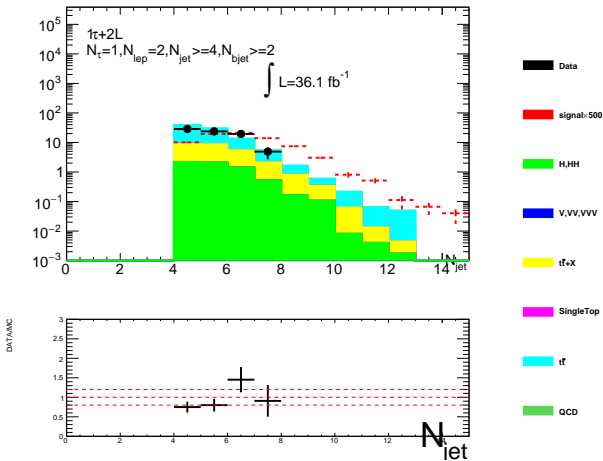


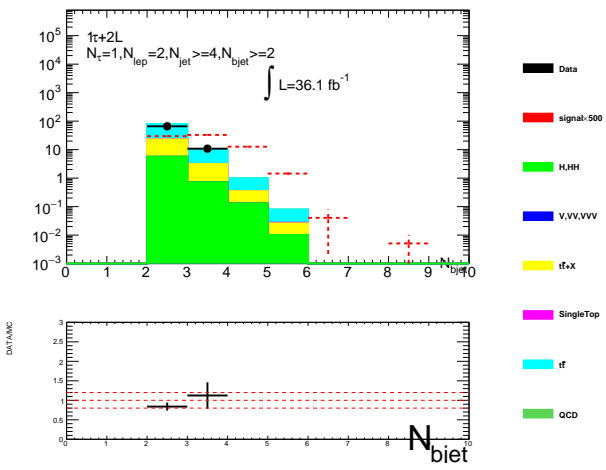


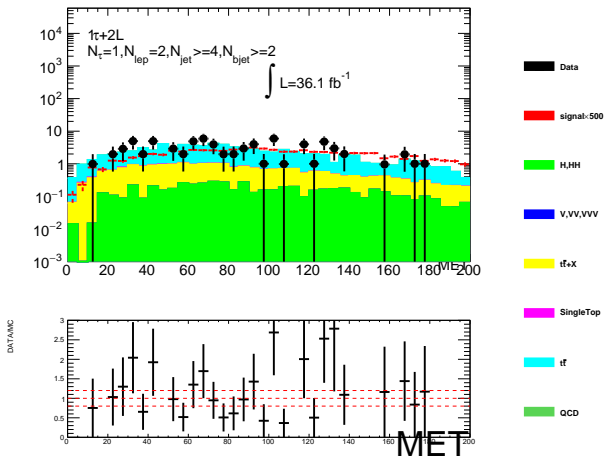


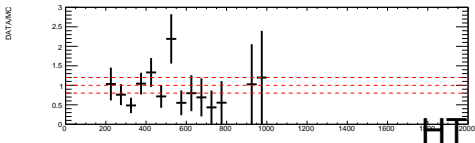
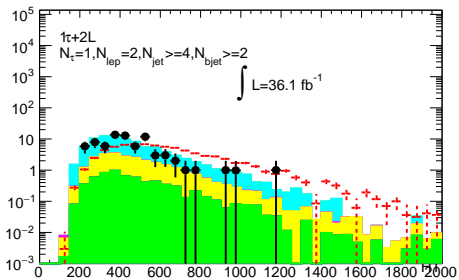


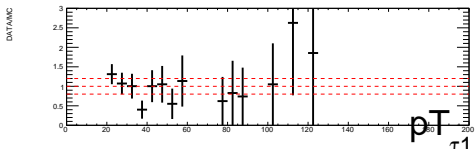
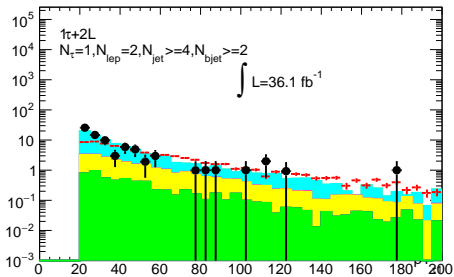
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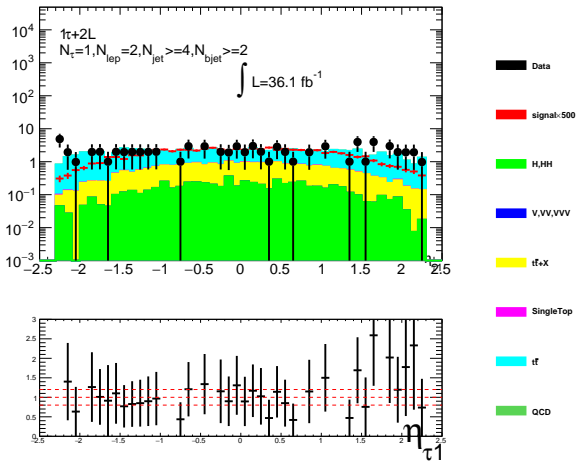




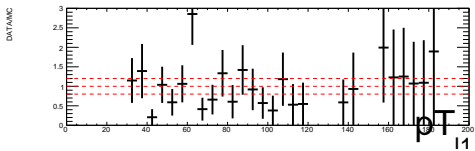
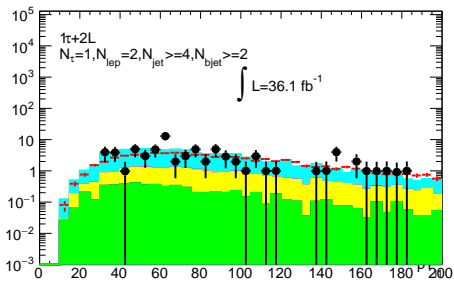


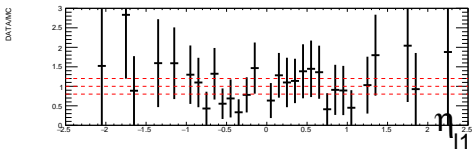
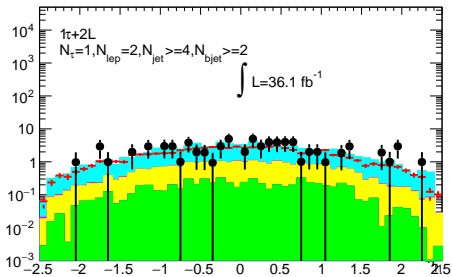


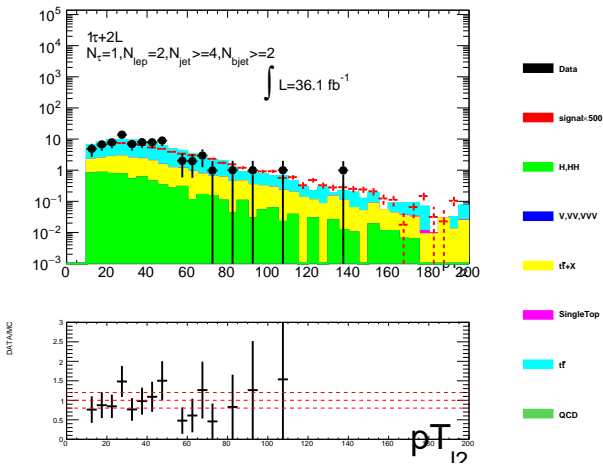


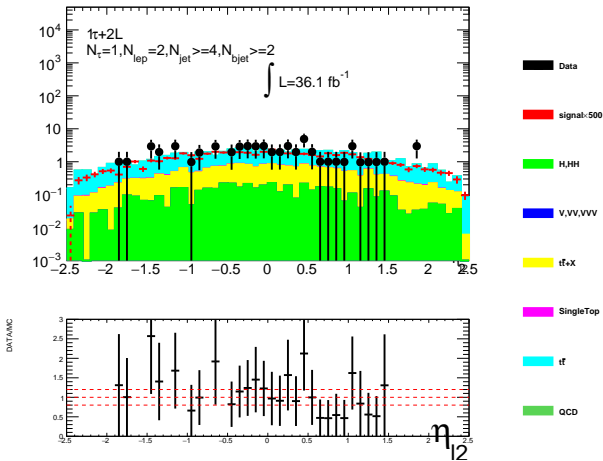


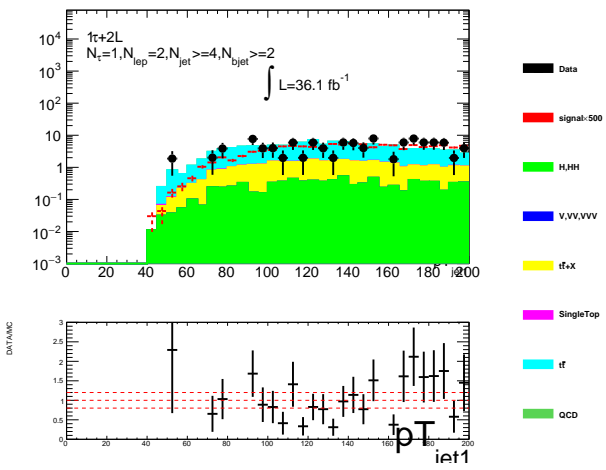


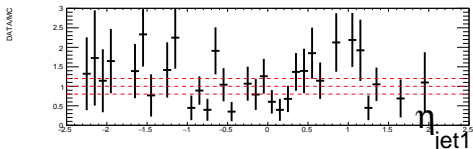
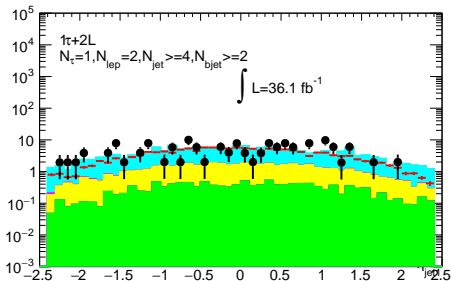


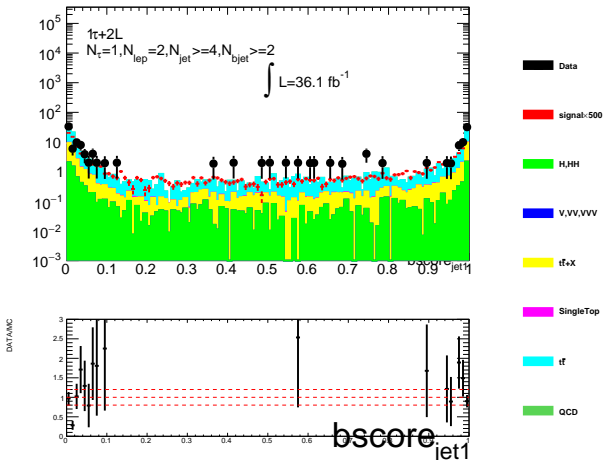


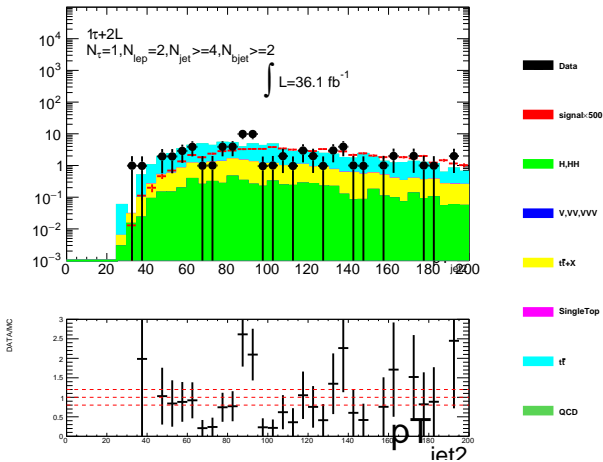




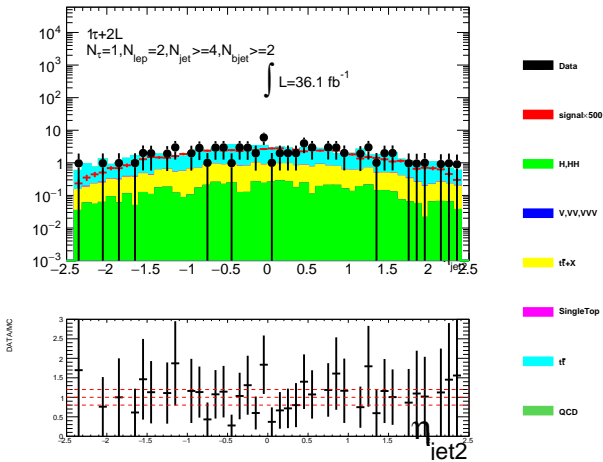


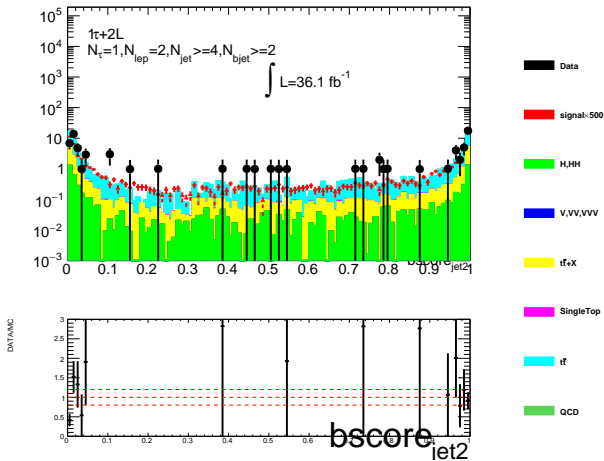


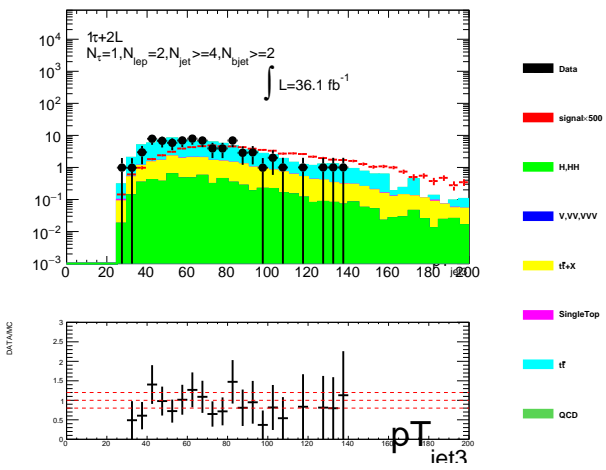


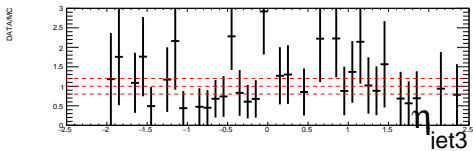
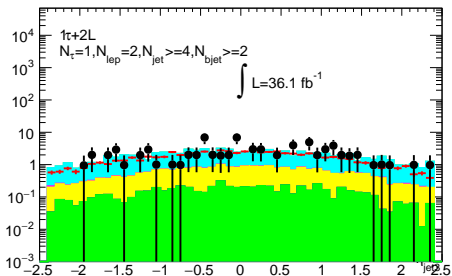


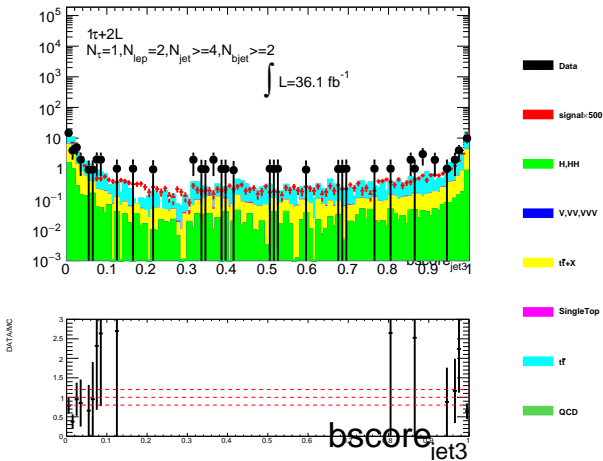


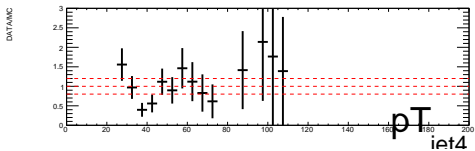
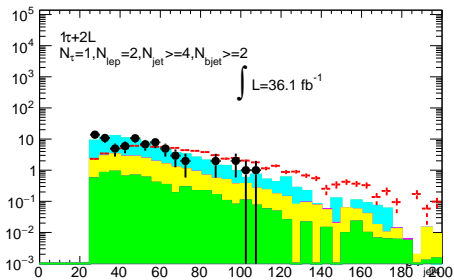


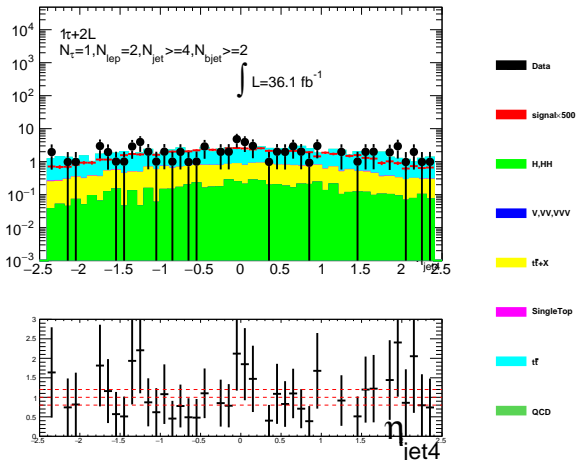


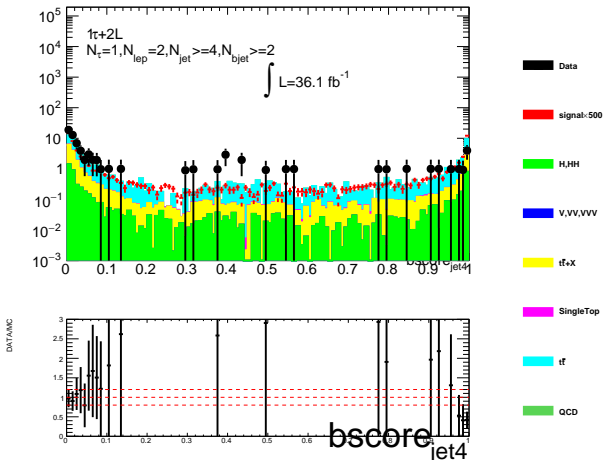




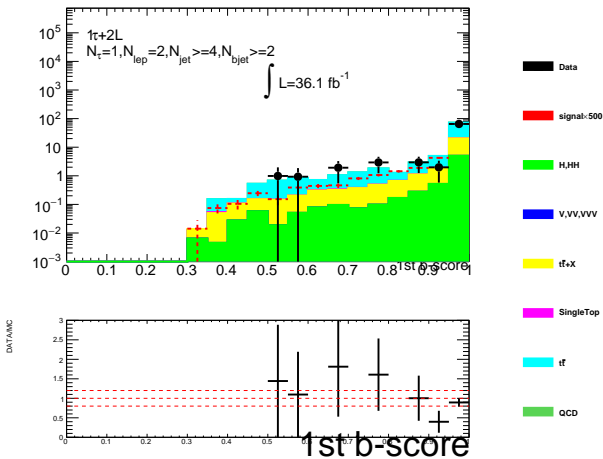


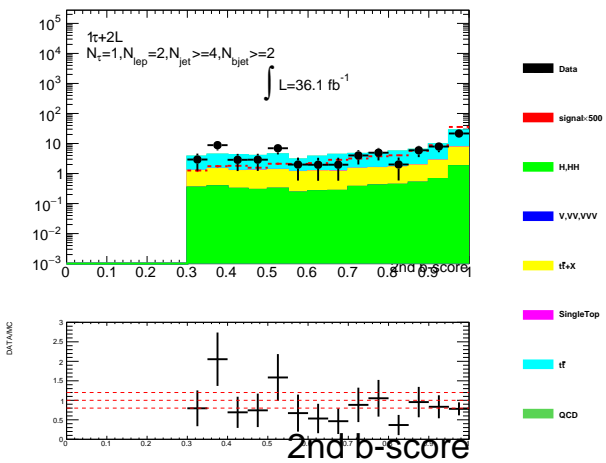


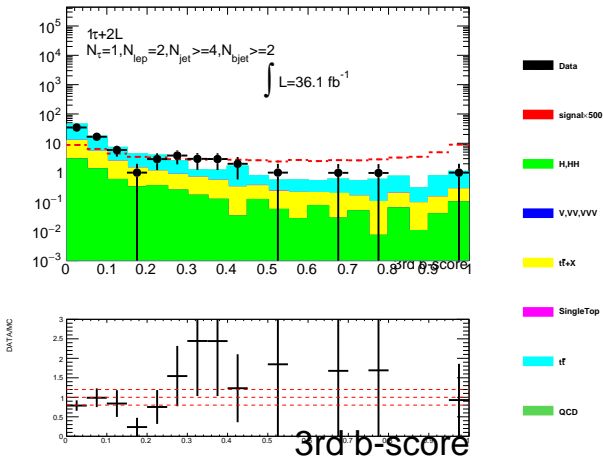


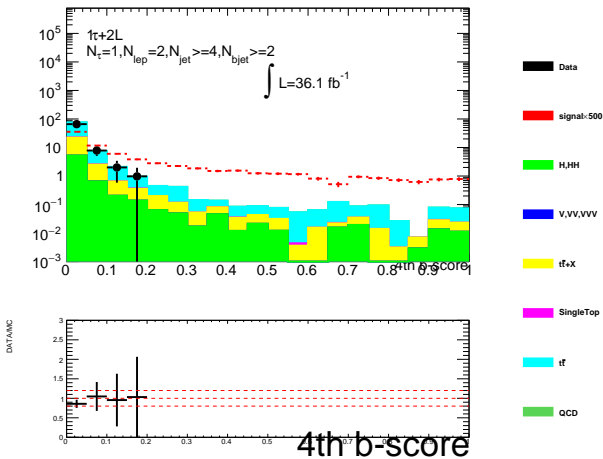


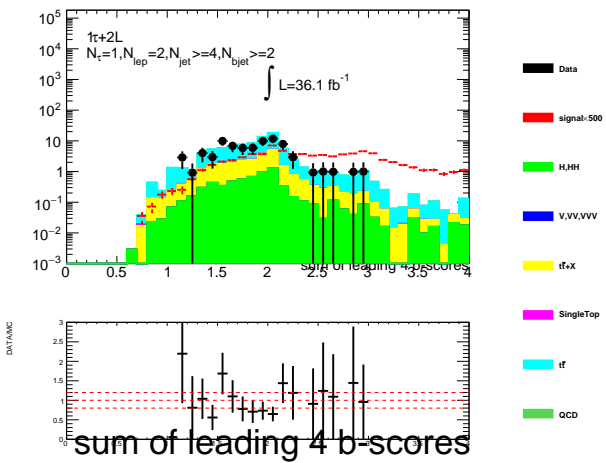


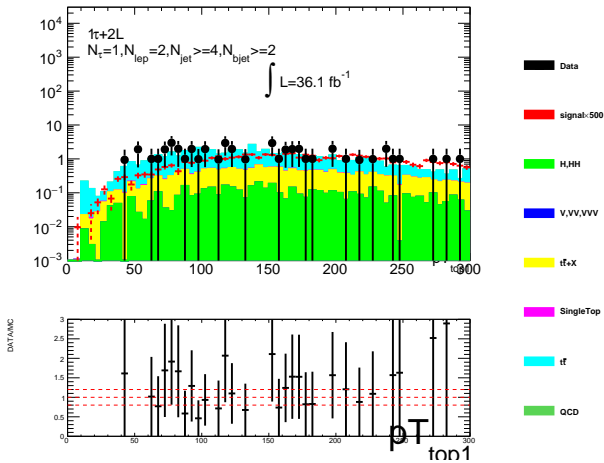


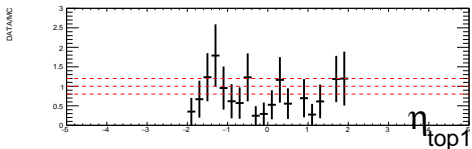
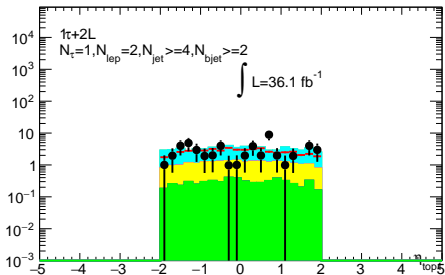


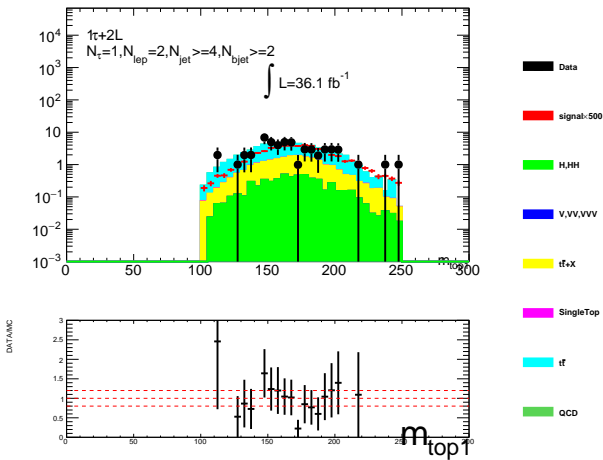




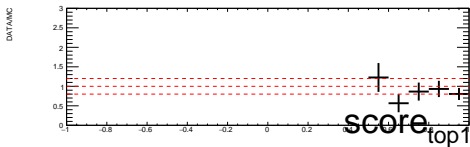
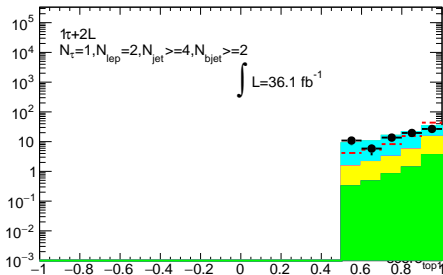


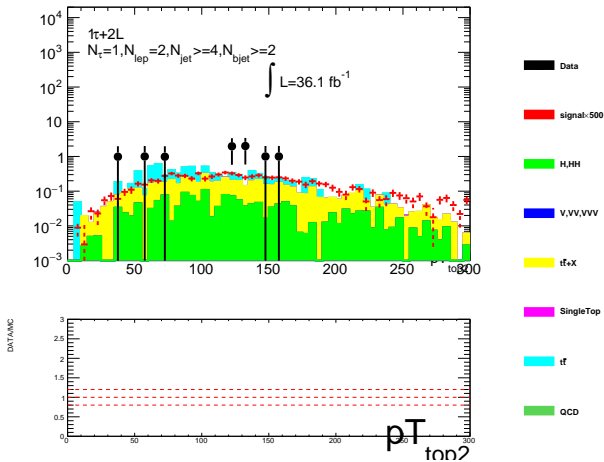


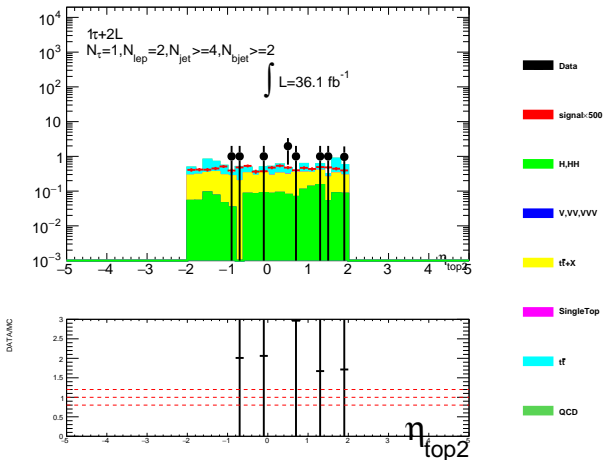


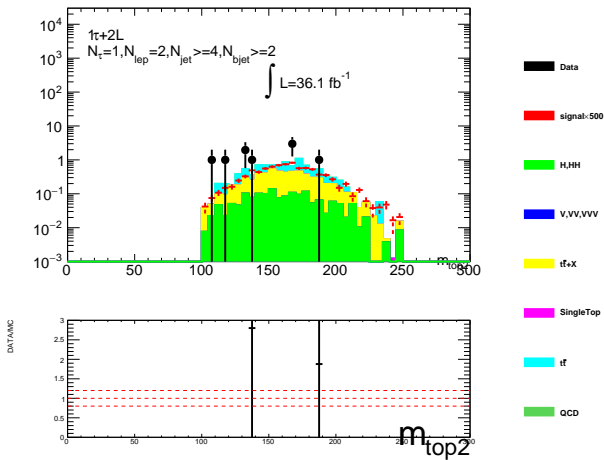


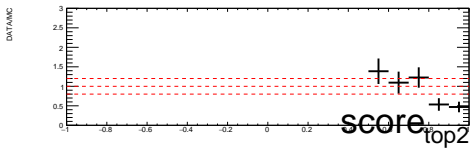
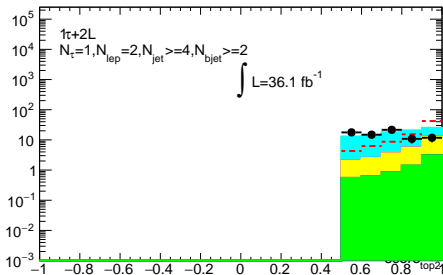


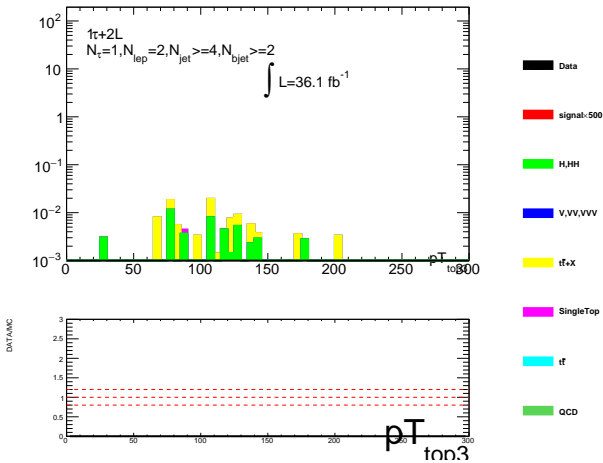


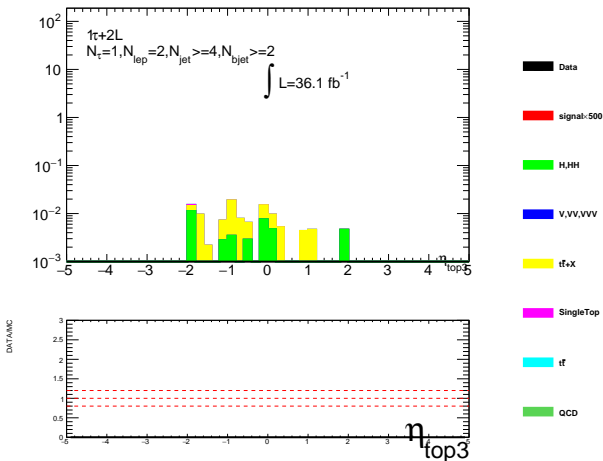


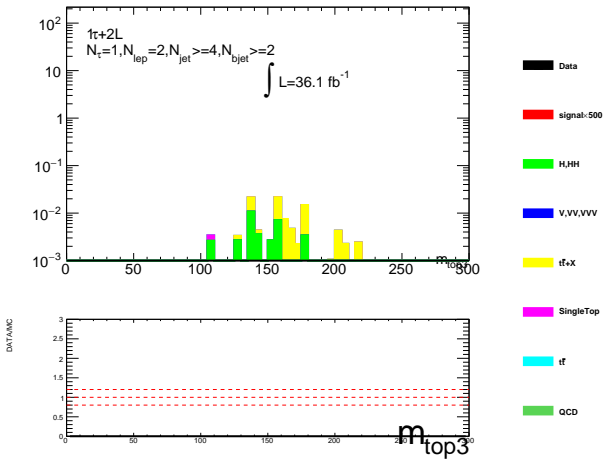




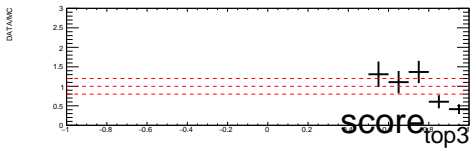
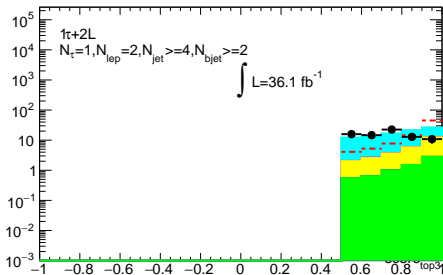


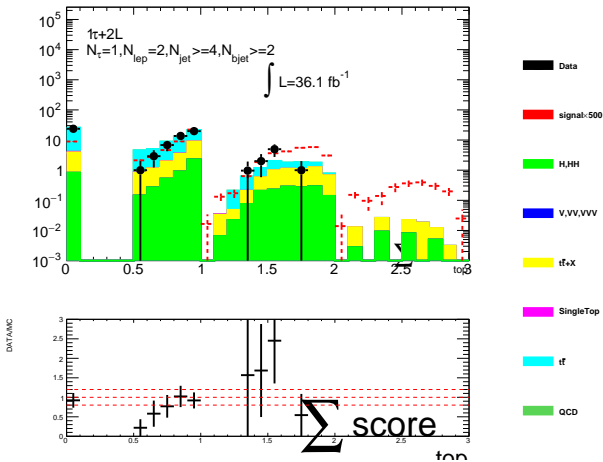


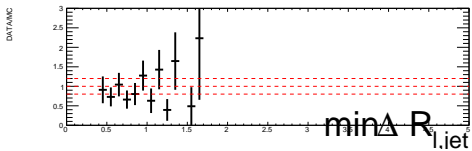
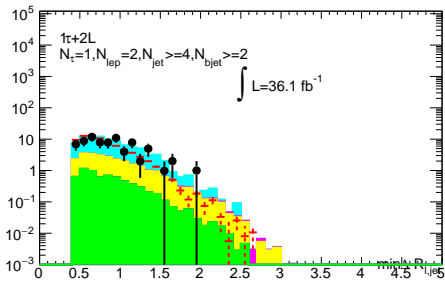


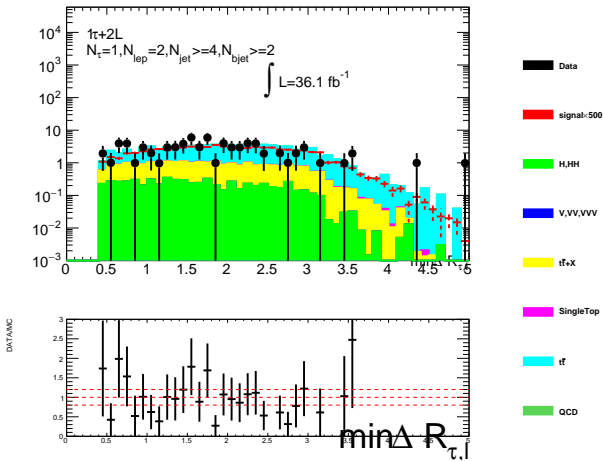


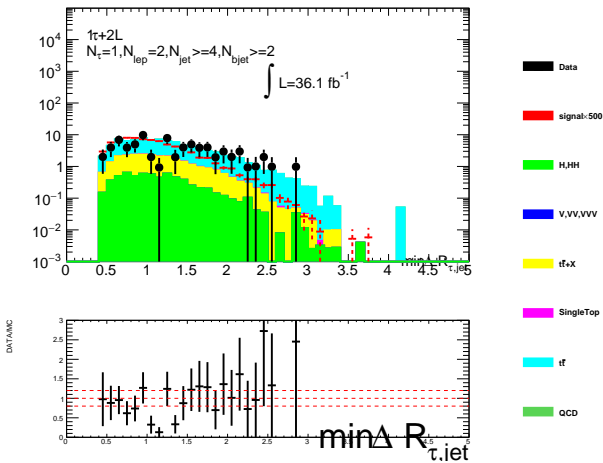


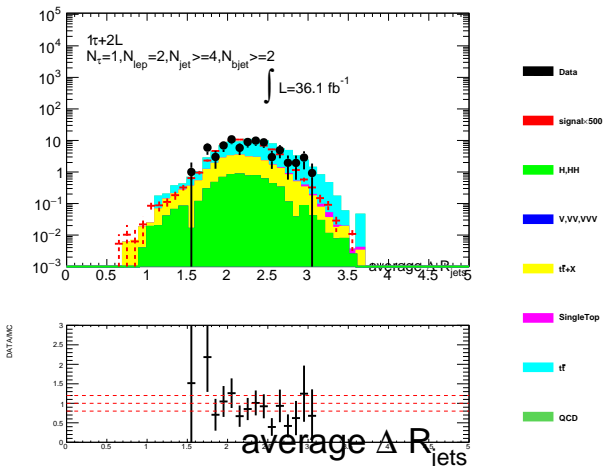


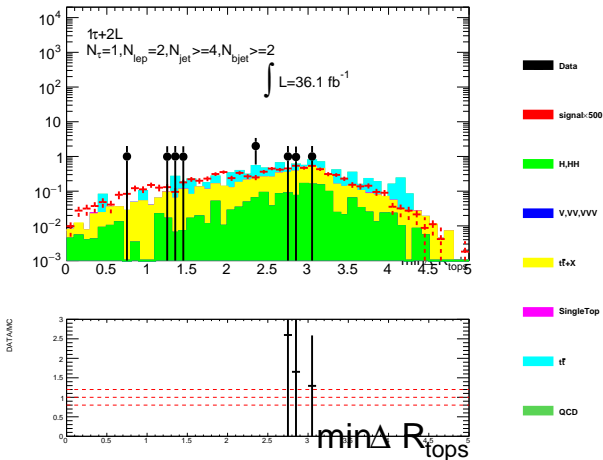


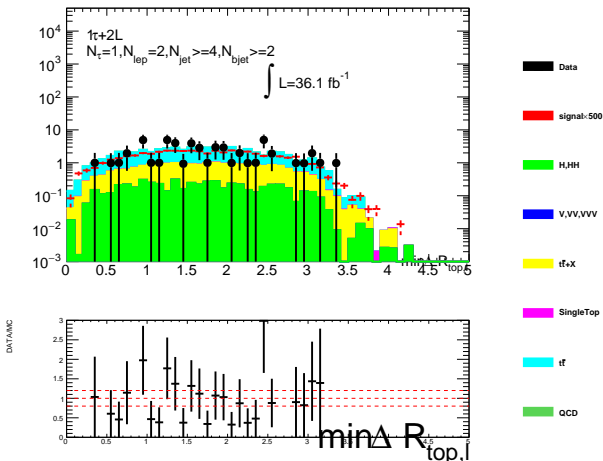






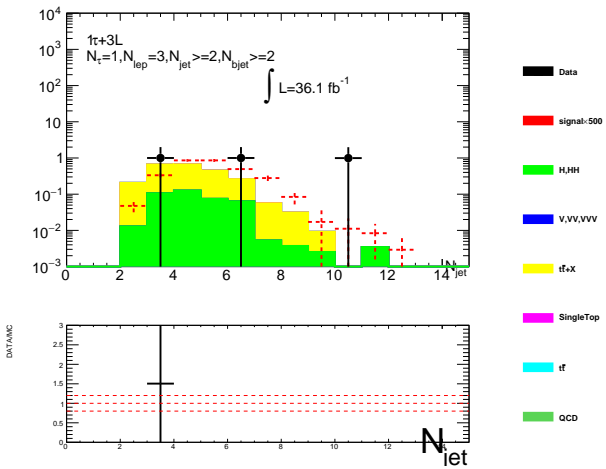


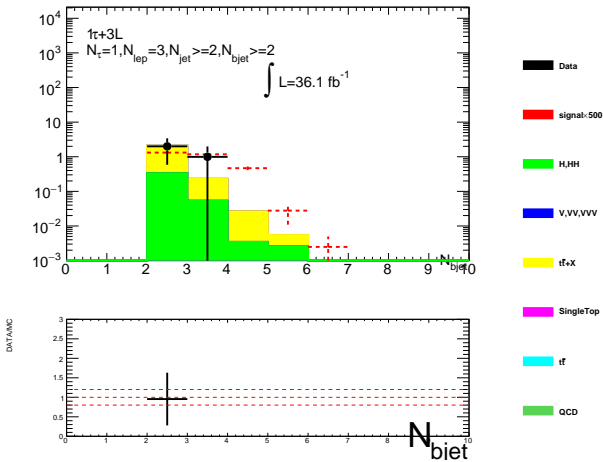


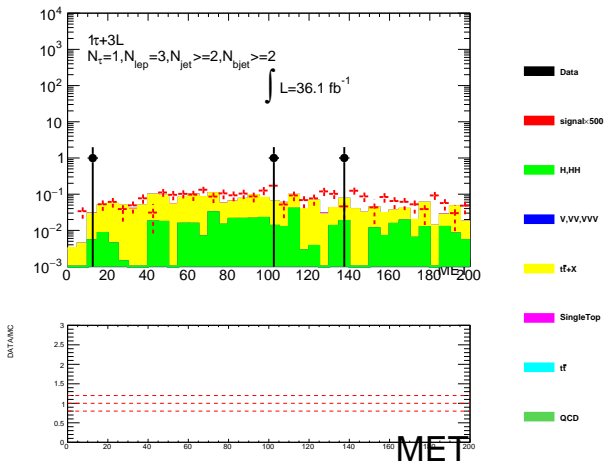


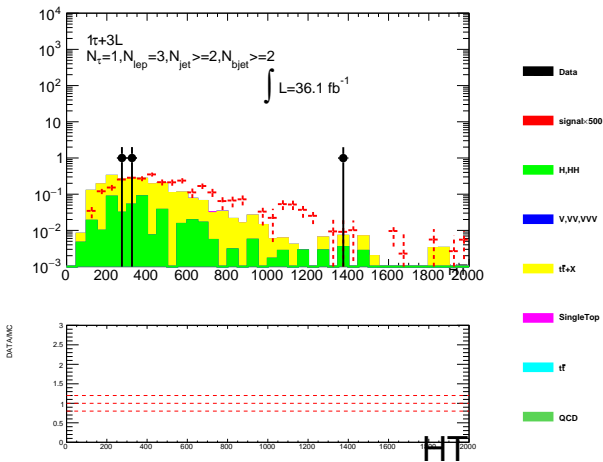


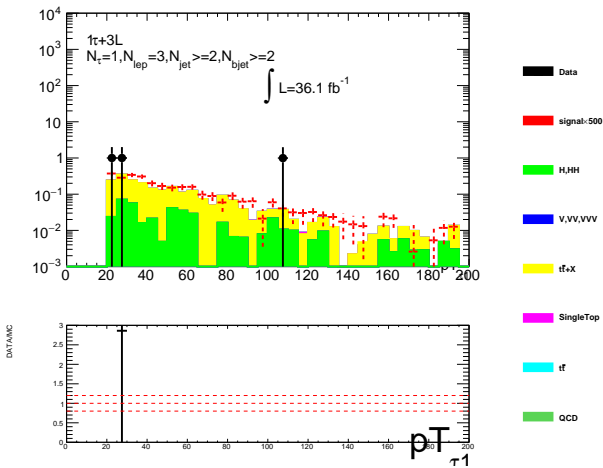
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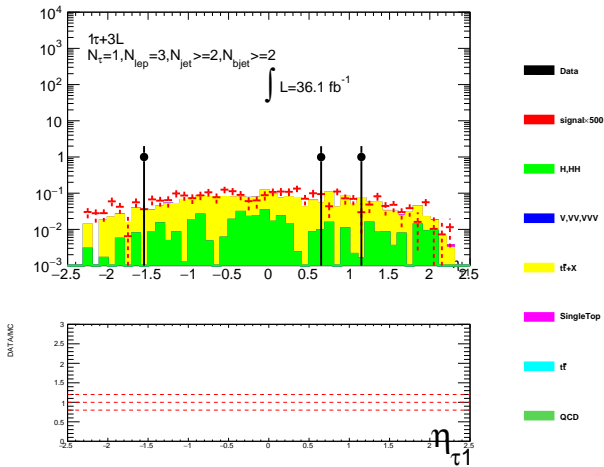


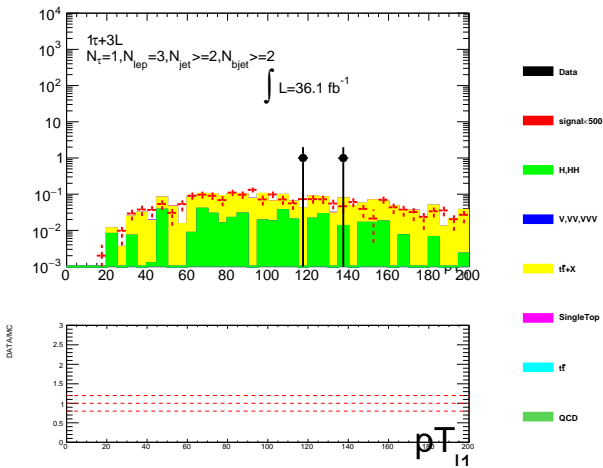




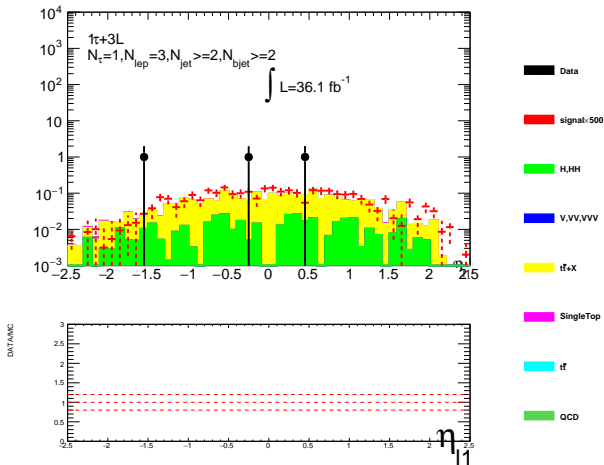


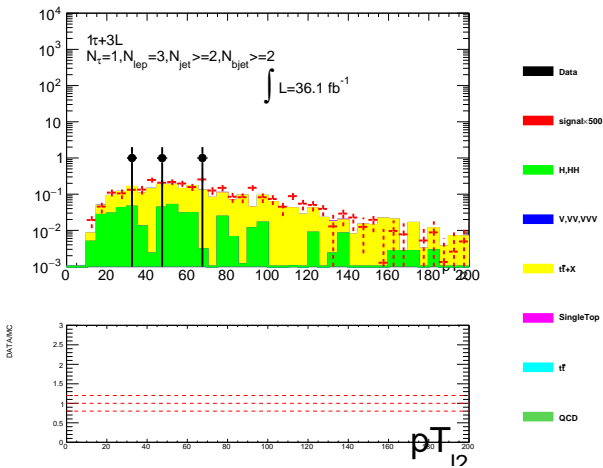


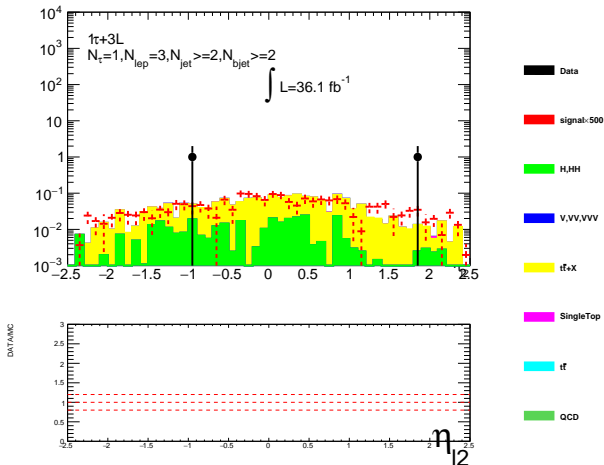


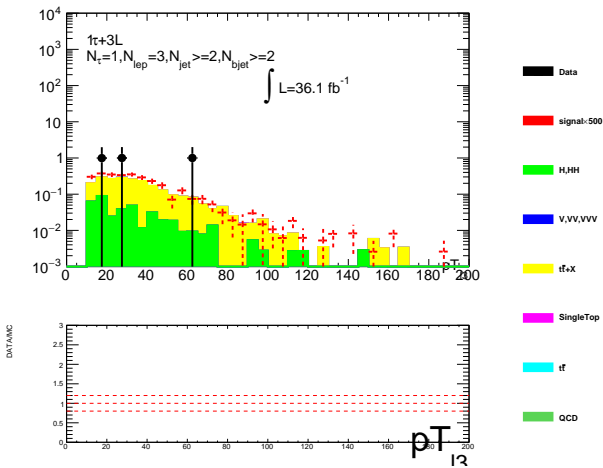


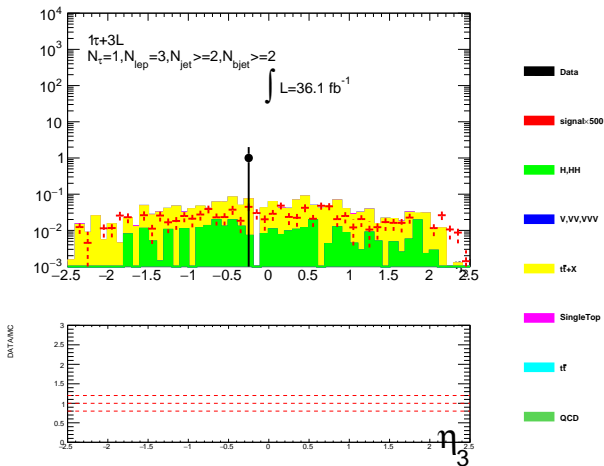


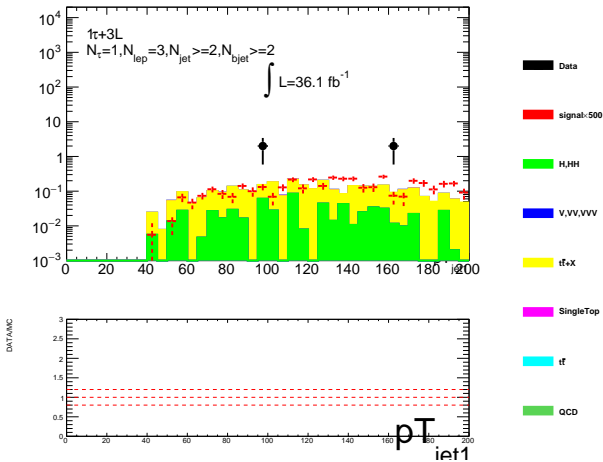


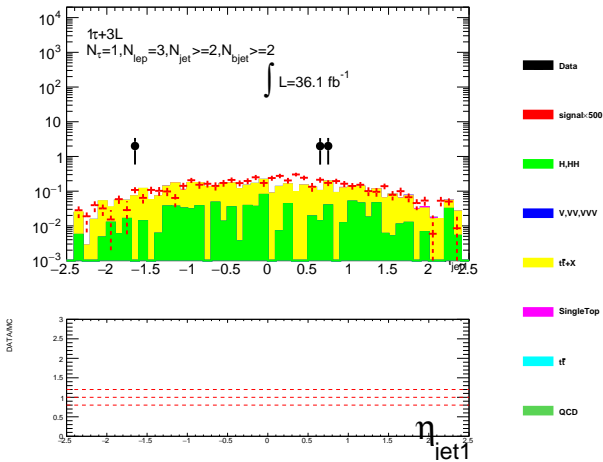


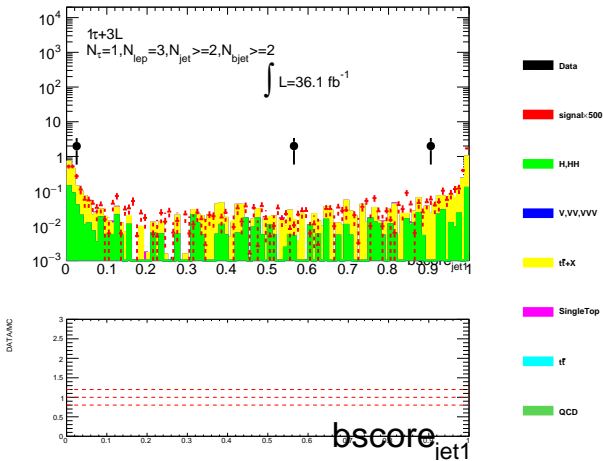




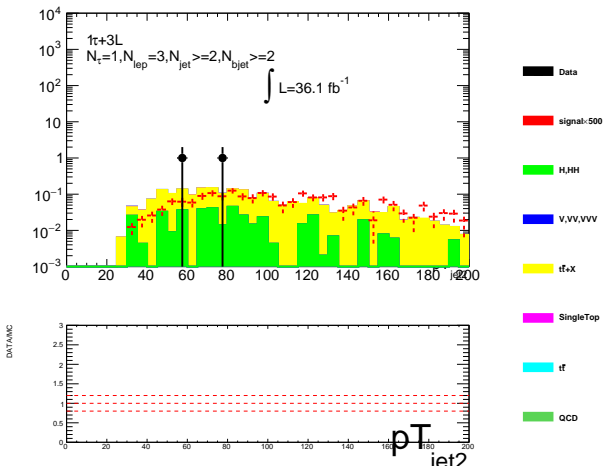


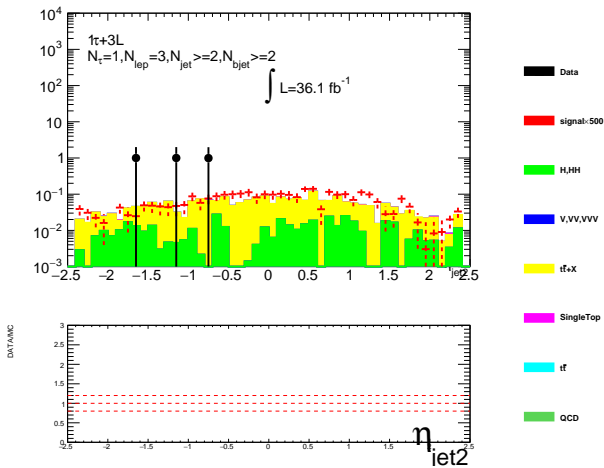


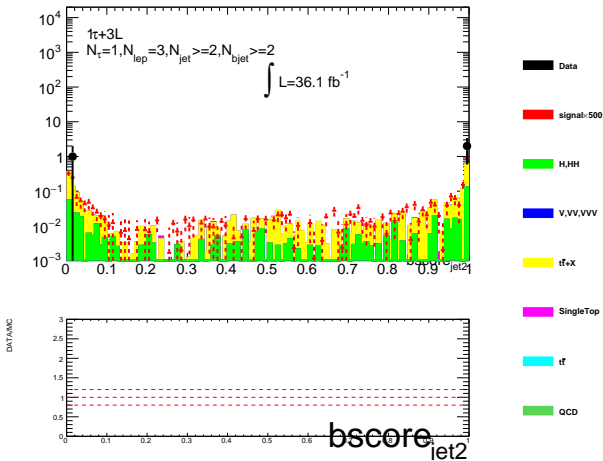


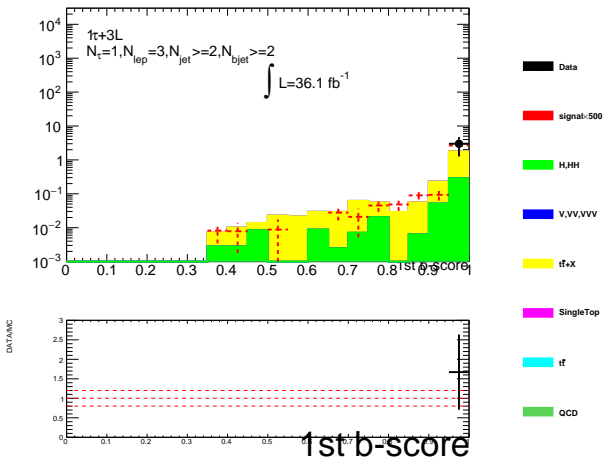


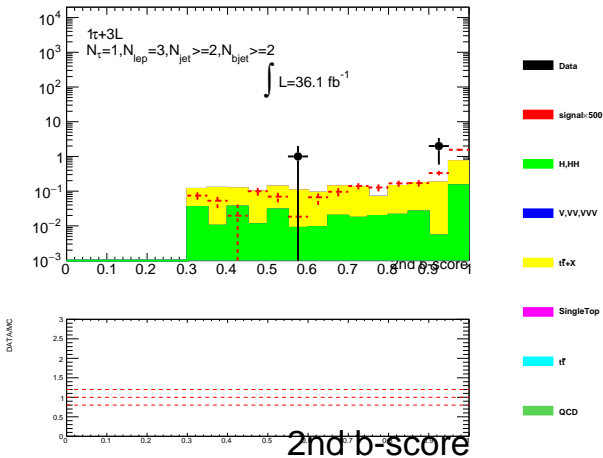


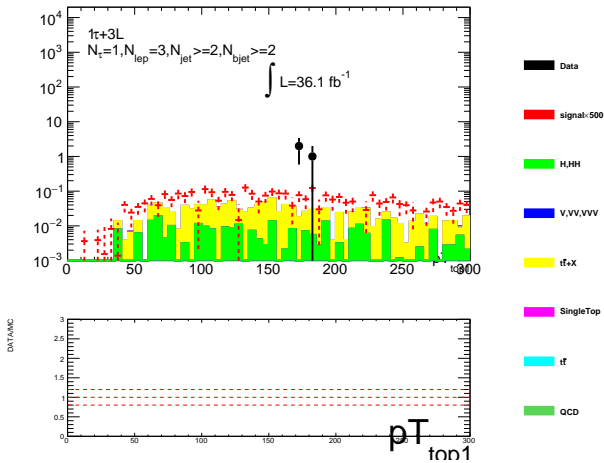


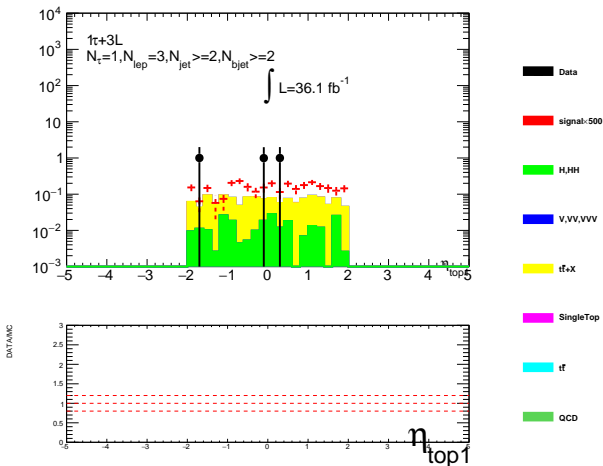


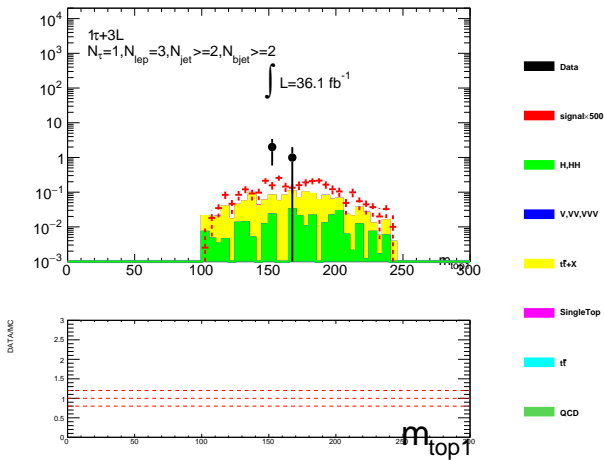




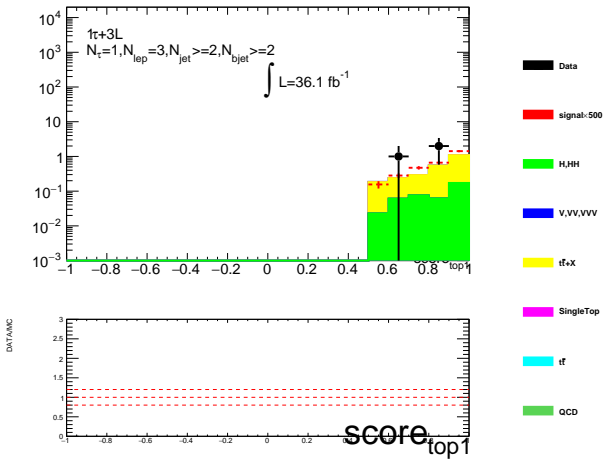


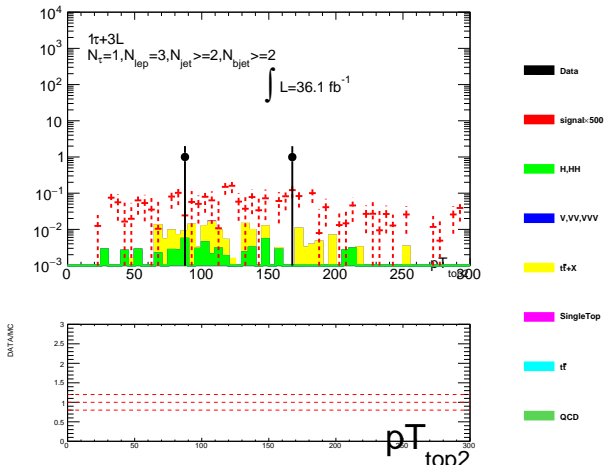


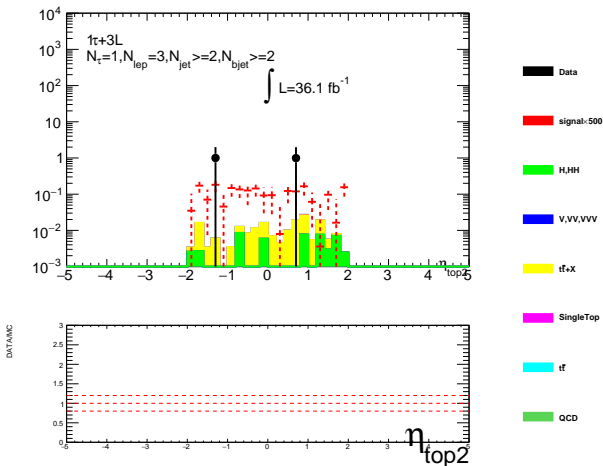


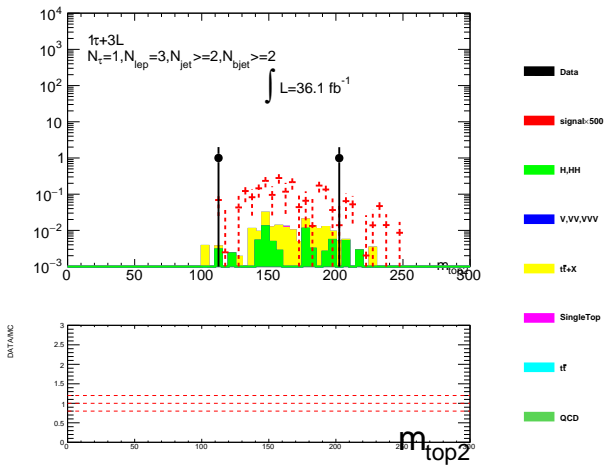


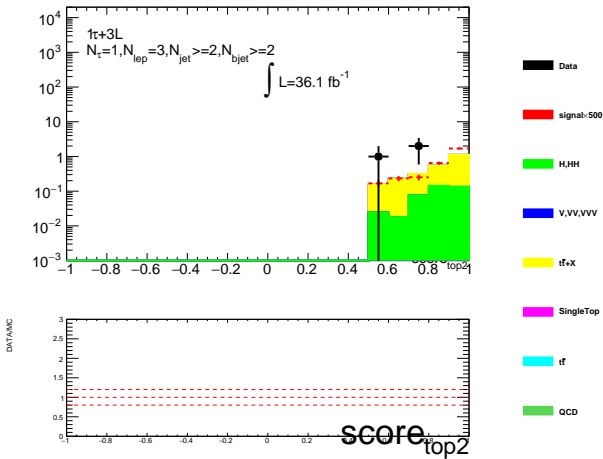


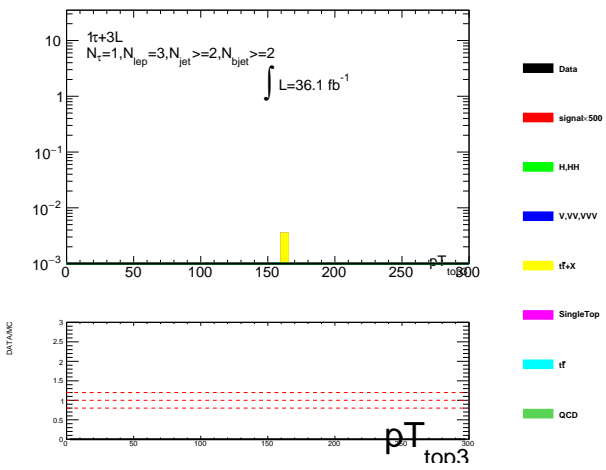


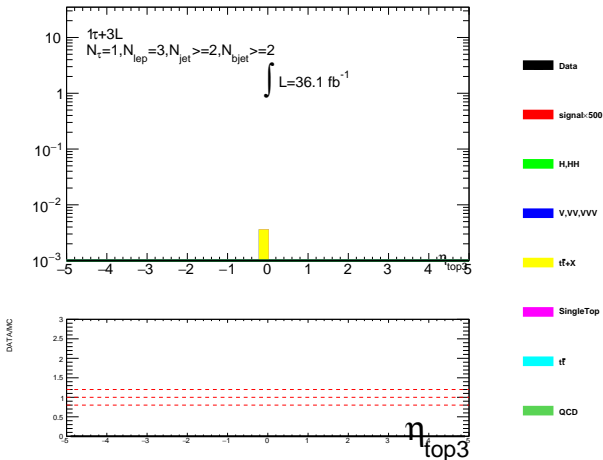


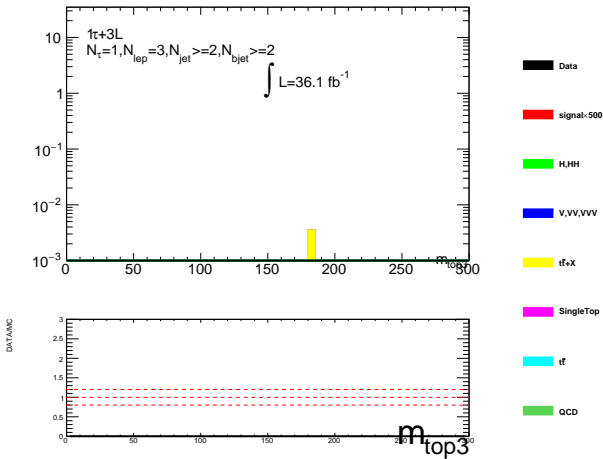




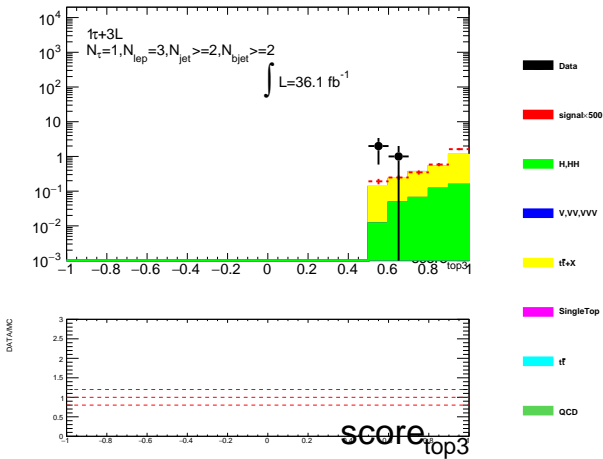


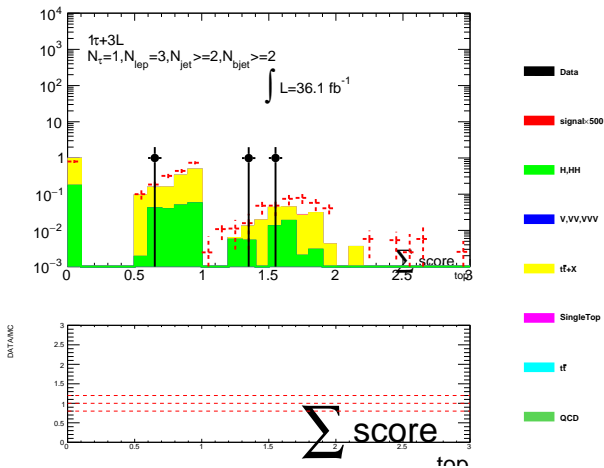


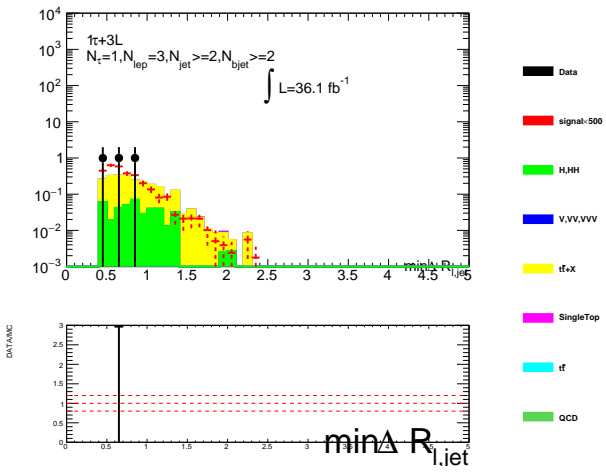


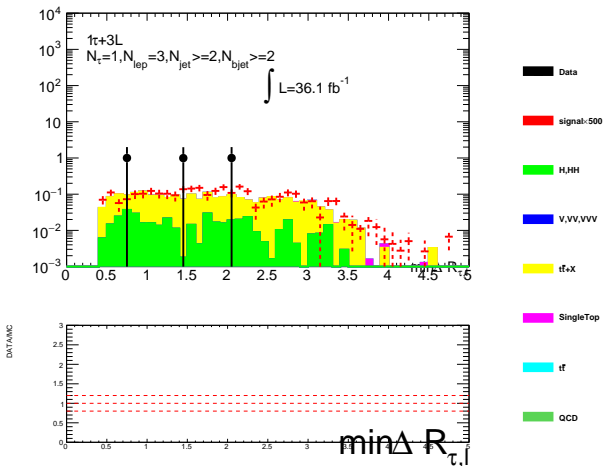


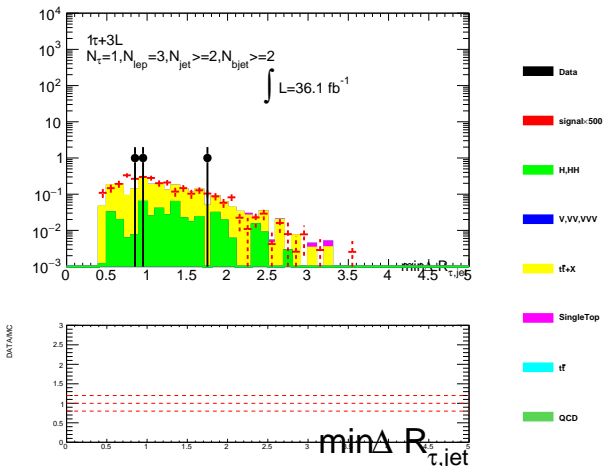


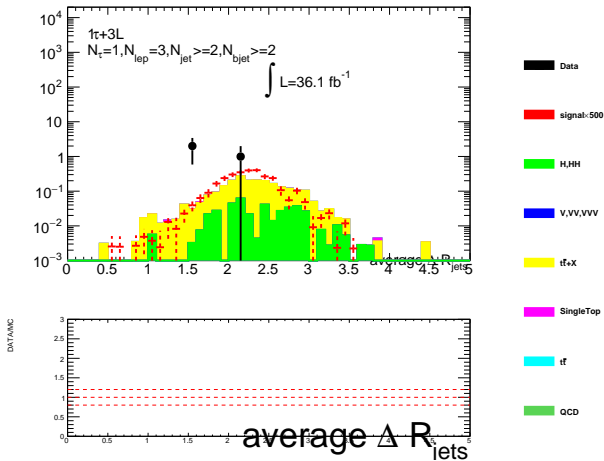


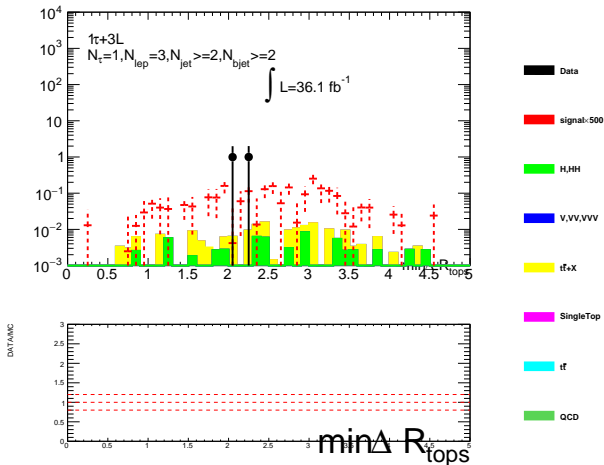


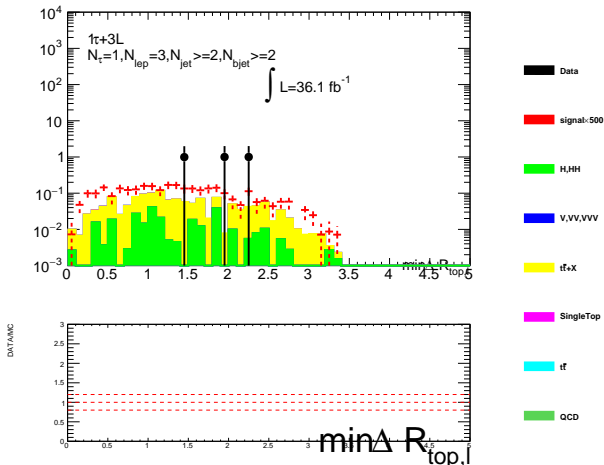






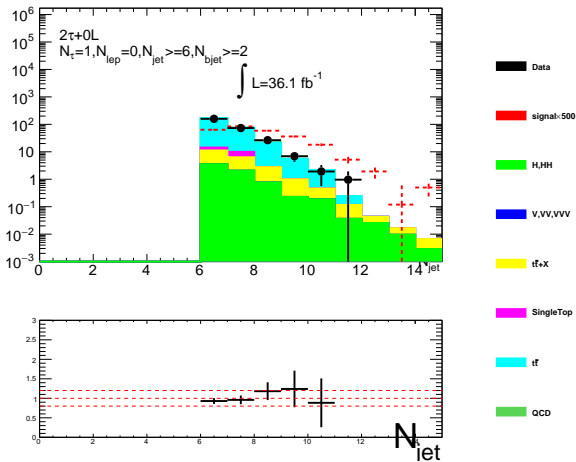


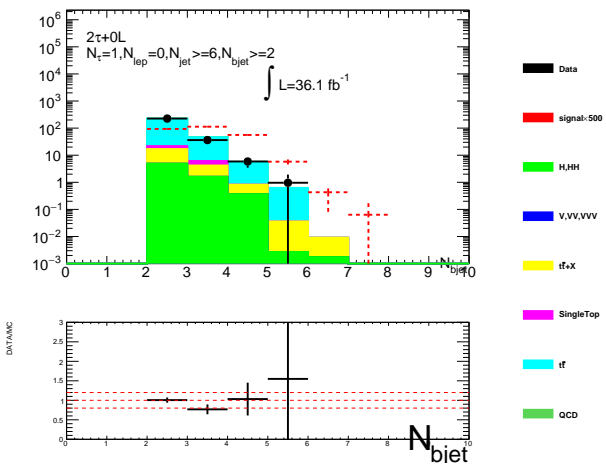


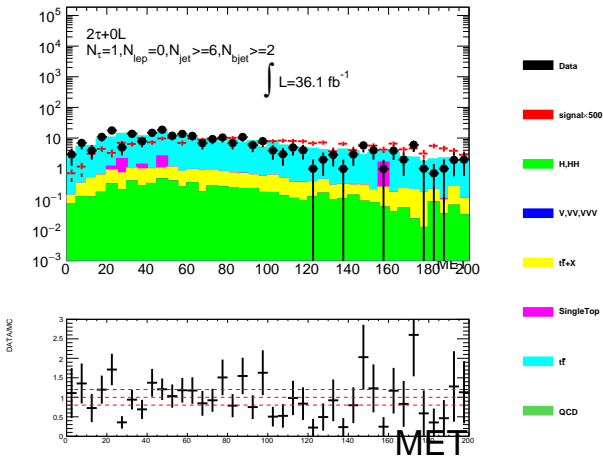


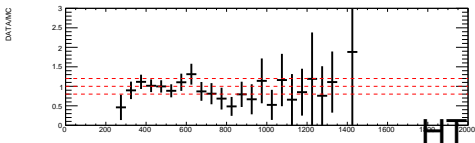
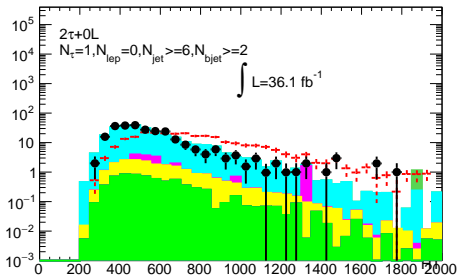


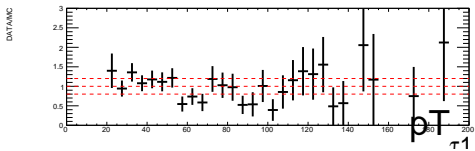
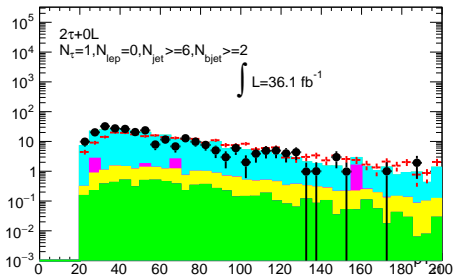
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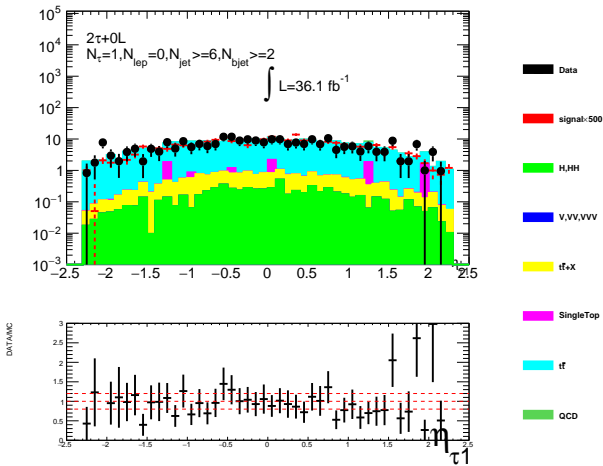


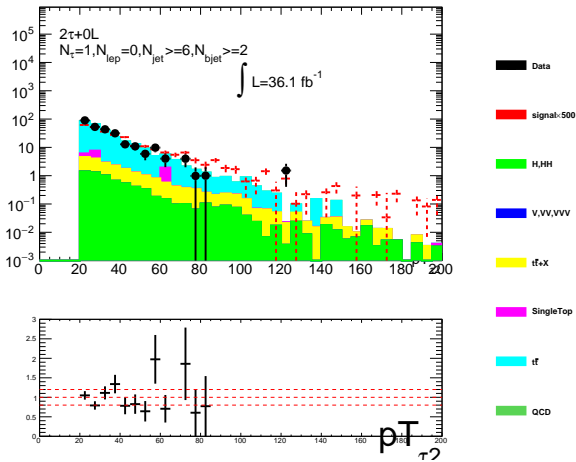




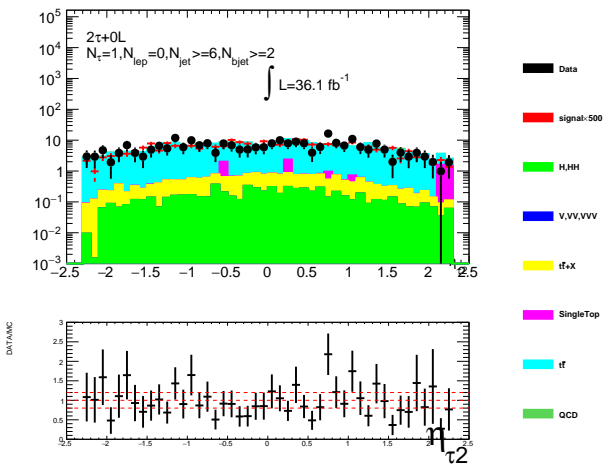


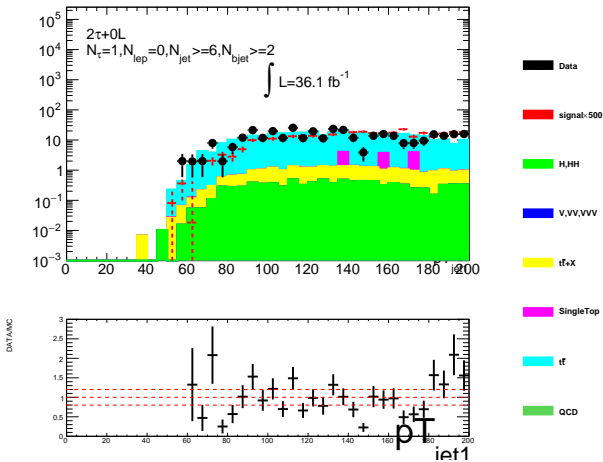


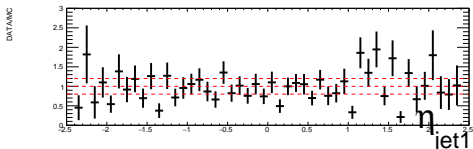
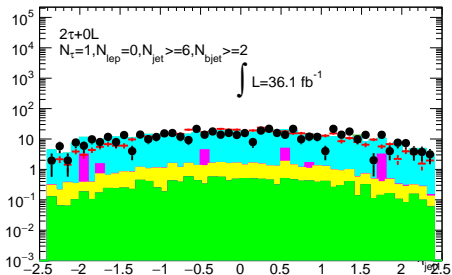


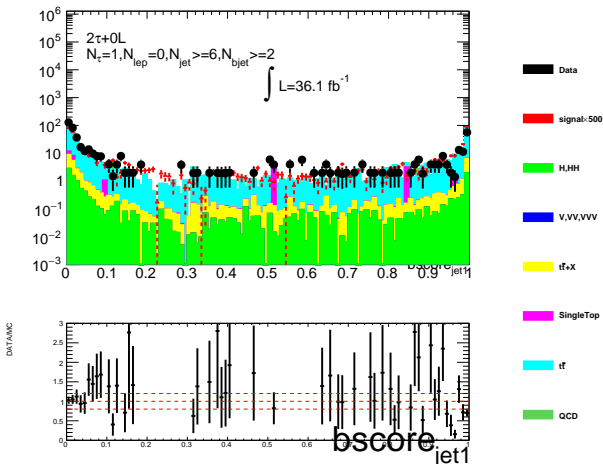


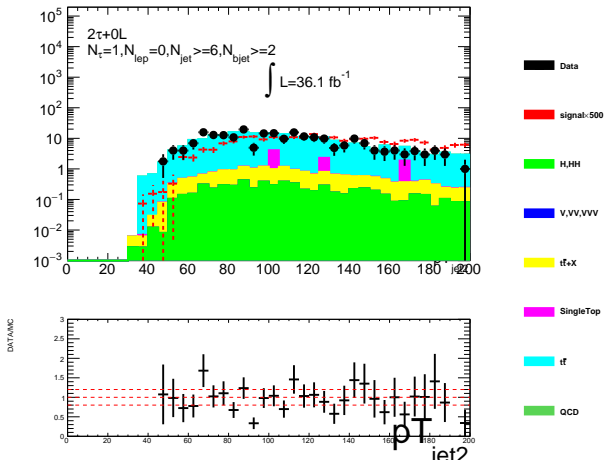


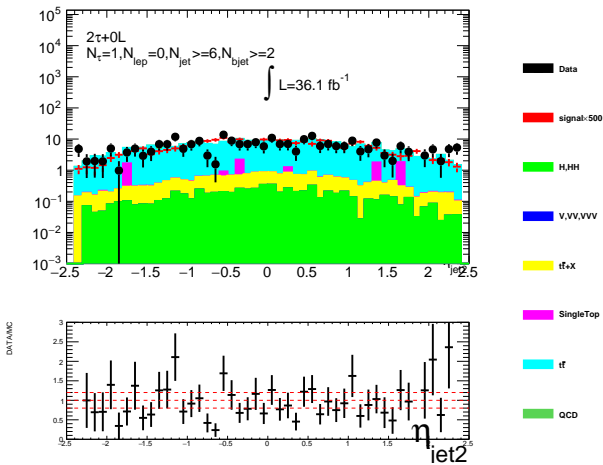


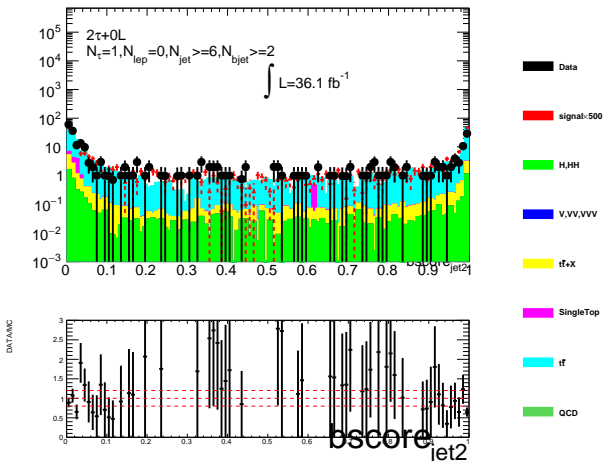


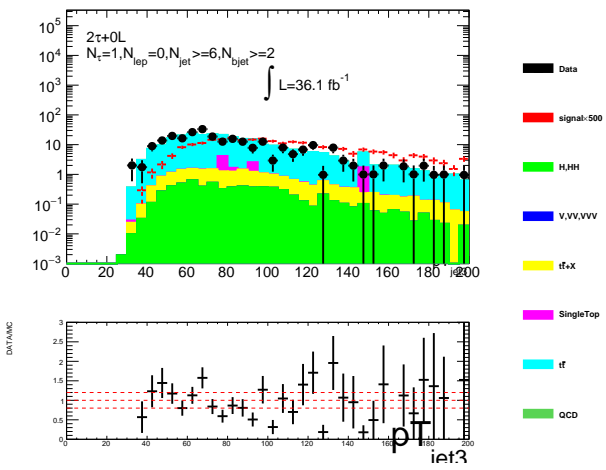




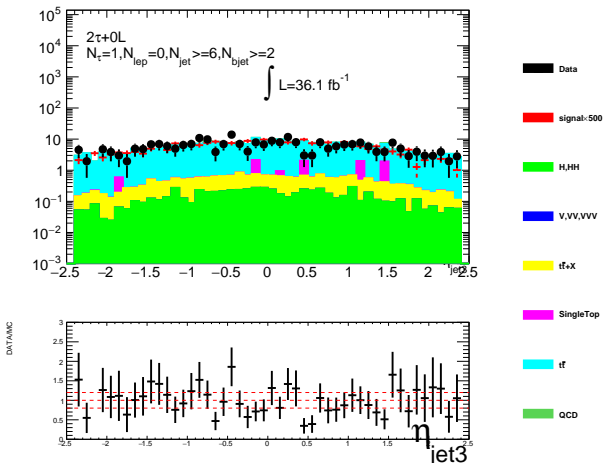


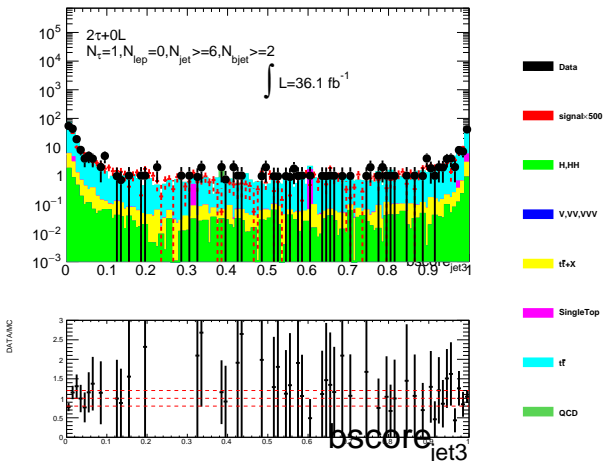


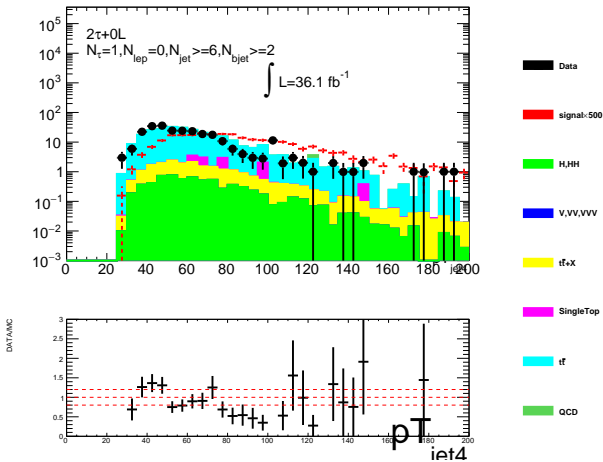


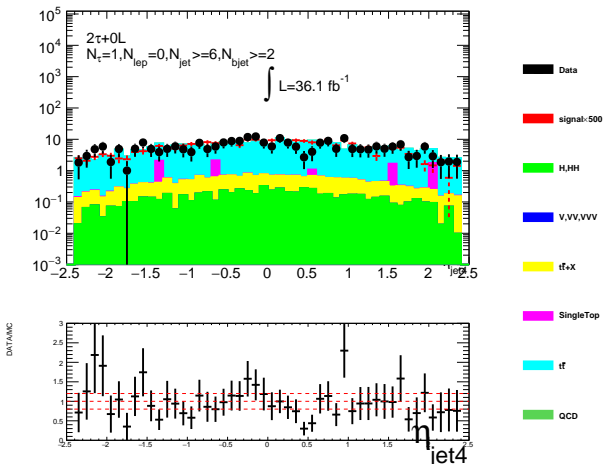


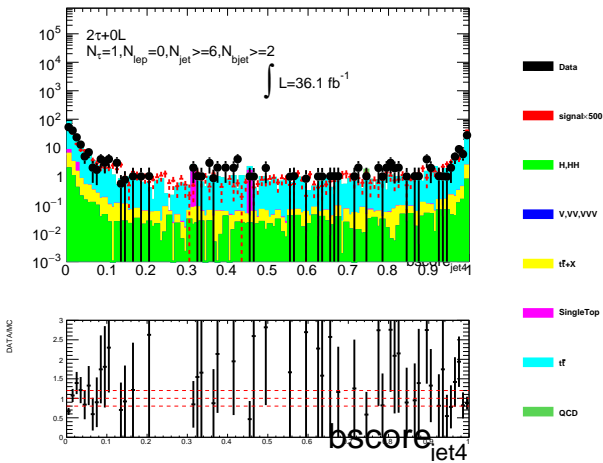


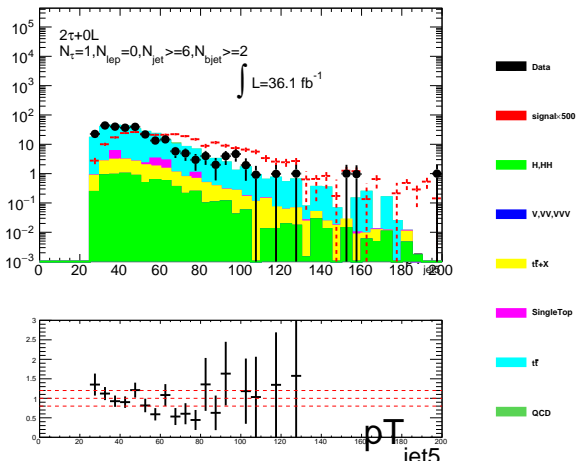


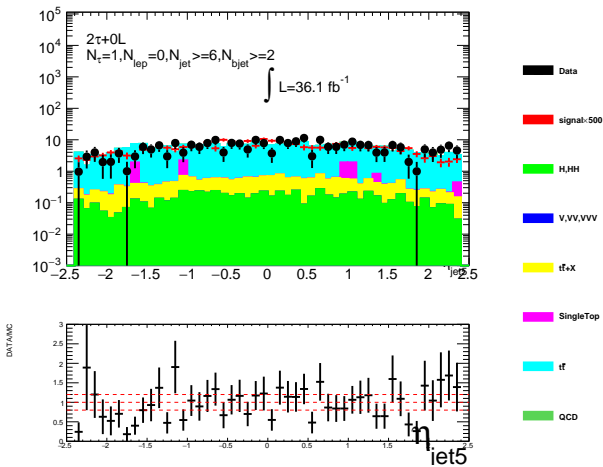


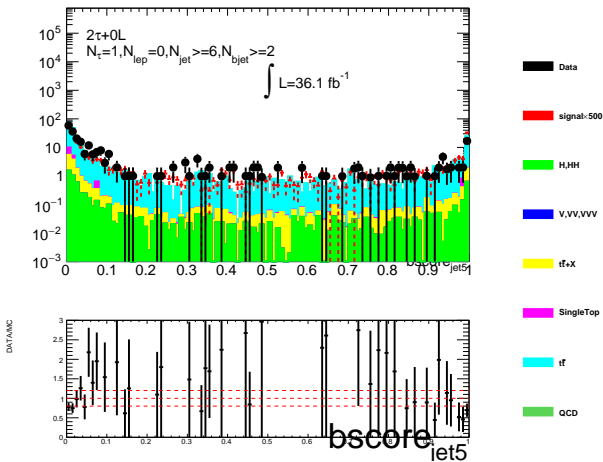




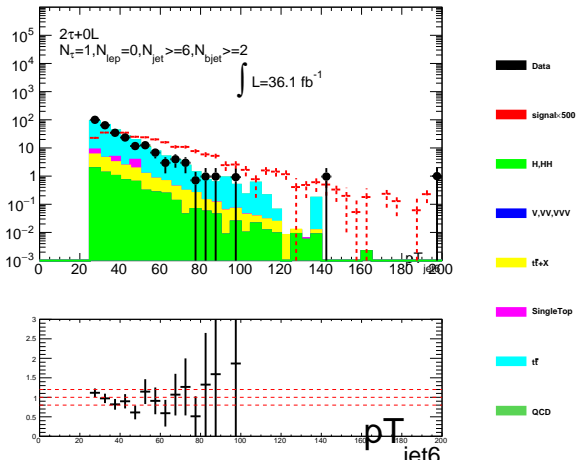


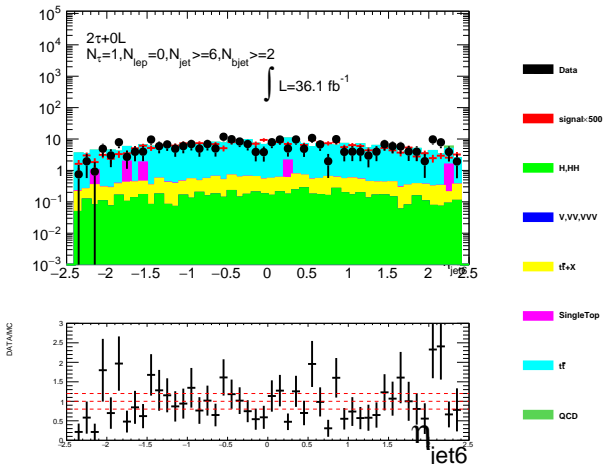


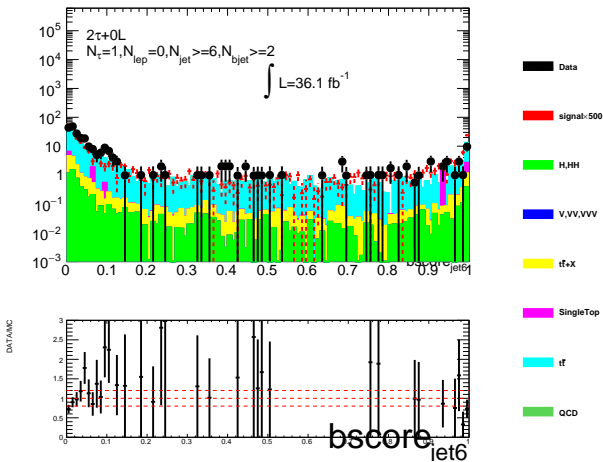


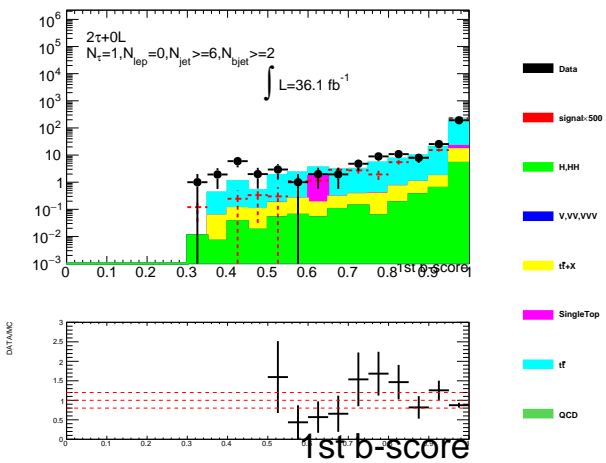


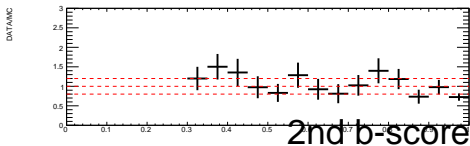
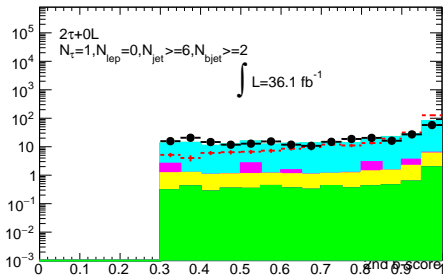


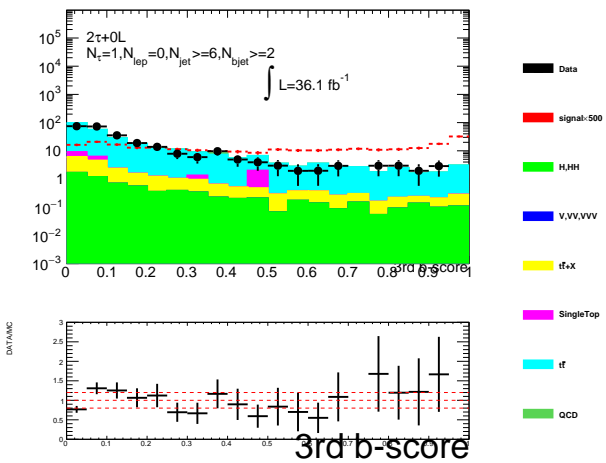


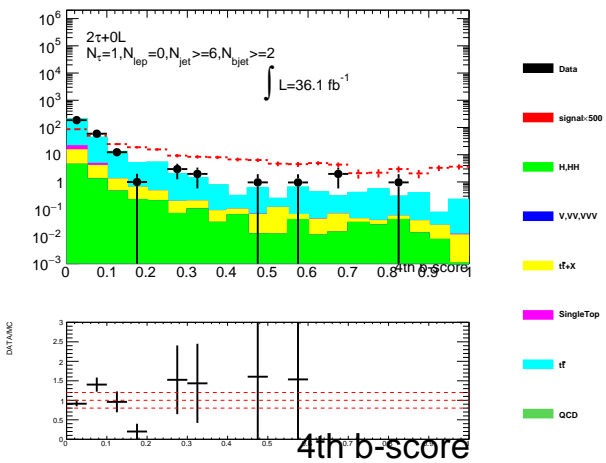


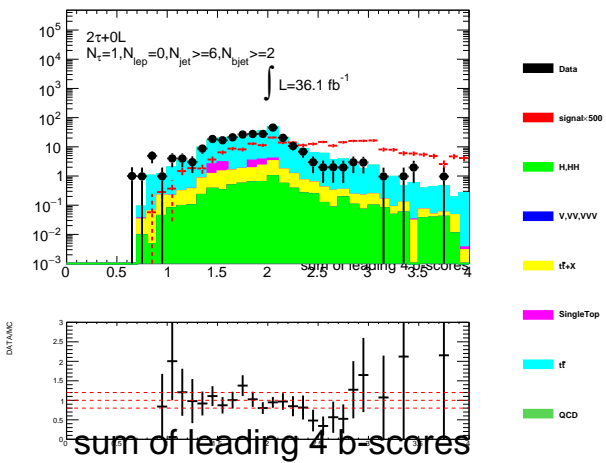




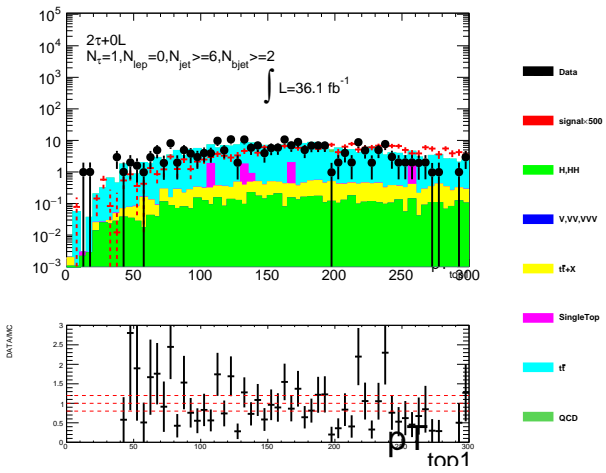


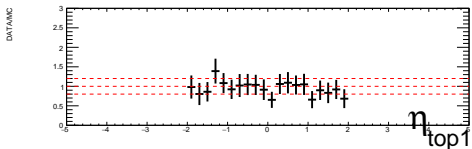
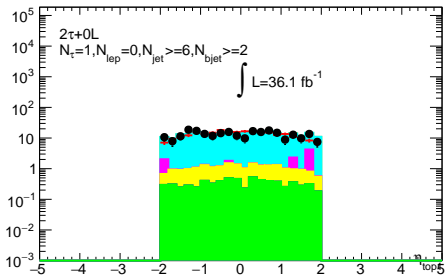


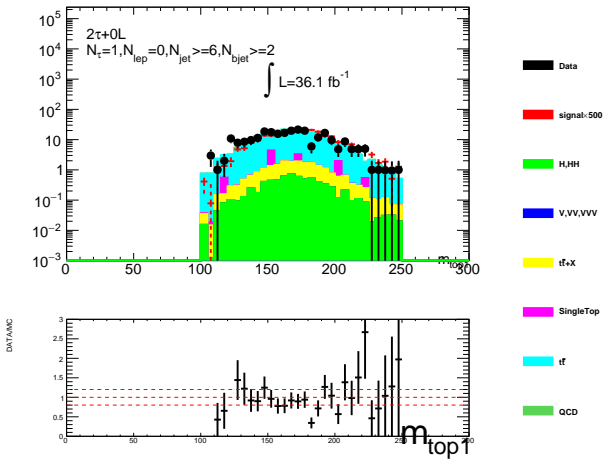


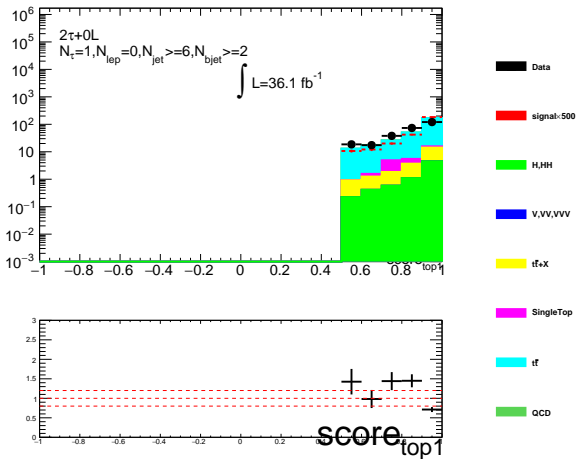


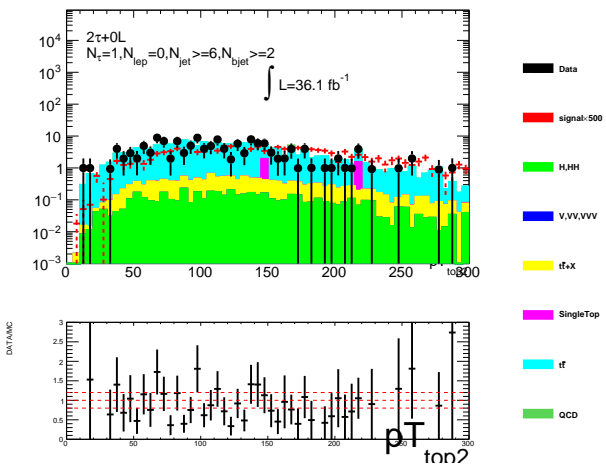


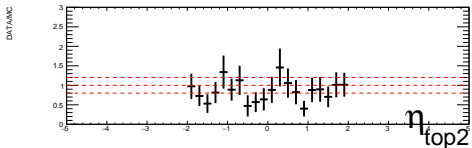
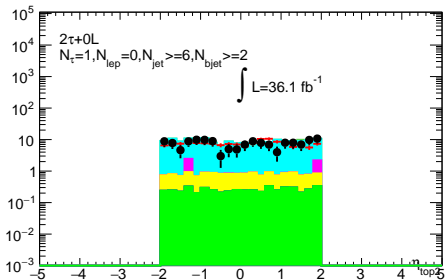


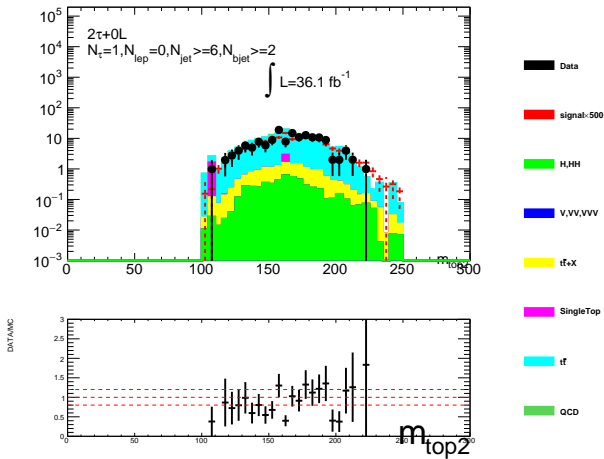


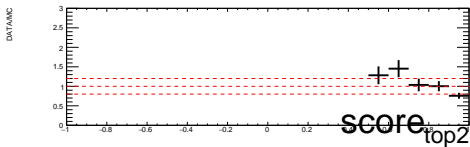
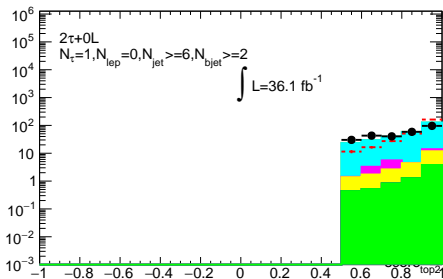




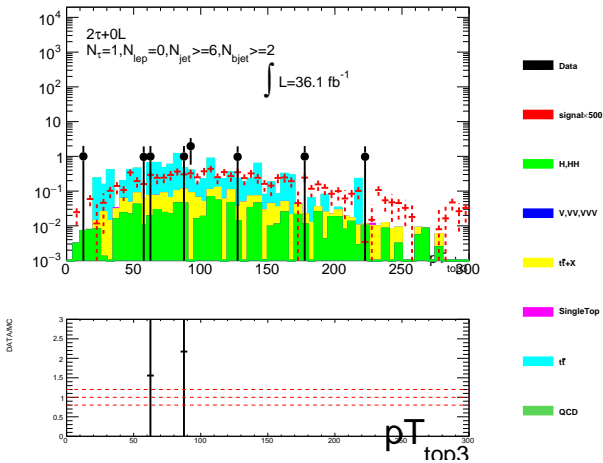


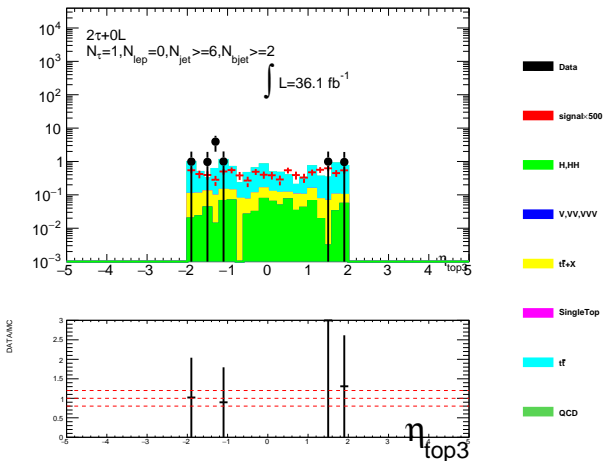


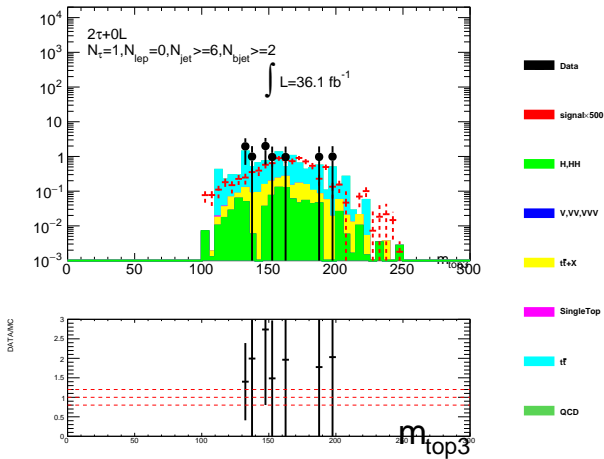


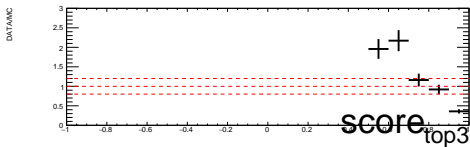
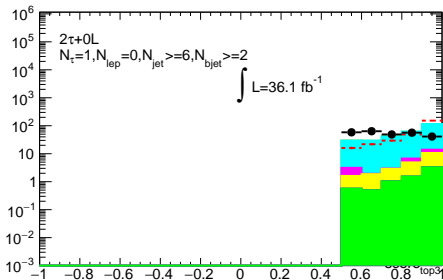


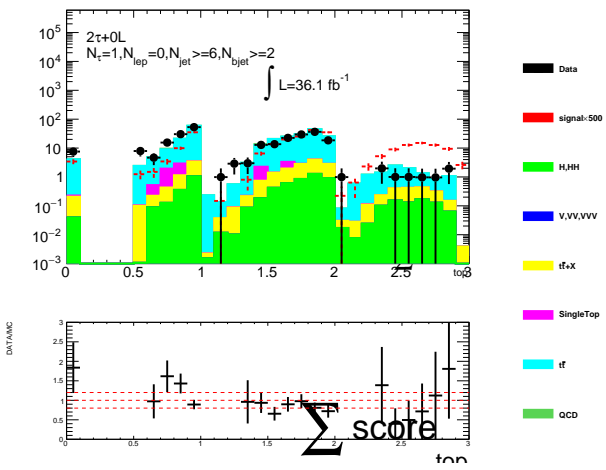


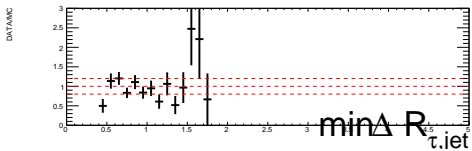
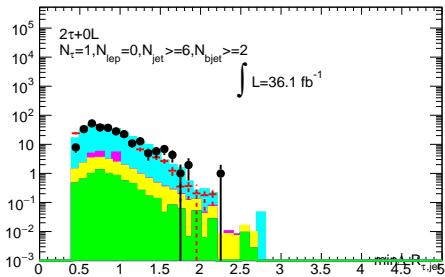


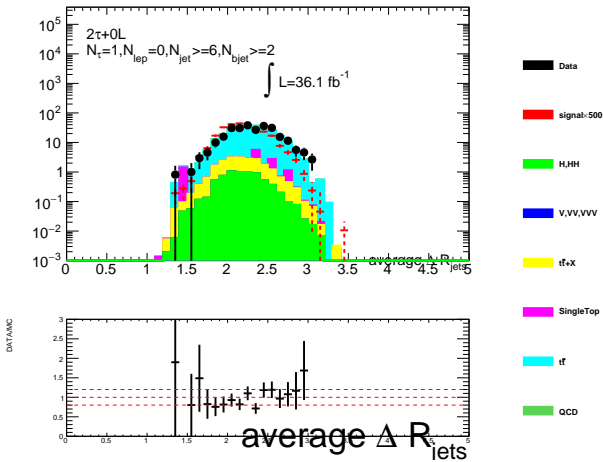


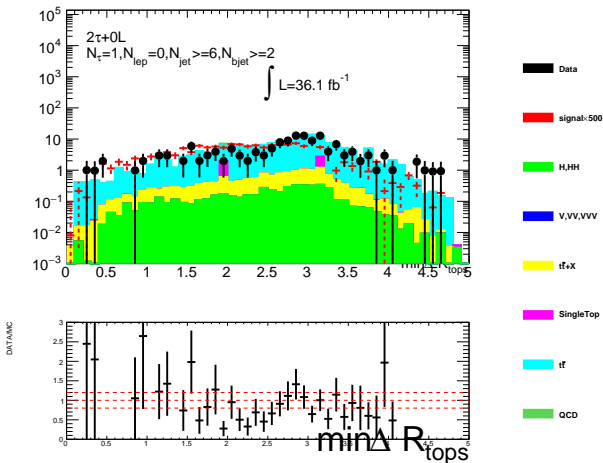






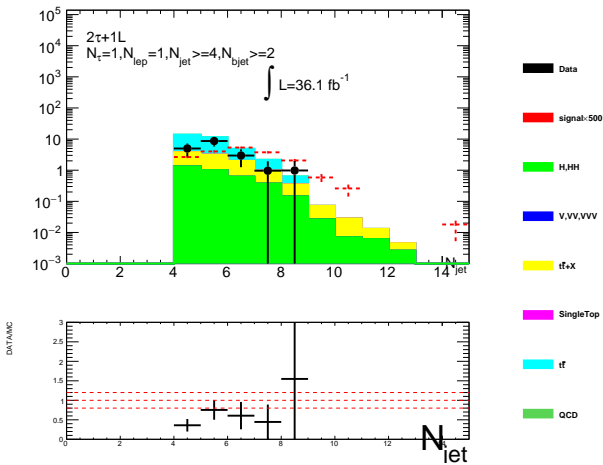


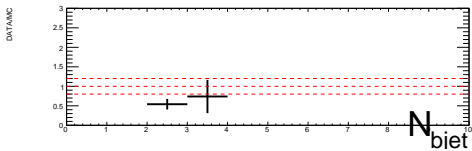
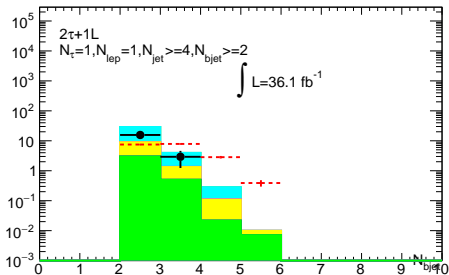


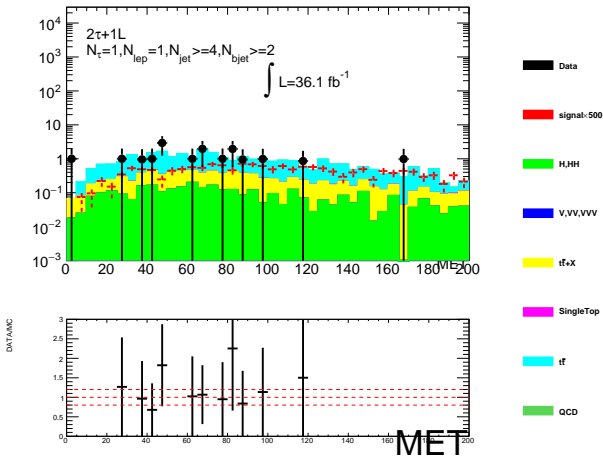


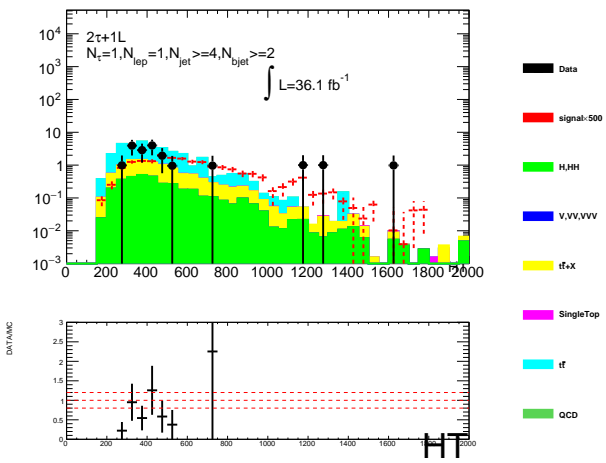


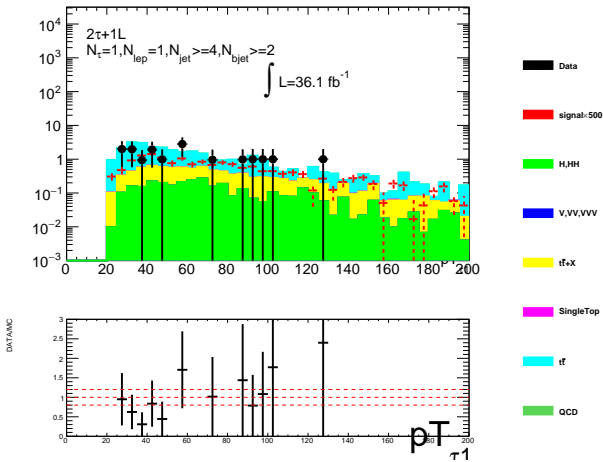
$2\tau + 1L$

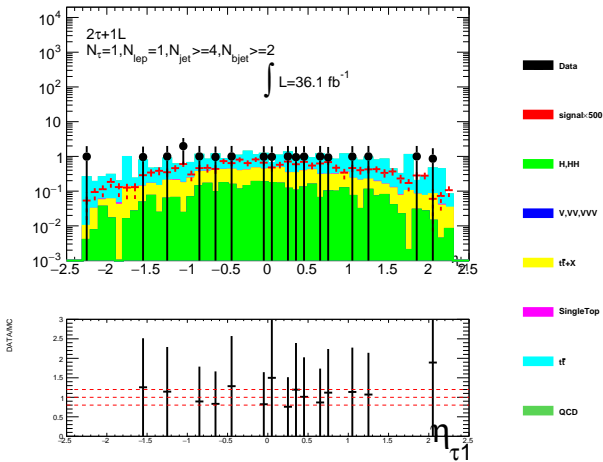


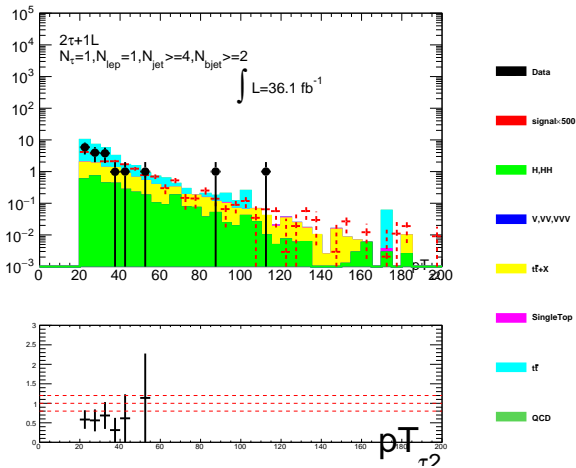




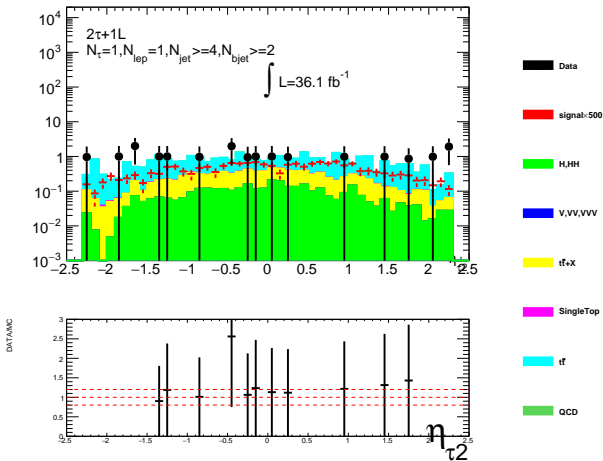


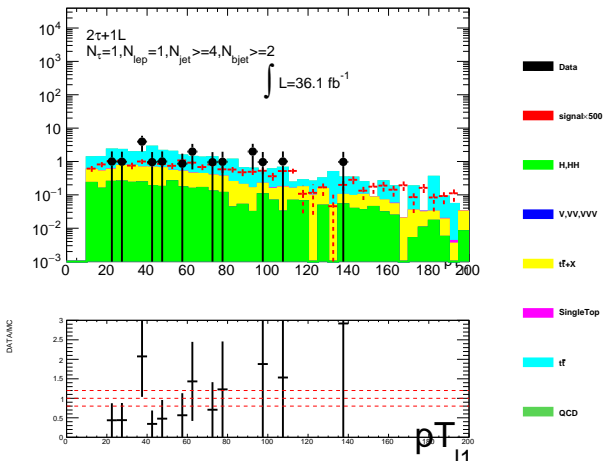


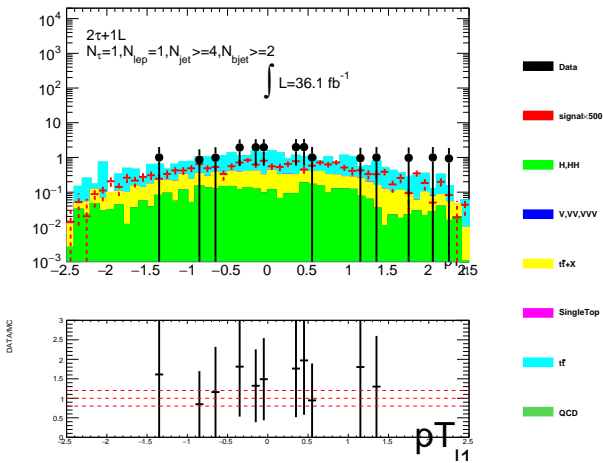


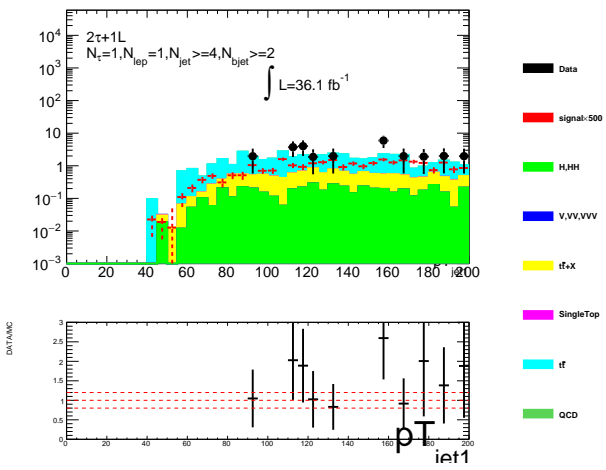


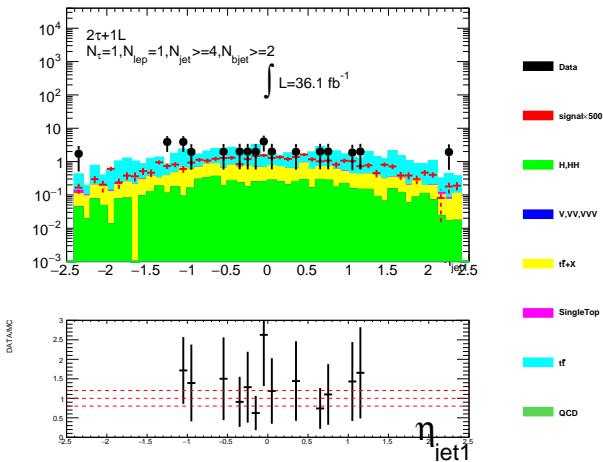


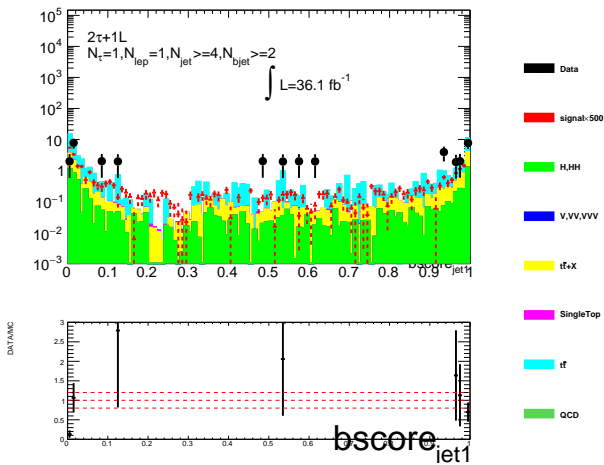


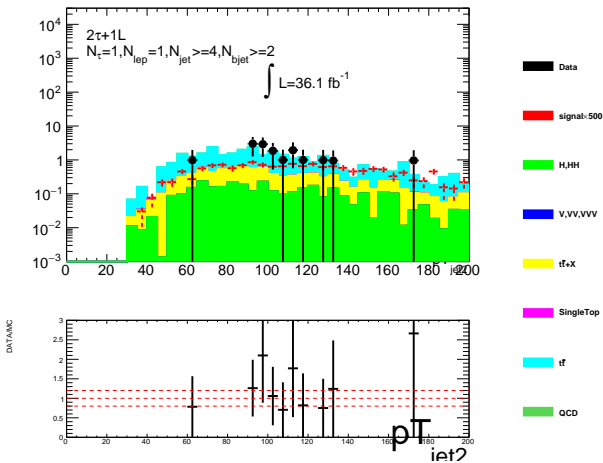


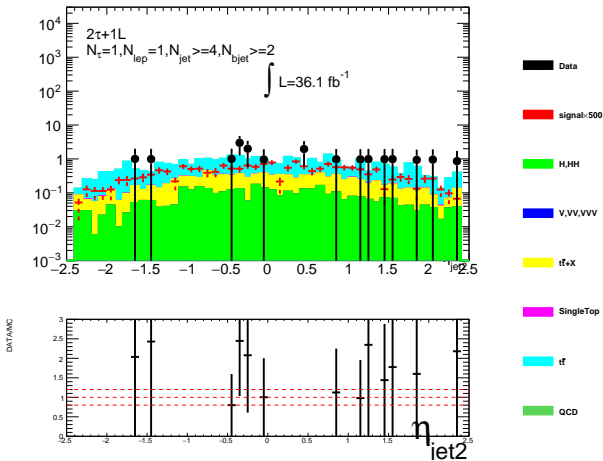




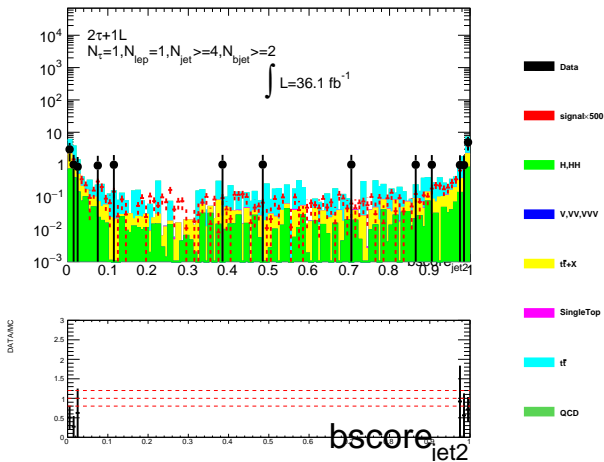


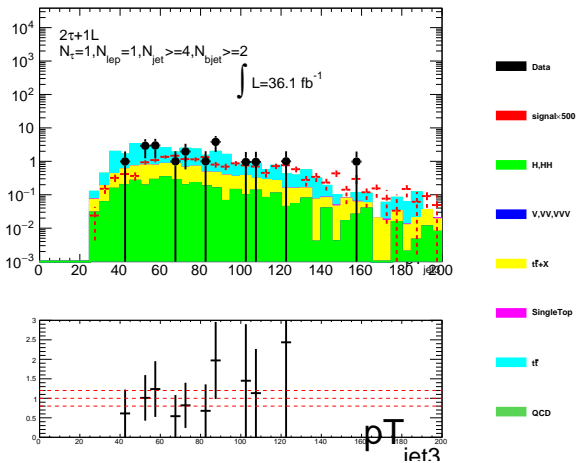


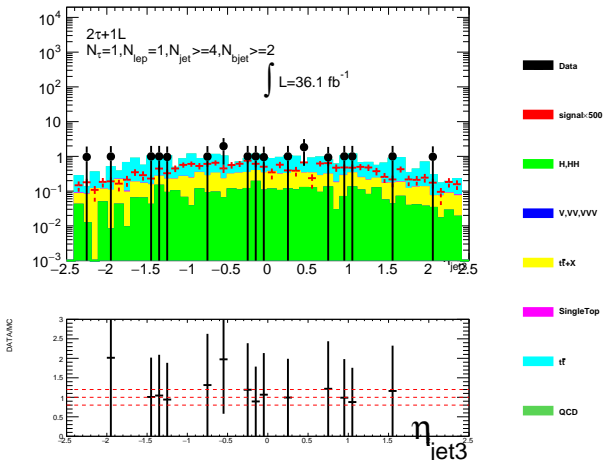


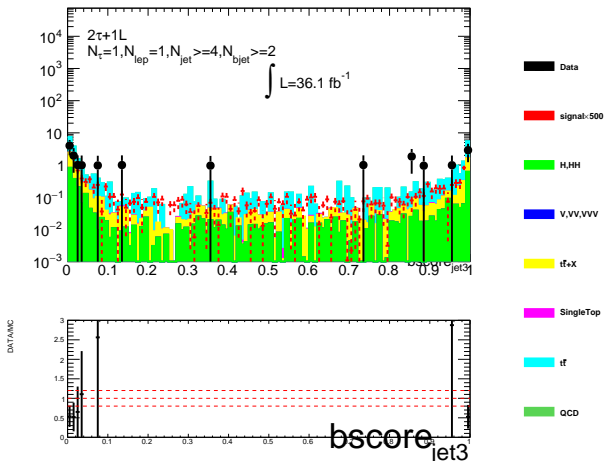


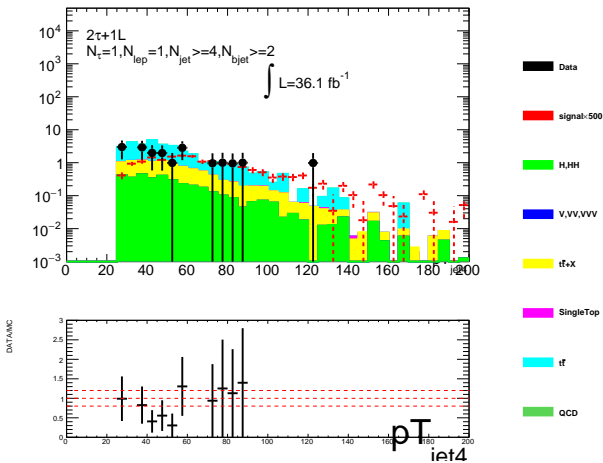


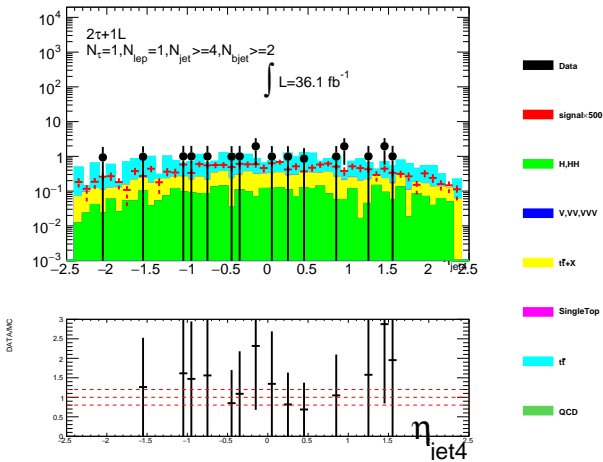


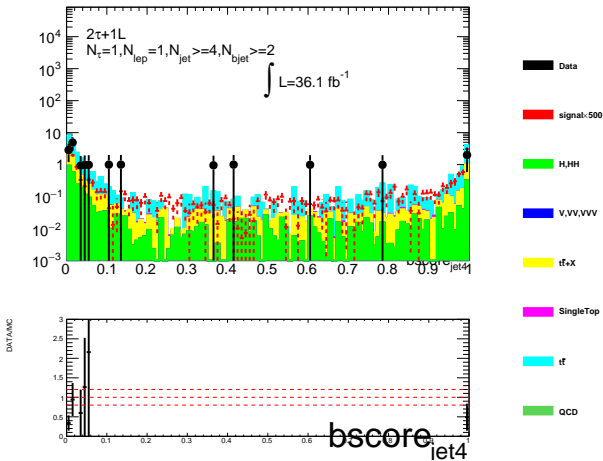


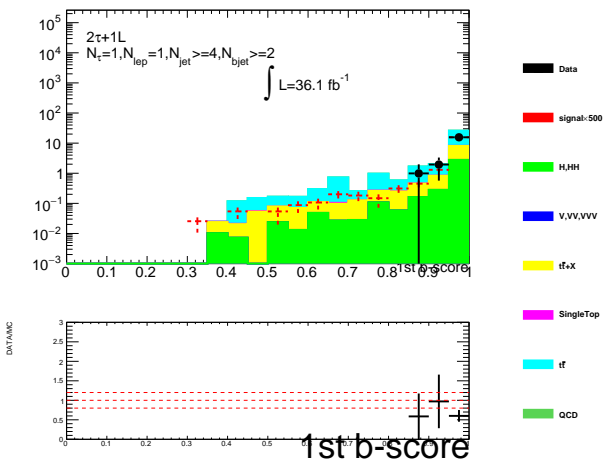




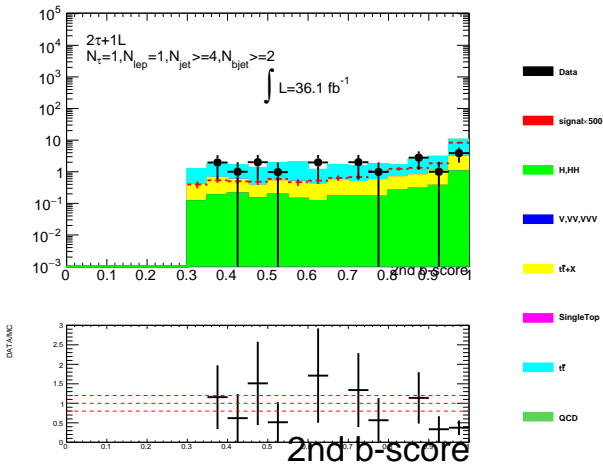


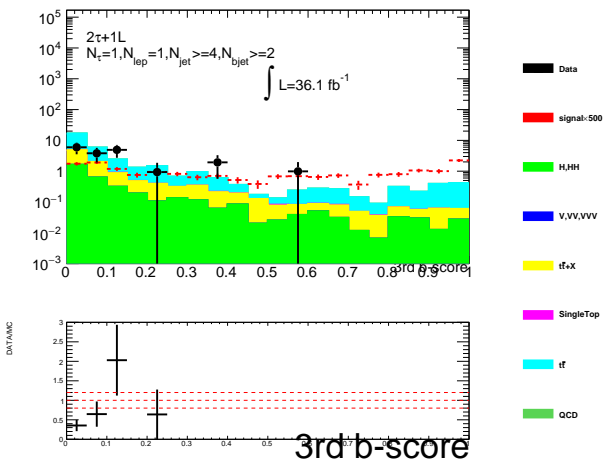


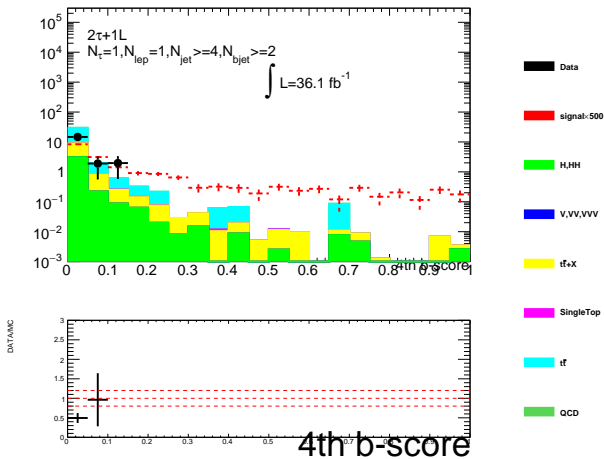


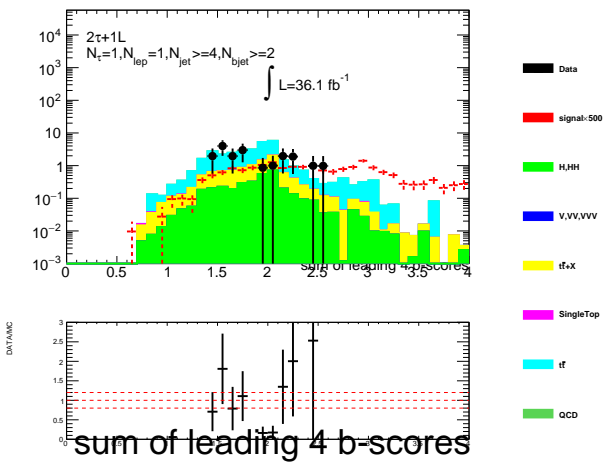


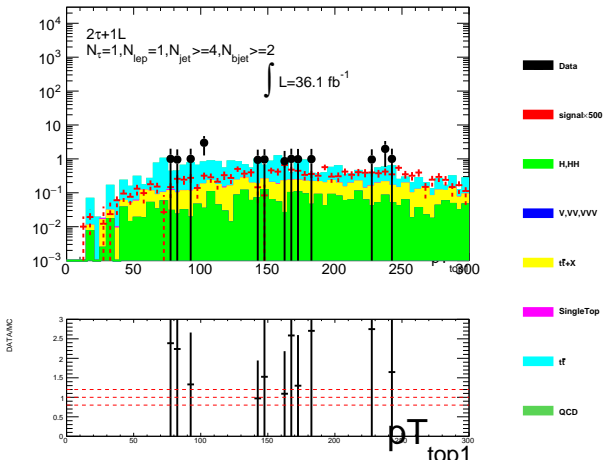


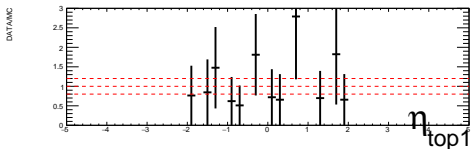
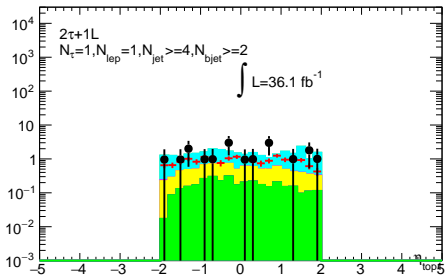


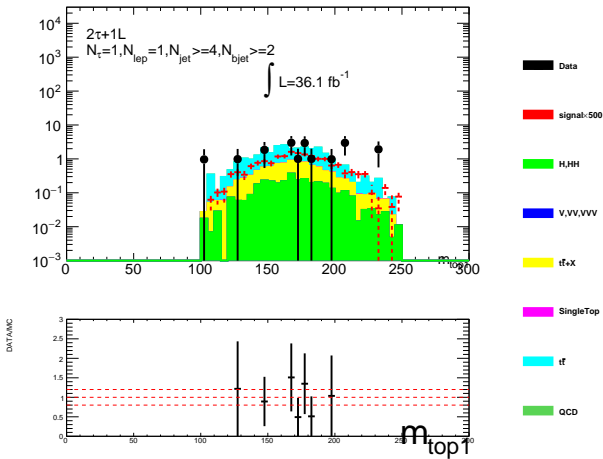


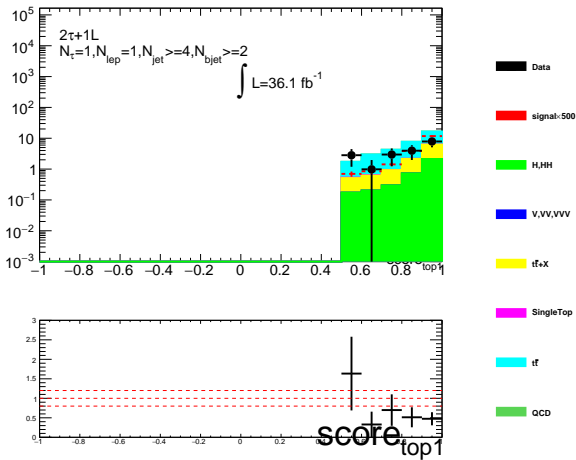




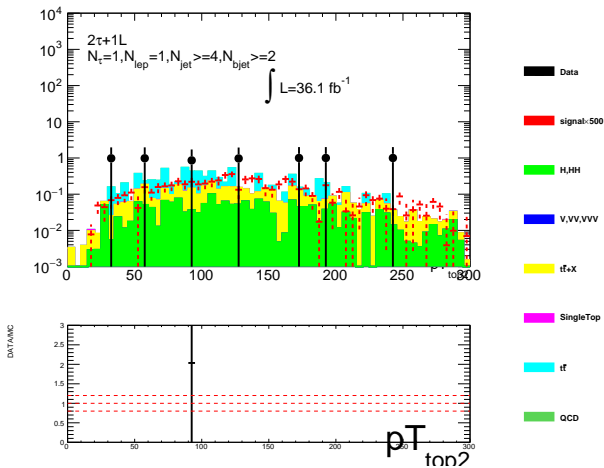


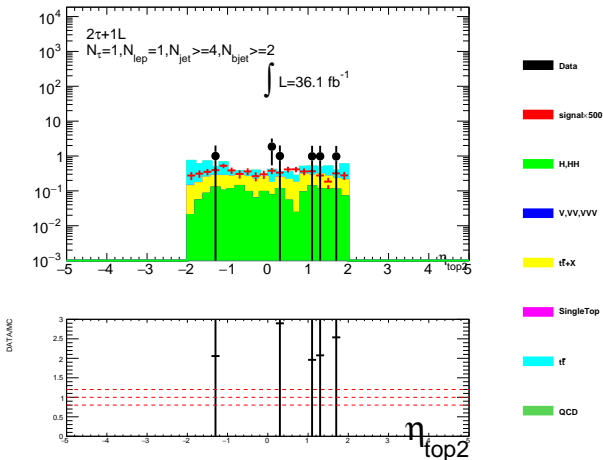


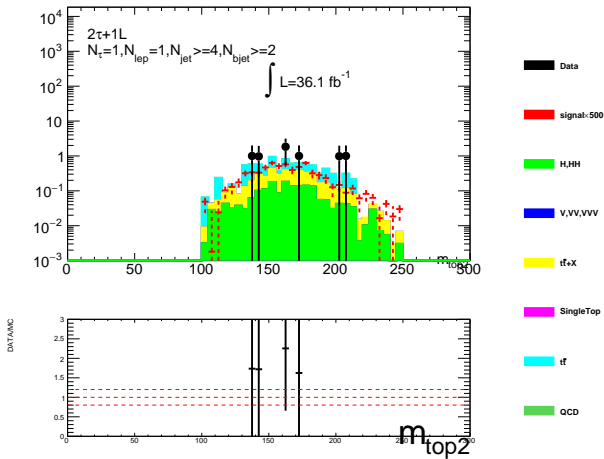


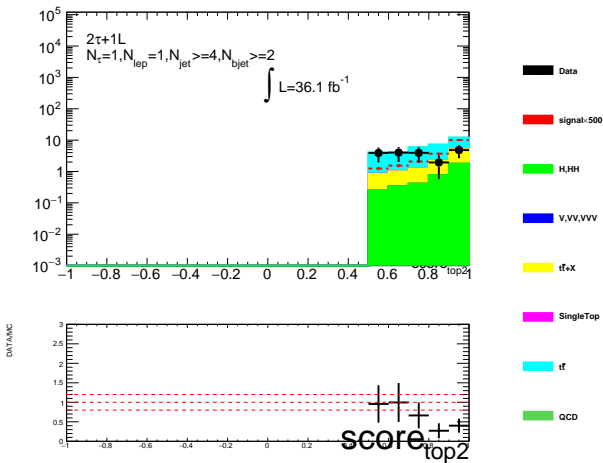


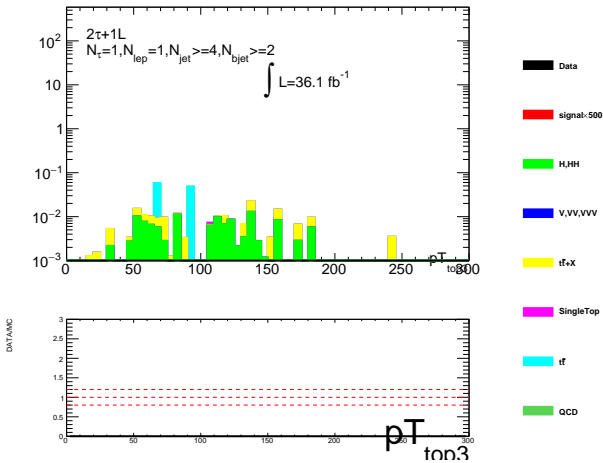


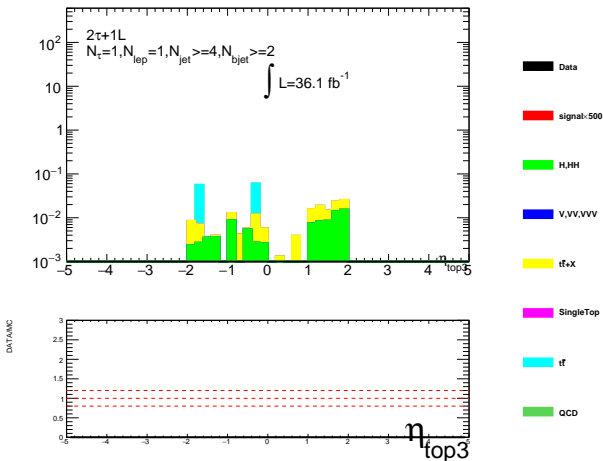


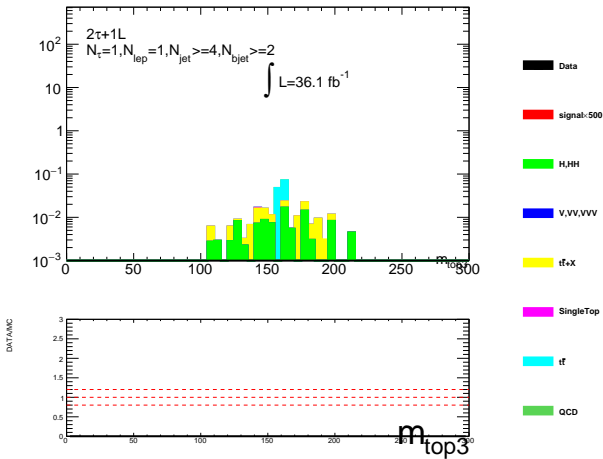


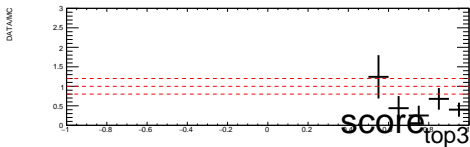
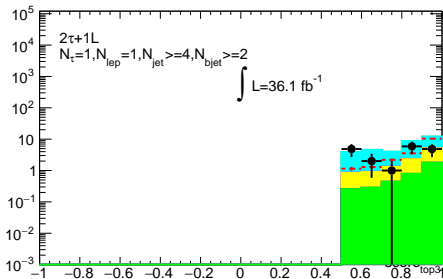




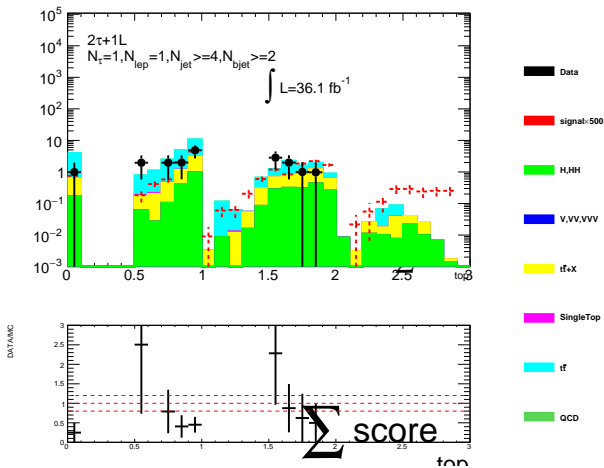


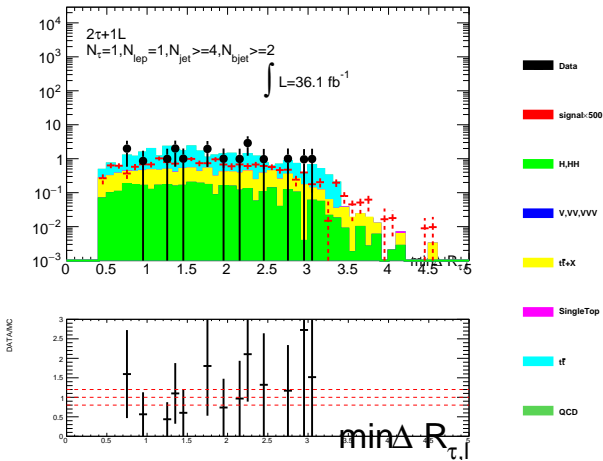


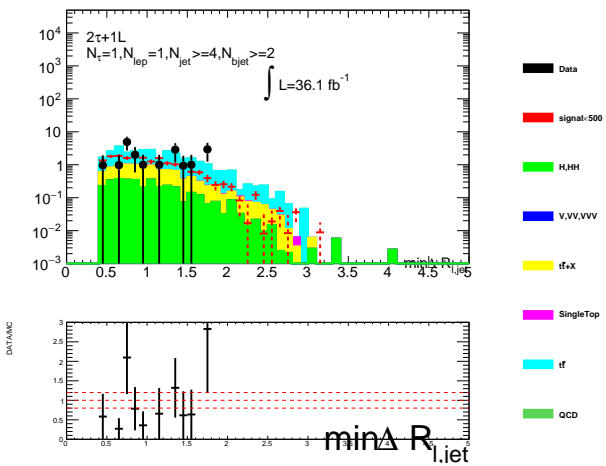


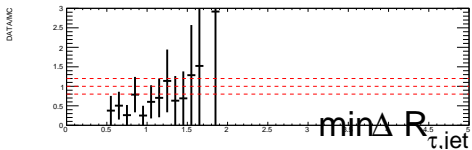
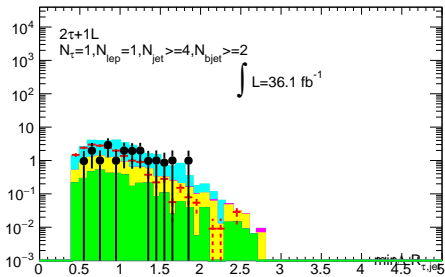


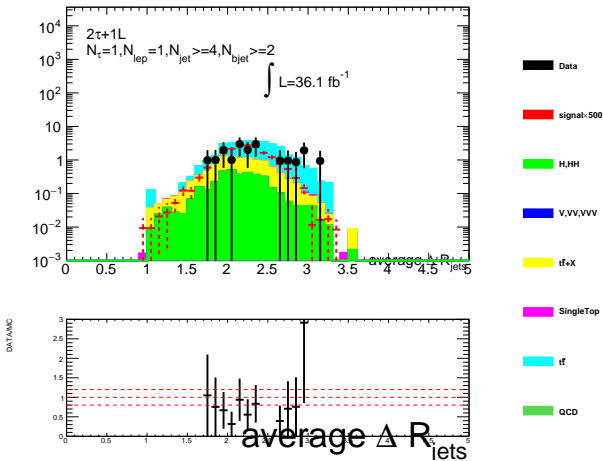


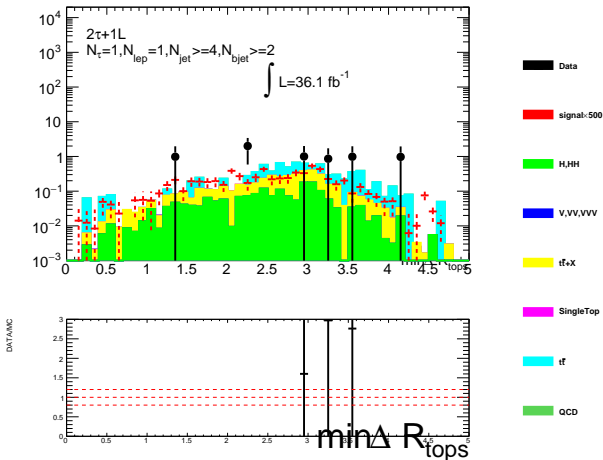


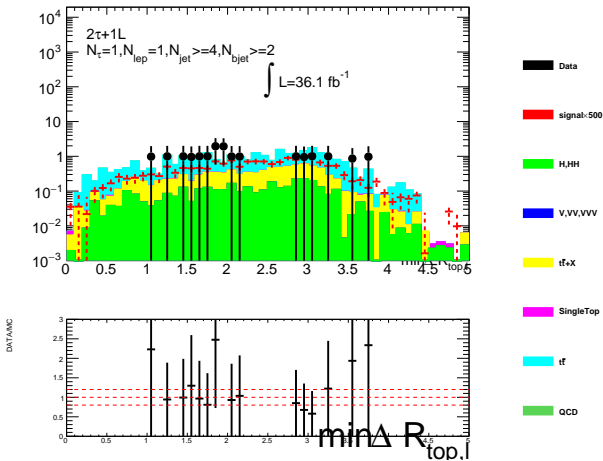












$2\tau + 2L$



