Discussion

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Sample

- Data : v2
  - JetHT PD
- MC : v3
  - QCD, TTbar, TTX, SingleTop, V+jets, VV, VVV, H, HH

Trigger

- HLT_PFHT450_SixJet40_BTagCSV_p056
- HLT_PFHT400_SixJet30_DoubleBTagCSV_p056

Object

	electron	muon	tau	jet
pT	10 GeV	10 GeV	20 GeV	25 GeV
η	$\lvert\eta\rvert < 2.5$	$\lvert\eta\rvert < 2.4$	$\lvert\eta\rvert < 2.3$	$\lvert\eta\rvert < 2.4$
ID	Tight	Medium	as ttH	LooseID, medium DeepFlavour b-tagging
ISO	Tight	Tight	-	-
Other	IP	IP	IP	Forward jet(not used)

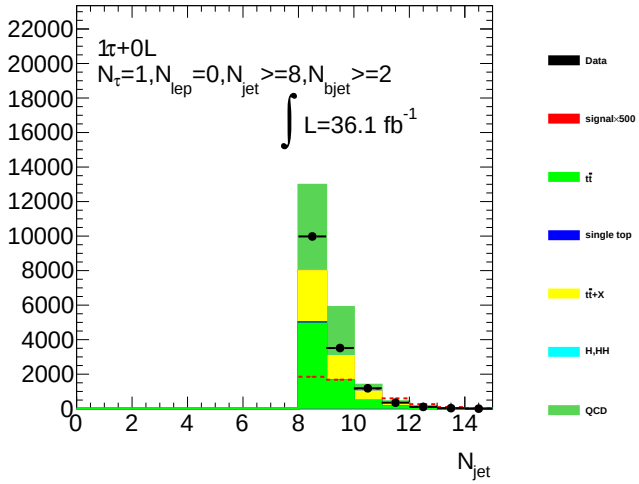
Pre-selection

	N_τ	N_{lep}	N_{jet}	pT_τ	pT_{lep}	$\sum pT_{jet}$
1Tau+0L	==1	==0	$\geq 2b+ \geq 8jets$			
1Tau+1L	==1	==1	$\geq 2b+ \geq 6jets$			
1Tau+2L	==1	==2	$\geq 2b+ \geq 4jets$			
1Tau+3L	==1	==3	$\geq 2b+ \geq 2jets$	20 GeV	10 GeV	
2Tau+0L	==2	==0	$\geq 2b+ \geq 6jets$			
2Tau+1L	==2	==1	$\geq 2b+ \geq 4jets$			
2Tau+2L	==2	==2	$\geq 2b+ \geq 2jets$			

Cutflow in data

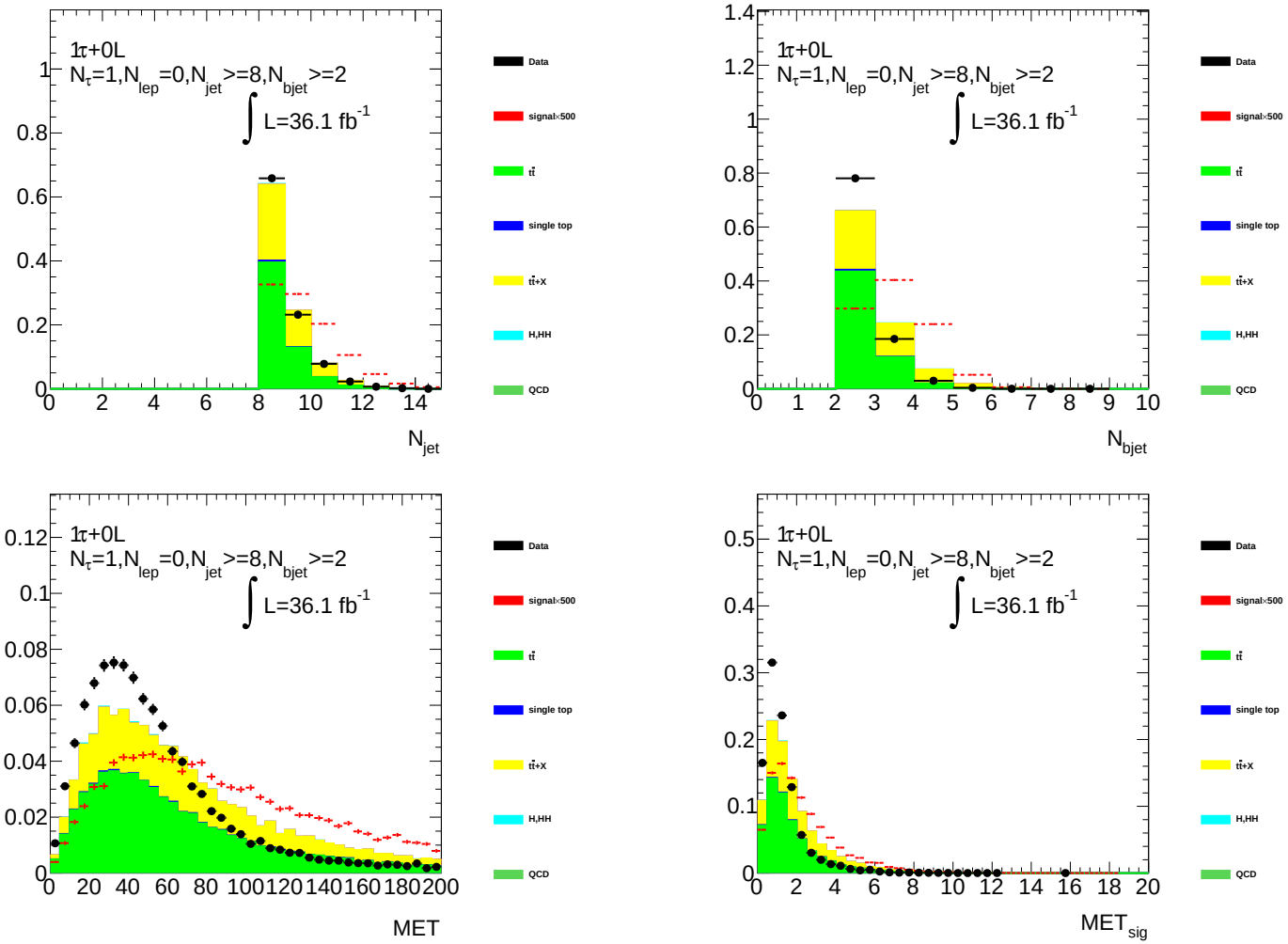
	data2016
Initial	
Trigger	
2 b-jets	17313549
1Tau+0L	14979
1Tau+1L	2333
1Tau+2L	97
1Tau+3L	3
2Tau+0L	276
2Tau+1L	25
2Tau+2L	1

$1\tau + 0L$



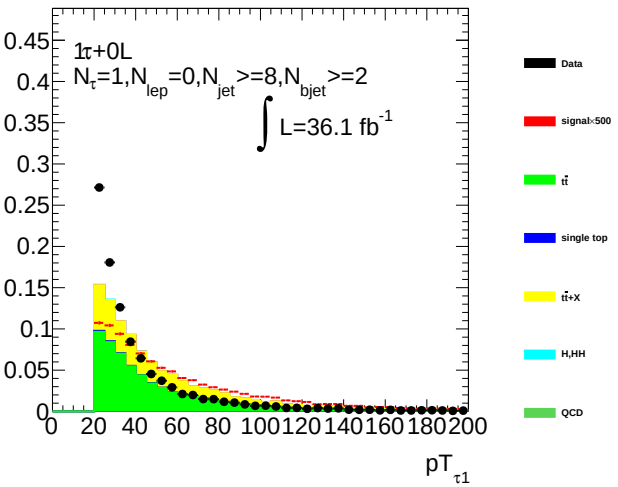
- I do not fully trust QCD MC, so they are not included in the following slides.
- The data is more than MC(all but QCD). This means there are some fake backgrounds.
- The following slides only show the shape comparisons(normalized to 1).
- The V+jets/VV/VVV MC samples have very few events.

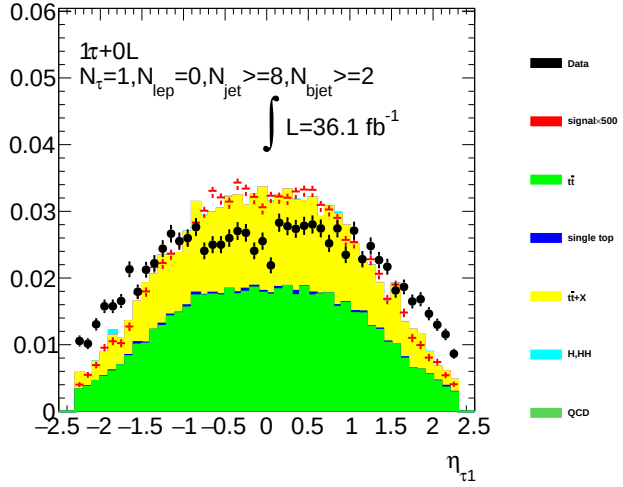
$N_{jet}, N_{bjet}, MET, MET_{sig}$



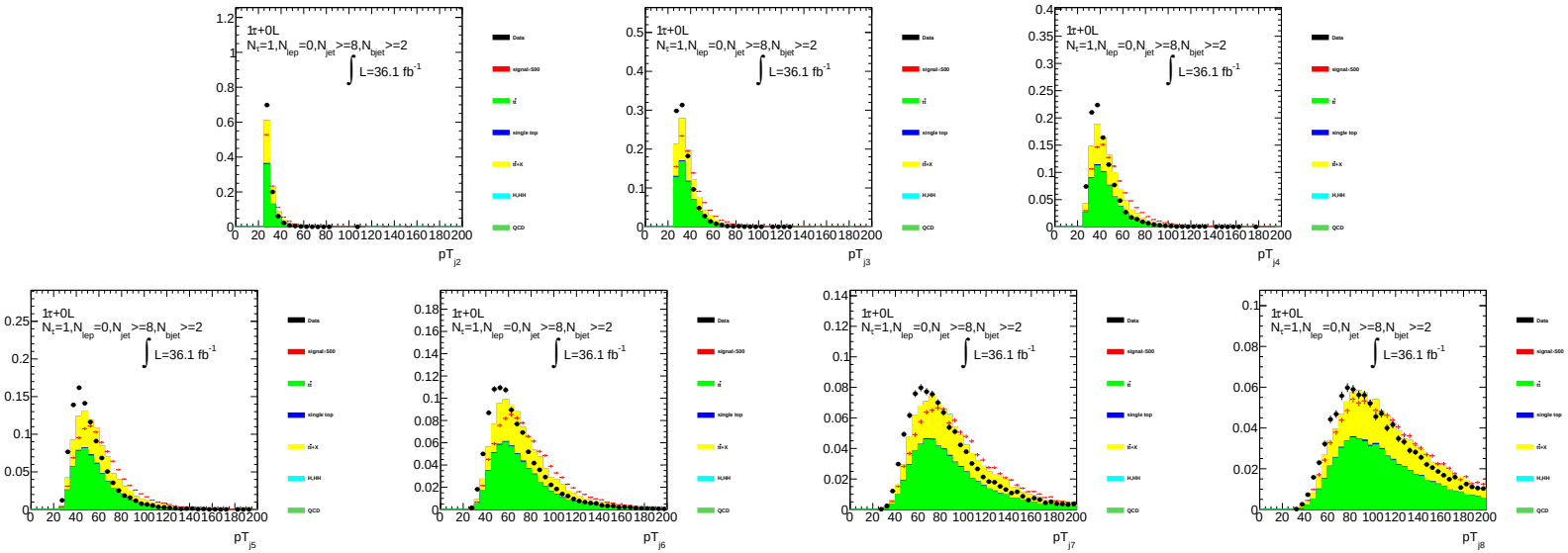
- The fake background lies in the low $N_{jet}/N_{bjet}/MET/MET_{sig}$ region.

τ pT


1τ+0L
N_τ=1,N_lep=0,N_jet>=8,N_bjet>=2
∫ L=36.1 fb^-1
pT_τ1
Data
signal×500
tt̄
single top
tt̄+X
H,HH
QCD

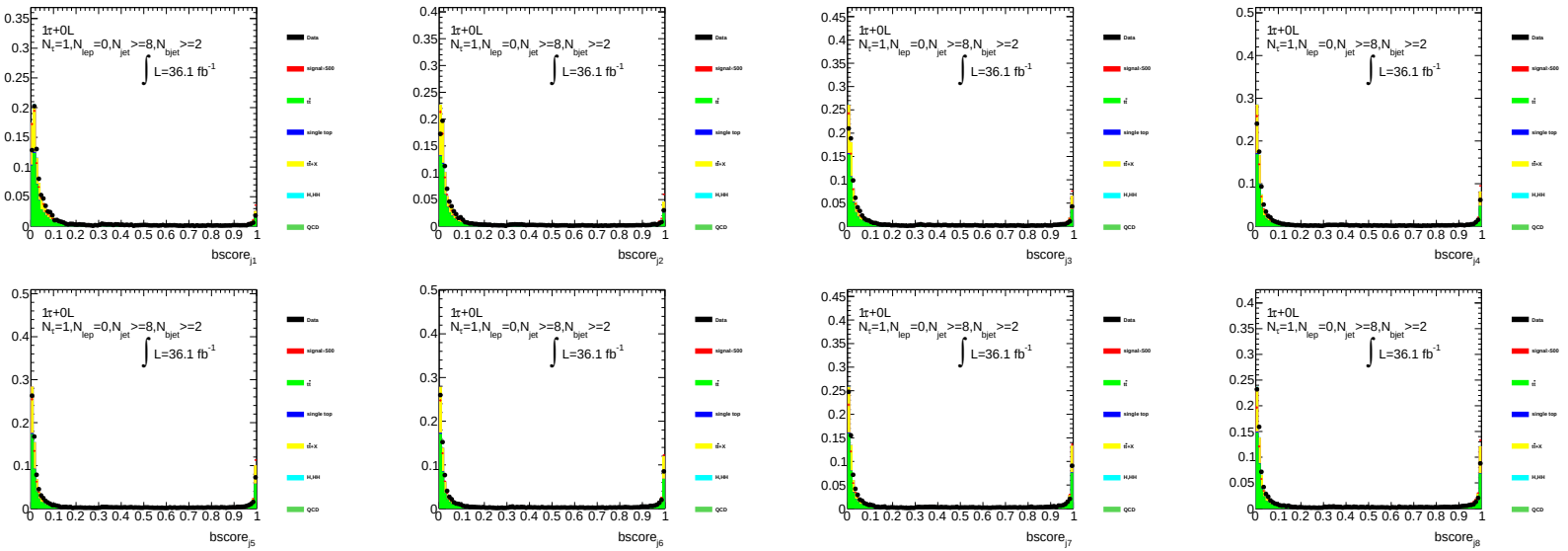

1τ+0L
N_τ=1,N_lep=0,N_jet>=8,N_bjet>=2
∫ L=36.1 fb^-1
η_τ1
Data
signal×500
tt̄
single top
tt̄+X
H,HH
QCD

Jet pT



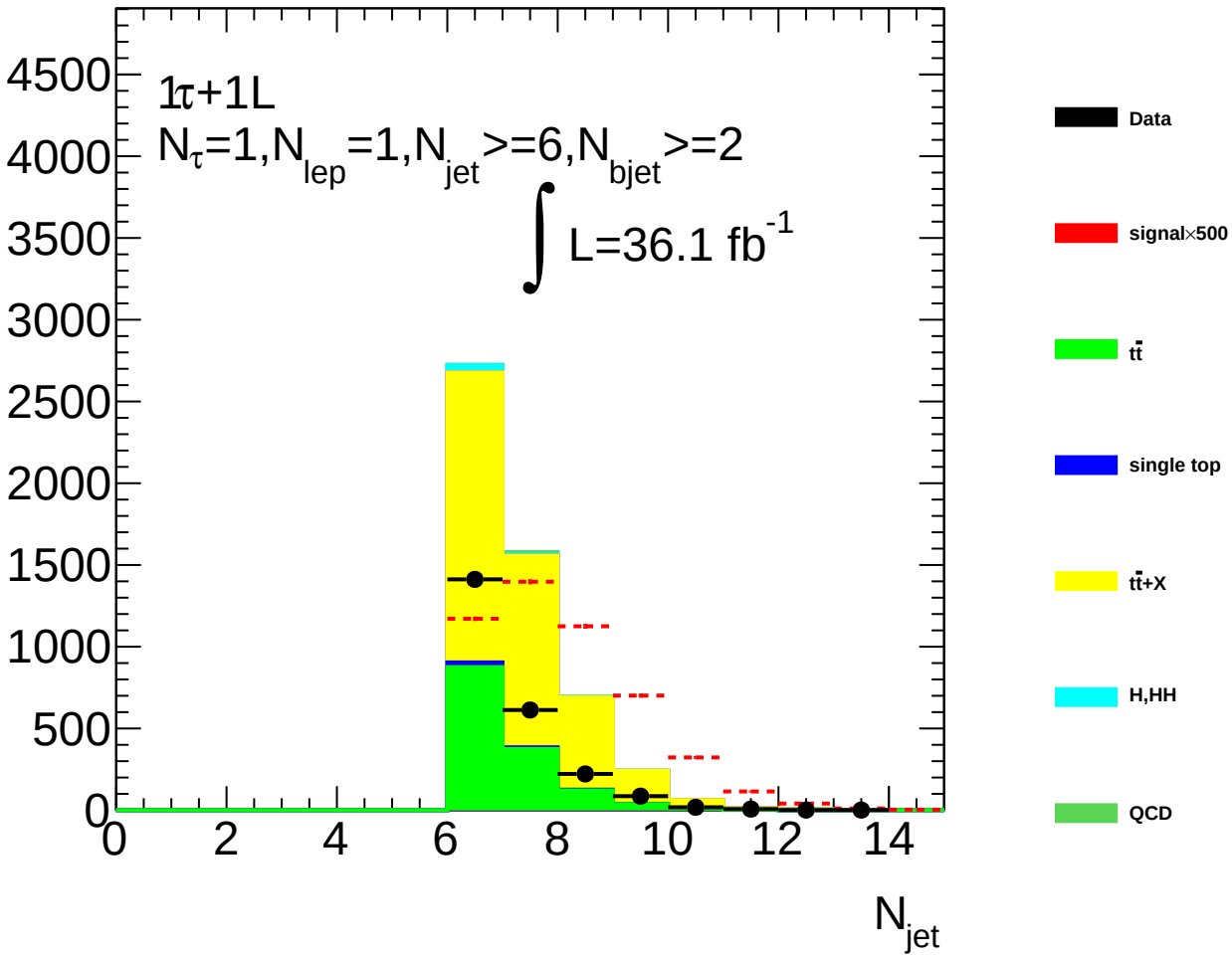
- It is know that jet pT in signal sample is higher.
- By an accident in my code, pT_{j8} is leading jet pT.

b-tagging score



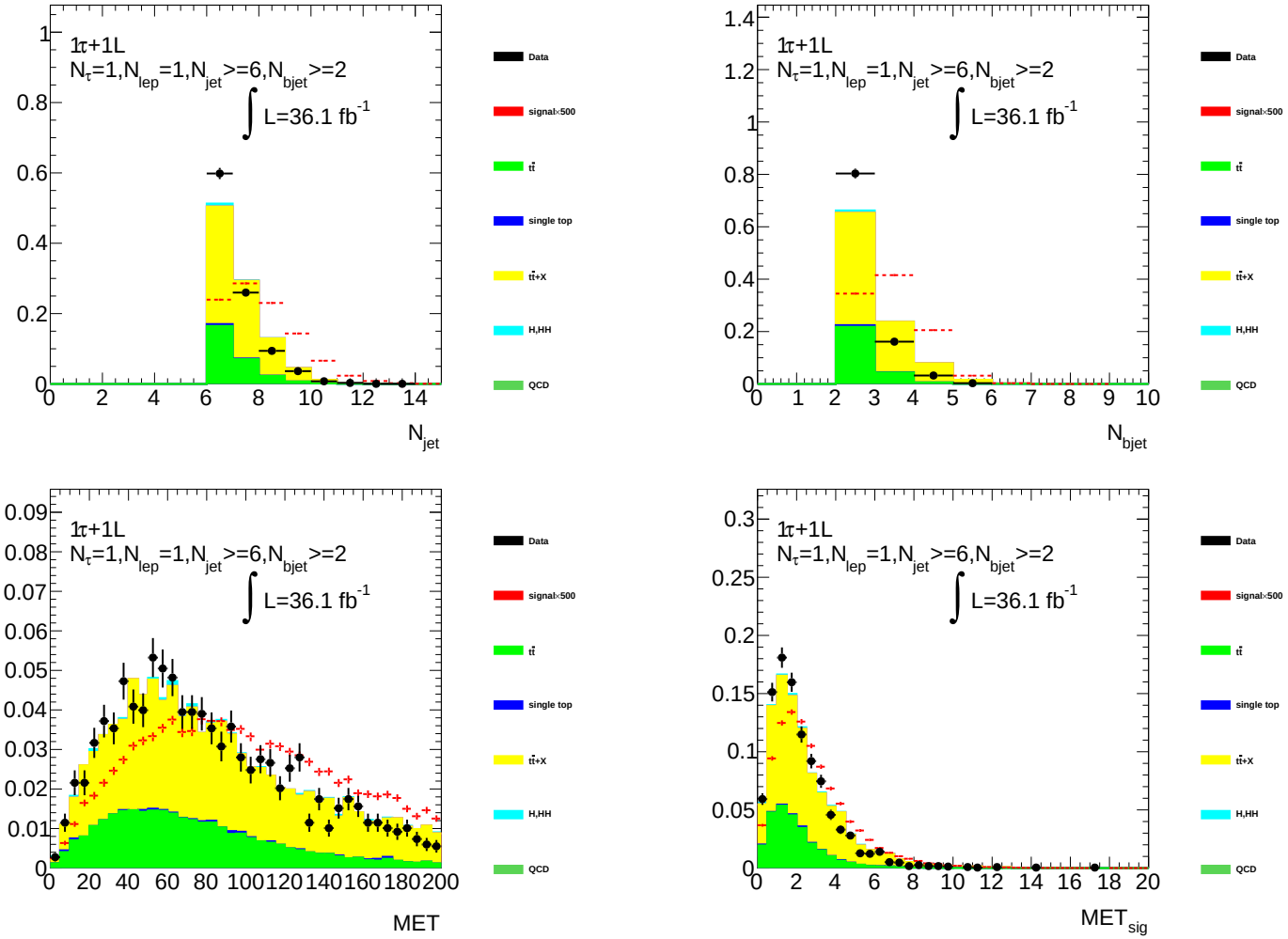
- The b-score of jet or the sum of the b score is also powerful.

$1\tau + 1L$



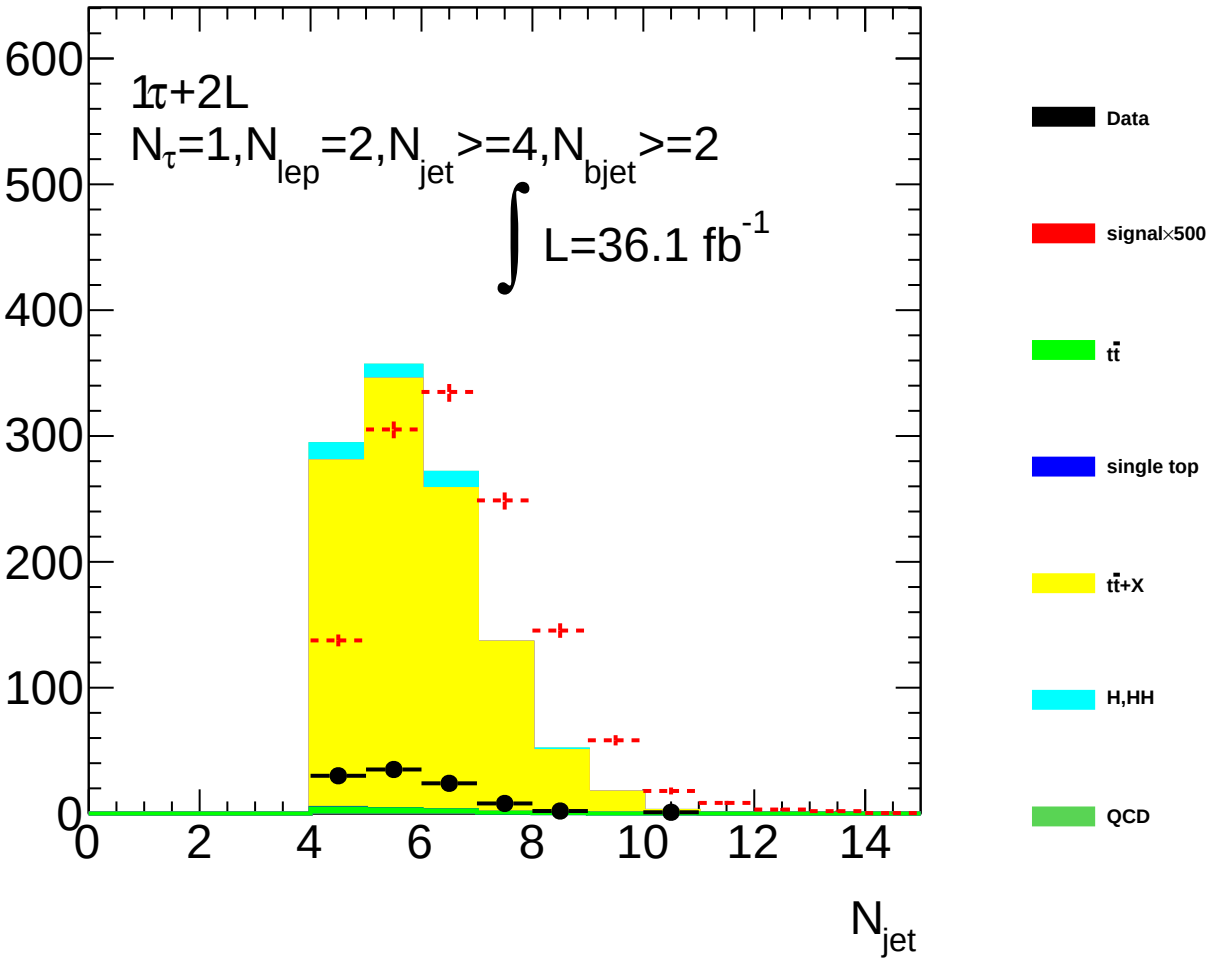
- The data is lower than MC!!!
- Hard to understand.

N_{jet}, N_{bjet}, MET, MET_{sig}

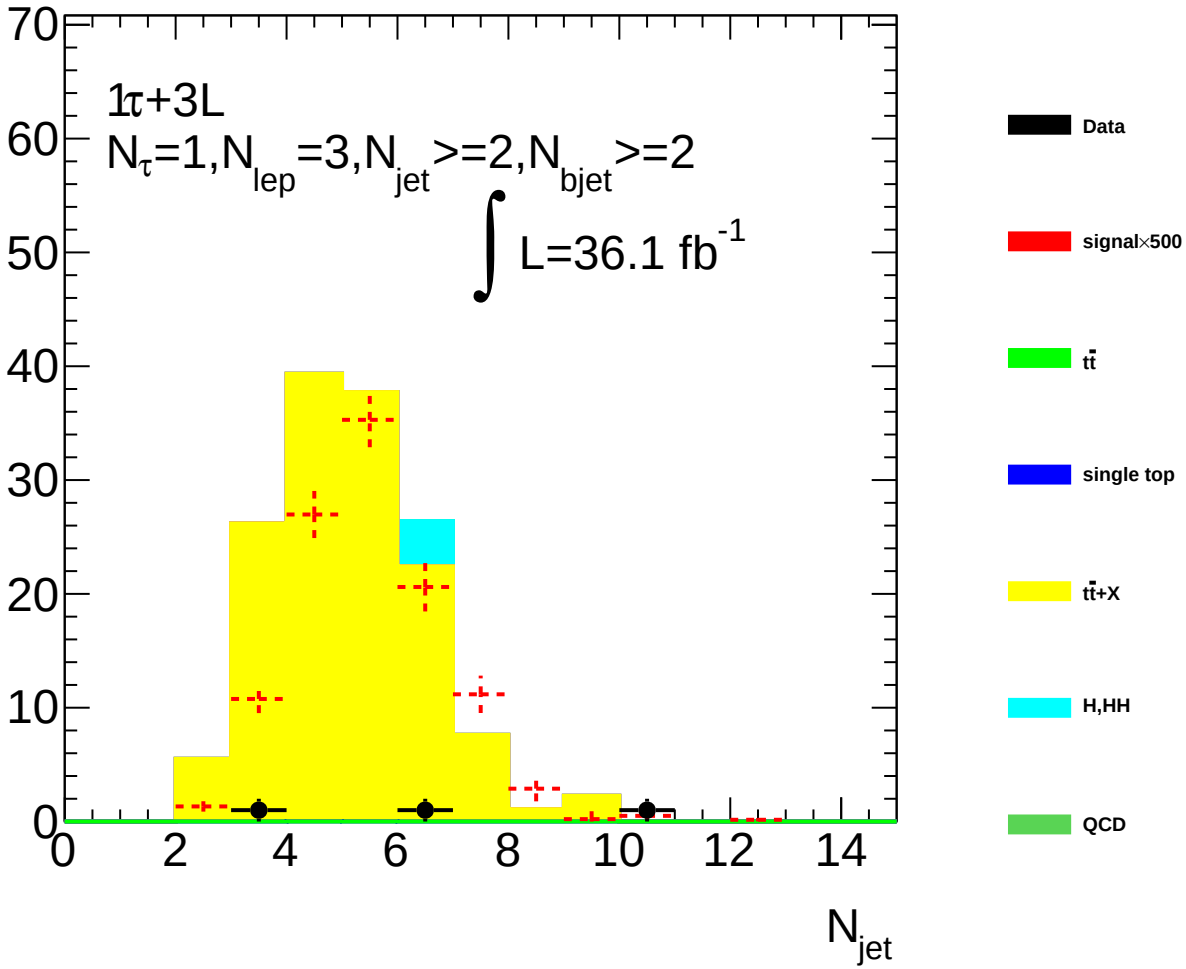


- The shapes are somehow consistent.
- It could be a normalization problem.

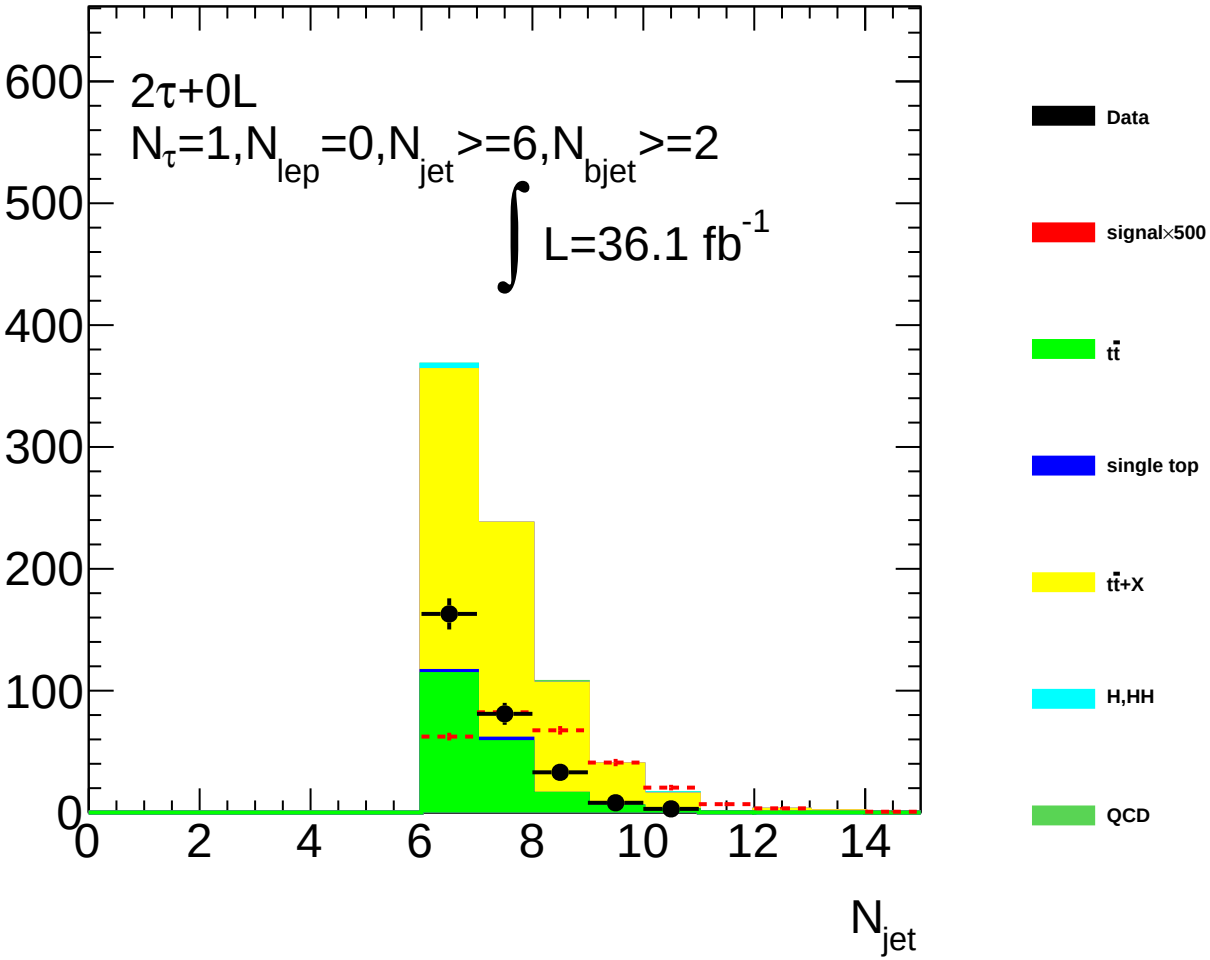
$1\tau + 2L$


1τ+2L
N_τ=1,N_lep=2,N_jet>=4,N_bjet>=2
∫ L=36.1 fb^-1
600
500
400
300
200
100
0
0
2
4
6
8
10
12
14
N_jet
Data
signal×500
tt̄
single top
tt̄+X
H,HH
QCD

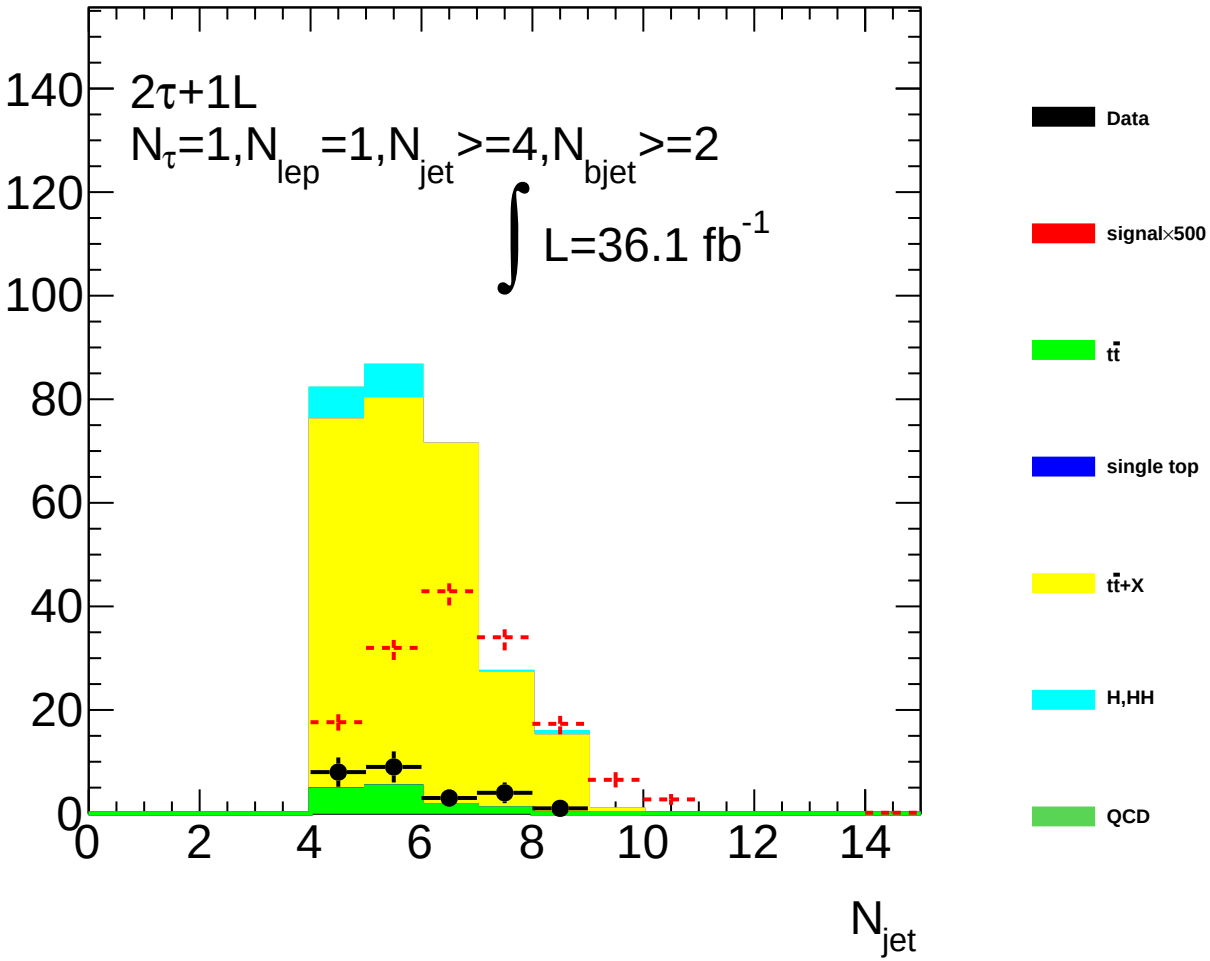
$1\tau + 3L$


1τ+3L
N_τ=1,N_lep=3,N_jet>=2,N_bjet>=2
∫ L=36.1 fb^-1
Data
signal×500
tt̄
single top
tt̄+X
H,HH
QCD
N_jet

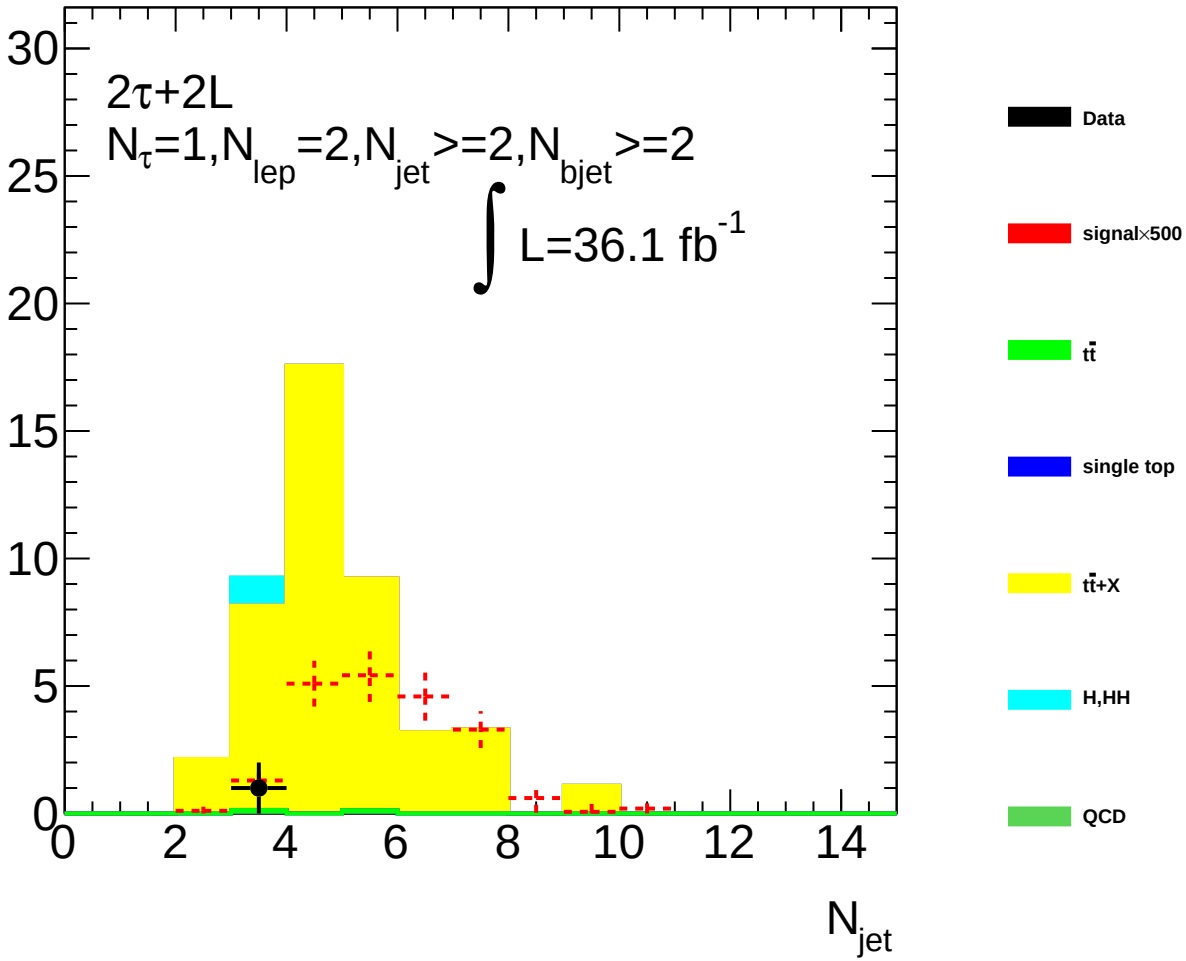
$2\tau + 0L$


2τ+0L
N_τ=1,N_lep=0,N_jet>=6,N_bjet>=2
∫ L=36.1 fb^-1
600
500
400
300
200
100
0
0
2
4
6
8
10
12
14
N_jet
Data
signal×500
tt̄
single top
tt̄+X
H,HH
QCD

$2\tau + 1L$


2τ+1L
N_τ=1,N_lep=1,N_jet>=4,N_bjet>=2
∫ L=36.1 fb^-1
Data
signal×500
tt̄
single top
tt̄+X
H,HH
QCD
N_jet

$2\tau + 2L$


2τ+2L
N_τ=1,N_lep=2,N_jet>=2,N_bjet>=2
∫ L=36.1 fb^-1
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
N_jet
Data
signal×500
tt̄
single top
tt̄+X
H,HH
QCD

Background estimation

$1\tau + 0L$

- Fake τ and Fake b-jet?
- use fakable τ and one(or zero) b-jet control region.

$1\tau + 1L$

- Fake τ, Fake lepton and Fake b-jet?

General method:

- Define CR and use fake factor or matrix method.
- It could be a bit complicated.
- Refer to other analysis.

To do

- Check the MC normalization
- Estimate the background : at least in 1Tau+0L
- Is there a baseline BDT optimization?
- Blinding strategy?