



Data/MC
agreement

F. lemmi

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

1tau0L

1tau3L

2tau0L

2tau2L

Data/MC agreement with latest SFs

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Hongbo Liao¹ Hideki Okawa² Yu Zhang²

¹Institute of High Energy Physics (IHEP), Beijing

²Fudan University, Shanghai

October 13, 2021



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Data/MC agreement plots

Data/MC comparisons for variables used in BDT



- **Compare data and MC** to see if variables are well modeled by simulation
- **Stacked histogram** with sum of all **MC processes**
 - **Signal is added to $t\bar{t}+X$ in this histogram**
- **Signal** is also reported as a **red, dashed line, scaled** by a multiplicative factor to make it visible
- Apply scale factors that we discussed so far
 - PU
 - Prefiring
 - Trigger
 - b tagging
 - Electron SFs
 - Muon SFs
- Plots should (more or less) comply with the **CMS publication guidelines**

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distributions

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2tau0L

2tau2L



1tau0L

Data events: 13693
signal events: 8.78554
ttbar events: 5389.6
QCD events: 7679
tt+X events: 171.034
single top events: 111.117
single Higgs events: -0.292551
total MC events: 13350.5
data/MC agreement: 2.56573%

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H_T
distributions

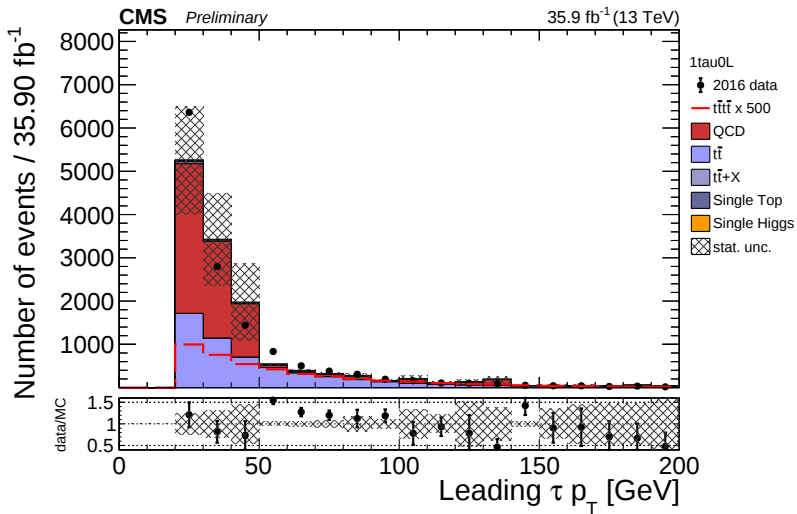
1tau0L

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2tau0L

2tau2L



1tau1L

Data events: 1633

signal events: 6.46899

ttbar events: 1570.35

QCD events: 2.20767

tt+X events: 73.3412

single top events: 31.7227

single Higgs events: 0.029302

total MC events: 1677.65

data/MC agreement: -2.66172% (previously: -6.0947%)

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H_T
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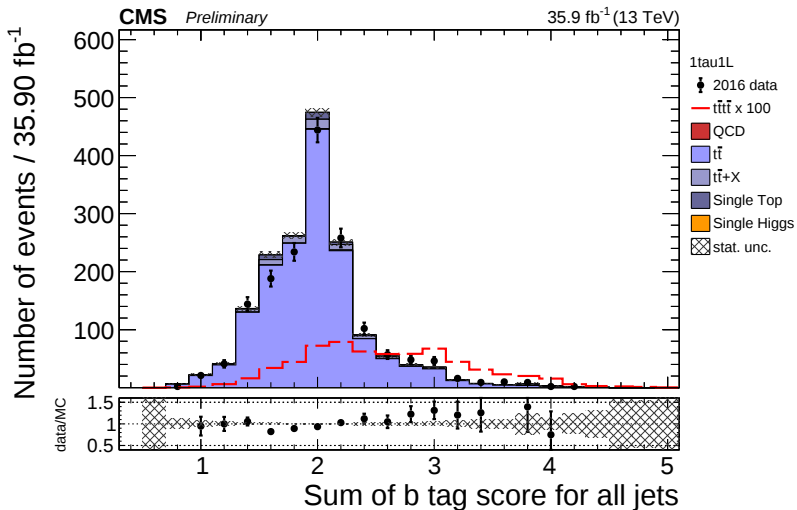
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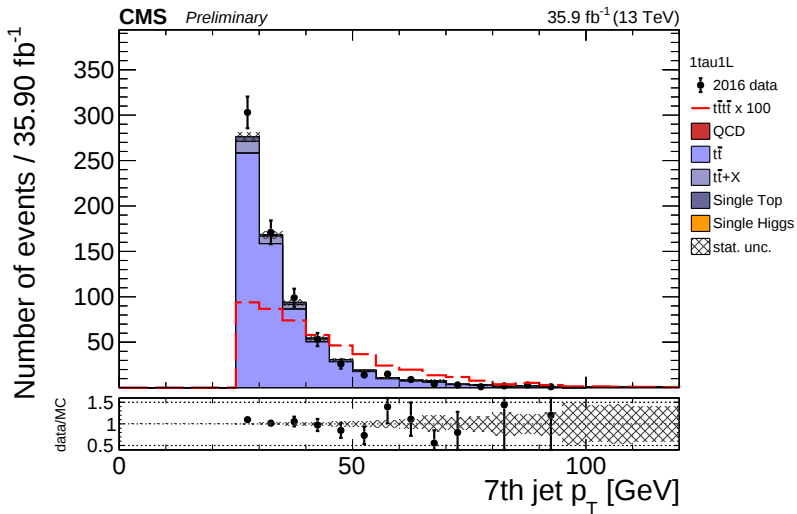
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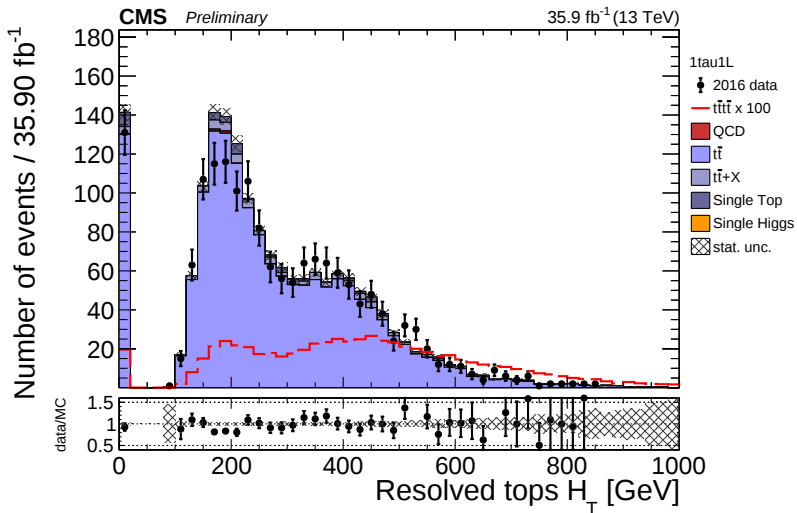
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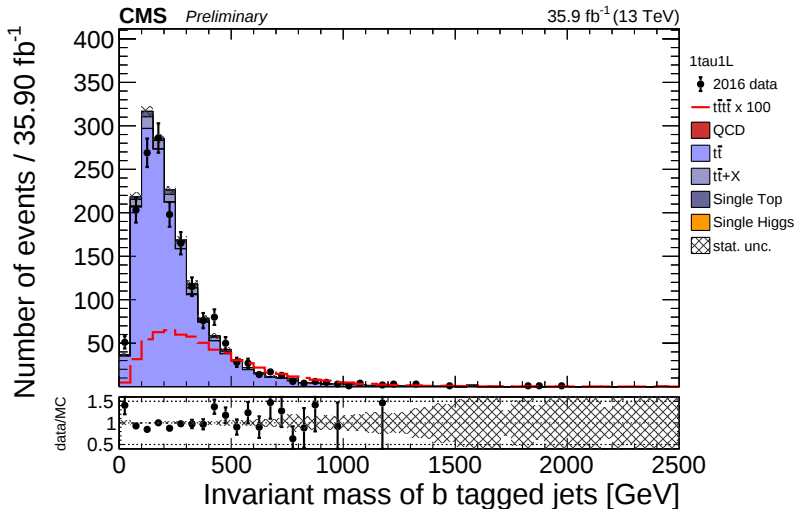
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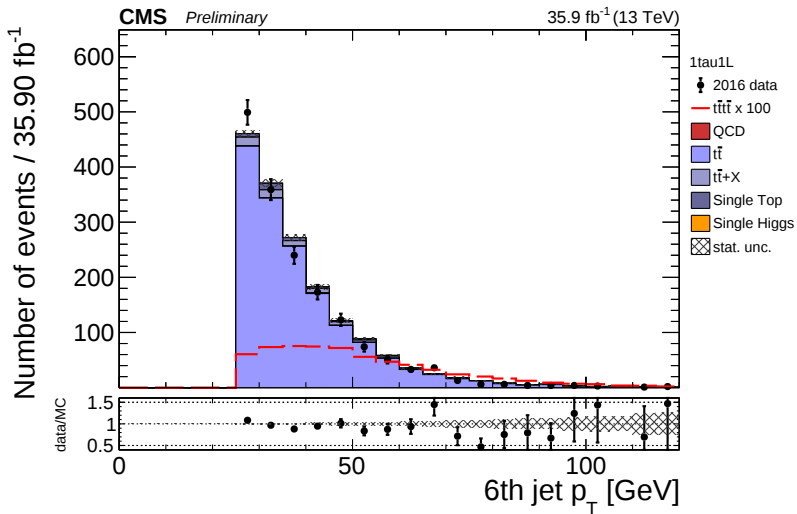
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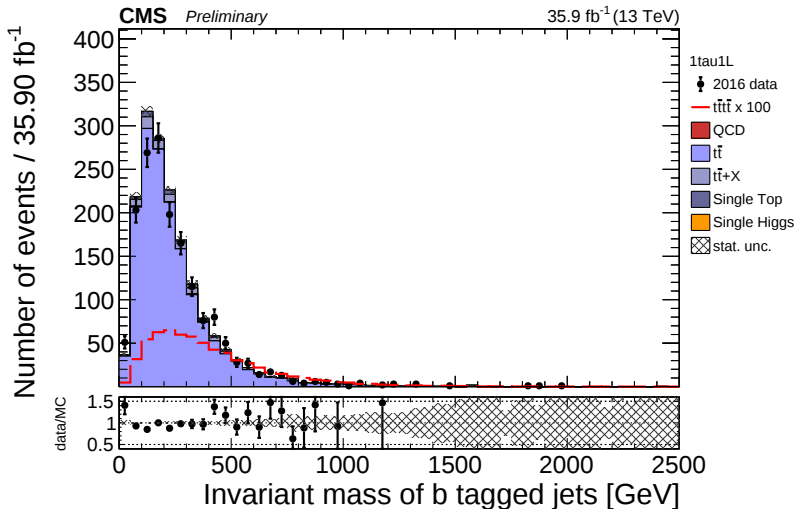
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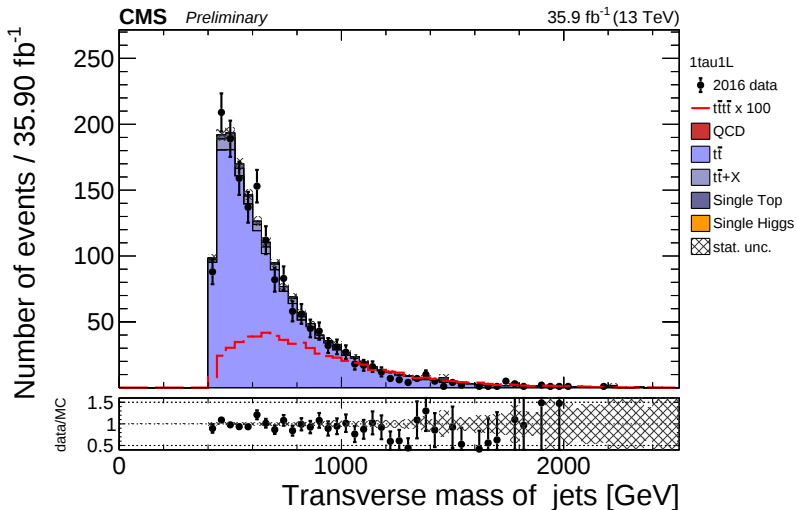
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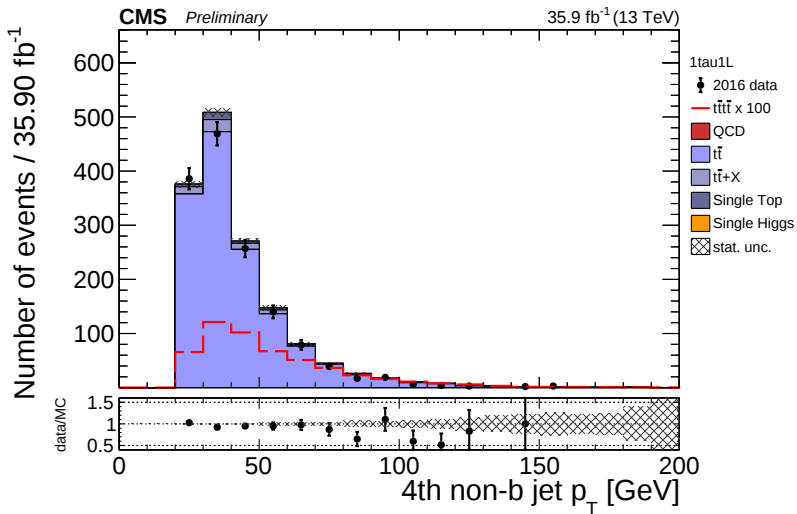
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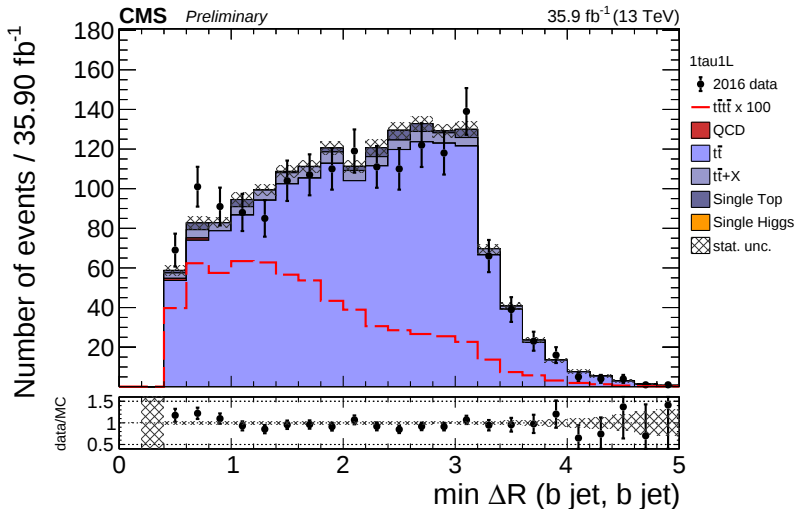
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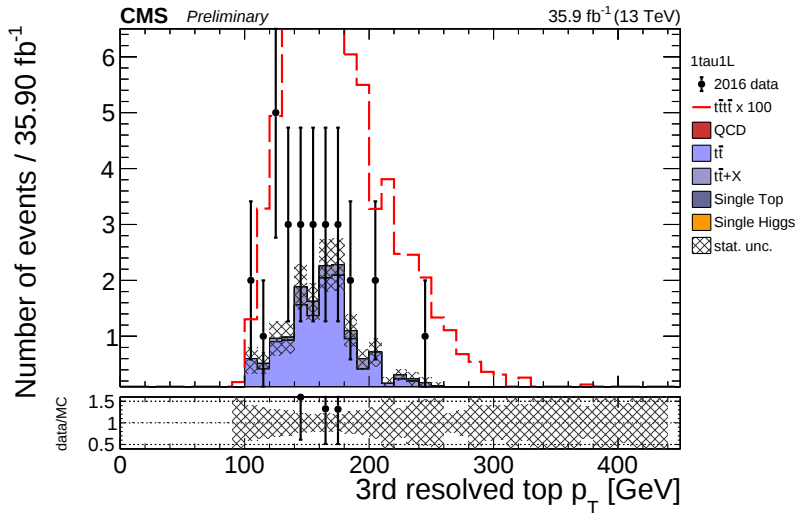
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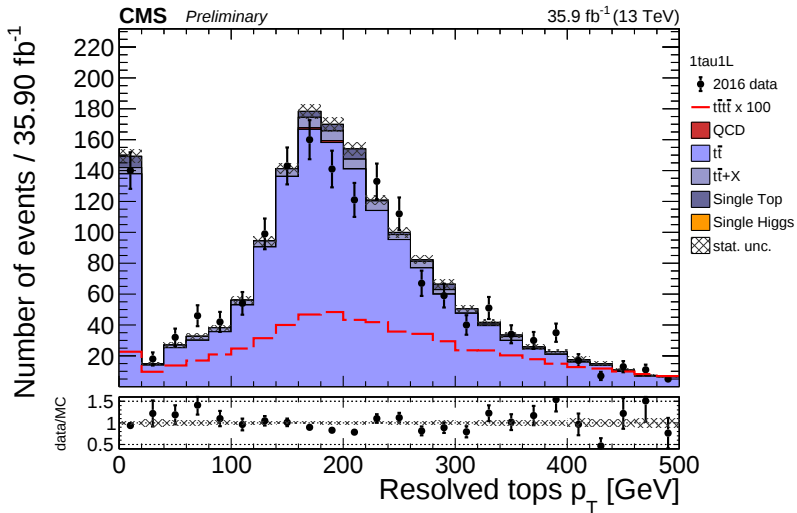
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1tau2L

Data events: 44

signal events: 1.24755

ttbar events: 24.4849

QCD events: 0

tt+X events: 9.98816

single top events: 0.216959

single Higgs events: 0.00010434

total MC events: 34.6901

data/MC agreement: 26.8374% (previously: 18.4015%)

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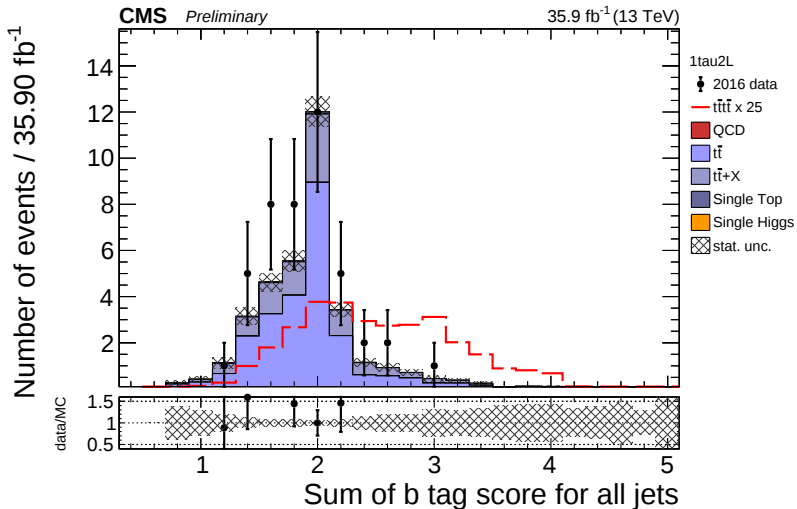
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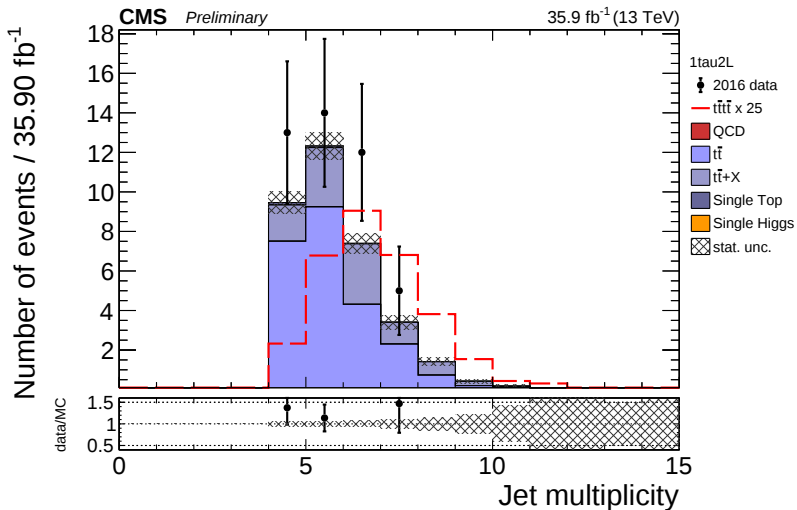
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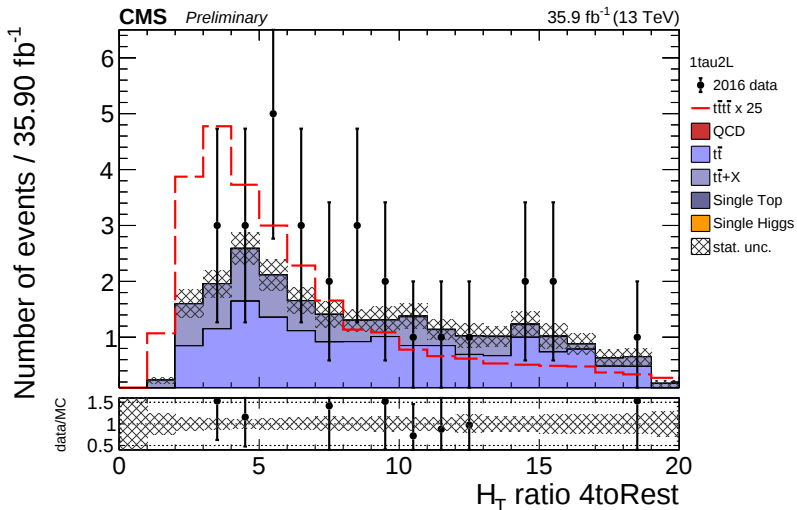
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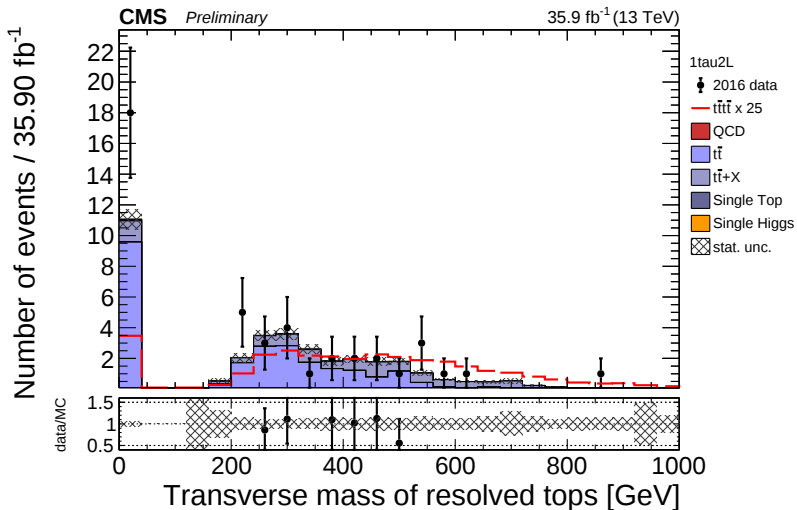
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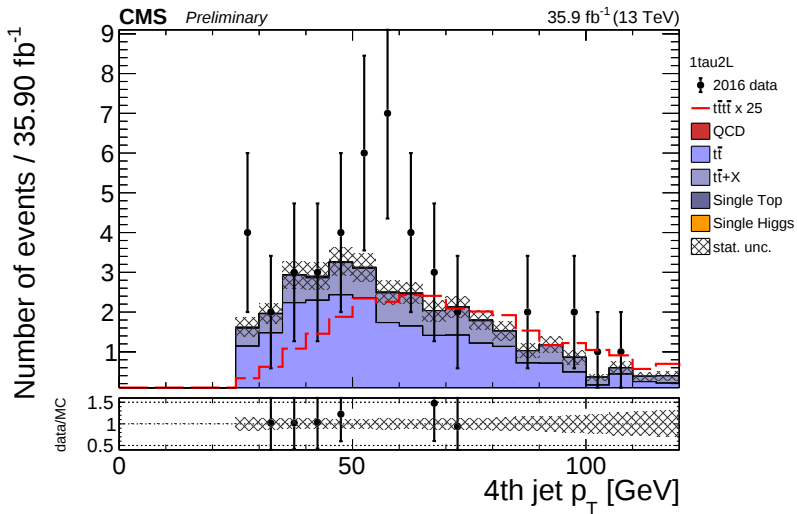
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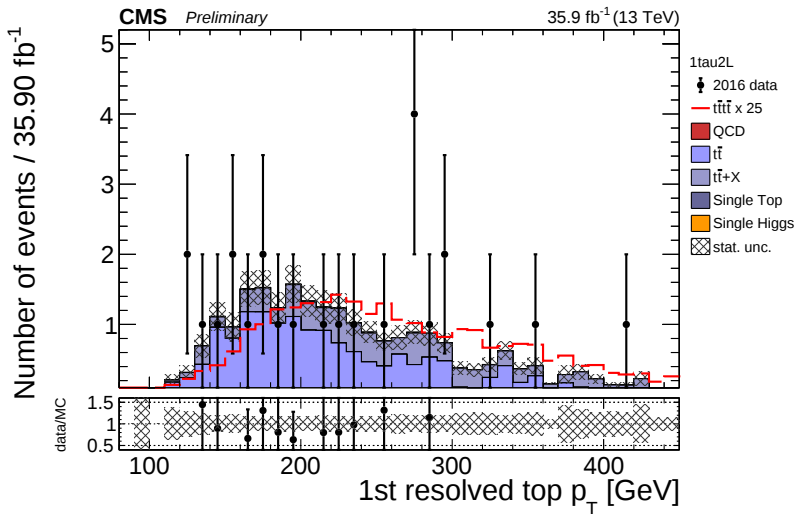
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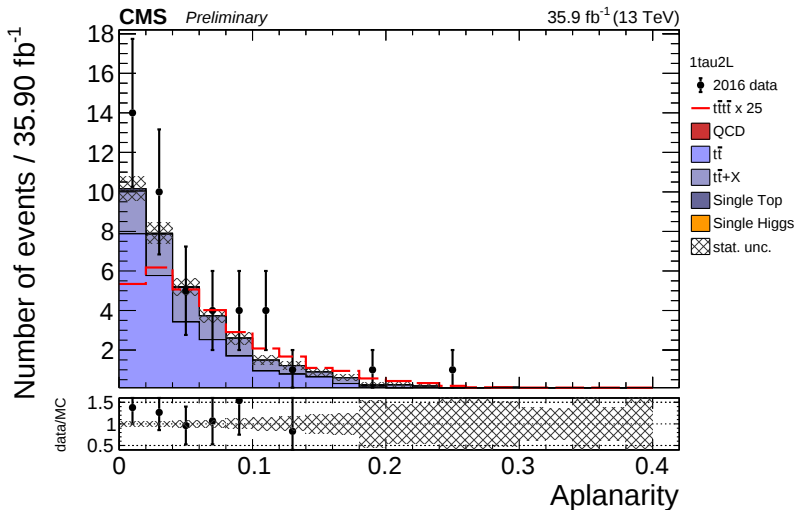
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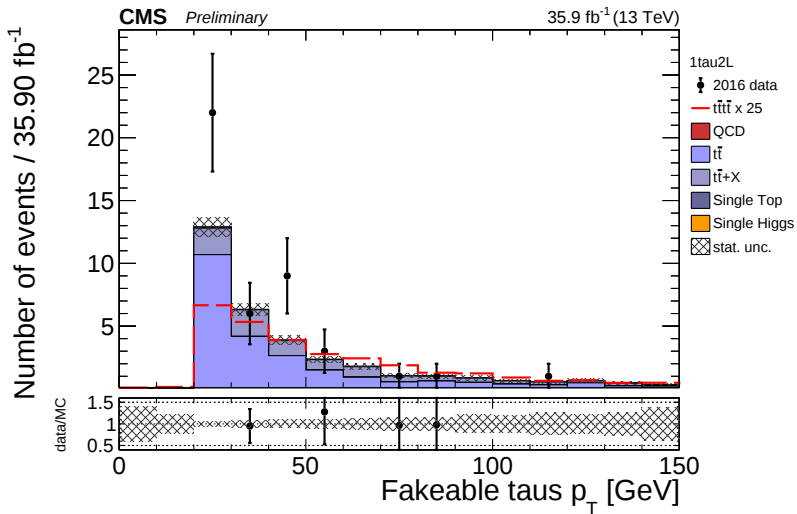
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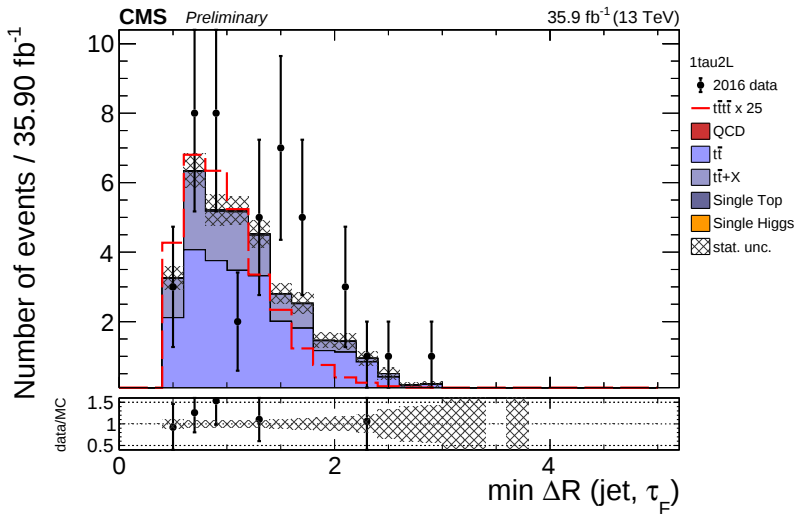
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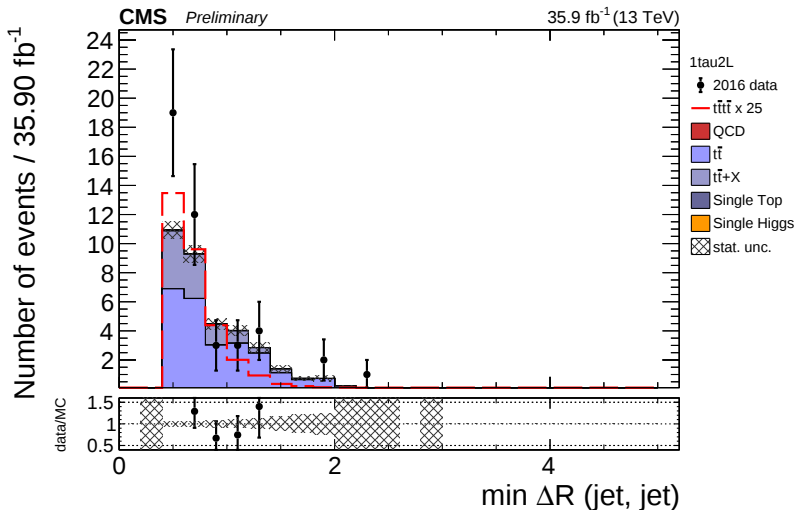
1tau0L

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distributions

1tau0L

1tau3L

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2tau2L



1tau3L

Data events: 1

signal events: 0.0711158

ttbar events: 0

QCD events: 0

tt+X events: 0.56731

single top events: 0.00224964

single Higgs events: 0

total MC events: 0.56956

data/MC agreement: 75.5741%

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1tau0L

1tau1L

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1tau3L

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H_T
distributions

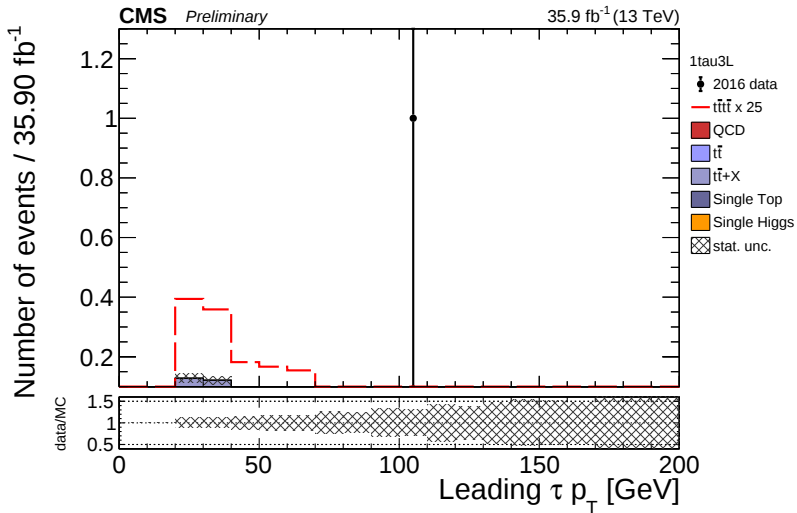
1tau0L

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Data/MC agreement



Data/MC
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2tau1L

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H_T
distributions

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1tau3L

2tau0L

2tau2L



2tau0L

Data events: 225

signal events: 0.441411

ttbar events: 168.271

QCD events: 1.70299

tt+X events: 13.0018

single top events: 6.33067

single Higgs events: 0.0157843

total MC events: 189.323

data/MC agreement: 18.8447%

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H_T
distributions

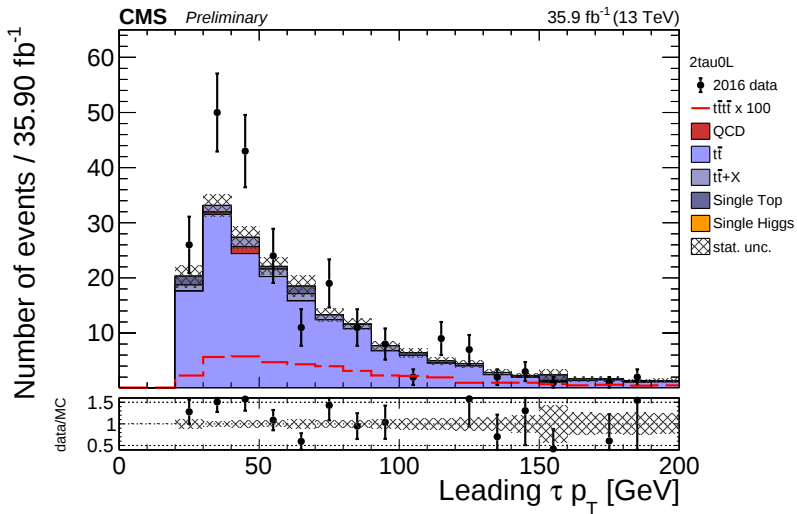
1tau0L

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Data/MC agreement



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distributions

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2tau0L

2tau2L



2tau1L

Data events: 13

signal events: 0.174785

ttbar events: 8.63095

QCD events: 0

tt+X events: 3.65918

single top events: 0.0758465

single Higgs events: 0

total MC events: 12.366

data/MC agreement: 5.12715%

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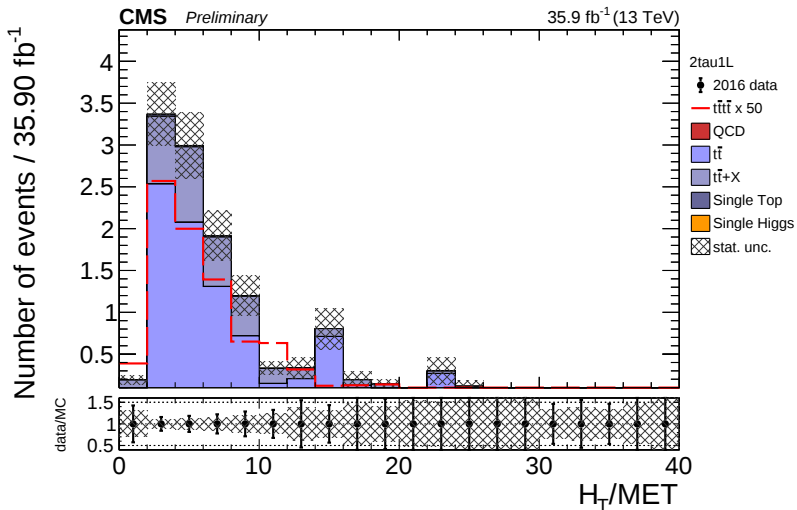
1tau0L

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Data/MC agreement



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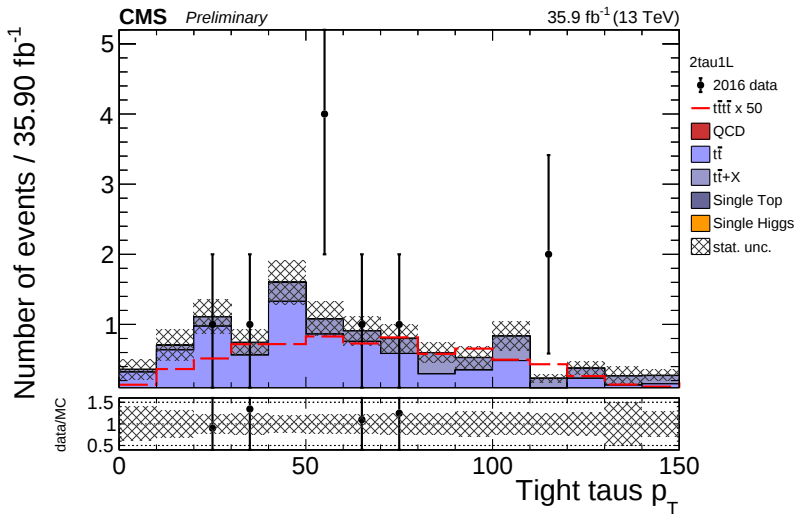
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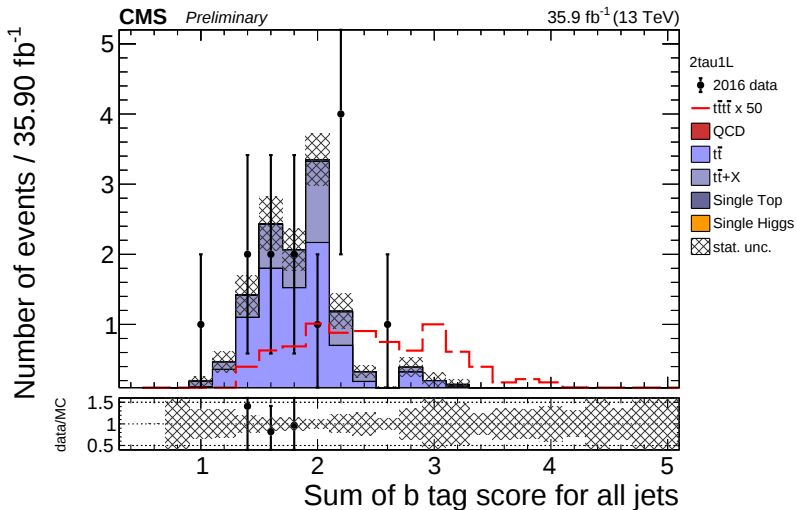
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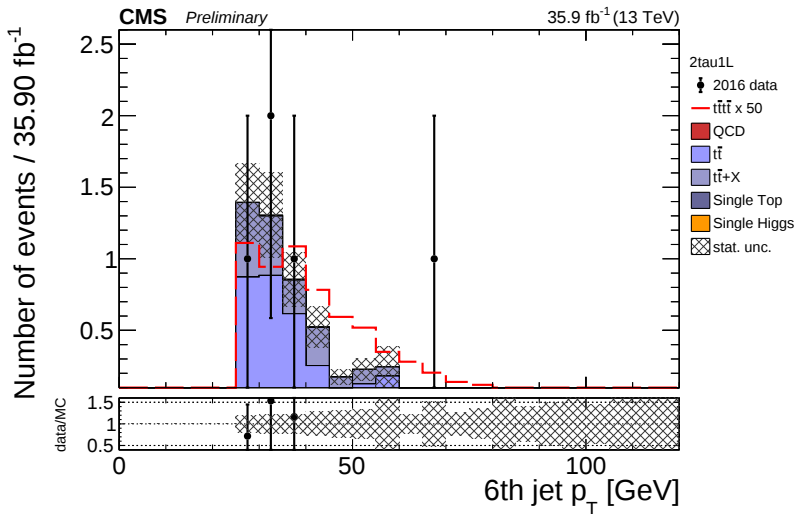
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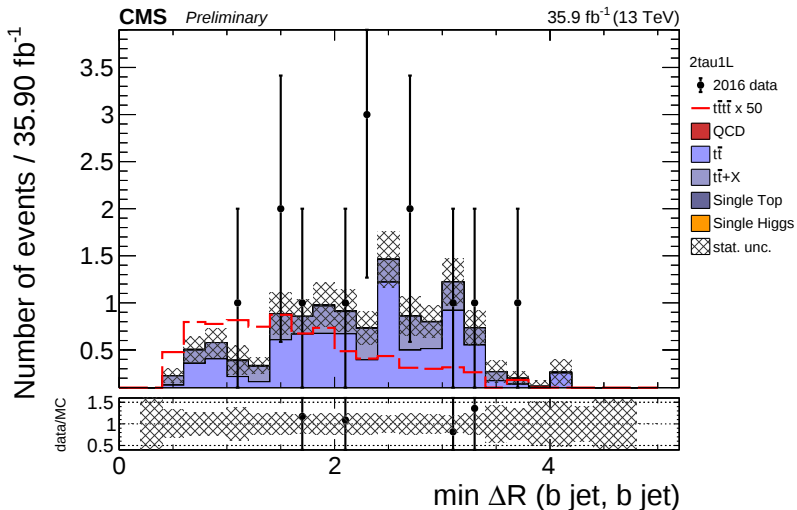
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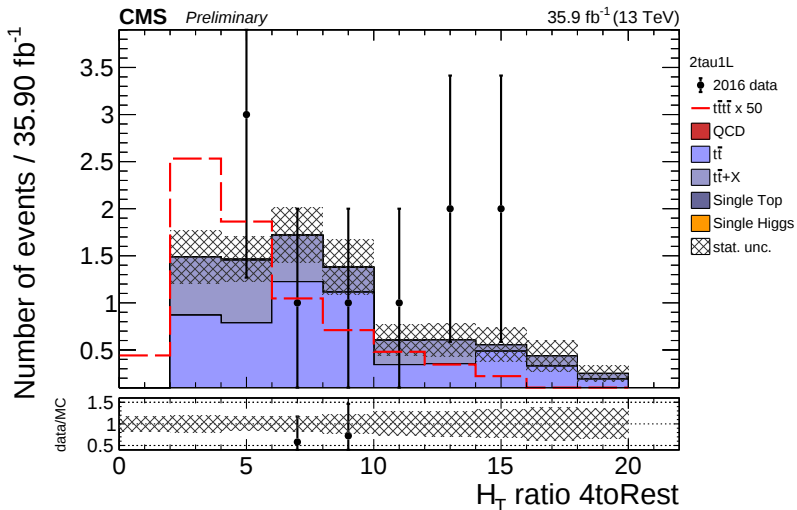
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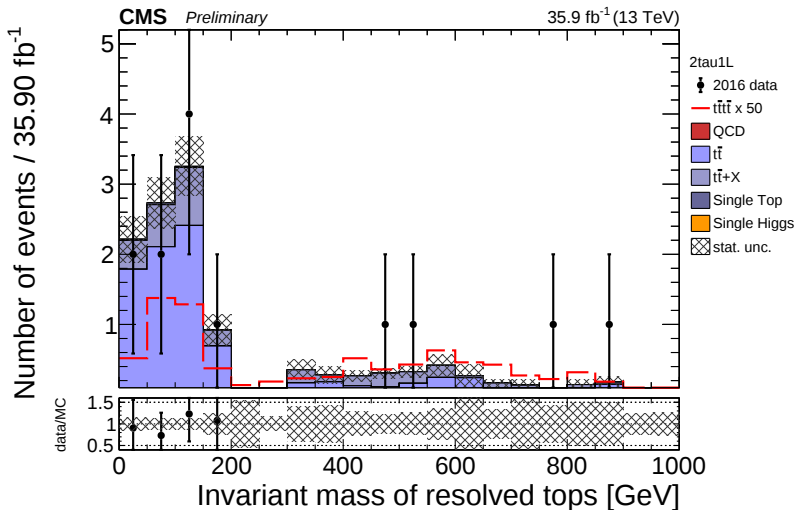
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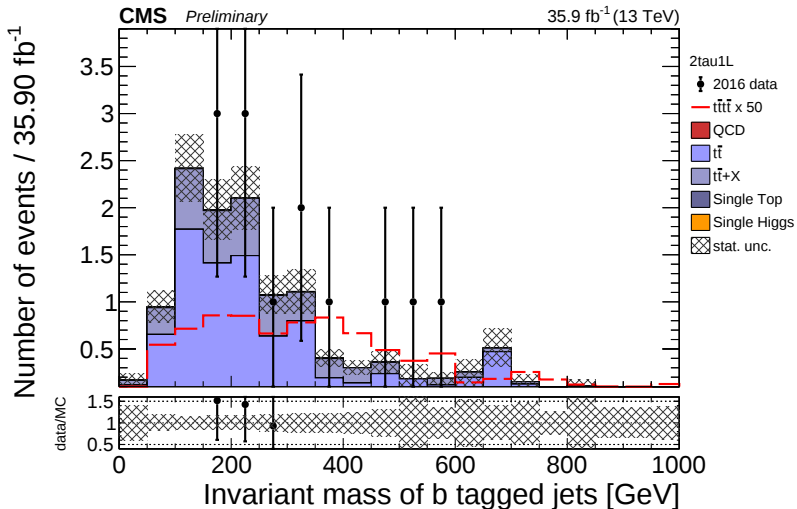
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H_T distributions

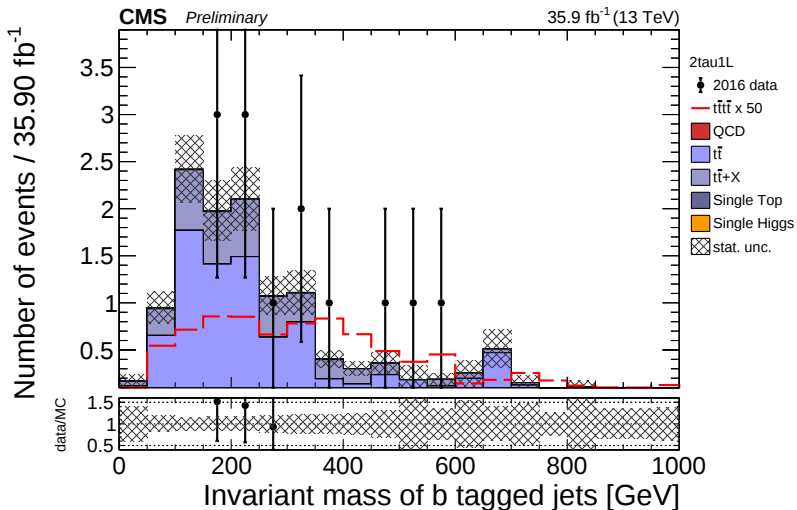
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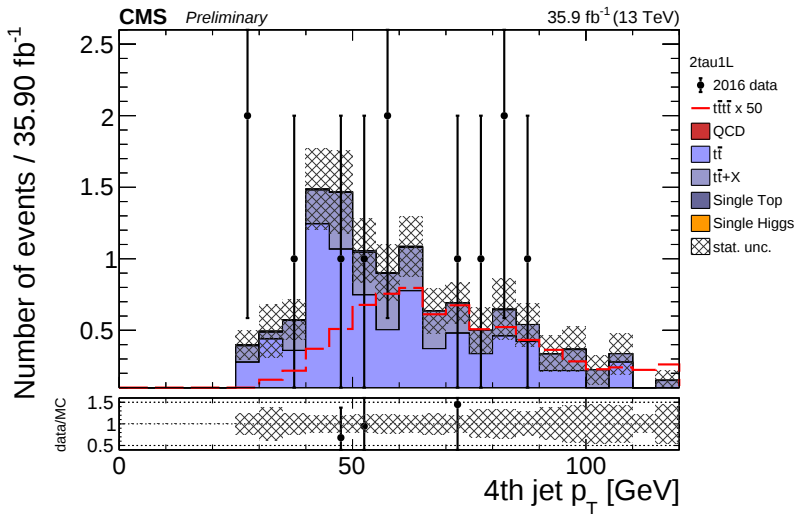
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H_T
distributions

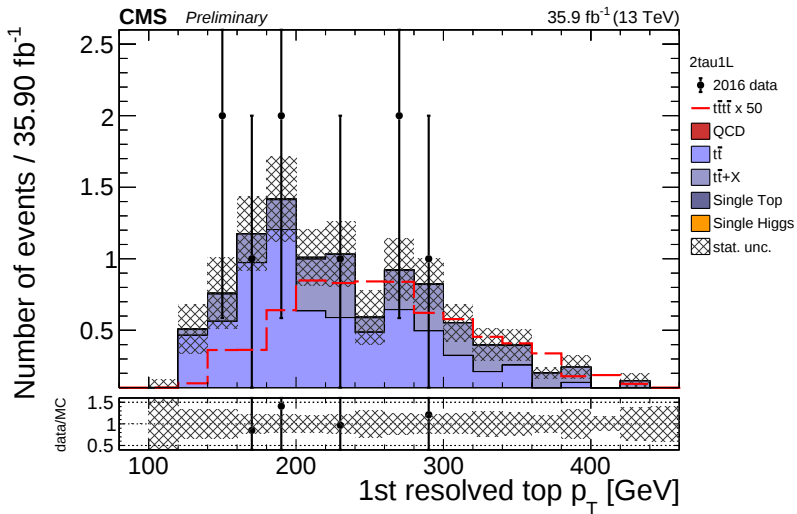
1tau0L

1tau3L

2tau0L

2tau2L

Data/MC agreement



Data/MC
agreement

F. lemми

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

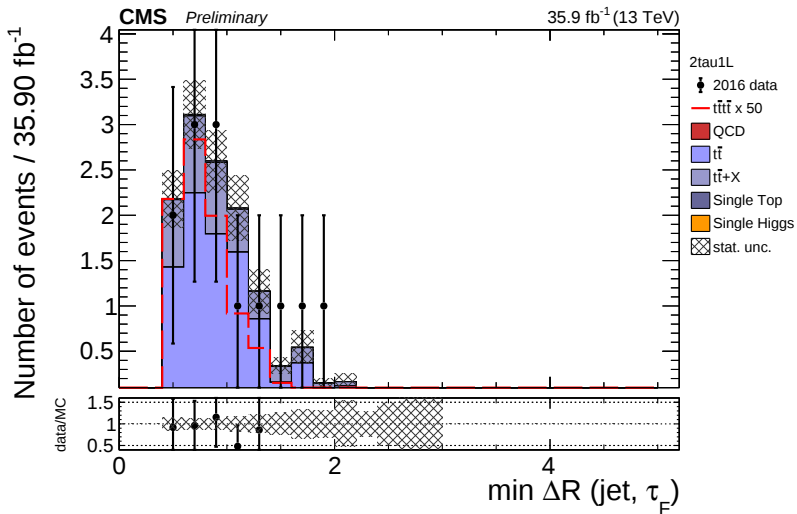
1tau0L

1tau3L

2tau0L

2tau2L

Data/MC agreement



Data/MC
agreement

F. lemми

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

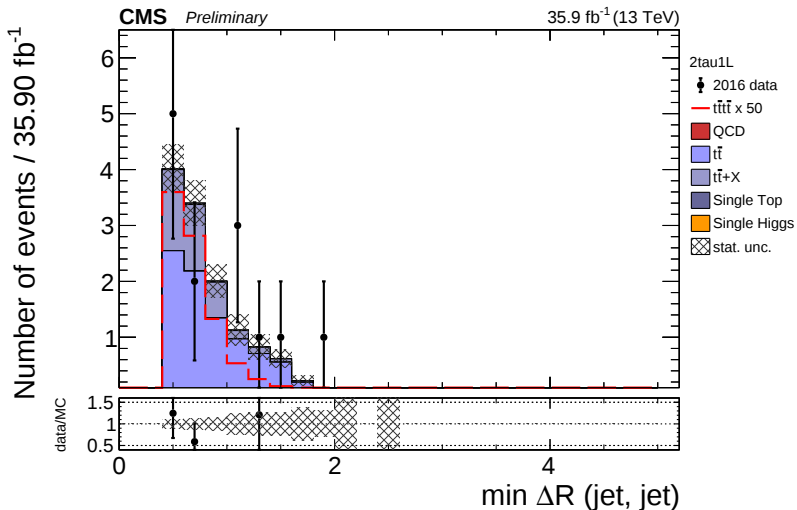
1tau0L

1tau3L

2tau0L

2tau2L

Data/MC agreement



Data/MC
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F. lemми

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

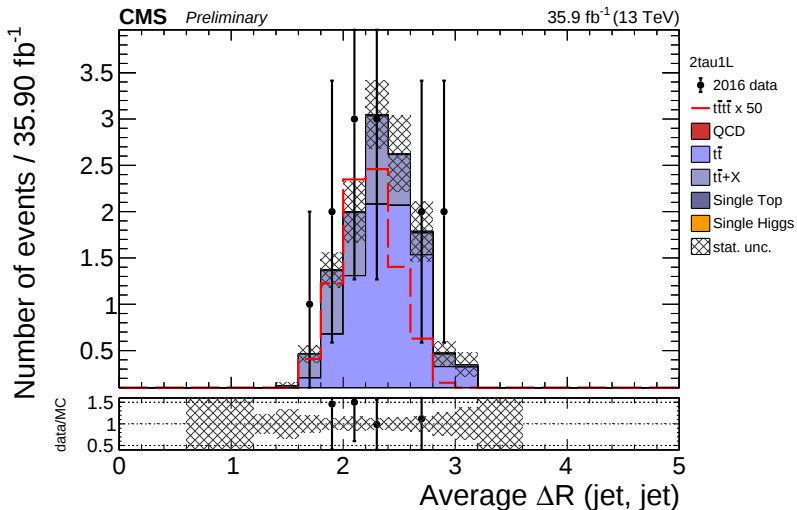
1tau0L

1tau3L

2tau0L

2tau2L

Data/MC agreement



Data/MC
agreement

F. lemми

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

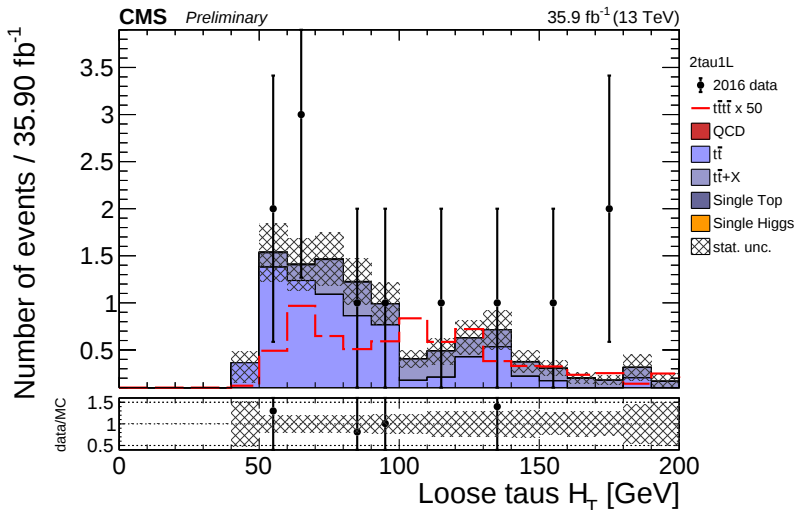
1tau0L

1tau3L

2tau0L

2tau2L

Data/MC agreement



Data/MC
agreement

F. lemми

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

1tau0L

1tau3L

2tau0L

2tau2L



2tau2L

Data events: 0

signal events: 0.0147807

ttbar events: 0.0802532

QCD events: 0

tt+X events: 0.196236

single top events: 0.00222102

single Higgs events: 0

total MC events: 0.27871

data/MC agreement: -100%

Data/MC
agreement

F. lemmi

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

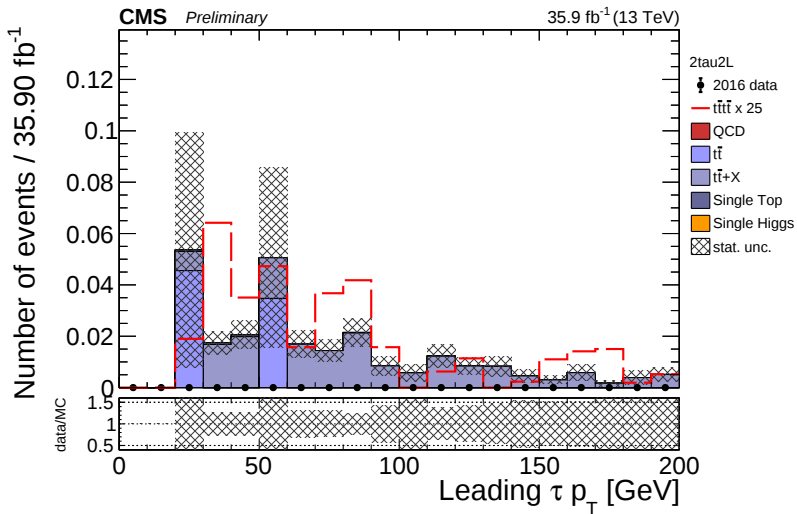
1tau0L

1tau3L

2tau0L

2tau2L

Data/MC agreement



Data/MC
agreement

F. lemми

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

1tau0L

1tau3L

2tau0L

2tau2L



Data/MC
agreement

F. lemmi

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

1tau0L

1tau3L

2tau0L

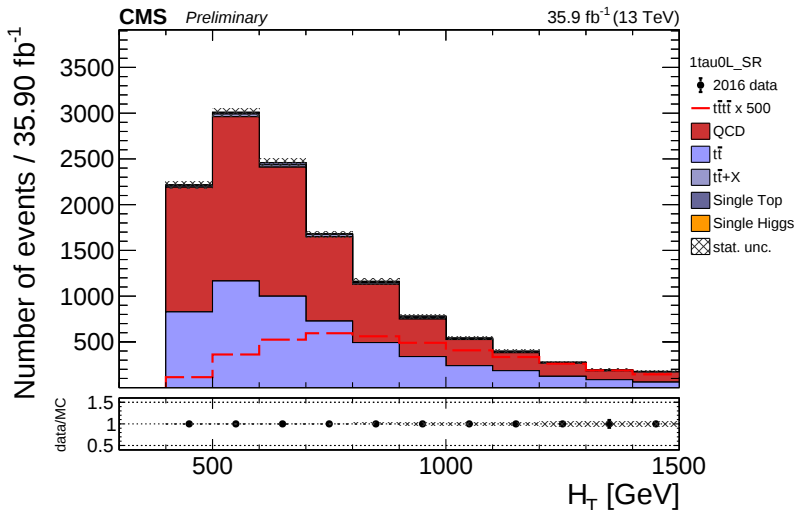
2tau2L

H_T distributions



- For categories in which we don't have a BDT, check H_T distributions
- **Do they discriminate between signal and background?**

H_T distributions



Data/MC
agreement

F. lemми

Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

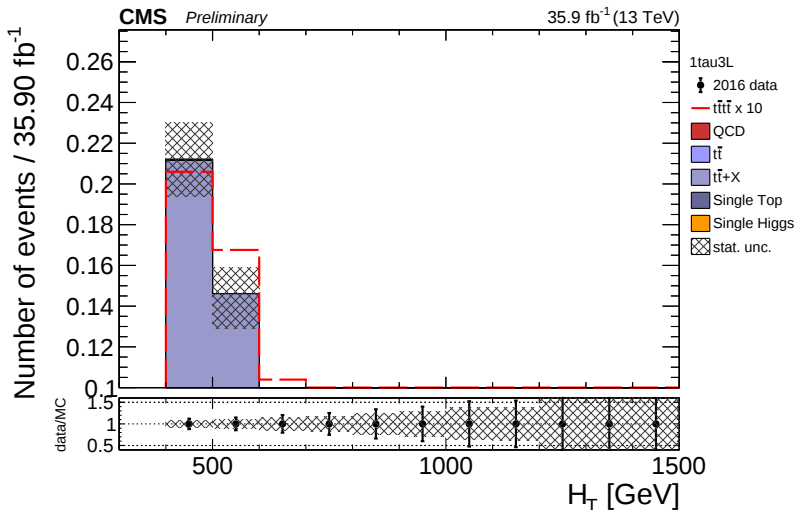
1tau0L

1tau3L

2tau0L

2tau2L

H_T distributions



Data/MC
agreement

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Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

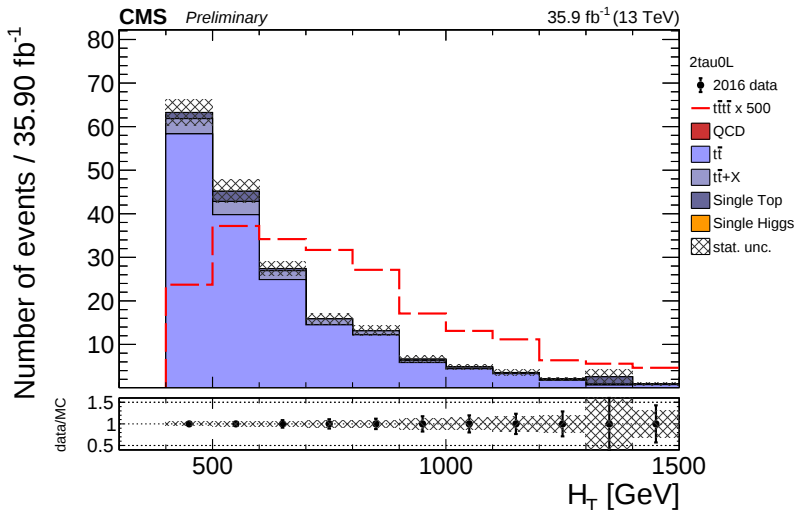
1tau0L

1tau3L

2tau0L

2tau2L

H_T distributions



Data/MC
agreement

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Data/MC
agreement

1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

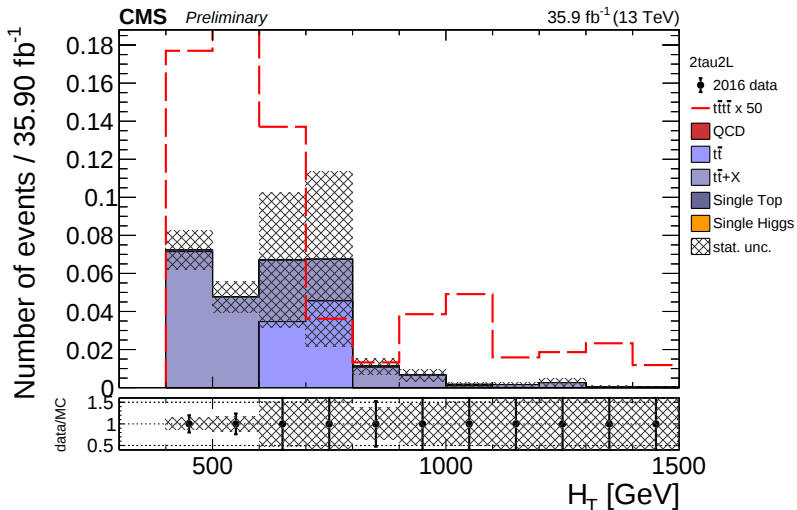
1tau0L

1tau3L

2tau0L

2tau2L

H_T distributions



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1tau0L

1tau1L

1tau2L

1tau3L

2tau0L

2tau1L

2tau2L

H_T
distributions

1tau0L

1tau3L

2tau0L

2tau2L