W'+b TTbar control region

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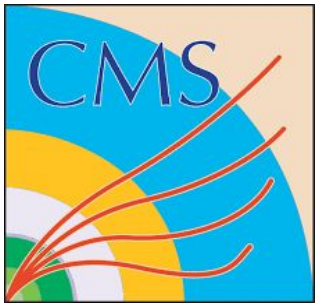
Instituto de Física - Universidad de Antioquia
2023



Latest results on ttbar control region

Datasets: SingleMuon and UL MC samples 2017

Pre-selection cuts

Object	Variable	Cut
Electrons	p_T	> 30 GeV
	η	1.57 < |η| < 2.4 or 0 < | η | 1.44
	pfRelIso04_all	< 0.15
	mvaFall17V2Iso_WP80 (ele) mvaFall17V2Iso_WP90 (mu)	True
Muons	p_T	> 35 GeV
	η	< 2.4
	pfRelIso04_all	< 0.15
	tightId	True

Object	Variable	Cut
Taus	p_T	> 20 GeV
	η	< 2.3
	dz	< 0.2
	idDeepTau2017v2p1VSjet	> 8
	idDeepTau2017v2p1VSe	> 8
	idDeepTau2017v2p1VSmu	> 1
Jets	p_T	> 20 GeV
	η	< 2.4
	JetId	6
	puId	7
	btagDeepFlavB	> Medium WP
	ΔR (μ, bjet)	> 0.4

Latest results on ttbar control region

Selection cuts

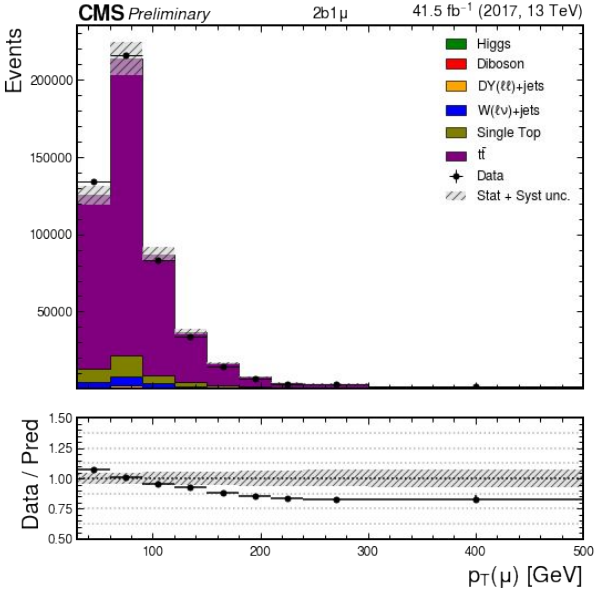
Selection cuts
Muon Trigger
Luminosity calibration
MET filters
p_T^{miss} > 50 GeV
N(bjet) = 2
N(τ) = 0
N(e) = 0
N(μ) = 1

- **Muon trigger**: `HLT_Mu50 OR HLT_OldMu100 OR HLT_TkMu100`
- **Luminosity mask**: https://twiki.cern.ch/twiki/bin/view/CMS/LumiRecommendationsRun2
- **MET Filters:** https://twiki.cern.ch/twiki/bin/view/CMS/MissingETOptionalFiltersRun2
- **MC:** https://github.com/deoache/wprime_plus_b/blob/main/wprime_plus_b/fileset/fileset_2017_UL_NANO.json

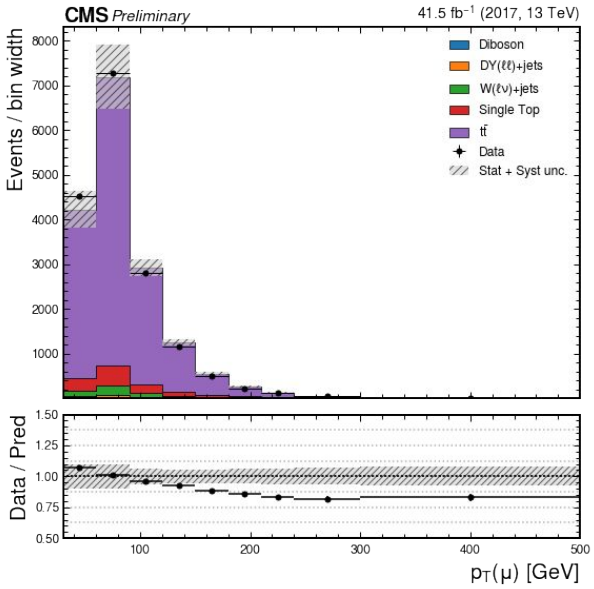
	events	error	percentage	syst error
tt	447668.818798	194.117104	89.230739	46526.886232
SingleTop	32359.64401	135.619729	6.450025	3531.797633
WJetsToLNu	16349.614115	182.817747	3.258856	2826.457721
DYJetsToLL	4675.143382	98.010539	0.931864	807.541350
VV	644.764622	17.566921	0.128516	98.640734
Total bkg	501697.984927	315.295341	NaN	46753.346974
Data	502143.0	708.620491	NaN	0.000000
Data/bkg	1.000887	0.090365	NaN	0.000000
SF_tt	1.001	0.002	NaN	0.000000

Results

Muon channel: μ



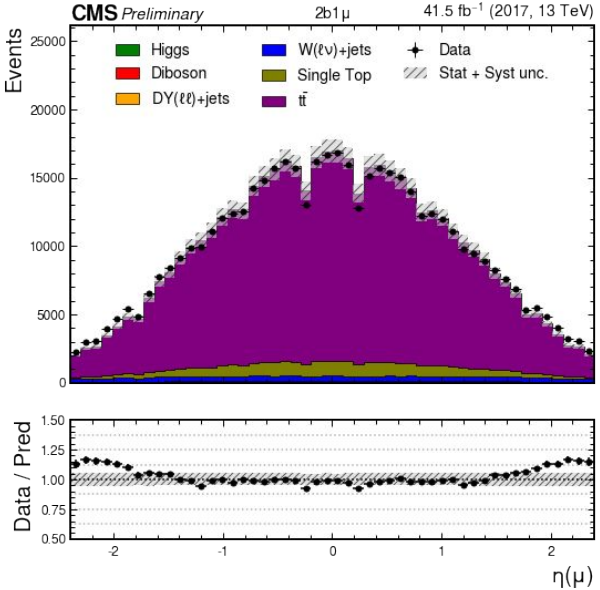
OLD



NEW

Results

Muon channel: μ



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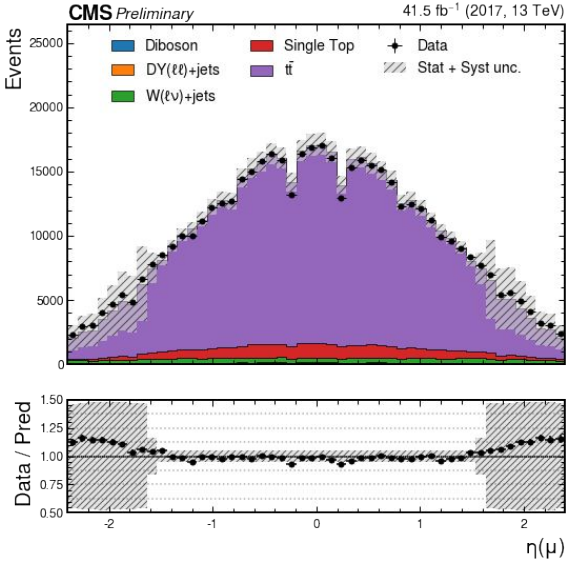
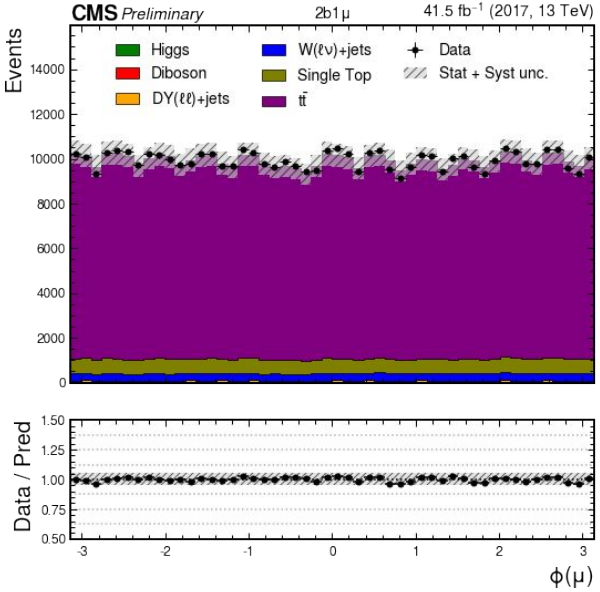


NEW

Results

Muon channel: μ



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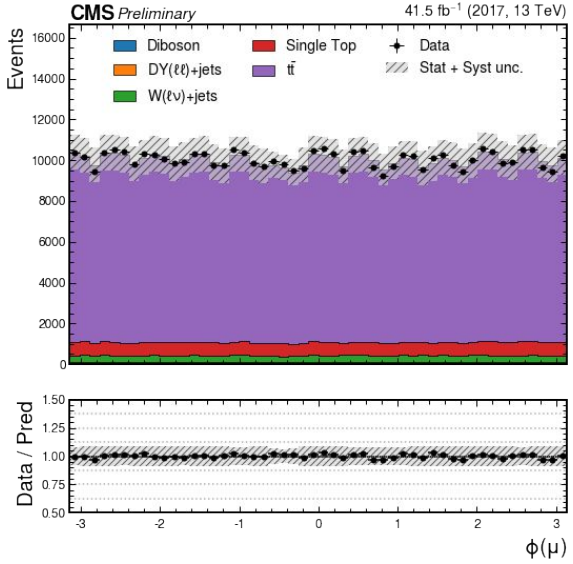
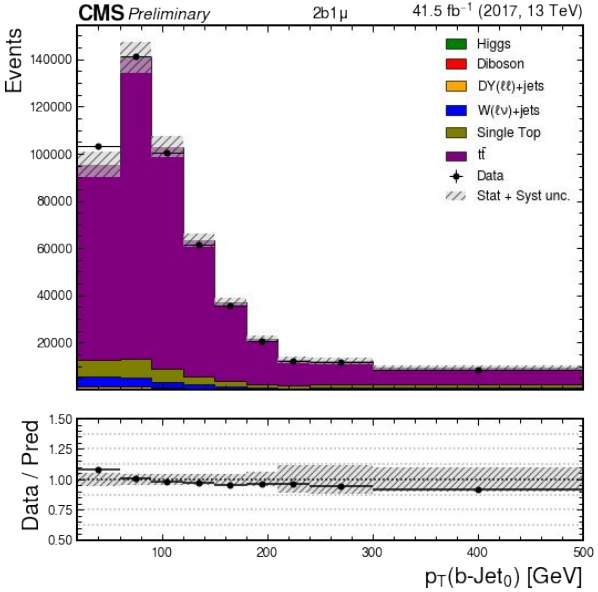


NEW

Results

Muon channel: b-jet



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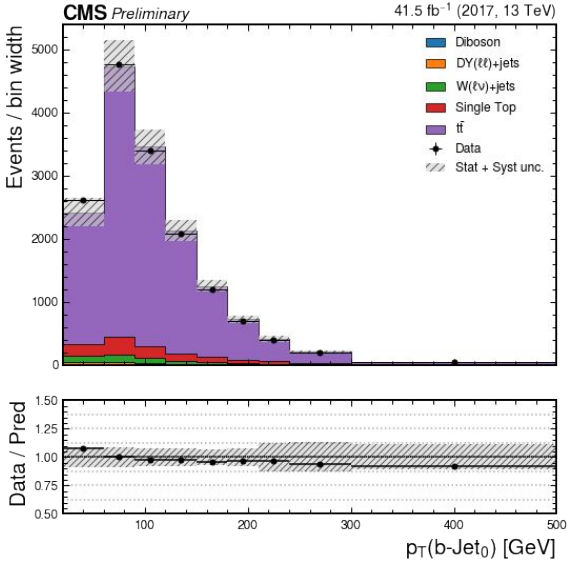
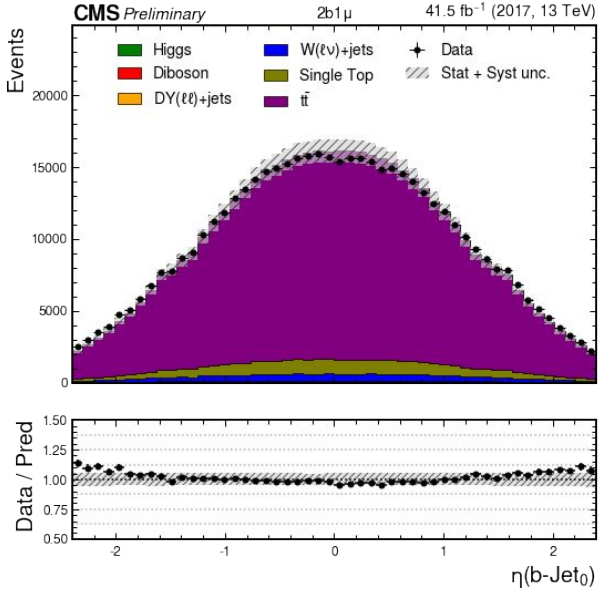


NEW

Results

Muon channel: b-jet



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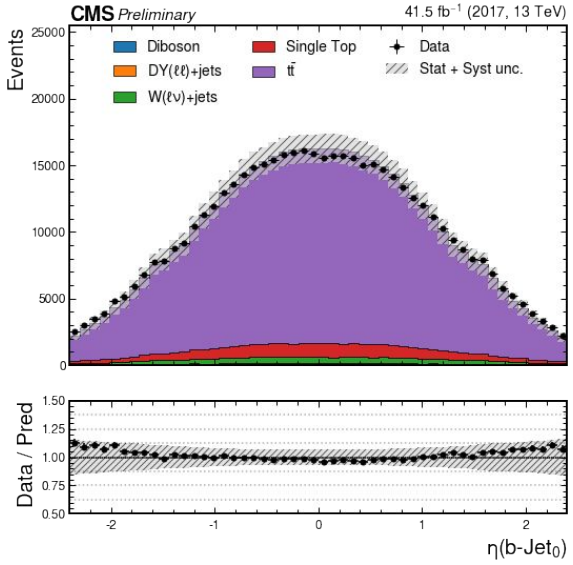
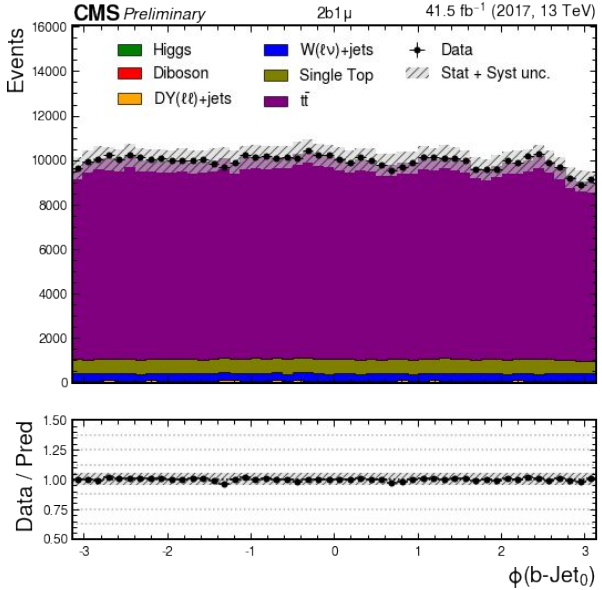


NEW

Muon channel: b-jet



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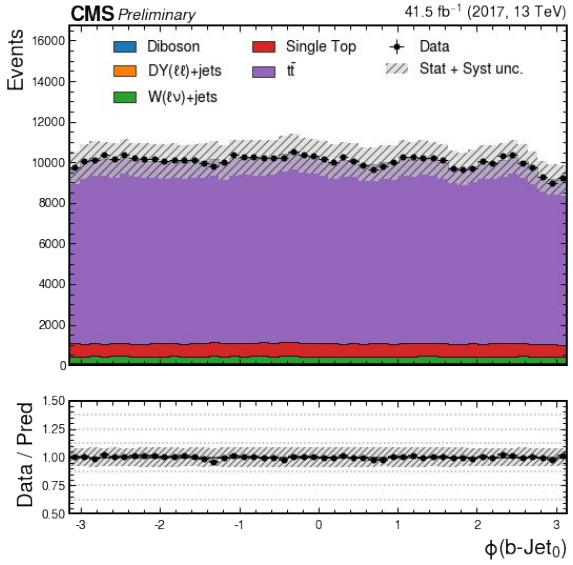
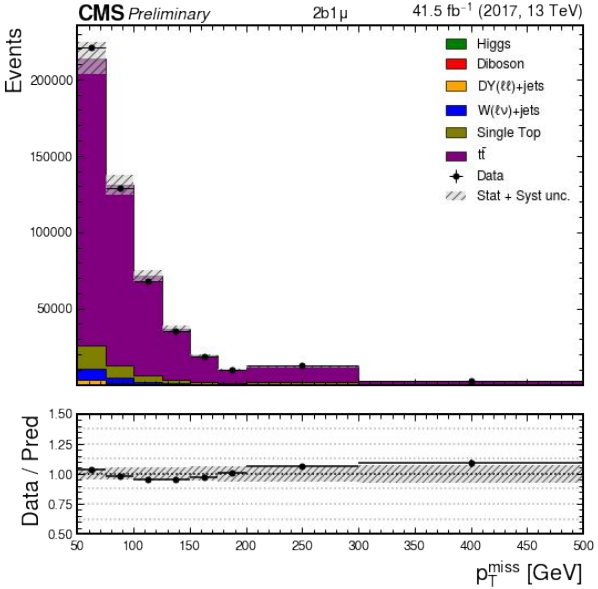


NEW

Results

Muon channel: p_T^{miss}



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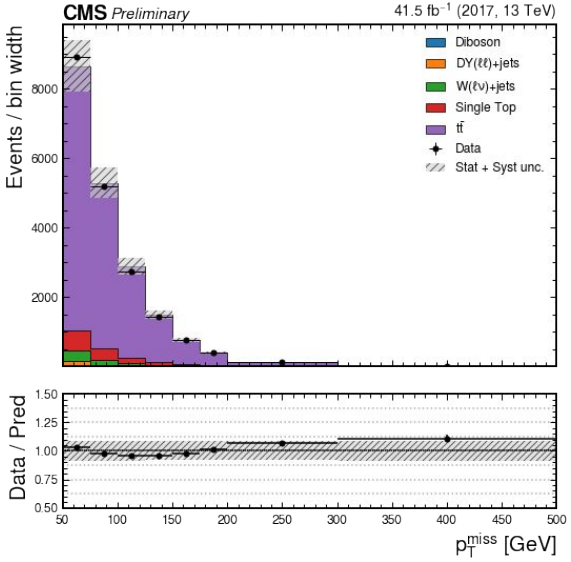
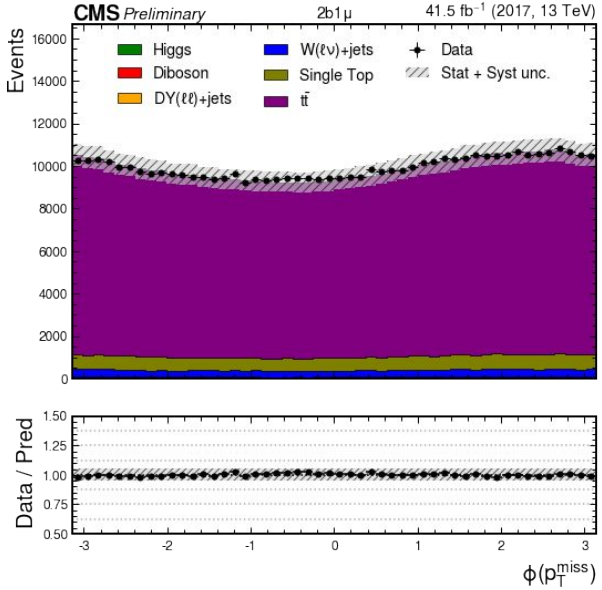


NEW

Results

Muon channel: p_T^{miss}



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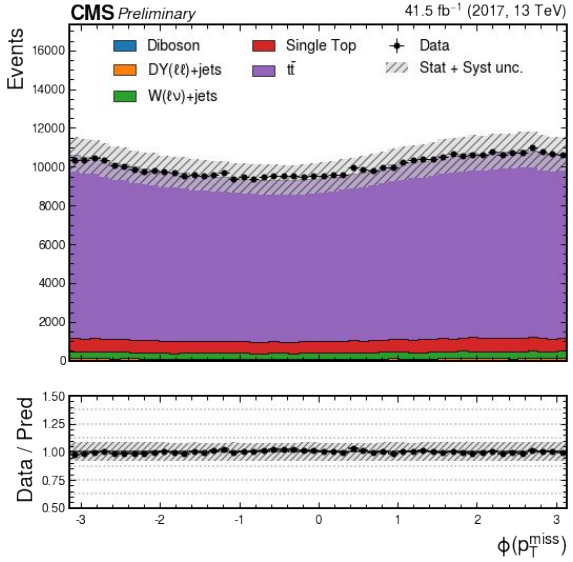
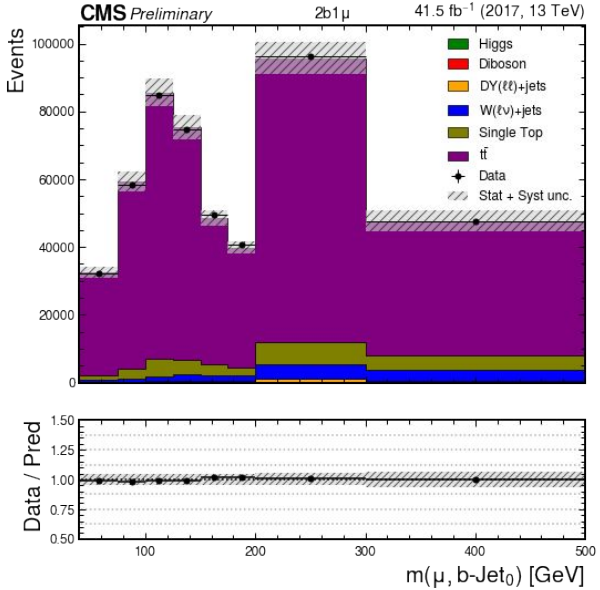


NEW

Results

Muon channel: Mass



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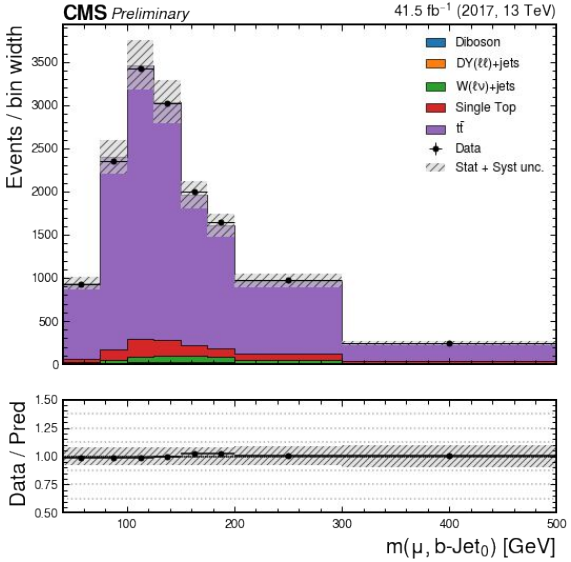
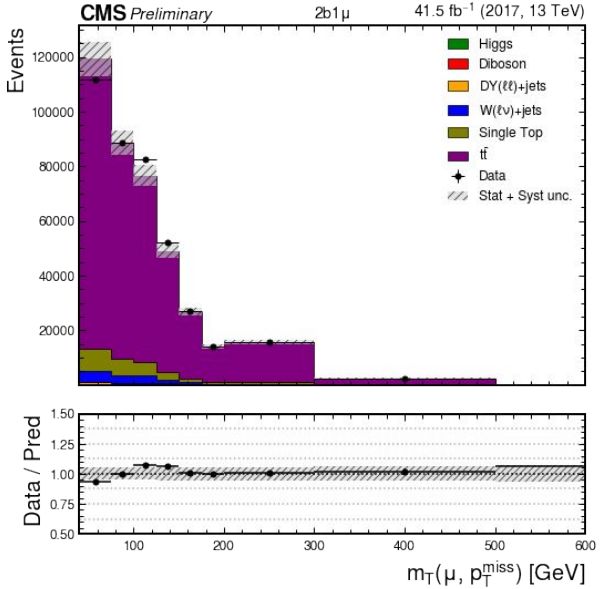


NEW

Muon channel: Mass



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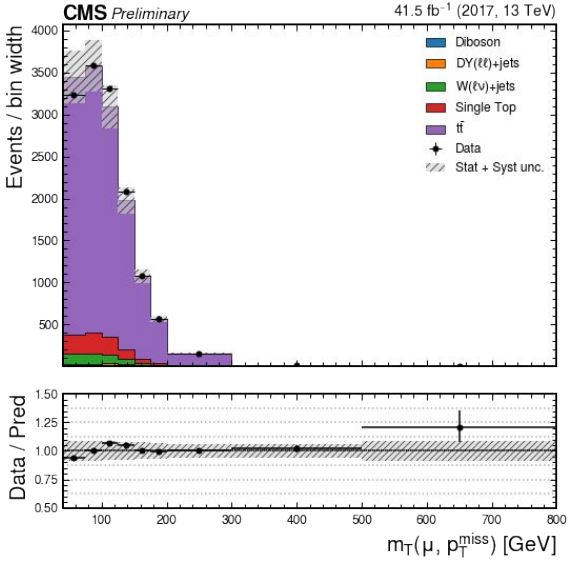
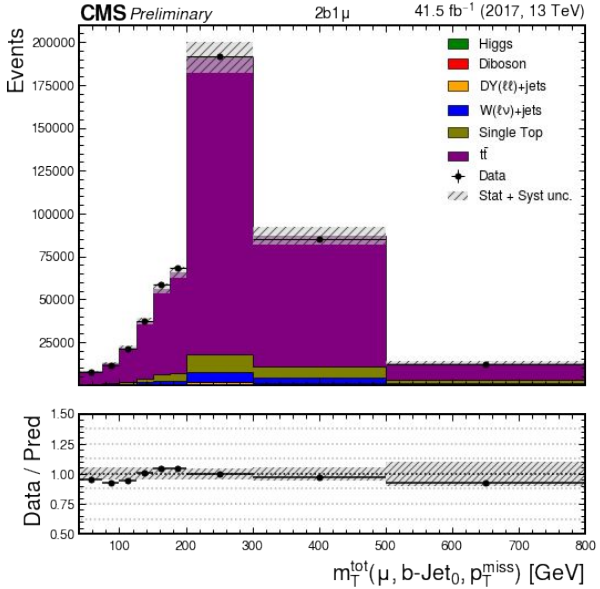


NEW

Muon channel: Mass



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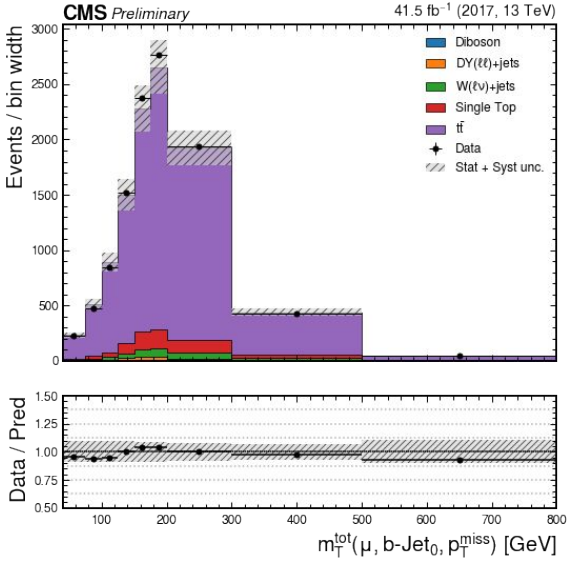

NEW

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Pre-selection cuts

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	pfRelIso04_all	< 0.15
	mvaFall17V2Iso_WP80 (ele) mvaFall17V2Iso_WP90 (mu)	True
Muons	p_T	>= 35 GeV
	η	< 2.4
	pfRelIso04_all	< 0.15
	ID	highPtId == 2

Object	Variable	Cut
Taus	p_T	>= 20 GeV
	η	< 2.3
	dz	< 0.2
	idDeepTau2017v2p1VSjet	> 8
	idDeepTau2017v2p1VSe	> 8
	idDeepTau2017v2p1VSmu	> 1
Jets	p_T	>= 20 GeV
	η	< 2.4
	JetId	6
	puId	7
	btagDeepFlavB	> Medium WP

Latest results on ttbar control region

Selection cuts

Selection cuts
Electron Trigger
Luminosity calibration
MET filters
ΔR (μ, bjet) > 0.4
p_T^{miss} > 50 GeV
N(bjet) = 2
N(τ) = 0
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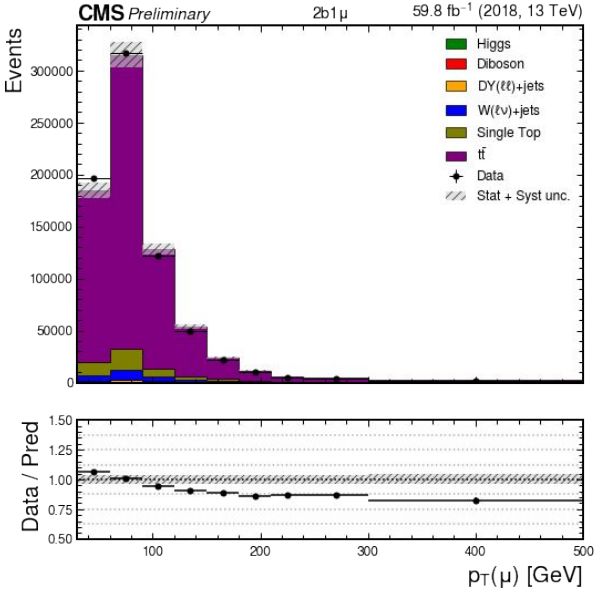
- **Muon trigger**: **HLT_Mu50 OR HLT_OldMu100 OR HLT_TkMu100**
- **Luminosity mask**: https://twiki.cern.ch/twiki/bin/view/CMS/LumiRecommendationsRun2
- **MET Filters:** https://twiki.cern.ch/twiki/bin/view/CMS/MissingETOptionalFiltersRun2

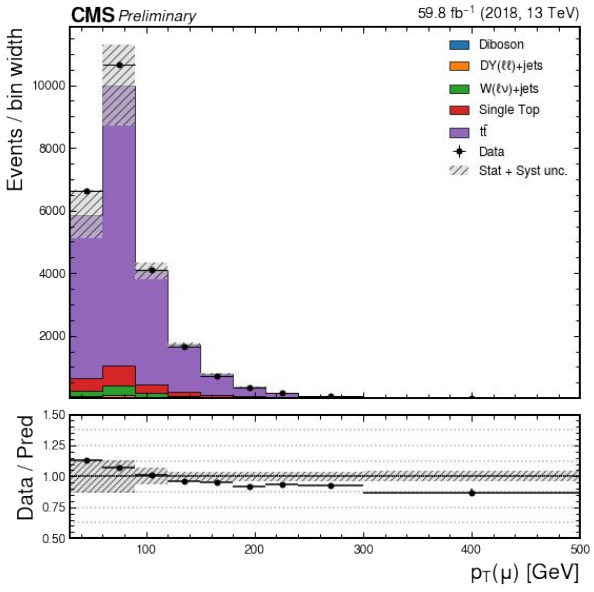
	events	error	percentage	syst error
tt	621135.252553	369.510889	89.096037	25431.194327
SingleTop	45621.486599	168.142656	6.543975	1924.567123
WJetsToLNu	23734.956309	238.974269	3.404557	1585.211238
DYJetsToLL	5620.84477	71.803204	0.806258	442.489892
VV	926.460633	24.742797	0.132892	50.725106
Higgs	113.503085	19.230934	0.016281	17.154258
Total bkg	697152.503949	477.55281	NaN	25557.017878
Data	734455.0	857.003501	NaN	0.000000
Data/bkg	1.053507	0.088339	NaN	0.000000
SF_tt	1.06	0.002	NaN	0.000000

Results

Muon channel: μ

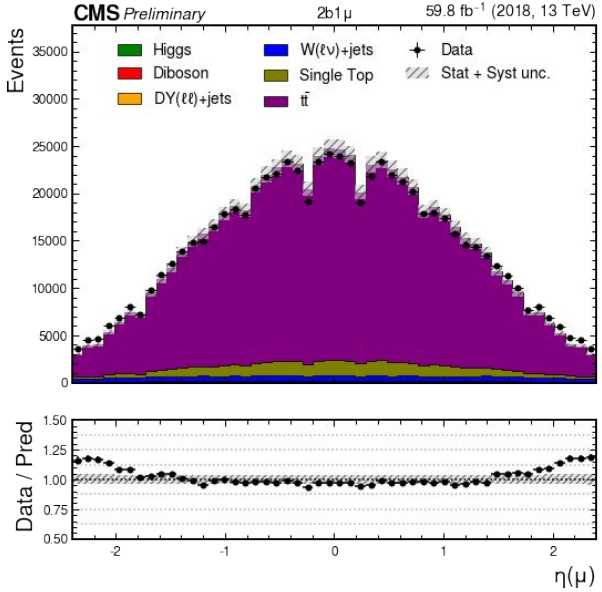


OLD



NEW

Muon channel: μ



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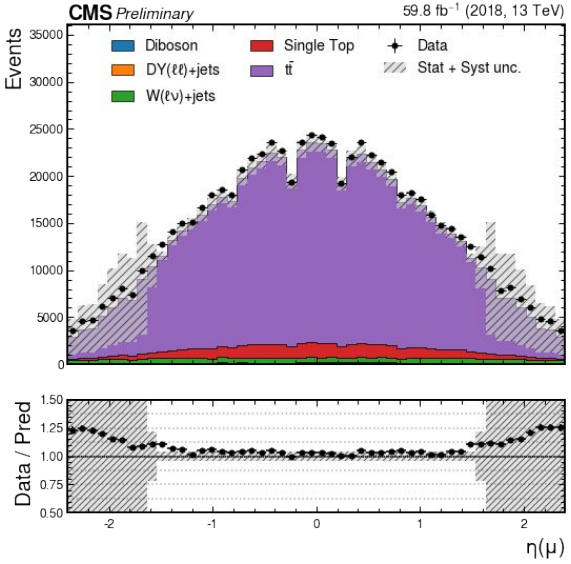
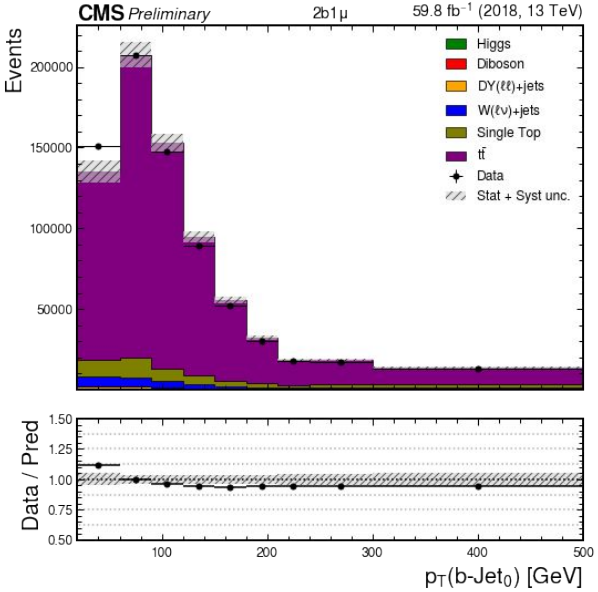


NEW

Muon channel: b-jet



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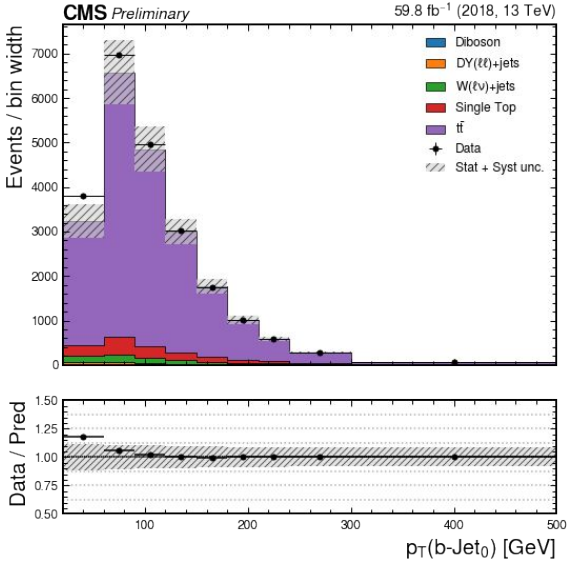
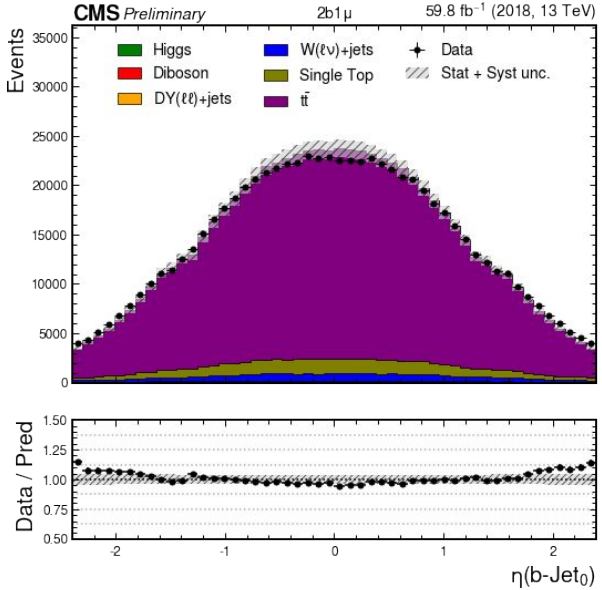


NEW

Muon channel: b-jet



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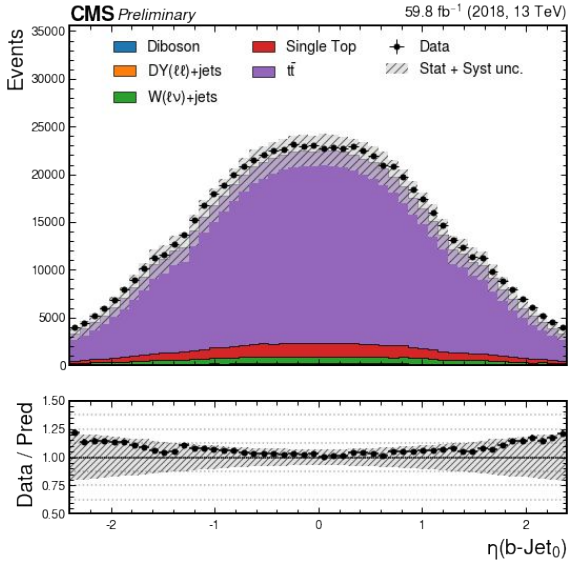
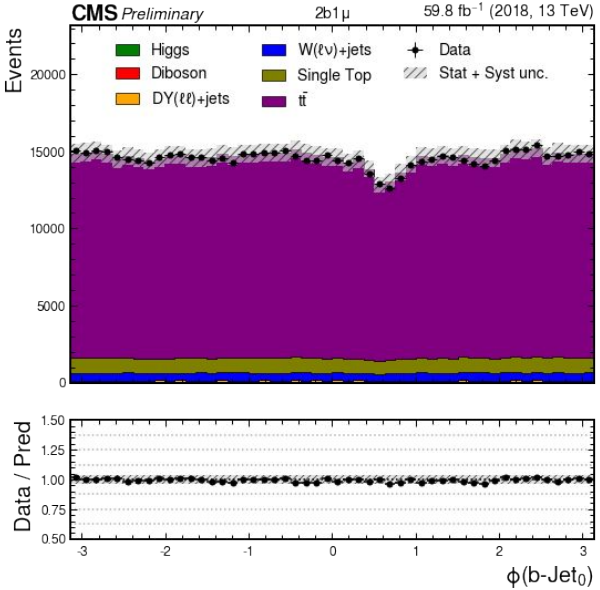


NEW

Results

Muon channel: b-jet



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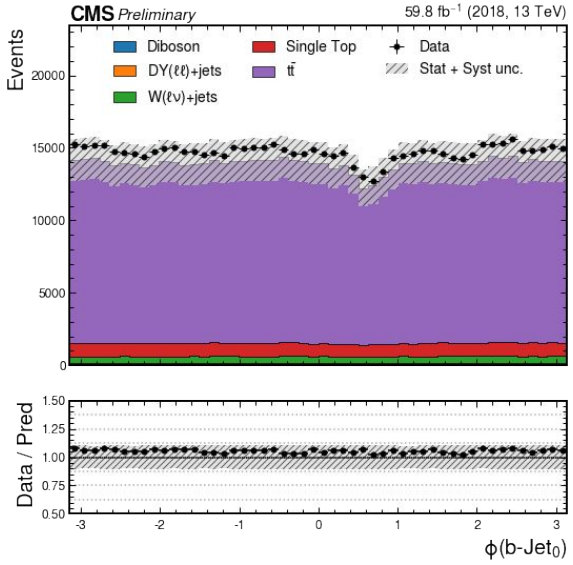
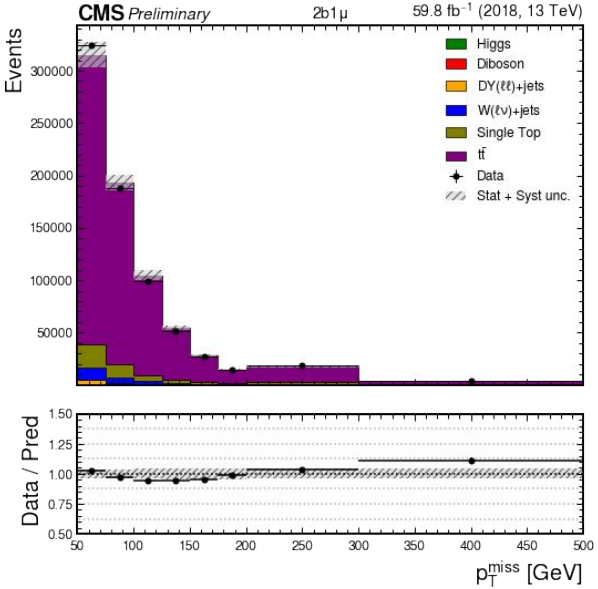


NEW

Results

Muon channel: p_T^{miss}



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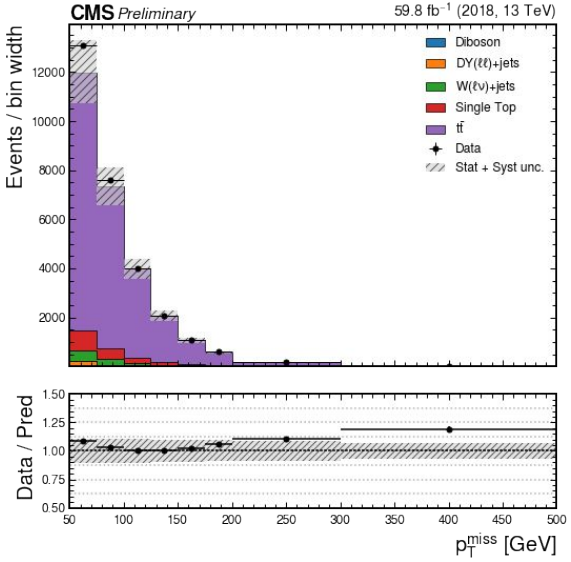
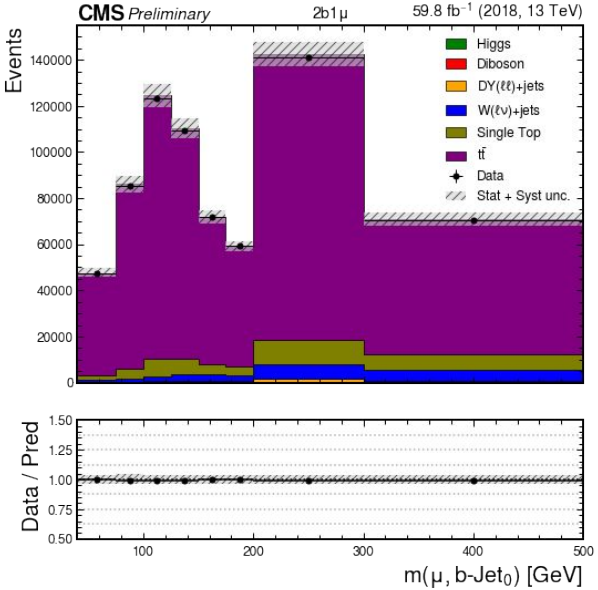


NEW

Muon channel: Mass



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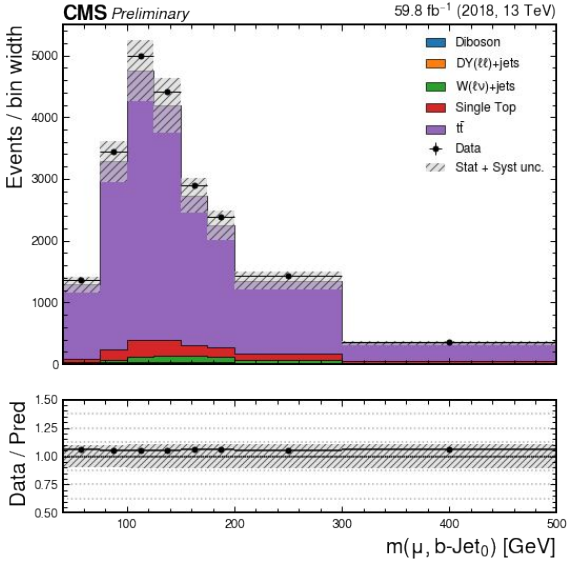
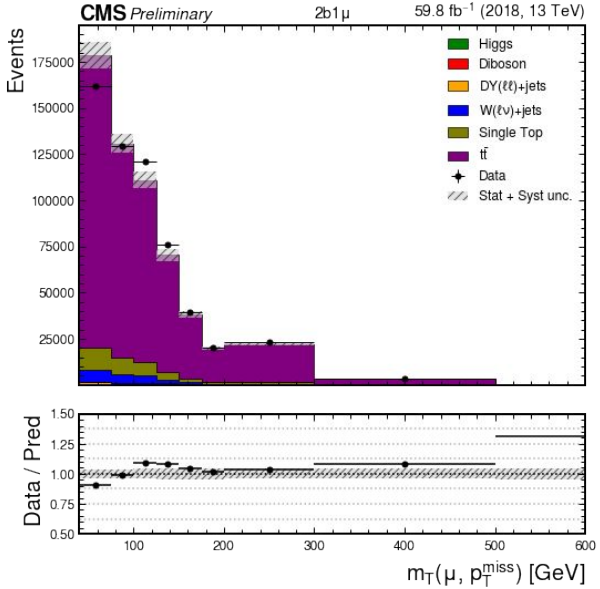


NEW

Muon channel: Mass



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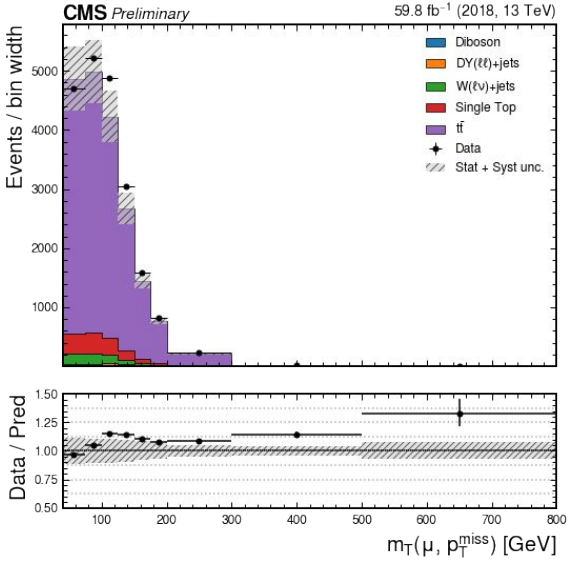
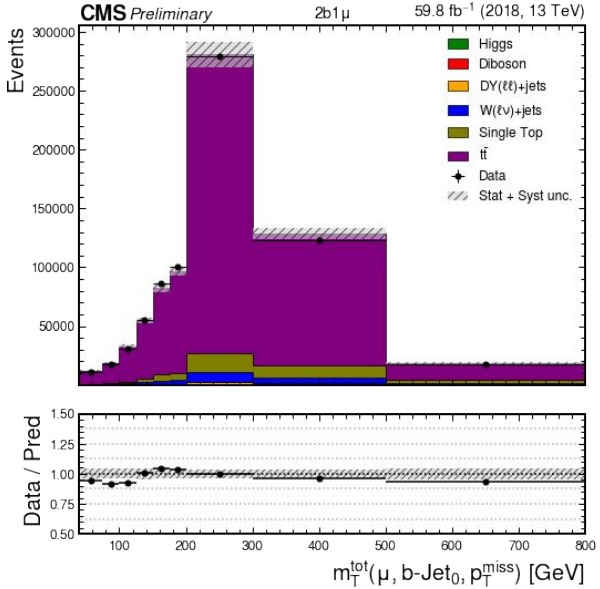


NEW

Muon channel: Mass



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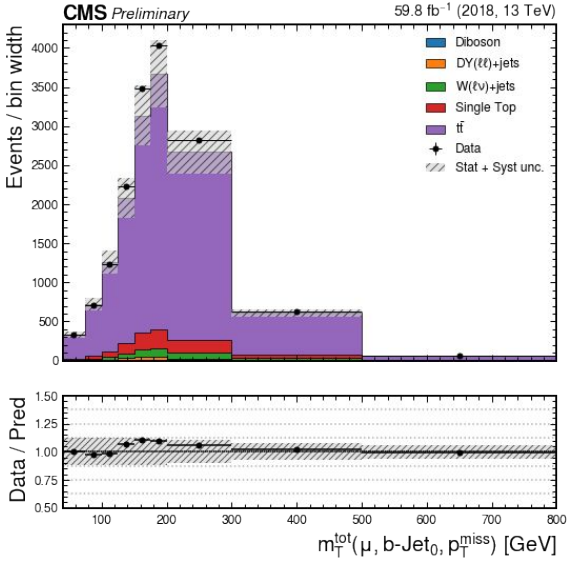
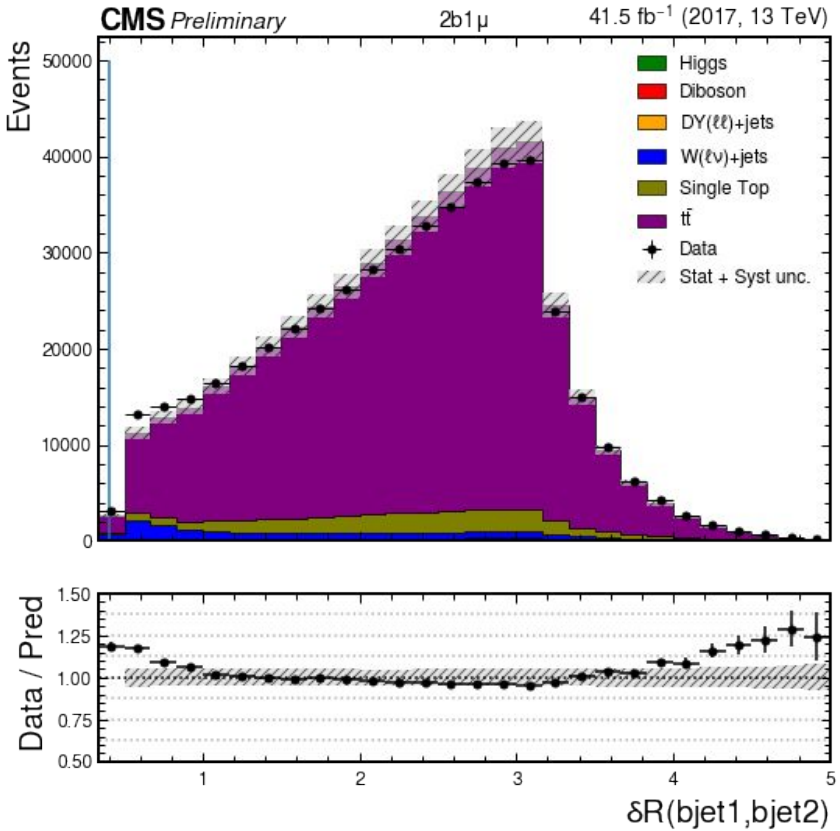
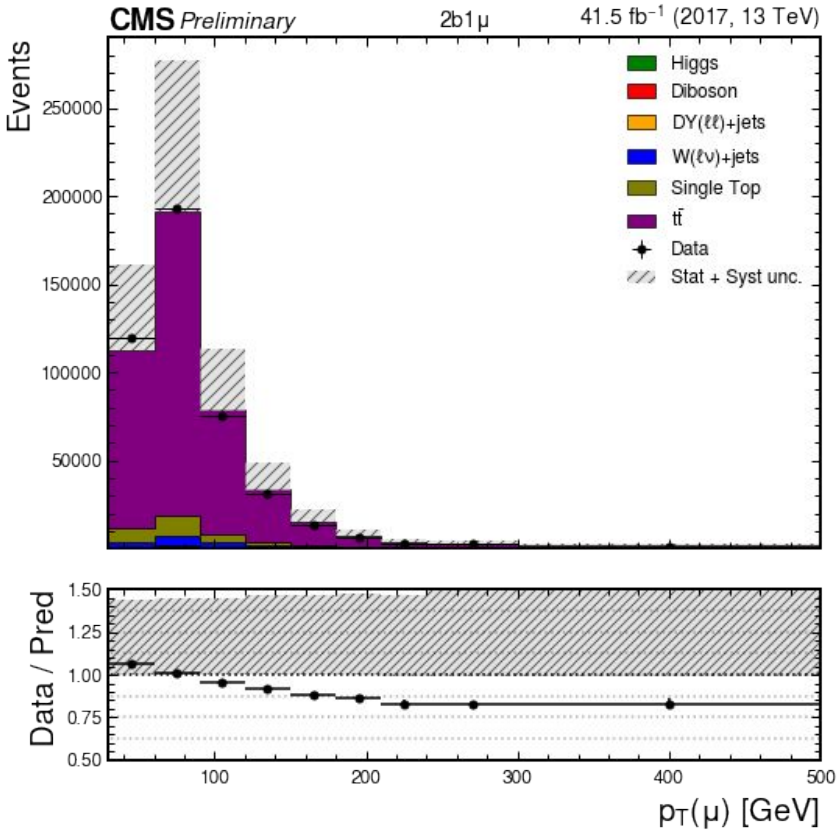


NEW

BACKUP

Results


CMS Preliminary
2b1μ
41.5 fb⁻¹ (2017, 13 TeV)
Events
Higgs
Diboson
DY(ℓℓ)+jets
W(ℓν)+jets
Single Top
tt̄
Data
Stat + Syst unc.
Data / Pred
δR(bjet1,bjet2)


CMS Preliminary
2b1μ
41.5 fb⁻¹ (2017, 13 TeV)
Events
Higgs
Diboson
DY(ℓℓ)+jets
W(ℓν)+jets
Single Top
tt̄
Data
Stat + Syst unc.
Data / Pred
pT(μ) [GeV]

Statistical uncertainty

The statistical uncertainties are computed using the module ***intervals*** of the ***hist*** library (see here)

- **Statistical uncertainty:** *poisson_interval()*
  The Frequentist coverage interval for Poisson-distributed observations. i.e. The Poisson central coverage interval. What is calculated is the “Garwood” interval (see CMS Statistics Committee Recommendations: Asymmetric Error Bars for Poisson Event Counts)
- **Ratio uncertainty:** *ratio_uncertainty(uncertainty_type="poisson")*
  Calculate the uncertainties for the values of the ratio *num/denom* using the Garwood confidence interval for a Poisson-distributed numerator scaled by the denominator. (see CMS Statistics Committee Recommendations: Confidence levels for ratios of measurements (Ratio of Poisson))

  For ratio uncertainty we use data/bkg.
  For uncertainty band we use bkg/bkg centered at 1.