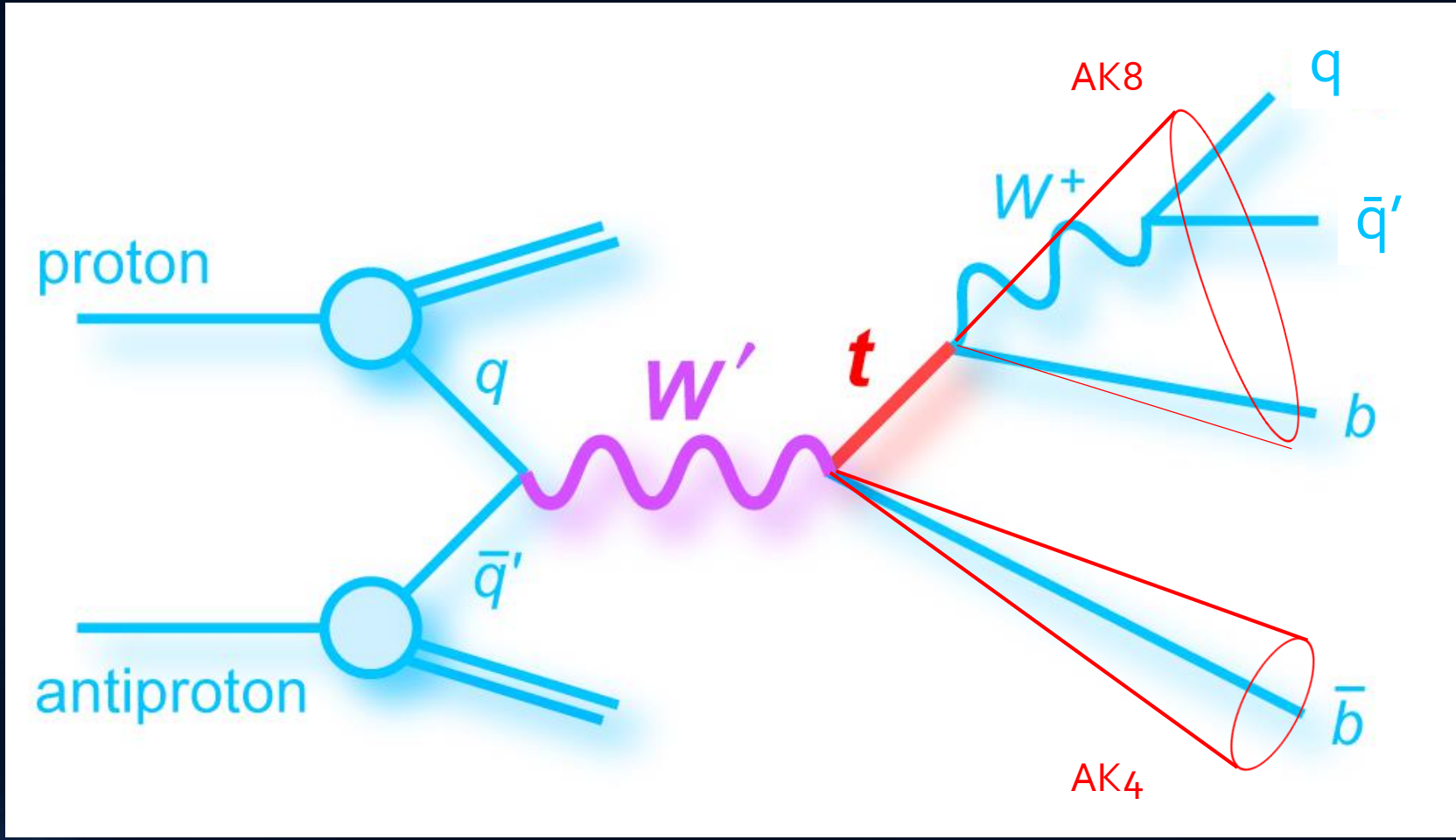
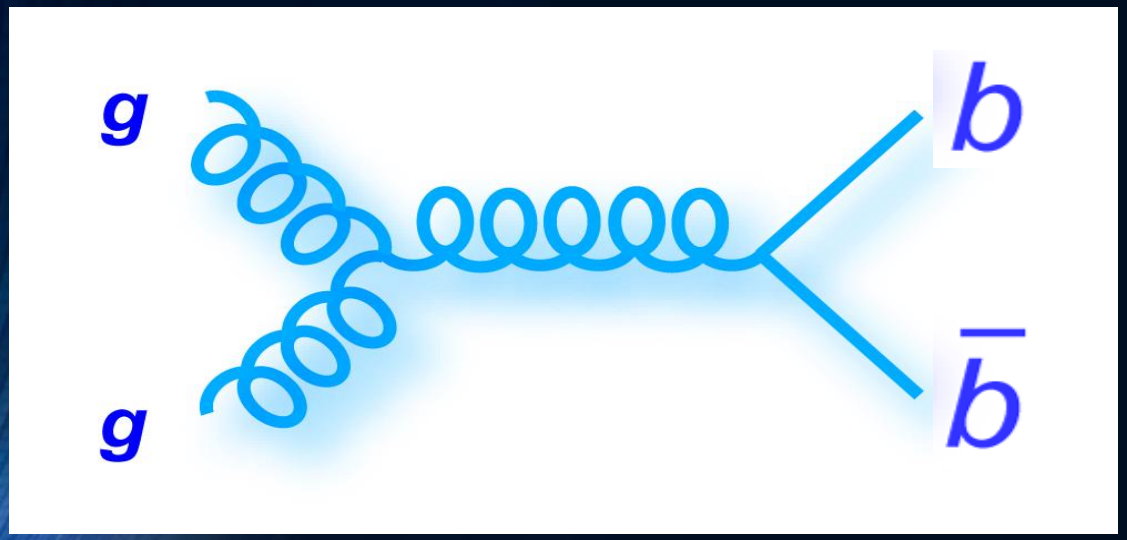
Search for a W’ resonance in the all-hadronic channel at $\sqrt{s}$ = 13 TeV

SIGNAL DIAGRAM

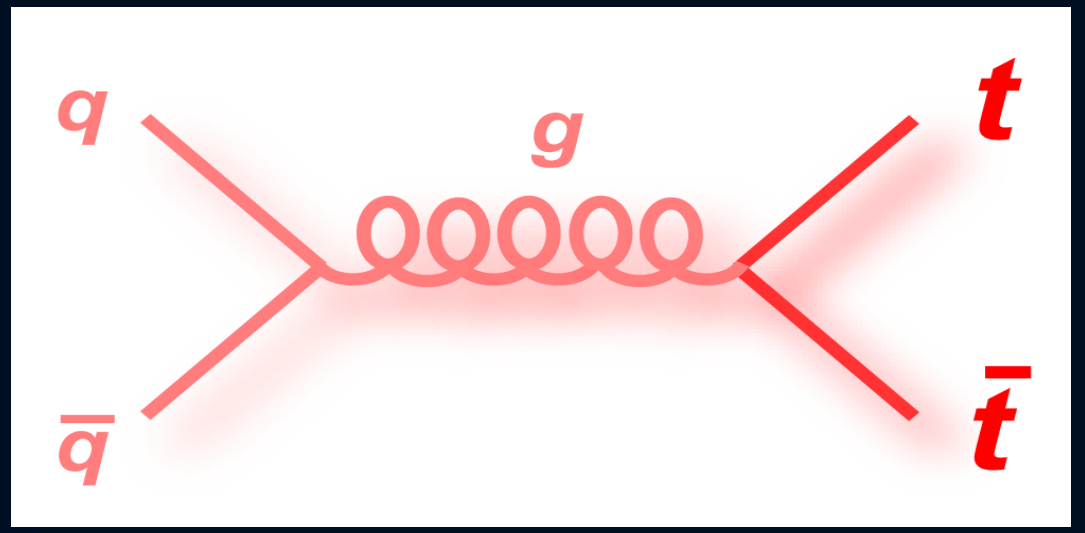


MAIN BACKGROUND PROCESSES

QCD multijet



$t\bar{t}$



SAMPLES

- SIGNAL
/WprimeToTB_plusSM_TToHad_M-2000_LH_TuneCUETP8M1_13TeV-comphep-pythia8/.../MINIAODSIM
/WprimeToTB_TToHad_M-2000_RH_TuneCUETP8M1_13TeV-comphep-pythia8/.../MINIAODSIM
/WprimeToTB_plusSM_TToHad_M-1000_LH_TuneCUETP8M1_13TeV-comphep-pythia8/.../MINIAODSIM
/WprimeToTB_TToHad_M-1000_RH_TuneCUETP8M1_13TeV-comphep-pythia8/.../MINIAODSIM

- BACKGROUND
/TT_TuneCUETP8M2T4_13TeV-powheg-pythia8/.../MINIAODSIM
/TT_Mtt-1000toInf_TuneCUETP8M2T4_13TeV-powheg-pythia8/.../MINIAODSIM
/TT_Mtt-700to1000_TuneCUETP8M2T4_13TeV-powheg-pythia8/.../MINIAODSIM
/QCD_HT100to200_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM
/QCD_HT200to300_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM
/QCD_HT300to500_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM
/QCD_HT500to700_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM
/QCD_HT700to1000_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM
/QCD_HT1000to1500_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM
/QCD_HT1500to2000_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM
/QCD_HT2000toInf_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/.../MINIAODSIM

- DATA
/JetHT/Run2016B-03Feb2017_ver2-v2/MINIAOD
/JetHT/Run2016C-03Feb2017-v1/MINIAOD
/JetHT/Run2016D-03Feb2017-v1/MINIAOD
/JetHT/Run2016E-03Feb2017-v1/MINIAOD
/JetHT/Run2016F-03Feb2017-v1/MINIAOD
/JetHT/Run2016G-03Feb2017-v1/MINIAOD

We are using the B2GAnaFW at the moment:
https://twiki.cern.ch/twiki/bin/view/CMS/B2GAnaEDMNTuples80X

Soon we will run on 2017 data.

TRIGGER AND PRE-SELECTION

- Trigger :

- HLT_PFHT800> 0

- Pre-selection:

- number of loose muons = 0
- number of veto electrons = 0
- number of AK8 jets (CHS) ≥ 1
- number of AK4 jets (CHS) ≥ 1

TAGGING JET

- Identification AK8 CHS jet produced by quark top:

- 150 GeV < m < 220 GeV

- Pt > 400 GeV

- $\frac{\tau_3}{\tau_2}$ → < 0.55 tight working point — signal region
  → > 0.55

- subjet → b-tag medium working point — signal region
  → veto b-tag

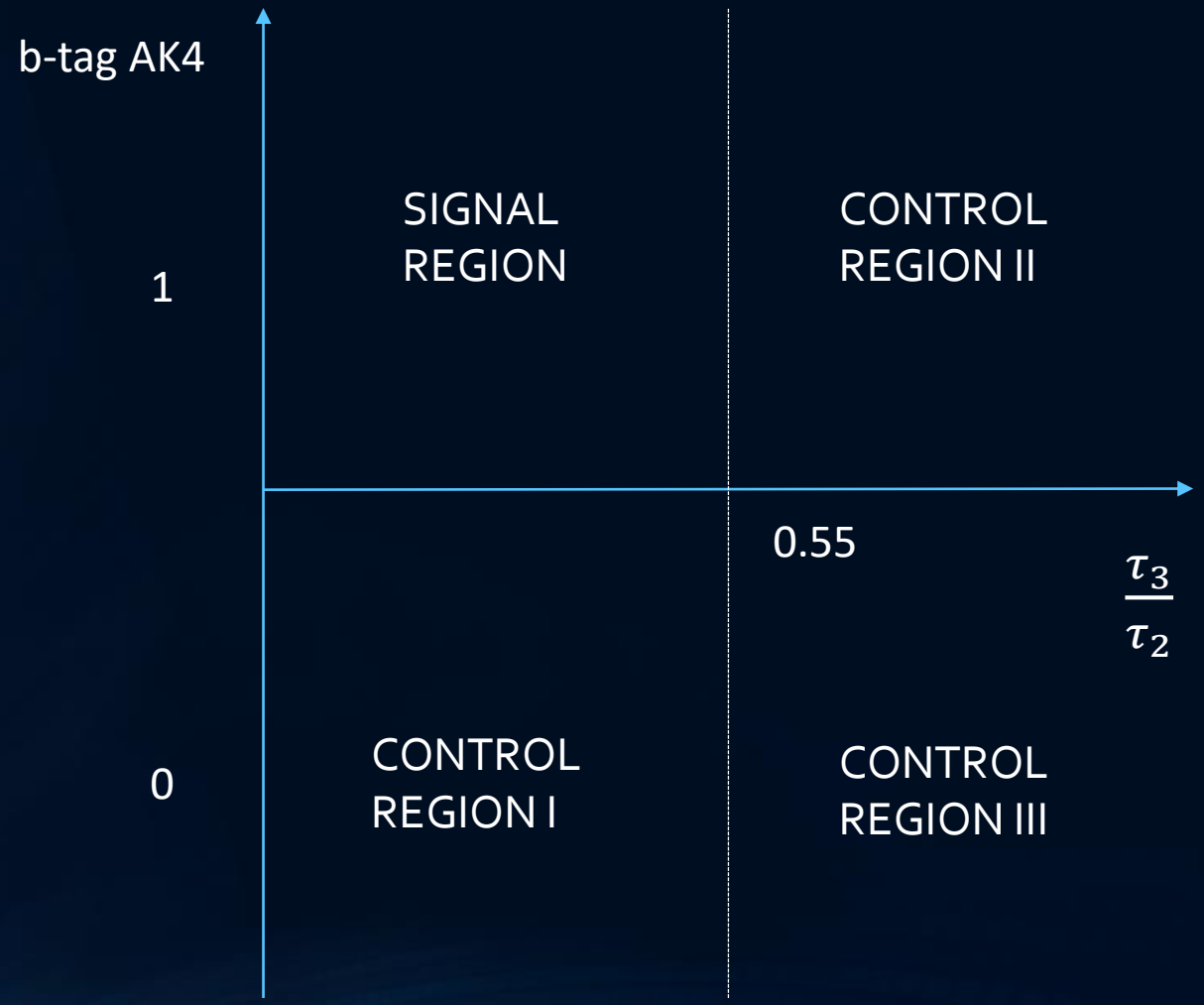
- Identification AK4 CHS jet:

- no overlap between fat jet and narrow jet (ΔR > 1.2)

- AK4 → b-tag CSVv2 tight working point — signal region
  → veto b-tag

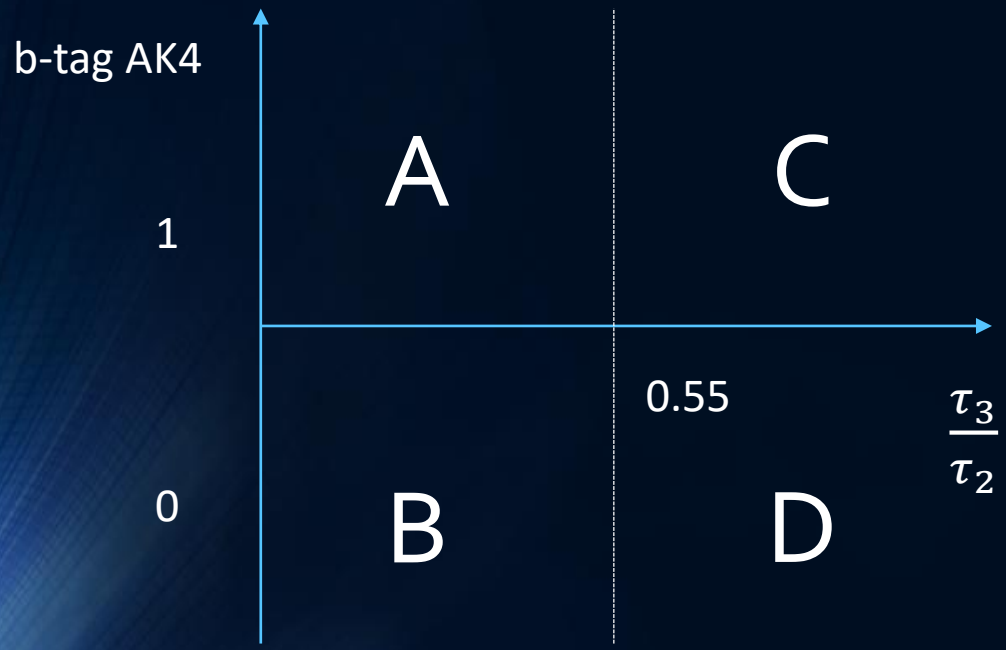
SIGNAL AND CONTROL REGIONS

We plan to use an alphabet method, using as variables b-tag of AK4 and τ_3/τ_2

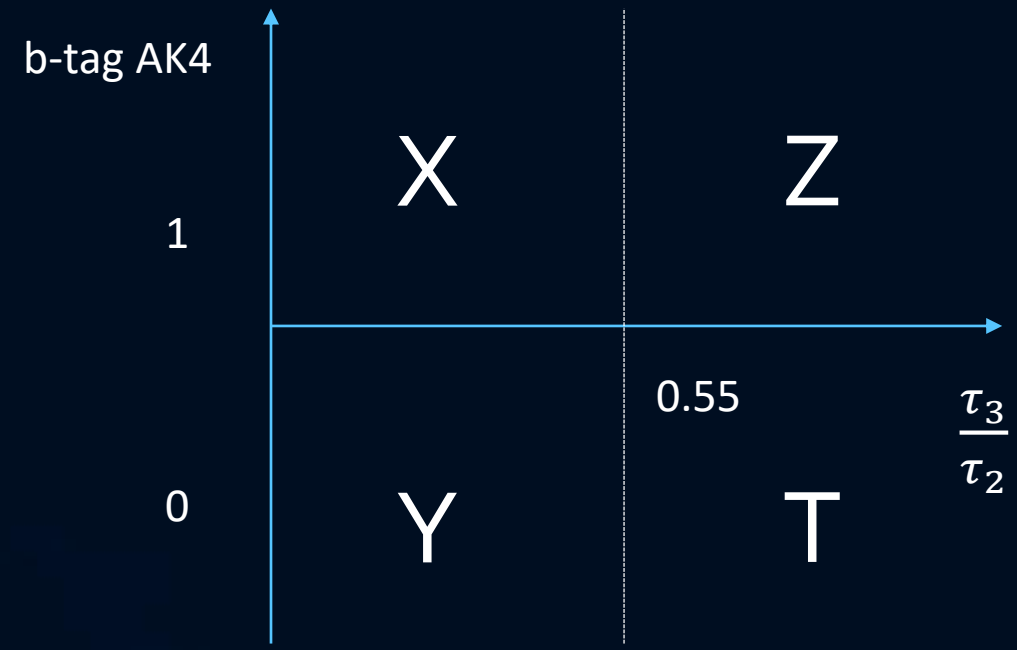


REGIONS ABCD AND XYZT

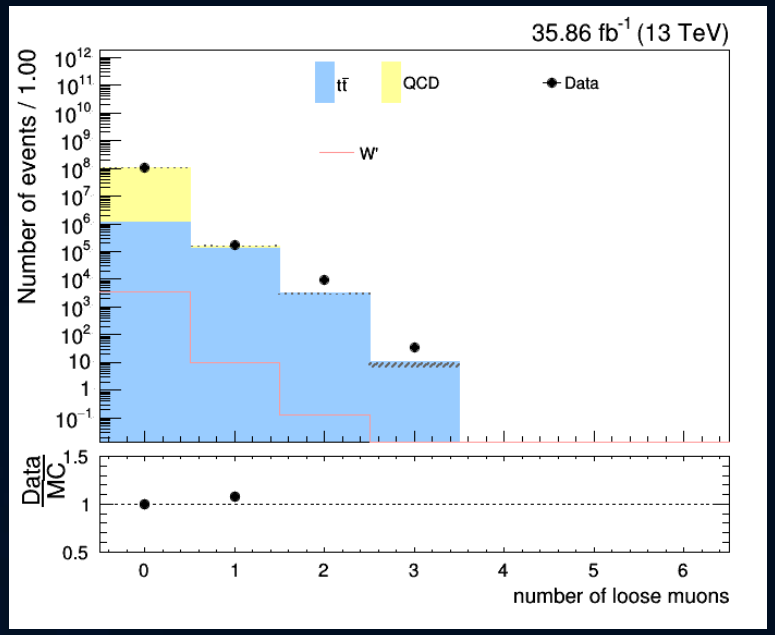
If b-tag subjet is true -> ABCD REGION

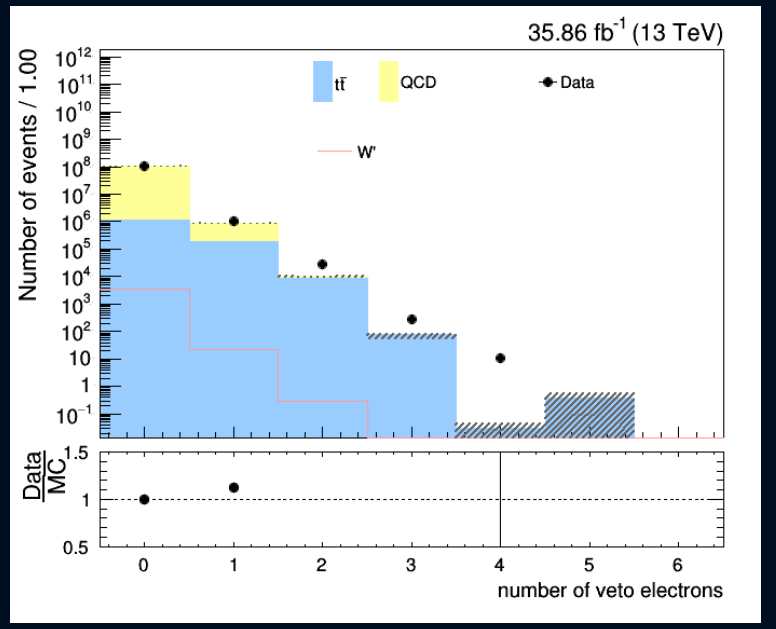


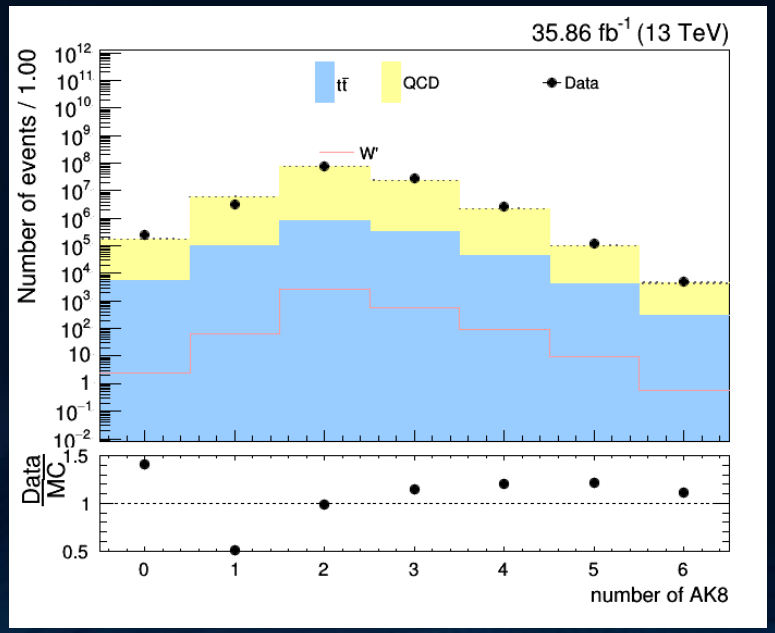
If veto b-tag subjet is true -> XYZT REGION

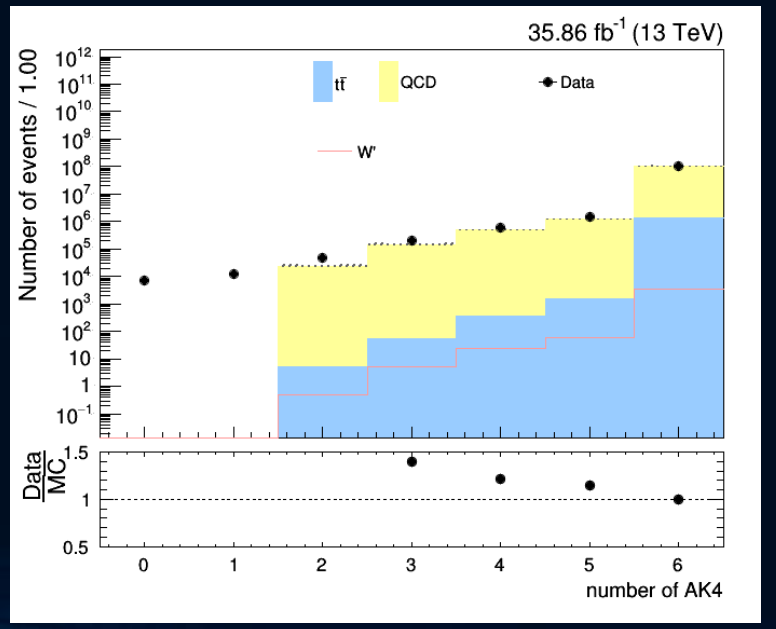


AFTER TRIGGER SELECTION



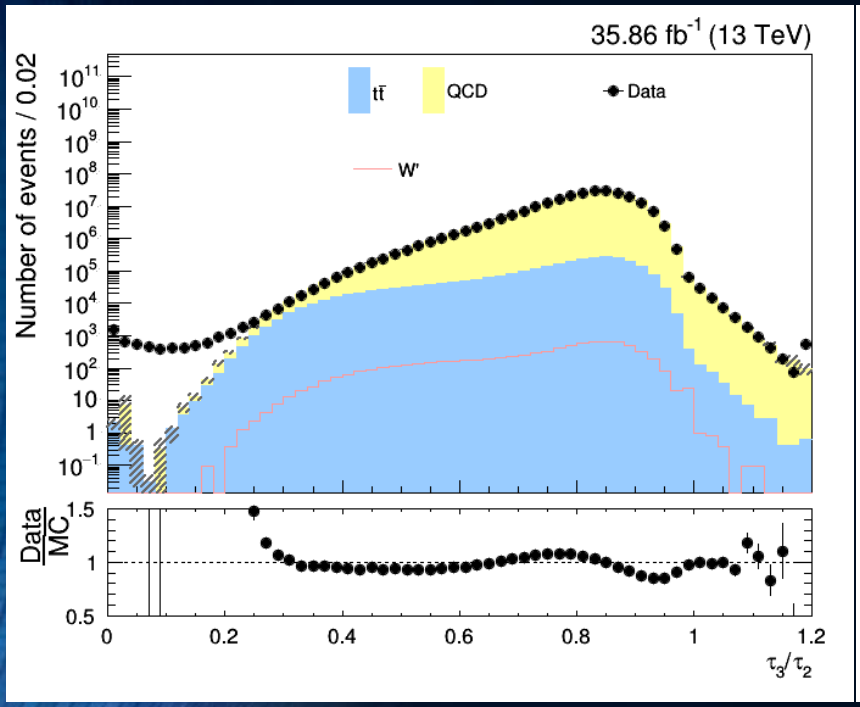


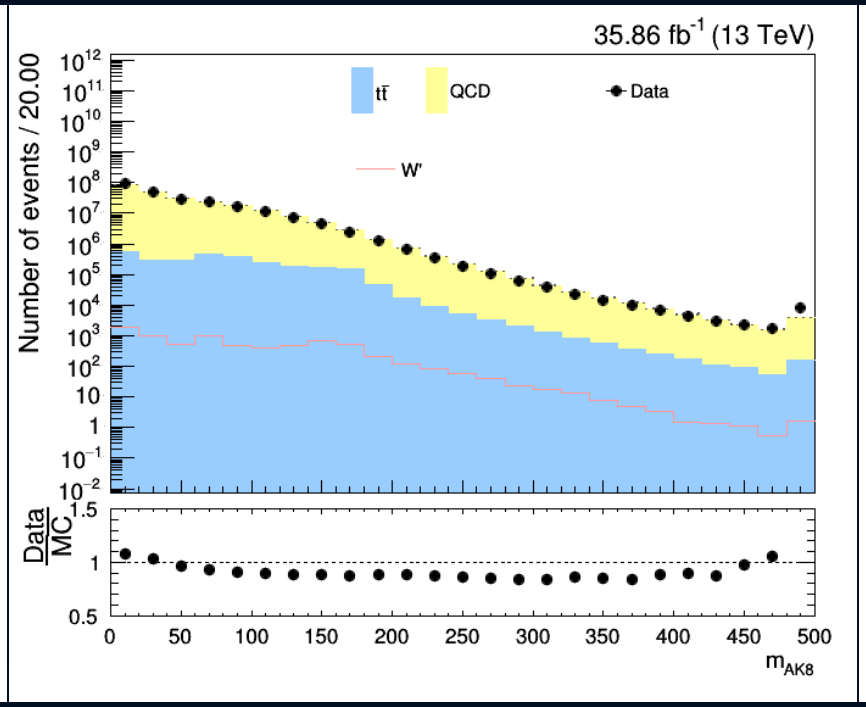


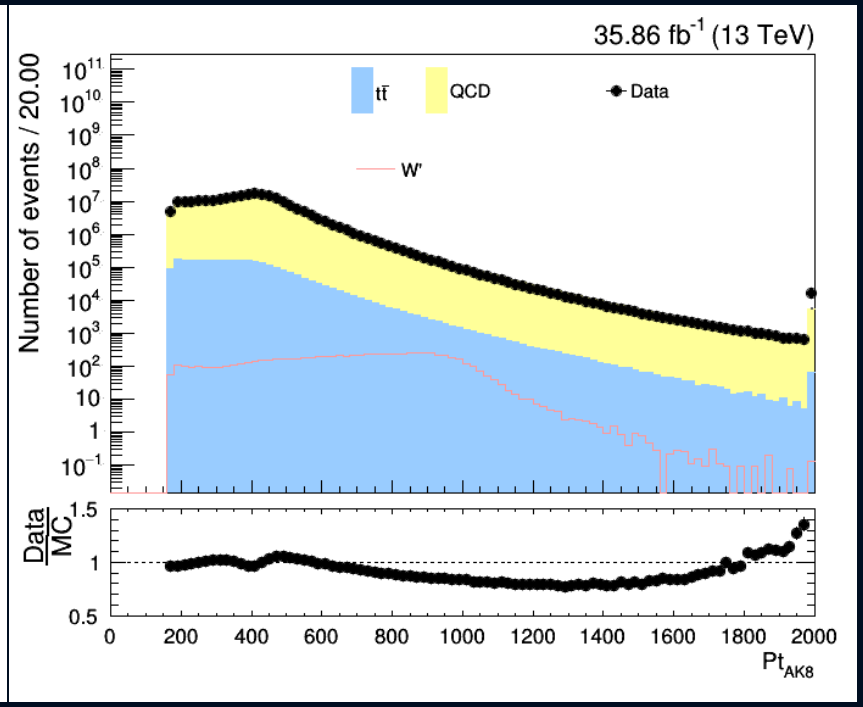


Plots normalized to data, not to lumi. Still work to do on trigger SFs.

AFTER PRE-SELECTION



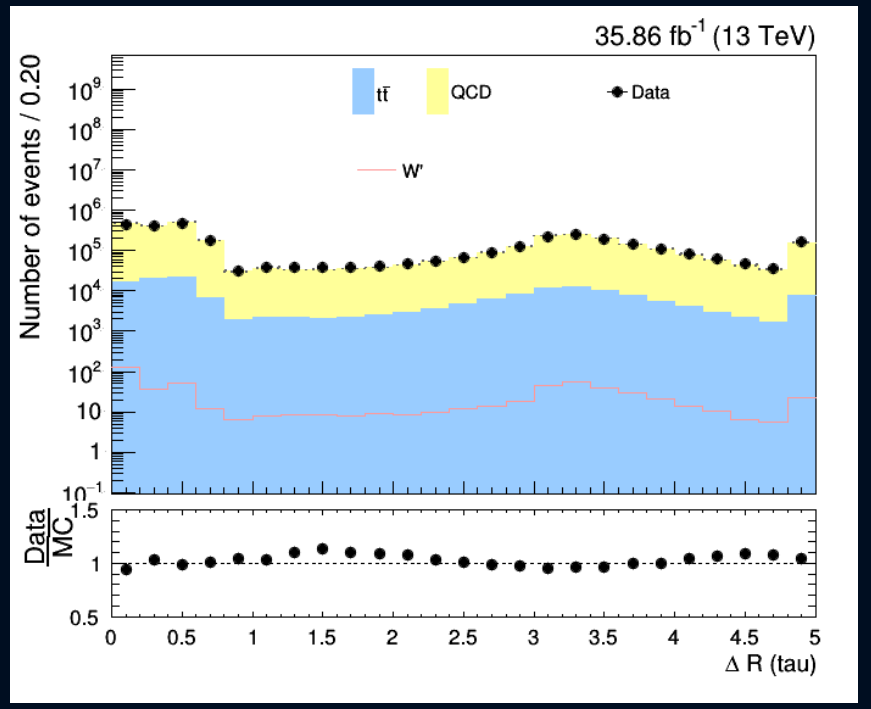


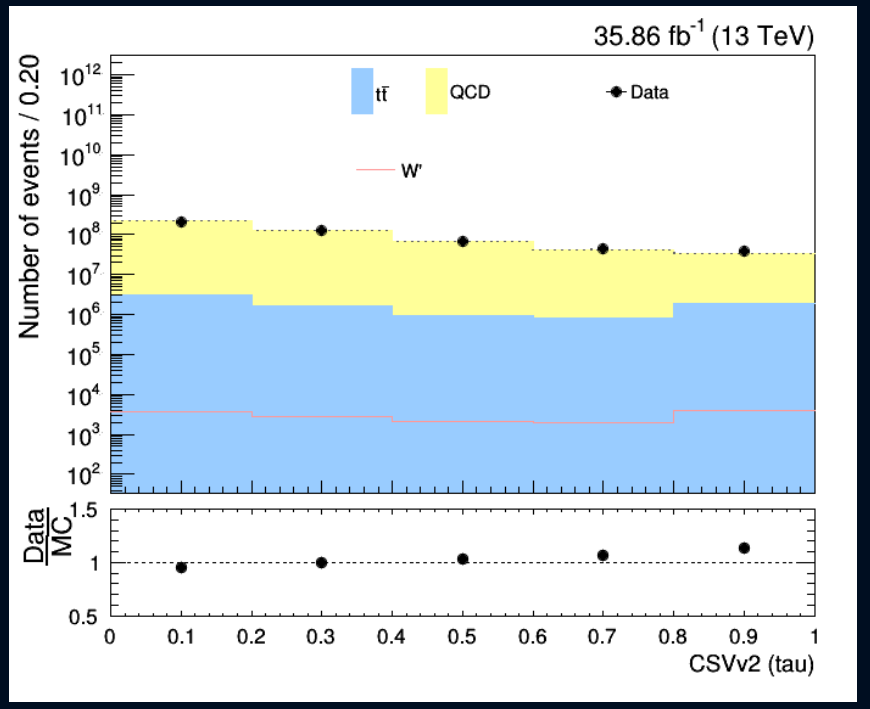


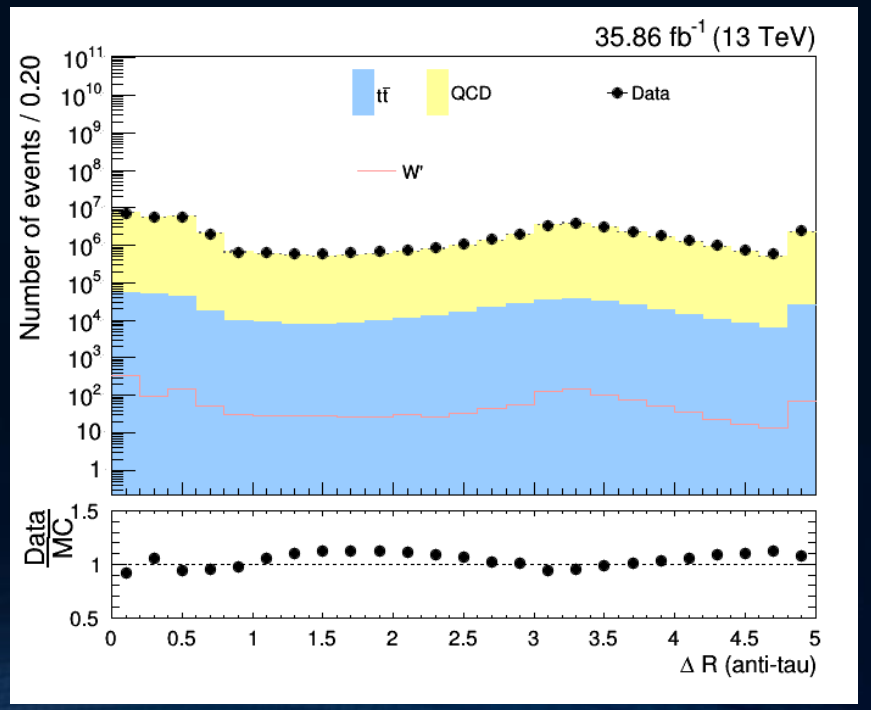
$\frac{\tau_3}{\tau_2} < 0.55$

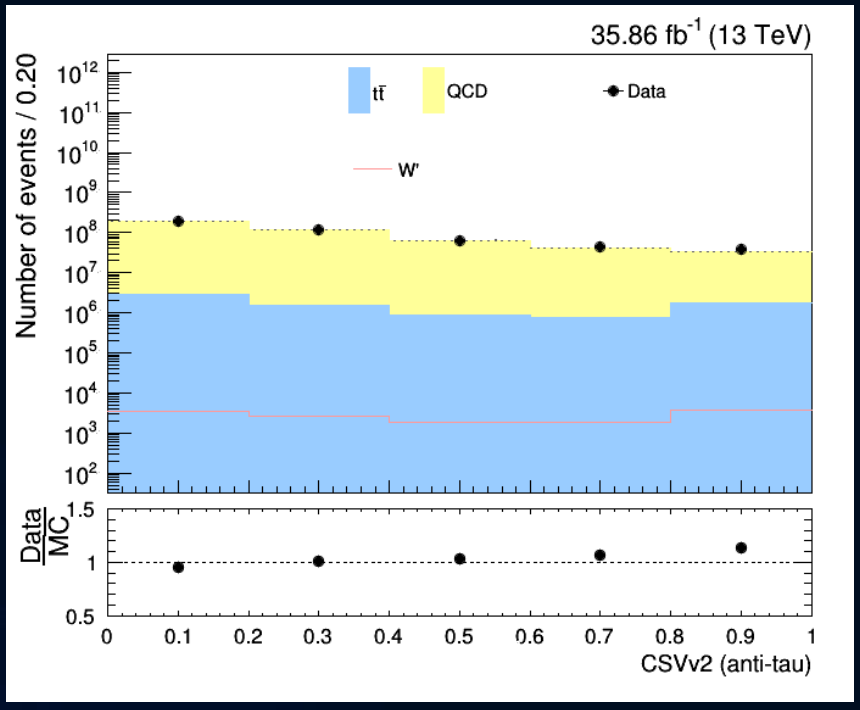
AK8 JET IDENTIFICATION: VARIABLES

$\frac{\tau_3}{\tau_2} > 0.55$



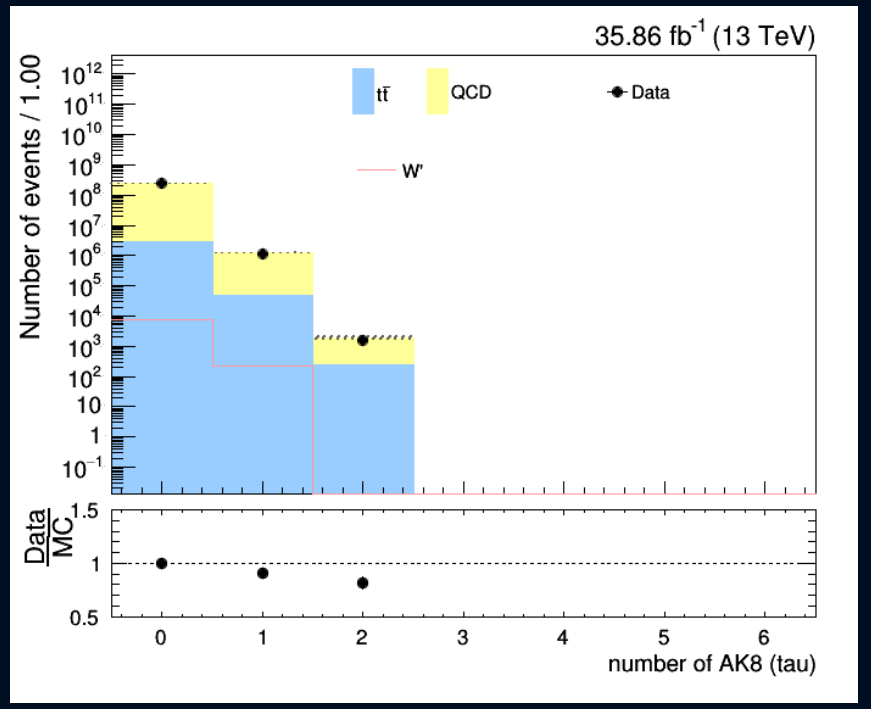


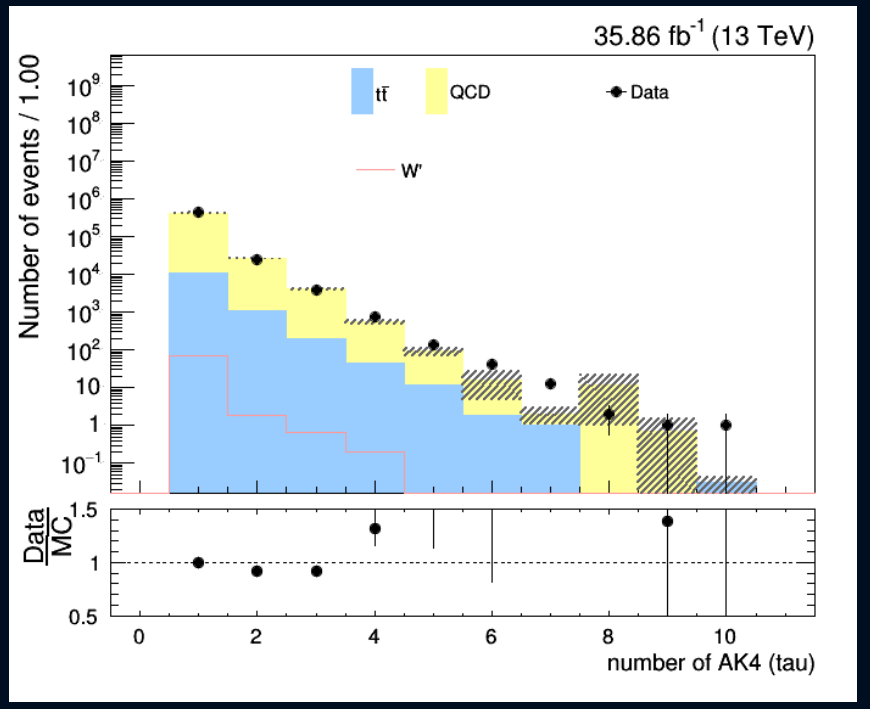


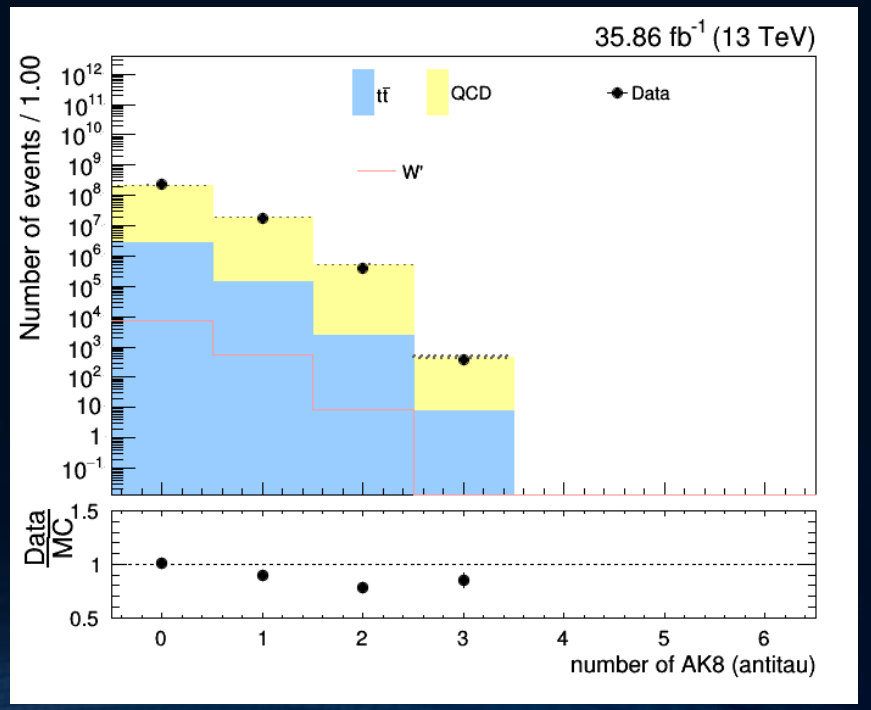


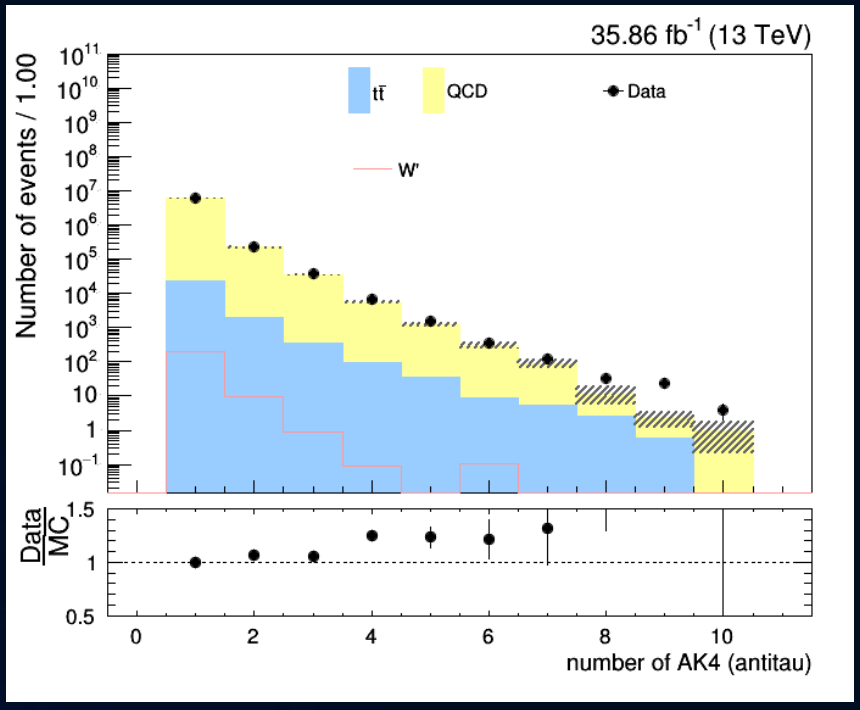
$$\frac{\tau_3}{\tau_2} < 0.55$$

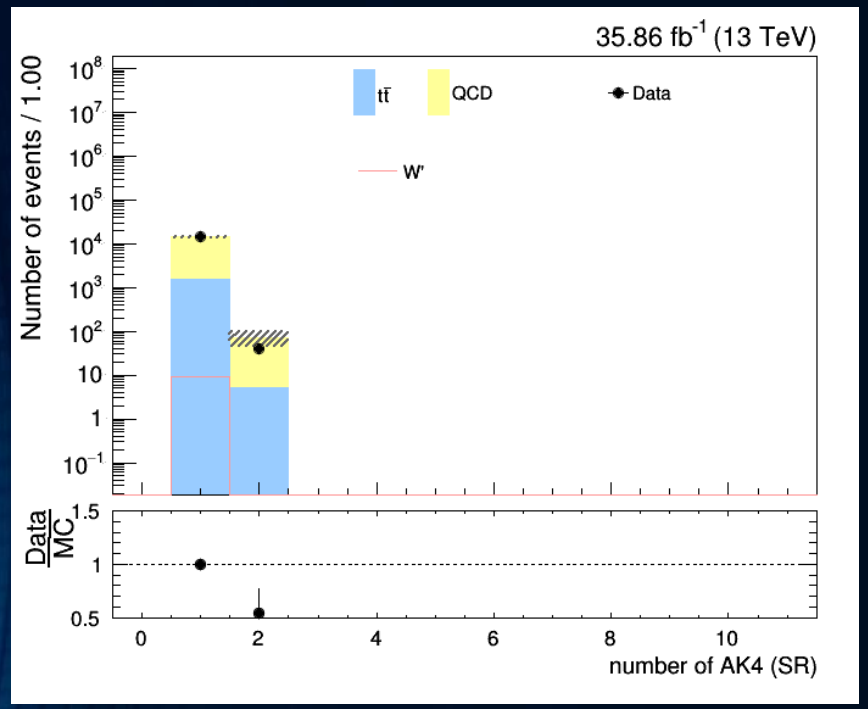
$$\frac{\tau_3}{\tau_2} > 0.55$$





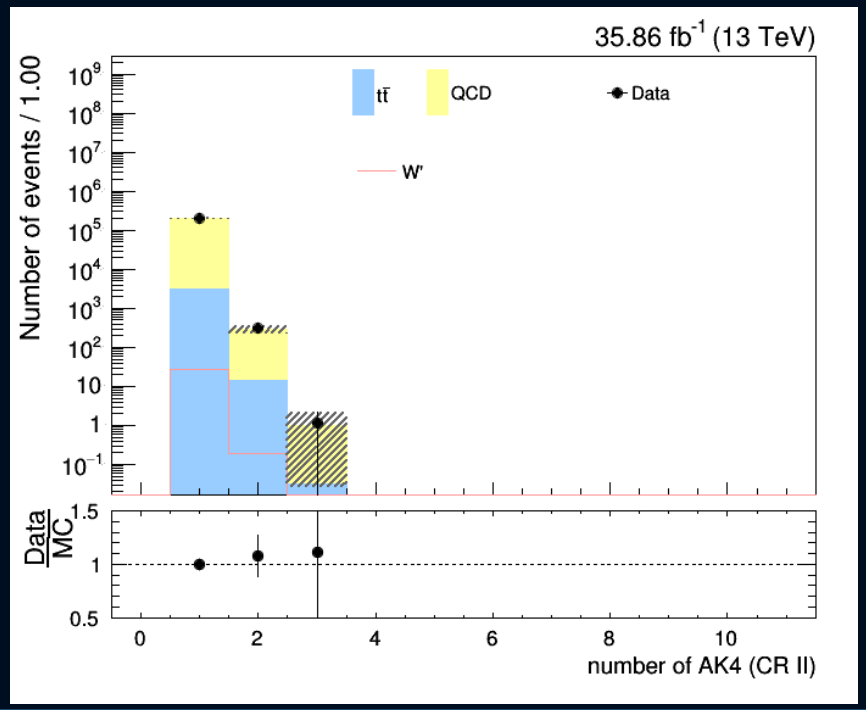




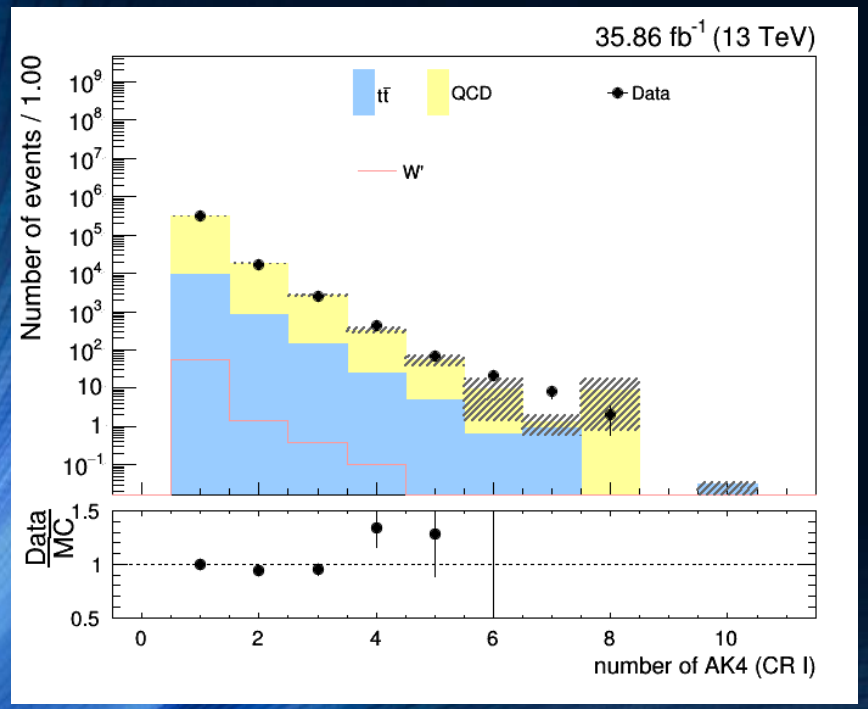


b-tag AK4

1



0.55



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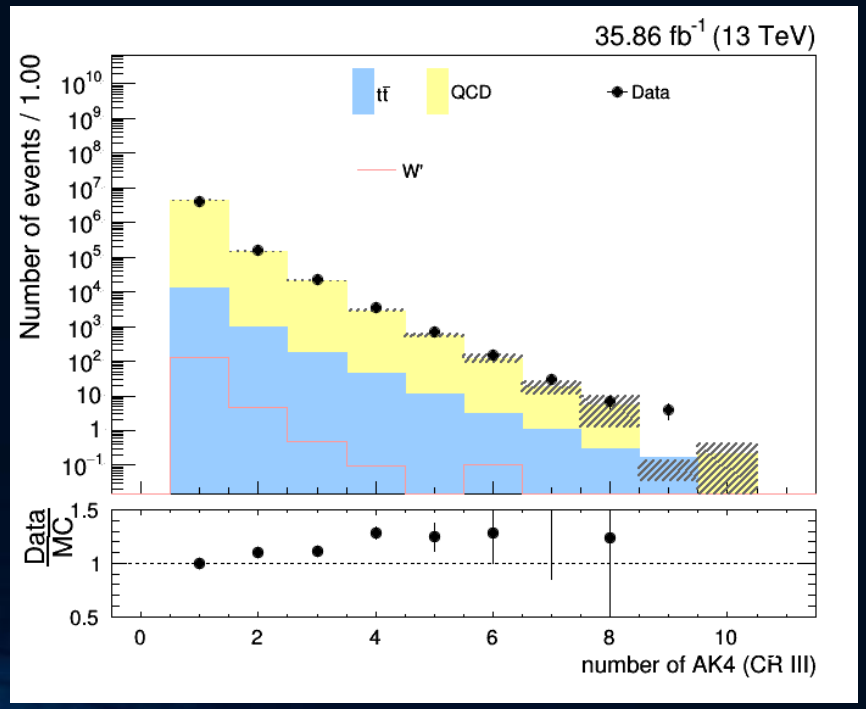

$\frac{\tau_3}{\tau_2}$

DATA DRIVEN METHOD

Taking Y/T == X/Z one has:

$$X_i = Z_i * Y_i / T_i$$

with *i* as index of bin

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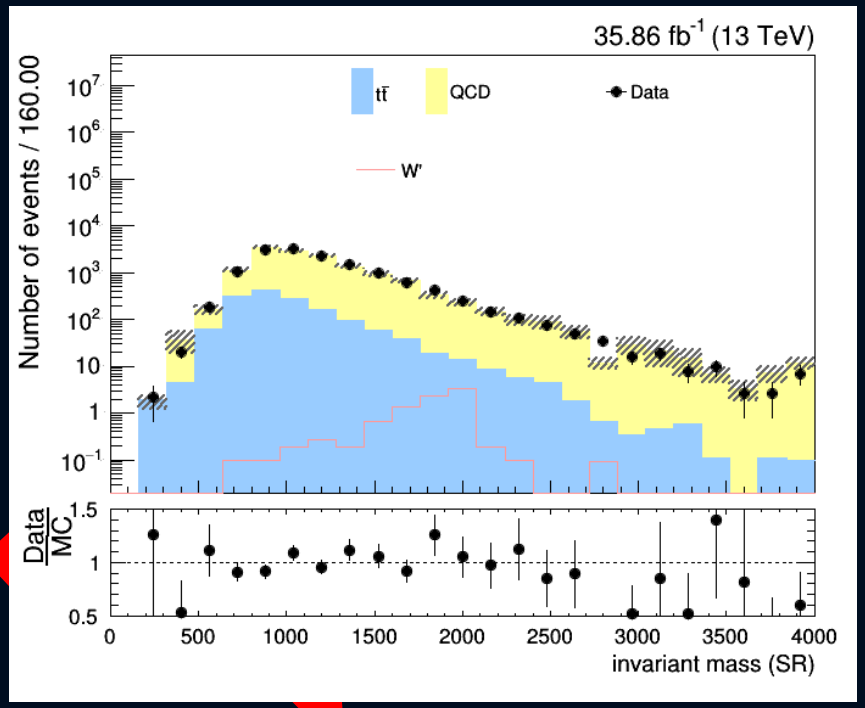
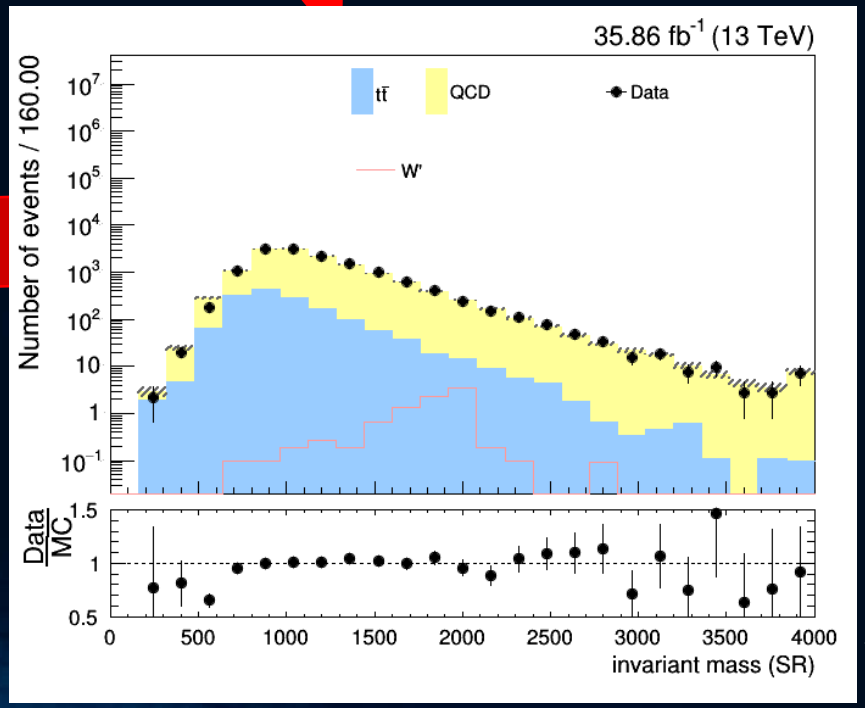
DATA DRIVEN



Without Data-Driven



With Data-Driven

WORK IN PROGRESS…

- Further optimize the selection
- Check correlation of W’ mass variable across control regions for QCD extraction
- Finalize trigger strategy, add scale factors
- Include systematics
- Perform the limit evaluation
- Running on 2017 data

THANKS

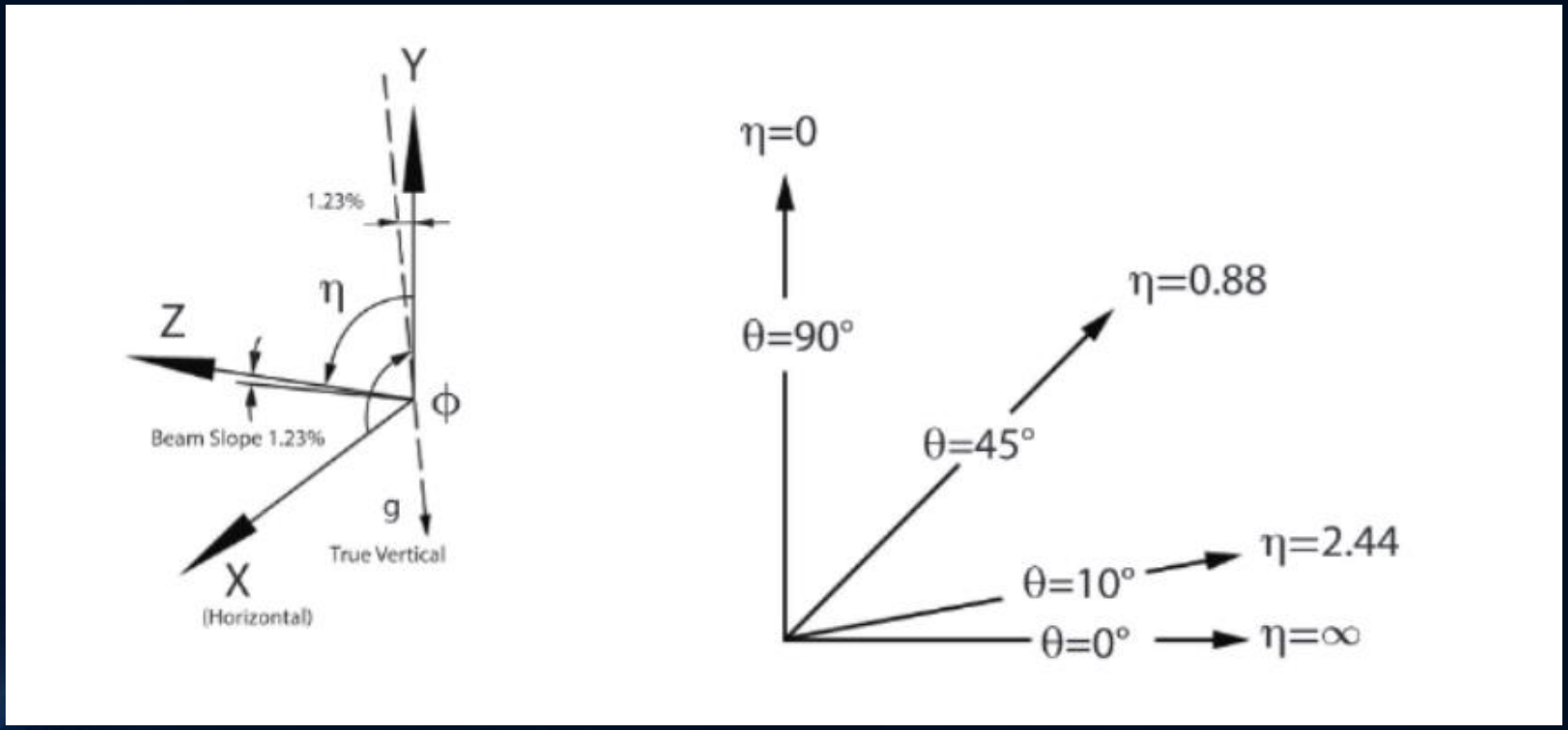
BACKUP

σ

	σ (pb)
W’	0.11459
tt̄ 0-700	831.76
tt̄ 700-1000	80.5
tt̄ 1000-inf	21.3
QCD 300-500	347700
QCD 500-700	32100
QCD 700-1000	6831
QCD 1000-1500	1207
QCD 1500-2000	120
QCD 2000-inf	25

R è il raggio parametro usato per definire la porzione di angolo solido coperto dal jet.

$$R = \sqrt{\phi^2 + \eta^2} \qquad \text{con} \qquad \eta = -ln\left(tg\ \frac{\theta}{2}\right)$$



INVARIANT MASS

$$M = \sqrt{\left(\sum_i E_i\right)^2 - \left(\sum_i \vec{p}_i\right)^2}$$

$$p^2 = p_x^2 + p_y^2 + p_z^2$$

$$p_x = p_T \cos\phi$$
$$p_y = p_T \, sen\phi$$
$$p_z = p_T \operatorname{senh}\eta$$

$$|p| = p_T \cosh\eta$$