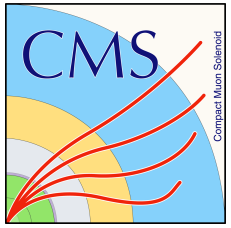
Weekly Report
NTUA
17/1/2020

George Bakas

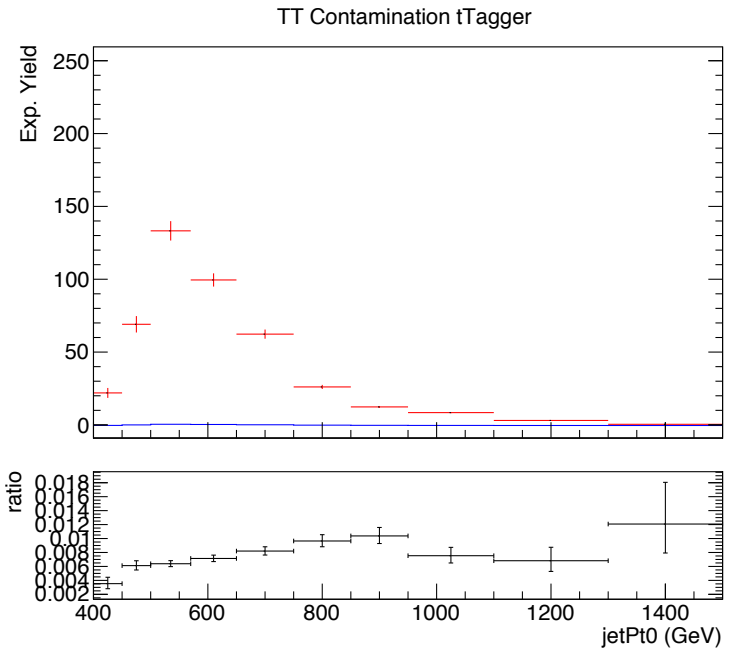


Status Report

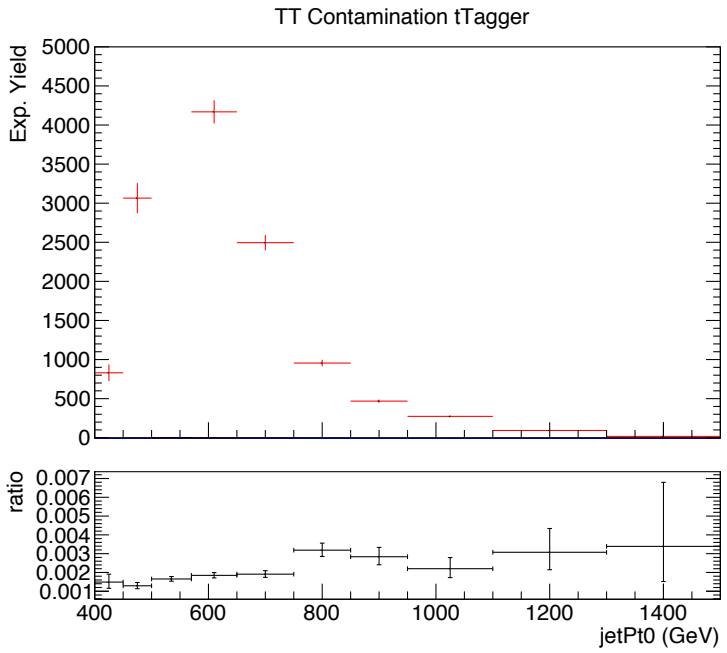
- Files for 2017 and 2018 with Loose B tagging working points
- Mixed situation where:
  - CR: Loose B-tagging WP
  - SR: Medium B-tagging WP
- New TT Contamination plots, qcd closure ✓
- Mass Fit ✓
- Transfer factor: R_{yield} ✓
  - We need to estimate the uncertainty of the transfer factor
  - To check the sensitivity of the transfer factor
    - Production for all years with QCD b-enriched MC's ✓
    - QCD MC → pdf weights
- For 2017 and 2018:
  - TT MC is now: Hadronic, Semileptonic and Leptonic
    - As a result we need to produce all files and add them scaled to their XSEC (Weights * LUMI / XSEC) in order to calculate efficiency and acceptance
    - Production ✓
    - We can check how different the results are with the High Mtt samples
- For 2018:
  - Until now we didn't have qcd MC files (used 2017 QCD files).
  - QCD files for 2018 are now available → production ✓
- Fiducial Measurement:
  - Ryield uncertainty and correction only missing

TT contamination with mixed btagging wp's

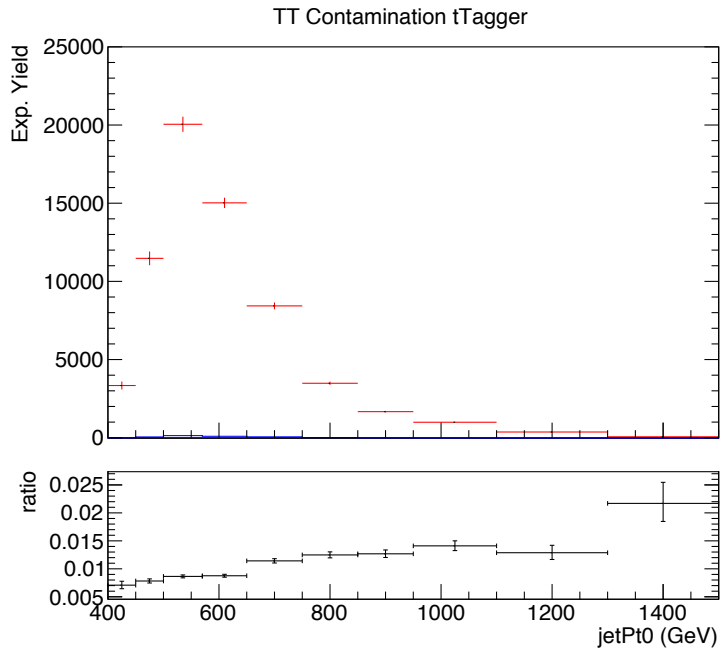
2016



2017



2018



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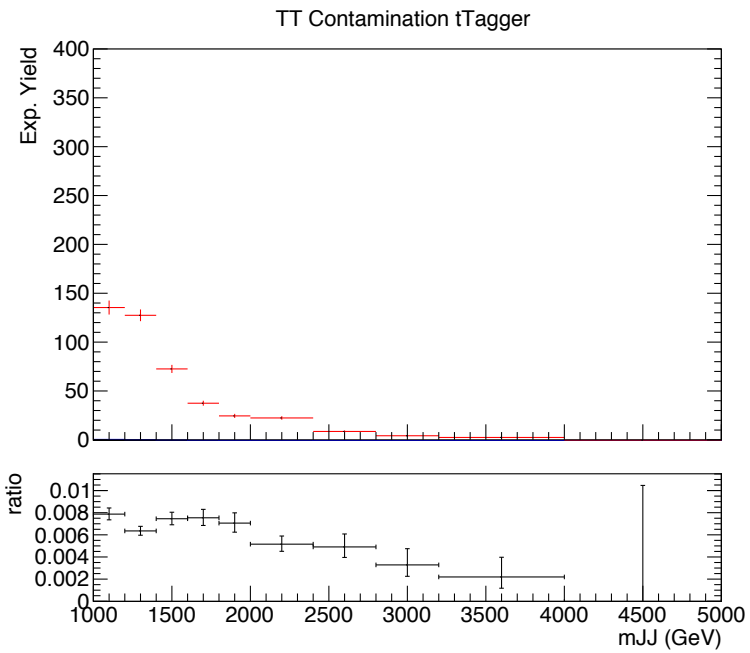
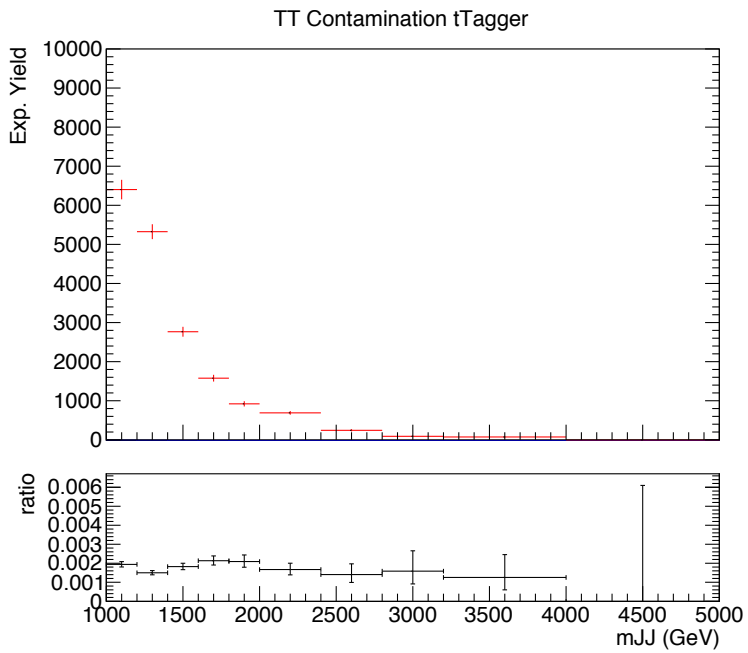
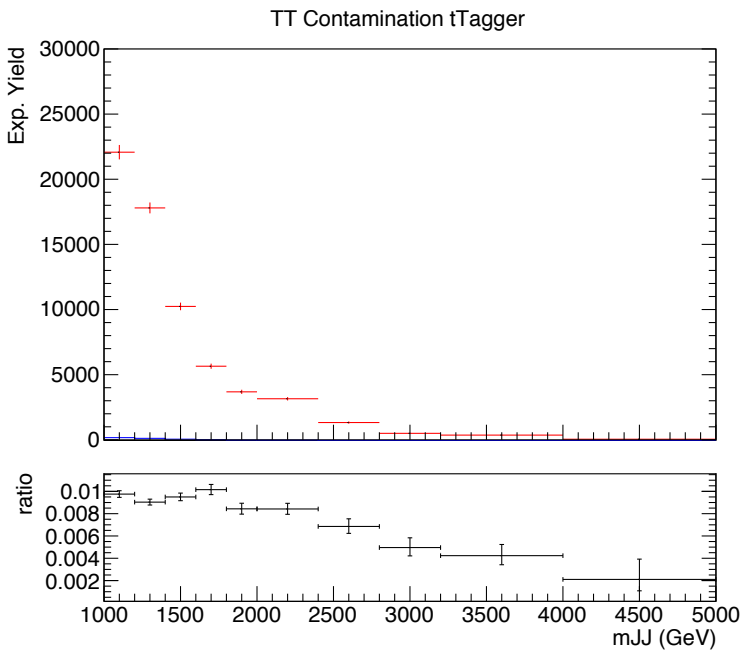


2017

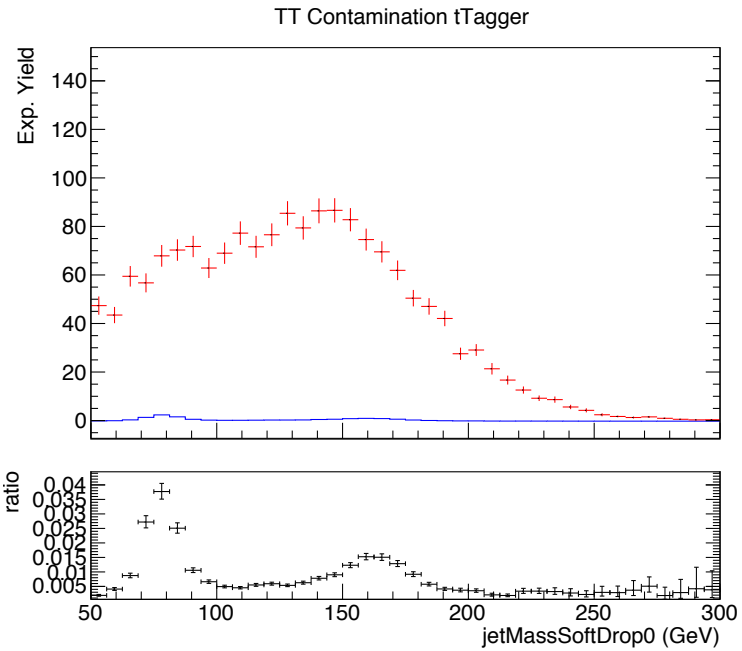


2018

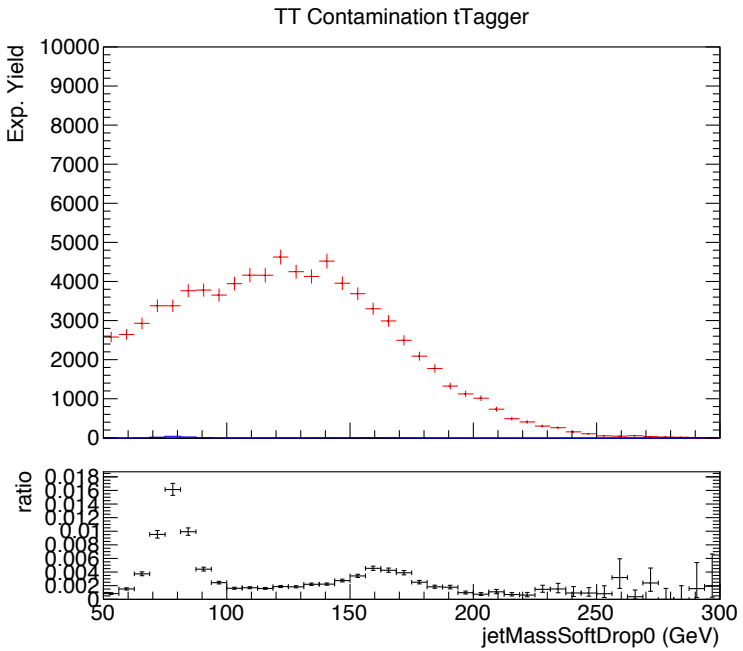


TT contamination with mixed btagging wp's

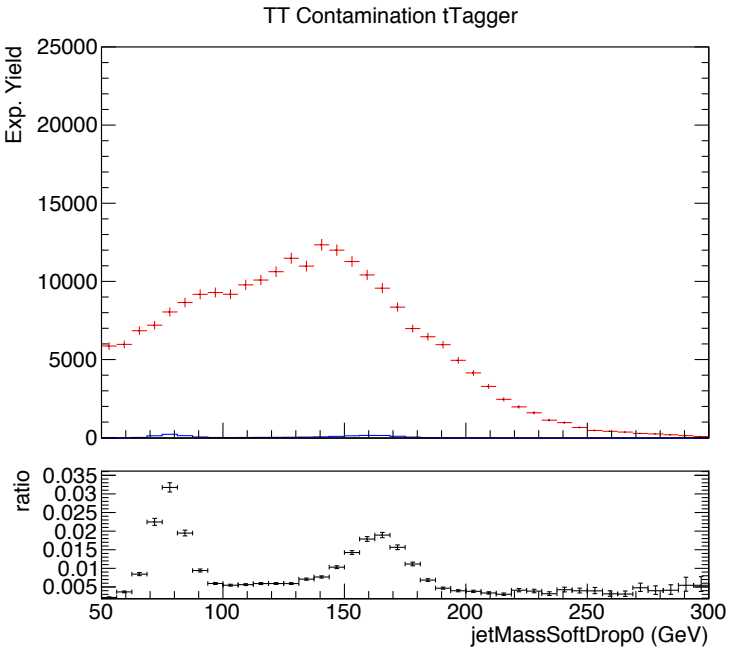
2016



2017

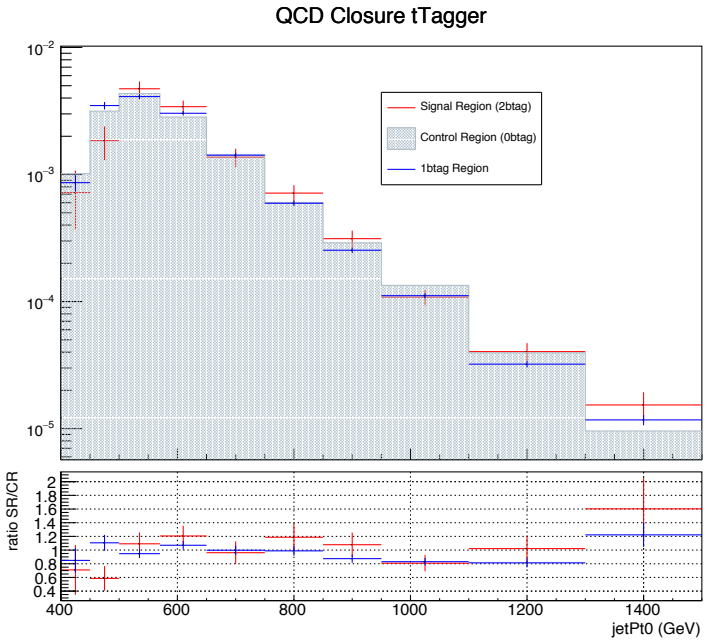


2018

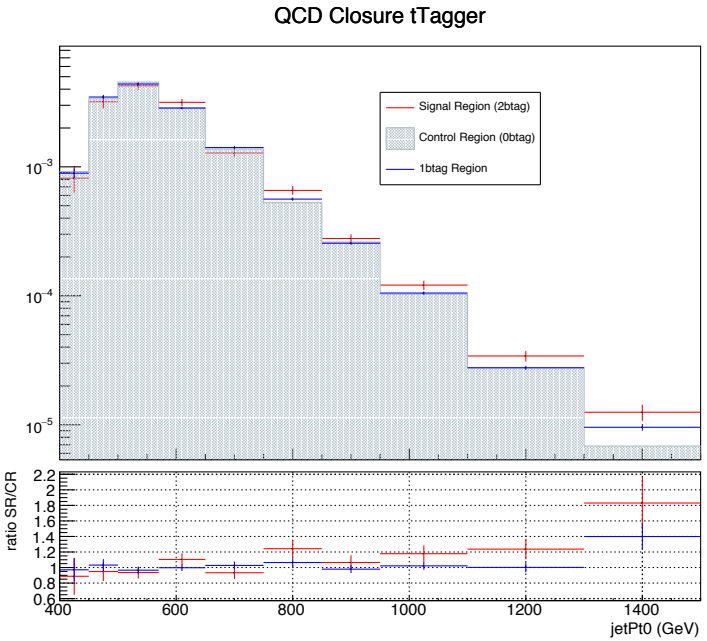


QCD Closure tests with mixed b-tagging WP's

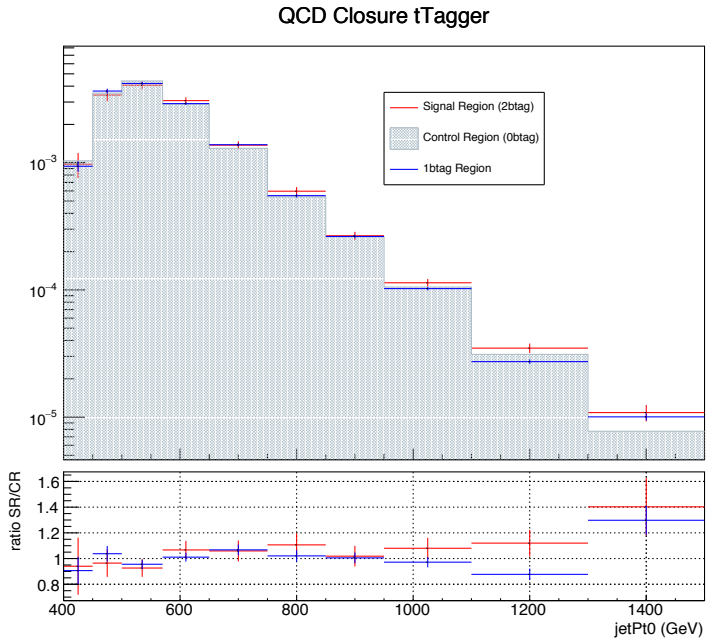
2016



2017

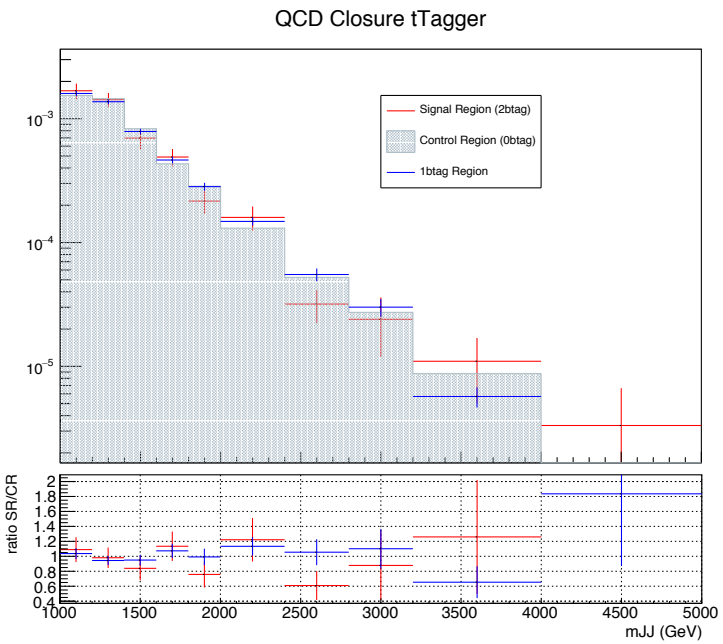


2018

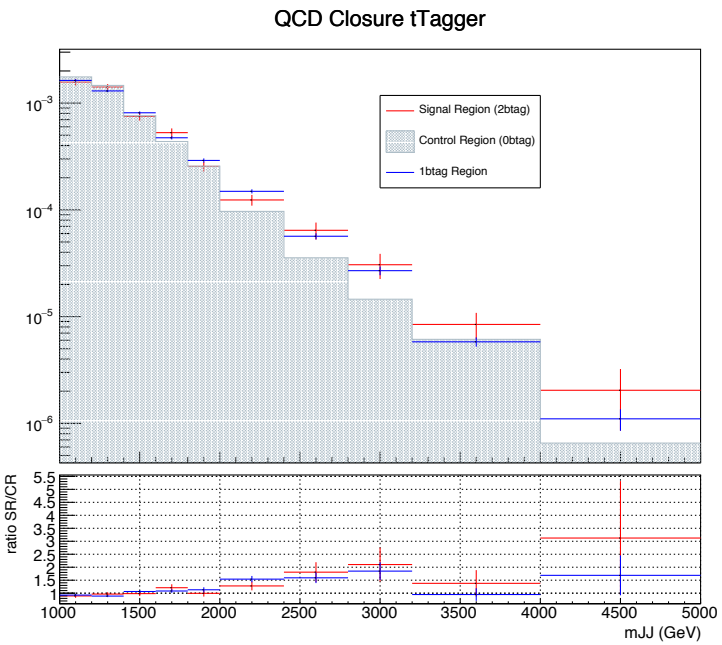


QCD Closure tests with mixed b-tagging WP's

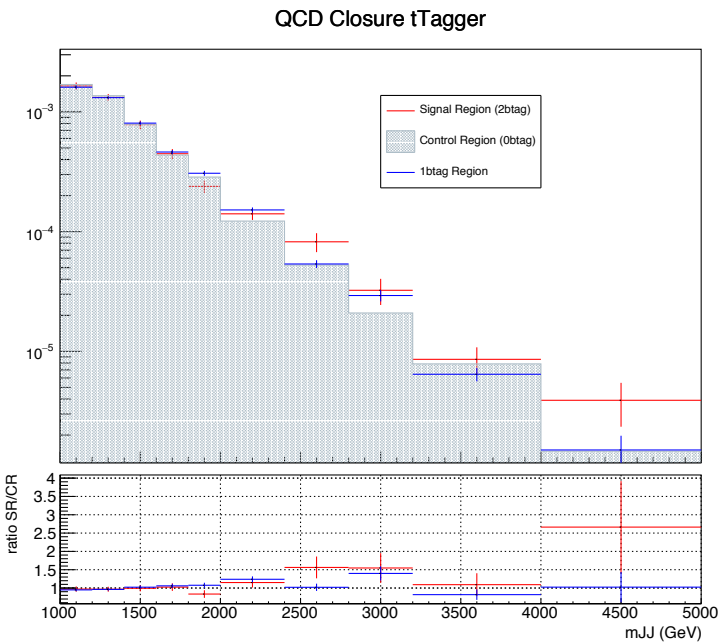
2016



2017



2018



Signal Extraction

Measured dist from data

QCD shape taken from Data (CR)

$$S(x_{reco}) = D(x_{reco}) - N^{(2)}_{QCD,reduced} C^{shape}_{QCD}(x_{reco}) Q(x_{reco}) - B(x_{reco})$$

Fiducial Yield

Mass Fit in 2btag region

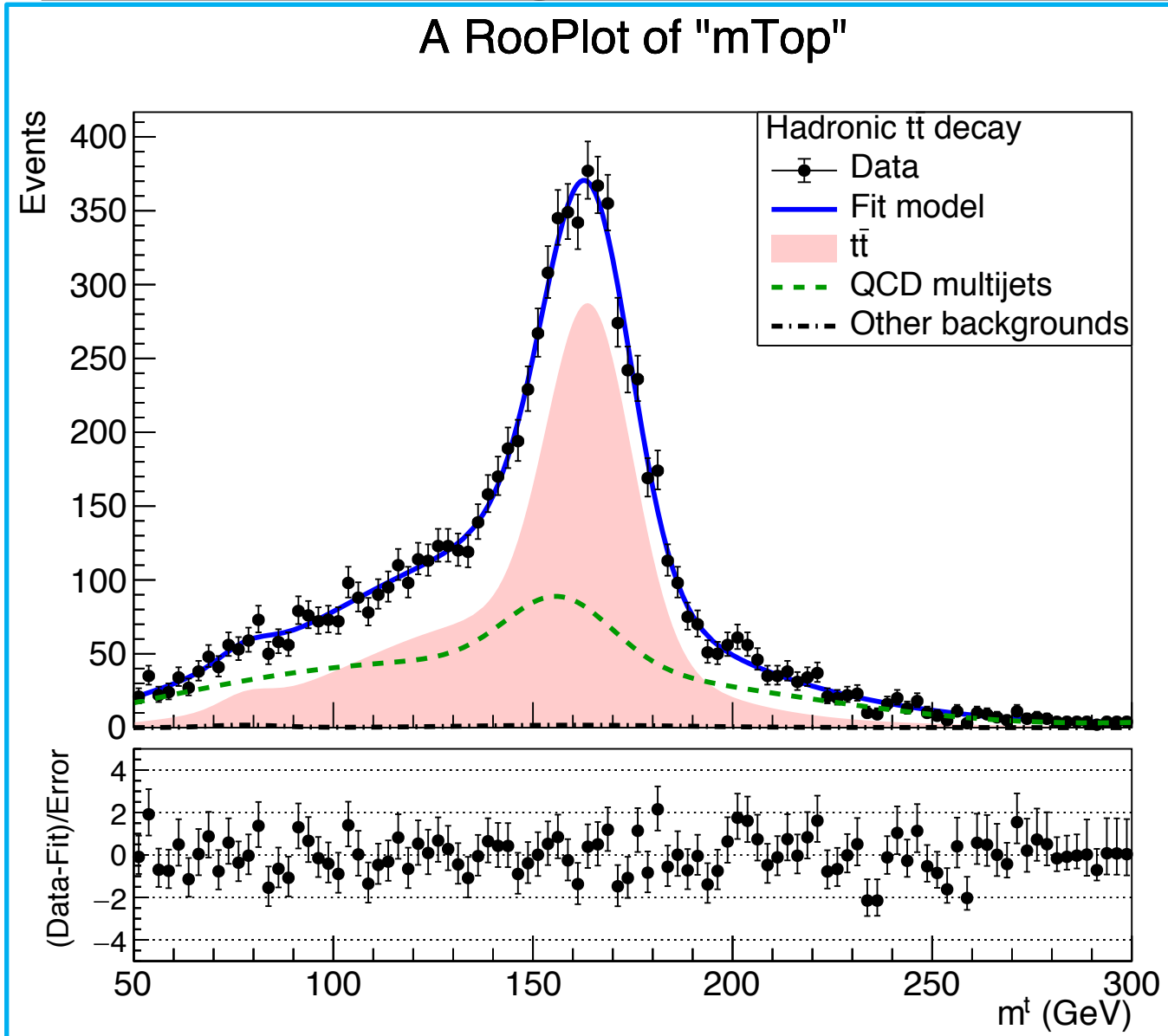
QCD shape correction factor

Subdominant bkg shape and contribution (MC)

- Where x_{reco} is the respected variable of interest (ttbar mass,pt, rapidity, leading and subleading jetPt and |jetY|)
- We deploy a fit in the 2btag region: Now we have a pure Control Region.

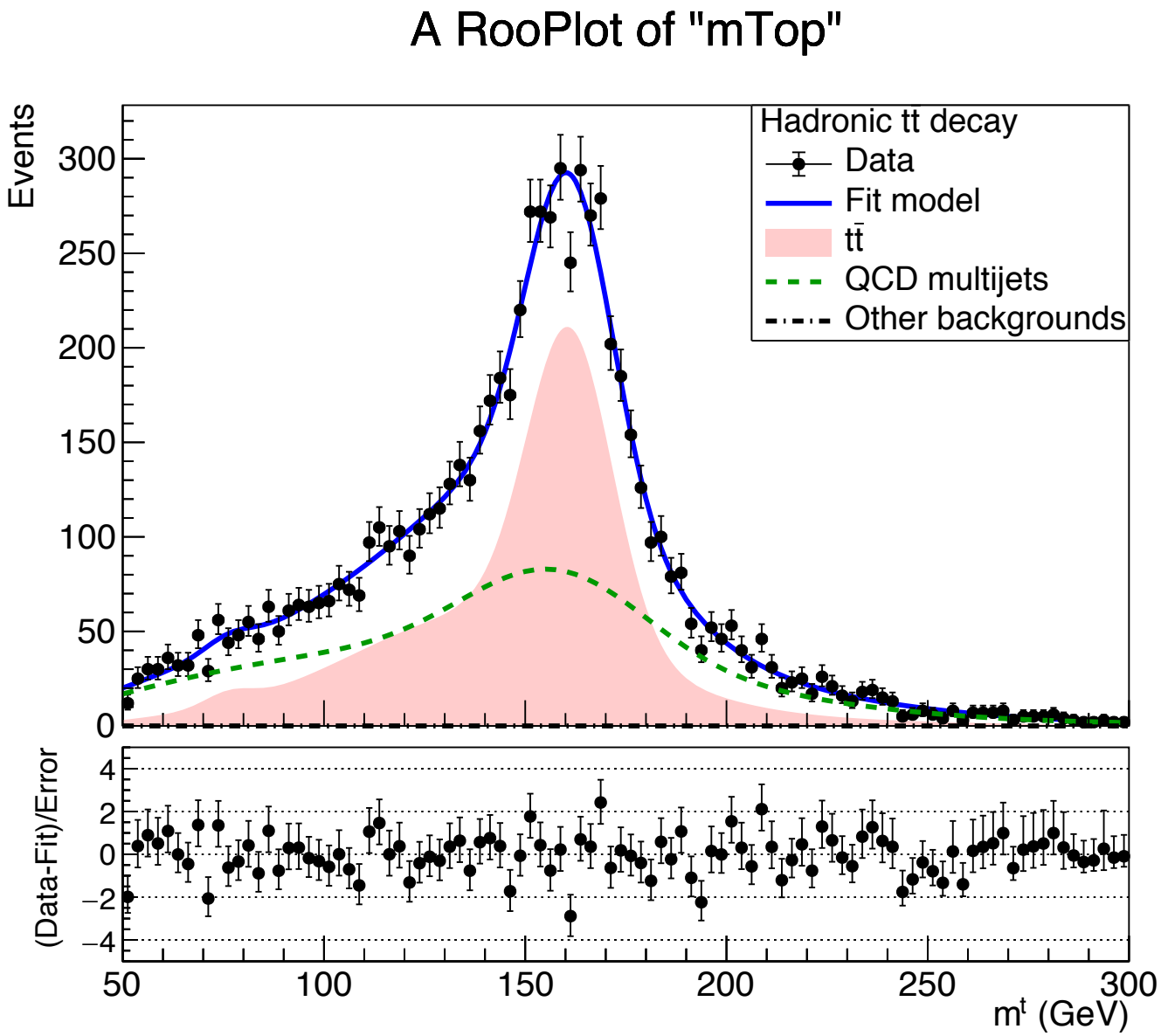
$$D(m^t)^{(2)} = N^{(2)}_{tt} T^{(2)}(m^t, k_{MassScale}, k_{MassResolution}) + N^{(2)}_{bkg} B(m^t)(1 + k_1 x) + N^{(2)}_{sub} O^{(2)}(m^t)$$

Fit Result 2016 using CR Loose WP and SR Medium WP



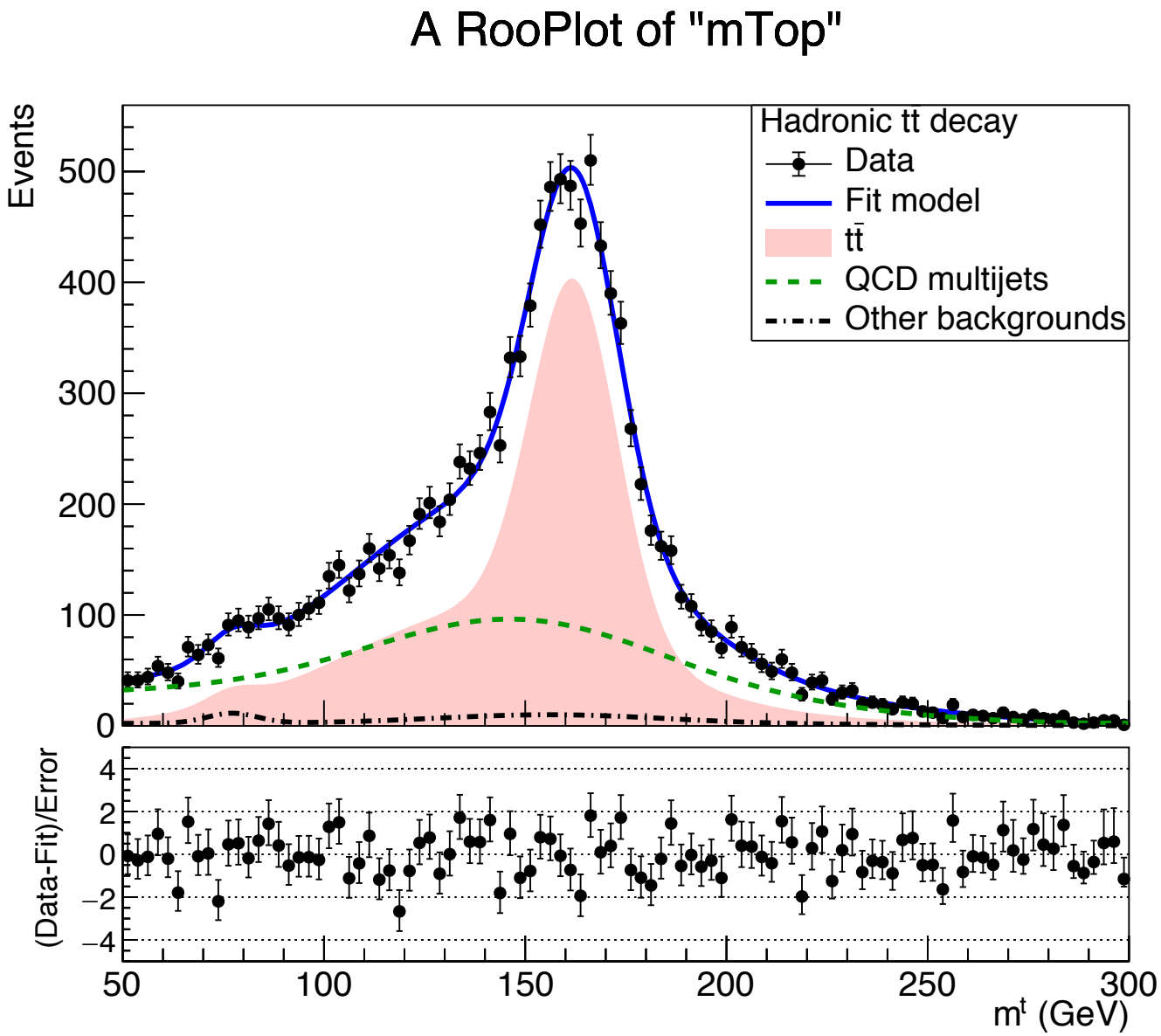
Floating Parameter	FinalValue +/-	Error
kMassResol	9.7943e-01 +/-	3.33e-02
kMassScale	1.0039e+00 +/-	4.13e-03
kQCD_2b	3.6446e-01 +/-	1.64e+00
nFitBkg_2b	6.3506e+01 +/-	1.41e+02
nFitQCD_2b	3.2755e+03 +/-	2.09e+02
nFitSig2b	5.1672e+03 +/-	1.73e+02
qcd_b0	9.7207e-01 +/-	1.45e+00
qcd_b1	1.8572e+00 +/-	1.05e+00
qcd_b2	2.8832e-01 +/-	1.25e-01
qcd_b3	1.6395e-05 +/-	1.28e+00
qcd_b4	3.5595e-02 +/-	2.78e-02
qcd_f1	8.4093e-01 +/-	2.66e-02
qcd_mean	1.5539e+02 +/-	2.92e+00
qcd_sigma	1.3283e+01 +/-	2.61e+00

Fit Result 2017 using CR Loose WP and SR Medium WP



Floating Parameter	FinalValue +/- Error
kMassResol	1.0015e+00 +/- 6.95e-02
kMassScale	9.8569e-01 +/- 4.83e-03
kQCD_2b	-3.1159e-03 +/- 3.94e-04
nFitBkg_2b	1.9719e-04 +/- 3.50e+02
nFitQCD_2b	3.3491e+03 +/- 6.98e+02
nFitSig2b	3.8962e+03 +/- 6.97e+02
qcd_b0	2.4669e-02 +/- 2.58e-02
qcd_b1	8.1279e-02 +/- 8.80e-02
qcd_b2	1.4843e-01 +/- 1.39e-01
qcd_b3	2.9683e-07 +/- 4.02e-01
qcd_b4	3.1764e-02 +/- 5.48e-02
qcd_f1	6.7973e-01 +/- 6.50e-02
qcd_mean	1.6077e+02 +/- 4.50e+00
qcd_sigma	2.2815e+01 +/- 5.92e+00

Fit Result 2018 using CR Loose WP and SR Medium WP



Floating Parameter	FinalValue +/- Error
kMassResol	1.0014e+00 +/- 2.36e-02
kMassScale	9.9029e-01 +/- 1.75e-03
kQCD_2b	3.3835e-03 +/- 4.33e-03
nFitBkg_2b	4.4771e+02 +/- 1.26e+02
nFitQCD_2b	4.5360e+03 +/- 1.52e+02
nFitSig2b	7.3403e+03 +/- 1.45e+02
qcd_b0	1.8669e+00 +/- 1.60e+00
qcd_b1	1.8415e+00 +/- 1.83e+00
qcd_b2	1.5600e+00 +/- 3.65e-01
qcd_b3	1.0321e-04 +/- 1.59e+00
qcd_b4	9.1230e-02 +/- 6.29e-02
qcd_f1	4.9374e-01 +/- 1.19e-01
qcd_mean	1.4549e+02 +/- 2.51e+00
qcd_sigma	3.5629e+01 +/- 1.97e+00

Transfer Factors (Closure tests) in mixed Loose WP CR and Medium WP SR