

W charge asymmetry studies: pseudorapidity rebinning

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15.12.2017

Object and event selection

For this analysis, the events are collected when triggered by the presence of at least one electron with large transverse energy and η cut:

- $P_T > 25 \text{ GeV}$
- $|\eta| < 2.5$

Several Monte Carlo event generators are used to simulate the signal and background processes:

- MadGraph5 aMC@NLO - event samples for the W and Z boson signal and top background.
- PYTHIA 8 with NNPDF3.0 - parton shower.
- PYTHIA 8 and POWHEG - diboson backgrounds.
- GEANT4 - detector response.

Probability Density Function fits*

QCD background modeled by analytical function:

$$f(x) = x \cdot \exp(\{-x^2\} / \{ax^2+bx+c\}) *$$

$$a = 4.0 \in [-10.0, 10.0]$$

$$b = 6.0 \in [0.0, 20.0]$$

$$c = 2.9 \in [0.3, 6.0]$$

$$X \in [0.0, 2.0, 150.0]$$

Signal and EWK backgrounds are modeled with simulation based fitting functions.

As a minimum finder used Minos

*both codes uses the same function

*new function to come

smth like that $f(x) = (x \cdot \exp(\{-x^2\} / \{ax^2+bx+c\})) * (\{ax^2+bx+c\})$

NEW improvements!

Lepton efficiencies are measured in different eta bins:

- New electron eta binning:

-2.5, -2.0, -1.566, -1.4442, -1.0, -0.5,
0.0,
0.5, 1.0, 1.4442, 1.566, 2.0, 2.5

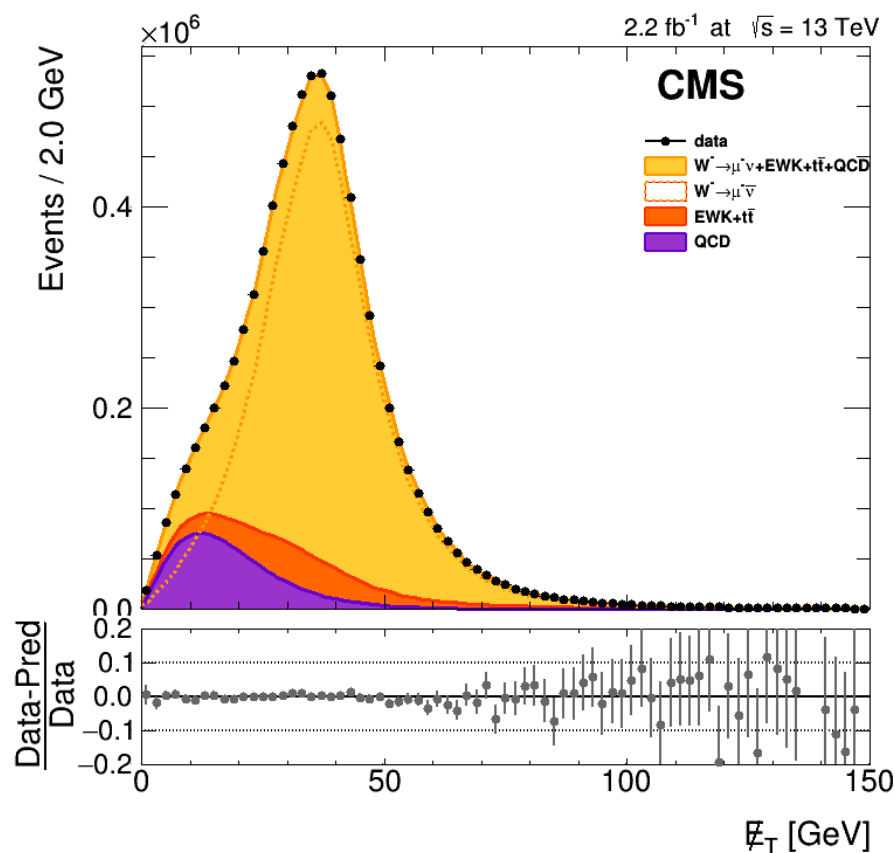
- New muon eta binning:

-2.4 -2.1, -1.2, -0.9, -0.3, -0.2,
0.0,
0.2, 0.3, 0.9, 1.2, 2.1, 2.4

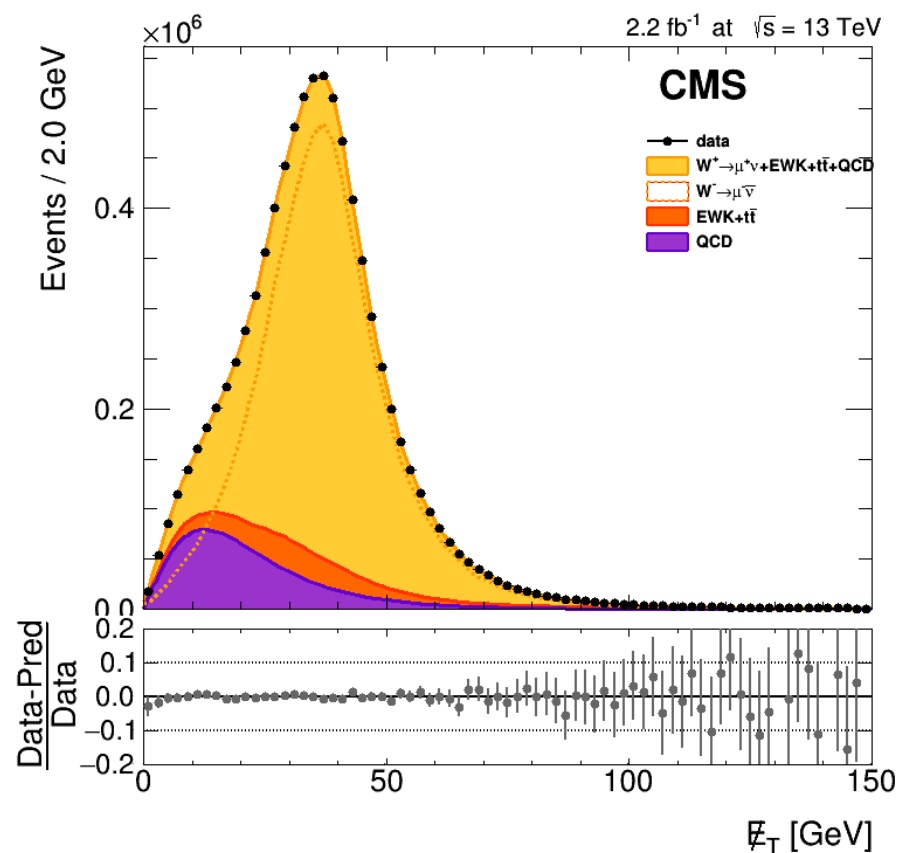
Old binning:

0.0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 1.85, 2.1, 2.5
(for muons: up to 2.4)

Comparing missing E_T for the whole eta region (W^- to muon ch.)

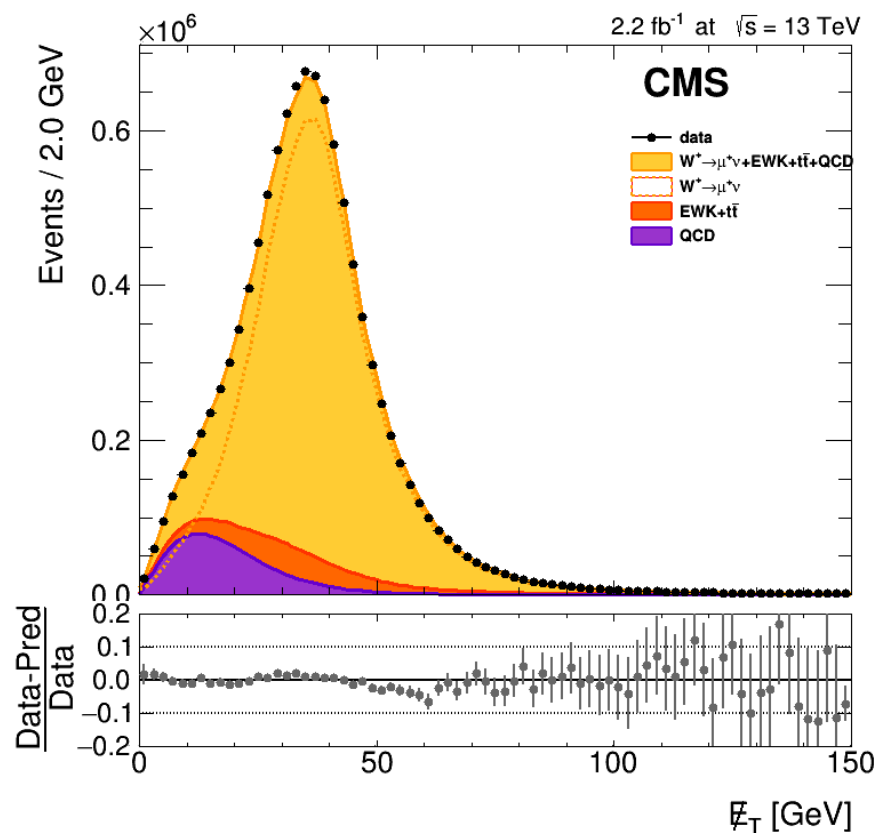


Old binning

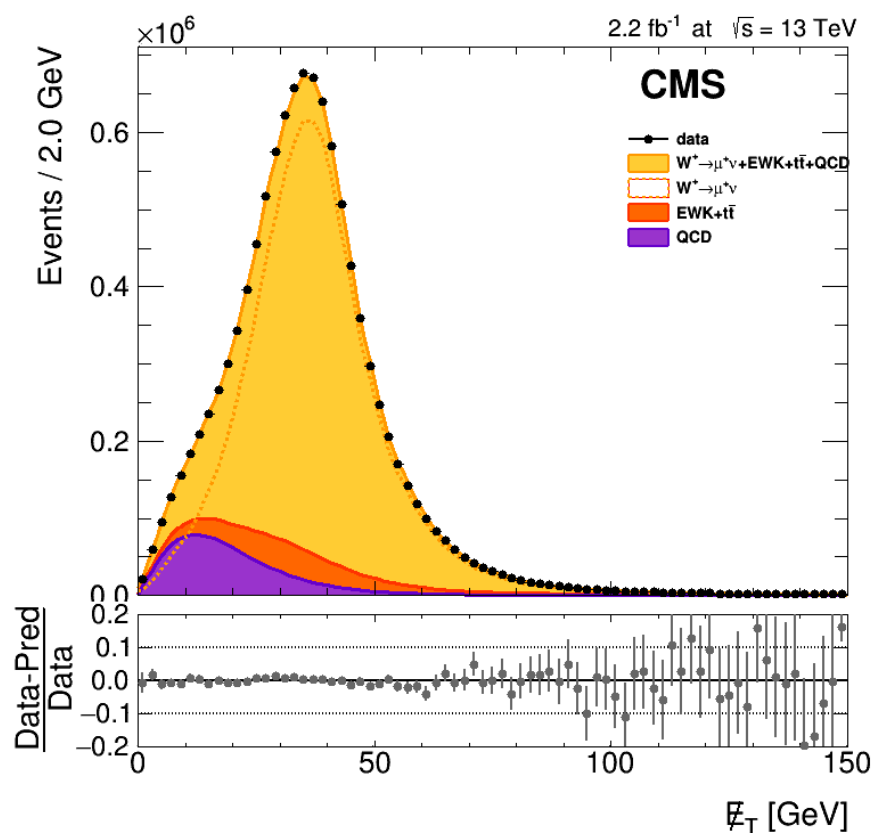


New binning

Comparing missing E_T for the whole eta region (W^+ to muon ch.)

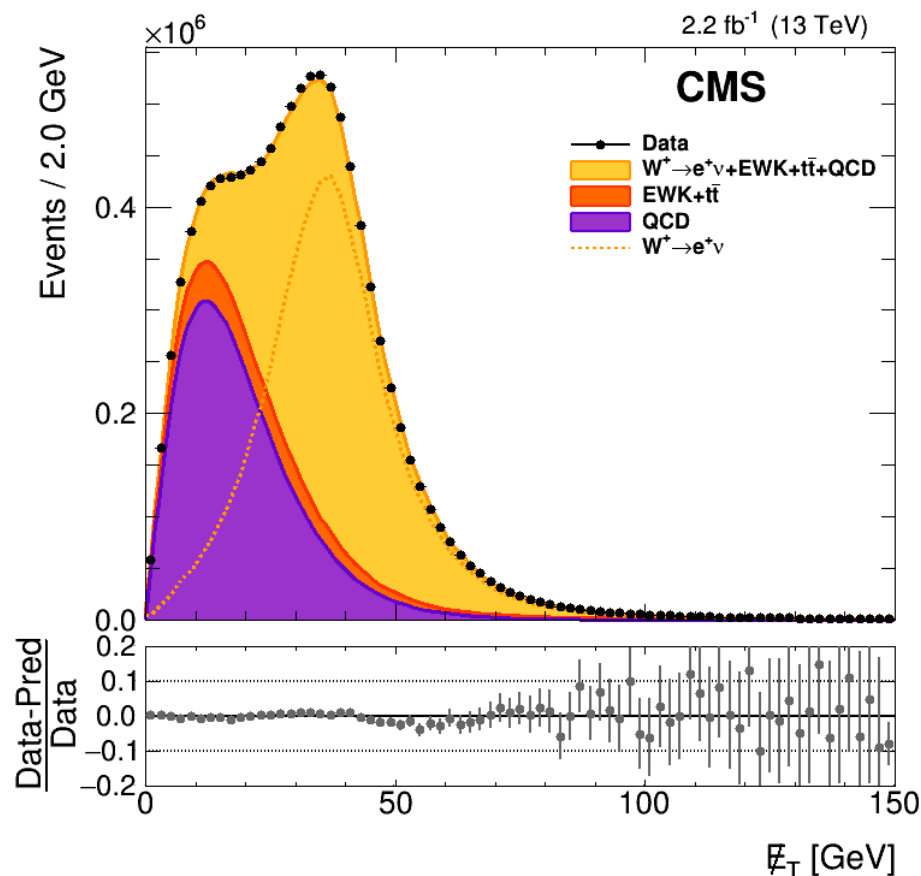


Old binning

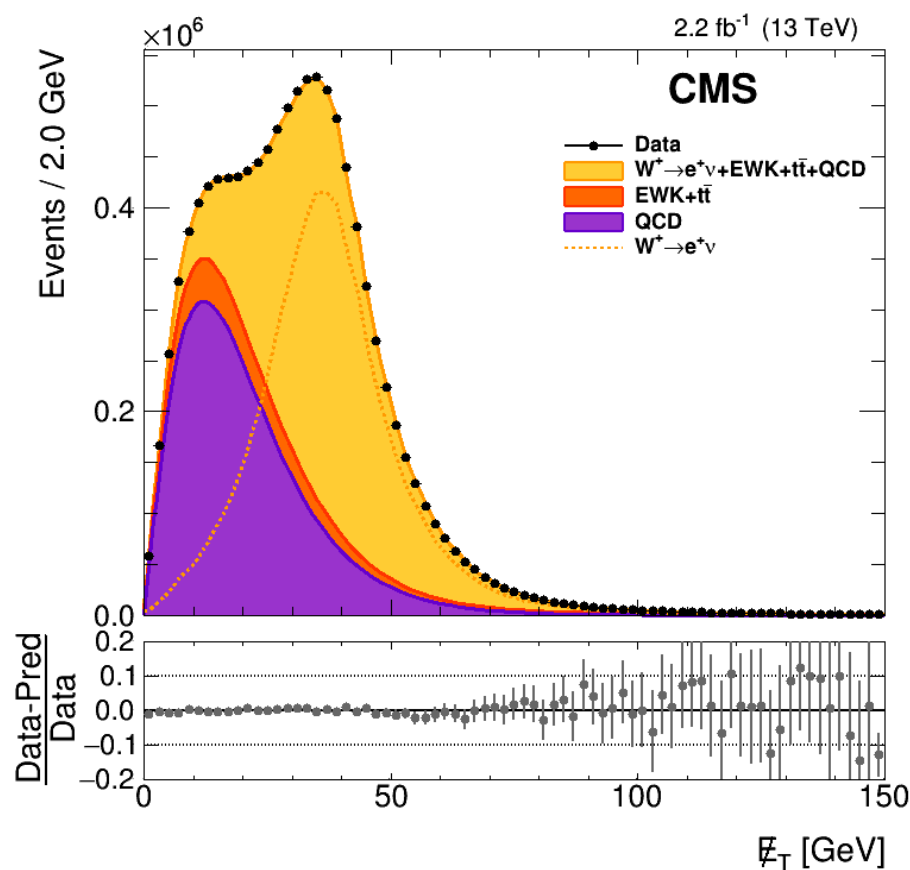


New binning

Comparing missing E_T for the whole eta region (W^+ to electron ch.)

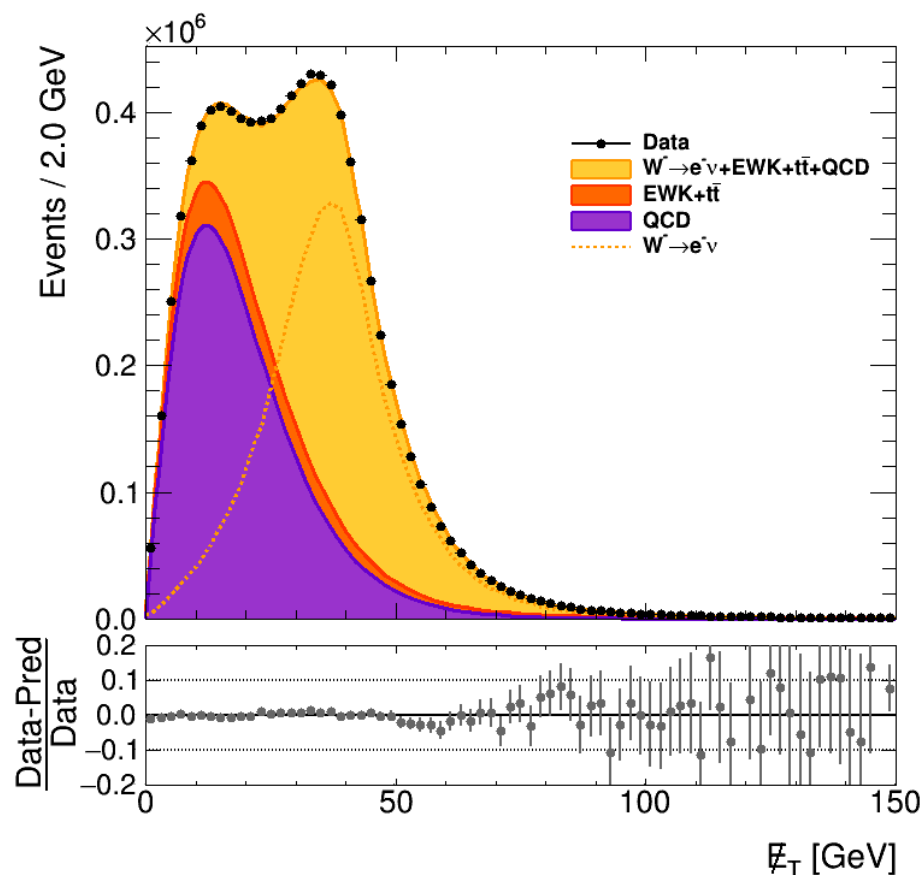


Old binning

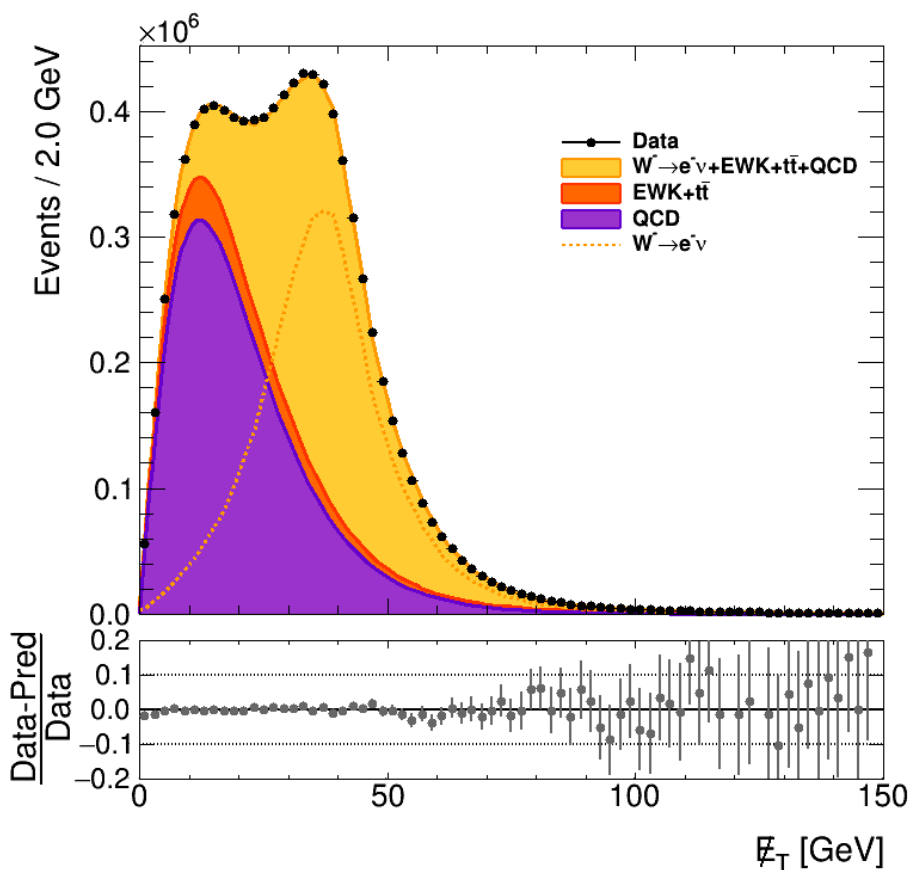


New binning

Comparing missing E_T for the whole eta region (W^- to electron ch.)

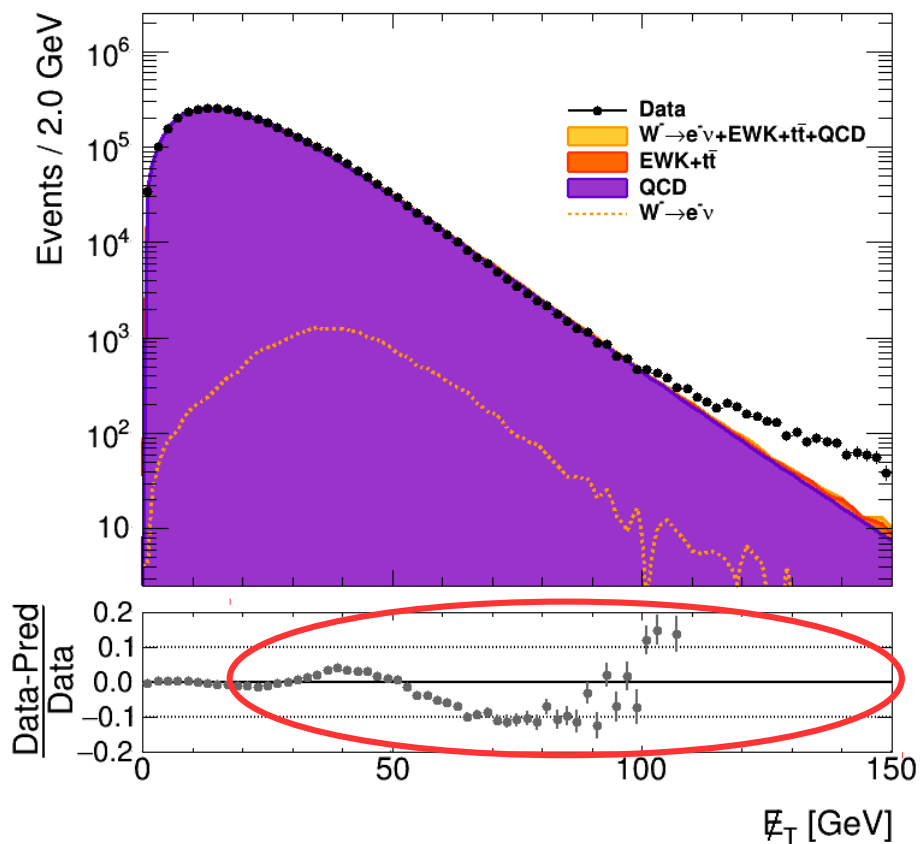


Old binning

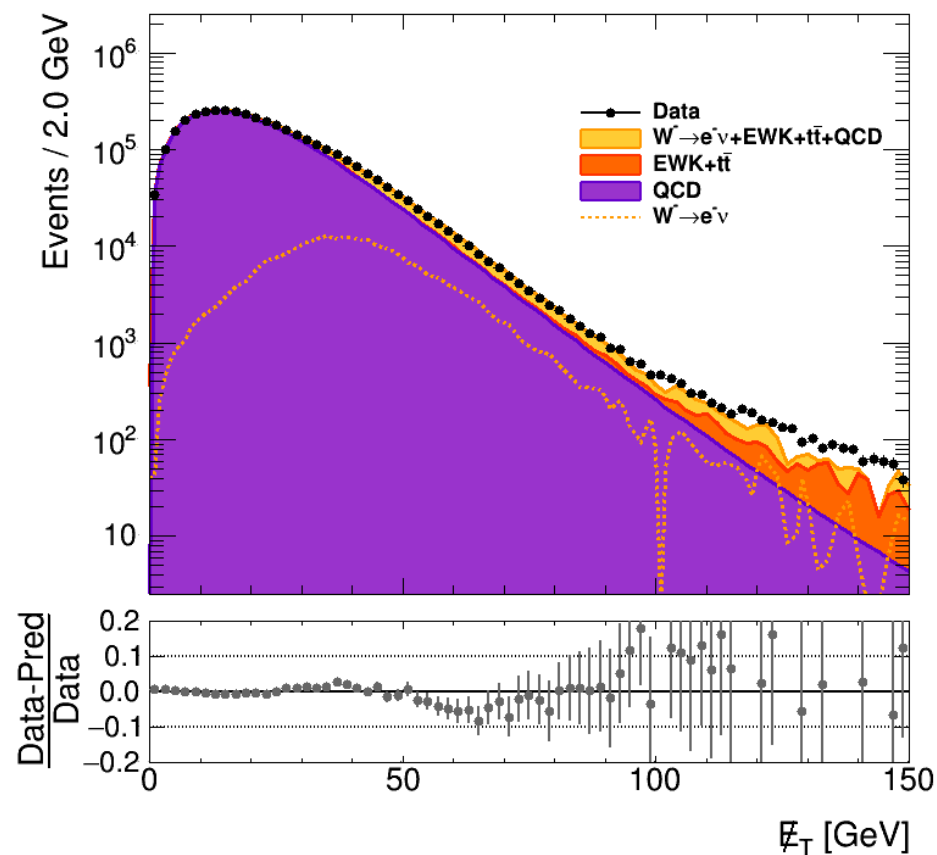


New binning

Control region

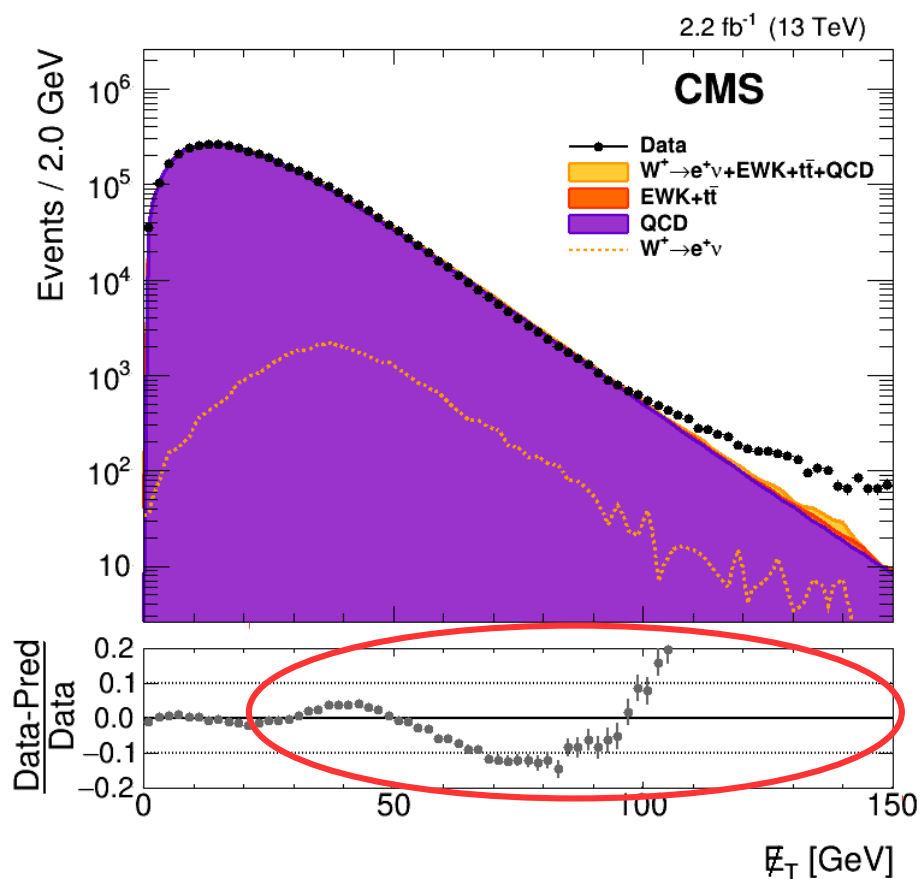


Old binning

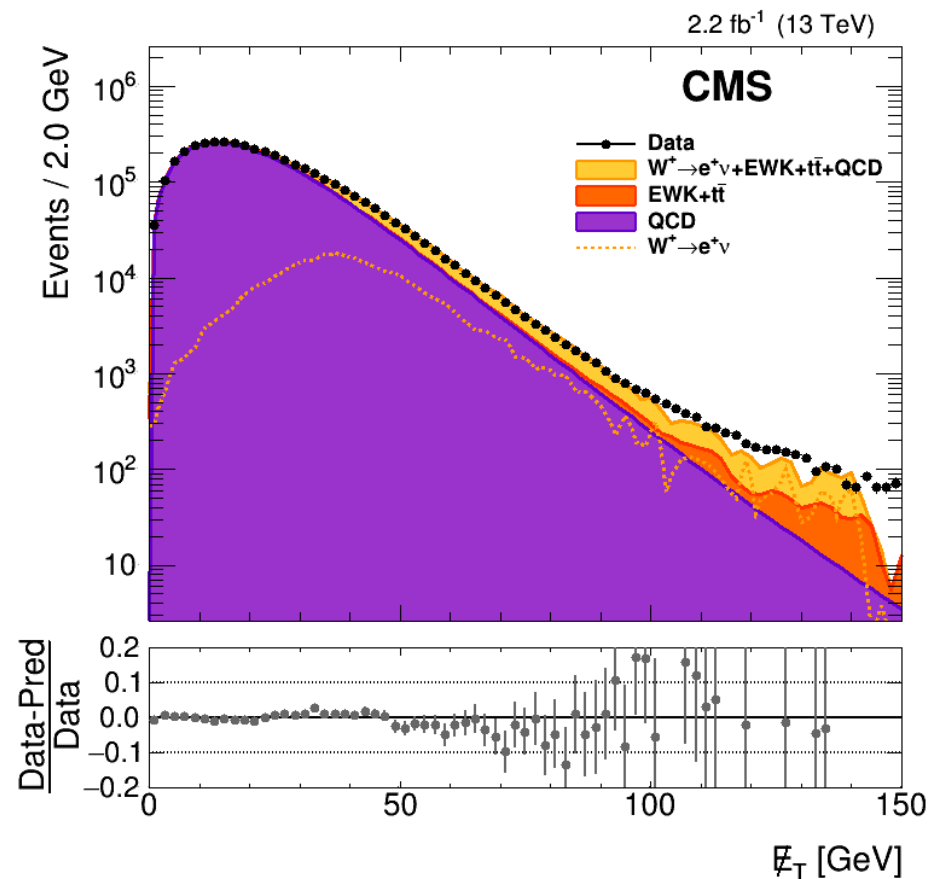


New binning

Control region



Old binning



New binning

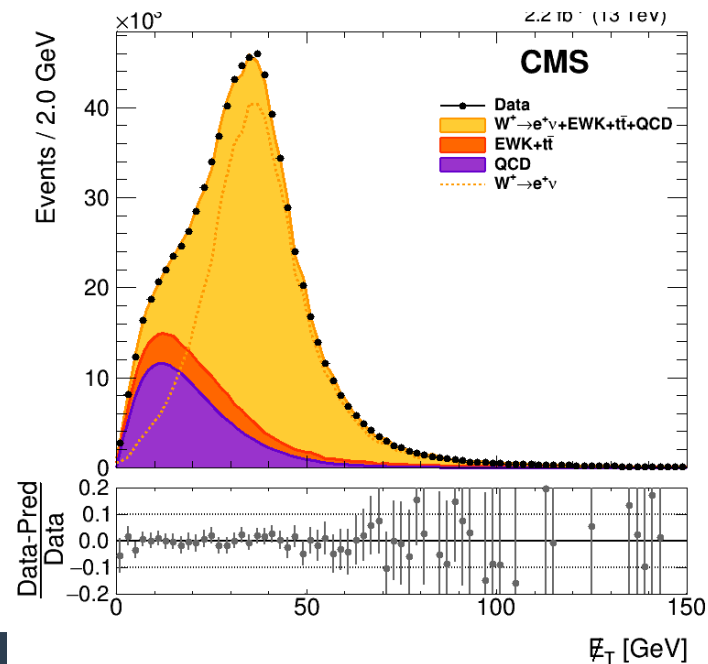
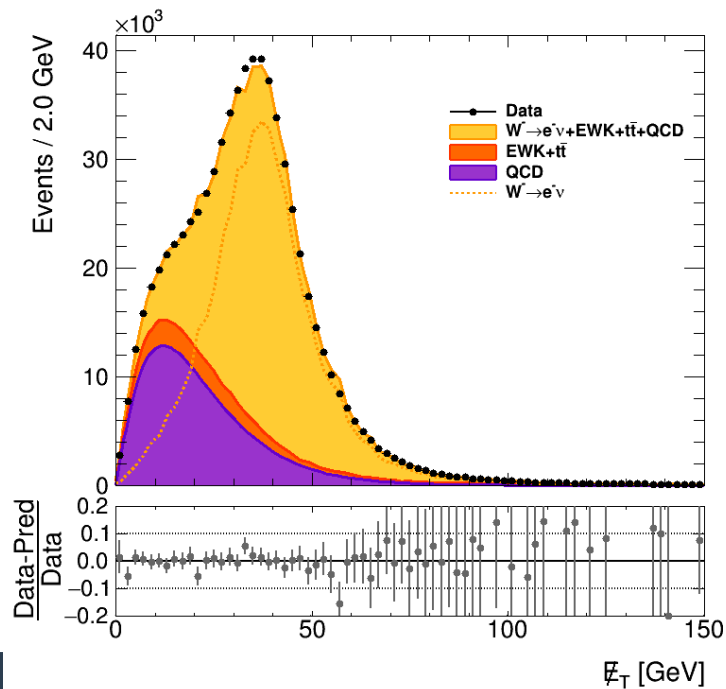
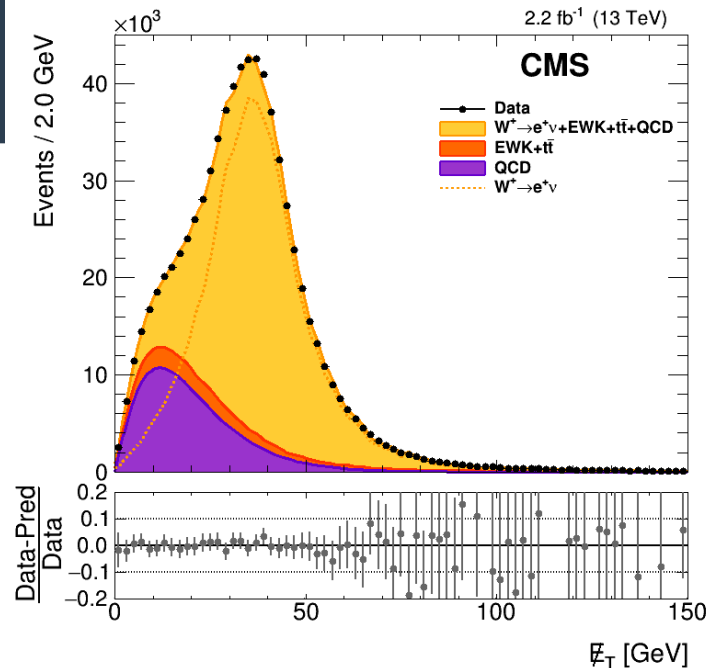
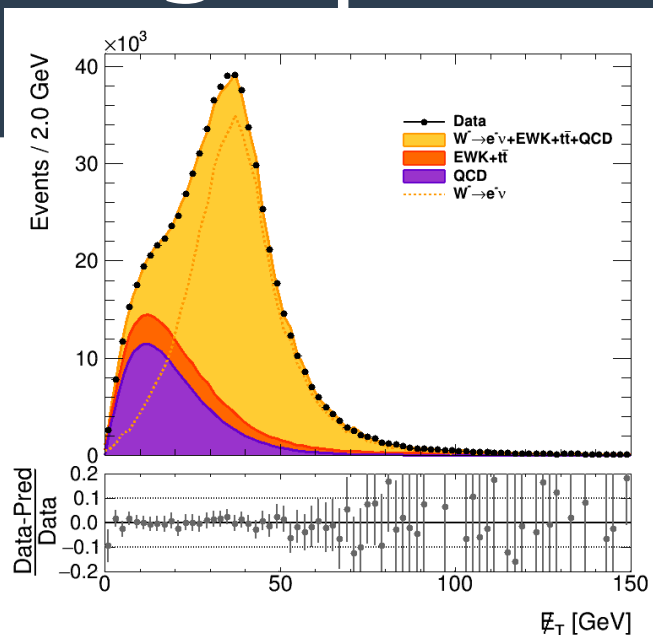
More results next Year!

Happy New Year and Merry Christmas!!

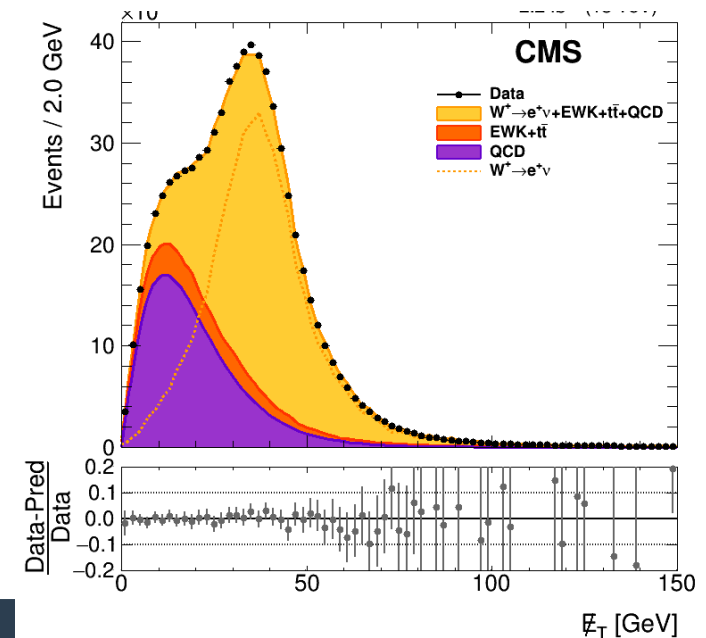
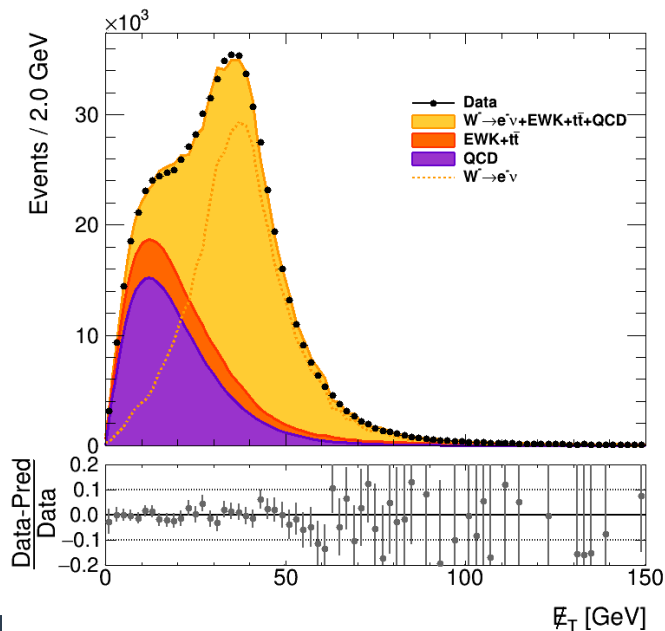
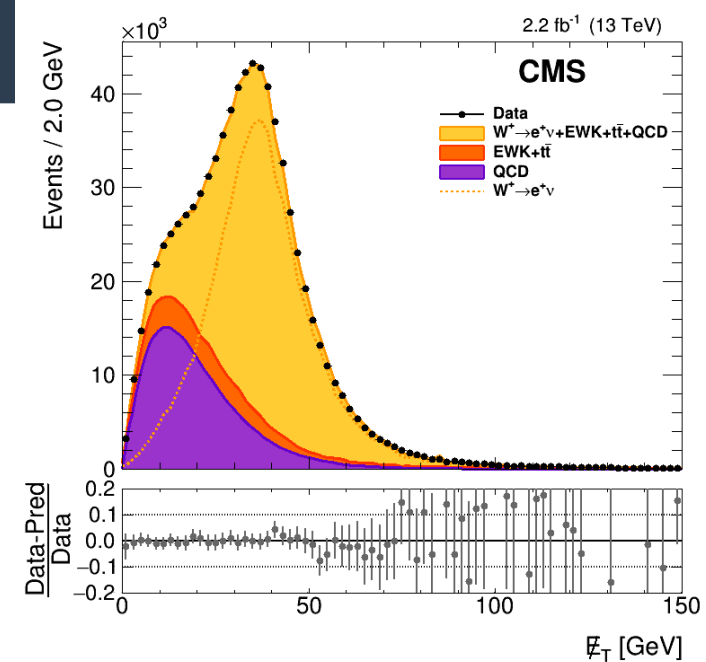
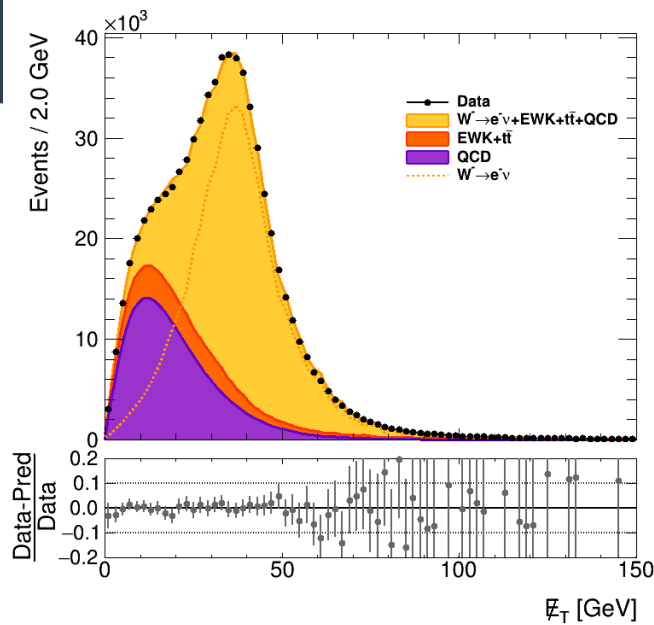


Back up

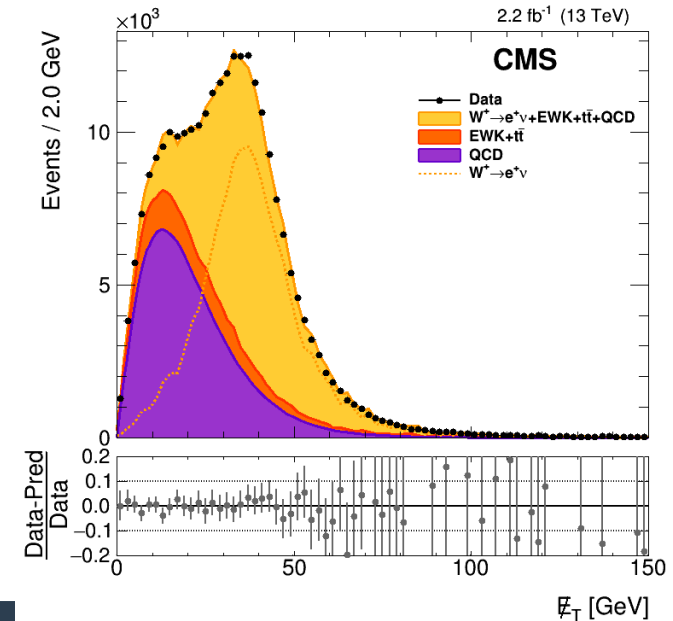
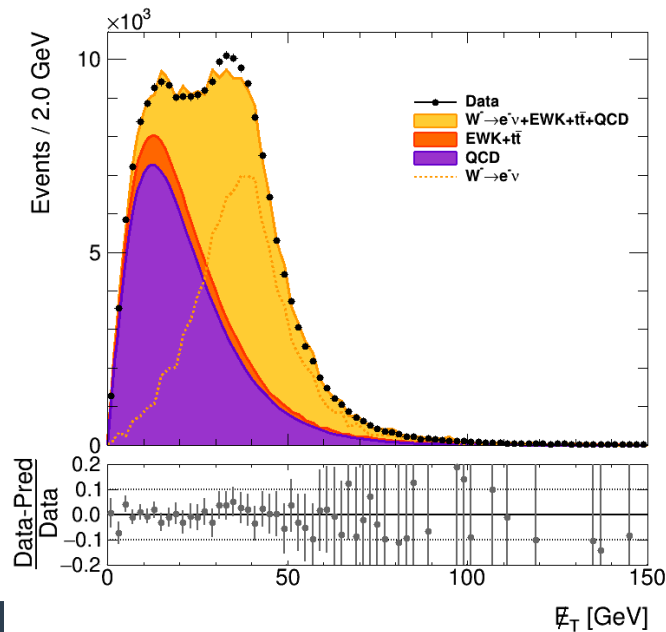
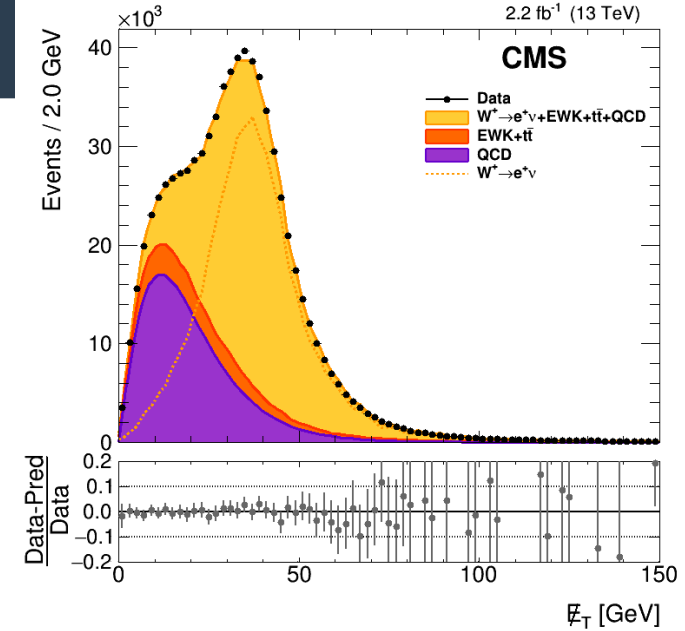
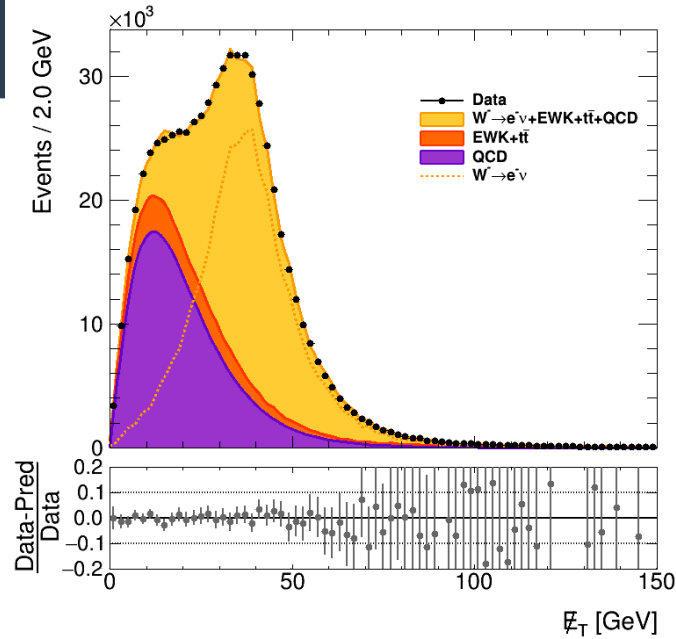
Missing E_T for eta 0.4-0.6, 0.6-0.8



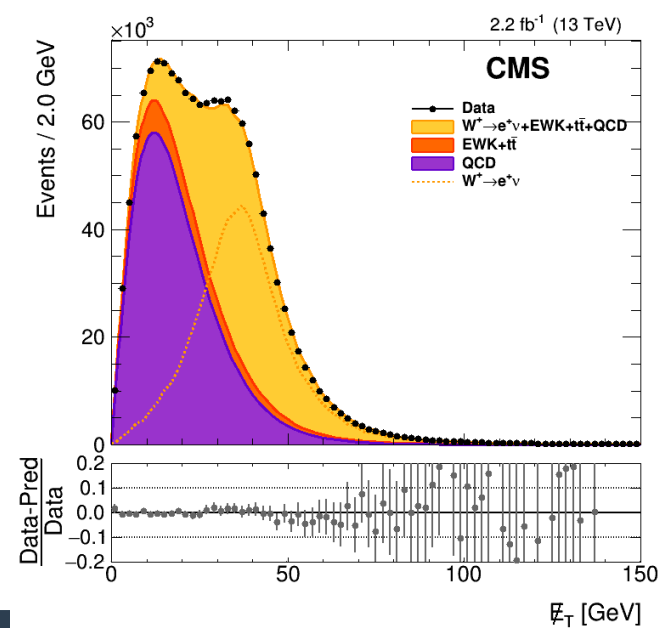
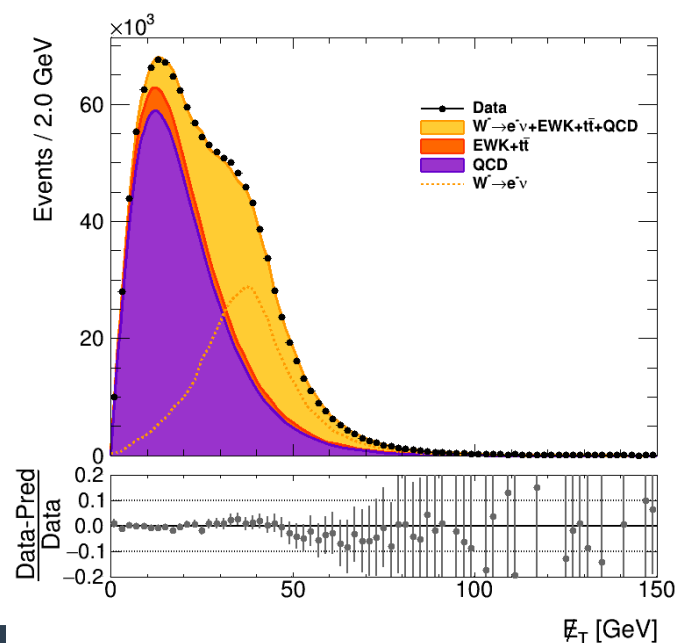
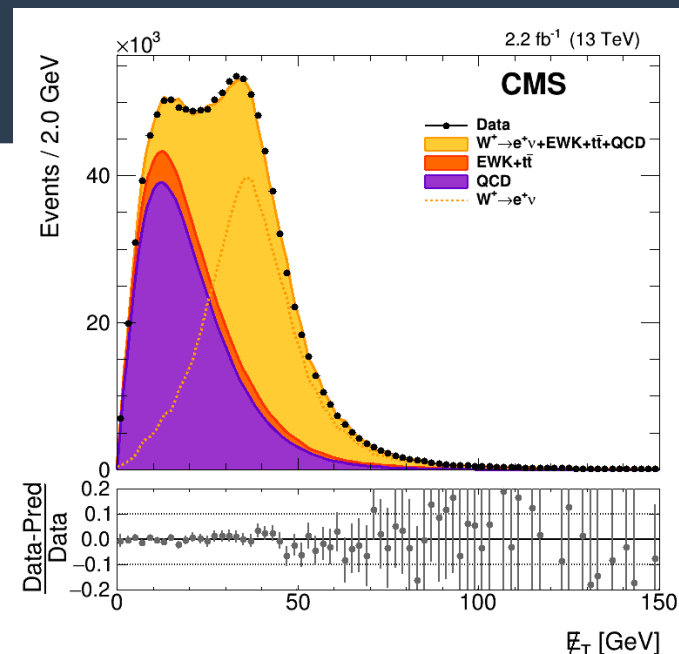
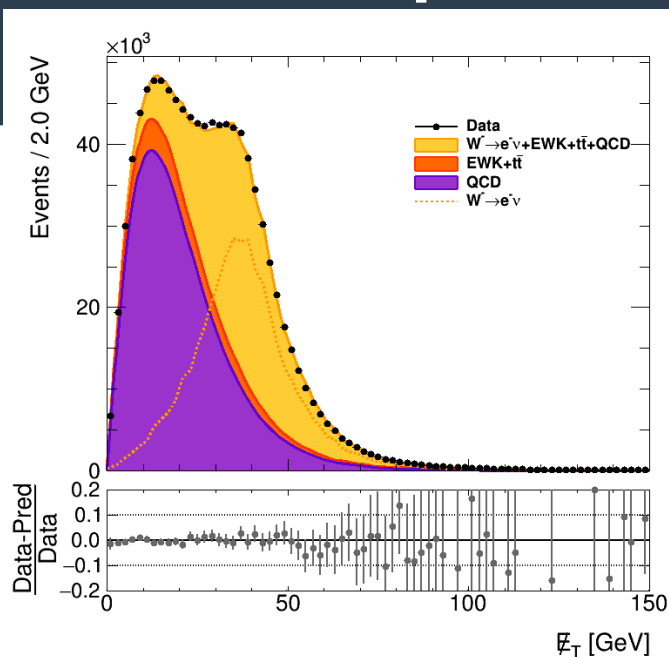
Missing E_T for eta 0.8-1.0 1.0-1.2



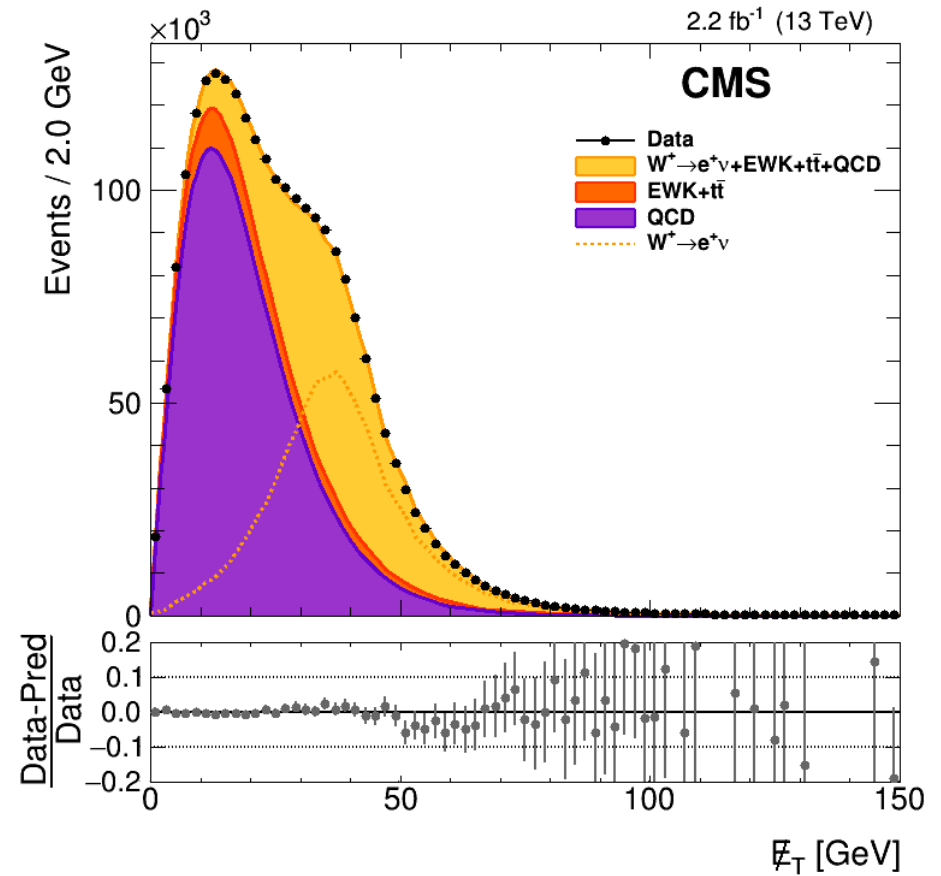
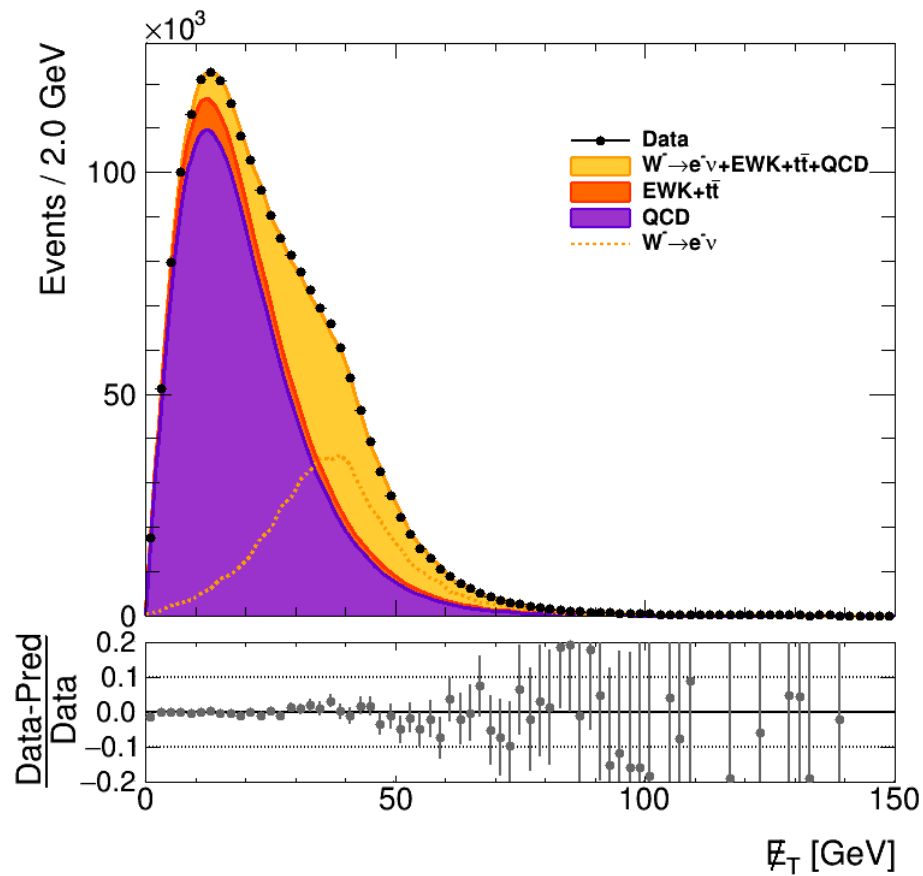
Missing E_T for eta 1.2-1.4 1.4-1.6



Missing E_T for eta 1.6-1.9 1.9-2.1



Missing E_T for eta 2.1-2.5



Fit table for bin 1.2-1.4

```
*** Yields *** (1.2,1.4) :
Selected: 704761
Signal: 435573.4003 +/- 2210.683183
QCD: 201324.4345 +/- 2896.693949
Other: 67852.89905 +/- 2056.653743
AntiSelected: 177600
Signal: 780.6002841 +/- 98.07050961
QCD: 176673.0977 +/- 437.1072762
Other: 136.4313625 +/- 17.14051803
```

```
RooFitResult: minimized FCN value: -6489281.266, estimated distance to minimum: 4.019910745e-06
covariance matrix quality: Full, accurate covariance matrix
Status : MIGRAD=4 HESSE=0 MINOS=6
```

Constant Parameter	Value
dewkm	1.7478e-01

Floating Parameter	InitialValue	FinalValue (+HiError,-LoError)	GblCorr.
a1_qcdm	4.0000e+00	1.1259e+00 (+1.60e-01,-1.59e-01)	<none>
a2_aqcdm	6.0000e+00	8.6016e+00 (+1.69e-01,-1.70e-01)	<none>
a2_qcdm	6.0000e+00	7.5408e+00 (+2.33e-01,-0.00e+00)	<none>
a3_aqcdm	2.9000e+00	1.5736e+00 (+5.22e-02,-5.17e-02)	<none>
a3_qcdm	2.9000e+00	1.3676e+00 (+5.04e-02,-5.29e-02)	<none>
cewkm	1.2670e-01	1.5578e-01 (+4.87e-03,-4.83e-03)	<none>
nAntiQCDm	1.6872e+05	1.7667e+05 (+4.38e+02,-4.36e+02)	<none>
nAntiSigM	6.6119e+02	7.8060e+02 (+9.23e+01,-9.71e+01)	<none>
nQCDm	1.4095e+05	2.0132e+05 (+3.14e+03,-3.09e+03)	<none>
nSigM	5.6381e+05	4.3557e+05 (+2.42e+03,-2.39e+03)	<none>

Correlation Matrix

1.0000	-0.9563	-0.5214	0.8219	-0.3955	-0.1879	0.0004	-0.0013	0.0665	0.0794
-0.9563	1.0000	0.4986	-0.9333	0.3783	0.1797	-0.0129	0.0453	-0.0636	-0.0759
-0.5214	0.4986	1.0000	-0.4286	0.8499	-0.0374	-0.0002	0.0007	0.6463	-0.7016
0.8219	-0.9333	-0.4286	1.0000	-0.3251	-0.1544	0.0024	-0.0084	0.0546	0.0652
-0.3955	0.3783	0.8499	-0.3251	1.0000	-0.0688	-0.0001	0.0005	0.4093	-0.4072
-0.1879	0.1797	-0.0374	-0.1544	-0.0688	1.0000	-0.0001	0.0002	-0.5404	-0.2108
0.0004	-0.0129	-0.0002	0.0024	-0.0001	-0.0001	1.0000	-0.2665	0.0000	0.0000
-0.0013	0.0453	0.0007	-0.0084	0.0005	0.0002	-0.2665	1.0000	-0.0001	-0.0001
0.0665	-0.0636	0.6463	0.0546	0.4093	-0.5404	0.0000	-0.0001	1.0000	-0.6612
0.0794	-0.0759	-0.7016	0.0652	-0.4072	-0.2108	0.0000	-0.0001	-0.6612	1.0000

Chi2 Test

```
prob = 1
chi2/ndf = 0.3968
```

KS Test

```
prob = 0.8188
prob = 0.592 with 1000 pseudo-experiments
```

fitresWem bin 6.txt (END)

Input ntuple files

Enums for isolated e^+ , e^- (signal region):

- **eData**
- **eWenu (MC)**
- **eEWK (τ channel and DY)**
- **eQCD**
- **eBKG (diboson and $t\bar{t}$)**

Enums for non isolated e^+,e^- (control region):

- **eAntiData**
- **eAntiWenu**
- **eAntiEWK**
- **eAntiQCD**