

W charge asymmetry studies Measurement of inclusive W bosons production cross section - e^+ , e^- distributions

Vladyslav Danilov, Volodymyr Myronenko,
Katarzyna Wichmann

21.09.2017

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.

The average number of pileup events per beam crossing in the analyzed data collected in 2015 is about thirteen

Input ntuple files

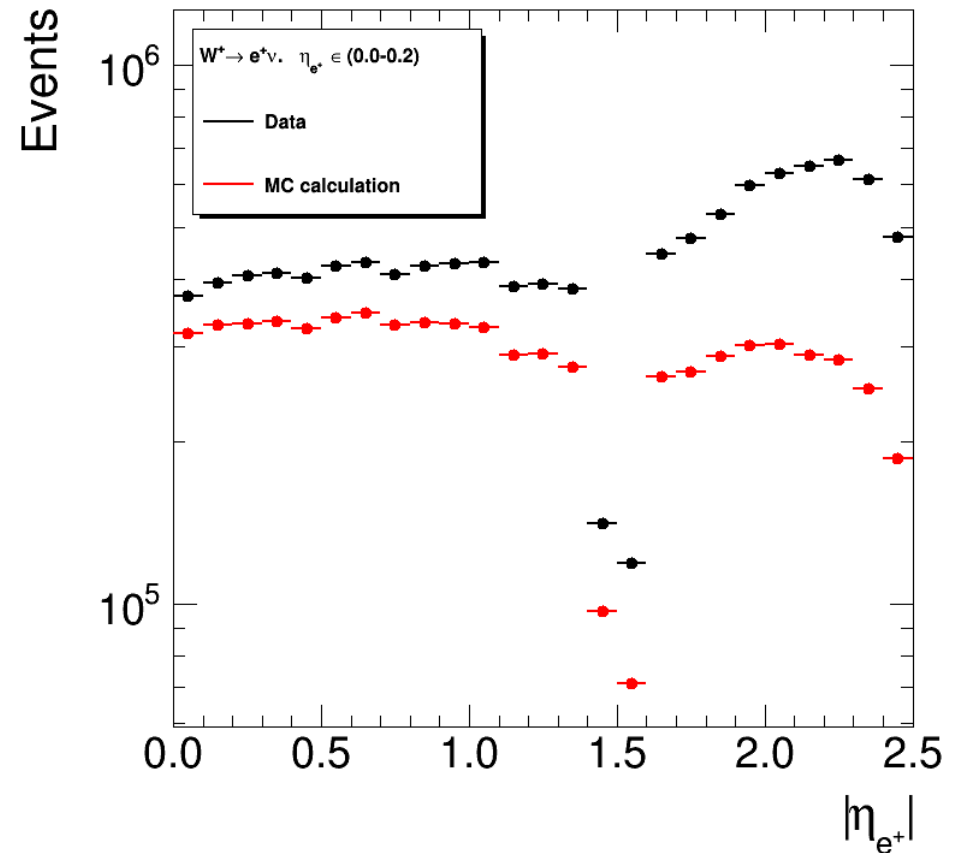
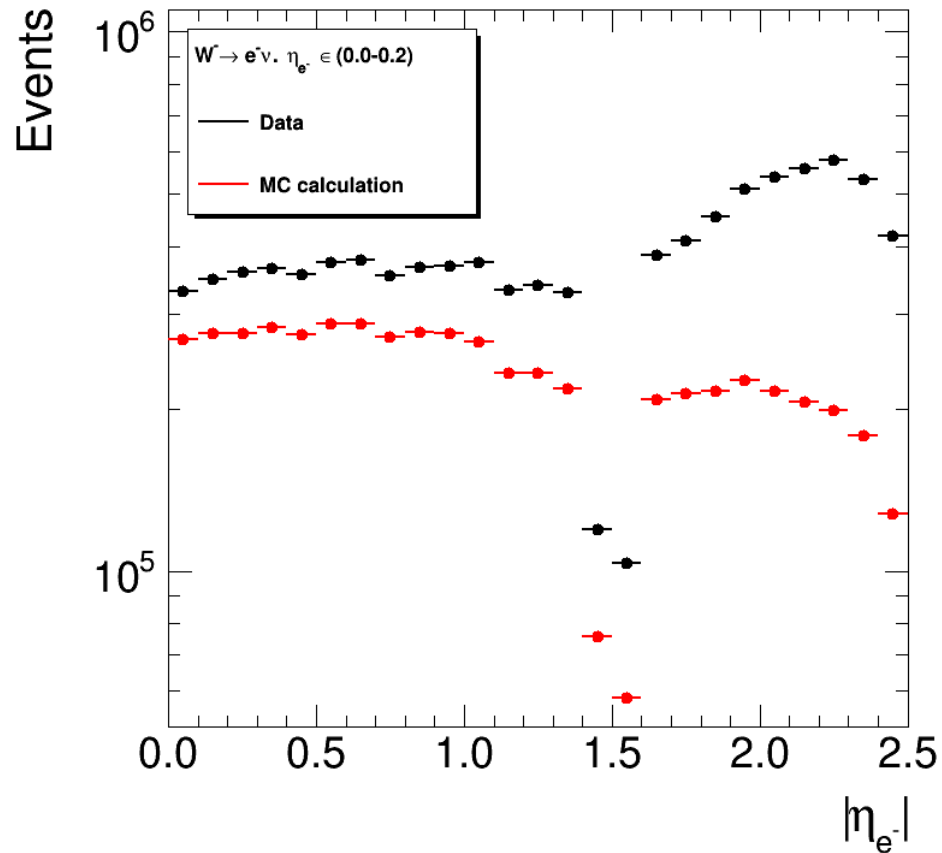
Enums for isolated e^+ , e^- (signal region):

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

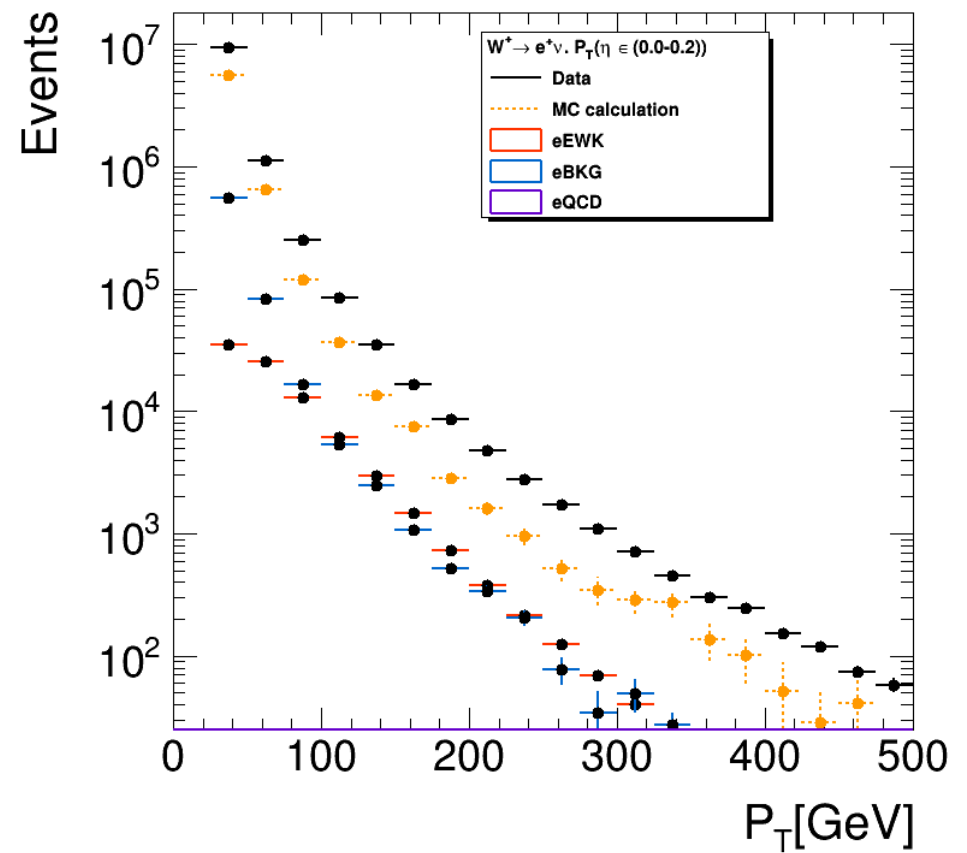
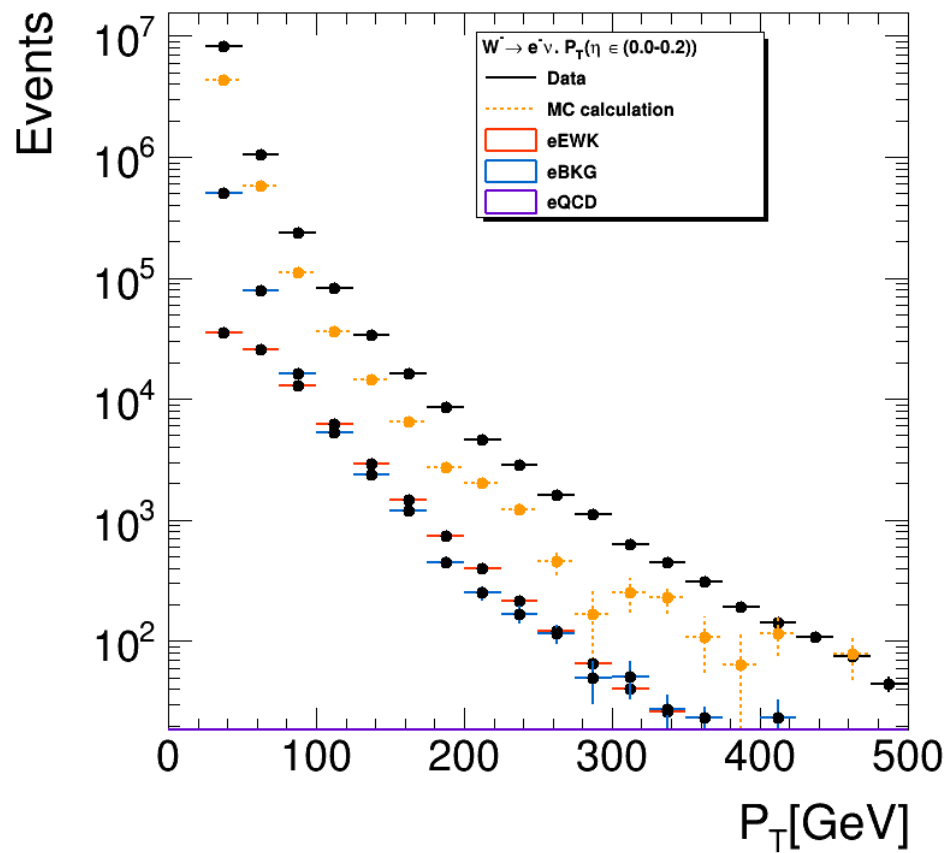
Enums for non isolated e^+,e^- (control region):

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

e^+, e^- pseudorapidity distributions (for all eta region)



e^+ , e^- P_T distributions(Signal region)



PDF fits

QCD background modeled by analytical function:

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

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

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

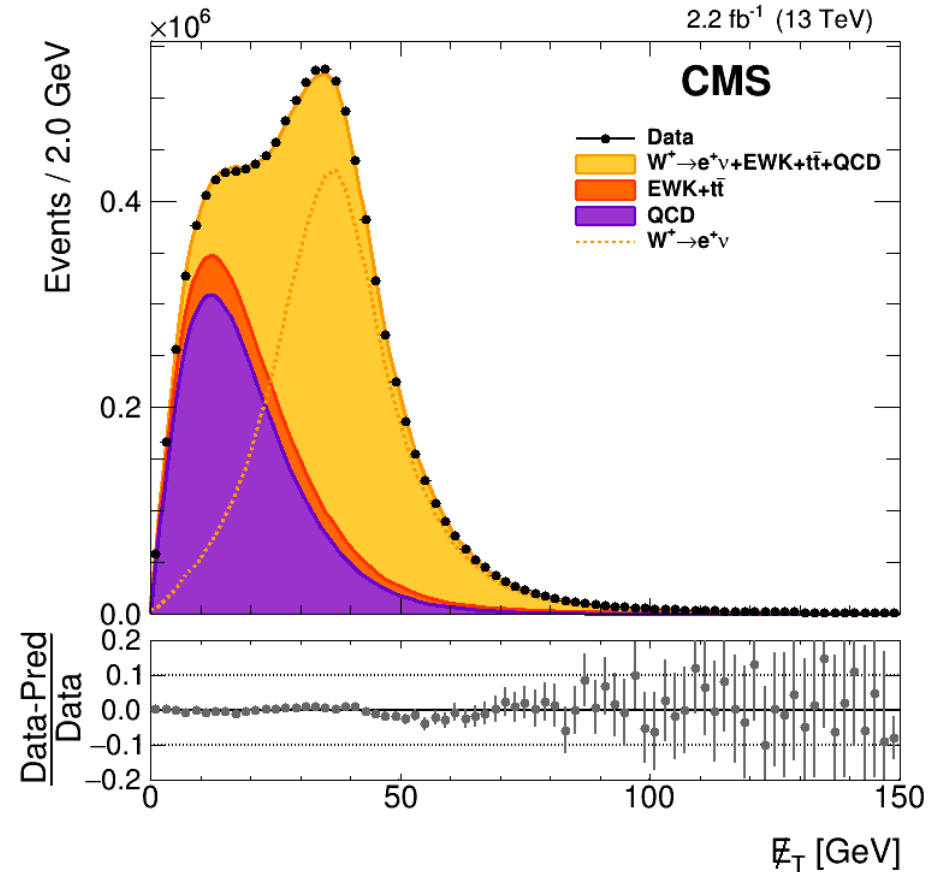
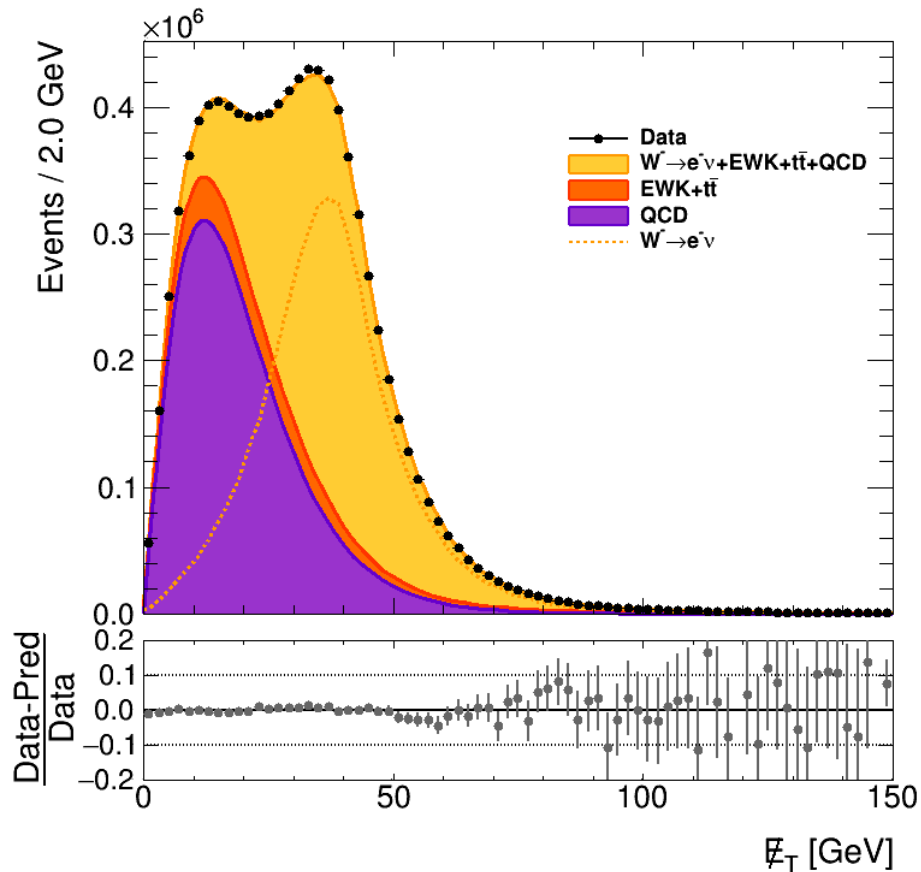
$$c = 2.9 \in [0.3, 6.0]$$

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

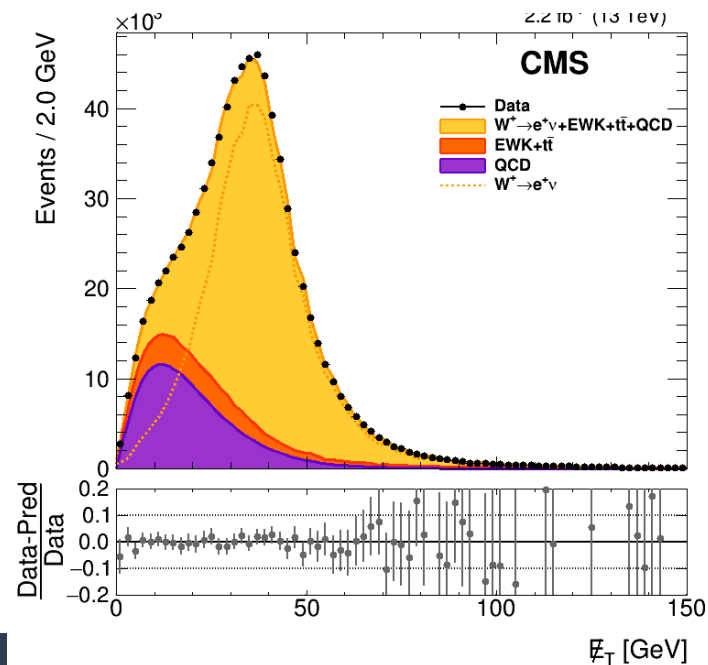
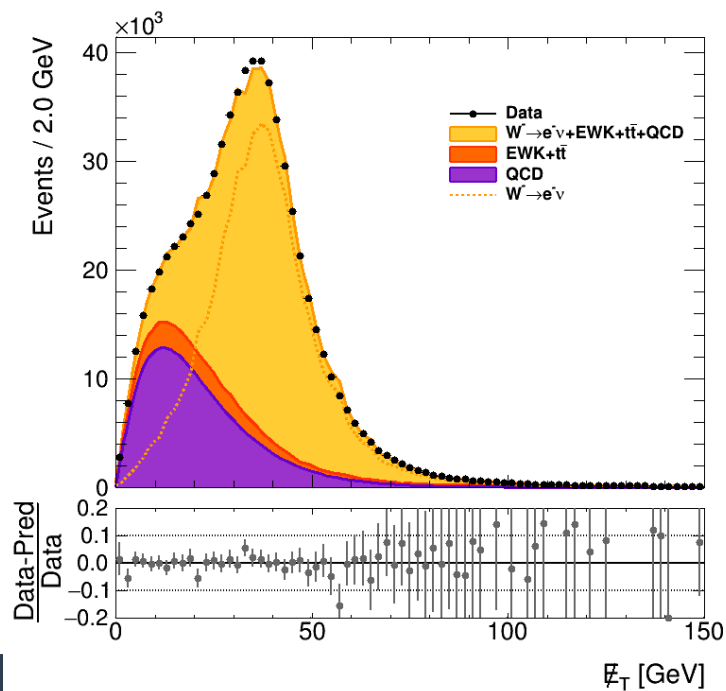
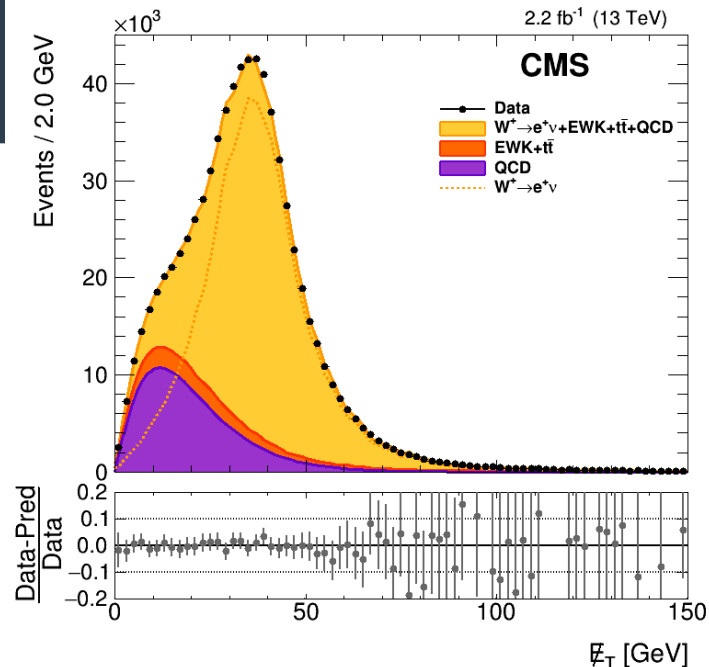
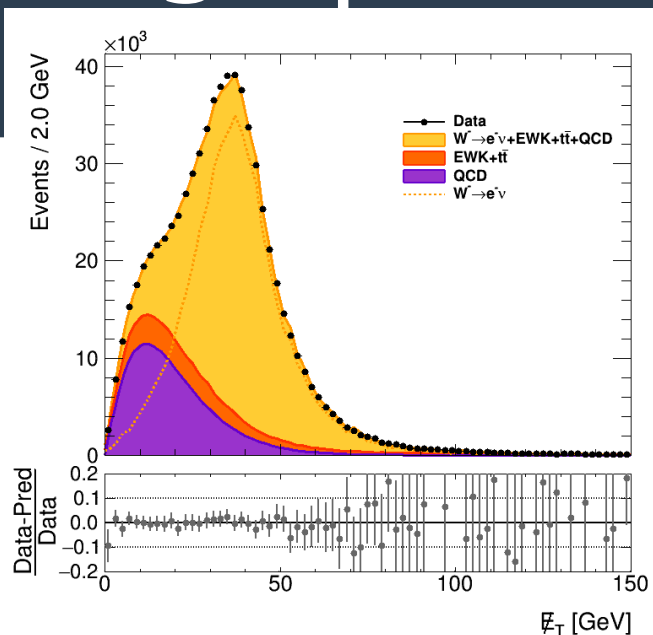
Signal and EWK backgrounds are modeled with simulation based fitting functions.

As a minimum finder used Minos

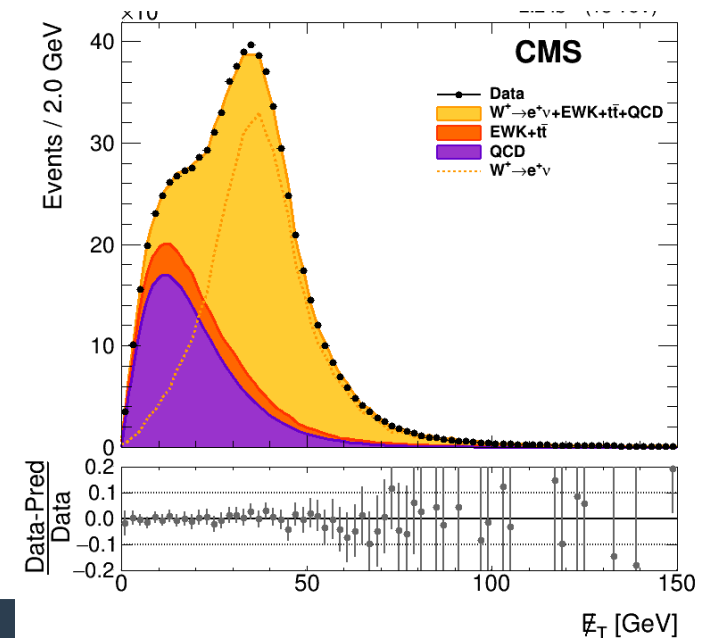
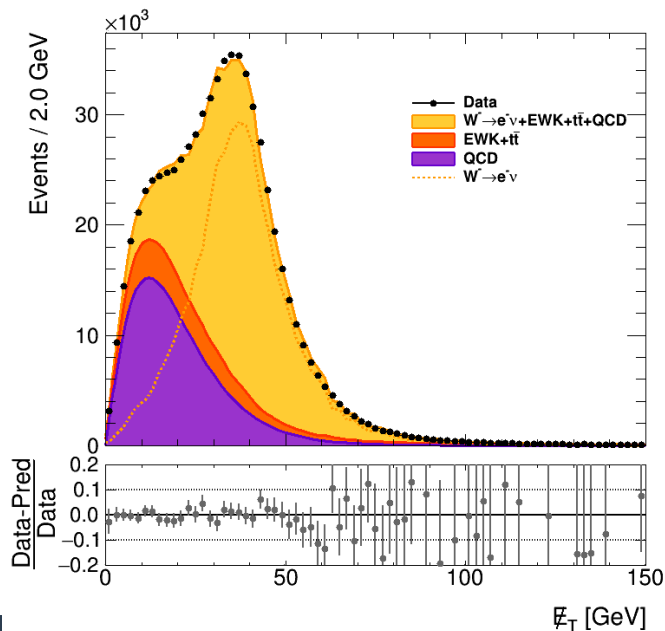
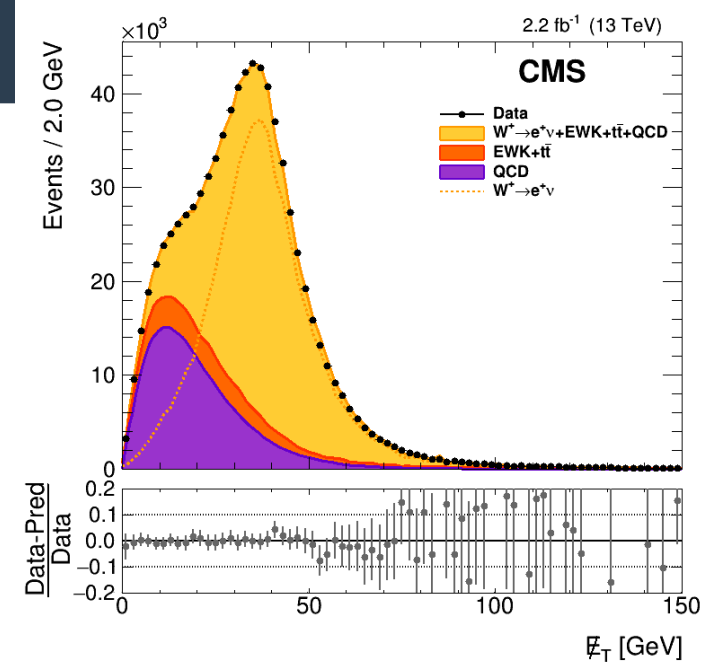
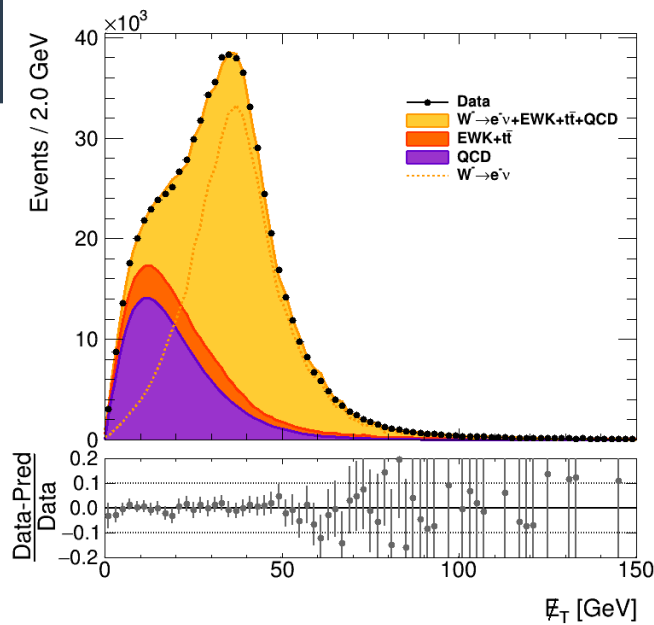
Missing E_T for the whole eta region



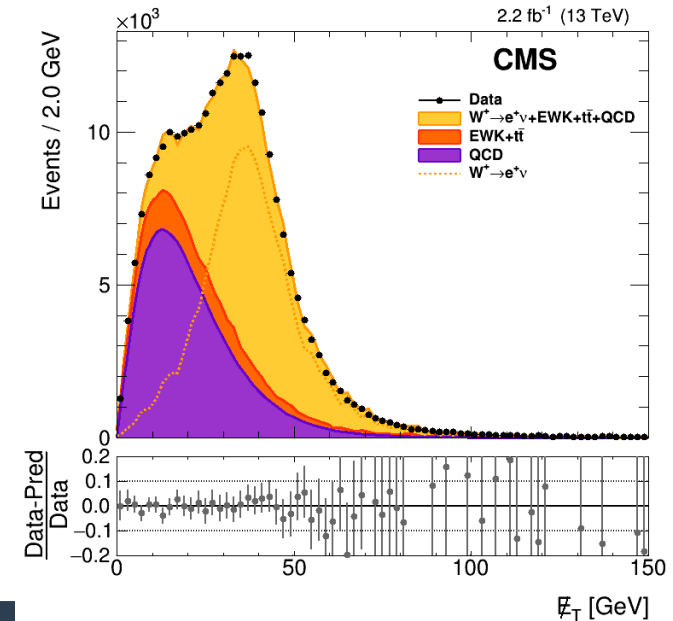
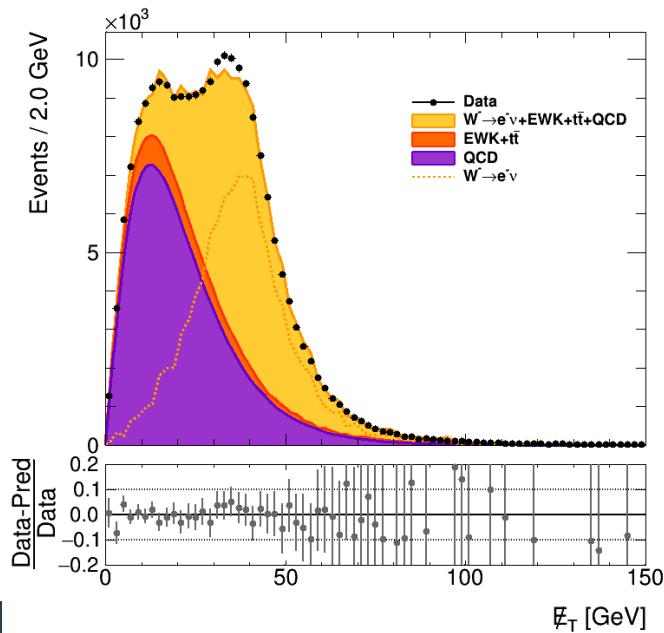
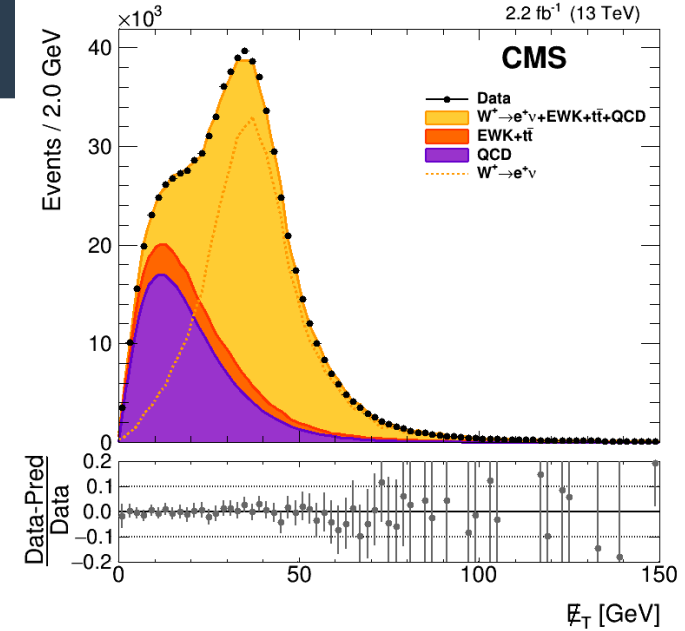
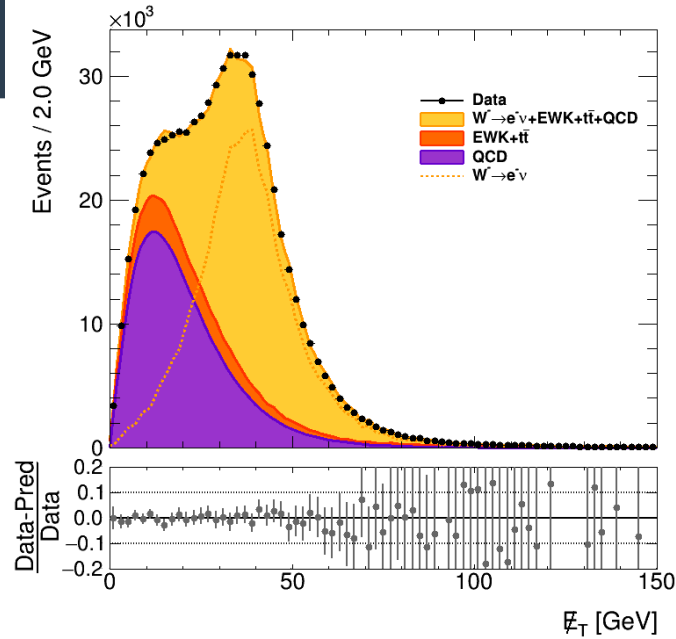
Missing E_T for eta 0.4-0.6, 0.6-0.8



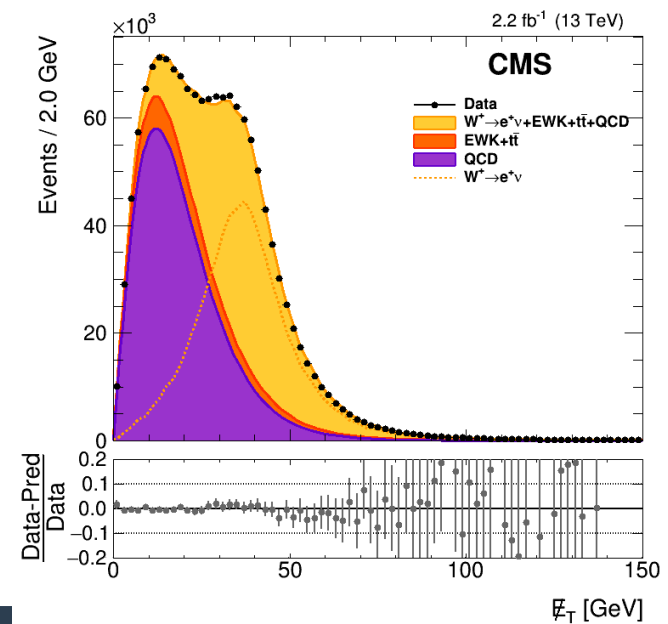
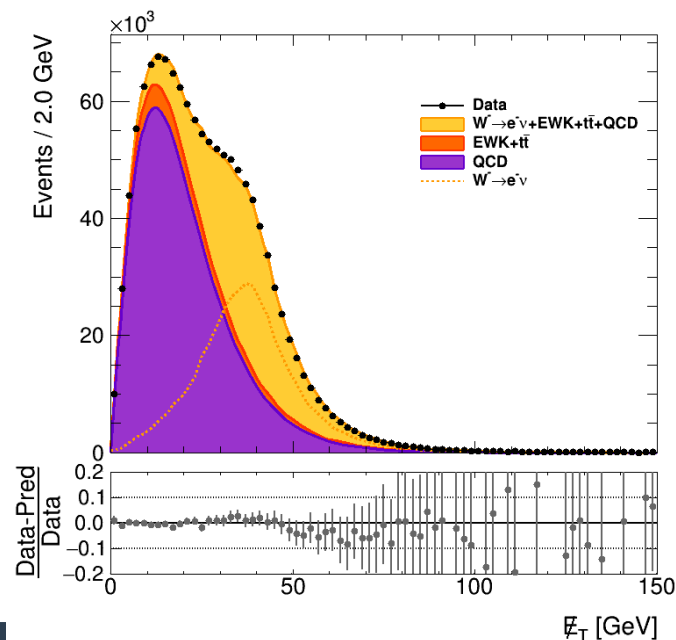
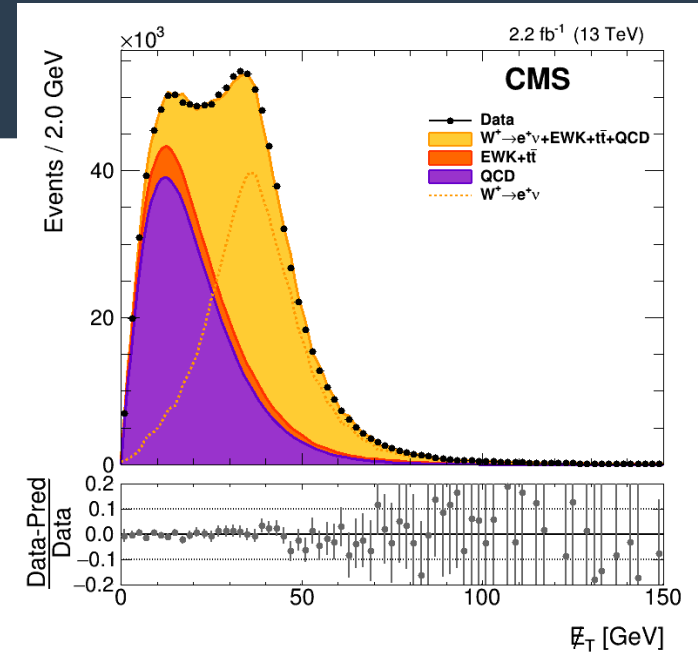
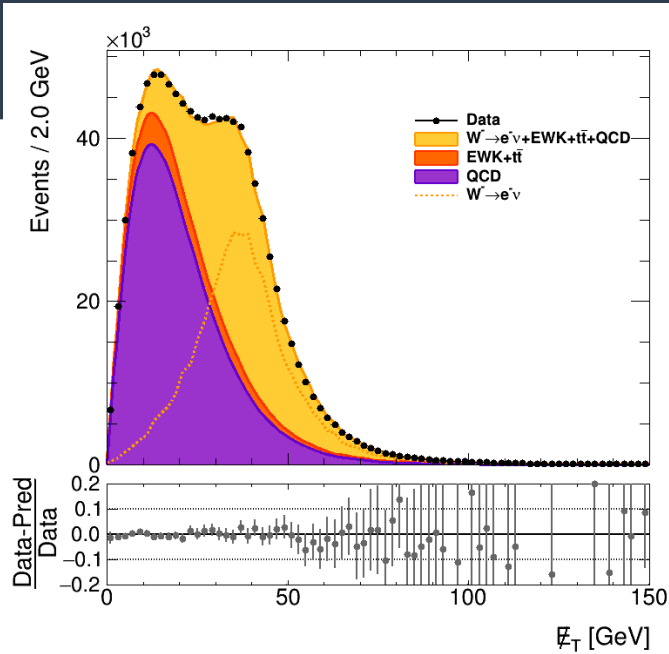
Missing E_T for eta 0.8-1.0 1.0-1.2



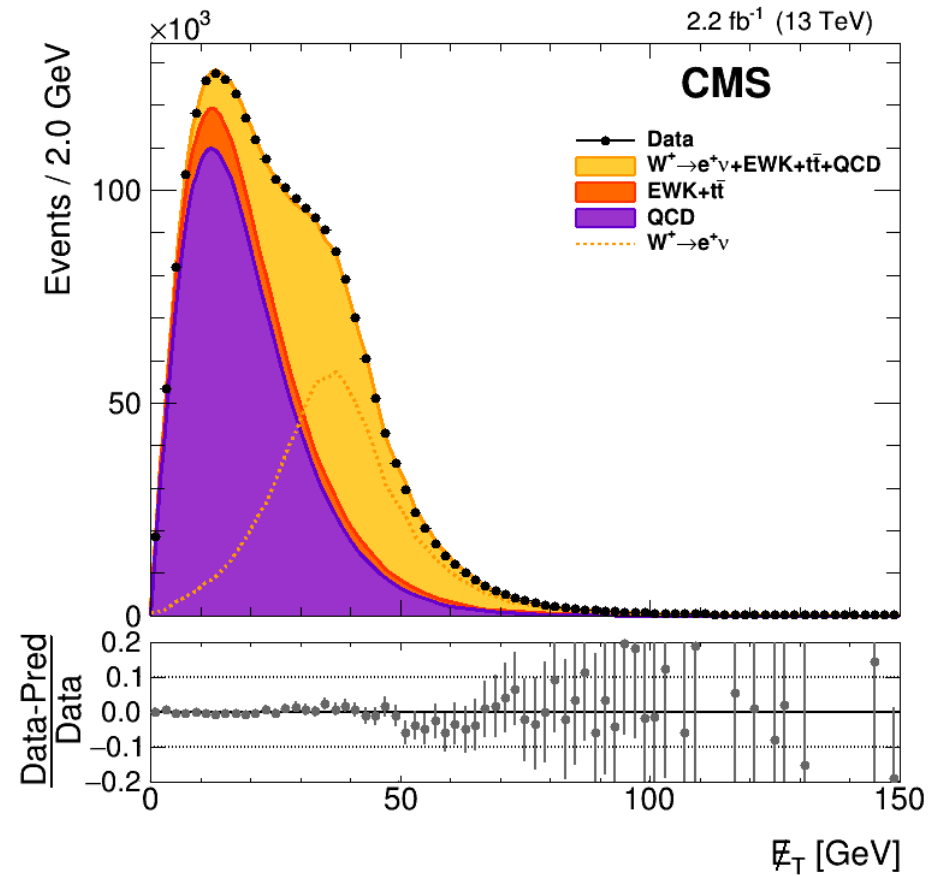
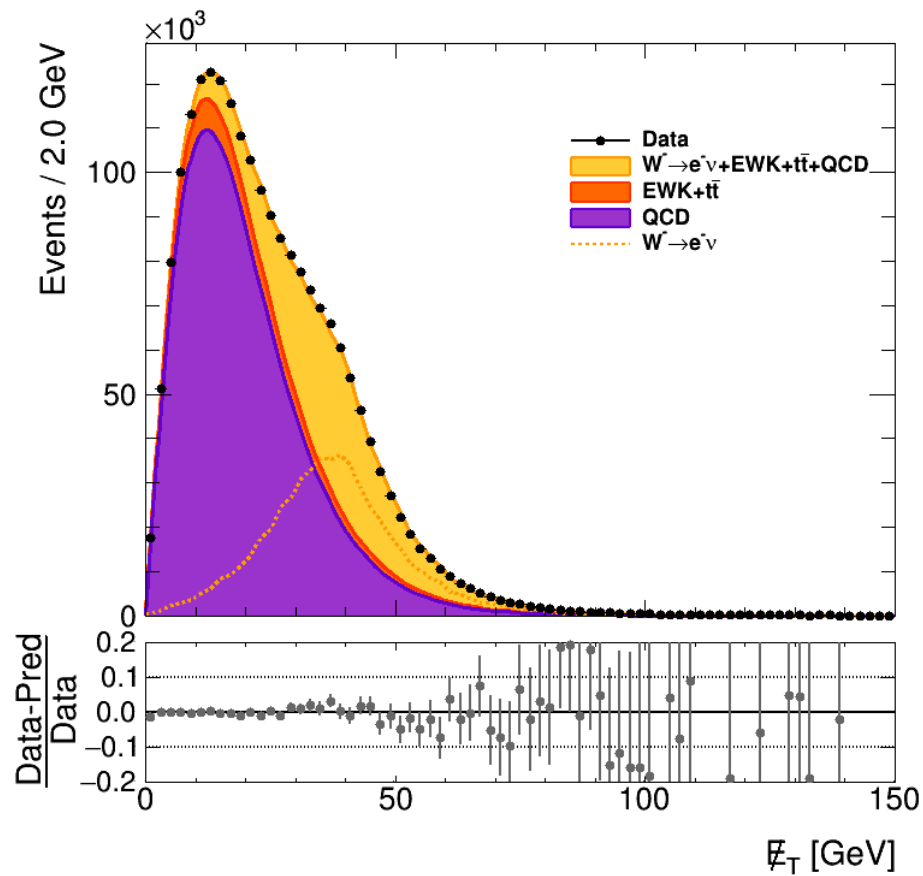
Missing E_T for eta 1.2-1.4 1.4-1.6



Missing E_T for eta 1.6-1.9 1.9-2.1



Missing E_T for eta 2.1-2.5



Back up

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>
nAntiSig	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>
nSig	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)