W charge asymmetry and BRIL BCM1F studies

02.02.2018

BRIL BCM1F final results

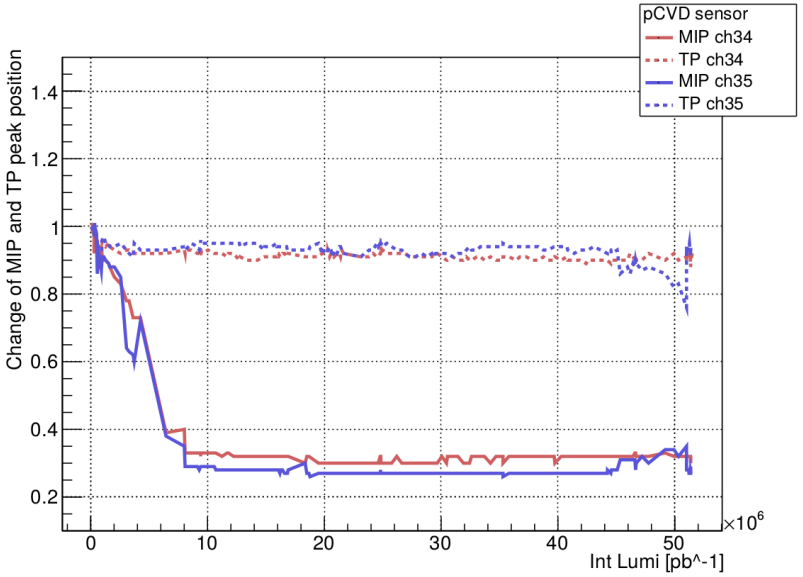
MIP and TP efficiency studies

1) Represent plots of MPV peaks of MIP and TP as a function of luminosity and fill number in general files(in .pdf format).

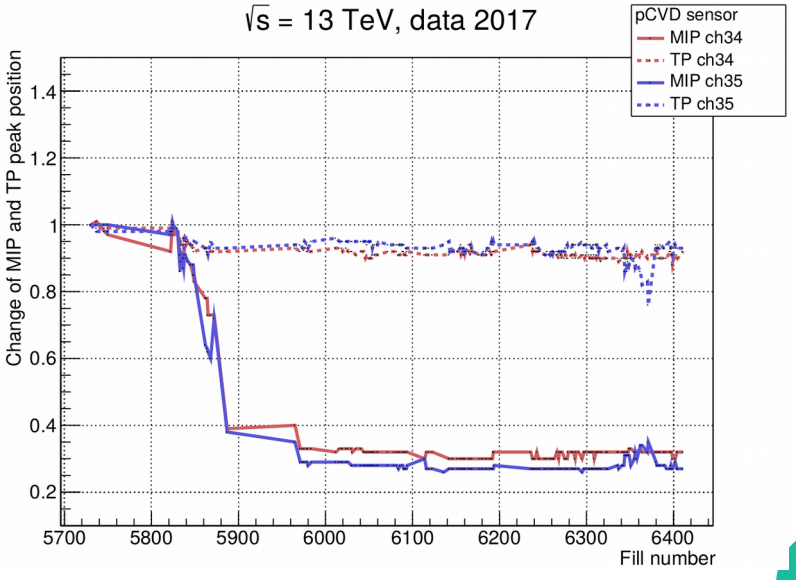
+ comments from Andreas

2) Label sensor type on MIP and TP spectrum.

3) Change normalization of MIP and TP plots as a function of lumi/fill (reference fill is 5730 or 5840, need to be checked), check peaks on those plots.



From “Sensor behavior chronology per lumi.pdf”



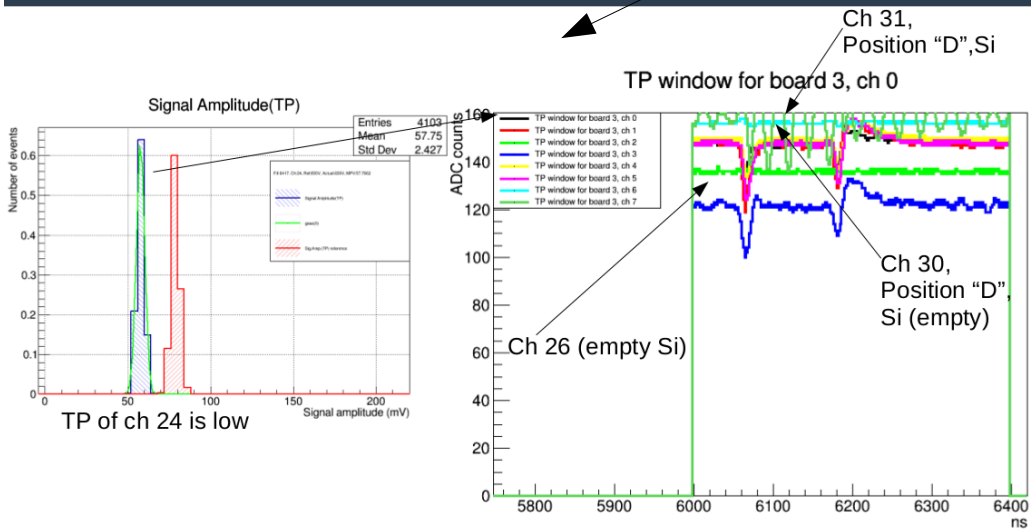
From “Sensor behavior chronology per fill.pdf”

Test pulse and baseline quality studies

recent

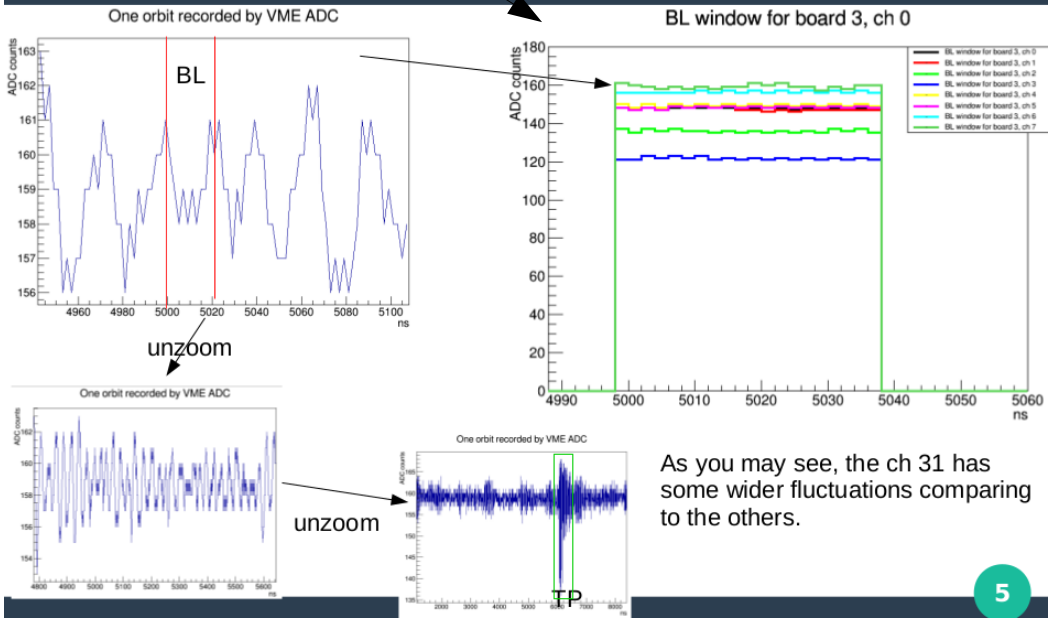
4) Check TP time window by plotting TP of ~~all~~ fills in a default time window + comments from Lena(BL check).

Board number 3 (Counting from 0)



5

Board 3



5

From "TPwindow_studies_28.01.18.pdf"

From "BLwindow_studies_29.01.18.pdf"

Fit range identifier

- **Some sort of an algorithm was offered.**
- **The procedure of a peak identifier was implemented, tested and improved according to the test results.**
- **Final test was performed using fills 6255, 6346, 6404.**

Check the threshold

The threshold values were varied down :

1) sCVD & pCVD :
   5→3 ADC counts

2) Si : 7→5 ADC counts

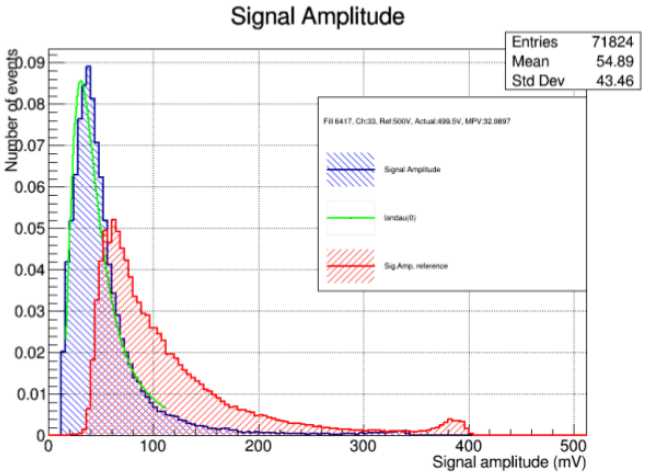


Figure 67: Channel 33, Threshold down

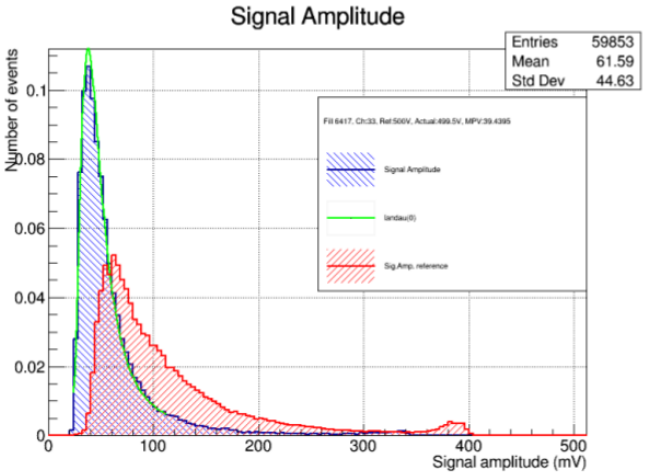


Figure 68: Channel 33, Threshold default

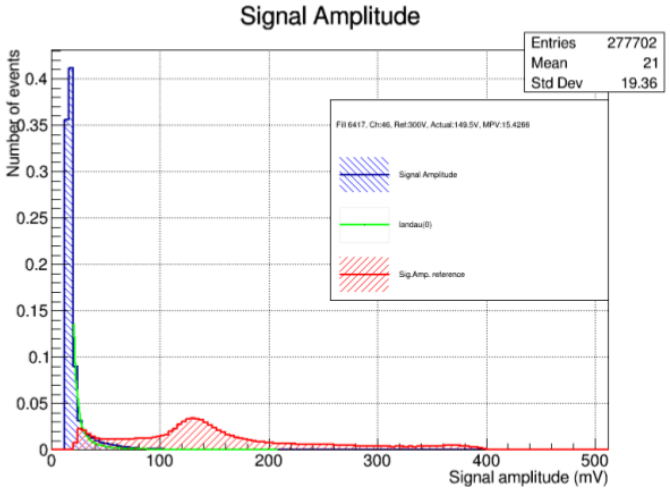


Figure 93: Channel 46, Threshold down

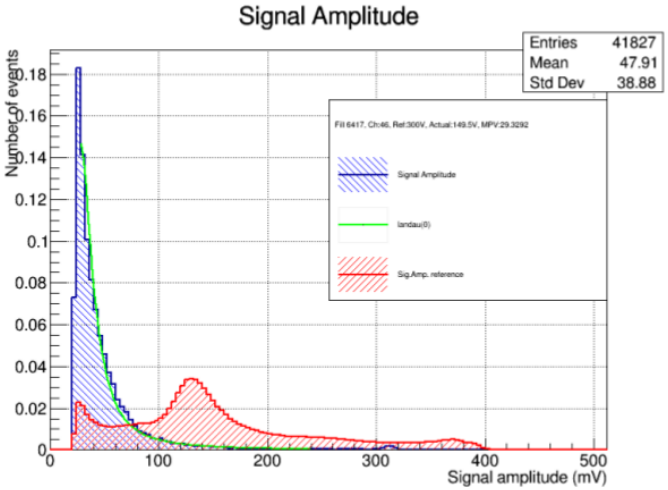


Figure 94: Channel 46, Threshold default

The List

1) Represent plots of MPV peaks of MIP and TP as a function of luminosity and fill number in general files(in .pdf format).

2) Label sensor type on MIP and TP spectrum.

3) Change normalization of MIP and TP plots as a function of lumi/fill (reference fill is 5730 or 5840, need to be checked), check peaks on those plots.

4) Check TP time window by plotting TP of all fills in a default time window + comments from Lena.

5) Few words about algorithm that checks cutted signal.
6) Implement fitting range identifier.

7) Check the threshold.

W charge asymmetry studies

Eta binning changes

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)

Efficiency

- The total efficiency of the electrons can be factorized as follows for the muons with the total efficiency defined with respect to a reconstructed supercluster passing the kinematic cuts

$$\varepsilon_{total} = \varepsilon_{tracking+ID+ISO} \times \varepsilon_{STA} \times \varepsilon_{trigger}$$

$\varepsilon_{tracking+ID+ISO}$ – is the efficiency for a track in the muon system to be matched to a global muon that passes identification and isolation requirements.
ε_{STA} – is the efficiency for a isolated tracker track from a muon to be matched to a global muon track.
$\varepsilon_{trigger}$ – is the efficiency for a fully identified and isolated muon to pass the trigger (HLT and Level-1) requirements.

All efficiencies implemented as a weights to events in a form:

$$weight = scale\,1\,fb * lumi * \prod \frac{Data_{eff}(eta, pt)}{MC_{eff}(eta, pt)}$$

- The acceptance code exists but it crashes, I need to discuss it with Maria and, probably, try to debug it myself.

Summary table on event numbers for eta binned $\not{E}_T$ distributions of $W \rightarrow \mu^+$

	W-> mu plus	Selected	Signal	QCD	Other		Signal+QCD+Other	Selected / Signal+QCD+Other
0	Total:	10972017	9154760	1005162	812093		10972015	1.000000182
1	-2.4 - -2.0	597843	506271	54482	37099		597852	0.999849461
2	-2.0 - -1.566	2162007	1765001	252645	144368		2162014	0.999967623
3	-1.566 - -1.442	683300	562309	74244	46747		683300	1
4	-1.442 - -1.0	1397945	1170317	125906	101707		1397930	1.00001073
5	-1.0 - -0.5	193760	161895	31196	670		193761	0.999994839
6	-0.5 - 0.0	452744	381590	51068	20090		452748	0.999911651
7	0.0 - 0.5	454405	381027	44802	28565		454394	1.000024208
8	0.5 - 1.0	192171	156236	31358	4586		192180	0.999531689
9	1.0 - 1.442	1394476	1186889	119002	88581		1394472	1.000002868
10	1.442 - 1.566	670700	557706	76749	36251		670706	0.999910542
11	1.566 - 2.0	2171081	1739613	200562	230890		2171065	1.00000737
12	2.0 - 2.4	601585	504372	64709	32513		601594	0.999850397
	Sum over bins	10972017	9073226	1126723	772067		10972016	1.000000091
	Total / Sum over bins	1	1.008986219	0.8921110158	1.051842651		0.9999999089	

The table represents yields on signal, QCD, other(background) and total(selected) distribution for the whole region of eta and per bin.

The last row and column represents ratios to estimate possible correlation of number of events in the whole eta region and eta binned distributions.

Summary table on event numbers for eta binned $\not{E}_T$ distributions of $W \rightarrow \mu^-$

	W->mu minus	Selected	Signal	QCD	Other		Signal+QCD+Other	Selected / Signal+QCD+Other
0	Total:	8804750	7038593	1138882	626977		8804452	1.000033847
1	-2.4 - -2.0	430063	332454	63676	33942		430072	0.999790733
2	-2.0 - -1.566	1671140	1277199	263588	130358		1671145	0.999997008
3	-1.566 - -1.442	557101	440939	82959	33210		557108	0.999874351
4	-1.442 - -1.0	1185837	969787	155547	60508		1185842	0.999957836
5	-1.0 - -0.5	166746	139222	24165	3367		166754	0.999520251
6	-0.5 - 0.0	390755	321187	58570	11007		390764	0.999769682
7	0.0 - 0.5	393668	328566	45544	19562		393672	0.999898393
8	0.5 - 1.0	167513	136985	23947	6590		167522	0.999462757
9	1.0 - 1.442	1186698	984177	143105	59419		1186701	0.999997472
10	1.442 - 1.566	551268	433588	84103	33582		551273	0.999909301
11	1.566 - 2.0	1671179	1302068	275760	93367		1671195	0.999990426
12	2.0 - 2.4	432782	334737	61081	36970		432788	0.999861364
	Sum over bins	8804750	7000909	1282045	521882		8804836	0.999902326
	Total / Sum over bins	1	1.00538273	0.8883323128	1.20137694		0.9999563876	

The table represents yields on signal, QCD, other(background) and total(selected) distribution for the whole region of eta and per bin.

The last row and column represents ratios to estimate possible correlation of number of events in the whole eta region and eta binned distributions.

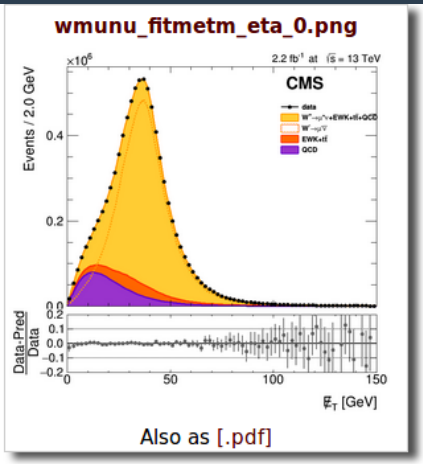
Number of events and chi2/ndf in different eta bins

eta bins	N + (Signal)	N - (Signal)	chi2/ndf (N +)	chi2/ndf (N -)
-2.4 - 2.4	9154760	7038593	0.6562	0.408
-2.4 - -2.0	506271	332454	0.704	0.2375
-2.0 - -1.566	1765001	1277199	0.3233	0.3122
-1.566 - -1.442	562309	440939	0.4019	0.314
-1.442 - -1.0	1170317	969787	0.361	0.3224
-1.0 - -0.5	161895	139222	0.3447	0.2717
-0.5 - 0.0	381590	321187	0.3362	0.3216
0.0 - 0.5	381027	328566	0.3365	0.5061
0.5 - 1.0	156236	136985	0.3469	0.3878
1.0 - 1.442	118689	984177	0.3165	0.3373
1.442 - 1.566	557706	433588	0.4605	0.3457
1.566 - 2.0	1739613	1302068	0.9921	0.2603
2.0 - 2.4	504372	334737	0.3259	0.3012

From the table we may conclude that we overestimate uncertainties

Missing energy per eta bin for W→μ

wmunu_fitmetm_eta_0.png



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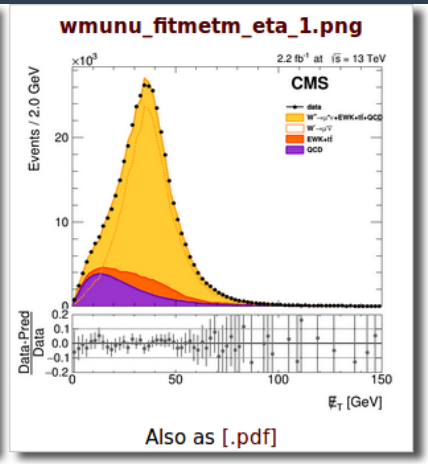

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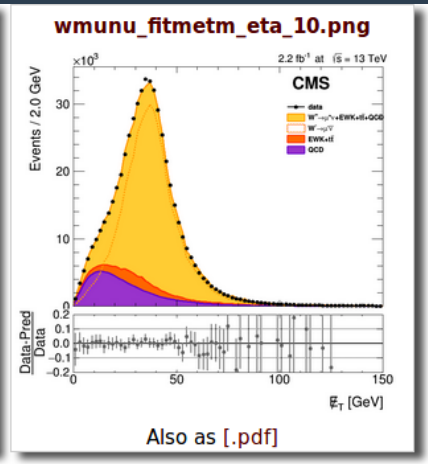

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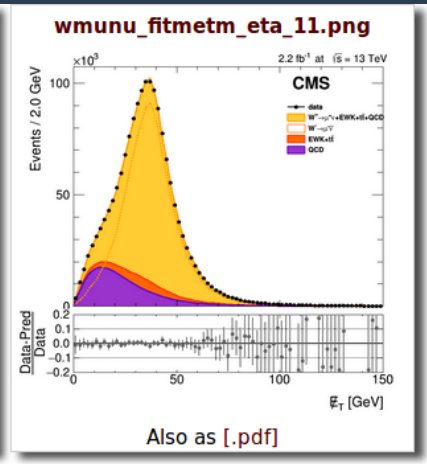

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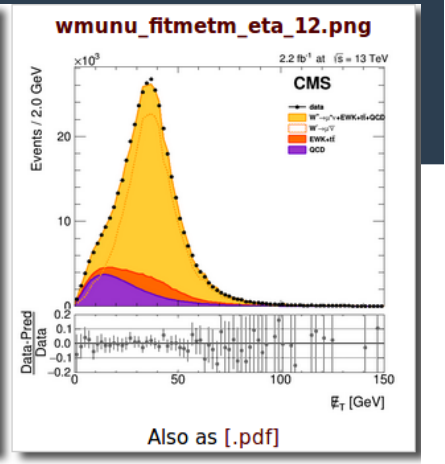

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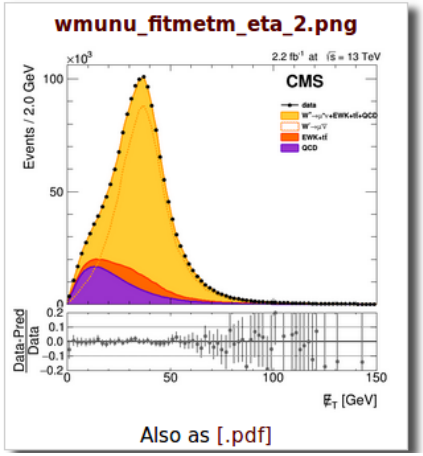

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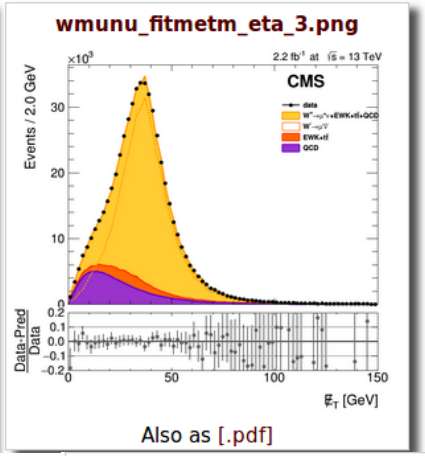

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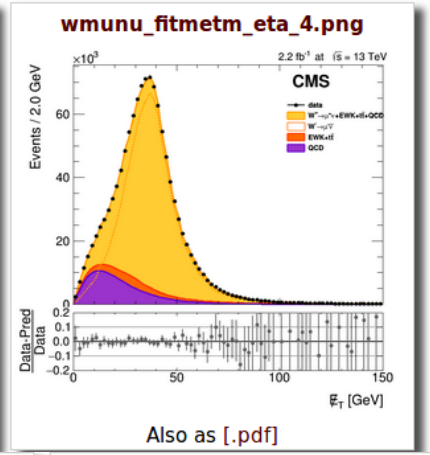

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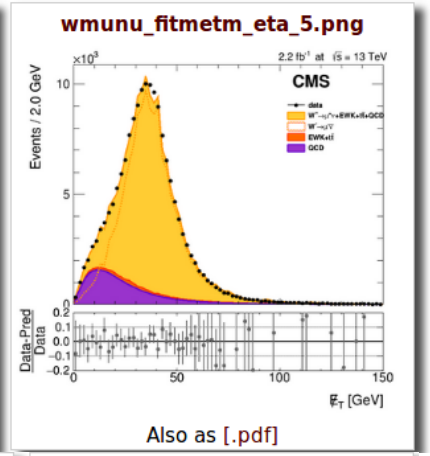

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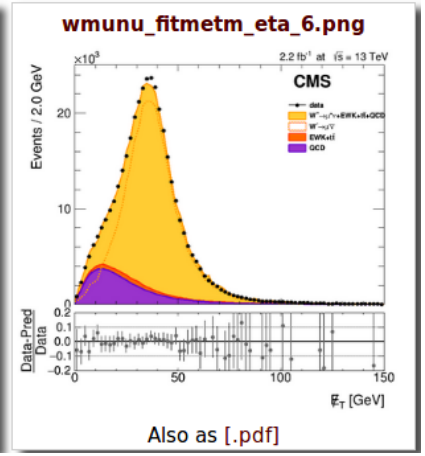

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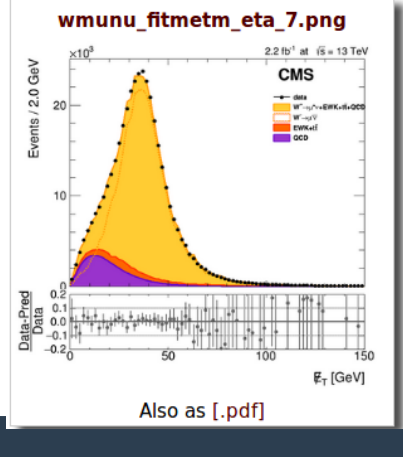

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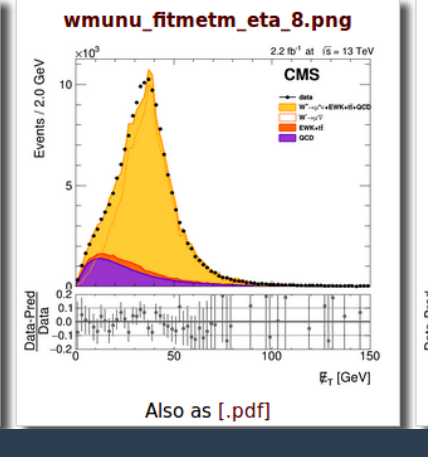

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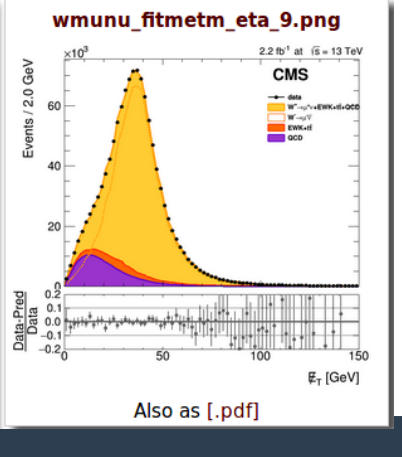

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Missing energy per eta bin for W→μ⁺

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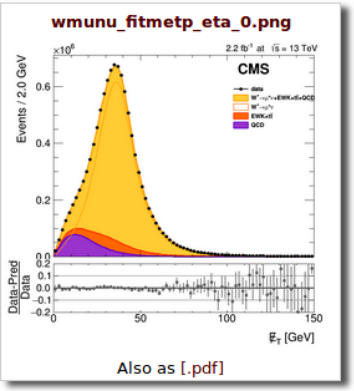

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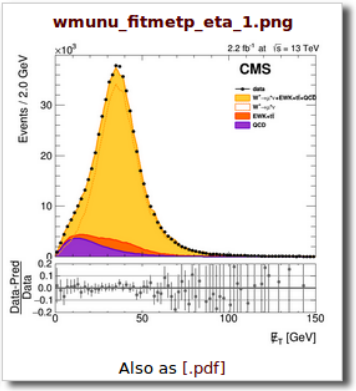

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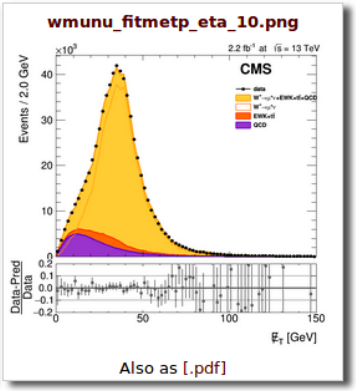

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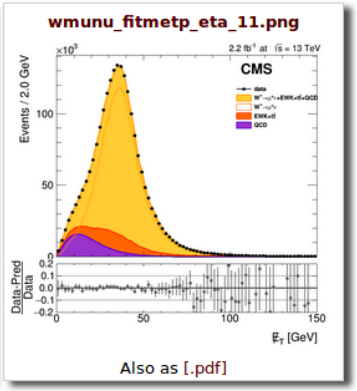

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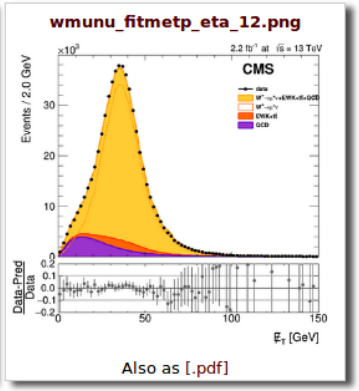

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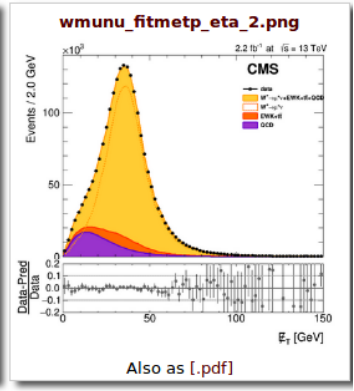

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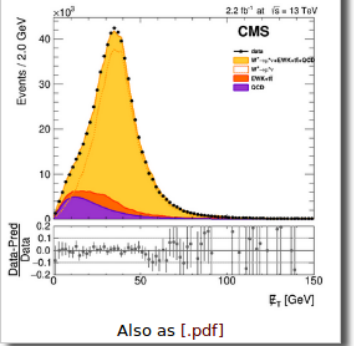

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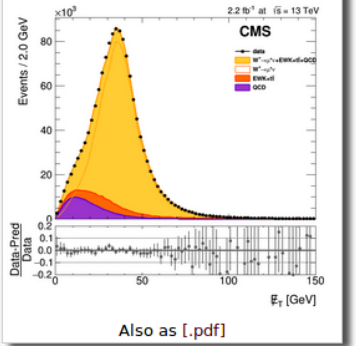

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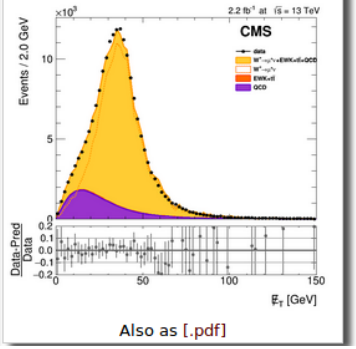

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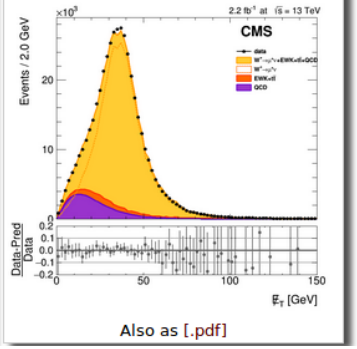

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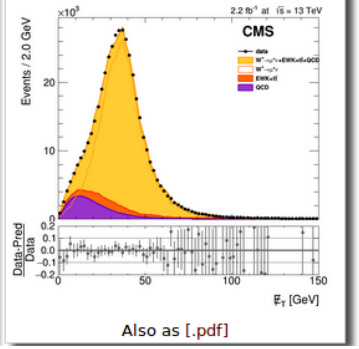

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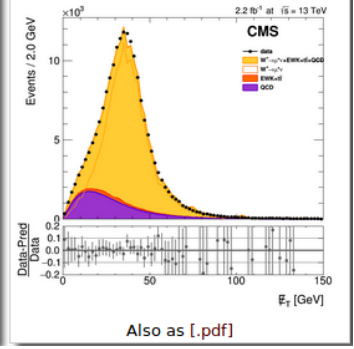

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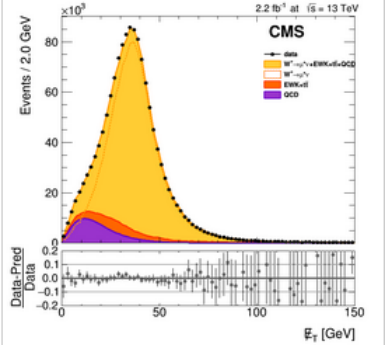

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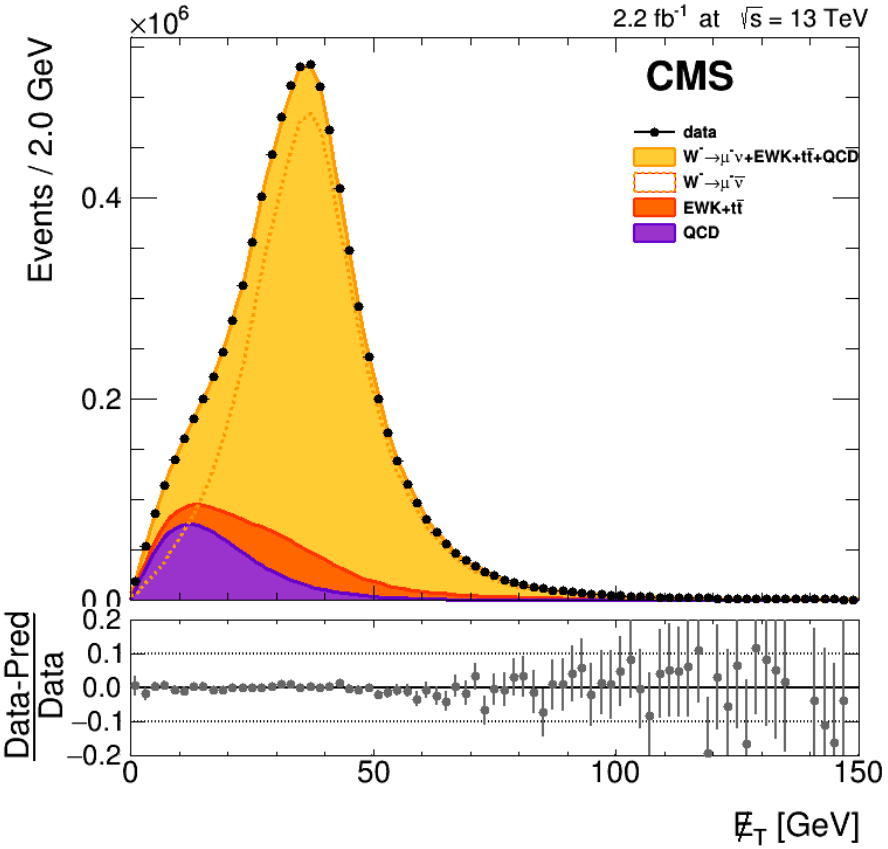
Eta-binned missing Et distributions

Here in my CERN BOX

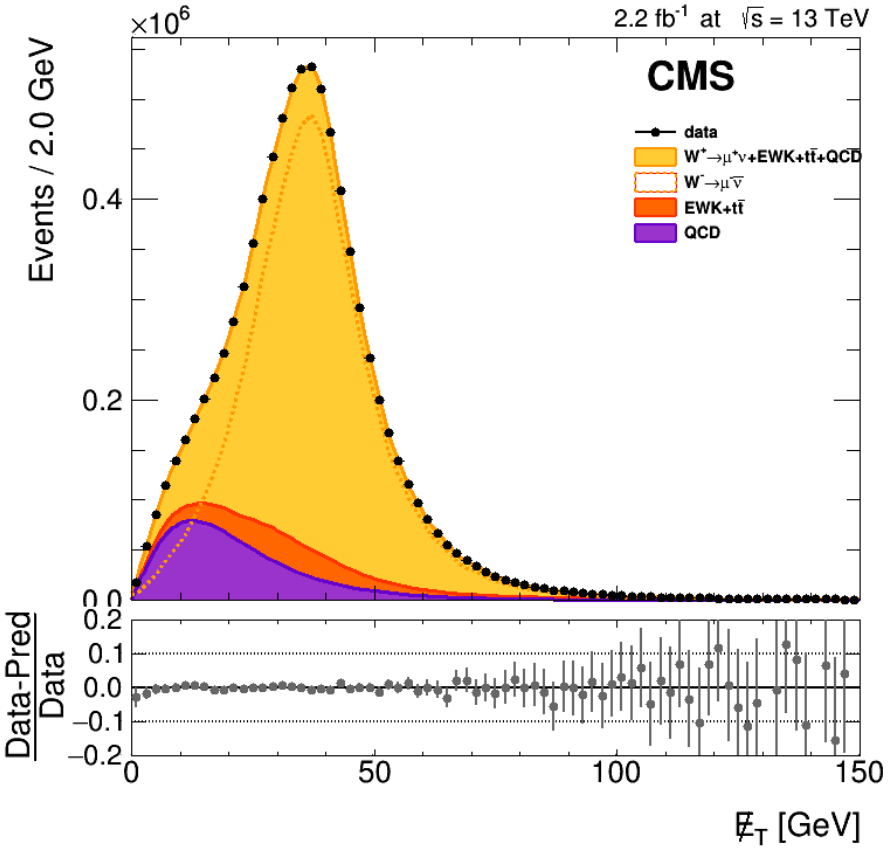
https://vldanilo.web.cern.ch/vldanilo/wAsymmetry/Wmunu_newEtaBinned/

Back up

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

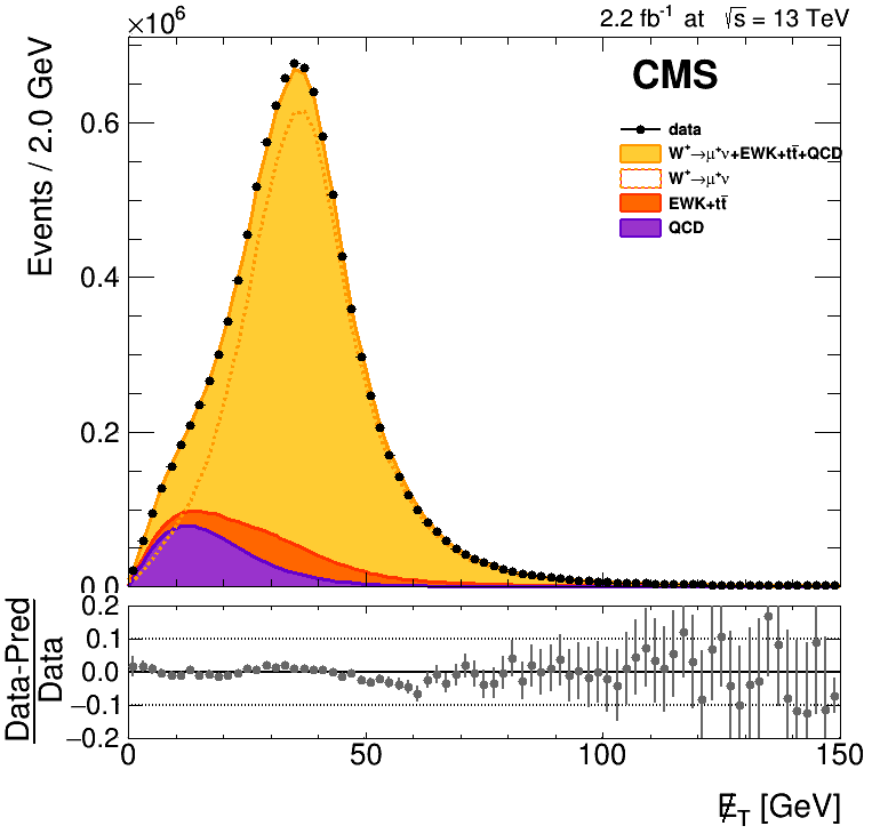


Old binning



New binning

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



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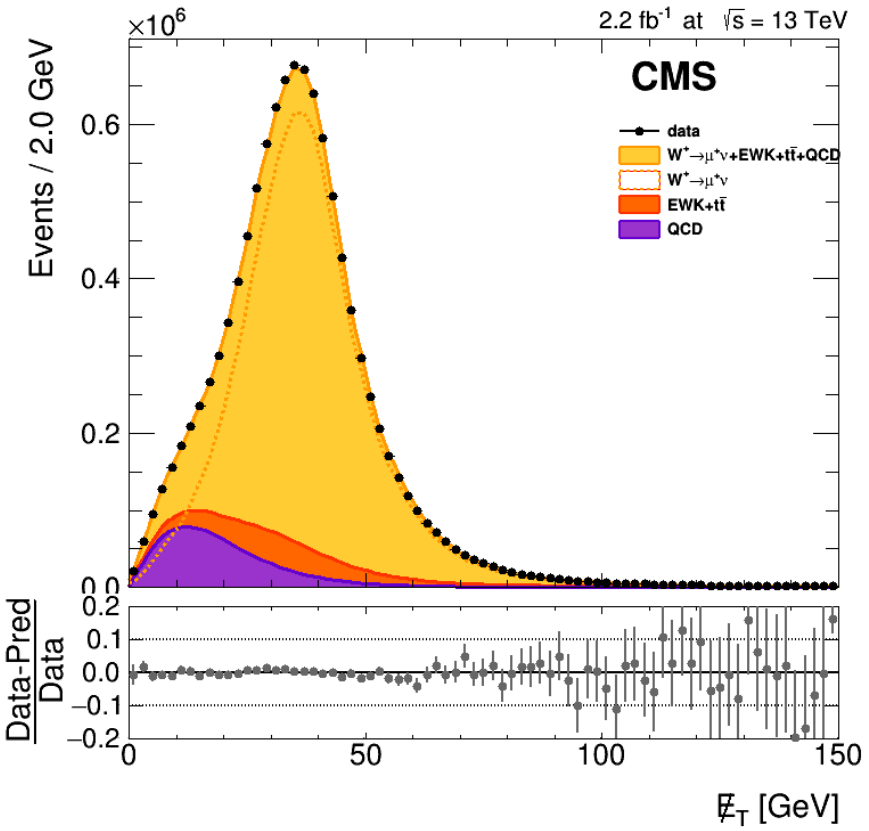
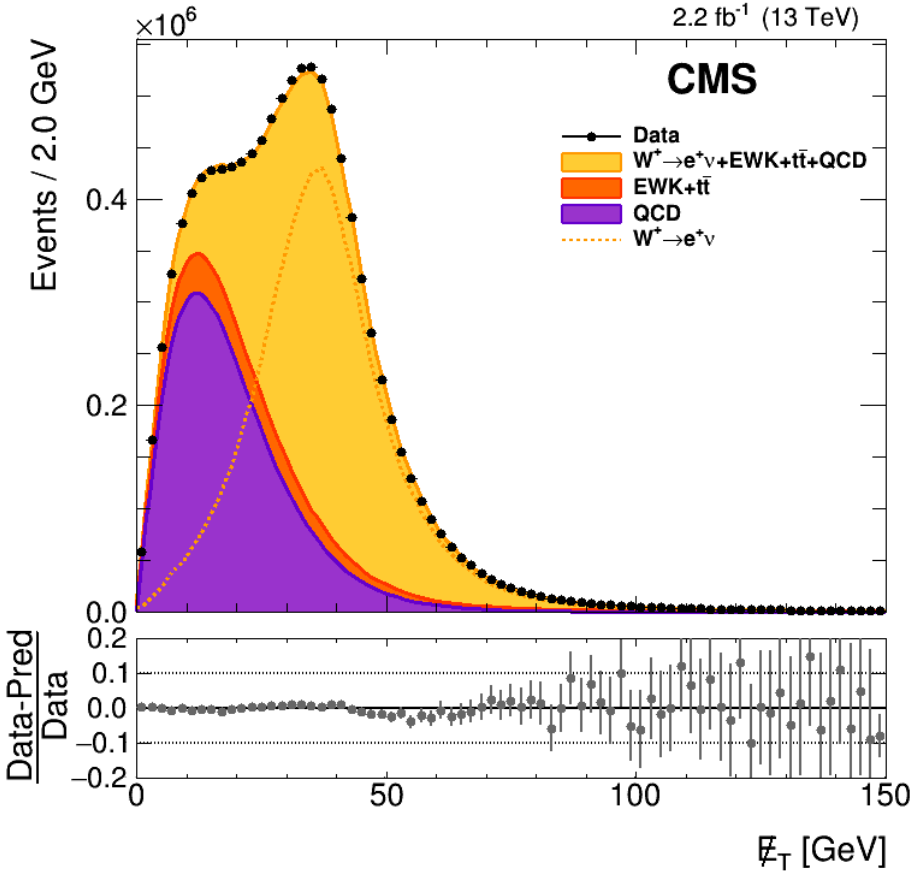
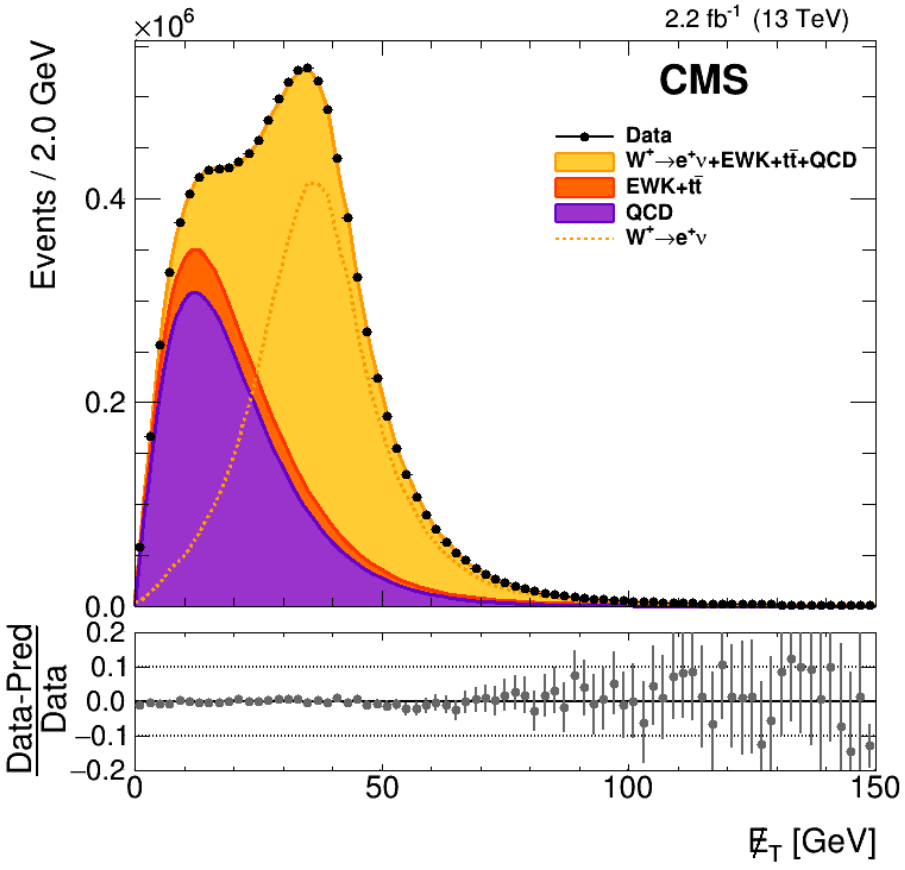


New binning

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

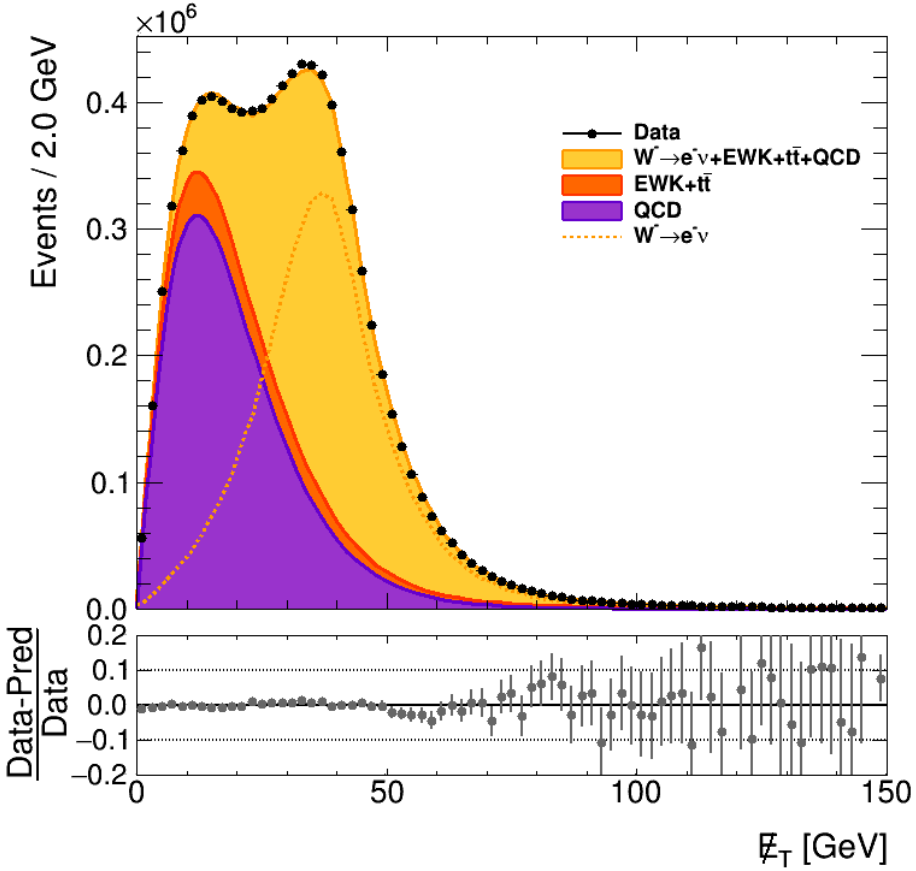


Old binning

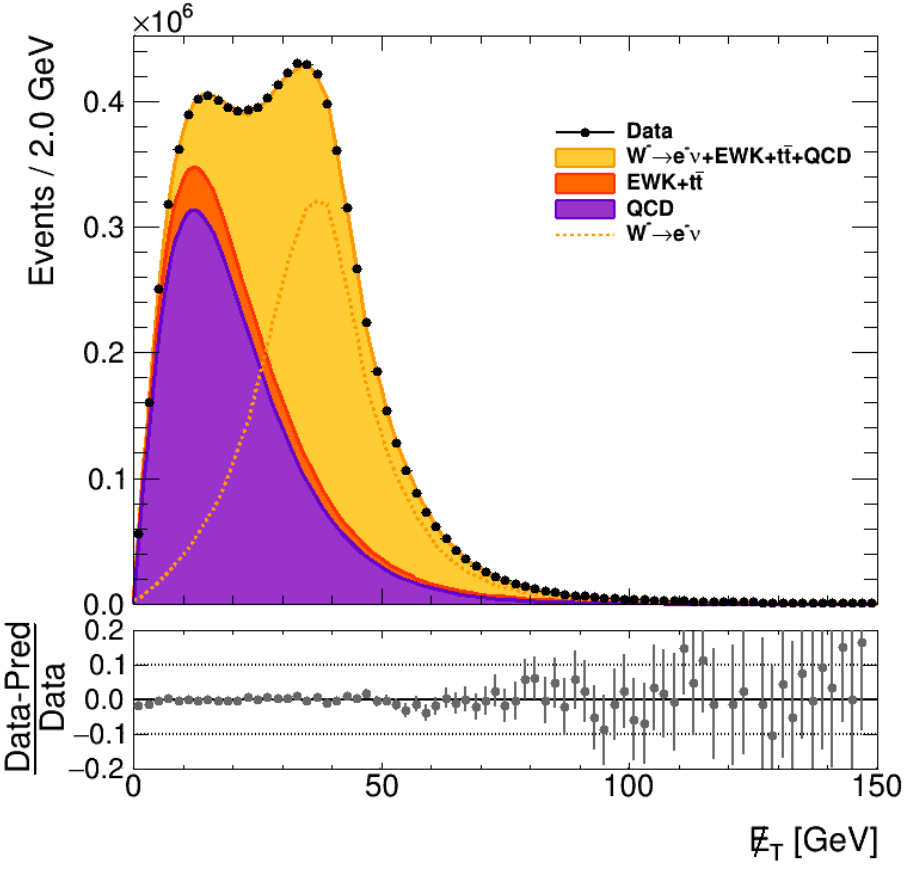


New binning

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

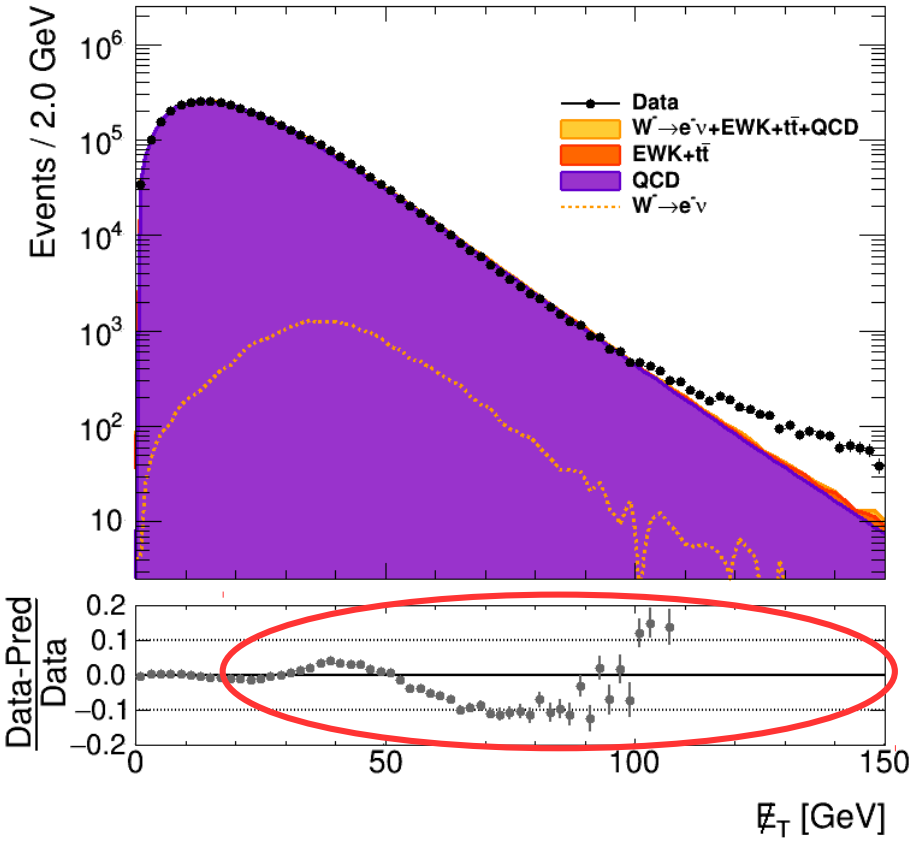


Old binning

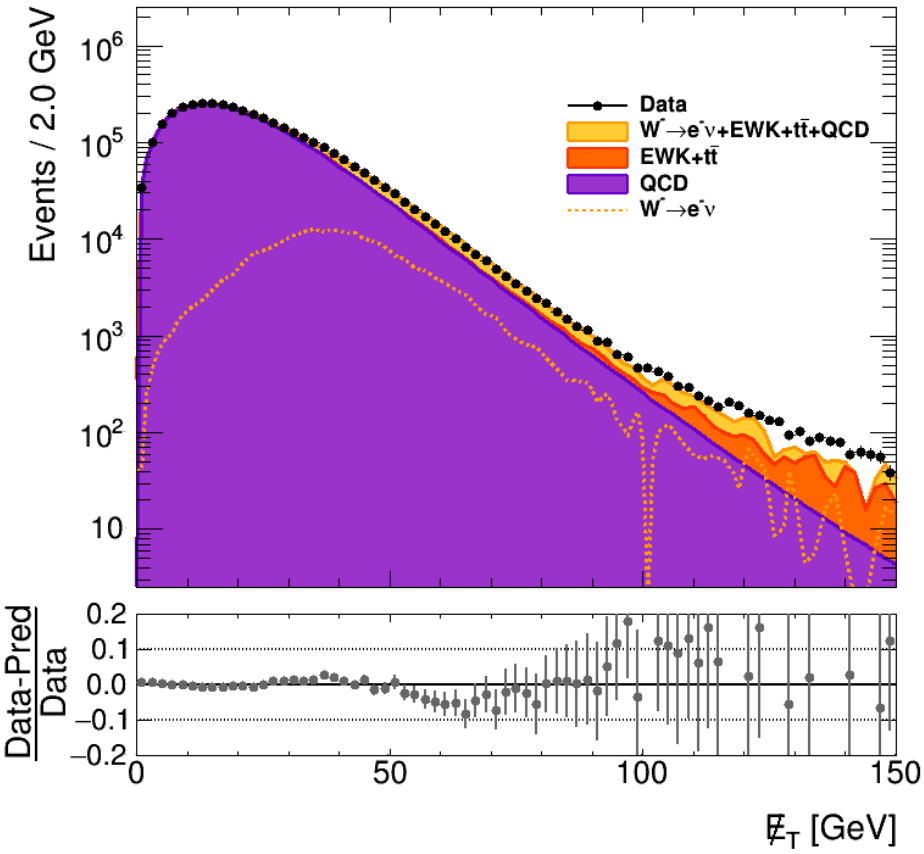


New binning

Control region

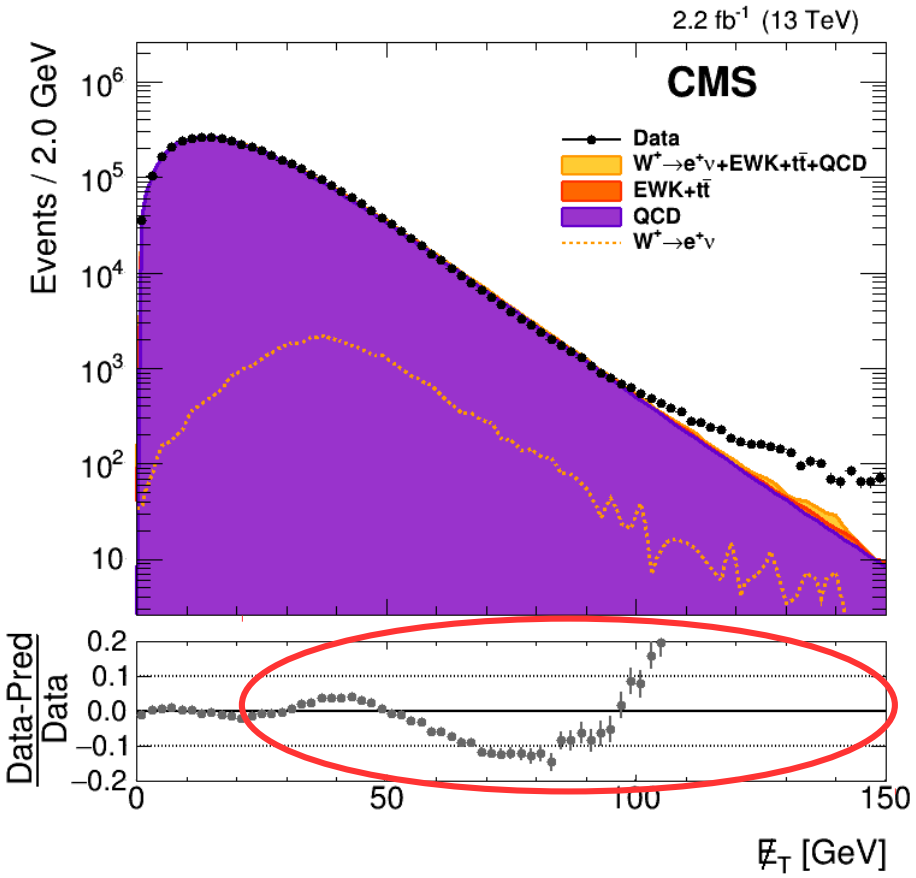


Old binning

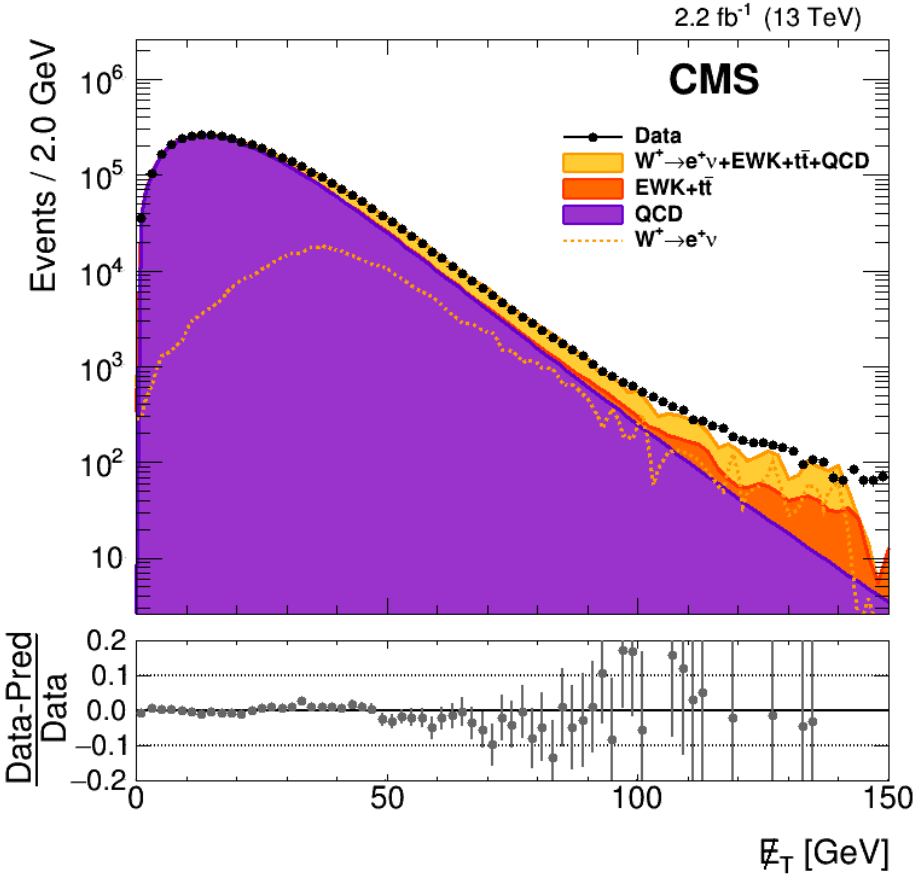


New binning

Control region



Old binning



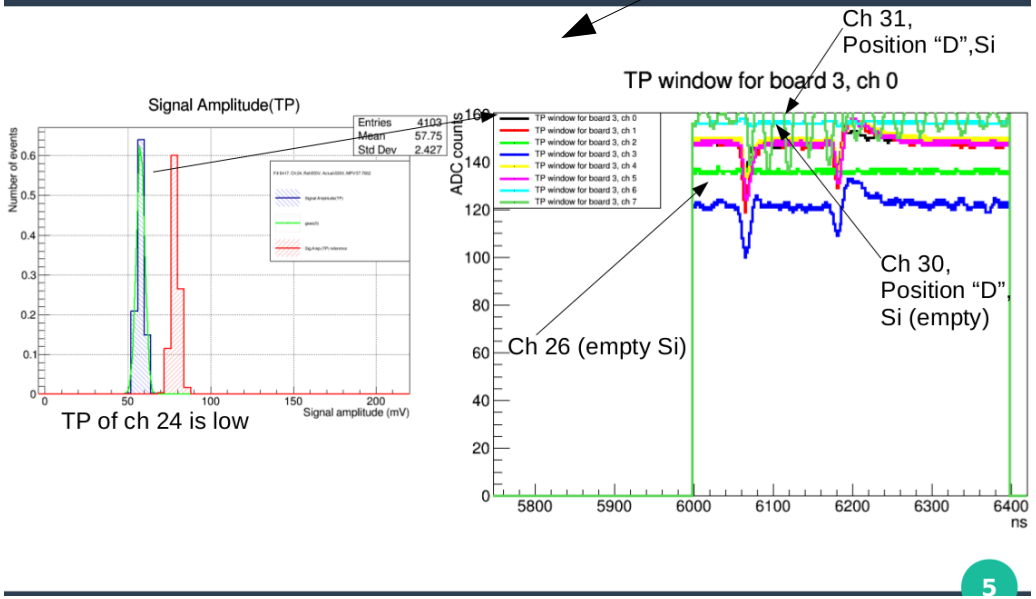
New binning

Test pulse and baseline quality studies

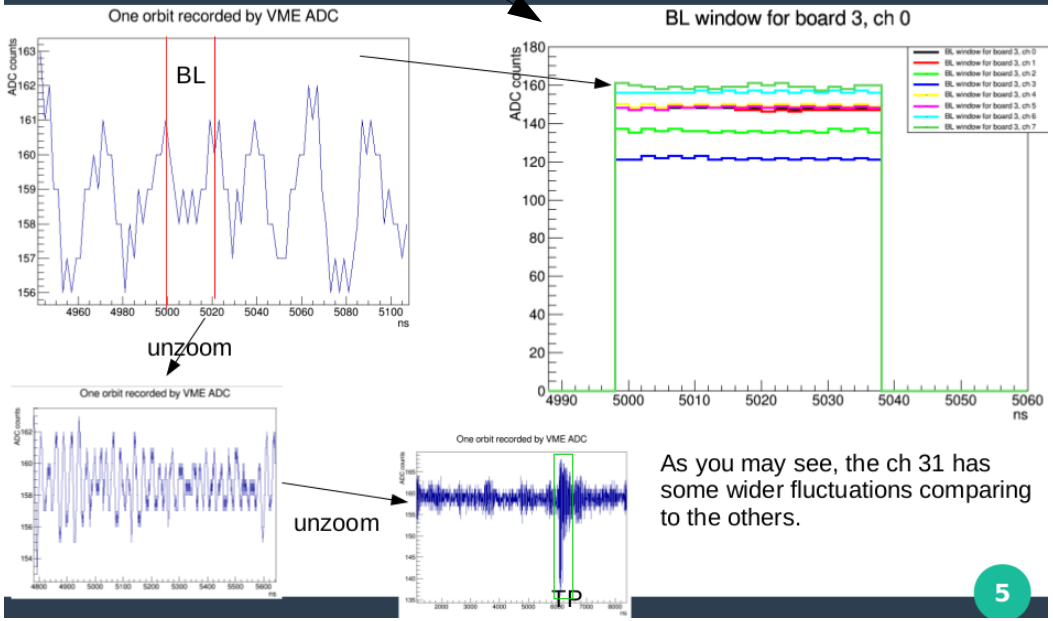
recent

4) Check TP time window by plotting TP of ~~all~~ fills in a default time window + comments from Lena(BL check).

Board number 3 (Counting from 0)



Board 3



From "TPwindow_studies_28.01.18.pdf"

From "BLwindow_studies_29.01.18.pdf"