

W charge asymmetry studies:

08.06.2018

Acceptance

For inclusive measurements of W xsection acceptance defined as:
“The acceptance **A** for W boson events is defined as the fraction of simulated events that have decay products within the fiducial volume satisfying the kinematic and geometrical selection.”

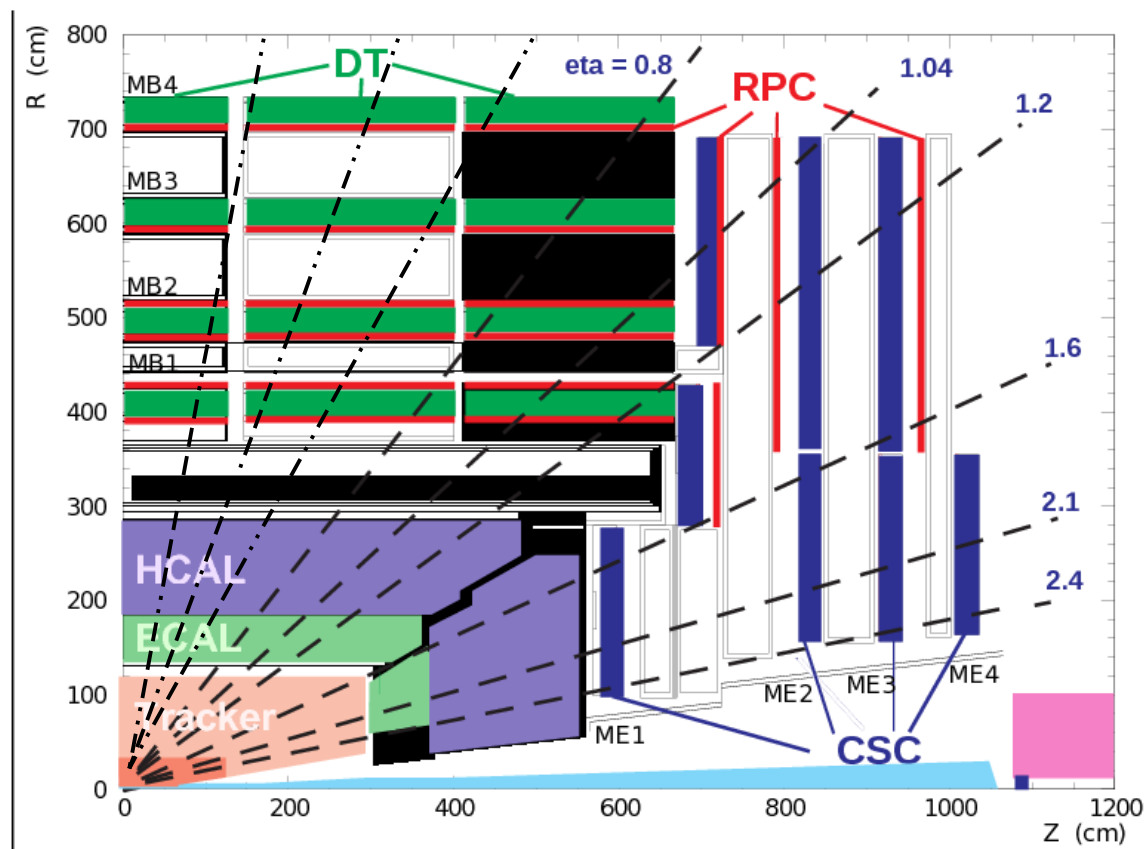
But for W asymmetry studies we have to redefine the acceptance due to a nature of the process.

Re-definition

Constraints on u/d ratio can be provided only in terms of pseudorapidity..

For that case we have:
“The acceptance **A** for W boson events is defined as the fraction of simulated events that have decay products within the fiducial volume satisfying the kinematic and ~~geometrical~~ requirements”

$P_t < 25 \text{ GeV}$



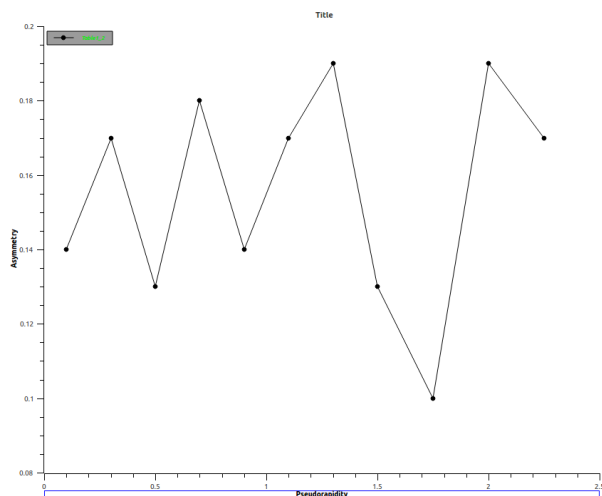
Results

W->mu minus	Data	Signal	Signal norm	QCD	Other	Signal+QCD+C	Data / Signal+QCD+Other	Acceptance*efficiency	Acceptance*efficiency NEW(per eta bin)	Data	Signal %	QCD %	Other %	CROSS SECTION
0 Total:	8835493	7043894		1179216	612398	8835508	0.9999983023	0.375	0.466	100%	79.7	13.3	6.9	7.01E-09
1 0.0 - 0.2	785783	660247	3301235	77535	47998	4087015	0.1922633022	0.034	0.45	9%	84	9.9	6.1	3.40E-09
2 0.2 - 0.4	730670	608042	3040210	70866	51752	3770870	0.1937669556	0.033	0.443	8%	83.2	9.7	7.1	3.18E-09
3 0.4 - 0.6	813480	675480	3377400	110665	27344	4190889	0.1941067874	0.034	0.455	9%	83	13.6	3.4	3.44E-09
4 0.6 - 0.8	801520	628857	3144285	119615	53046	3945803	0.2031322902	0.035	0.459	9%	78.5	14.9	6.6	3.17E-09
5 0.8 - 1.0	736393	592387	2961935	98559	45451	3698332	0.1991148983	0.031	0.45	8%	80.5	13.4	6.2	3.05E-09
6 1.0 - 1.2	740903	579079	2895395	105192	56630	3636296	0.2037521148	0.032	0.443	8%	78.5	14.2	7.6	3.03E-09
7 1.2 - 1.4	806372	620992	3104960	128592	56798	3911342	0.2061624885	0.035	0.451	9%	77.5	15.9	7.0	3.19E-09
8 1.4 - 1.6	804511	599060	2995300	142138	63316	3799814	0.2117237844	0.032	0.462	9%	74.5	17.7	7.9	3.00E-09
9 1.6 - 1.85	882305	677705	2710820	137015	67592	3593132	0.2455531831	0.035	0.468	10%	76.8	15.5	7.7	2.68E-09
10 1.85 - 2.1	863917	618814	2475256	143667	101435	3339172	0.2587219227	0.035	0.474	10%	75.6	16.6	11.7	2.42E-09
11 2.1 - 2.4	869639	663307	2211023.333	117433	88908	3080671.333	0.2822887955	0.034	0.464	10%	76.3	13.5	10.2	2.21E-09
Sum over bins	8835493	6923970		1251277	660270	41053336.33	0.2152198527							
Total/Sum over	1	1.017320121		0.942410	0.9274963	0.2152202181								
W->mu plus	Data	Signal		QCD	Other	Signal+QCD+C	Data / Signal+QCD+Other	Acceptance*efficiency	Acceptance*efficiency NEW(per eta bin)	Data	Signal %	QCD %	Other %	CROSS SECTION
0 Total:	11007396	9179612		944324	883456	11007392	1.000000363	0.36	0.45	100%	83.4	8.6	8.0	9.45E-09
1 0.0 - 0.2	908163	771102	3855510	83254	53805	4763671	0.1906435184	0.03	0.416	8%	84.9	9.2	5.9	4.30E-09
2 0.2 - 0.4	848544	725252	3626260	96943	26366	4474821	0.189626356	0.028	0.415	8%	85.5	11.4	3.1	4.05E-09
3 0.4 - 0.6	951901	797953	3989765	86488	67451	4941657	0.1926278979	0.031	0.422	9%	83.4	9.1	7.1	4.38E-09
4 0.6 - 0.8	950977	777333	3886665	105404	68231	4837633	0.1965789881	0.03	0.422	9%	81.5	11.1	7.2	4.27E-09
5 0.8 - 1.0	877905	734555	3672775	89082	54270	4550682	0.1929172375	0.029	0.416	8%	83.5	10.1	6.2	4.09E-09
6 1.0 - 1.2	910356	739799	3698995	95639	74909	4609342	0.1975023767	0.029	0.409	8%	81.5	10.5	8.2	4.19E-09
7 1.2 - 1.4	1004326	803787	4018935	88346	112161	5023229	0.1999363358	0.031	0.418	9%	80	8.8	11.2	4.46E-09
8 1.4 - 1.6	1023373	809093	4045465	107275	107001	5068834	0.2018951499	0.033	0.431	9%	79.5	10.5	10.5	4.35E-09
9 1.6 - 1.85	1153777	894033	3576132	124942	134778	4729885	0.2439334149	0.038	0.433	10%	77.5	10.8	11.7	3.83E-09
10 1.85 - 2.1	1170676	986704	3946816	139616	44364	5117500	0.2287593532	0.038	0.445	11%	84.3	11.9	3.8	4.11E-09
11 2.1 - 2.4	1207398	1054142	3513806.667	120965	32299	4721212.667	0.2557389563	0.038	0.436	11%	87.3	10	2.7	3.73E-09

Asymmetries

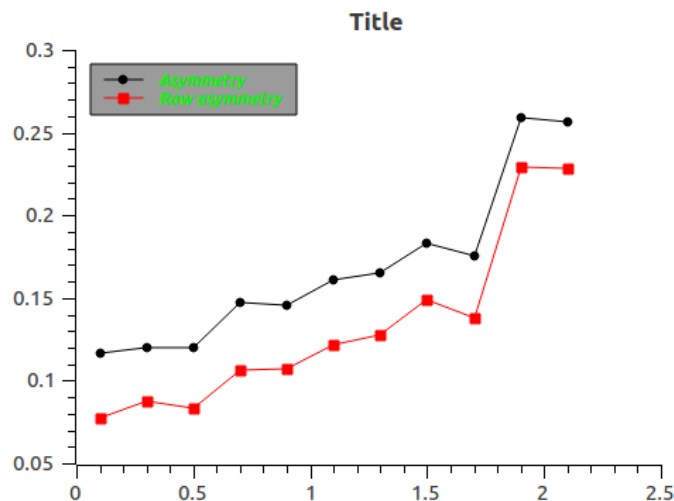
Old acceptance

	Asymmetry	Asymmetry(raw)
0 Total:	0.15	1.32E-01
1 0.0 - 0.2	0.14	7.74E-02
2 0.2 - 0.4	0.17	8.79E-02
3 0.4 - 0.6	0.13	8.31E-02
4 0.6 - 0.8	0.18	1.06E-01
5 0.8 - 1.0	0.14	1.07E-01
6 1.0 - 1.2	0.17	1.22E-01
7 1.2 - 1.4	0.19	1.28E-01
8 1.4 - 1.6	0.13	1.49E-01
9 1.6 - 1.85	0.10	1.38E-01
10 1.85 - 2.1	0.19	2.29E-01
11 2.1 - 2.4	0.17	2.28E-01

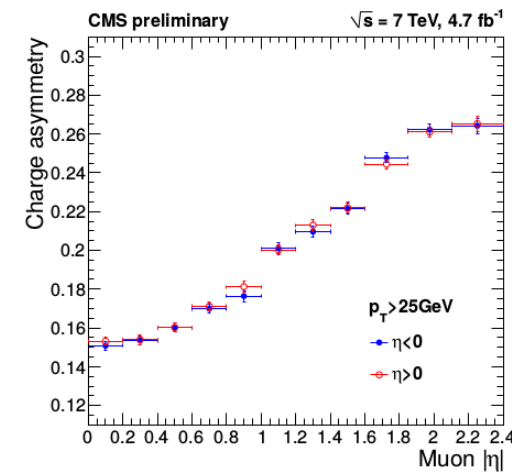
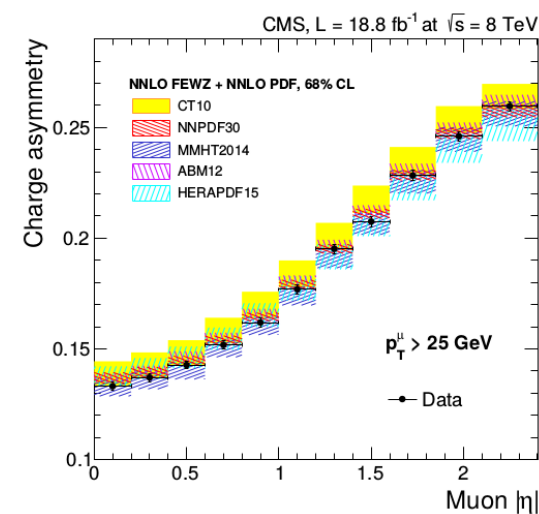


New acceptance

	Asymmetry	bin width	Asymmetry(raw)
0 Total:	0.15		1.32E-01
1 0.0 - 0.2	0.11636	0.2	7.74E-02
2 0.2 - 0.4	0.12020	0.2	8.79E-02
3 0.4 - 0.6	0.12037	0.2	8.31E-02
4 0.6 - 0.8	0.14693	0.2	1.06E-01
5 0.8 - 1.0	0.14579	0.2	1.07E-01
6 1.0 - 1.2	0.16098	0.2	1.22E-01
7 1.2 - 1.4	0.16547	0.2	1.28E-01
8 1.4 - 1.6	0.18292	0.2	1.49E-01
9 1.6 - 1.85	0.17554	0.25	1.38E-01
10 1.85 - 2.1	0.25883	0.25	2.29E-01
11 2.1 - 2.4	0.25686	0.3	2.28E-01

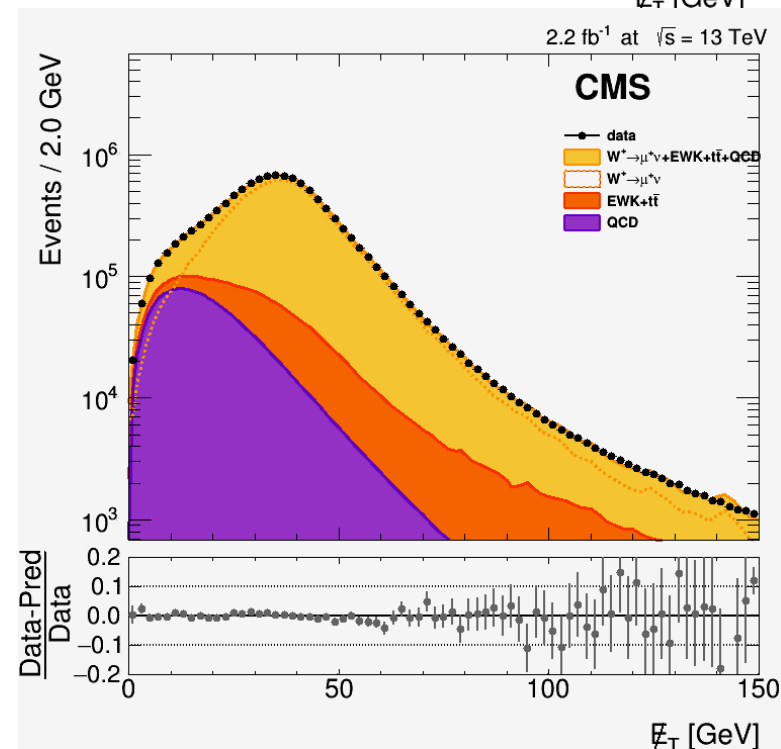
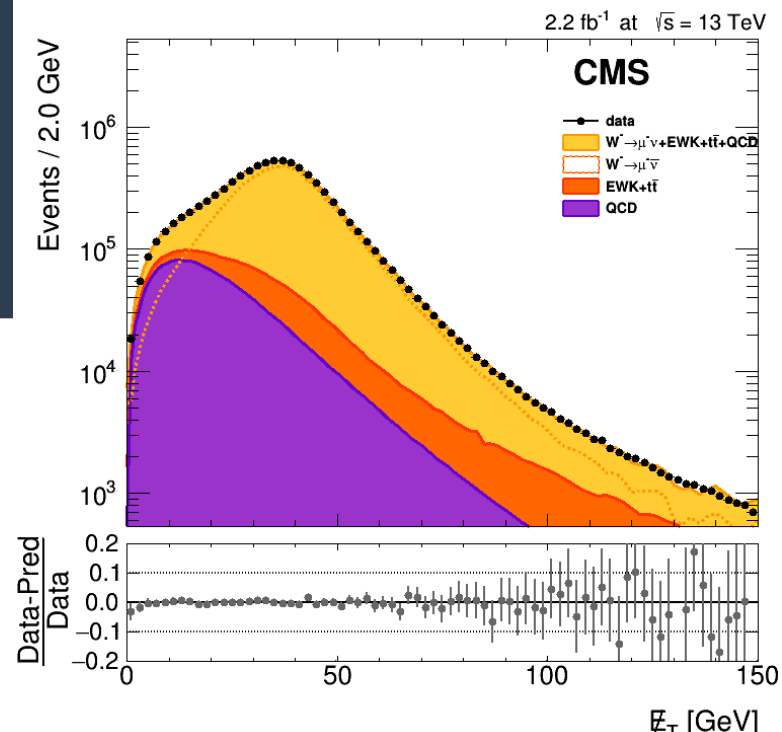


8 & 7 TeV



QCD background

- QCD background should be the same for W^+ and W^- (we assume that possible QCD bkg from asymmetry effect is negligible or we can estimate it's contribution from the asymmetry values).
- In the analysis code simultaneous fit performed for the Signal and Control regions.
- Due to invariance to $W^+/-$ processes the simultaneous fit should be applied to W^+ and W^- .



Backup

Acceptance

The acceptance A of the W bosons defines as a fraction of simulated events with decay products passing kinematic requirements in the fiducial phase-space.

- $p_T > 25$ GeV;
- $|\eta| < 2.4$;

Calculated* Acceptance for W^+ & W^- in muon channel:

- $A(W^+) = 0.45$
- $A(W^-) = 0.46$

* - acceptance when only p_T & $|\eta|$ cuts are used.

Calculated* Acceptance for W^+ & W^- in muon channel:

- $A(W^+) = 0.381461$
- $A(W^-) = 0.394783$

* - acceptance when object selection is performed.

	Process	A_{Gen} (Pre-FSR)	A_{Gen} (Post-FSR)
Results from the	$W^+ \rightarrow \mu^+ \nu$	0.45	0.44
	$W^- \rightarrow \mu^- \bar{\nu}$	0.47	0.46