Extract of Summary Tables and Plots

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W+jets MC numbers

$\nu\nu$ selection

Step	W$\to e\nu$	W$\to \mu\nu$	W$\to \tau\nu$	Z$\to \nu\nu$	Z$\to$ll	EWK Z+2j
$\Delta\phi < 1.0$	133 ± 11	119 ± 10	130 ± 10	239 ± 8	4.9 ± 0.8	14 ± 0.9
$\Delta\phi > 2.6$	149 ± 10	150 ± 10	139 ± 10	232 ± 6	5.7 ± 0.9	17 ± 1

$e\nu$ selection

Step	W$\to e\nu$	W$\to \mu\nu$	W$\to \tau\nu$	Z$\to \nu\nu$	Z$\to$ll	EWK Z+2j
$\Delta\phi < 1.0$	109 ± 9	0 ± 0	1.3 ± 0.7	0 ± 0	2.8 ± 0.6	0.9 ± 0.2
$\Delta\phi > 2.6$	99 ± 8	0.0005 ± 0.0005	3 ± 2	0 ± 0	2.3 ± 0.6	0.8 ± 0.2

$\mu\nu$ selection

Step	W$\to e\nu$	W$\to \mu\nu$	W$\to \tau\nu$	Z$\to \nu\nu$	Z$\to$ll	EWK Z+2j
$\Delta\phi < 1.0$	0 ± 0	293 ± 16	0 ± 0	0 ± 0	12 ± 1	3 ± 0.4
$\Delta\phi > 2.6$	0 ± 0	260 ± 14	0 ± 0	0 ± 0	12 ± 1	3.1 ± 0.4

Standard Selection - For Reference

Signal selection

Step	QCD	γ+jets	Top	W+jets	Z+jets	VV	SumMC	Data	Signal 120
HLTMetClean	13661241± 836429	13687± 51	44648± 168	221636± 597	52009± 181	2504 ± 14	13995725± 837440	2198348	2745 ± 32
LeptonVeto	6811140± 388759	12305± 48	18971± 110	72543± 256	27385± 104	891 ± 8	6943236± 389284	1967288	2016 ± 27
JetPair	3911378± 356597	7080 ± 37	9600 ± 78	45726± 195	18796± 86	432 ± 6	3993013± 356999	1435063	1913 ± 27
AN	15831± 1685	229 ± 6	801 ± 23	5144 ± 61	3514 ± 32	50 ± 2	25568± 1810	32324	856 ± 18
DEta	1286174± 111259	1296 ± 19	1612 ± 31	18921± 137	7709 ± 62	135 ± 3	1315846± 111512	576792	1492 ± 24
MET	5022 ± 1529	96 ± 5	524 ± 18	4873 ± 62	3194 ± 35	59 ± 2	13767± 1651	16282	968 ± 19
TightMjj	2672 ± 1005	52 ± 3	225 ± 12	1987 ± 39	1345 ± 21	16 ± 1	6297 ± 1081	10481	550 ± 14
DPhiSIGNAL	705 ± 688	8 ± 1	55 ± 6	382 ± 18	258 ± 10	5.2 ± 0.6	1412 ± 724	XXX	209 ± 9
DPhiQCD	1784 ± 718	16 ± 2	45 ± 5	438 ± 18	256 ± 8	2.1 ± 0.4	2540 ± 751	6363	40 ± 4

W/Z+jets sample separated

Step	W$\rightarrow e\nu$	W$\rightarrow \mu\nu$	W$\rightarrow \tau\nu$	Z$\rightarrow \nu\nu$	Z$\rightarrow$ll	EWK Z+2j
$\Delta\phi < 1.0$	133 ± 11	119 ± 10	130 ± 10	239 ± 8	4.9 ± 0.8	14 ± 0.9
$\Delta\phi > 2.6$	149 ± 10	150 ± 10	139 ± 10	232 ± 6	5.7 ± 0.9	17 ± 1

W+jets selection - Electron selection

Step	QCD	γ+jets	Top	W+jets	Z+jets	VV	SumMC	Data	Signal 120
HLTMetClean	13661241 $\pm$ 836429	13687 $\pm$ 51	44648 $\pm$ 168	221636 $\pm$ 597	52009 $\pm$ 181	2504 $\pm$ 14	13995725 $\pm$ 837440	2198348	2745 $\pm$ 32
WSelection	88 $\pm$ 21	87 $\pm$ 4	5322 $\pm$ 59	11072 $\pm$ 88	319 $\pm$ 8	134 $\pm$ 4	17021 $\pm$ 183	7860	0 $\pm$ 0
JetPair	47 $\pm$ 16	52 $\pm$ 3	2842 $\pm$ 43	7385 $\pm$ 73	193 $\pm$ 6	67 $\pm$ 3	10586 $\pm$ 143	5551	0 $\pm$ 0
AN	0.2 $\pm$ 0.1	0.7 $\pm$ 0.2	280 $\pm$ 14	973 $\pm$ 26	28 $\pm$ 2	9.0 $\pm$ 1.0	1291 $\pm$ 44	1091	0 $\pm$ 0
DEta	2 $\pm$ 1	7 $\pm$ 1	541 $\pm$ 19	2582 $\pm$ 47	51 $\pm$ 3	21 $\pm$ 1	3204 $\pm$ 73	2063	0 $\pm$ 0
MET	2 $\pm$ 1	3.6 $\pm$ 0.9	269 $\pm$ 13	1260 $\pm$ 31	30 $\pm$ 2	13 $\pm$ 1	1576 $\pm$ 50	1157	0 $\pm$ 0
TightMjj	2 $\pm$ 1	1.5 $\pm$ 0.4	125 $\pm$ 9	550 $\pm$ 20	16 $\pm$ 2	4.3 $\pm$ 0.7	698 $\pm$ 34	620	0 $\pm$ 0
DPhiSIGNAL	0 $\pm$ 0	0.07 $\pm$ 0.06	32 $\pm$ 5	111 $\pm$ 9	3.7 $\pm$ 0.9	1.4 $\pm$ 0.4	147 $\pm$ 15	111	0 $\pm$ 0
DPhiQCD	0 $\pm$ 0	0.4 $\pm$ 0.1	19 $\pm$ 4	102 $\pm$ 9	3.1 $\pm$ 0.8	0.4 $\pm$ 0.2	124 $\pm$ 13	113	0 $\pm$ 0

W+jets selection - Muon selection

Step	QCD	γ+jets	Top	W+jets	Z+jets	VV	SumMC	Data	Signal 120
HLTMetClean	13661241 ± 836429	13687 ± 51	44648 ± 168	221636 ± 597	52009 ± 181	2504 ± 14	13995725 ± 837440	2198348	2745 ± 32
WSelection	1575 ± 943	3.6 ± 0.8	10104 ± 81	29335 ± 142	3044 ± 23	315 ± 5	44377 ± 1195	21777	0 ± 0
JetPair	477 ± 248	1.4 ± 0.4	5239 ± 59	19505 ± 118	1874 ± 18	161 ± 4	27255 ± 448	15433	0 ± 0
AN	0.2 ± 0.2	0.05 ± 0.05	313 ± 15	1200 ± 29	73 ± 4	9.2 ± 1.0	1595 ± 49	1395	0 ± 0
DEta	257 ± 206	0.05 ± 0.04	1064 ± 26	6927 ± 76	619 ± 11	54 ± 2	8921 ± 322	6007	0 ± 0
MET	0 ± 0	0 ± 0	589 ± 20	3391 ± 52	205 ± 6	30 ± 2	4216 ± 80	3334	0 ± 0
TightMjj	0 ± 0	0 ± 0	234 ± 13	1320 ± 32	81 ± 4	8.2 ± 0.9	1644 ± 50	1645	0 ± 0
DPhiSIGNAL	0 ± 0	0 ± 0	65 ± 7	293 ± 16	15 ± 2	1.8 ± 0.4	374 ± 25	336	0 ± 0
DPhiQCD	0 ± 0	0 ± 0	39 ± 5	260 ± 14	15 ± 2	0.9 ± 0.3	315 ± 22	305	0 ± 0

Data-driven W+jets estimates - standard selection - signal region - central

From MC

Step	W$\to e\nu$	W$\to \mu\nu$	W$\to \tau\nu$	Z$\to \nu\nu$	Z$\to$ll	EWK Z+2j
$\Delta\phi < 1.0$	133 $\pm$ 11	119 $\pm$ 10	130 $\pm$ 10	239 $\pm$ 8	4.9 $\pm$ 0.8	14 $\pm$ 0.9
$\Delta\phi > 2.6$	149 $\pm$ 10	150 $\pm$ 10	139 $\pm$ 10	232 $\pm$ 6	5.7 $\pm$ 0.9	17 $\pm$ 1

From data: electron $\Delta\phi < 1.0$

	Signal Region	Control Region
N_{data}	XXX	111
N_{EWK}	n/a	37.1 $\pm$ 5.1
ϵ_{lepsel}	0.264 $\pm$ 0.00144	0.118 $\pm$ 0.00106
ϵ_{VBF}	0.0054 $\pm$ 0.000467	0.00989 $\pm$ 0.000942
$N^{MC}_{W\to e\nu}$	133 $\pm$ 11	109 $\pm$ 9
$N^{data}_{W\to e\nu}$	90.2 $\pm$ 18.2	73.9 $\pm$ 12.1

From data: electron $\Delta\phi > 2.6$

	Signal Region	Control Region
N_{data}	XXX	113
N_{EWK}	n/a	22.5 $\pm$ 4.08
ϵ_{lepsel}	0.264 $\pm$ 0.00144	0.118 $\pm$ 0.00106
ϵ_{VBF}	0.00605 $\pm$ 0.000494	0.00898 $\pm$ 0.000899
$N^{MC}_{W\to e\nu}$	149 $\pm$ 10	99 $\pm$ 8
$N^{data}_{W\to e\nu}$	136 $\pm$ 22.7	90.5 $\pm$ 11.7

From data: muon $\Delta\phi < 1.0$

	Signal Region	Control Region
N_{data}	XXX	336
N_{EWK}	n/a	81.8 $\pm$ 7.29
ϵ_{lepsel}	0.276 $\pm$ 0.00147	0.318 $\pm$ 0.00153
ϵ_{VBF}	0.00467 $\pm$ 0.000427	0.00999 $\pm$ 0.00058
$N^{MC}_{W\to \mu\nu}$	119 $\pm$ 10	293 $\pm$ 16
$N^{data}_{W\to \mu\nu}$	103 $\pm$ 13	254 $\pm$ 19.4

From data: muon $\Delta\phi > 2.6$

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	Signal Region	Control Region
N_{data}	XXX	305
N_{EWK}	n/a	54.9 $\pm$ 5.39
ϵ_{lepsel}	0.276 $\pm$ 0.00147	0.318 $\pm$ 0.00153
ϵ_{VBF}	0.00589 $\pm$ 0.000479	0.00886 $\pm$ 0.000547
$N^{MC}_{W\to \mu\nu}$	150 $\pm$ 10	260 $\pm$ 14
$N^{data}_{W\to \mu\nu}$	144 $\pm$ 16.1	250 $\pm$ 17.8

Data-driven W+jets estimates - standard selection - signal region - JESUP

From MC

Step	W$\to e\nu$	W$\to \mu\nu$	W$\to \tau\nu$	Z$\to \nu\nu$	Z$\to$ll	EWK Z+2j
$\Delta\phi < 1.0$	152 $\pm$ 12	147 $\pm$ 11	148 $\pm$ 11	279 $\pm$ 9	5.8 $\pm$ 0.9	14.7 $\pm$ 0.9
$\Delta\phi > 2.6$	168 $\pm$ 11	168 $\pm$ 11	153 $\pm$ 10	263 $\pm$ 7	6.2 $\pm$ 0.9	18 $\pm$ 1

From data: electron signal

	Signal Region	Control Region
N_{data}	XXX	111
N_{EWK}	n/a	41.6 $\pm$ 5.1
ϵ_{lepsel}	0.276 $\pm$ 0.00146	0.122 $\pm$ 0.00107
ϵ_{VBF}	0.0059 $\pm$ 0.000477	0.011 $\pm$ 0.000977
$N^{MC}_{W\to e\nu}$	152 $\pm$ 12	125 $\pm$ 10
$N^{data}_{W\to e\nu}$	84.4 $\pm$ 17.5	69.4 $\pm$ 12.1

From data: electron QCD

	Signal Region	Control Region
N_{data}	XXX	113
N_{EWK}	n/a	22.8 $\pm$ 4.08
ϵ_{lepsel}	0.276 $\pm$ 0.00146	0.122 $\pm$ 0.00107
ϵ_{VBF}	0.00652 $\pm$ 0.000501	0.00932 $\pm$ 0.000901
$N^{MC}_{W\to e\nu}$	168 $\pm$ 11	106 $\pm$ 9
$N^{data}_{W\to e\nu}$	143 $\pm$ 24.1	90.2 $\pm$ 11.7

From data: muon signal

	Signal Region	Control Region
N_{data}	XXX	336
N_{EWK}	n/a	97 $\pm$ 7.3
ϵ_{lepsel}	0.283 $\pm$ 0.00148	0.329 $\pm$ 0.00155
ϵ_{VBF}	0.00563 $\pm$ 0.000463	0.0112 $\pm$ 0.000605
$N^{MC}_{W\to \mu\nu}$	147 $\pm$ 11	340 $\pm$ 18
$N^{data}_{W\to \mu\nu}$	103 $\pm$ 12.7	239 $\pm$ 19.4

From data: muon QCD

	Signal Region	Control Region
N_{data}	XXX	305
N_{EWK}	n/a	61.9 $\pm$ 6.33
ϵ_{lepsel}	0.283 $\pm$ 0.00148	0.329 $\pm$ 0.00155
ϵ_{VBF}	0.00643 $\pm$ 0.000494	0.00934 $\pm$ 0.000553
$N^{MC}_{W\to \mu\nu}$	168 $\pm$ 11	283 $\pm$ 15
$N^{data}_{W\to \mu\nu}$	144 $\pm$ 16.2	243 $\pm$ 18.1

Data-driven W+jets estimates - standard selection - signal region - JESDOWN

From MC

Step	W$\to e\nu$	W$\to \mu\nu$	W$\to \tau\nu$	Z$\to \nu\nu$	Z$\to$ll	EWK Z+2j
$\Delta\phi < 1.0$	101 $\pm$ 9	99 $\pm$ 9	113 $\pm$ 9	197 $\pm$ 7	4 $\pm$ 0.7	12.9 $\pm$ 0.9
$\Delta\phi > 2.6$	131 $\pm$ 10	136 $\pm$ 10	125 $\pm$ 9	208 $\pm$ 6	5.2 $\pm$ 0.9	16 $\pm$ 1

From data: electron signal

	Signal Region	Control Region
N_{data}	XXX	111
N_{EWK}	n/a	30.4 $\pm$ 4.1
ϵ_{lepsel}	0.251 $\pm$ 0.00142	0.114 $\pm$ 0.00104
ϵ_{VBF}	0.0043 $\pm$ 0.000427	0.0089 $\pm$ 0.000909
$N^{MC}_{W\to e\nu}$	101 $\pm$ 9	95 $\pm$ 8
$N^{data}_{W\to e\nu}$	85.7 $\pm$ 16.3	80.6 $\pm$ 11.7

From data: electron QCD

	Signal Region	Control Region
N_{data}	XXX	113
N_{EWK}	n/a	22.2 $\pm$ 4.08
ϵ_{lepsel}	0.251 $\pm$ 0.00142	0.114 $\pm$ 0.00104
ϵ_{VBF}	0.00558 $\pm$ 0.000486	0.00862 $\pm$ 0.000895
$N^{MC}_{W\to e\nu}$	131 $\pm$ 10	92 $\pm$ 8
$N^{data}_{W\to e\nu}$	129 $\pm$ 22.4	90.8 $\pm$ 11.7

From data: muon signal

	Signal Region	Control Region
N_{data}	XXX	336
N_{EWK}	n/a	71.7 $\pm$ 6.34
ϵ_{lepsel}	0.269 $\pm$ 0.00146	0.308 $\pm$ 0.00152
ϵ_{VBF}	0.00399 $\pm$ 0.0004	0.00901 $\pm$ 0.000561
$N^{MC}_{W\to \mu\nu}$	99 $\pm$ 9	256 $\pm$ 15
$N^{data}_{W\to \mu\nu}$	102 $\pm$ 13.3	264 $\pm$ 19.1

From data: muon QCD

	Signal Region	Control Region
N_{data}	XXX	305
N_{EWK}	n/a	51.7 $\pm$ 5.39
ϵ_{lepsel}	0.269 $\pm$ 0.00146	0.308 $\pm$ 0.00152
ϵ_{VBF}	0.00548 $\pm$ 0.000468	0.00817 $\pm$ 0.000534
$N^{MC}_{W\to \mu\nu}$	136 $\pm$ 10	232 $\pm$ 14
$N^{data}_{W\to \mu\nu}$	148 $\pm$ 17.6	253 $\pm$ 17.8

Control plots (1)

Control plots for W+jets estimates: loose Mjj selection

W$\rightarrow e\nu$

W$\rightarrow \mu\nu$

Control plots for W+jets estimates: tight Mjj selection

W$\rightarrow e\nu$

W$\rightarrow \mu\nu$