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
$\Delta\phi < 1.0$	142 ± 11	130 ± 10	146 ± 11	255 ± 9	5.5 ± 0.9	14.3 ± 0.9
$\Delta\phi > 2.6$	162 ± 11	152 ± 11	143 ± 10	240 ± 6	6.4 ± 1	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
$\Delta\phi < 1.0$	119 ± 9	0 ± 0	1.3 ± 0.7	0 ± 0	2.6 ± 0.6	0.9 ± 0.2
$\Delta\phi > 2.6$	100 ± 8	0.0005 ± 0.0005	3 ± 2	0 ± 0	2.4 ± 0.6	0.7 ± 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	310 ± 17	0 ± 0	0 ± 0	13 ± 1	3 ± 0.4
$\Delta\phi > 2.6$	0 ± 0	266 ± 15	0 ± 0	0 ± 0	13 ± 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	6719668 ± 387003	12287 ± 48	18982 ± 110	73272 ± 259	27532 ± 105	901 ± 8	6852642 ± 387533	1967288	2020 ± 27
JetPair	3837249 ± 354101	7064 ± 37	9626 ± 79	46183 ± 198	18927 ± 87	436 ± 6	3919485 ± 354507	1435063	1913 ± 27
AN	25966 ± 2330	282 ± 6	841 ± 24	5384 ± 63	3648 ± 33	53 ± 2	36174 ± 2458	32324	879 ± 18
DEta	1205692 ± 102904	1289 ± 19	1643 ± 32	19349 ± 141	7831 ± 63	139 ± 3	1235944 ± 103162	576792	1494 ± 24
MET	10216 ± 2040	109 ± 6	547 ± 19	5089 ± 63	3295 ± 36	61 ± 2	19318 ± 2165	16282	978 ± 19
TightMjj	7797 ± 1669	63 ± 4	238 ± 13	2113 ± 40	1406 ± 22	18 ± 1	11635 ± 1749	10481	557 ± 14
DPhiSIGNAL	838 ± 701	8 ± 1	59 ± 6	418 ± 19	275 ± 11	5.5 ± 0.7	1602 ± 739	XXX	210 ± 9
DPhiQCD	6636 ± 1502	24 ± 2	46 ± 5	457 ± 18	264 ± 8	2.3 ± 0.4	7428 ± 1537	6363	42 ± 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
$\Delta\phi < 1.0$	142 ± 11	130 ± 10	146 ± 11	255 ± 9	5.5 ± 0.9	14.3 ± 0.9
$\Delta\phi > 2.6$	162 ± 11	152 ± 11	143 ± 10	240 ± 6	6.4 ± 1	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	87 $\pm$ 21	87 $\pm$ 4	5324 $\pm$ 59	11146 $\pm$ 89	320 $\pm$ 8	135 $\pm$ 4	17100 $\pm$ 184	7860	0 $\pm$ 0
JetPair	46 $\pm$ 16	53 $\pm$ 3	2844 $\pm$ 43	7431 $\pm$ 73	194 $\pm$ 6	68 $\pm$ 3	10636 $\pm$ 144	5551	0 $\pm$ 0
AN	0.8 $\pm$ 0.7	0.8 $\pm$ 0.2	292 $\pm$ 14	1006 $\pm$ 27	28 $\pm$ 2	10 $\pm$ 1	1338 $\pm$ 45	1091	0 $\pm$ 0
DEta	1.3 $\pm$ 0.9	7 $\pm$ 1	545 $\pm$ 19	2622 $\pm$ 48	52 $\pm$ 3	22 $\pm$ 1	3250 $\pm$ 73	2063	0 $\pm$ 0
MET	1.3 $\pm$ 0.9	3.6 $\pm$ 0.9	269 $\pm$ 13	1288 $\pm$ 32	30 $\pm$ 2	13 $\pm$ 1	1605 $\pm$ 50	1157	0 $\pm$ 0
TightMjj	1.3 $\pm$ 0.9	1.5 $\pm$ 0.4	129 $\pm$ 9	566 $\pm$ 21	16 $\pm$ 2	4.5 $\pm$ 0.7	719 $\pm$ 34	620	0 $\pm$ 0
DPhiSIGNAL	0 $\pm$ 0	0.07 $\pm$ 0.06	33 $\pm$ 5	120 $\pm$ 10	3.5 $\pm$ 0.8	1.6 $\pm$ 0.4	158 $\pm$ 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	126 $\pm$ 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	1630 ± 945	3.6 ± 0.8	10110 ± 81	29512 ± 143	3051 ± 23	317 ± 6	44624 ± 1198	21777	0 ± 0
JetPair	531 ± 254	1.4 ± 0.4	5255 ± 59	19641 ± 119	1878 ± 18	163 ± 4	27470 ± 454	15433	0 ± 0
AN	0.2 ± 0.2	0.05 ± 0.05	322 ± 15	1239 ± 30	74 ± 4	9.2 ± 1.0	1644 ± 50	1395	0 ± 0
DEta	257 ± 206	0.05 ± 0.04	1083 ± 26	7061 ± 77	624 ± 11	55 ± 2	9080 ± 324	6007	0 ± 0
MET	0 ± 0	0 ± 0	600 ± 20	3465 ± 53	207 ± 6	32 ± 2	4304 ± 81	3334	0 ± 0
TightMjj	0 ± 0	0 ± 0	244 ± 13	1374 ± 33	83 ± 4	8.3 ± 0.9	1710 ± 51	1645	0 ± 0
DPhiSIGNAL	0 ± 0	0 ± 0	69 ± 7	310 ± 17	16 ± 2	1.6 ± 0.4	397 ± 26	336	0 ± 0
DPhiQCD	0 ± 0	0 ± 0	42 ± 5	266 ± 15	16 ± 2	0.9 ± 0.3	325 ± 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
$\Delta\phi < 1.0$	142 ± 11	130 ± 10	146 ± 11	255 ± 9	5.5 ± 0.9	14.3 ± 0.9
$\Delta\phi > 2.6$	162 ± 11	152 ± 11	143 ± 10	240 ± 6	6.4 ± 1	17 ± 1

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

	Signal Region	Control R
N_{data}	XXX	11
N_{EWK}	n/a	$38.1 \pm$
ϵ_{lepsel}	0.269 ± 0.00145	$0.119 \pm$
ϵ_{VBF}	0.00565 ± 0.000473	$0.0107 \pm$
$N^{MC}_{W\to e\nu}$	$142 \pm 11\ ^{+28.4(+20\%)}_{-25.7(-18.1\%)}$	$119 \pm 9\ ^{+12.}_{-16}$
$N^{data}_{W\to e\nu}$	$87 \pm 17.3\ ^{+7.05(+8.1\%)}_{-3.36(-3.87\%)}$	$72.9 \pm 12.1\ ^{+6}_{-}$

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

	Signal Region	Control R
N_{data}	XXX	113
N_{EWK}	n/a	$22.5 \pm$
ϵ_{lepsel}	0.269 ± 0.00145	$0.119 \pm$
ϵ_{VBF}	0.00645 ± 0.000505	$0.00901 \pm$
$N^{MC}_{W\to e\nu}$	$162 \pm 11\ ^{+16.5(+10.2\%)}_{-18.4(-11.4\%)}$	$100 \pm 8\ ^{+8.5}_{-6(}$
$N^{data}_{W\to e\nu}$	$147 \pm 24.5\ ^{+1.89(+1.29\%)}_{-7.25(-4.95\%)}$	$90.5 \pm 11.7\ ^{+1}_{-(}$

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

	Signal Region	Contro
N_{data}	XXX	3
N_{EWK}	n/a	86.6
ϵ_{lepsel}	0.277 ± 0.00147	$0.32 \pm$
ϵ_{VBF}	0.00508 ± 0.000445	$0.0105 \pm$
$N^{MC}_{W\to \mu\nu}$	$130 \pm 10\ ^{+34.9(+26.8\%)}_{-23.4(-18\%)}$	$310 \pm 17\ ^{+}_{-}$
$N^{data}_{W\to \mu\nu}$	$105 \pm 12.8\ ^{+8.56(+8.19\%)}_{-0.64(-0.612\%)}$	249 ± 19.4

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

	Signal Region	Control R
N_{data}	XXX	305
N_{EWK}	n/a	58.9 ± 5
ϵ_{lepsel}	0.277 ± 0.00147	$0.32 \pm 0.$
ϵ_{VBF}	0.00594 ± 0.000481	$0.00901 \pm$
$N^{MC}_{W\to \mu\nu}$	$152 \pm 11\ ^{+20.6(+13.6\%)}_{-9.06(-5.96\%)}$	$266 \pm 15\ ^{+22.}_{-26}$
$N^{data}_{W\to \mu\nu}$	$141 \pm 16.4\ ^{+8.93(+6.35\%)}_{-0(-0\%)}$	$246 \pm 17.8\ ^{+4.}_{-4.}$

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
$\Delta\phi < 1.0$	164 $\pm$ 12	161 $\pm$ 12	160 $\pm$ 11	302 $\pm$ 10	6.3 $\pm$ 0.9	15.3 $\pm$ 1
$\Delta\phi > 2.6$	178 $\pm$ 11	171 $\pm$ 11	167 $\pm$ 11	272 $\pm$ 7	6.9 $\pm$ 1	18 $\pm$ 1

From data: electron signal

	Signal Region	Control Region
N_{data}	XXX	111
N_{EWK}	n/a	44.2 $\pm$ 5.1
ϵ_{lepsel}	0.282 $\pm$ 0.00147	0.122 $\pm$ 0.00107
ϵ_{VBF}	0.00624 $\pm$ 0.000486	0.0115 $\pm$ 0.000996
$N^{MC}_{W\to e\nu}$	164 $\pm$ 12	131 $\pm$ 10
$N^{data}_{W\to e\nu}$	83.6 $\pm$ 17.6	66.8 $\pm$ 12.1

From data: electron QCD

	Signal Region	Control Region
N_{data}	XXX	113
N_{EWK}	n/a	22.9 $\pm$ 4.08
ϵ_{lepsel}	0.282 $\pm$ 0.00147	0.122 $\pm$ 0.00107
ϵ_{VBF}	0.00677 $\pm$ 0.000506	0.00946 $\pm$ 0.000906
$N^{MC}_{W\to e\nu}$	178 $\pm$ 11	108 $\pm$ 9
$N^{data}_{W\to e\nu}$	148 $\pm$ 24.7	90.1 $\pm$ 11.7

From data: muon signal

	Signal Region	Control Region
N_{data}	XXX	336
N_{EWK}	n/a	99.6 $\pm$ 7.3
ϵ_{lepsel}	0.285 $\pm$ 0.00149	0.331 $\pm$ 0.00155
ϵ_{VBF}	0.00614 $\pm$ 0.000482	0.0114 $\pm$ 0.000609
$N^{MC}_{W\to \mu\nu}$	161 $\pm$ 12	348 $\pm$ 18
$N^{data}_{W\to \mu\nu}$	109 $\pm$ 13.4	236 $\pm$ 19.4

From data: muon QCD

	Signal Region	Control Region
N_{data}	XXX	305
N_{EWK}	n/a	63.2 $\pm$ 6.34
ϵ_{lepsel}	0.285 $\pm$ 0.00149	0.331 $\pm$ 0.00155
ϵ_{VBF}	0.00652 $\pm$ 0.000497	0.00942 $\pm$ 0.000553
$N^{MC}_{W\to \mu\nu}$	171 $\pm$ 11	287 $\pm$ 15
$N^{data}_{W\to \mu\nu}$	144 $\pm$ 16.1	242 $\pm$ 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
$\Delta\phi < 1.0$	117 $\pm$ 10	108 $\pm$ 9	125 $\pm$ 10	216 $\pm$ 8	4.6 $\pm$ 0.8	13.3 $\pm$ 0.9
$\Delta\phi > 2.6$	144 $\pm$ 10	143 $\pm$ 10	131 $\pm$ 10	214 $\pm$ 6	5.5 $\pm$ 0.9	17 $\pm$ 1

From data: electron signal

	Signal Region	Control Region
N_{data}	XXX	111
N_{EWK}	n/a	31.6 $\pm$ 4.1
ϵ_{lepsel}	0.257 $\pm$ 0.00143	0.115 $\pm$ 0.00105
ϵ_{VBF}	0.00488 $\pm$ 0.00045	0.00958 $\pm$ 0.00094
$N^{MC}_{W\to e\nu}$	117 $\pm$ 10	103 $\pm$ 9
$N^{data}_{W\to e\nu}$	90.2 $\pm$ 17.3	79.4 $\pm$ 11.7

From data: electron QCD

	Signal Region	Control Region
N_{data}	XXX	113
N_{EWK}	n/a	21.4 $\pm$ 4.08
ϵ_{lepsel}	0.257 $\pm$ 0.00143	0.115 $\pm$ 0.00105
ϵ_{VBF}	0.00601 $\pm$ 0.000499	0.00874 $\pm$ 0.000898
$N^{MC}_{W\to e\nu}$	144 $\pm$ 10	94 $\pm$ 8
$N^{data}_{W\to e\nu}$	140 $\pm$ 23.7	91.6 $\pm$ 11.7

From data: muon signal

	Signal Region	Control Region
N_{data}	XXX	336
N_{EWK}	n/a	75.5 $\pm$ 6.34
ϵ_{lepsel}	0.271 $\pm$ 0.00146	0.309 $\pm$ 0.00152
ϵ_{VBF}	0.00432 $\pm$ 0.000415	0.00925 $\pm$ 0.000567
$N^{MC}_{W\to \mu\nu}$	108 $\pm$ 9	264 $\pm$ 15
$N^{data}_{W\to \mu\nu}$	107 $\pm$ 13.3	260 $\pm$ 19.1

From data: muon QCD

	Signal Region	Control Region
N_{data}	XXX	305
N_{EWK}	n/a	54.8 $\pm$ 5.39
ϵ_{lepsel}	0.271 $\pm$ 0.00146	0.309 $\pm$ 0.00152
ϵ_{VBF}	0.00573 $\pm$ 0.000477	0.00841 $\pm$ 0.000541
$N^{MC}_{W\to \mu\nu}$	143 $\pm$ 10	240 $\pm$ 14
$N^{data}_{W\to \mu\nu}$	149 $\pm$ 17.2	250 $\pm$ 17.8

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

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
$\Delta\phi < 1.0$	136 $\pm$ 11	122 $\pm$ 10	135 $\pm$ 10	241 $\pm$ 9	5.1 $\pm$ 0.8	14 $\pm$ 0.9
$\Delta\phi > 2.6$	158 $\pm$ 11	151 $\pm$ 11	138 $\pm$ 10	235 $\pm$ 6	6 $\pm$ 0.9	17 $\pm$ 1

From data: electron signal

	Signal Region	Control Region
N_{data}	XXX	111
N_{EWK}	n/a	35.9 $\pm$ 4.1
ϵ_{lepsel}	0.266 $\pm$ 0.00145	0.118 $\pm$ 0.00106
ϵ_{VBF}	0.00548 $\pm$ 0.000469	0.0103 $\pm$ 0.000961
$N^{MC}_{W\to e\nu}$	136 $\pm$ 11	114 $\pm$ 9
$N^{data}_{W\to e\nu}$	89.6 $\pm$ 17.3	75.1 $\pm$ 11.7

From data: electron QCD

	Signal Region	Control Region
N_{data}	XXX	113
N_{EWK}	n/a	22.5 $\pm$ 4.08
ϵ_{lepsel}	0.266 $\pm$ 0.00145	0.118 $\pm$ 0.00106
ϵ_{VBF}	0.00637 $\pm$ 0.000505	0.00905 $\pm$ 0.000901
$N^{MC}_{W\to e\nu}$	158 $\pm$ 11	100 $\pm$ 8
$N^{data}_{W\to e\nu}$	143 $\pm$ 24	90.5 $\pm$ 11.7

From data: muon signal

	Signal Region	Control Region
N_{data}	XXX	336
N_{EWK}	n/a	83.8 $\pm$ 7.29
ϵ_{lepsel}	0.277 $\pm$ 0.00147	0.319 $\pm$ 0.00153
ϵ_{VBF}	0.00478 $\pm$ 0.000432	0.0101 $\pm$ 0.000583
$N^{MC}_{W\to \mu\nu}$	122 $\pm$ 10	296 $\pm$ 17
$N^{data}_{W\to \mu\nu}$	104 $\pm$ 13.1	252 $\pm$ 19.4

From data: muon QCD

	Signal Region	Control Region
N_{data}	XXX	305
N_{EWK}	n/a	57.9 $\pm$ 5.39
ϵ_{lepsel}	0.277 $\pm$ 0.00147	0.319 $\pm$ 0.00153
ϵ_{VBF}	0.00592 $\pm$ 0.00048	0.00885 $\pm$ 0.000546
$N^{MC}_{W\to \mu\nu}$	151 $\pm$ 11	260 $\pm$ 14
$N^{data}_{W\to \mu\nu}$	144 $\pm$ 16.6	247 $\pm$ 17.8

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

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
$\Delta\phi < 1.0$	160 $\pm$ 13	146 $\pm$ 11	151 $\pm$ 11	270 $\pm$ 9	5.7 $\pm$ 0.9	14.4 $\pm$ 0.9
$\Delta\phi > 2.6$	166 $\pm$ 11	160 $\pm$ 11	158 $\pm$ 11	248 $\pm$ 6	7 $\pm$ 1	17 $\pm$ 1

From data: electron signal

	Signal Region	Control Region
N_{data}	XXX	111
N_{EWK}	n/a	39.3 $\pm$ 5.08
ϵ_{lepsel}	0.273 $\pm$ 0.00146	0.119 $\pm$ 0.00106
ϵ_{VBF}	0.00629 $\pm$ 0.000496	0.0111 $\pm$ 0.000991
$N^{MC}_{W\to e\nu}$	160 $\pm$ 13	123 $\pm$ 10
$N^{data}_{W\to e\nu}$	93.3 $\pm$ 19.1	71.7 $\pm$ 12.1

From data: electron QCD

	Signal Region	Control Region
N_{data}	XXX	113
N_{EWK}	n/a	22.5 $\pm$ 4.08
ϵ_{lepsel}	0.273 $\pm$ 0.00146	0.119 $\pm$ 0.00106
ϵ_{VBF}	0.00652 $\pm$ 0.000505	0.00926 $\pm$ 0.000908
$N^{MC}_{W\to e\nu}$	166 $\pm$ 11	103 $\pm$ 8
$N^{data}_{W\to e\nu}$	146 $\pm$ 24.1	90.5 $\pm$ 11.7

From data: muon signal

	Signal Region	Control Region
N_{data}	XXX	336
N_{EWK}	n/a	88.9 $\pm$ 7.29
ϵ_{lepsel}	0.278 $\pm$ 0.00148	0.322 $\pm$ 0.00154
ϵ_{VBF}	0.00569 $\pm$ 0.00047	0.0109 $\pm$ 0.000603
$N^{MC}_{W\to \mu\nu}$	146 $\pm$ 11	323 $\pm$ 17
$N^{data}_{W\to \mu\nu}$	112 $\pm$ 13.5	247 $\pm$ 19.4

From data: muon QCD

	Signal Region	Control Region
N_{data}	XXX	305
N_{EWK}	n/a	60.3 $\pm$ 6.34
ϵ_{lepsel}	0.278 $\pm$ 0.00148	0.322 $\pm$ 0.00154
ϵ_{VBF}	0.00624 $\pm$ 0.000491	0.0092 $\pm$ 0.000555
$N^{MC}_{W\to \mu\nu}$	160 $\pm$ 11	273 $\pm$ 15
$N^{data}_{W\to \mu\nu}$	143 $\pm$ 16.5	245 $\pm$ 18.1

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$\rightarrow \mu\nu$