

SR, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	2jets modTopness ≥ 6.4 250 < MET < 350	2jets modTopness ≥ 6.4 350 < MET < 450	2jets modTopness ≥ 6.4 MET > 450
Data, single e/μ , MET	Inclusive	107.00 \pm 10.34	17.00 \pm 4.12	8.00 \pm 2.83
All Background	Inclusive	88.56 \pm 4.72	13.64 \pm 1.81	4.35 \pm 0.96
	1 lepton	20.44 \pm 3.81	4.53 \pm 1.46	2.41 \pm 0.79
	1 lepton, from W	19.85 \pm 3.80	4.53 \pm 1.46	2.41 \pm 0.79
	1 lepton, from t	0.59 \pm 0.30	—	—
	≥ 2 leptons	62.89 \pm 2.68	7.23 \pm 0.95	0.72 \pm 0.20
	$Z \rightarrow \nu\nu$	5.23 \pm 0.75	1.88 \pm 0.50	1.23 \pm 0.51
$t\bar{t}$	Inclusive	57.79 \pm 2.05	6.23 \pm 0.62	0.49 \pm 0.16
	1 lepton	0.59 \pm 0.30	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.59 \pm 0.30	—	—
	≥ 2 leptons	57.20 \pm 2.03	6.23 \pm 0.62	0.49 \pm 0.16
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	0.27 \pm 0.27	—	—
	1 lepton	0.27 \pm 0.27	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.27 \pm 0.27	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	0.32 \pm 0.14	—	—
	1 lepton	0.32 \pm 0.14	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.32 \pm 0.14	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	57.20 \pm 2.03	6.23 \pm 0.62	0.49 \pm 0.16
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	57.20 \pm 2.03	6.23 \pm 0.62	0.49 \pm 0.16
	$Z \rightarrow \nu\nu$	—	—	—
single t	Inclusive	3.65 \pm 1.66	0.70 \pm 0.70	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.65 \pm 1.66	0.70 \pm 0.70	—
	$Z \rightarrow \nu\nu$	—	—	—
single t $t - W$ -channel	Inclusive	3.65 \pm 1.66	0.70 \pm 0.70	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.65 \pm 1.66	0.70 \pm 0.70	—
	$Z \rightarrow \nu\nu$	—	—	—
single t , $t - W$ -channel, powheg pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
single \bar{t} , $t - W$ -channel, powheg pythia8	Inclusive	3.65 \pm 1.66	0.70 \pm 0.70	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.65 \pm 1.66	0.70 \pm 0.70	—
	$Z \rightarrow \nu\nu$	—	—	—
single t non $t - W$ -channel	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—

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Table 1 – continued from previous page

Sample	Classification	2jets modTopness ≥ 6.4 250 < MET < 350	2jets modTopness ≥ 6.4 350 < MET < 450	2jets modTopness ≥ 6.4 MET > 450
single t , s-channel, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —
V+Jets	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	17.02 \pm 3.65 17.02 \pm 3.65 17.02 \pm 3.65 — —	4.36 \pm 1.45 4.36 \pm 1.45 4.36 \pm 1.45 — —	2.41 \pm 0.79 2.41 \pm 0.79 2.41 \pm 0.79 — —
DY+Jets $\rightarrow \ell\ell$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	17.02 \pm 3.65 17.02 \pm 3.65 17.02 \pm 3.65 — —	4.36 \pm 1.45 4.36 \pm 1.45 4.36 \pm 1.45 — —	2.41 \pm 0.79 2.41 \pm 0.79 2.41 \pm 0.79 — —
W+Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	2.12 \pm 1.50 2.12 \pm 1.50 2.12 \pm 1.50 — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	12.62 \pm 3.16 12.62 \pm 3.16 12.62 \pm 3.16 — —	2.80 \pm 1.27 2.80 \pm 1.27 2.80 \pm 1.27 — —	0.76 \pm 0.54 0.76 \pm 0.54 0.76 \pm 0.54 — —
W+Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.89 \pm 0.89 0.89 \pm 0.89 0.89 \pm 0.89 — —	0.40 \pm 0.40 0.40 \pm 0.40 0.40 \pm 0.40 — —	0.42 \pm 0.42 0.42 \pm 0.42 0.42 \pm 0.42 — —
W+Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.52 \pm 0.26 0.52 \pm 0.26 0.52 \pm 0.26 — —	0.22 \pm 0.13 0.22 \pm 0.13 0.22 \pm 0.13 — —	0.34 \pm 0.16 0.34 \pm 0.16 0.34 \pm 0.16 — —

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Table 1 – continued from previous page

Sample	Classification	2jets	2jets	2jets
		modTopness ≥ 6.4 $250 < MET < 350$	modTopness ≥ 6.4 $350 < MET < 450$	modTopness ≥ 6.4 $MET > 450$
W+Jets $\rightarrow \ell\nu$, $800 < HT < 1200$, madgraph pythia8	Inclusive	0.16 ± 0.08	0.16 ± 0.08	0.56 ± 0.15
	1 lepton	0.16 ± 0.08	0.16 ± 0.08	0.56 ± 0.15
	1 lepton, from W	0.16 ± 0.08	0.16 ± 0.08	0.56 ± 0.15
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W+Jets $\rightarrow \ell\nu$, $1200 < HT < 2500$, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.66 ± 0.47	0.79 ± 0.56	0.33 ± 0.33
	1 lepton	0.66 ± 0.47	0.79 ± 0.56	0.33 ± 0.33
	1 lepton, from W	0.66 ± 0.47	0.79 ± 0.56	0.33 ± 0.33
	1 lepton, from t	—	—	—
W+Jets $\rightarrow \ell\nu$, $2500 < HT < Inf$, madgraph pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.05 ± 0.04	—	0.00 ± 0.00
	1 lepton	0.05 ± 0.04	—	0.00 ± 0.00
	1 lepton, from W	0.05 ± 0.04	—	0.00 ± 0.00
Rare	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	10.11 ± 1.42	2.35 ± 0.53	1.45 ± 0.53
	1 lepton	2.83 ± 1.07	0.17 ± 0.07	—
diBoson	1 lepton, from W	2.83 ± 1.07	0.17 ± 0.07	—
	1 lepton, from t	0.00 ± 0.00	—	—
	≥ 2 leptons	2.05 ± 0.55	0.30 ± 0.17	0.22 ± 0.13
	$Z \rightarrow \nu\nu$	5.23 ± 0.75	1.88 ± 0.50	1.23 ± 0.51
	Inclusive	7.83 ± 1.41	1.89 ± 0.53	1.20 ± 0.53
WW	1 lepton	2.83 ± 1.07	0.17 ± 0.07	—
	1 lepton, from W	2.83 ± 1.07	0.17 ± 0.07	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	1.63 ± 0.54	0.29 ± 0.17	0.20 ± 0.12
	$Z \rightarrow \nu\nu$	3.36 ± 0.75	1.43 ± 0.50	1.00 ± 0.51
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	3.93 ± 1.19	0.20 ± 0.14	0.08 ± 0.08
	1 lepton	2.38 ± 1.07	—	—
	1 lepton, from W	2.38 ± 1.07	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	1.55 ± 0.54	0.20 ± 0.14	0.08 ± 0.08
WW $\rightarrow \ell\nu qq$, powheg	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.55 ± 0.54	0.20 ± 0.14	0.08 ± 0.08
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
WZ	≥ 2 leptons	2.38 ± 1.07	—	—
	$Z \rightarrow \nu\nu$	2.38 ± 1.07	—	—
	Inclusive	2.38 ± 1.07	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	0.08 ± 0.04	0.09 ± 0.09	0.12 ± 0.09
	$Z \rightarrow \nu\nu$	3.20 ± 0.75	1.39 ± 0.50	0.96 ± 0.51
	Inclusive	0.04 ± 0.04	0.09 ± 0.09	0.11 ± 0.09
	1 lepton	—	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.04 ± 0.04	0.09 ± 0.09	0.11 ± 0.09
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—

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Table 1 – continued from previous page

Sample	Classification	2jets modTopness ≥ 6.4 250 < MET < 350	2jets modTopness ≥ 6.4 350 < MET < 450	2jets modTopness ≥ 6.4 MET > 450
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.04 ± 0.02	—	0.01 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.04 ± 0.02	—	0.01 ± 0.01
$WZ \rightarrow \ell \nu 2Q$, amcnlo pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.45 ± 0.13	0.17 ± 0.07	—
	1 lepton	0.45 ± 0.13	0.17 ± 0.07	—
	1 lepton, from W	0.45 ± 0.13	0.17 ± 0.07	—
	1 lepton, from t	—	—	—
$WZ \rightarrow 1\ell 3\nu$, amcnlo pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	3.20 ± 0.75	1.39 ± 0.50	0.96 ± 0.51
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
ZZ	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	3.20 ± 0.75	1.39 ± 0.50	0.96 ± 0.51
	Inclusive	0.16 ± 0.02	0.04 ± 0.01	0.04 ± 0.01
	1 lepton	—	—	—
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	0.13 ± 0.02	0.04 ± 0.01	0.03 ± 0.01
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive	0.13 ± 0.02	0.04 ± 0.01	0.03 ± 0.01
	1 lepton	0.03 ± 0.01	—	0.01 ± 0.01
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
$t\bar{t} + V$	$Z \rightarrow \nu\nu$	0.03 ± 0.01	—	0.01 ± 0.01
	Inclusive	2.28 ± 0.12	0.46 ± 0.02	0.25 ± 0.04
	1 lepton	0.00 ± 0.00	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
$t\bar{t} + W$	≥ 2 leptons	0.00 ± 0.00	—	—
	$Z \rightarrow \nu\nu$	0.41 ± 0.11	0.02 ± 0.01	0.02 ± 0.04
	Inclusive	1.87 ± 0.04	0.45 ± 0.02	0.23 ± 0.01
	1 lepton	0.41 ± 0.11	0.01 ± 0.01	0.02 ± 0.04
	1 lepton, from W	—	—	—
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	0.41 ± 0.11	0.01 ± 0.01	0.02 ± 0.04
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.32 ± 0.11	—	0.02 ± 0.04
	1 lepton	—	—	—
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.32 ± 0.11	—	0.02 ± 0.04
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—

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Table 1 – continued from previous page

Sample	Classification	2jets	2jets	2jets
		modTopness ≥ 6.4 $250 < MET < 350$	modTopness ≥ 6.4 $350 < MET < 450$	modTopness ≥ 6.4 $MET > 450$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.08 ± 0.04	0.01 ± 0.01	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.08 ± 0.04	0.01 ± 0.01	—
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.88 ± 0.04	0.45 ± 0.02	0.23 ± 0.01
	1 lepton	0.00 ± 0.00	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.00 ± 0.00	—	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.01 ± 0.00	0.00 ± 0.00	—
	$Z \rightarrow \nu\nu$	1.87 ± 0.04	0.45 ± 0.02	0.23 ± 0.01
	Inclusive	1.88 ± 0.04	0.45 ± 0.02	0.23 ± 0.01
	1 lepton	0.00 ± 0.00	—	—
	1 lepton, from W	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.00 ± 0.00	—	—
	≥ 2 leptons	0.01 ± 0.00	0.00 ± 0.00	—
	$Z \rightarrow \nu\nu$	1.87 ± 0.04	0.45 ± 0.02	0.23 ± 0.01
	Inclusive	0.08 ± 0.07	—	—
	1 lepton	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.77 ± 0.26	0.76 ± 0.17	0.27 ± 0.08
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	0.09 ± 0.09	—
	$Z \rightarrow \nu\nu$	1.77 ± 0.26	0.66 ± 0.14	0.27 ± 0.08

SR, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
Data, single e/μ , MET	Inclusive	63.00 \pm 7.94	15.00 \pm 3.87	9.00 \pm 3.00	4.00 \pm 2.00
All Background	Inclusive	74.07 \pm 4.96	14.01 \pm 1.84	5.67 \pm 1.13	2.81 \pm 0.96
	1 lepton	23.93 \pm 3.98	5.12 \pm 1.47	2.44 \pm 0.87	2.00 \pm 0.92
	1 lepton, from W	23.70 \pm 3.97	5.12 \pm 1.47	2.44 \pm 0.87	2.00 \pm 0.92
	1 lepton, from t	0.23 \pm 0.13	0.00 \pm 0.00	0.00 \pm 0.00	—
	≥ 2 leptons	44.17 \pm 2.89	6.78 \pm 1.00	1.63 \pm 0.60	0.42 \pm 0.16
	$Z \rightarrow \nu\nu$	5.97 \pm 0.63	2.12 \pm 0.48	1.61 \pm 0.40	0.39 \pm 0.22
$t\bar{t}$	Inclusive	36.05 \pm 1.81	5.30 \pm 0.63	0.99 \pm 0.38	0.28 \pm 0.11
	1 lepton	0.23 \pm 0.13	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.23 \pm 0.13	—	—	—
	≥ 2 leptons	35.82 \pm 1.81	5.30 \pm 0.63	0.99 \pm 0.38	0.28 \pm 0.11
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	0.23 \pm 0.13	—	—	—
	1 lepton	0.23 \pm 0.13	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.23 \pm 0.13	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	35.82 \pm 1.81	5.30 \pm 0.63	0.99 \pm 0.38	0.28 \pm 0.11
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	35.82 \pm 1.81	5.30 \pm 0.63	0.99 \pm 0.38	0.28 \pm 0.11
	$Z \rightarrow \nu\nu$	—	—	—	—
single t	Inclusive	7.06 \pm 2.32	1.05 \pm 0.74	0.38 \pm 0.38	—
	1 lepton	0.70 \pm 0.70	—	—	—
	1 lepton, from W	0.70 \pm 0.70	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	6.36 \pm 2.21	1.05 \pm 0.74	0.38 \pm 0.38	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single t t - W-channel	Inclusive	7.06 \pm 2.32	1.05 \pm 0.74	0.38 \pm 0.38	—
	1 lepton	0.70 \pm 0.70	—	—	—
	1 lepton, from W	0.70 \pm 0.70	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	6.36 \pm 2.21	1.05 \pm 0.74	0.38 \pm 0.38	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single t , t - W-channel, powheg pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single \bar{t} , t - W-channel, powheg pythia8	Inclusive	7.06 \pm 2.32	1.05 \pm 0.74	0.38 \pm 0.38	—
	1 lepton	0.70 \pm 0.70	—	—	—
	1 lepton, from W	0.70 \pm 0.70	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	6.36 \pm 2.21	1.05 \pm 0.74	0.38 \pm 0.38	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single t non t - W-channel	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—

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Table 2 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
single t , s-channel, amcnlo pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
V +Jets	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	21.46 \pm 3.84	4.84 \pm 1.47	2.02 \pm 0.78	1.88 \pm 0.92
	1 lepton	21.46 \pm 3.84	4.84 \pm 1.47	2.02 \pm 0.78	1.88 \pm 0.92
	1 lepton, from W	21.46 \pm 3.84	4.84 \pm 1.47	2.02 \pm 0.78	1.88 \pm 0.92
	1 lepton, from t	—	—	—	—
DY +Jets $\rightarrow \ell\ell$	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
DY +Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
DY +Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
W +Jets $\rightarrow \ell\nu$	1 lepton	21.46 \pm 3.84	4.84 \pm 1.47	2.02 \pm 0.78	1.88 \pm 0.92
	1 lepton, from W	21.46 \pm 3.84	4.84 \pm 1.47	2.02 \pm 0.78	1.88 \pm 0.92
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	Inclusive	1.11 \pm 1.11	—	—	0.70 \pm 0.70
	1 lepton	1.11 \pm 1.11	—	—	0.70 \pm 0.70
	1 lepton, from W	1.11 \pm 1.11	—	—	0.70 \pm 0.70
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	7.83 \pm 2.23	0.94 \pm 0.94	0.82 \pm 0.58	0.55 \pm 0.55
	1 lepton	7.83 \pm 2.23	0.94 \pm 0.94	0.82 \pm 0.58	0.55 \pm 0.55
	1 lepton, from W	7.83 \pm 2.23	0.94 \pm 0.94	0.82 \pm 0.58	0.55 \pm 0.55
	1 lepton, from t	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	8.45 \pm 2.81	1.70 \pm 1.00	0.43 \pm 0.43	—
	1 lepton	8.45 \pm 2.81	1.70 \pm 1.00	0.43 \pm 0.43	—
	1 lepton, from W	8.45 \pm 2.81	1.70 \pm 1.00	0.43 \pm 0.43	—
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	1.49 \pm 0.48	1.02 \pm 0.28	0.45 \pm 0.25	0.27 \pm 0.19
	1 lepton	1.49 \pm 0.48	1.02 \pm 0.28	0.45 \pm 0.25	0.27 \pm 0.19
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from W	1.49 \pm 0.48	1.02 \pm 0.28	0.45 \pm 0.25	0.27 \pm 0.19
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—

Continued on next page

Table 2 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	1.58 \pm 0.27	0.54 \pm 0.14	0.17 \pm 0.06	0.28 \pm 0.07
	1 lepton	1.58 \pm 0.27	0.54 \pm 0.14	0.17 \pm 0.06	0.28 \pm 0.07
	1 lepton, from W	1.58 \pm 0.27	0.54 \pm 0.14	0.17 \pm 0.06	0.28 \pm 0.07
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Inclusive	0.98 \pm 0.58	0.59 \pm 0.42	0.15 \pm 0.10	0.06 \pm 0.06
	1 lepton	0.98 \pm 0.58	0.59 \pm 0.42	0.15 \pm 0.10	0.06 \pm 0.06
	1 lepton, from W	0.98 \pm 0.58	0.59 \pm 0.42	0.15 \pm 0.10	0.06 \pm 0.06
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	Inclusive	0.03 \pm 0.02	0.04 \pm 0.02	0.00 \pm 0.00	0.02 \pm 0.01
	1 lepton	0.03 \pm 0.02	0.04 \pm 0.02	0.00 \pm 0.00	0.02 \pm 0.01
	1 lepton, from W	0.03 \pm 0.02	0.04 \pm 0.02	0.00 \pm 0.00	0.02 \pm 0.01
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
Rare	Inclusive	9.50 \pm 1.10	2.82 \pm 0.54	2.29 \pm 0.62	0.66 \pm 0.25
	1 lepton	1.54 \pm 0.76	0.28 \pm 0.09	0.42 \pm 0.39	0.12 \pm 0.04
	1 lepton, from W	1.54 \pm 0.76	0.28 \pm 0.09	0.42 \pm 0.39	0.12 \pm 0.04
	1 lepton, from t	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	—
	≥ 2 leptons	1.99 \pm 0.48	0.42 \pm 0.23	0.26 \pm 0.26	0.14 \pm 0.11
	Z $\rightarrow \nu\nu$	5.97 \pm 0.63	2.12 \pm 0.48	1.61 \pm 0.40	0.39 \pm 0.22
diBoson	Inclusive	4.79 \pm 1.08	1.24 \pm 0.51	1.88 \pm 0.62	0.39 \pm 0.25
	1 lepton	1.54 \pm 0.76	0.25 \pm 0.09	0.42 \pm 0.39	0.10 \pm 0.04
	1 lepton, from W	1.54 \pm 0.76	0.25 \pm 0.09	0.42 \pm 0.39	0.10 \pm 0.04
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.36 \pm 0.44	0.21 \pm 0.15	0.26 \pm 0.26	0.13 \pm 0.11
	Z $\rightarrow \nu\nu$	1.90 \pm 0.63	0.78 \pm 0.48	1.19 \pm 0.40	0.16 \pm 0.22
WW	Inclusive	2.31 \pm 0.86	0.21 \pm 0.15	0.65 \pm 0.47	0.10 \pm 0.10
	1 lepton	1.05 \pm 0.75	—	0.39 \pm 0.39	—
	1 lepton, from W	1.05 \pm 0.75	—	0.39 \pm 0.39	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.26 \pm 0.43	0.21 \pm 0.15	0.26 \pm 0.26	0.10 \pm 0.10
	Z $\rightarrow \nu\nu$	—	—	—	—
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	1.26 \pm 0.43	0.21 \pm 0.15	0.26 \pm 0.26	0.10 \pm 0.10
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.26 \pm 0.43	0.21 \pm 0.15	0.26 \pm 0.26	0.10 \pm 0.10
	Z $\rightarrow \nu\nu$	—	—	—	—
WW $\rightarrow \ell\nu qq$, powheg	Inclusive	1.05 \pm 0.75	—	0.39 \pm 0.39	—
	1 lepton	1.05 \pm 0.75	—	0.39 \pm 0.39	—
	1 lepton, from W	1.05 \pm 0.75	—	0.39 \pm 0.39	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
WZ	Inclusive	2.42 \pm 0.65	0.99 \pm 0.48	1.21 \pm 0.40	0.26 \pm 0.22
	1 lepton	0.48 \pm 0.14	0.25 \pm 0.09	0.03 \pm 0.04	0.10 \pm 0.04
	1 lepton, from W	0.48 \pm 0.14	0.25 \pm 0.09	0.03 \pm 0.04	0.10 \pm 0.04
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.10 \pm 0.07	—	—	—
	Z $\rightarrow \nu\nu$	1.84 \pm 0.63	0.73 \pm 0.48	1.18 \pm 0.40	0.15 \pm 0.22
WZ $\rightarrow 3\ell\nu$, powheg pythia8	Inclusive	0.10 \pm 0.07	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.10 \pm 0.07	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—

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Table 2 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
WZ \rightarrow 2 ℓ 2Q, amcnlo pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	\geq 2 leptons	—	—	—	—
WZ \rightarrow $\ell\nu$ 2Q, amcnlo pythia8	Z \rightarrow $\nu\nu$	—	—	—	—
	Inclusive	0.48 \pm 0.14	0.25 \pm 0.09	0.03 \pm 0.04	0.10 \pm 0.04
	1 lepton	0.48 \pm 0.14	0.25 \pm 0.09	0.03 \pm 0.04	0.10 \pm 0.04
	1 lepton, from W	0.48 \pm 0.14	0.25 \pm 0.09	0.03 \pm 0.04	0.10 \pm 0.04
	1 lepton, from t	—	—	—	—
WZ \rightarrow 1 ℓ 3 ν , amcnlo pythia8	\geq 2 leptons	—	—	—	—
	Z \rightarrow $\nu\nu$	—	—	—	—
	Inclusive	1.84 \pm 0.63	0.73 \pm 0.48	1.18 \pm 0.40	0.15 \pm 0.22
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
ZZ	1 lepton, from t	—	—	—	—
	\geq 2 leptons	—	—	—	—
	Z \rightarrow $\nu\nu$	1.84 \pm 0.63	0.73 \pm 0.48	1.18 \pm 0.40	0.15 \pm 0.22
	Inclusive	0.06 \pm 0.02	0.05 \pm 0.01	0.01 \pm 0.00	0.03 \pm 0.02
	1 lepton	—	—	—	—
ZZ \rightarrow 2 ℓ 2Q, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	\geq 2 leptons	—	—	—	0.02 \pm 0.02
	Z \rightarrow $\nu\nu$	0.06 \pm 0.01	0.05 \pm 0.01	0.01 \pm 0.00	0.01 \pm 0.00
	Inclusive	—	—	—	0.02 \pm 0.02
ZZ \rightarrow 2 ℓ 2 ν , powheg pythia8	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	\geq 2 leptons	—	—	—	—
	Z \rightarrow $\nu\nu$	0.06 \pm 0.01	0.04 \pm 0.01	0.01 \pm 0.00	0.01 \pm 0.00
ZZ \rightarrow 2Q2 ν , amcnlo pythia8	Inclusive	0.01 \pm 0.01	0.01 \pm 0.01	—	0.00 \pm 0.00
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	\geq 2 leptons	—	—	—	—
t \bar{t} + V	Z \rightarrow $\nu\nu$	0.01 \pm 0.01	0.01 \pm 0.01	—	0.00 \pm 0.00
	Inclusive	4.71 \pm 0.21	1.58 \pm 0.18	0.41 \pm 0.04	0.26 \pm 0.03
	1 lepton	0.00 \pm 0.00	0.03 \pm 0.03	0.00 \pm 0.00	0.02 \pm 0.02
	1 lepton, from W	—	0.03 \pm 0.03	—	0.02 \pm 0.02
	1 lepton, from t	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	—
t \bar{t} + W	\geq 2 leptons	0.64 \pm 0.20	0.22 \pm 0.17	0.00 \pm 0.03	0.02 \pm 0.02
	Z \rightarrow $\nu\nu$	4.07 \pm 0.05	1.33 \pm 0.03	0.41 \pm 0.02	0.23 \pm 0.01
	Inclusive	0.61 \pm 0.20	0.24 \pm 0.17	—	0.03 \pm 0.02
	1 lepton	—	0.03 \pm 0.03	—	0.02 \pm 0.02
	1 lepton, from W	—	0.03 \pm 0.03	—	0.02 \pm 0.02
t \bar{t} + W \rightarrow $\ell\nu$, amcnlo pythia8	1 lepton, from t	—	—	—	—
	\geq 2 leptons	0.61 \pm 0.20	0.22 \pm 0.17	—	0.02 \pm 0.02
	Z \rightarrow $\nu\nu$	—	—	—	—
	Inclusive	0.50 \pm 0.18	0.23 \pm 0.17	—	0.03 \pm 0.02
	1 lepton	—	0.03 \pm 0.03	—	0.02 \pm 0.02
	1 lepton, from W	—	0.03 \pm 0.03	—	0.02 \pm 0.02
	1 lepton, from t	—	—	—	—
	\geq 2 leptons	0.50 \pm 0.18	0.20 \pm 0.17	—	0.02 \pm 0.02
	Z \rightarrow $\nu\nu$	—	—	—	—

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Table 2 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.11 ± 0.10	0.02 ± 0.02	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.11 ± 0.10	0.02 ± 0.02	—	—
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	4.10 ± 0.06	1.34 ± 0.03	0.41 ± 0.02	0.23 ± 0.01
	1 lepton	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.03 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	—
	$Z \rightarrow \nu\nu$	4.07 ± 0.05	1.33 ± 0.03	0.41 ± 0.02	0.23 ± 0.01
	Inclusive	4.10 ± 0.06	1.34 ± 0.03	0.41 ± 0.02	0.23 ± 0.01
	1 lepton	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	—
	≥ 2 leptons	0.03 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	—
	$Z \rightarrow \nu\nu$	4.07 ± 0.05	1.33 ± 0.03	0.41 ± 0.02	0.23 ± 0.01
	Inclusive	0.04 ± 0.08	0.02 ± 0.02	0.02 ± 0.02	—
	1 lepton	—	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.04 ± 0.08	0.02 ± 0.02	0.02 ± 0.02	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	3.05 ± 0.42	1.40 ± 0.23	0.48 ± 0.12	0.27 ± 0.07
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	3.05 ± 0.42	1.40 ± 0.23	0.48 ± 0.12	0.27 ± 0.07

SR, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
Data, single e/μ , MET	Inclusive	188.00 \pm 13.71	43.00 \pm 6.56	17.00 \pm 4.12
All Background	Inclusive	317.27 \pm 6.04	48.88 \pm 2.09	13.10 \pm 0.93
	1 lepton	19.59 \pm 2.73	3.25 \pm 0.92	0.76 \pm 0.25
	1 lepton, from W	9.64 \pm 2.22	1.71 \pm 0.71	0.30 \pm 0.10
	1 lepton, from t	9.95 \pm 1.59	1.53 \pm 0.57	0.46 \pm 0.22
	≥ 2 leptons	290.11 \pm 5.36	43.95 \pm 1.87	12.00 \pm 0.90
	Z $\rightarrow \nu\nu$	7.57 \pm 0.46	1.69 \pm 0.22	0.33 \pm 0.09
$t\bar{t}$	Inclusive	292.70 \pm 5.28	45.06 \pm 1.94	12.17 \pm 0.92
	1 lepton	8.17 \pm 1.27	1.51 \pm 0.57	0.44 \pm 0.22
	1 lepton, from W	—	—	—
	1 lepton, from t	8.17 \pm 1.27	1.51 \pm 0.57	0.44 \pm 0.22
	≥ 2 leptons	284.53 \pm 5.13	43.54 \pm 1.86	11.72 \pm 0.89
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	3.24 \pm 1.10	1.08 \pm 0.54	0.19 \pm 0.19
	1 lepton	3.24 \pm 1.10	1.08 \pm 0.54	0.19 \pm 0.19
	1 lepton, from W	—	—	—
	1 lepton, from t	3.24 \pm 1.10	1.08 \pm 0.54	0.19 \pm 0.19
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	4.93 \pm 0.63	0.43 \pm 0.18	0.25 \pm 0.11
	1 lepton	4.93 \pm 0.63	0.43 \pm 0.18	0.25 \pm 0.11
	1 lepton, from W	—	—	—
	1 lepton, from t	4.93 \pm 0.63	0.43 \pm 0.18	0.25 \pm 0.11
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	284.53 \pm 5.13	43.54 \pm 1.86	11.72 \pm 0.89
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	284.53 \pm 5.13	43.54 \pm 1.86	11.72 \pm 0.89
	Z $\rightarrow \nu\nu$	—	—	—
single t	Inclusive	4.68 \pm 1.76	—	—
	1 lepton	1.73 \pm 0.95	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	1.73 \pm 0.95	—	—
	≥ 2 leptons	2.95 \pm 1.48	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single t t - W-channel	Inclusive	4.58 \pm 1.75	—	—
	1 lepton	1.63 \pm 0.95	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	1.63 \pm 0.95	—	—
	≥ 2 leptons	2.95 \pm 1.48	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single t, t - W-channel, powheg pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single \bar{t} , t - W-channel, powheg pythia8	Inclusive	4.58 \pm 1.75	—	—
	1 lepton	1.63 \pm 0.95	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	1.63 \pm 0.95	—	—
	≥ 2 leptons	2.95 \pm 1.48	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single t non t - W-channel	Inclusive	0.10 \pm 0.10	—	—
	1 lepton	0.10 \pm 0.10	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.10 \pm 0.10	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—

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Table 3 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
single t , s-channel, amcnlo pythia8	Inclusive	0.10 ± 0.10	—	—
	1 lepton	0.10 ± 0.10	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.10 ± 0.10	—	—
	≥ 2 leptons	—	—	—
V +Jets	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	8.67 ± 2.14	1.65 ± 0.71	0.27 ± 0.09
	1 lepton	8.67 ± 2.14	1.65 ± 0.71	0.27 ± 0.09
	1 lepton, from W	8.67 ± 2.14	1.65 ± 0.71	0.27 ± 0.09
	1 lepton, from t	—	—	—
DY+Jets $\rightarrow \ell\ell$	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
W +Jets $\rightarrow \ell\nu$	1 lepton	8.67 ± 2.14	1.65 ± 0.71	0.27 ± 0.09
	1 lepton, from W	8.67 ± 2.14	1.65 ± 0.71	0.27 ± 0.09
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
W +Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W +Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	2.05 ± 1.20	0.48 ± 0.48	—
	1 lepton	2.05 ± 1.20	0.48 ± 0.48	—
	1 lepton, from W	2.05 ± 1.20	0.48 ± 0.48	—
	1 lepton, from t	—	—	—
W +Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	3.76 ± 1.69	0.48 ± 0.48	—
	1 lepton	3.76 ± 1.69	0.48 ± 0.48	—
	1 lepton, from W	3.76 ± 1.69	0.48 ± 0.48	—
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.42 ± 0.17	0.53 ± 0.21	0.08 ± 0.08
	1 lepton	0.42 ± 0.17	0.53 ± 0.21	0.08 ± 0.08
	1 lepton, from W	0.42 ± 0.17	0.53 ± 0.21	0.08 ± 0.08
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—

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Table 3 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	1.08 \pm 0.17	0.15 \pm 0.06	0.18 \pm 0.05
	1 lepton	1.08 \pm 0.17	0.15 \pm 0.06	0.18 \pm 0.05
	1 lepton, from W	1.08 \pm 0.17	0.15 \pm 0.06	0.18 \pm 0.05
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	1.36 \pm 0.49	—	—
	1 lepton	1.36 \pm 0.49	—	—
	1 lepton, from W	1.36 \pm 0.49	—	—
	1 lepton, from t	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	0.01 \pm 0.01	0.01 \pm 0.00	0.01 \pm 0.01
	1 lepton	0.01 \pm 0.01	0.01 \pm 0.00	0.01 \pm 0.01
	1 lepton, from W	0.01 \pm 0.01	0.01 \pm 0.00	0.01 \pm 0.01
Rare	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	11.22 \pm 0.93	2.18 \pm 0.30	0.66 \pm 0.15
	1 lepton	1.02 \pm 0.59	0.08 \pm 0.05	0.05 \pm 0.04
diBoson	1 lepton, from W	0.97 \pm 0.59	0.06 \pm 0.05	0.03 \pm 0.04
	1 lepton, from t	0.05 \pm 0.04	0.02 \pm 0.01	0.02 \pm 0.02
	≥ 2 leptons	2.63 \pm 0.55	0.40 \pm 0.20	0.28 \pm 0.12
	Z $\rightarrow \nu\nu$	7.57 \pm 0.46	1.69 \pm 0.22	0.33 \pm 0.09
	Inclusive	2.44 \pm 0.80	0.47 \pm 0.23	0.05 \pm 0.09
WW	1 lepton	0.92 \pm 0.59	0.06 \pm 0.05	0.03 \pm 0.04
	1 lepton, from W	0.92 \pm 0.59	0.06 \pm 0.05	0.03 \pm 0.04
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.61 \pm 0.30	—	—
	Z $\rightarrow \nu\nu$	0.91 \pm 0.45	0.41 \pm 0.22	0.02 \pm 0.09
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	1.08 \pm 0.65	—	—
	1 lepton	0.58 \pm 0.58	—	—
	1 lepton, from W	0.58 \pm 0.58	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.50 \pm 0.29	—	—
WW $\rightarrow \ell\nu qq$, powheg	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	0.50 \pm 0.29	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
WZ	≥ 2 leptons	0.50 \pm 0.29	—	—
	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	0.58 \pm 0.58	—	—
	1 lepton	0.58 \pm 0.58	—	—
	1 lepton, from W	0.58 \pm 0.58	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	1.33 \pm 0.47	0.45 \pm 0.23	0.04 \pm 0.09
	1 lepton	0.34 \pm 0.11	0.06 \pm 0.05	0.03 \pm 0.04
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from W	0.34 \pm 0.11	0.06 \pm 0.05	0.03 \pm 0.04
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.11 \pm 0.08	—	—
	Z $\rightarrow \nu\nu$	0.88 \pm 0.45	0.39 \pm 0.22	0.01 \pm 0.09
	Inclusive	0.11 \pm 0.08	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.11 \pm 0.08	—	—
	Z $\rightarrow \nu\nu$	—	—	—

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Table 3 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200
		250 < MET < 350	350 < MET < 450	MET > 450
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.00 ± 0.01	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.00 ± 0.01	—	—
$WZ \rightarrow \ell \nu 2Q$, amcnlo pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.34 ± 0.11	0.06 ± 0.05	0.03 ± 0.04
	1 lepton	0.34 ± 0.11	0.06 ± 0.05	0.03 ± 0.04
	1 lepton, from W	0.34 ± 0.11	0.06 ± 0.05	0.03 ± 0.04
	1 lepton, from t	—	—	—
$WZ \rightarrow 1\ell 3\nu$, amcnlo pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.88 ± 0.45	0.39 ± 0.22	0.01 ± 0.09
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
ZZ	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	0.88 ± 0.45	0.39 ± 0.22	0.01 ± 0.09
	Inclusive	0.03 ± 0.02	0.02 ± 0.01	0.00 ± 0.00
	1 lepton	—	—	—
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.00 ± 0.01	—	—
	$Z \rightarrow \nu\nu$	0.03 ± 0.02	0.02 ± 0.01	0.00 ± 0.00
	Inclusive	0.00 ± 0.01	—	—
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	0.00 ± 0.01	—	—
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive	0.03 ± 0.01	0.01 ± 0.00	0.00 ± 0.00
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
$t\bar{t} + V$	$Z \rightarrow \nu\nu$	0.03 ± 0.01	0.01 ± 0.00	0.00 ± 0.00
	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
$t\bar{t} + W$	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	0.00 ± 0.01	0.00 ± 0.00	—
	Inclusive	8.78 ± 0.47	1.71 ± 0.20	0.61 ± 0.12
	1 lepton	0.09 ± 0.05	0.02 ± 0.01	0.02 ± 0.02
	1 lepton, from W	0.05 ± 0.03	—	—
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from t	0.05 ± 0.04	0.02 ± 0.01	0.02 ± 0.02
	≥ 2 leptons	2.02 ± 0.46	0.40 ± 0.20	0.28 ± 0.12
	$Z \rightarrow \nu\nu$	6.66 ± 0.07	1.29 ± 0.03	0.32 ± 0.01
	Inclusive	1.99 ± 0.47	0.40 ± 0.20	0.29 ± 0.12
	1 lepton	0.06 ± 0.05	0.01 ± 0.01	0.02 ± 0.02
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from W	0.05 ± 0.03	—	—
	1 lepton, from t	0.01 ± 0.04	0.01 ± 0.01	0.02 ± 0.02
	≥ 2 leptons	1.93 ± 0.46	0.39 ± 0.20	0.27 ± 0.12
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.32 ± 0.43	0.23 ± 0.18	0.19 ± 0.11
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton	0.05 ± 0.03	—	—
	1 lepton, from W	0.05 ± 0.03	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	1.27 ± 0.43	0.23 ± 0.18	0.19 ± 0.11
	$Z \rightarrow \nu\nu$	—	—	—

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Table 3 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200
		$250 < MET < 350$	$350 < MET < 450$	$MET > 450$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.66 ± 0.19	0.16 ± 0.09	0.10 ± 0.05
	1 lepton	0.01 ± 0.04	0.01 ± 0.01	0.02 ± 0.02
	1 lepton, from W	—	—	—
	1 lepton, from t	0.01 ± 0.04	0.01 ± 0.01	0.02 ± 0.02
	≥ 2 leptons	0.65 ± 0.18	0.15 ± 0.08	0.09 ± 0.05
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	6.79 ± 0.07	1.31 ± 0.03	0.33 ± 0.01
	1 lepton	0.03 ± 0.00	0.01 ± 0.00	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.03 ± 0.00	0.01 ± 0.00	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.09 ± 0.01	0.02 ± 0.00	0.01 ± 0.00
	$Z \rightarrow \nu\nu$	6.66 ± 0.07	1.29 ± 0.03	0.32 ± 0.01
	Inclusive	6.79 ± 0.07	1.31 ± 0.03	0.33 ± 0.01
	1 lepton	0.03 ± 0.00	0.01 ± 0.00	—
	1 lepton, from W	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.03 ± 0.00	0.01 ± 0.00	—
	≥ 2 leptons	0.09 ± 0.01	0.02 ± 0.00	0.01 ± 0.00
	$Z \rightarrow \nu\nu$	6.66 ± 0.07	1.29 ± 0.03	0.32 ± 0.01
	Inclusive	0.67 ± 0.32	0.33 ± 0.13	0.06 ± 0.07
	1 lepton	0.05 ± 0.06	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	0.05 ± 0.06	—	—
	≥ 2 leptons	0.62 ± 0.31	0.33 ± 0.13	0.06 ± 0.06
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	7.08 ± 0.71	1.66 ± 0.34	0.75 ± 0.18
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.40 ± 0.14	—	0.01 ± 0.01
	$Z \rightarrow \nu\nu$	6.67 ± 0.70	1.66 ± 0.32	0.74 ± 0.18

SR, Nominal Systematic, Yield Table for Input Samples						
Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
Data, single e/μ , MET	Inclusive	61.00 \pm 7.81	22.00 \pm 4.69	6.00 \pm 2.45	1.00 \pm 1.00	6.00 \pm 2.45
All Background	Inclusive	86.78 \pm 4.26	29.08 \pm 2.17	9.71 \pm 1.53	2.87 \pm 0.78	2.43 \pm 0.54
	1 lepton	20.70 \pm 2.92	8.27 \pm 1.52	3.30 \pm 1.01	0.77 \pm 0.29	1.34 \pm 0.37
	1 lepton, from W	16.30 \pm 2.80	6.40 \pm 1.39	3.25 \pm 1.01	0.77 \pm 0.29	1.17 \pm 0.36
	1 lepton, from t	4.39 \pm 0.85	1.86 \pm 0.62	0.05 \pm 0.05	—	0.17 \pm 0.09
	≥ 2 leptons	59.27 \pm 3.07	16.36 \pm 1.45	4.95 \pm 1.08	1.51 \pm 0.69	0.88 \pm 0.34
	$Z \rightarrow \nu\nu$	6.81 \pm 0.46	4.45 \pm 0.55	1.46 \pm 0.39	0.59 \pm 0.23	0.21 \pm 0.19
$t\bar{t}$	Inclusive	55.98 \pm 2.47	16.94 \pm 1.46	3.82 \pm 0.65	0.78 \pm 0.27	0.63 \pm 0.22
	1 lepton	4.33 \pm 0.84	1.86 \pm 0.62	0.05 \pm 0.05	—	0.17 \pm 0.09
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	4.33 \pm 0.84	1.86 \pm 0.62	0.05 \pm 0.05	—	0.17 \pm 0.09
	≥ 2 leptons	51.65 \pm 2.33	15.08 \pm 1.32	3.77 \pm 0.64	0.78 \pm 0.27	0.46 \pm 0.20
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	1.62 \pm 0.68	1.01 \pm 0.52	—	—	—
	1 lepton	1.62 \pm 0.68	1.01 \pm 0.52	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	1.62 \pm 0.68	1.01 \pm 0.52	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	2.71 \pm 0.49	0.85 \pm 0.35	0.05 \pm 0.05	—	0.17 \pm 0.09
	1 lepton	2.71 \pm 0.49	0.85 \pm 0.35	0.05 \pm 0.05	—	0.17 \pm 0.09
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	2.71 \pm 0.49	0.85 \pm 0.35	0.05 \pm 0.05	—	0.17 \pm 0.09
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	51.65 \pm 2.33	15.08 \pm 1.32	3.77 \pm 0.64	0.78 \pm 0.27	0.46 \pm 0.20
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	51.65 \pm 2.33	15.08 \pm 1.32	3.77 \pm 0.64	0.78 \pm 0.27	0.46 \pm 0.20
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t	Inclusive	5.84 \pm 2.12	1.23 \pm 0.87	0.85 \pm 0.85	0.63 \pm 0.63	0.28 \pm 0.28
	1 lepton	0.86 \pm 0.86	0.70 \pm 0.70	—	—	—
	1 lepton, from W	0.86 \pm 0.86	0.70 \pm 0.70	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	4.98 \pm 1.94	0.53 \pm 0.53	0.85 \pm 0.85	0.63 \pm 0.63	0.28 \pm 0.28
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single $t - W$ -channel	Inclusive	5.84 \pm 2.12	1.23 \pm 0.87	0.85 \pm 0.85	0.63 \pm 0.63	0.28 \pm 0.28
	1 lepton	0.86 \pm 0.86	0.70 \pm 0.70	—	—	—
	1 lepton, from W	0.86 \pm 0.86	0.70 \pm 0.70	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	4.98 \pm 1.94	0.53 \pm 0.53	0.85 \pm 0.85	0.63 \pm 0.63	0.28 \pm 0.28
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t , $t - W$ -channel, powheg pythia8	Inclusive	—	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single \bar{t} , $t - W$ -channel, powheg pythia8	Inclusive	5.84 \pm 2.12	1.23 \pm 0.87	0.85 \pm 0.85	0.63 \pm 0.63	0.28 \pm 0.28
	1 lepton	0.86 \pm 0.86	0.70 \pm 0.70	—	—	—
	1 lepton, from W	0.86 \pm 0.86	0.70 \pm 0.70	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	4.98 \pm 1.94	0.53 \pm 0.53	0.85 \pm 0.85	0.63 \pm 0.63	0.28 \pm 0.28
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t non $t - W$ -channel	Inclusive	—	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
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Table 4 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $250 < \text{MET} < 350$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $350 < \text{MET} < 450$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $450 < \text{MET} < 550$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $550 < \text{MET} < 650$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $\text{MET} > 650$
single t , s-channel, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
V+Jets	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	14.43 ± 2.62 14.43 ± 2.62 14.43 ± 2.62 — —	5.42 ± 1.19 5.42 ± 1.19 5.42 ± 1.19 — —	3.12 ± 1.01 3.12 ± 1.01 3.12 ± 1.01 — —	0.74 ± 0.28 0.74 ± 0.28 0.74 ± 0.28 — —	1.17 ± 0.36 1.17 ± 0.36 1.17 ± 0.36 — —
DY+Jets $\rightarrow \ell\ell$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	14.43 ± 2.62 14.43 ± 2.62 14.43 ± 2.62 — —	5.42 ± 1.19 5.42 ± 1.19 5.42 ± 1.19 — —	3.12 ± 1.01 3.12 ± 1.01 3.12 ± 1.01 — —	0.74 ± 0.28 0.74 ± 0.28 0.74 ± 0.28 — —	1.17 ± 0.36 1.17 ± 0.36 1.17 ± 0.36 — —
W+Jets $\rightarrow \ell\nu$, $100 < HT < 200$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	1.46 ± 1.46 1.46 ± 1.46 1.46 ± 1.46 — —	— — — — —	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$, $200 < HT < 400$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	3.12 ± 1.42 3.12 ± 1.42 3.12 ± 1.42 — —	— — — — —	0.61 ± 0.61 0.61 ± 0.61 0.61 ± 0.61 — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$, $400 < HT < 600$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	3.11 ± 1.41 3.11 ± 1.41 3.11 ± 1.41 — —	1.38 ± 0.80 1.38 ± 0.80 1.38 ± 0.80 — —	0.66 ± 0.66 0.66 ± 0.66 0.66 ± 0.66 — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$, $600 < HT < 800$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	2.27 ± 0.51 2.27 ± 0.51 2.27 ± 0.51 — —	1.70 ± 0.50 1.70 ± 0.50 1.70 ± 0.50 — —	0.76 ± 0.32 0.76 ± 0.32 0.76 ± 0.32 — —	0.06 ± 0.06 0.06 ± 0.06 0.06 ± 0.06 — —	0.28 ± 0.14 0.28 ± 0.14 0.28 ± 0.14 — —

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Table 4 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	2.88 ± 0.31	1.09 ± 0.18	0.49 ± 0.13	0.20 ± 0.09	0.41 ± 0.09
	1 lepton	2.88 ± 0.31	1.09 ± 0.18	0.49 ± 0.13	0.20 ± 0.09	0.41 ± 0.09
	1 lepton, from W	2.88 ± 0.31	1.09 ± 0.18	0.49 ± 0.13	0.20 ± 0.09	0.41 ± 0.09
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	1.41 ± 0.58	1.17 ± 0.71	0.54 ± 0.30	0.46 ± 0.26	0.46 ± 0.32
	1 lepton	1.41 ± 0.58	1.17 ± 0.71	0.54 ± 0.30	0.46 ± 0.26	0.46 ± 0.32
	1 lepton, from W	1.41 ± 0.58	1.17 ± 0.71	0.54 ± 0.30	0.46 ± 0.26	0.46 ± 0.32
	1 lepton, from t	—	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.19 ± 0.03	0.07 ± 0.02	0.06 ± 0.02	0.02 ± 0.01	0.02 ± 0.01
	1 lepton	0.19 ± 0.03	0.07 ± 0.02	0.06 ± 0.02	0.02 ± 0.01	0.02 ± 0.01
	1 lepton, from W	0.19 ± 0.03	0.07 ± 0.02	0.06 ± 0.02	0.02 ± 0.01	0.02 ± 0.01
Rare	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	10.54 ± 0.83	5.50 ± 0.62	1.92 ± 0.43	0.71 ± 0.24	0.35 ± 0.20
	1 lepton	1.08 ± 0.50	0.29 ± 0.11	0.13 ± 0.08	0.03 ± 0.04	0.00 ± 0.02
diBoson	1 lepton, from W	1.02 ± 0.50	0.29 ± 0.11	0.13 ± 0.08	0.03 ± 0.04	—
	1 lepton, from t	0.06 ± 0.03	0.01 ± 0.00	0.00 ± 0.00	—	0.00 ± 0.00
	≥ 2 leptons	2.65 ± 0.48	0.75 ± 0.26	0.33 ± 0.16	0.09 ± 0.07	0.14 ± 0.06
	Z $\rightarrow \nu\nu$	6.81 ± 0.46	4.45 ± 0.55	1.46 ± 0.39	0.59 ± 0.23	0.21 ± 0.19
	Inclusive	2.26 ± 0.73	2.20 ± 0.57	0.76 ± 0.42	0.29 ± 0.23	0.08 ± 0.19
WW	1 lepton	0.87 ± 0.49	0.29 ± 0.10	0.13 ± 0.06	0.01 ± 0.04	—
	1 lepton, from W	0.87 ± 0.49	0.29 ± 0.10	0.13 ± 0.06	0.01 ± 0.04	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.61 ± 0.28	0.11 ± 0.10	0.13 ± 0.13	—	0.01 ± 0.01
	Z $\rightarrow \nu\nu$	0.77 ± 0.46	1.81 ± 0.55	0.50 ± 0.39	0.28 ± 0.22	0.07 ± 0.19
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	0.94 ± 0.55	0.10 ± 0.10	0.13 ± 0.13	—	—
	1 lepton	0.48 ± 0.48	—	—	—	—
	1 lepton, from W	0.48 ± 0.48	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.46 ± 0.27	0.10 ± 0.10	0.13 ± 0.13	—	—
WW $\rightarrow \ell\nu q\bar{q}$, powheg	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.46 ± 0.27	0.10 ± 0.10	0.13 ± 0.13	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
WZ	≥ 2 leptons	0.48 ± 0.48	—	—	—	—
	Z $\rightarrow \nu\nu$	0.48 ± 0.48	—	—	—	—
	Inclusive	0.48 ± 0.48	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.12 ± 0.09	0.01 ± 0.01	—	—	—
	Z $\rightarrow \nu\nu$	0.73 ± 0.46	1.78 ± 0.55	0.48 ± 0.39	0.28 ± 0.22	0.07 ± 0.19
	Inclusive	0.11 ± 0.08	—	—	—	—
	1 lepton	—	—	—	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.11 ± 0.08	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	—	—	—	—	—

Continued on next page

Table 4 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $250 < MET < 350$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $350 < MET < 450$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $450 < MET < 550$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $550 < MET < 650$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $MET > 650$
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.01 ± 0.01 — — 0.01 ± 0.01 —	0.01 ± 0.01 — — 0.01 ± 0.01 —	— — — — —	— — — — —	— — — — —
$WZ \rightarrow \ell\nu 2Q$, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.40 ± 0.13 0.40 ± 0.13 0.40 ± 0.13 — —	0.29 ± 0.10 0.29 ± 0.10 0.29 ± 0.10 — —	0.13 ± 0.06 0.13 ± 0.06 0.13 ± 0.06 — —	0.01 ± 0.04 0.01 ± 0.04 0.01 ± 0.04 — —	— — — — —
$WZ \rightarrow \ell 3\nu$, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.73 ± 0.46 — — — —	1.78 ± 0.55 — — — —	0.48 ± 0.39 — — — —	0.28 ± 0.22 — — — —	0.07 ± 0.19 — — — —
ZZ	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.73 ± 0.46 0.07 ± 0.02 — — 0.03 ± 0.02 0.04 ± 0.01	1.78 ± 0.55 0.03 ± 0.01 — — 0.01 ± 0.01 0.02 ± 0.01	0.48 ± 0.39 0.02 ± 0.01 — — — 0.02 ± 0.01	0.28 ± 0.22 0.01 ± 0.00 — — — 0.01 ± 0.00	0.07 ± 0.19 0.01 ± 0.01 — — 0.01 ± 0.01 0.01 ± 0.00
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.03 ± 0.02 — — — 0.03 ± 0.02 —	0.01 ± 0.01 — — — 0.01 ± 0.01 —	— — — — — —	— — — — — —	0.01 ± 0.01 — — — 0.01 ± 0.01 —
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.04 ± 0.01 — — — — 0.04 ± 0.01	0.02 ± 0.01 — — — — 0.02 ± 0.01	0.02 ± 0.00 — — — — 0.02 ± 0.00	0.01 ± 0.00 — — — — 0.01 ± 0.00	0.00 ± 0.00 — — — — 0.00 ± 0.00
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — — —	0.00 ± 0.00 — — — — 0.00 ± 0.00	0.00 ± 0.00 — — — — 0.00 ± 0.00	— — — — — —	0.00 ± 0.00 — — — — 0.00 ± 0.00
$t\bar{t} + V$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	8.28 ± 0.40 0.20 ± 0.08 0.14 ± 0.07 0.06 ± 0.03 2.03 ± 0.39 6.04 ± 0.07	3.29 ± 0.25 0.01 ± 0.05 — 0.01 ± 0.00 0.64 ± 0.25 2.64 ± 0.04	1.16 ± 0.10 0.00 ± 0.05 — 0.00 ± 0.00 0.20 ± 0.08 0.96 ± 0.03	0.42 ± 0.07 0.02 ± 0.02 0.02 ± 0.02 — 0.09 ± 0.07 0.31 ± 0.01	0.27 ± 0.06 0.00 ± 0.00 — 0.00 ± 0.00 0.13 ± 0.05 0.14 ± 0.01
$t\bar{t} + W$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	2.15 ± 0.39 0.18 ± 0.08 0.14 ± 0.07 0.04 ± 0.03 1.97 ± 0.39 —	0.63 ± 0.25 — — — 0.63 ± 0.25 —	0.19 ± 0.09 — — — 0.19 ± 0.08 —	0.10 ± 0.07 0.02 ± 0.02 0.02 ± 0.02 — 0.09 ± 0.07 —	0.13 ± 0.05 — — — 0.13 ± 0.05 —
$t\bar{t} + W \rightarrow \ell\nu$, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	1.87 ± 0.38 0.14 ± 0.07 0.14 ± 0.07 — 1.73 ± 0.38 —	0.36 ± 0.22 — — — 0.36 ± 0.21 —	0.19 ± 0.09 — — — 0.19 ± 0.08 —	0.10 ± 0.07 0.02 ± 0.02 0.02 ± 0.02 — 0.09 ± 0.07 —	0.10 ± 0.05 — — — 0.10 ± 0.05 —

Continued on next page

Table 4 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $250 < \text{MET} < 350$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $350 < \text{MET} < 450$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $450 < \text{MET} < 550$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $550 < \text{MET} < 650$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $\text{MET} > 650$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.28 ± 0.09	0.27 ± 0.12	—	—	0.03 ± 0.03
	1 lepton	0.04 ± 0.03	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.04 ± 0.03	—	—	—	—
	≥ 2 leptons	0.24 ± 0.09	0.27 ± 0.12	—	—	0.03 ± 0.03
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	6.13 ± 0.07	2.66 ± 0.04	0.97 ± 0.03	0.31 ± 0.01	0.14 ± 0.01
	1 lepton	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—	0.00 ± 0.00
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—	0.00 ± 0.00
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.06 ± 0.01	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	$Z \rightarrow \nu\nu$	6.04 ± 0.07	2.64 ± 0.04	0.96 ± 0.03	0.31 ± 0.01	0.14 ± 0.01
	Inclusive	6.13 ± 0.07	2.66 ± 0.04	0.97 ± 0.03	0.31 ± 0.01	0.14 ± 0.01
	1 lepton	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—	0.00 ± 0.00
	1 lepton, from W	—	—	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—	0.00 ± 0.00
	≥ 2 leptons	0.06 ± 0.01	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	$Z \rightarrow \nu\nu$	6.04 ± 0.07	2.64 ± 0.04	0.96 ± 0.03	0.31 ± 0.01	0.14 ± 0.01
	Inclusive	0.10 ± 0.16	—	0.02 ± 0.02	—	0.01 ± 0.01
	1 lepton	—	—	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.10 ± 0.16	—	0.02 ± 0.02	—	0.01 ± 0.01
	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	7.24 ± 0.72	2.53 ± 0.49	1.07 ± 0.28	0.11 ± 0.18	0.16 ± 0.11
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.31 ± 0.18	0.06 ± 0.10	0.02 ± 0.04	—	—
	$Z \rightarrow \nu\nu$	6.92 ± 0.69	2.47 ± 0.48	1.05 ± 0.28	0.11 ± 0.18	0.16 ± 0.11

CR0b, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	2jets modTopness ≥ 6.4 250 < MET < 350	2jets modTopness ≥ 6.4 350 < MET < 450	2jets modTopness ≥ 6.4 MET > 450
Data, single e/μ , MET	Inclusive	371.00 \pm 19.26	131.00 \pm 11.45	93.00 \pm 9.64
All Background	Inclusive	334.79 \pm 17.13	93.61 \pm 8.88	41.77 \pm 3.73
	1 lepton	240.53 \pm 13.58	67.05 \pm 6.44	31.41 \pm 3.57
	1 lepton, from W	240.12 \pm 13.57	66.98 \pm 6.44	31.35 \pm 3.57
	1 lepton, from t	0.41 \pm 0.34	0.07 \pm 0.07	0.06 \pm 0.06
	≥ 2 leptons	60.41 \pm 10.19	14.23 \pm 5.98	2.55 \pm 0.62
	$Z \rightarrow \nu\nu$	33.85 \pm 2.28	12.33 \pm 1.23	7.82 \pm 0.88
$t\bar{t}$	Inclusive	43.56 \pm 2.18	4.82 \pm 0.69	0.73 \pm 0.28
	1 lepton	0.41 \pm 0.34	0.07 \pm 0.07	0.06 \pm 0.06
	1 lepton, from W	—	—	—
	1 lepton, from t	0.41 \pm 0.34	0.07 \pm 0.07	0.06 \pm 0.06
	≥ 2 leptons	43.15 \pm 2.16	4.76 \pm 0.69	0.67 \pm 0.27
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	0.33 \pm 0.33	—	—
	1 lepton	0.33 \pm 0.33	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.33 \pm 0.33	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	0.08 \pm 0.08	0.07 \pm 0.07	0.06 \pm 0.06
	1 lepton	0.08 \pm 0.08	0.07 \pm 0.07	0.06 \pm 0.06
	1 lepton, from W	—	—	—
	1 lepton, from t	0.08 \pm 0.08	0.07 \pm 0.07	0.06 \pm 0.06
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	43.15 \pm 2.16	4.76 \pm 0.69	0.67 \pm 0.27
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	43.15 \pm 2.16	4.76 \pm 0.69	0.67 \pm 0.27
	$Z \rightarrow \nu\nu$	—	—	—
single t	Inclusive	3.71 \pm 1.87	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.71 \pm 1.87	—	—
	$Z \rightarrow \nu\nu$	—	—	—
single $t - W$ -channel	Inclusive	3.71 \pm 1.87	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.71 \pm 1.87	—	—
	$Z \rightarrow \nu\nu$	—	—	—
single t , $t - W$ -channel, powheg pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
single \bar{t} , $t - W$ -channel, powheg pythia8	Inclusive	3.71 \pm 1.87	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.71 \pm 1.87	—	—
	$Z \rightarrow \nu\nu$	—	—	—
single t non $t - W$ -channel	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—

Continued on next page

Table 5 – continued from previous page

Sample	Classification	2jets modTopness ≥ 6.4 250 < MET < 350	2jets modTopness ≥ 6.4 350 < MET < 450	2jets modTopness ≥ 6.4 MET > 450
single t , s-channel, amcnlo pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
V +Jets	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	229.35 \pm 16.52	69.50 \pm 8.66	29.21 \pm 3.46
	1 lepton	229.35 \pm 13.38	63.59 \pm 6.33	29.21 \pm 3.46
	1 lepton, from W	229.35 \pm 13.38	63.59 \pm 6.33	29.21 \pm 3.46
	1 lepton, from t	—	—	—
DY+Jets $\rightarrow \ell\ell$	≥ 2 leptons	—	5.91 \pm 5.91	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	5.91 \pm 5.91	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	5.91 \pm 5.91	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	5.91 \pm 5.91	—
W +Jets $\rightarrow \ell\nu$	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	5.91 \pm 5.91	—
	$Z \rightarrow \nu\nu$	—	—	—
W +Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	Inclusive	229.35 \pm 13.38	63.59 \pm 6.33	29.21 \pm 3.46
	1 lepton	229.35 \pm 13.38	63.59 \pm 6.33	29.21 \pm 3.46
	1 lepton, from W	229.35 \pm 13.38	63.59 \pm 6.33	29.21 \pm 3.46
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W +Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	62.02 \pm 8.96	11.78 \pm 3.76	3.78 \pm 1.89
	1 lepton	62.02 \pm 8.96	11.78 \pm 3.76	3.78 \pm 1.89
	1 lepton, from W	62.02 \pm 8.96	11.78 \pm 3.76	3.78 \pm 1.89
	1 lepton, from t	—	—	—
W +Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	139.55 \pm 9.19	29.95 \pm 3.97	8.08 \pm 1.91
	1 lepton	139.55 \pm 9.19	29.95 \pm 3.97	8.08 \pm 1.91
	1 lepton, from W	139.55 \pm 9.19	29.95 \pm 3.97	8.08 \pm 1.91
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	21.43 \pm 3.75	17.79 \pm 3.15	9.08 \pm 2.09
	1 lepton	21.43 \pm 3.75	17.79 \pm 3.15	9.08 \pm 2.09
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from W	21.43 \pm 3.75	17.79 \pm 3.15	9.08 \pm 2.09
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	4.52 \pm 0.61	3.08 \pm 0.47	5.63 \pm 0.58
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton	4.52 \pm 0.61	3.08 \pm 0.47	5.63 \pm 0.58
	1 lepton, from W	4.52 \pm 0.61	3.08 \pm 0.47	5.63 \pm 0.58
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—

Continued on next page

Table 5 – continued from previous page

Sample	Classification	2jets modTopness ≥ 6.4 $250 < MET < 350$	2jets modTopness ≥ 6.4 $350 < MET < 450$	2jets modTopness ≥ 6.4 $MET > 450$
W+Jets $\rightarrow \ell\nu$, $800 < HT < 1200$, madgraph pythia8	Inclusive	1.52 ± 0.18	0.76 ± 0.12	2.26 ± 0.19
	1 lepton	1.52 ± 0.18	0.76 ± 0.12	2.26 ± 0.19
	1 lepton, from W	1.52 ± 0.18	0.76 ± 0.12	2.26 ± 0.19
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W+Jets $\rightarrow \ell\nu$, $1200 < HT < 2500$, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.24 ± 0.17	0.20 ± 0.14	0.35 ± 0.18
	1 lepton	0.24 ± 0.17	0.20 ± 0.14	0.35 ± 0.18
	1 lepton, from W	0.24 ± 0.17	0.20 ± 0.14	0.35 ± 0.18
	1 lepton, from t	—	—	—
W+Jets $\rightarrow \ell\nu$, $2500 < HT < Inf$, madgraph pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.07 ± 0.01	0.02 ± 0.01	0.02 ± 0.01
	1 lepton	0.07 ± 0.01	0.02 ± 0.01	0.02 ± 0.01
	1 lepton, from W	0.07 ± 0.01	0.02 ± 0.01	0.02 ± 0.01
Rare	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	58.17 ± 3.47	19.29 ± 1.84	11.83 ± 1.36
	1 lepton	10.77 ± 2.25	3.40 ± 1.20	2.14 ± 0.86
diBoson	1 lepton, from W	10.77 ± 2.25	3.40 ± 1.20	2.14 ± 0.86
	1 lepton, from t	—	—	—
	≥ 2 leptons	13.55 ± 1.33	3.57 ± 0.64	1.87 ± 0.56
	$Z \rightarrow \nu\nu$	33.85 ± 2.28	12.33 ± 1.23	7.82 ± 0.88
	Inclusive	56.71 ± 3.47	18.92 ± 1.84	11.63 ± 1.36
WW	1 lepton	10.77 ± 2.25	3.37 ± 1.20	2.11 ± 0.86
	1 lepton, from W	10.77 ± 2.25	3.37 ± 1.20	2.11 ± 0.86
	1 lepton, from t	—	—	—
	≥ 2 leptons	13.22 ± 1.33	3.54 ± 0.64	1.85 ± 0.56
	$Z \rightarrow \nu\nu$	32.71 ± 2.28	12.01 ± 1.23	7.66 ± 0.88
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	21.56 ± 2.59	6.16 ± 1.35	3.52 ± 1.02
	1 lepton	8.94 ± 2.24	2.93 ± 1.19	1.71 ± 0.86
	1 lepton, from W	8.94 ± 2.24	2.93 ± 1.19	1.71 ± 0.86
	1 lepton, from t	—	—	—
	≥ 2 leptons	12.62 ± 1.31	3.24 ± 0.63	1.80 ± 0.56
WW $\rightarrow \ell\nu qq$, powheg	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	12.62 ± 1.31	3.24 ± 0.63	1.80 ± 0.56
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
WZ	≥ 2 leptons	12.62 ± 1.31	3.24 ± 0.63	1.80 ± 0.56
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	8.94 ± 2.24	2.93 ± 1.19	1.71 ± 0.86
	1 lepton	8.94 ± 2.24	2.93 ± 1.19	1.71 ± 0.86
	1 lepton, from W	8.94 ± 2.24	2.93 ± 1.19	1.71 ± 0.86
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	33.87 ± 2.31	12.41 ± 1.25	7.91 ± 0.89
	1 lepton	1.83 ± 0.27	0.44 ± 0.13	0.40 ± 0.10
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from W	1.83 ± 0.27	0.44 ± 0.13	0.40 ± 0.10
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.56 ± 0.17	0.30 ± 0.12	0.05 ± 0.04
	$Z \rightarrow \nu\nu$	31.48 ± 2.28	11.66 ± 1.23	7.47 ± 0.88
	Inclusive	0.51 ± 0.16	0.29 ± 0.12	0.04 ± 0.04
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.51 ± 0.16	0.29 ± 0.12	0.04 ± 0.04
	$Z \rightarrow \nu\nu$	—	—	—

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Table 5 – continued from previous page

Sample	Classification	2jets modTopness ≥ 6.4 250 < MET < 350	2jets modTopness ≥ 6.4 350 < MET < 450	2jets modTopness ≥ 6.4 MET > 450
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.05 ± 0.04	0.01 ± 0.01	0.01 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.05 ± 0.04 —	0.01 ± 0.01 —	0.01 ± 0.01 —
$WZ \rightarrow \ell\nu 2Q$, amcnlo pythia8	Inclusive	1.83 ± 0.27	0.44 ± 0.13	0.40 ± 0.10
	1 lepton	1.83 ± 0.27	0.44 ± 0.13	0.40 ± 0.10
	1 lepton, from W	1.83 ± 0.27	0.44 ± 0.13	0.40 ± 0.10
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	— —	— —	— —
$WZ \rightarrow 1\ell 3\nu$, amcnlo pythia8	Inclusive	31.48 ± 2.28	11.66 ± 1.23	7.47 ± 0.88
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	— 31.48 ± 2.28	— 11.66 ± 1.23	— 7.47 ± 0.88
ZZ	Inclusive	1.27 ± 0.07	0.35 ± 0.03	0.20 ± 0.02
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.04 ± 0.04 1.23 ± 0.05	0.00 ± 0.01 0.35 ± 0.03	— 0.20 ± 0.02
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.04 ± 0.04	0.00 ± 0.01	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.04 ± 0.04 —	0.00 ± 0.01 —	— —
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	Inclusive	1.18 ± 0.04	0.34 ± 0.02	0.19 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	— 1.18 ± 0.04	— 0.34 ± 0.02	— 0.19 ± 0.01
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive	0.05 ± 0.03	0.01 ± 0.02	0.01 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	— 0.05 ± 0.03	— 0.01 ± 0.02	— 0.01 ± 0.01
$t\bar{t} + V$	Inclusive	1.47 ± 0.14	0.37 ± 0.05	0.20 ± 0.03
	1 lepton	—	0.03 ± 0.03	0.02 ± 0.02
	1 lepton, from W	—	0.03 ± 0.03	0.02 ± 0.02
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.33 ± 0.13 1.14 ± 0.03	0.03 ± 0.04 0.31 ± 0.02	0.02 ± 0.02 0.16 ± 0.01
$t\bar{t} + W$	Inclusive	0.32 ± 0.13	0.06 ± 0.05	0.04 ± 0.03
	1 lepton	—	0.03 ± 0.03	0.02 ± 0.02
	1 lepton, from W	—	0.03 ± 0.03	0.02 ± 0.02
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.32 ± 0.13 —	0.03 ± 0.04 —	0.02 ± 0.02 —
$t\bar{t} + W \rightarrow \ell\nu$, amcnlo pythia8	Inclusive	0.26 ± 0.13	0.06 ± 0.04	0.02 ± 0.02
	1 lepton	—	0.03 ± 0.03	0.02 ± 0.02
	1 lepton, from W	—	0.03 ± 0.03	0.02 ± 0.02
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.26 ± 0.13 —	0.03 ± 0.03 —	— —

Continued on next page

Table 5 – continued from previous page

Sample	Classification	2jets	2jets	2jets
		modTopness ≥ 6.4 $250 < MET < 350$	modTopness ≥ 6.4 $350 < MET < 450$	modTopness ≥ 6.4 $MET > 450$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.06 ± 0.04	—	0.02 ± 0.02
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.06 ± 0.04	—	0.02 ± 0.02
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.14 ± 0.03	0.31 ± 0.02	0.16 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.01 ± 0.00	—	0.00 ± 0.00
	$Z \rightarrow \nu\nu$	1.14 ± 0.03	0.31 ± 0.02	0.16 ± 0.01
	Inclusive	1.14 ± 0.03	0.31 ± 0.02	0.16 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	0.01 ± 0.00	—	0.00 ± 0.00
	$Z \rightarrow \nu\nu$	1.14 ± 0.03	0.31 ± 0.02	0.16 ± 0.01
	Inclusive	0.05 ± 0.05	0.03 ± 0.03	—
	1 lepton	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.05 ± 0.05	0.03 ± 0.03	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.07 ± 0.25	0.32 ± 0.12	0.25 ± 0.09
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.06 ± 0.04	—	—
	$Z \rightarrow \nu\nu$	1.01 ± 0.25	0.32 ± 0.12	0.25 ± 0.09

CR0b, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
		164.00 \pm 12.81	48.00 \pm 6.93	17.00 \pm 4.12	25.00 \pm 5.00
Data, single e/μ , MET	Inclusive	164.00 \pm 12.81	48.00 \pm 6.93	17.00 \pm 4.12	25.00 \pm 5.00
All Background	Inclusive	148.16 \pm 7.88	55.95 \pm 4.59	14.61 \pm 2.14	13.11 \pm 1.73
	1 lepton	94.07 \pm 7.35	40.07 \pm 4.41	11.72 \pm 2.05	9.79 \pm 1.66
	1 lepton, from W	93.41 \pm 7.34	40.07 \pm 4.41	11.72 \pm 2.05	9.52 \pm 1.65
	1 lepton, from t	0.66 \pm 0.36	0.00 \pm 0.00	0.00 \pm 0.00	0.27 \pm 0.21
	≥ 2 leptons	35.97 \pm 2.42	8.12 \pm 0.91	1.08 \pm 0.30	0.88 \pm 0.25
	$Z \rightarrow \nu\nu$	18.13 \pm 1.51	7.77 \pm 0.89	1.81 \pm 0.55	2.44 \pm 0.42
$t\bar{t}$	Inclusive	27.65 \pm 1.94	5.65 \pm 0.73	0.63 \pm 0.21	0.71 \pm 0.27
	1 lepton	0.65 \pm 0.36	—	—	0.27 \pm 0.21
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.65 \pm 0.36	—	—	0.27 \pm 0.21
	≥ 2 leptons	26.99 \pm 1.90	5.65 \pm 0.73	0.63 \pm 0.21	0.44 \pm 0.17
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	0.32 \pm 0.32	—	—	0.20 \pm 0.20
	1 lepton	0.32 \pm 0.32	—	—	0.20 \pm 0.20
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.32 \pm 0.32	—	—	0.20 \pm 0.20
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	0.33 \pm 0.16	—	—	0.07 \pm 0.07
	1 lepton	0.33 \pm 0.16	—	—	0.07 \pm 0.07
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.33 \pm 0.16	—	—	0.07 \pm 0.07
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	26.99 \pm 1.90	5.65 \pm 0.73	0.63 \pm 0.21	0.44 \pm 0.17
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	26.99 \pm 1.90	5.65 \pm 0.73	0.63 \pm 0.21	0.44 \pm 0.17
	$Z \rightarrow \nu\nu$	—	—	—	—
single t	Inclusive	1.08 \pm 1.08	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.08 \pm 1.08	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single t t - W-channel	Inclusive	1.08 \pm 1.08	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.08 \pm 1.08	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single t , t - W-channel, powheg pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single \bar{t} , t - W-channel, powheg pythia8	Inclusive	1.08 \pm 1.08	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.08 \pm 1.08	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single t non t - W-channel	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—

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Table 6 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
single t , s-channel, amcnlo pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
V +Jets	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	89.66 \pm 7.24	35.39 \pm 4.15	11.02 \pm 1.98	8.63 \pm 1.56
	1 lepton	89.66 \pm 7.24	35.39 \pm 4.15	11.02 \pm 1.98	8.63 \pm 1.56
	1 lepton, from W	89.66 \pm 7.24	35.39 \pm 4.15	11.02 \pm 1.98	8.63 \pm 1.56
	1 lepton, from t	—	—	—	—
DY +Jets $\rightarrow \ell\ell$	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
DY +Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
DY +Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
W +Jets $\rightarrow \ell\nu$	1 lepton	89.66 \pm 7.24	35.39 \pm 4.15	11.02 \pm 1.98	8.63 \pm 1.56
	1 lepton, from W	89.66 \pm 7.24	35.39 \pm 4.15	11.02 \pm 1.98	8.63 \pm 1.56
	1 lepton, from t	89.66 \pm 7.24	35.39 \pm 4.15	11.02 \pm 1.98	8.63 \pm 1.56
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	≥ 2 leptons	6.76 \pm 3.02	2.22 \pm 1.57	1.02 \pm 1.02	1.60 \pm 1.13
	$Z \rightarrow \nu\nu$	6.76 \pm 3.02	2.22 \pm 1.57	1.02 \pm 1.02	1.60 \pm 1.13
	Inclusive	6.76 \pm 3.02	2.22 \pm 1.57	1.02 \pm 1.02	1.60 \pm 1.13
	1 lepton	6.76 \pm 3.02	2.22 \pm 1.57	1.02 \pm 1.02	1.60 \pm 1.13
	1 lepton, from W	6.76 \pm 3.02	2.22 \pm 1.57	1.02 \pm 1.02	1.60 \pm 1.13
W +Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	40.36 \pm 5.01	8.45 \pm 2.11	2.33 \pm 1.04	0.77 \pm 0.54
	1 lepton	40.36 \pm 5.01	8.45 \pm 2.11	2.33 \pm 1.04	0.77 \pm 0.54
W +Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	1 lepton, from W	40.36 \pm 5.01	8.45 \pm 2.11	2.33 \pm 1.04	0.77 \pm 0.54
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	25.77 \pm 4.13	16.45 \pm 3.13	3.02 \pm 1.23	1.62 \pm 0.81
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton	25.77 \pm 4.13	16.45 \pm 3.13	3.02 \pm 1.23	1.62 \pm 0.81
	1 lepton, from W	25.77 \pm 4.13	16.45 \pm 3.13	3.02 \pm 1.23	1.62 \pm 0.81
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	Inclusive	9.50 \pm 0.90	5.32 \pm 0.62	2.43 \pm 0.40	1.69 \pm 0.30
	1 lepton	9.50 \pm 0.90	5.32 \pm 0.62	2.43 \pm 0.40	1.69 \pm 0.30
	1 lepton, from W	9.50 \pm 0.90	5.32 \pm 0.62	2.43 \pm 0.40	1.69 \pm 0.30
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—

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Table 6 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	4.89 \pm 0.33	2.26 \pm 0.21	1.51 \pm 0.16	2.06 \pm 0.17
	1 lepton	4.89 \pm 0.33	2.26 \pm 0.21	1.51 \pm 0.16	2.06 \pm 0.17
	1 lepton, from W	4.89 \pm 0.33	2.26 \pm 0.21	1.51 \pm 0.16	2.06 \pm 0.17
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Z $\rightarrow \nu\nu$	—	—	—	—
	Inclusive	2.27 \pm 0.54	0.63 \pm 0.26	0.68 \pm 0.26	0.85 \pm 0.26
	1 lepton	2.27 \pm 0.54	0.63 \pm 0.26	0.68 \pm 0.26	0.85 \pm 0.26
	1 lepton, from W	2.27 \pm 0.54	0.63 \pm 0.26	0.68 \pm 0.26	0.85 \pm 0.26
	1 lepton, from t	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
	Inclusive	0.12 \pm 0.02	0.05 \pm 0.01	0.03 \pm 0.01	0.03 \pm 0.01
	1 lepton	0.12 \pm 0.02	0.05 \pm 0.01	0.03 \pm 0.01	0.03 \pm 0.01
	1 lepton, from W	0.12 \pm 0.02	0.05 \pm 0.01	0.03 \pm 0.01	0.03 \pm 0.01
Rare	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
	Inclusive	29.77 \pm 2.17	14.91 \pm 1.81	2.96 \pm 0.80	3.77 \pm 0.70
	1 lepton	3.75 \pm 1.16	4.68 \pm 1.48	0.70 \pm 0.54	0.89 \pm 0.54
diBoson	1 lepton, from W	3.75 \pm 1.16	4.68 \pm 1.48	0.70 \pm 0.54	0.89 \pm 0.54
	1 lepton, from t	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	—
	≥ 2 leptons	7.89 \pm 1.03	2.46 \pm 0.54	0.46 \pm 0.21	0.44 \pm 0.18
	Z $\rightarrow \nu\nu$	18.13 \pm 1.51	7.77 \pm 0.89	1.81 \pm 0.55	2.44 \pm 0.42
	Inclusive	27.69 \pm 2.16	14.36 \pm 1.81	2.75 \pm 0.80	3.68 \pm 0.70
WW	1 lepton	3.75 \pm 1.16	4.68 \pm 1.48	0.70 \pm 0.54	0.89 \pm 0.54
	1 lepton, from W	3.75 \pm 1.16	4.68 \pm 1.48	0.70 \pm 0.54	0.89 \pm 0.54
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	7.38 \pm 1.01	2.43 \pm 0.53	0.41 \pm 0.21	0.44 \pm 0.18
	Z $\rightarrow \nu\nu$	16.56 \pm 1.51	7.26 \pm 0.89	1.64 \pm 0.55	2.35 \pm 0.42
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	9.20 \pm 1.51	6.55 \pm 1.57	0.95 \pm 0.57	1.10 \pm 0.56
	1 lepton	2.27 \pm 1.14	4.17 \pm 1.48	0.54 \pm 0.54	0.75 \pm 0.53
	1 lepton, from W	2.27 \pm 1.14	4.17 \pm 1.48	0.54 \pm 0.54	0.75 \pm 0.53
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	6.93 \pm 1.00	2.38 \pm 0.53	0.41 \pm 0.21	0.35 \pm 0.17
WW $\rightarrow \ell\nu qq$, powheg	Z $\rightarrow \nu\nu$	—	—	—	—
	Inclusive	6.93 \pm 1.00	2.38 \pm 0.53	0.41 \pm 0.21	0.35 \pm 0.17
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
WZ	≥ 2 leptons	6.93 \pm 1.00	2.38 \pm 0.53	0.41 \pm 0.21	0.35 \pm 0.17
	Z $\rightarrow \nu\nu$	—	—	—	—
	Inclusive	2.27 \pm 1.14	4.17 \pm 1.48	0.54 \pm 0.54	0.75 \pm 0.53
	1 lepton	2.27 \pm 1.14	4.17 \pm 1.48	0.54 \pm 0.54	0.75 \pm 0.53
	1 lepton, from W	2.27 \pm 1.14	4.17 \pm 1.48	0.54 \pm 0.54	0.75 \pm 0.53
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
	Inclusive	17.99 \pm 1.54	7.62 \pm 0.90	1.71 \pm 0.55	2.53 \pm 0.43
	1 lepton	1.48 \pm 0.26	0.51 \pm 0.15	0.16 \pm 0.08	0.14 \pm 0.06
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from W	1.48 \pm 0.26	0.51 \pm 0.15	0.16 \pm 0.08	0.14 \pm 0.06
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.43 \pm 0.15	0.04 \pm 0.05	—	0.10 \pm 0.06
	Z $\rightarrow \nu\nu$	16.09 \pm 1.51	7.07 \pm 0.89	1.55 \pm 0.55	2.29 \pm 0.42
	Inclusive	0.38 \pm 0.15	0.04 \pm 0.04	—	0.10 \pm 0.06
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.38 \pm 0.15	0.04 \pm 0.04	—	0.10 \pm 0.06
	Z $\rightarrow \nu\nu$	—	—	—	—

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Table 6 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.04 ± 0.04	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.04 ± 0.04	—	—	—
$WZ \rightarrow \ell\nu 2Q$, amcnlo pythia8	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	1.48 ± 0.26	0.51 ± 0.15	0.16 ± 0.08	0.14 ± 0.06
	1 lepton	1.48 ± 0.26	0.51 ± 0.15	0.16 ± 0.08	0.14 ± 0.06
	1 lepton, from W	1.48 ± 0.26	0.51 ± 0.15	0.16 ± 0.08	0.14 ± 0.06
	1 lepton, from t	—	—	—	—
$WZ \rightarrow 1\ell 3\nu$, amcnlo pythia8	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	16.09 ± 1.51	7.07 ± 0.89	1.55 ± 0.55	2.29 ± 0.42
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
ZZ	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	16.09 ± 1.51	7.07 ± 0.89	1.55 ± 0.55	2.29 ± 0.42
	Inclusive	0.50 ± 0.04	0.19 ± 0.02	0.10 ± 0.01	0.05 ± 0.01
	1 lepton	—	—	—	—
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.03 ± 0.02	0.00 ± 0.01	—	—
	$Z \rightarrow \nu\nu$	0.47 ± 0.03	0.19 ± 0.02	0.10 ± 0.01	0.05 ± 0.01
	Inclusive	0.03 ± 0.02	0.00 ± 0.01	—	—
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	0.44 ± 0.03	0.17 ± 0.01	0.08 ± 0.01	0.05 ± 0.01
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive	0.44 ± 0.03	0.17 ± 0.01	0.08 ± 0.01	0.05 ± 0.01
	1 lepton	0.03 ± 0.02	0.01 ± 0.01	0.02 ± 0.01	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
$t\bar{t} + V$	$Z \rightarrow \nu\nu$	0.03 ± 0.02	0.01 ± 0.01	0.02 ± 0.01	—
	Inclusive	2.08 ± 0.18	0.55 ± 0.07	0.21 ± 0.06	0.09 ± 0.01
	1 lepton	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
$t\bar{t} + W$	≥ 2 leptons	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	—
	$Z \rightarrow \nu\nu$	0.51 ± 0.17	0.03 ± 0.07	0.05 ± 0.05	—
	Inclusive	1.57 ± 0.04	0.51 ± 0.02	0.16 ± 0.01	0.09 ± 0.01
	1 lepton	0.49 ± 0.17	0.03 ± 0.07	0.04 ± 0.05	—
	1 lepton, from W	—	—	—	—
$t\bar{t} + W \rightarrow \ell\nu$, amcnlo pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	0.49 ± 0.17	0.03 ± 0.07	0.04 ± 0.05	—
	Inclusive	0.39 ± 0.16	0.03 ± 0.07	0.04 ± 0.05	—
	1 lepton	—	—	—	—
$t\bar{t} + W \rightarrow \ell\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.39 ± 0.16	0.03 ± 0.07	0.04 ± 0.05	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—

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Table 6 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.10 \pm 0.05	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.10 \pm 0.05	—	—	—
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	1.59 \pm 0.04	0.52 \pm 0.02	0.16 \pm 0.01	0.09 \pm 0.01
	1 lepton	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.02 \pm 0.01	0.00 \pm 0.00	0.00 \pm 0.00	—
	$Z \rightarrow \nu\nu$	1.57 \pm 0.04	0.51 \pm 0.02	0.16 \pm 0.01	0.09 \pm 0.01
	Inclusive	1.59 \pm 0.04	0.52 \pm 0.02	0.16 \pm 0.01	0.09 \pm 0.01
	1 lepton	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	—
	1 lepton, from W	—	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	—
	≥ 2 leptons	0.02 \pm 0.01	0.00 \pm 0.00	0.00 \pm 0.00	—
	$Z \rightarrow \nu\nu$	1.57 \pm 0.04	0.51 \pm 0.02	0.16 \pm 0.01	0.09 \pm 0.01
	Inclusive	0.07 \pm 0.05	—	—	—
	1 lepton	—	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.07 \pm 0.05	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	1.49 \pm 0.37	0.42 \pm 0.17	0.30 \pm 0.13	0.17 \pm 0.07
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	1.49 \pm 0.37	0.42 \pm 0.17	0.30 \pm 0.13	0.17 \pm 0.07

CR0b, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
Data, single e/μ , MET	Inclusive	87.00 \pm 9.33	20.00 \pm 4.47	15.00 \pm 3.87
All Background	Inclusive	117.08 \pm 5.55	24.58 \pm 2.64	6.61 \pm 0.73
	1 lepton	35.82 \pm 4.29	10.71 \pm 2.20	1.66 \pm 0.29
	1 lepton, from W	32.67 \pm 4.14	10.62 \pm 2.20	1.43 \pm 0.24
	1 lepton, from t	3.15 \pm 1.11	0.09 \pm 0.09	0.23 \pm 0.15
	≥ 2 leptons	73.52 \pm 3.40	12.75 \pm 1.38	3.86 \pm 0.60
	Z $\rightarrow \nu\nu$	7.73 \pm 0.89	1.12 \pm 0.45	1.09 \pm 0.29
$t\bar{t}$	Inclusive	72.12 \pm 3.29	11.60 \pm 1.34	3.55 \pm 0.58
	1 lepton	3.14 \pm 1.11	0.09 \pm 0.09	0.21 \pm 0.15
	1 lepton, from W	—	—	—
	1 lepton, from t	3.14 \pm 1.11	0.09 \pm 0.09	0.21 \pm 0.15
	≥ 2 leptons	68.98 \pm 3.10	11.51 \pm 1.33	3.35 \pm 0.56
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	2.30 \pm 1.06	—	—
	1 lepton	2.30 \pm 1.06	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	2.30 \pm 1.06	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	0.85 \pm 0.34	0.09 \pm 0.09	0.21 \pm 0.15
	1 lepton	0.85 \pm 0.34	0.09 \pm 0.09	0.21 \pm 0.15
	1 lepton, from W	—	—	—
	1 lepton, from t	0.85 \pm 0.34	0.09 \pm 0.09	0.21 \pm 0.15
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	68.98 \pm 3.10	11.51 \pm 1.33	3.35 \pm 0.56
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	68.98 \pm 3.10	11.51 \pm 1.33	3.35 \pm 0.56
	Z $\rightarrow \nu\nu$	—	—	—
single t	Inclusive	1.24 \pm 1.24	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	1.24 \pm 1.24	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single t t - W-channel	Inclusive	1.24 \pm 1.24	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	1.24 \pm 1.24	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single t, t - W-channel, powheg pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single \bar{t} , t - W-channel, powheg pythia8	Inclusive	1.24 \pm 1.24	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	1.24 \pm 1.24	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single t non t - W-channel	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—

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Table 7 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200
		250 < MET < 350	350 < MET < 450	MET > 450
single t , s-channel, amcnlo pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
V +Jets	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	30.59 ± 4.05	9.96 ± 2.14	1.42 ± 0.24
	1 lepton	30.59 ± 4.05	9.96 ± 2.14	1.42 ± 0.24
	1 lepton, from W	30.59 ± 4.05	9.96 ± 2.14	1.42 ± 0.24
	1 lepton, from t	—	—	—
DY+Jets $\rightarrow \ell\ell$	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
W +Jets $\rightarrow \ell\nu$	1 lepton	30.59 ± 4.05	9.96 ± 2.14	1.42 ± 0.24
	1 lepton, from W	30.59 ± 4.05	9.96 ± 2.14	1.42 ± 0.24
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
W +Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	Inclusive	1.29 ± 1.29	1.11 ± 1.11	—
	1 lepton	1.29 ± 1.29	1.11 ± 1.11	—
	1 lepton, from W	1.29 ± 1.29	1.11 ± 1.11	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W +Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	11.49 ± 2.71	1.59 ± 0.92	—
	1 lepton	11.49 ± 2.71	1.59 ± 0.92	—
	1 lepton, from W	11.49 ± 2.71	1.59 ± 0.92	—
	1 lepton, from t	—	—	—
W +Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	10.08 ± 2.61	3.97 ± 1.50	—
	1 lepton	10.08 ± 2.61	3.97 ± 1.50	—
	1 lepton, from W	10.08 ± 2.61	3.97 ± 1.50	—
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	4.20 ± 0.60	2.07 ± 0.39	0.63 ± 0.19
	1 lepton	4.20 ± 0.60	2.07 ± 0.39	0.63 ± 0.19
	1 lepton, from W	4.20 ± 0.60	2.07 ± 0.39	0.63 ± 0.19
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—

Continued on next page

Table 7 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	2.47 \pm 0.23	0.71 \pm 0.12	0.61 \pm 0.10
	1 lepton	2.47 \pm 0.23	0.71 \pm 0.12	0.61 \pm 0.10
	1 lepton, from W	2.47 \pm 0.23	0.71 \pm 0.12	0.61 \pm 0.10
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Inclusive	1.03 \pm 0.37	0.50 \pm 0.25	0.17 \pm 0.12
	1 lepton	1.03 \pm 0.37	0.50 \pm 0.25	0.17 \pm 0.12
	1 lepton, from W	1.03 \pm 0.37	0.50 \pm 0.25	0.17 \pm 0.12
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	Inclusive	0.03 \pm 0.01	0.01 \pm 0.01	0.01 \pm 0.00
	1 lepton	0.03 \pm 0.01	0.01 \pm 0.01	0.01 \pm 0.00
	1 lepton, from W	0.03 \pm 0.01	0.01 \pm 0.01	0.01 \pm 0.00
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
Rare	Inclusive	13.13 \pm 1.41	3.02 \pm 0.78	1.64 \pm 0.36
	1 lepton	2.09 \pm 0.86	0.66 \pm 0.53	0.03 \pm 0.03
	1 lepton, from W	2.08 \pm 0.86	0.66 \pm 0.53	0.01 \pm 0.02
	1 lepton, from t	0.01 \pm 0.00	0.00 \pm 0.00	0.02 \pm 0.02
	≥ 2 leptons	3.31 \pm 0.67	1.24 \pm 0.36	0.51 \pm 0.22
diBoson	Z $\rightarrow \nu\nu$	7.73 \pm 0.89	1.12 \pm 0.45	1.09 \pm 0.29
	Inclusive	10.96 \pm 1.39	2.49 \pm 0.78	1.49 \pm 0.36
	1 lepton	2.05 \pm 0.86	0.66 \pm 0.53	0.01 \pm 0.02
	1 lepton, from W	2.05 \pm 0.86	0.66 \pm 0.53	0.01 \pm 0.02
	1 lepton, from t	—	—	—
WW	≥ 2 leptons	3.09 \pm 0.64	1.11 \pm 0.35	0.47 \pm 0.21
	Z $\rightarrow \nu\nu$	5.82 \pm 0.89	0.73 \pm 0.45	1.01 \pm 0.29
	Inclusive	3.96 \pm 1.05	1.47 \pm 0.62	0.47 \pm 0.21
	1 lepton	1.19 \pm 0.84	0.52 \pm 0.52	—
	1 lepton, from W	1.19 \pm 0.84	0.52 \pm 0.52	—
WW $\rightarrow 2\ell 2\nu$, powheg	1 lepton, from t	—	—	—
	≥ 2 leptons	2.77 \pm 0.62	0.95 \pm 0.34	0.47 \pm 0.21
	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	2.77 \pm 0.62	0.95 \pm 0.34	0.47 \pm 0.21
	1 lepton	—	—	—
WW $\rightarrow \ell\nu qq$, powheg	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	2.77 \pm 0.62	0.95 \pm 0.34	0.47 \pm 0.21
	Z $\rightarrow \nu\nu$	—	—	—
	Inclusive	1.19 \pm 0.84	0.52 \pm 0.52	—
WZ	1 lepton	1.19 \pm 0.84	0.52 \pm 0.52	—
	1 lepton, from W	1.19 \pm 0.84	0.52 \pm 0.52	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	Inclusive	6.83 \pm 0.91	0.99 \pm 0.46	1.01 \pm 0.29
	1 lepton	0.86 \pm 0.18	0.13 \pm 0.08	0.01 \pm 0.02
	1 lepton, from W	0.86 \pm 0.18	0.13 \pm 0.08	0.01 \pm 0.02
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.31 \pm 0.13	0.15 \pm 0.09	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	Z $\rightarrow \nu\nu$	5.65 \pm 0.89	0.70 \pm 0.45	0.99 \pm 0.29
	Inclusive	0.31 \pm 0.13	0.15 \pm 0.09	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.31 \pm 0.13	0.15 \pm 0.09	—
	Z $\rightarrow \nu\nu$	—	—	—

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Table 7 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.01 ± 0.02	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.01 ± 0.02	—	—
$WZ \rightarrow \ell \nu 2Q$, amcnlo pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.86 ± 0.18	0.13 ± 0.08	0.01 ± 0.02
	1 lepton	0.86 ± 0.18	0.13 ± 0.08	0.01 ± 0.02
	1 lepton, from W	0.86 ± 0.18	0.13 ± 0.08	0.01 ± 0.02
	1 lepton, from t	—	—	—
$WZ \rightarrow 1\ell 3\nu$, amcnlo pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	5.65 ± 0.89	0.70 ± 0.45	0.99 ± 0.29
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
ZZ	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	5.65 ± 0.89	0.70 ± 0.45	0.99 ± 0.29
	Inclusive	0.17 ± 0.03	0.03 ± 0.01	0.01 ± 0.00
	1 lepton	—	—	—
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.00 ± 0.02	0.01 ± 0.01	—
	$Z \rightarrow \nu\nu$	0.17 ± 0.02	0.03 ± 0.01	0.01 ± 0.00
	Inclusive	0.00 ± 0.02	0.01 ± 0.01	—
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.00 ± 0.02	0.01 ± 0.01	—
	$Z \rightarrow \nu\nu$	—	—	—
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive	0.16 ± 0.02	0.03 ± 0.01	0.01 ± 0.00
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
$t\bar{t} + V$	$Z \rightarrow \nu\nu$	0.16 ± 0.02	0.03 ± 0.01	0.01 ± 0.00
	Inclusive	0.00 ± 0.01	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
$t\bar{t} + W$	≥ 2 leptons	0.00 ± 0.01	—	—
	$Z \rightarrow \nu\nu$	0.00 ± 0.01	—	—
	Inclusive	2.17 ± 0.23	0.53 ± 0.10	0.15 ± 0.06
	1 lepton	0.04 ± 0.03	0.00 ± 0.00	0.02 ± 0.02
	1 lepton, from W	0.03 ± 0.03	—	—
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from t	0.01 ± 0.00	0.00 ± 0.00	0.02 ± 0.02
	≥ 2 leptons	0.22 ± 0.22	0.13 ± 0.09	0.04 ± 0.06
	$Z \rightarrow \nu\nu$	1.91 ± 0.05	0.39 ± 0.02	0.09 ± 0.01
	Inclusive	0.22 ± 0.23	0.13 ± 0.09	0.06 ± 0.06
	1 lepton	0.03 ± 0.03	—	0.02 ± 0.02
$t\bar{t} + W$	1 lepton, from W	0.03 ± 0.03	—	—
	1 lepton, from t	—	—	0.02 ± 0.02
	≥ 2 leptons	0.19 ± 0.22	0.13 ± 0.09	0.04 ± 0.06
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.03 ± 0.19	0.06 ± 0.08	0.02 ± 0.04
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton	0.03 ± 0.03	—	—
	1 lepton, from W	0.03 ± 0.03	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	0.06 ± 0.08	0.02 ± 0.04
	$Z \rightarrow \nu\nu$	—	—	—

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Table 7 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200	$\geq 4\text{jets}$ MT2W < 200
		$250 < MET < 350$	$350 < MET < 450$	$MET > 450$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.19 ± 0.12	0.07 ± 0.05	0.04 ± 0.04
	1 lepton	—	—	0.02 ± 0.02
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	0.02 ± 0.02
	≥ 2 leptons	0.19 ± 0.12	0.07 ± 0.05	0.02 ± 0.04
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.95 ± 0.05	0.40 ± 0.02	0.09 ± 0.01
	1 lepton	0.01 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	1 lepton, from W	—	—	—
	1 lepton, from t	0.01 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.03 ± 0.01	—	0.00 ± 0.00
	$Z \rightarrow \nu\nu$	1.91 ± 0.05	0.39 ± 0.02	0.09 ± 0.01
	Inclusive	1.95 ± 0.05	0.40 ± 0.02	0.09 ± 0.01
	1 lepton	0.01 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	1 lepton, from W	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.01 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	≥ 2 leptons	0.03 ± 0.01	—	0.00 ± 0.00
	$Z \rightarrow \nu\nu$	1.91 ± 0.05	0.39 ± 0.02	0.09 ± 0.01
	Inclusive	0.27 ± 0.18	—	0.21 ± 0.14
	1 lepton	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.27 ± 0.18	—	0.21 ± 0.14
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	2.66 ± 0.53	0.33 ± 0.21	0.22 ± 0.12
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.11 ± 0.09	—	—
	$Z \rightarrow \nu\nu$	2.55 ± 0.52	0.33 ± 0.21	0.22 ± 0.11

CR0b, Nominal Systematic, Yield Table for Input Samples						
Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
Data, single e/μ , MET	Inclusive	86.00 \pm 9.27	32.00 \pm 5.66	6.00 \pm 2.45	6.00 \pm 2.45	7.00 \pm 2.65
All Background	Inclusive	118.73 \pm 11.74	34.72 \pm 3.03	13.45 \pm 1.72	7.72 \pm 1.63	5.99 \pm 1.11
	1 lepton	62.04 \pm 5.44	21.62 \pm 2.79	9.22 \pm 1.60	4.53 \pm 0.97	4.62 \pm 1.06
	1 lepton, from W	60.36 \pm 5.42	21.33 \pm 2.78	9.22 \pm 1.60	4.53 \pm 0.97	4.56 \pm 1.06
	1 lepton, from t	1.68 \pm 0.55	0.29 \pm 0.28	—	—	0.06 \pm 0.06
	≥ 2 leptons	49.14 \pm 10.35	8.77 \pm 0.97	1.78 \pm 0.41	2.42 \pm 1.29	0.56 \pm 0.20
	$Z \rightarrow \nu\nu$	7.55 \pm 0.98	4.33 \pm 0.67	2.45 \pm 0.48	0.77 \pm 0.26	0.81 \pm 0.25
$t\bar{t}$	Inclusive	30.70 \pm 2.14	6.83 \pm 0.90	1.32 \pm 0.34	0.62 \pm 0.25	0.26 \pm 0.13
	1 lepton	1.64 \pm 0.55	0.28 \pm 0.28	—	—	0.06 \pm 0.06
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	1.64 \pm 0.55	0.28 \pm 0.28	—	—	0.06 \pm 0.06
	≥ 2 leptons	29.06 \pm 2.07	6.54 \pm 0.86	1.32 \pm 0.34	0.62 \pm 0.25	0.20 \pm 0.12
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	0.41 \pm 0.41	0.28 \pm 0.28	—	—	—
	1 lepton	0.41 \pm 0.41	0.28 \pm 0.28	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.41 \pm 0.41	0.28 \pm 0.28	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	1.23 \pm 0.36	—	—	—	0.06 \pm 0.06
	1 lepton	1.23 \pm 0.36	—	—	—	0.06 \pm 0.06
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	1.23 \pm 0.36	—	—	—	0.06 \pm 0.06
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	29.06 \pm 2.07	6.54 \pm 0.86	1.32 \pm 0.34	0.62 \pm 0.25	0.20 \pm 0.12
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	29.06 \pm 2.07	6.54 \pm 0.86	1.32 \pm 0.34	0.62 \pm 0.25	0.20 \pm 0.12
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t	Inclusive	2.22 \pm 1.58	—	—	1.24 \pm 1.24	—
	1 lepton	1.19 \pm 1.19	—	—	—	—
	1 lepton, from W	1.19 \pm 1.19	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	1.03 \pm 1.03	—	—	1.24 \pm 1.24	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single $t - W$ -channel	Inclusive	2.22 \pm 1.58	—	—	1.24 \pm 1.24	—
	1 lepton	1.19 \pm 1.19	—	—	—	—
	1 lepton, from W	1.19 \pm 1.19	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	1.03 \pm 1.03	—	—	1.24 \pm 1.24	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t , $t - W$ -channel, powheg pythia8	Inclusive	—	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single \bar{t} , $t - W$ -channel, powheg pythia8	Inclusive	2.22 \pm 1.58	—	—	1.24 \pm 1.24	—
	1 lepton	1.19 \pm 1.19	—	—	—	—
	1 lepton, from W	1.19 \pm 1.19	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	1.03 \pm 1.03	—	—	1.24 \pm 1.24	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t non $t - W$ -channel	Inclusive	—	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
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Table 8 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $250 < \text{MET} < 350$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $350 < \text{MET} < 450$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $450 < \text{MET} < 550$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $550 < \text{MET} < 650$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $\text{MET} > 650$
single t , s-channel, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
V+Jets	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	68.05 ± 11.26 53.82 ± 5.05 53.82 ± 5.05 14.23 ± 10.06 —	20.56 ± 2.73 20.56 ± 2.73 20.56 ± 2.73 — —	8.54 ± 1.53 8.54 ± 1.53 8.54 ± 1.53 — —	4.06 ± 0.88 4.06 ± 0.88 4.06 ± 0.88 — —	4.17 ± 1.01 4.17 ± 1.01 4.17 ± 1.01 — —
DY+Jets $\rightarrow \ell\ell$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	14.23 ± 10.06 — — 14.23 ± 10.06 —	— — — — —	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	14.23 ± 10.06 — — 14.23 ± 10.06 —	— — — — —	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	53.82 ± 5.05 53.82 ± 5.05 53.82 ± 5.05 — —	20.56 ± 2.73 20.56 ± 2.73 20.56 ± 2.73 — —	8.54 ± 1.53 8.54 ± 1.53 8.54 ± 1.53 — —	4.06 ± 0.88 4.06 ± 0.88 4.06 ± 0.88 — —	4.17 ± 1.01 4.17 ± 1.01 4.17 ± 1.01 — —
W+Jets $\rightarrow \ell\nu$, $100 < HT < 200$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	2.68 ± 1.90 2.68 ± 1.90 2.68 ± 1.90 — —	— — — — —	— — — — —	— — — — —	0.71 ± 0.71 0.71 ± 0.71 0.71 ± 0.71 — —
W+Jets $\rightarrow \ell\nu$, $200 < HT < 400$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	16.26 ± 3.20 16.26 ± 3.20 16.26 ± 3.20 — —	3.92 ± 1.50 3.92 ± 1.50 3.92 ± 1.50 — —	1.03 ± 0.73 1.03 ± 0.73 1.03 ± 0.73 — —	— — — — —	0.31 ± 0.31 0.31 ± 0.31 0.31 ± 0.31 — —
W+Jets $\rightarrow \ell\nu$, $400 < HT < 600$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	15.73 ± 3.21 15.73 ± 3.21 15.73 ± 3.21 — —	7.75 ± 2.16 7.75 ± 2.16 7.75 ± 2.16 — —	2.76 ± 1.23 2.76 ± 1.23 2.76 ± 1.23 — —	1.40 ± 0.81 1.40 ± 0.81 1.40 ± 0.81 — —	1.02 ± 0.59 1.02 ± 0.59 1.02 ± 0.59 — —
W+Jets $\rightarrow \ell\nu$, $600 < HT < 800$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	8.88 ± 0.87 8.88 ± 0.87 8.88 ± 0.87 — —	3.38 ± 0.50 3.38 ± 0.50 3.38 ± 0.50 — —	2.48 ± 0.43 2.48 ± 0.43 2.48 ± 0.43 — —	0.97 ± 0.24 0.97 ± 0.24 0.97 ± 0.24 — —	0.40 ± 0.13 0.40 ± 0.13 0.40 ± 0.13 — —

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Table 8 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	7.02 \pm 0.40	3.38 \pm 0.26	1.58 \pm 0.17	1.01 \pm 0.12	0.92 \pm 0.10
	1 lepton	7.02 \pm 0.40	3.38 \pm 0.26	1.58 \pm 0.17	1.01 \pm 0.12	0.92 \pm 0.10
	1 lepton, from W	7.02 \pm 0.40	3.38 \pm 0.26	1.58 \pm 0.17	1.01 \pm 0.12	0.92 \pm 0.10
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Inclusive	2.98 \pm 0.61	2.00 \pm 0.47	0.63 \pm 0.26	0.67 \pm 0.24	0.77 \pm 0.22
	1 lepton	2.98 \pm 0.61	2.00 \pm 0.47	0.63 \pm 0.26	0.67 \pm 0.24	0.77 \pm 0.22
	1 lepton, from W	2.98 \pm 0.61	2.00 \pm 0.47	0.63 \pm 0.26	0.67 \pm 0.24	0.77 \pm 0.22
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	Inclusive	0.26 \pm 0.03	0.14 \pm 0.02	0.06 \pm 0.01	0.02 \pm 0.01	0.05 \pm 0.01
	1 lepton	0.26 \pm 0.03	0.14 \pm 0.02	0.06 \pm 0.01	0.02 \pm 0.01	0.05 \pm 0.01
	1 lepton, from W	0.26 \pm 0.03	0.14 \pm 0.02	0.06 \pm 0.01	0.02 \pm 0.01	0.05 \pm 0.01
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
Rare	Inclusive	17.76 \pm 2.01	7.33 \pm 0.96	3.60 \pm 0.71	1.80 \pm 0.53	1.56 \pm 0.44
	1 lepton	5.38 \pm 1.57	0.77 \pm 0.52	0.68 \pm 0.48	0.46 \pm 0.40	0.39 \pm 0.32
	1 lepton, from W	5.35 \pm 1.57	0.77 \pm 0.52	0.68 \pm 0.48	0.46 \pm 0.40	0.39 \pm 0.32
	1 lepton, from t	0.04 \pm 0.03	0.00 \pm 0.00	—	—	—
	≥ 2 leptons	4.82 \pm 0.79	2.23 \pm 0.45	0.46 \pm 0.22	0.56 \pm 0.24	0.36 \pm 0.16
	Z $\rightarrow \nu\nu$	7.55 \pm 0.98	4.33 \pm 0.67	2.45 \pm 0.48	0.77 \pm 0.26	0.81 \pm 0.25
diBoson	Inclusive	15.49 \pm 1.99	5.96 \pm 0.94	3.32 \pm 0.70	1.71 \pm 0.53	1.52 \pm 0.44
	1 lepton	5.35 \pm 1.57	0.77 \pm 0.52	0.68 \pm 0.48	0.46 \pm 0.40	0.39 \pm 0.32
	1 lepton, from W	5.35 \pm 1.57	0.77 \pm 0.52	0.68 \pm 0.48	0.46 \pm 0.40	0.39 \pm 0.32
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	4.09 \pm 0.74	1.56 \pm 0.42	0.45 \pm 0.20	0.55 \pm 0.23	0.35 \pm 0.16
	Z $\rightarrow \nu\nu$	6.06 \pm 0.98	3.63 \pm 0.67	2.19 \pm 0.48	0.69 \pm 0.26	0.78 \pm 0.25
WW	Inclusive	7.81 \pm 1.72	1.93 \pm 0.65	0.80 \pm 0.51	0.90 \pm 0.46	0.67 \pm 0.36
	1 lepton	4.10 \pm 1.55	0.51 \pm 0.51	0.47 \pm 0.47	0.40 \pm 0.40	0.32 \pm 0.32
	1 lepton, from W	4.10 \pm 1.55	0.51 \pm 0.51	0.47 \pm 0.47	0.40 \pm 0.40	0.32 \pm 0.32
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	3.71 \pm 0.73	1.42 \pm 0.41	0.33 \pm 0.19	0.51 \pm 0.23	0.35 \pm 0.16
	Z $\rightarrow \nu\nu$	—	—	—	—	—
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	3.71 \pm 0.73	1.42 \pm 0.41	0.33 \pm 0.19	0.51 \pm 0.23	0.35 \pm 0.16
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	3.71 \pm 0.73	1.42 \pm 0.41	0.33 \pm 0.19	0.51 \pm 0.23	0.35 \pm 0.16
	Z $\rightarrow \nu\nu$	—	—	—	—	—
WW $\rightarrow \ell\nu qq$, powheg	Inclusive	4.10 \pm 1.55	0.51 \pm 0.51	0.47 \pm 0.47	0.40 \pm 0.40	0.32 \pm 0.32
	1 lepton	4.10 \pm 1.55	0.51 \pm 0.51	0.47 \pm 0.47	0.40 \pm 0.40	0.32 \pm 0.32
	1 lepton, from W	4.10 \pm 1.55	0.51 \pm 0.51	0.47 \pm 0.47	0.40 \pm 0.40	0.32 \pm 0.32
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
WZ	Inclusive	7.50 \pm 1.01	3.93 \pm 0.68	2.46 \pm 0.49	0.79 \pm 0.26	0.83 \pm 0.25
	1 lepton	1.24 \pm 0.20	0.26 \pm 0.12	0.21 \pm 0.08	0.07 \pm 0.05	0.07 \pm 0.03
	1 lepton, from W	1.24 \pm 0.20	0.26 \pm 0.12	0.21 \pm 0.08	0.07 \pm 0.05	0.07 \pm 0.03
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.38 \pm 0.13	0.13 \pm 0.08	0.12 \pm 0.07	0.05 \pm 0.04	—
	Z $\rightarrow \nu\nu$	5.88 \pm 0.98	3.54 \pm 0.67	2.12 \pm 0.48	0.67 \pm 0.26	0.76 \pm 0.25
WZ $\rightarrow 3\ell\nu$, powheg pythia8	Inclusive	0.30 \pm 0.12	0.13 \pm 0.07	0.12 \pm 0.07	0.03 \pm 0.03	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.30 \pm 0.12	0.13 \pm 0.07	0.12 \pm 0.07	0.03 \pm 0.03	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—

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Table 8 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.08 ± 0.03	—	—	0.01 ± 0.01	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.08 ± 0.03	—	—	0.01 ± 0.01	—
$WZ \rightarrow \ell \nu 2Q$, amcnlo pythia8	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	1.24 ± 0.20	0.26 ± 0.12	0.21 ± 0.08	0.07 ± 0.05	0.07 ± 0.03
	1 lepton	1.24 ± 0.20	0.26 ± 0.12	0.21 ± 0.08	0.07 ± 0.05	0.07 ± 0.03
	1 lepton, from W	1.24 ± 0.20	0.26 ± 0.12	0.21 ± 0.08	0.07 ± 0.05	0.07 ± 0.03
	1 lepton, from t	—	—	—	—	—
$WZ \rightarrow \ell \ell 3\nu$, amcnlo pythia8	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	5.88 ± 0.98	3.54 ± 0.67	2.12 ± 0.48	0.67 ± 0.26	0.76 ± 0.25
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
ZZ	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	5.88 ± 0.98	3.54 ± 0.67	2.12 ± 0.48	0.67 ± 0.26	0.76 ± 0.25
	Inclusive	0.18 ± 0.02	0.10 ± 0.02	0.06 ± 0.01	0.01 ± 0.01	0.02 ± 0.00
	1 lepton	—	—	—	—	—
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.00 ± 0.01	0.01 ± 0.01	—	—	—
	$Z \rightarrow \nu\nu$	0.18 ± 0.02	0.09 ± 0.01	0.06 ± 0.01	0.01 ± 0.01	0.02 ± 0.00
	Inclusive	0.00 ± 0.01	0.01 ± 0.01	—	—	—
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	0.15 ± 0.01	0.09 ± 0.01	0.06 ± 0.01	0.01 ± 0.00	0.02 ± 0.00
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive	0.15 ± 0.01	0.09 ± 0.01	0.06 ± 0.01	0.01 ± 0.00	0.02 ± 0.00
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
$t\bar{t} + V$	$Z \rightarrow \nu\nu$	0.03 ± 0.01	—	0.00 ± 0.00	0.00 ± 0.01	—
	Inclusive	2.27 ± 0.27	1.37 ± 0.18	0.28 ± 0.08	0.09 ± 0.07	0.04 ± 0.05
	1 lepton	0.04 ± 0.06	0.00 ± 0.00	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
$t\bar{t} + W$	≥ 2 leptons	0.04 ± 0.03	0.00 ± 0.00	—	—	—
	$Z \rightarrow \nu\nu$	0.74 ± 0.26	0.67 ± 0.18	0.01 ± 0.08	0.01 ± 0.07	0.01 ± 0.05
	Inclusive	1.49 ± 0.04	0.70 ± 0.03	0.27 ± 0.02	0.08 ± 0.01	0.03 ± 0.00
	1 lepton	0.75 ± 0.27	0.66 ± 0.18	0.00 ± 0.08	0.01 ± 0.07	0.01 ± 0.05
	1 lepton, from W	0.03 ± 0.06	—	—	—	—
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.03 ± 0.03	—	—	—	—
	$Z \rightarrow \nu\nu$	0.72 ± 0.26	0.66 ± 0.18	0.00 ± 0.08	0.01 ± 0.07	0.01 ± 0.05
	Inclusive	—	—	—	—	—
	1 lepton	0.56 ± 0.25	0.54 ± 0.17	0.00 ± 0.08	0.01 ± 0.05	—
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	0.56 ± 0.24	0.54 ± 0.17	0.00 ± 0.08	0.01 ± 0.05	—
	Inclusive	—	—	—	—	—

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Table 8 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $250 < \text{MET} < 350$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $350 < \text{MET} < 450$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $450 < \text{MET} < 550$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $550 < \text{MET} < 650$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $\text{MET} > 650$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.20 ± 0.10	0.12 ± 0.06	—	—	0.01 ± 0.01
	1 lepton	0.03 ± 0.03	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.03 ± 0.03	—	—	—	—
	≥ 2 leptons	0.16 ± 0.10	0.12 ± 0.06	—	—	0.01 ± 0.01
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	1.51 ± 0.04	0.71 ± 0.03	0.27 ± 0.02	0.08 ± 0.01	0.03 ± 0.00
	1 lepton	0.01 ± 0.00	0.00 ± 0.00	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.01 ± 0.00	0.00 ± 0.00	—	—	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—	—
	$Z \rightarrow \nu\nu$	1.49 ± 0.04	0.70 ± 0.03	0.27 ± 0.02	0.08 ± 0.01	0.03 ± 0.00
	Inclusive	1.51 ± 0.04	0.71 ± 0.03	0.27 ± 0.02	0.08 ± 0.01	0.03 ± 0.00
	1 lepton	0.01 ± 0.00	0.00 ± 0.00	—	—	—
	1 lepton, from W	—	—	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.01 ± 0.00	0.00 ± 0.00	—	—	—
	≥ 2 leptons	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—	—
	$Z \rightarrow \nu\nu$	1.49 ± 0.04	0.70 ± 0.03	0.27 ± 0.02	0.08 ± 0.01	0.03 ± 0.00
	Inclusive	0.22 ± 0.12	0.02 ± 0.05	—	—	—
	1 lepton	0.04 ± 0.04	—	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.04 ± 0.04	—	—	—	—
	≥ 2 leptons	0.18 ± 0.12	0.02 ± 0.05	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	1.74 ± 0.50	1.49 ± 0.31	0.12 ± 0.16	0.18 ± 0.09	0.10 ± 0.05
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.01 ± 0.05	0.00 ± 0.05	—	—	—
	$Z \rightarrow \nu\nu$	1.73 ± 0.50	1.49 ± 0.31	0.12 ± 0.16	0.18 ± 0.09	0.10 ± 0.05

CR2l, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	2jets modTopness ≥ 6.4 250 < MET < 350	2jets modTopness ≥ 6.4 350 < MET < 450	2jets modTopness ≥ 6.4 $MET > 450$
Data, single e/μ , MET	Inclusive	265.00 \pm 16.28	54.00 \pm 7.35	13.00 \pm 3.61
All Background	Inclusive	275.94 \pm 19.67	47.79 \pm 7.60	10.41 \pm 1.11
	1 lepton	8.03 \pm 1.54	1.39 \pm 0.29	0.43 \pm 0.14
	1 lepton, from W	5.43 \pm 1.40	0.81 \pm 0.16	0.43 \pm 0.14
	1 lepton, from t	2.60 \pm 0.66	0.59 \pm 0.24	—
	≥ 2 leptons	266.17 \pm 19.61	45.95 \pm 7.59	9.78 \pm 1.10
	$Z \rightarrow \nu\nu$	1.75 \pm 0.04	0.45 \pm 0.02	0.20 \pm 0.02
$t\bar{t}$	Inclusive	228.93 \pm 3.83	33.75 \pm 1.41	7.18 \pm 0.70
	1 lepton	2.50 \pm 0.65	0.59 \pm 0.24	—
	1 lepton, from W	—	—	—
	1 lepton, from t	2.50 \pm 0.65	0.59 \pm 0.24	—
	≥ 2 leptons	226.43 \pm 3.78	33.16 \pm 1.39	7.18 \pm 0.70
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	1.45 \pm 0.60	0.18 \pm 0.18	—
	1 lepton	1.45 \pm 0.60	0.18 \pm 0.18	—
	1 lepton, from W	—	—	—
	1 lepton, from t	1.45 \pm 0.60	0.18 \pm 0.18	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	1.04 \pm 0.26	0.41 \pm 0.16	—
	1 lepton	1.04 \pm 0.26	0.41 \pm 0.16	—
	1 lepton, from W	—	—	—
	1 lepton, from t	1.04 \pm 0.26	0.41 \pm 0.16	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	226.43 \pm 3.78	33.16 \pm 1.39	7.18 \pm 0.70
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	226.43 \pm 3.78	33.16 \pm 1.39	7.18 \pm 0.70
	$Z \rightarrow \nu\nu$	—	—	—
single t	Inclusive	14.08 \pm 2.97	3.82 \pm 1.46	1.24 \pm 0.72
	1 lepton	0.10 \pm 0.10	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.10 \pm 0.10	—	—
	≥ 2 leptons	13.98 \pm 2.97	3.82 \pm 1.46	1.24 \pm 0.72
	$Z \rightarrow \nu\nu$	—	—	—
single $t - W$ -channel	Inclusive	13.98 \pm 2.97	3.82 \pm 1.46	1.24 \pm 0.72
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	13.98 \pm 2.97	3.82 \pm 1.46	1.24 \pm 0.72
	$Z \rightarrow \nu\nu$	—	—	—
single t , $t - W$ -channel, powheg pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
single \bar{t} , $t - W$ -channel, powheg pythia8	Inclusive	13.98 \pm 2.97	3.82 \pm 1.46	1.24 \pm 0.72
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	13.98 \pm 2.97	3.82 \pm 1.46	1.24 \pm 0.72
	$Z \rightarrow \nu\nu$	—	—	—
single t non $t - W$ -channel	Inclusive	0.10 \pm 0.10	—	—
	1 lepton	0.10 \pm 0.10	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.10 \pm 0.10	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—

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Table 9 – continued from previous page

Sample	Classification	2jets modTopness ≥ 6.4 $250 < MET < 350$	2jets modTopness ≥ 6.4 $350 < MET < 450$	2jets modTopness ≥ 6.4 $MET > 450$
single t , s-channel, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.10 ± 0.10 0.10 ± 0.10 — 0.10 ± 0.10 — —	— — — — — —	— — — — — —
V+Jets	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	25.85 ± 19.05 5.40 ± 1.39 5.40 ± 1.39 — 20.45 ± 19.00 —	8.04 ± 7.31 0.73 ± 0.16 0.73 ± 0.16 — 7.31 ± 7.31 —	0.41 ± 0.14 0.41 ± 0.14 0.41 ± 0.14 — — —
DY+Jets $\rightarrow \ell\ell$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	20.45 ± 19.00 — — — 20.45 ± 19.00 —	7.31 ± 7.31 — — — 7.31 ± 7.31 —	— — — — — —
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — — —	— — — — — —	— — — — — —
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	20.45 ± 19.00 — — — 20.45 ± 19.00 —	7.31 ± 7.31 — — — 7.31 ± 7.31 —	— — — — — —
W+Jets $\rightarrow \ell\nu$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	5.40 ± 1.39 5.40 ± 1.39 5.40 ± 1.39 — — —	0.73 ± 0.16 0.73 ± 0.16 0.73 ± 0.16 — — —	0.41 ± 0.14 0.41 ± 0.14 0.41 ± 0.14 — — —
W+Jets $\rightarrow \ell\nu$, $100 < HT < 200$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — — —	— — — — — —	— — — — — —
W+Jets $\rightarrow \ell\nu$, $200 < HT < 400$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.44 ± 0.44 0.44 ± 0.44 0.44 ± 0.44 — — —	— — — — — —	— — — — — —
W+Jets $\rightarrow \ell\nu$, $400 < HT < 600$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	2.10 ± 1.25 2.10 ± 1.25 2.10 ± 1.25 — — —	— — — — — —	— — — — — —
W+Jets $\rightarrow \ell\nu$, $600 < HT < 800$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	1.73 ± 0.40 1.73 ± 0.40 1.73 ± 0.40 — — —	0.06 ± 0.06 0.06 ± 0.06 0.06 ± 0.06 — — —	0.06 ± 0.06 0.06 ± 0.06 0.06 ± 0.06 — — —

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Table 9 – continued from previous page

Sample	Classification	2jets	2jets	2jets
		modTopness ≥ 6.4 $250 < MET < 350$	modTopness ≥ 6.4 $350 < MET < 450$	modTopness ≥ 6.4 $MET > 450$
W+Jets $\rightarrow \ell\nu$, $800 < HT < 1200$, madgraph pythia8	Inclusive	1.13 ± 0.19	0.59 ± 0.12	0.21 ± 0.07
	1 lepton	1.13 ± 0.19	0.59 ± 0.12	0.21 ± 0.07
	1 lepton, from W	1.13 ± 0.19	0.59 ± 0.12	0.21 ± 0.07
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
W+Jets $\rightarrow \ell\nu$, $1200 < HT < 2500$, madgraph pythia8	Inclusive	—	0.08 ± 0.08	0.14 ± 0.10
	1 lepton	—	0.08 ± 0.08	0.14 ± 0.10
	1 lepton, from W	—	0.08 ± 0.08	0.14 ± 0.10
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
W+Jets $\rightarrow \ell\nu$, $2500 < HT < Inf$, madgraph pythia8	Inclusive	—	—	0.00 ± 0.00
	1 lepton	—	—	0.00 ± 0.00
	1 lepton, from W	—	—	0.00 ± 0.00
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
Rare	Inclusive	7.09 ± 0.74	2.18 ± 0.39	1.58 ± 0.44
	1 lepton	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from W	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from t	0.00 ± 0.00	0.00 ± 0.00	—
	≥ 2 leptons	5.31 ± 0.74	1.66 ± 0.39	1.36 ± 0.44
	$Z \rightarrow \nu\nu$	1.75 ± 0.04	0.45 ± 0.02	0.20 ± 0.02
diBoson	Inclusive	4.26 ± 0.70	1.63 ± 0.37	1.35 ± 0.43
	1 lepton	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from W	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.85 ± 0.70	1.42 ± 0.37	1.24 ± 0.43
	$Z \rightarrow \nu\nu$	0.37 ± 0.02	0.13 ± 0.01	0.09 ± 0.01
WW	Inclusive	2.88 ± 0.67	1.00 ± 0.34	0.76 ± 0.38
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	2.88 ± 0.67	1.00 ± 0.34	0.76 ± 0.38
	$Z \rightarrow \nu\nu$	—	—	—
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	2.88 ± 0.67	1.00 ± 0.34	0.76 ± 0.38
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	2.88 ± 0.67	1.00 ± 0.34	0.76 ± 0.38
	$Z \rightarrow \nu\nu$	—	—	—
WW $\rightarrow \ell\nu qq$, powheg	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
WZ	Inclusive	0.91 ± 0.21	0.50 ± 0.15	0.45 ± 0.20
	1 lepton	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from W	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.88 ± 0.20	0.42 ± 0.15	0.43 ± 0.20
	$Z \rightarrow \nu\nu$	—	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	Inclusive	0.78 ± 0.20	0.37 ± 0.15	0.42 ± 0.20
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.78 ± 0.20	0.37 ± 0.15	0.42 ± 0.20
	$Z \rightarrow \nu\nu$	—	—	—

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Table 9 – continued from previous page

Sample	Classification	2jets	2jets	2jets
		modTopness ≥ 6.4 $250 < MET < 350$	modTopness ≥ 6.4 $350 < MET < 450$	modTopness ≥ 6.4 $MET > 450$
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.11 ± 0.03	0.06 ± 0.03	0.01 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.11 ± 0.03 — —	0.06 ± 0.03 — —	0.01 ± 0.01 — —
$WZ \rightarrow \ell\nu 2Q$, amcnlo pythia8	Inclusive	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from W	0.03 ± 0.04	0.08 ± 0.04	0.02 ± 0.02
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — —	— — —	— — —
$WZ \rightarrow 1\ell 3\nu$, amcnlo pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — —	— — —	— — —
ZZ	Inclusive	0.47 ± 0.04	0.13 ± 0.02	0.14 ± 0.02
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.09 ± 0.03 0.37 ± 0.02 —	— 0.13 ± 0.01 —	0.05 ± 0.02 0.09 ± 0.01 —
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.09 ± 0.03	—	0.05 ± 0.02
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.09 ± 0.03 — —	— — —	0.05 ± 0.02 — —
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	Inclusive	0.37 ± 0.02	0.13 ± 0.01	0.09 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — —	— — —	— — —
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — —	— — —	— — —
$t\bar{t} + V$	Inclusive	2.83 ± 0.23	0.55 ± 0.11	0.22 ± 0.08
	1 lepton	0.00 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.00 ± 0.00 1.45 ± 0.23 1.37 ± 0.03	0.00 ± 0.00 0.24 ± 0.11 0.32 ± 0.01	— 0.11 ± 0.08 0.11 ± 0.01
$t\bar{t} + W$	Inclusive	1.24 ± 0.23	0.19 ± 0.11	0.09 ± 0.08
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— 1.24 ± 0.23 —	— 0.19 ± 0.11 —	— 0.09 ± 0.08 —
$t\bar{t} + W \rightarrow \ell\nu$, amcnlo pythia8	Inclusive	1.04 ± 0.22	0.16 ± 0.11	0.03 ± 0.07
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— 1.04 ± 0.22 —	— 0.16 ± 0.11 —	— 0.03 ± 0.07 —

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Table 9 – continued from previous page

Sample	Classification	2jets	2jets	2jets
		modTopness ≥ 6.4 $250 < MET < 350$	modTopness ≥ 6.4 $350 < MET < 450$	modTopness ≥ 6.4 $MET > 450$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.21 ± 0.07	0.03 ± 0.02	0.06 ± 0.04
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.21 ± 0.07	0.03 ± 0.02	0.06 ± 0.04
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.59 ± 0.03	0.36 ± 0.01	0.13 ± 0.01
	1 lepton	0.00 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.00 ± 0.00	0.00 ± 0.00	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.21 ± 0.01	0.04 ± 0.01	0.02 ± 0.00
	$Z \rightarrow \nu\nu$	1.37 ± 0.03	0.32 ± 0.01	0.11 ± 0.01
	Inclusive	1.59 ± 0.03	0.36 ± 0.01	0.13 ± 0.01
	1 lepton	0.00 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.00 ± 0.00	0.00 ± 0.00	—
	≥ 2 leptons	0.21 ± 0.01	0.04 ± 0.01	0.02 ± 0.00
	$Z \rightarrow \nu\nu$	1.37 ± 0.03	0.32 ± 0.01	0.11 ± 0.01
	Inclusive	0.08 ± 0.08	0.00 ± 0.03	0.03 ± 0.02
	1 lepton	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.48 ± 0.14	0.03 ± 0.05	0.03 ± 0.02
	$Z \rightarrow \nu\nu$	0.66 ± 0.17	0.25 ± 0.10	0.13 ± 0.05
	Inclusive	1.14 ± 0.22	0.28 ± 0.11	0.16 ± 0.06

CR2l, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
		Inclusive	Inclusive	Inclusive	Inclusive
Data, single e/μ , MET		135.00 \pm 11.62	48.00 \pm 6.93	18.00 \pm 4.24	6.00 \pm 2.45
All Background	Inclusive	169.43 \pm 7.08	40.51 \pm 2.46	12.83 \pm 4.17	5.23 \pm 0.98
	1 lepton	12.38 \pm 1.53	3.26 \pm 1.07	0.81 \pm 0.20	0.70 \pm 0.32
	1 lepton, from W	3.39 \pm 0.57	2.02 \pm 0.99	0.48 \pm 0.15	0.46 \pm 0.29
	1 lepton, from t	8.99 \pm 1.42	1.24 \pm 0.41	0.33 \pm 0.14	0.23 \pm 0.15
	≥ 2 leptons	155.55 \pm 6.91	36.70 \pm 2.21	11.89 \pm 4.17	4.45 \pm 0.93
	$Z \rightarrow \nu\nu$	1.50 \pm 0.03	0.55 \pm 0.06	0.12 \pm 0.01	0.08 \pm 0.04
$t\bar{t}$	Inclusive	140.51 \pm 3.46	31.23 \pm 1.49	6.61 \pm 0.63	2.55 \pm 0.38
	1 lepton	8.96 \pm 1.42	1.23 \pm 0.41	0.33 \pm 0.14	0.23 \pm 0.15
	1 lepton, from W	—	—	—	—
	1 lepton, from t	8.96 \pm 1.42	1.23 \pm 0.41	0.33 \pm 0.14	0.23 \pm 0.15
	≥ 2 leptons	131.55 \pm 3.15	30.00 \pm 1.43	6.28 \pm 0.61	2.31 \pm 0.34
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	4.59 \pm 1.28	0.48 \pm 0.34	—	0.14 \pm 0.14
	1 lepton	4.59 \pm 1.28	0.48 \pm 0.34	—	0.14 \pm 0.14
	1 lepton, from W	—	—	—	—
	1 lepton, from t	4.59 \pm 1.28	0.48 \pm 0.34	—	0.14 \pm 0.14
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	4.37 \pm 0.62	0.75 \pm 0.22	0.33 \pm 0.14	0.09 \pm 0.07
	1 lepton	4.37 \pm 0.62	0.75 \pm 0.22	0.33 \pm 0.14	0.09 \pm 0.07
	1 lepton, from W	—	—	—	—
	1 lepton, from t	4.37 \pm 0.62	0.75 \pm 0.22	0.33 \pm 0.14	0.09 \pm 0.07
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	131.55 \pm 3.15	30.00 \pm 1.43	6.28 \pm 0.61	2.31 \pm 0.34
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	131.55 \pm 3.15	30.00 \pm 1.43	6.28 \pm 0.61	2.31 \pm 0.34
	$Z \rightarrow \nu\nu$	—	—	—	—
single t	Inclusive	12.42 \pm 2.92	5.48 \pm 1.89	0.48 \pm 0.48	1.38 \pm 0.80
	1 lepton	—	0.97 \pm 0.97	—	—
	1 lepton, from W	—	0.97 \pm 0.97	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	12.42 \pm 2.92	4.50 \pm 1.62	0.48 \pm 0.48	1.38 \pm 0.80
	$Z \rightarrow \nu\nu$	—	—	—	—
single t $t - W$ -channel	Inclusive	12.42 \pm 2.92	5.48 \pm 1.89	0.48 \pm 0.48	1.38 \pm 0.80
	1 lepton	—	0.97 \pm 0.97	—	—
	1 lepton, from W	—	0.97 \pm 0.97	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	12.42 \pm 2.92	4.50 \pm 1.62	0.48 \pm 0.48	1.38 \pm 0.80
	$Z \rightarrow \nu\nu$	—	—	—	—
single t , $t - W$ -channel, powheg pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
single \bar{t} , $t - W$ -channel, powheg pythia8	Inclusive	12.42 \pm 2.92	5.48 \pm 1.89	0.48 \pm 0.48	1.38 \pm 0.80
	1 lepton	—	0.97 \pm 0.97	—	—
	1 lepton, from W	—	0.97 \pm 0.97	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	12.42 \pm 2.92	4.50 \pm 1.62	0.48 \pm 0.48	1.38 \pm 0.80
	$Z \rightarrow \nu\nu$	—	—	—	—
single t non $t - W$ -channel	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—

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Table 10 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
single t , s-channel, amcnlo pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
V +Jets	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	8.63 ± 5.39	1.01 ± 0.19	4.54 ± 4.08	0.46 ± 0.29
	1 lepton	3.27 ± 0.57	1.01 ± 0.19	0.47 ± 0.15	0.46 ± 0.29
	1 lepton, from W	3.27 ± 0.57	1.01 ± 0.19	0.47 ± 0.15	0.46 ± 0.29
	1 lepton, from t	—	—	—	—
DY+Jets $\rightarrow \ell\ell$	≥ 2 leptons	5.36 ± 5.36	—	4.07 ± 4.07	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	5.36 ± 5.36	—	4.07 ± 4.07	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	5.36 ± 5.36	—	4.07 ± 4.07	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	5.36 ± 5.36	—	4.07 ± 4.07	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	5.36 ± 5.36	—	4.07 ± 4.07	—
W +Jets $\rightarrow \ell\nu$	1 lepton	3.27 ± 0.57	1.01 ± 0.19	0.47 ± 0.15	0.46 ± 0.29
	1 lepton, from W	3.27 ± 0.57	1.01 ± 0.19	0.47 ± 0.15	0.46 ± 0.29
	1 lepton, from t	3.27 ± 0.57	1.01 ± 0.19	0.47 ± 0.15	0.46 ± 0.29
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
W +Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	1.23 ± 0.36	0.14 ± 0.10	—	0.04 ± 0.04
	1 lepton	1.23 ± 0.36	0.14 ± 0.10	—	0.04 ± 0.04
	1 lepton, from W	1.23 ± 0.36	0.14 ± 0.10	—	0.04 ± 0.04
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	—	—	—	—

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Table 10 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	1.58 \pm 0.23	0.87 \pm 0.16	0.31 \pm 0.10	0.05 \pm 0.02
	1 lepton	1.58 \pm 0.23	0.87 \pm 0.16	0.31 \pm 0.10	0.05 \pm 0.02
	1 lepton, from W	1.58 \pm 0.23	0.87 \pm 0.16	0.31 \pm 0.10	0.05 \pm 0.02
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Inclusive	0.46 \pm 0.37	—	0.15 \pm 0.11	0.34 \pm 0.28
	1 lepton	0.46 \pm 0.37	—	0.15 \pm 0.11	0.34 \pm 0.28
	1 lepton, from W	0.46 \pm 0.37	—	0.15 \pm 0.11	0.34 \pm 0.28
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	Inclusive	—	—	—	0.04 \pm 0.02
	1 lepton	—	—	—	0.04 \pm 0.02
	1 lepton, from W	—	—	—	0.04 \pm 0.02
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
Rare	Inclusive	7.87 \pm 0.81	2.80 \pm 0.46	1.19 \pm 0.40	0.84 \pm 0.33
	1 lepton	0.15 \pm 0.06	0.05 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from W	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from t	0.03 \pm 0.01	0.01 \pm 0.00	0.00 \pm 0.00	—
	≥ 2 leptons	6.23 \pm 0.80	2.19 \pm 0.46	1.05 \pm 0.40	0.76 \pm 0.33
	Z $\rightarrow \nu\nu$	1.50 \pm 0.03	0.55 \pm 0.06	0.12 \pm 0.01	0.08 \pm 0.04
diBoson	Inclusive	4.16 \pm 0.74	1.77 \pm 0.43	0.96 \pm 0.39	0.70 \pm 0.33
	1 lepton	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from W	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	3.84 \pm 0.74	1.58 \pm 0.43	0.91 \pm 0.39	0.65 \pm 0.32
	Z $\rightarrow \nu\nu$	0.21 \pm 0.02	0.15 \pm 0.06	0.03 \pm 0.01	0.06 \pm 0.04
WW	Inclusive	2.64 \pm 0.69	1.16 \pm 0.40	0.82 \pm 0.39	0.49 \pm 0.31
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	2.64 \pm 0.69	1.16 \pm 0.40	0.82 \pm 0.39	0.49 \pm 0.31
	Z $\rightarrow \nu\nu$	—	—	—	—
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	2.64 \pm 0.69	1.16 \pm 0.40	0.82 \pm 0.39	0.49 \pm 0.31
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	2.64 \pm 0.69	1.16 \pm 0.40	0.82 \pm 0.39	0.49 \pm 0.31
	Z $\rightarrow \nu\nu$	—	—	—	—
WW $\rightarrow \ell\nu qq$, powheg	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—
WZ	Inclusive	1.25 \pm 0.26	0.50 \pm 0.15	0.11 \pm 0.05	0.19 \pm 0.09
	1 lepton	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from W	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.13 \pm 0.25	0.40 \pm 0.14	0.09 \pm 0.05	0.15 \pm 0.08
	Z $\rightarrow \nu\nu$	—	0.05 \pm 0.05	—	0.04 \pm 0.04
WZ $\rightarrow 3\ell\nu$, powheg pythia8	Inclusive	1.06 \pm 0.25	0.38 \pm 0.14	0.07 \pm 0.05	0.14 \pm 0.08
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.06 \pm 0.25	0.38 \pm 0.14	0.07 \pm 0.05	0.14 \pm 0.08
	Z $\rightarrow \nu\nu$	—	—	—	—

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Table 10 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
WZ \rightarrow 2 ℓ 2Q, amcnlo pythia8	Inclusive	0.07 \pm 0.05	0.02 \pm 0.02	0.02 \pm 0.01	0.01 \pm 0.01
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	0.07 \pm 0.05 — —	0.02 \pm 0.02 — —	0.02 \pm 0.01 — —	0.01 \pm 0.01 — —
WZ \rightarrow $\ell\nu$ 2Q, amcnlo pythia8	Inclusive	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from W	0.12 \pm 0.06	0.04 \pm 0.03	0.02 \pm 0.02	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	— — —	— — —	— — —	— — —
WZ \rightarrow 1 ℓ 3 ν , amcnlo pythia8	Inclusive	—	0.05 \pm 0.05	—	0.04 \pm 0.04
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	— — —	— — 0.05 \pm 0.05	— — —	— — 0.04 \pm 0.04
ZZ	Inclusive	0.27 \pm 0.04	0.11 \pm 0.02	0.04 \pm 0.01	0.02 \pm 0.01
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	0.07 \pm 0.04 0.21 \pm 0.02 —	0.01 \pm 0.02 0.10 \pm 0.01 —	0.01 \pm 0.01 0.03 \pm 0.01 —	0.00 \pm 0.01 0.02 \pm 0.01 —
ZZ \rightarrow 2 ℓ 2Q, amcnlo pythia8	Inclusive	0.07 \pm 0.04	0.01 \pm 0.02	0.01 \pm 0.01	0.00 \pm 0.01
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	0.07 \pm 0.04 — —	0.01 \pm 0.02 — —	0.01 \pm 0.01 — —	0.00 \pm 0.01 — —
ZZ \rightarrow 2 ℓ 2 ν , powheg pythia8	Inclusive	0.21 \pm 0.02	0.10 \pm 0.01	0.03 \pm 0.01	0.02 \pm 0.01
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	— — 0.21 \pm 0.02	— — 0.10 \pm 0.01	— — 0.03 \pm 0.01	— — 0.02 \pm 0.01
ZZ \rightarrow 2Q2 ν , amcnlo pythia8	Inclusive	—	—	—	—
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	— — —	— — —	— — —	— — —
t \bar{t} + V	Inclusive	3.71 \pm 0.32	1.02 \pm 0.17	0.23 \pm 0.07	0.14 \pm 0.04
	1 lepton	0.03 \pm 0.01	0.01 \pm 0.00	0.00 \pm 0.00	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	0.03 \pm 0.01 2.39 \pm 0.32 1.29 \pm 0.03	0.01 \pm 0.00 0.62 \pm 0.17 0.40 \pm 0.02	0.00 \pm 0.00 0.14 \pm 0.07 0.09 \pm 0.01	— 0.11 \pm 0.04 0.03 \pm 0.00
t \bar{t} + W	Inclusive	1.79 \pm 0.31	0.48 \pm 0.17	0.10 \pm 0.07	0.10 \pm 0.04
	1 lepton	0.01 \pm 0.01	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	0.01 \pm 0.01 1.78 \pm 0.31 —	— 0.48 \pm 0.17 —	— 0.10 \pm 0.07 —	— 0.10 \pm 0.04 —
t \bar{t} + W \rightarrow $\ell\nu$, amcnlo pythia8	Inclusive	1.42 \pm 0.30	0.45 \pm 0.17	0.02 \pm 0.06	0.10 \pm 0.04
	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t \geq 2 leptons Z \rightarrow $\nu\nu$	— 1.42 \pm 0.30 —	— 0.45 \pm 0.17 —	— 0.02 \pm 0.06 —	— 0.10 \pm 0.04 —

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Table 10 – continued from previous page

Sample	Classification	3jets MT2W \geq 200 250 < MET < 350	3jets MT2W \geq 200 350 < MET < 450	3jets MT2W \geq 200 450 < MET < 550	3jets MT2W \geq 200 MET > 550
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.37 ± 0.09	0.03 ± 0.05	0.07 ± 0.03	—
	1 lepton	0.01 ± 0.01	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.01 ± 0.01	—	—	—
	≥ 2 leptons	0.35 ± 0.09	0.03 ± 0.05	0.07 ± 0.03	—
$t\bar{t} + Z$	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	1.92 ± 0.04	0.54 ± 0.02	0.14 ± 0.01	0.04 ± 0.00
	1 lepton	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	0.61 ± 0.02	0.13 ± 0.01	0.04 ± 0.01	0.01 ± 0.00
	$Z \rightarrow \nu\nu$	1.29 ± 0.03	0.40 ± 0.02	0.09 ± 0.01	0.03 ± 0.00
	Inclusive	1.92 ± 0.04	0.54 ± 0.02	0.14 ± 0.01	0.04 ± 0.00
	1 lepton	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.02 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
	≥ 2 leptons	0.61 ± 0.02	0.13 ± 0.01	0.04 ± 0.01	0.01 ± 0.00
	$Z \rightarrow \nu\nu$	1.29 ± 0.03	0.40 ± 0.02	0.09 ± 0.01	0.03 ± 0.00
	Inclusive	0.45 ± 0.13	0.07 ± 0.05	0.08 ± 0.04	—
	1 lepton	—	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	0.45 ± 0.13	0.07 ± 0.05	0.08 ± 0.04	—
	$Z \rightarrow \nu\nu$	—	—	—	—
	Inclusive	2.18 ± 0.31	0.55 ± 0.17	0.09 ± 0.07	0.13 ± 0.06
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—	—
	1 lepton, from W	—	—	—	—
	1 lepton, from t	—	—	—	—
	≥ 2 leptons	1.08 ± 0.21	0.12 ± 0.08	—	0.06 ± 0.03
	$Z \rightarrow \nu\nu$	1.09 ± 0.23	0.42 ± 0.14	0.09 ± 0.06	0.07 ± 0.05

CR2l, Nominal Systematic, Yield Table for Input Samples

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
Data, single e/μ , MET	Inclusive	399.00 \pm 19.97	91.00 \pm 9.54	22.00 \pm 4.69
All Background	Inclusive	594.79 \pm 6.97	109.09 \pm 2.82	32.01 \pm 1.40
	1 lepton	17.80 \pm 1.88	4.54 \pm 0.92	1.73 \pm 0.44
	1 lepton, from W	2.48 \pm 0.83	0.48 \pm 0.18	0.12 \pm 0.07
	1 lepton, from t	15.32 \pm 1.69	4.06 \pm 0.90	1.61 \pm 0.44
	≥ 2 leptons	574.65 \pm 6.71	104.09 \pm 2.67	30.17 \pm 1.33
	Z $\rightarrow \nu\nu$	2.34 \pm 0.04	0.45 \pm 0.02	0.11 \pm 0.01
$t\bar{t}$	Inclusive	575.98 \pm 6.59	105.76 \pm 2.75	30.66 \pm 1.33
	1 lepton	15.23 \pm 1.69	4.00 \pm 0.90	1.61 \pm 0.44
	1 lepton, from W	—	—	—
	1 lepton, from t	15.23 \pm 1.69	4.00 \pm 0.90	1.61 \pm 0.44
	≥ 2 leptons	560.75 \pm 6.37	101.75 \pm 2.59	29.05 \pm 1.26
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	7.59 \pm 1.50	2.16 \pm 0.83	0.71 \pm 0.36
	1 lepton	7.59 \pm 1.50	2.16 \pm 0.83	0.71 \pm 0.36
	1 lepton, from W	—	—	—
	1 lepton, from t	7.59 \pm 1.50	2.16 \pm 0.83	0.71 \pm 0.36
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	7.63 \pm 0.78	1.84 \pm 0.35	0.90 \pm 0.25
	1 lepton	7.63 \pm 0.78	1.84 \pm 0.35	0.90 \pm 0.25
	1 lepton, from W	—	—	—
	1 lepton, from t	7.63 \pm 0.78	1.84 \pm 0.35	0.90 \pm 0.25
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	560.75 \pm 6.37	101.75 \pm 2.59	29.05 \pm 1.26
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	560.75 \pm 6.37	101.75 \pm 2.59	29.05 \pm 1.26
	Z $\rightarrow \nu\nu$	—	—	—
single t	Inclusive	7.18 \pm 2.12	0.55 \pm 0.55	0.41 \pm 0.41
	1 lepton	0.62 \pm 0.62	—	—
	1 lepton, from W	0.62 \pm 0.62	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	6.56 \pm 2.03	0.55 \pm 0.55	0.41 \pm 0.41
	Z $\rightarrow \nu\nu$	—	—	—
single t t - W-channel	Inclusive	7.18 \pm 2.12	0.55 \pm 0.55	0.41 \pm 0.41
	1 lepton	0.62 \pm 0.62	—	—
	1 lepton, from W	0.62 \pm 0.62	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	6.56 \pm 2.03	0.55 \pm 0.55	0.41 \pm 0.41
	Z $\rightarrow \nu\nu$	—	—	—
single \bar{t} , t - W-channel, powheg pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—
single \bar{t} , t - W-channel, powheg pythia8	Inclusive	7.18 \pm 2.12	0.55 \pm 0.55	0.41 \pm 0.41
	1 lepton	0.62 \pm 0.62	—	—
	1 lepton, from W	0.62 \pm 0.62	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	6.56 \pm 2.03	0.55 \pm 0.55	0.41 \pm 0.41
	Z $\rightarrow \nu\nu$	—	—	—
single t non t - W-channel	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—

Continued on next page

Table 11 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W < 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W < 200 MET > 450
single t , s-channel, amcnlo pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
V +Jets	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	1.74 ± 0.55	0.48 ± 0.18	0.12 ± 0.07
	1 lepton	1.74 ± 0.55	0.48 ± 0.18	0.12 ± 0.07
	1 lepton, from W	1.74 ± 0.55	0.48 ± 0.18	0.12 ± 0.07
	1 lepton, from t	—	—	—
DY+Jets $\rightarrow \ell\ell$	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
W+Jets $\rightarrow \ell\nu$	1 lepton	1.74 ± 0.55	0.48 ± 0.18	0.12 ± 0.07
	1 lepton, from W	1.74 ± 0.55	0.48 ± 0.18	0.12 ± 0.07
	1 lepton, from t	1.74 ± 0.55	0.48 ± 0.18	0.12 ± 0.07
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
W+Jets $\rightarrow \ell\nu$, 100 < HT < 200, madgraph pythia8	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W+Jets $\rightarrow \ell\nu$, 200 < HT < 400, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
W+Jets $\rightarrow \ell\nu$, 400 < HT < 600, madgraph pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.50 ± 0.50	—	—
	1 lepton	0.50 ± 0.50	—	—
	1 lepton, from W	0.50 ± 0.50	—	—
W+Jets $\rightarrow \ell\nu$, 600 < HT < 800, madgraph pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.43 ± 0.18	—	—
	1 lepton	0.43 ± 0.18	—	—
	1 lepton, from W	0.43 ± 0.18	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—

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Table 11 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 $250 < MET < 350$	$\geq 4\text{jets}$ MT2W < 200 $350 < MET < 450$	$\geq 4\text{jets}$ MT2W < 200 $MET > 450$
W+Jets $\rightarrow \ell\nu$, $800 < HT < 1200$, madgraph pythia8	Inclusive	0.81 ± 0.14	0.14 ± 0.06	0.05 ± 0.03
	1 lepton	0.81 ± 0.14	0.14 ± 0.06	0.05 ± 0.03
	1 lepton, from W	0.81 ± 0.14	0.14 ± 0.06	0.05 ± 0.03
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
W+Jets $\rightarrow \ell\nu$, $1200 < HT < 2500$, madgraph pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	0.34 ± 0.17	0.07 ± 0.07
	1 lepton	—	0.34 ± 0.17	0.07 ± 0.07
	1 lepton, from W	—	0.34 ± 0.17	0.07 ± 0.07
	1 lepton, from t	—	—	—
W+Jets $\rightarrow \ell\nu$, $2500 < HT < Inf$, madgraph pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.01 ± 0.00	—	—
	1 lepton	0.01 ± 0.00	—	—
	1 lepton, from W	0.01 ± 0.00	—	—
Rare	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	9.89 ± 0.64	2.30 ± 0.29	0.82 ± 0.15
	1 lepton	0.21 ± 0.07	0.06 ± 0.03	0.00 ± 0.02
diBoson	1 lepton, from W	0.12 ± 0.05	—	—
	1 lepton, from t	0.09 ± 0.04	0.06 ± 0.03	0.00 ± 0.02
	≥ 2 leptons	7.34 ± 0.63	1.79 ± 0.29	0.71 ± 0.15
	$Z \rightarrow \nu\nu$	2.34 ± 0.04	0.45 ± 0.02	0.11 ± 0.01
	Inclusive	1.66 ± 0.37	0.35 ± 0.15	0.09 ± 0.05
WW	1 lepton	0.08 ± 0.04	—	—
	1 lepton, from W	0.08 ± 0.04	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	1.52 ± 0.36	0.34 ± 0.15	0.08 ± 0.05
	$Z \rightarrow \nu\nu$	0.07 ± 0.01	0.02 ± 0.00	0.01 ± 0.00
WW $\rightarrow 2\ell 2\nu$, powheg	Inclusive	0.87 ± 0.31	0.18 ± 0.13	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.87 ± 0.31	0.18 ± 0.13	—
WW $\rightarrow \ell\nu qq$, powheg	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.87 ± 0.31	0.18 ± 0.13	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
WZ	≥ 2 leptons	0.87 ± 0.31	0.18 ± 0.13	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.67 ± 0.19	0.15 ± 0.08	0.08 ± 0.05
	1 lepton	0.08 ± 0.04	—	—
	1 lepton, from W	0.08 ± 0.04	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from t	—	—	—
	≥ 2 leptons	0.59 ± 0.18	0.15 ± 0.08	0.08 ± 0.05
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.57 ± 0.18	0.13 ± 0.08	0.07 ± 0.05
	1 lepton	—	—	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.57 ± 0.18	0.13 ± 0.08	0.07 ± 0.05
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—

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Table 11 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 $250 < MET < 350$	$\geq 4\text{jets}$ MT2W < 200 $350 < MET < 450$	$\geq 4\text{jets}$ MT2W < 200 $MET > 450$
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.03 ± 0.02	0.02 ± 0.02	0.01 ± 0.01
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.03 ± 0.02	0.02 ± 0.02	0.01 ± 0.01
$WZ \rightarrow \ell \nu 2Q$, amcnlo pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.08 ± 0.04	—	—
	1 lepton	0.08 ± 0.04	—	—
	1 lepton, from W	0.08 ± 0.04	—	—
	1 lepton, from t	—	—	—
$WZ \rightarrow 1\ell 3\nu$, amcnlo pythia8	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
ZZ	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	0.12 ± 0.02	0.02 ± 0.01	0.01 ± 0.00
	1 lepton	—	—	—
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	0.06 ± 0.02	0.01 ± 0.01	—
	$Z \rightarrow \nu\nu$	0.07 ± 0.01	0.02 ± 0.00	0.01 ± 0.00
	Inclusive	0.06 ± 0.02	0.01 ± 0.01	—
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	0.07 ± 0.01	0.02 ± 0.00	0.01 ± 0.00
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	—	—	—
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
$t\bar{t} + V$	≥ 2 leptons	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	8.23 ± 0.52	1.94 ± 0.25	0.73 ± 0.14
	1 lepton	0.13 ± 0.05	0.06 ± 0.03	0.00 ± 0.02
	1 lepton, from W	0.04 ± 0.03	—	—
$t\bar{t} + W$	1 lepton, from t	0.09 ± 0.04	0.06 ± 0.03	0.00 ± 0.02
	≥ 2 leptons	5.82 ± 0.52	1.46 ± 0.25	0.63 ± 0.14
	$Z \rightarrow \nu\nu$	2.27 ± 0.04	0.43 ± 0.02	0.10 ± 0.01
	Inclusive	4.96 ± 0.52	1.34 ± 0.25	0.60 ± 0.14
	1 lepton	0.10 ± 0.05	0.05 ± 0.03	—
$t\bar{t} + W \rightarrow \ell \nu$, amcnlo pythia8	1 lepton, from W	0.04 ± 0.03	—	—
	1 lepton, from t	0.06 ± 0.04	0.05 ± 0.03	—
	≥ 2 leptons	4.86 ± 0.52	1.30 ± 0.25	0.60 ± 0.14
	$Z \rightarrow \nu\nu$	—	—	—
	Inclusive	3.18 ± 0.45	0.92 ± 0.22	0.36 ± 0.11
	1 lepton	0.04 ± 0.03	—	—
	1 lepton, from W	0.04 ± 0.03	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons	3.14 ± 0.45	0.92 ± 0.22	0.36 ± 0.11
	$Z \rightarrow \nu\nu$	—	—	—

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Table 11 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W < 200 $250 < MET < 350$	$\geq 4\text{jets}$ MT2W < 200 $350 < MET < 450$	$\geq 4\text{jets}$ MT2W < 200 $MET > 450$
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	1.78 ± 0.25	0.42 ± 0.13	0.24 ± 0.08
	1 lepton	0.06 ± 0.04	0.05 ± 0.03	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.06 ± 0.04	0.05 ± 0.03	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	1.72 ± 0.25 —	0.38 ± 0.13 —	0.24 ± 0.08 —
$t\bar{t} + Z$	Inclusive	3.27 ± 0.05	0.60 ± 0.02	0.13 ± 0.01
	1 lepton	0.03 ± 0.00	0.01 ± 0.00	0.00 ± 0.00
	1 lepton, from W	—	—	—
	1 lepton, from t	0.03 ± 0.00	0.01 ± 0.00	0.00 ± 0.00
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.96 ± 0.03 2.27 ± 0.04	0.16 ± 0.01 0.43 ± 0.02	0.03 ± 0.00 0.10 ± 0.01
$t\bar{t} + Z$, madgraph	Inclusive	3.27 ± 0.05	0.60 ± 0.02	0.13 ± 0.01
	1 lepton	0.03 ± 0.00	0.01 ± 0.00	0.00 ± 0.00
	1 lepton, from W	—	—	—
	1 lepton, from t	0.03 ± 0.00	0.01 ± 0.00	0.00 ± 0.00
	≥ 2 leptons $Z \rightarrow \nu\nu$	0.96 ± 0.03 2.27 ± 0.04	0.16 ± 0.01 0.43 ± 0.02	0.03 ± 0.00 0.10 ± 0.01
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	Inclusive	2.18 ± 0.39	0.33 ± 0.16	0.30 ± 0.08
	1 lepton	0.13 ± 0.08	0.03 ± 0.03	—
	1 lepton, from W	—	—	—
	1 lepton, from t	0.13 ± 0.08	0.03 ± 0.03	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	2.04 ± 0.38 —	0.30 ± 0.16 —	0.30 ± 0.08 —
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	Inclusive	2.16 ± 0.45	0.88 ± 0.19	0.19 ± 0.10
	1 lepton	—	—	—
	1 lepton, from W	—	—	—
	1 lepton, from t	—	—	—
	≥ 2 leptons $Z \rightarrow \nu\nu$	1.56 ± 0.39 0.60 ± 0.23	0.63 ± 0.13 0.25 ± 0.14	0.19 ± 0.08 —

CR2l, Nominal Systematic, Yield Table for Input Samples						
Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
Data, single e/μ , MET	Inclusive	132.00 \pm 11.49	37.00 \pm 6.08	14.00 \pm 3.74	3.00 \pm 1.73	3.00 \pm 1.73
All Background	Inclusive	178.46 \pm 10.59	54.33 \pm 5.35	16.78 \pm 1.28	7.82 \pm 1.37	3.04 \pm 0.52
	1 lepton	19.44 \pm 1.89	7.23 \pm 1.25	2.44 \pm 0.48	1.72 \pm 0.63	0.55 \pm 0.28
	1 lepton, from W	3.69 \pm 0.79	2.10 \pm 0.76	0.41 \pm 0.12	0.97 \pm 0.51	0.38 \pm 0.25
	1 lepton, from t	15.76 \pm 1.72	5.13 \pm 0.98	2.03 \pm 0.46	0.75 \pm 0.37	0.18 \pm 0.13
	≥ 2 leptons	157.85 \pm 10.42	46.76 \pm 5.20	14.19 \pm 1.19	6.06 \pm 1.22	2.42 \pm 0.44
	$Z \rightarrow \nu\nu$	1.17 \pm 0.06	0.34 \pm 0.02	0.15 \pm 0.05	0.04 \pm 0.01	0.06 \pm 0.04
$t\bar{t}$	Inclusive	157.90 \pm 4.13	44.51 \pm 1.99	15.52 \pm 1.25	4.21 \pm 0.64	1.99 \pm 0.36
	1 lepton	15.71 \pm 1.71	5.11 \pm 0.98	1.99 \pm 0.46	0.75 \pm 0.37	0.18 \pm 0.13
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	15.71 \pm 1.71	5.11 \pm 0.98	1.99 \pm 0.46	0.75 \pm 0.37	0.18 \pm 0.13
	≥ 2 leptons	142.18 \pm 3.75	39.40 \pm 1.73	13.53 \pm 1.16	3.47 \pm 0.52	1.81 \pm 0.33
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, single lepFromT, madgraph pythia8	Inclusive	7.64 \pm 1.52	2.36 \pm 0.88	0.87 \pm 0.39	0.51 \pm 0.36	0.11 \pm 0.11
	1 lepton	7.64 \pm 1.52	2.36 \pm 0.88	0.87 \pm 0.39	0.51 \pm 0.36	0.11 \pm 0.11
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	7.64 \pm 1.52	2.36 \pm 0.88	0.87 \pm 0.39	0.51 \pm 0.36	0.11 \pm 0.11
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, single lepFromTbar, madgraph pythia8, ext1	Inclusive	8.07 \pm 0.79	2.74 \pm 0.43	1.12 \pm 0.24	0.24 \pm 0.11	0.07 \pm 0.07
	1 lepton	8.07 \pm 0.79	2.74 \pm 0.43	1.12 \pm 0.24	0.24 \pm 0.11	0.07 \pm 0.07
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	8.07 \pm 0.79	2.74 \pm 0.43	1.12 \pm 0.24	0.24 \pm 0.11	0.07 \pm 0.07
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t}$, diLepton, madgraph pythia8, ext1	Inclusive	142.18 \pm 3.75	39.40 \pm 1.73	13.53 \pm 1.16	3.47 \pm 0.52	1.81 \pm 0.33
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	142.18 \pm 3.75	39.40 \pm 1.73	13.53 \pm 1.16	3.47 \pm 0.52	1.81 \pm 0.33
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t	Inclusive	9.08 \pm 2.40	3.69 \pm 1.54	—	2.55 \pm 1.16	—
	1 lepton	—	—	—	0.39 \pm 0.39	—
	1 lepton, from W	—	—	—	0.39 \pm 0.39	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	9.08 \pm 2.40	3.69 \pm 1.54	—	2.16 \pm 1.09	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single $t - W$ -channel	Inclusive	9.08 \pm 2.40	3.69 \pm 1.54	—	2.55 \pm 1.16	—
	1 lepton	—	—	—	0.39 \pm 0.39	—
	1 lepton, from W	—	—	—	0.39 \pm 0.39	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	9.08 \pm 2.40	3.69 \pm 1.54	—	2.16 \pm 1.09	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t , $t - W$ -channel, powheg pythia8	Inclusive	—	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single \bar{t} , $t - W$ -channel, powheg pythia8	Inclusive	9.08 \pm 2.40	3.69 \pm 1.54	—	2.55 \pm 1.16	—
	1 lepton	—	—	—	0.39 \pm 0.39	—
	1 lepton, from W	—	—	—	0.39 \pm 0.39	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	9.08 \pm 2.40	3.69 \pm 1.54	—	2.16 \pm 1.09	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
single t non $t - W$ -channel	Inclusive	—	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
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Table 12 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $250 < \text{MET} < 350$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $350 < \text{MET} < 450$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $450 < \text{MET} < 550$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $550 < \text{MET} < 650$	$\geq 4\text{jets}$ $\text{MT2W} \geq 200$ $\text{MET} > 650$
single t , s-channel, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
V+Jets	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	3.53 ± 9.43 3.53 ± 0.79 3.53 ± 0.79 — —	2.04 ± 4.69 2.04 ± 0.76 2.04 ± 0.76 — —	0.36 ± 0.12 0.36 ± 0.12 0.36 ± 0.12 — —	0.53 ± 0.32 0.53 ± 0.32 0.53 ± 0.32 — —	0.38 ± 0.25 0.38 ± 0.25 0.38 ± 0.25 — —
DY+Jets $\rightarrow \ell\ell$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M10to50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
DY+Jets $\rightarrow \ell\ell$, M50, amcnlo pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	3.53 ± 0.79 3.53 ± 0.79 3.53 ± 0.79 — —	2.04 ± 0.76 2.04 ± 0.76 2.04 ± 0.76 — —	0.36 ± 0.12 0.36 ± 0.12 0.36 ± 0.12 — —	0.53 ± 0.32 0.53 ± 0.32 0.53 ± 0.32 — —	0.38 ± 0.25 0.38 ± 0.25 0.38 ± 0.25 — —
W+Jets $\rightarrow \ell\nu$, $100 < HT < 200$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$, $200 < HT < 400$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$, $400 < HT < 600$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.67 ± 0.67 0.67 ± 0.67 0.67 ± 0.67 — —	0.70 ± 0.70 0.70 ± 0.70 0.70 ± 0.70 — —	— — — — —	— — — — —	— — — — —
W+Jets $\rightarrow \ell\nu$, $600 < HT < 800$, madgraph pythia8	Inclusive 1 lepton 1 lepton, from W 1 lepton, from t ≥ 2 leptons $Z \rightarrow \nu\nu$	0.86 ± 0.25 0.86 ± 0.25 0.86 ± 0.25 — —	0.06 ± 0.06 0.06 ± 0.06 0.06 ± 0.06 — —	— — — — —	— — — — —	— — — — —

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Table 12 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
W+Jets $\rightarrow \ell\nu$, 800 < HT < 1200, madgraph pythia8	Inclusive	1.41 \pm 0.20	0.53 \pm 0.11	0.22 \pm 0.07	—	0.01 \pm 0.01
	1 lepton	1.41 \pm 0.20	0.53 \pm 0.11	0.22 \pm 0.07	—	0.01 \pm 0.01
	1 lepton, from W	1.41 \pm 0.20	0.53 \pm 0.11	0.22 \pm 0.07	—	0.01 \pm 0.01
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 1200 < HT < 2500, madgraph pythia8	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.55 \pm 0.25	0.74 \pm 0.27	0.14 \pm 0.10	0.52 \pm 0.32	0.35 \pm 0.25
	1 lepton	0.55 \pm 0.25	0.74 \pm 0.27	0.14 \pm 0.10	0.52 \pm 0.32	0.35 \pm 0.25
	1 lepton, from W	0.55 \pm 0.25	0.74 \pm 0.27	0.14 \pm 0.10	0.52 \pm 0.32	0.35 \pm 0.25
	1 lepton, from t	—	—	—	—	—
W+Jets $\rightarrow \ell\nu$, 2500 < HT < Inf, madgraph pythia8	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.05 \pm 0.03	0.01 \pm 0.00	0.00 \pm 0.00	0.01 \pm 0.01	0.02 \pm 0.01
	1 lepton	0.05 \pm 0.03	0.01 \pm 0.00	0.00 \pm 0.00	0.01 \pm 0.01	0.02 \pm 0.01
	1 lepton, from W	0.05 \pm 0.03	0.01 \pm 0.00	0.00 \pm 0.00	0.01 \pm 0.01	0.02 \pm 0.01
Rare	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	7.95 \pm 0.65	4.09 \pm 0.59	0.89 \pm 0.25	0.53 \pm 0.17	0.67 \pm 0.29
	1 lepton	0.20 \pm 0.08	0.08 \pm 0.03	0.08 \pm 0.04	0.05 \pm 0.04	—
diBoson	1 lepton, from W	0.15 \pm 0.07	0.06 \pm 0.03	0.04 \pm 0.03	0.04 \pm 0.04	—
	1 lepton, from t	0.04 \pm 0.04	0.02 \pm 0.01	0.04 \pm 0.02	0.00 \pm 0.00	—
	≥ 2 leptons	6.59 \pm 0.65	3.67 \pm 0.59	0.66 \pm 0.24	0.44 \pm 0.16	0.61 \pm 0.28
	Z $\rightarrow \nu\nu$	1.17 \pm 0.06	0.34 \pm 0.02	0.15 \pm 0.05	0.04 \pm 0.01	0.06 \pm 0.04
	Inclusive	2.02 \pm 0.38	1.79 \pm 0.52	0.45 \pm 0.16	0.30 \pm 0.14	0.53 \pm 0.27
WW	1 lepton	0.10 \pm 0.04	0.04 \pm 0.02	0.03 \pm 0.03	0.04 \pm 0.04	—
	1 lepton, from W	0.10 \pm 0.04	0.04 \pm 0.02	0.03 \pm 0.03	0.04 \pm 0.04	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	1.82 \pm 0.37	1.70 \pm 0.52	0.35 \pm 0.15	0.25 \pm 0.13	0.48 \pm 0.27
	Z $\rightarrow \nu\nu$	0.11 \pm 0.06	0.05 \pm 0.01	0.07 \pm 0.05	0.01 \pm 0.00	0.05 \pm 0.04
WW	Inclusive	0.65 \pm 0.27	1.24 \pm 0.49	0.12 \pm 0.12	0.17 \pm 0.12	0.40 \pm 0.26
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.65 \pm 0.27	1.24 \pm 0.49	0.12 \pm 0.12	0.17 \pm 0.12	0.40 \pm 0.26
WW $\rightarrow 2\ell 2\nu$, powheg	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.65 \pm 0.27	1.24 \pm 0.49	0.12 \pm 0.12	0.17 \pm 0.12	0.40 \pm 0.26
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
WW $\rightarrow \ell\nu qq$, powheg	≥ 2 leptons	0.65 \pm 0.27	1.24 \pm 0.49	0.12 \pm 0.12	0.17 \pm 0.12	0.40 \pm 0.26
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	—	—	—	—	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
WZ	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	1.16 \pm 0.27	0.45 \pm 0.16	0.31 \pm 0.10	0.11 \pm 0.06	0.12 \pm 0.06
	1 lepton	0.10 \pm 0.04	0.04 \pm 0.02	0.03 \pm 0.03	0.04 \pm 0.04	—
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton, from W	0.10 \pm 0.04	0.04 \pm 0.02	0.03 \pm 0.03	0.04 \pm 0.04	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	1.06 \pm 0.26	0.40 \pm 0.16	0.23 \pm 0.08	0.07 \pm 0.04	0.08 \pm 0.05
	Z $\rightarrow \nu\nu$	—	—	0.05 \pm 0.05	—	0.04 \pm 0.04
	Inclusive	0.86 \pm 0.25	0.31 \pm 0.15	0.20 \pm 0.08	0.05 \pm 0.03	0.08 \pm 0.05
WZ $\rightarrow 3\ell\nu$, powheg pythia8	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.86 \pm 0.25	0.31 \pm 0.15	0.20 \pm 0.08	0.05 \pm 0.03	0.08 \pm 0.05
	Z $\rightarrow \nu\nu$	—	—	—	—	—

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Table 12 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 $250 < MET < 350$	$\geq 4\text{jets}$ MT2W ≥ 200 $350 < MET < 450$	$\geq 4\text{jets}$ MT2W ≥ 200 $450 < MET < 550$	$\geq 4\text{jets}$ MT2W ≥ 200 $550 < MET < 650$	$\geq 4\text{jets}$ MT2W ≥ 200 $MET > 650$
$WZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.20 ± 0.06	0.10 ± 0.04	0.04 ± 0.02	0.02 ± 0.01	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
$WZ \rightarrow \ell\nu 2Q$, amcnlo pythia8	≥ 2 leptons	0.20 ± 0.06	0.10 ± 0.04	0.04 ± 0.02	0.02 ± 0.01	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.10 ± 0.04	0.04 ± 0.02	0.03 ± 0.03	0.04 ± 0.04	—
	1 lepton	0.10 ± 0.04	0.04 ± 0.02	0.03 ± 0.03	0.04 ± 0.04	—
$WZ \rightarrow \ell\nu 2Q$, amcnlo pythia8	1 lepton, from W	0.10 ± 0.04	0.04 ± 0.02	0.03 ± 0.03	0.04 ± 0.04	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$WZ \rightarrow \ell\ell 3\nu$, amcnlo pythia8	Inclusive	—	—	0.05 ± 0.05	—	0.04 ± 0.04
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
ZZ	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.21 ± 0.04	0.10 ± 0.03	0.03 ± 0.01	0.01 ± 0.00	0.01 ± 0.00
	1 lepton	—	—	—	—	—
ZZ	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	0.11 ± 0.03	0.05 ± 0.03	—	0.00 ± 0.00	—
	$Z \rightarrow \nu\nu$	0.11 ± 0.01	0.05 ± 0.01	0.03 ± 0.01	0.01 ± 0.00	0.01 ± 0.00
$ZZ \rightarrow 2\ell 2Q$, amcnlo pythia8	Inclusive	0.11 ± 0.03	0.05 ± 0.03	—	0.00 ± 0.00	—
	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
$ZZ \rightarrow 2\ell 2\nu$, powheg pythia8	≥ 2 leptons	0.11 ± 0.03	0.05 ± 0.03	—	0.00 ± 0.00	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	0.11 ± 0.01	0.05 ± 0.01	0.02 ± 0.01	0.01 ± 0.00	0.01 ± 0.00
	1 lepton	—	—	—	—	—
$ZZ \rightarrow 2Q 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	—	—	—	—	—
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t} + V$	Inclusive	5.93 ± 0.53	2.31 ± 0.29	0.44 ± 0.19	0.23 ± 0.10	0.14 ± 0.09
	1 lepton	0.10 ± 0.07	0.04 ± 0.02	0.05 ± 0.03	0.00 ± 0.00	—
	1 lepton, from W	0.06 ± 0.06	0.02 ± 0.02	0.02 ± 0.02	—	—
	1 lepton, from t	0.04 ± 0.04	0.02 ± 0.01	0.04 ± 0.02	0.00 ± 0.00	—
$t\bar{t} + W$	≥ 2 leptons	4.77 ± 0.53	1.97 ± 0.29	0.31 ± 0.19	0.19 ± 0.10	0.13 ± 0.09
	$Z \rightarrow \nu\nu$	1.06 ± 0.03	0.29 ± 0.01	0.08 ± 0.01	0.03 ± 0.00	0.01 ± 0.00
	Inclusive	3.68 ± 0.53	1.72 ± 0.29	0.28 ± 0.19	0.17 ± 0.10	0.12 ± 0.09
	1 lepton	0.06 ± 0.07	0.03 ± 0.02	0.05 ± 0.03	—	—
$t\bar{t} + W$	1 lepton, from W	0.06 ± 0.06	0.02 ± 0.02	0.02 ± 0.02	—	—
	1 lepton, from t	—	0.01 ± 0.01	0.03 ± 0.02	—	—
	≥ 2 leptons	3.62 ± 0.53	1.68 ± 0.28	0.23 ± 0.19	0.17 ± 0.10	0.12 ± 0.09
	$Z \rightarrow \nu\nu$	—	—	—	—	—
$t\bar{t} + W \rightarrow \ell\nu$, amcnlo pythia8	Inclusive	3.32 ± 0.50	1.48 ± 0.27	0.14 ± 0.17	0.10 ± 0.09	0.12 ± 0.07
	1 lepton	0.06 ± 0.06	0.02 ± 0.02	0.02 ± 0.02	—	—
	1 lepton, from W	0.06 ± 0.06	0.02 ± 0.02	0.02 ± 0.02	—	—
	1 lepton, from t	—	—	—	—	—
$t\bar{t} + W$	≥ 2 leptons	3.27 ± 0.49	1.45 ± 0.27	0.12 ± 0.17	0.10 ± 0.09	0.12 ± 0.07
	$Z \rightarrow \nu\nu$	—	—	—	—	—

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Table 12 – continued from previous page

Sample	Classification	$\geq 4\text{jets}$ MT2W ≥ 200 250 < MET < 350	$\geq 4\text{jets}$ MT2W ≥ 200 350 < MET < 450	$\geq 4\text{jets}$ MT2W ≥ 200 450 < MET < 550	$\geq 4\text{jets}$ MT2W ≥ 200 550 < MET < 650	$\geq 4\text{jets}$ MT2W ≥ 200 MET > 650
$t\bar{t} + W \rightarrow QQ$, amcnlo pythia8	Inclusive	0.35 ± 0.19	0.24 ± 0.09	0.14 ± 0.08	0.06 ± 0.04	—
	1 lepton	—	0.01 ± 0.01	0.03 ± 0.02	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	0.01 ± 0.01	0.03 ± 0.02	—	—
	≥ 2 leptons	0.35 ± 0.19	0.23 ± 0.09	0.11 ± 0.08	0.06 ± 0.04	—
$t\bar{t} + Z$	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	2.26 ± 0.04	0.59 ± 0.02	0.16 ± 0.01	0.06 ± 0.01	0.02 ± 0.00
	1 lepton	0.04 ± 0.01	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.04 ± 0.01	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
$t\bar{t} + Z$, madgraph	≥ 2 leptons	1.15 ± 0.03	0.29 ± 0.01	0.08 ± 0.01	0.03 ± 0.00	0.01 ± 0.00
	Z $\rightarrow \nu\nu$	1.06 ± 0.03	0.29 ± 0.01	0.08 ± 0.01	0.03 ± 0.00	0.01 ± 0.00
	Inclusive	2.26 ± 0.04	0.59 ± 0.02	0.16 ± 0.01	0.06 ± 0.01	0.02 ± 0.00
	1 lepton	0.04 ± 0.01	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
	1 lepton, from W	—	—	—	—	—
$t\bar{t} + Z \rightarrow QQ$, amcnlo pythia8	1 lepton, from t	0.04 ± 0.01	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	—
	≥ 2 leptons	1.15 ± 0.03	0.29 ± 0.01	0.08 ± 0.01	0.03 ± 0.00	0.01 ± 0.00
	Z $\rightarrow \nu\nu$	1.06 ± 0.03	0.29 ± 0.01	0.08 ± 0.01	0.03 ± 0.00	0.01 ± 0.00
	Inclusive	0.66 ± 0.24	0.33 ± 0.17	0.01 ± 0.03	—	0.03 ± 0.02
	1 lepton	0.06 ± 0.07	—	—	—	—
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	0.06 ± 0.07	—	—	—	—
	≥ 2 leptons	0.60 ± 0.23	0.33 ± 0.16	0.01 ± 0.03	—	0.03 ± 0.02
	Z $\rightarrow \nu\nu$	—	—	—	—	—
	Inclusive	1.33 ± 0.43	0.74 ± 0.25	0.33 ± 0.12	0.06 ± 0.06	0.11 ± 0.04
$t\bar{t} + Z \rightarrow 2\ell 2\nu$, amcnlo pythia8	1 lepton	—	—	—	—	—
	1 lepton, from W	—	—	—	—	—
	1 lepton, from t	—	—	—	—	—
	≥ 2 leptons	1.25 ± 0.38	0.59 ± 0.22	0.19 ± 0.10	0.06 ± 0.05	0.05 ± 0.03
	Z $\rightarrow \nu\nu$	0.09 ± 0.19	0.14 ± 0.12	0.14 ± 0.07	—	0.06 ± 0.03