atlas_conf_2013_035 Validation

Trilepton, 0 jets + E_T^{miss}, [1]
Energy: 8 TeV
Luminosity: 20.7 fb^{-1}
Validation notes:

- Validation has been performed versus all published cutflows, see Tables 1 and 2.
  - The Monte-Carlo generator was Herwig++ 2.5.2 [2].
  - Cross-sections calculated with Prospino 2 [3]
- Trigger settings not given in detail so single lepton triggers taken from atlas_conf_2012_104 and di-lepton triggers from atlas_conf_2012_049.
  - Single electron trigger, $p_T(e_1) > 25$ GeV, fully efficient for signal region.
  - Single muon trigger, $p_T(\mu_1) > 25$ GeV, 90% efficient.
  - Symmetric di-electron trigger, $p_T(e_2) > 14$ GeV, 98% efficient.
  - Asymmetric di-electron trigger, $p_T(e_1) > 25$ GeV, $p_T(e_2) > 10$ GeV 85% efficient.
  - Symmetric di-muon trigger, $p_T(\mu_2) > 14$ GeV, 52% efficient.
  - Asymmetric di-muon trigger, $p_T(\mu_1) > 18$ GeV, $p_T(\mu_2) > 10$ GeV 80% efficient.
  - Mixed electron-muon trigger A, $p_T(e) > 14$ GeV, $p_T(\mu) > 10$ GeV 65% efficient.
  - Mixed electron-muon trigger B, $p_T(e) > 10$ GeV, $p_T(\mu) > 18$ GeV 65% efficient.
- Signal region SRZa shows a $\sim$16% deficit compared to the published result. The source of this deviation was investigated without success. However, since the problem leads to too few signal events being reconstructed, the issue will only lead to a conservative bound.

Process	$\tilde{\chi}_2^0 + \tilde{\chi}_1^\pm$ production; decay via W/Z or slepton					
Point	Simplified $\tilde{\ell}_L$ $m_{\tilde{\chi}_1^0} = 157.5$ GeV $m_{\tilde{\chi}_2^0} = m_{\tilde{\chi}_1^\pm} = 192.5$ GeV $m_{\tilde{\nu}} = m_{\tilde{l}_L} = \frac{m_{\tilde{\chi}_1^0}+m_{\tilde{\chi}_1^\pm}}{2}$		Simplified WZ $m_{\tilde{\chi}_1^0} = 75$ GeV $m_{\tilde{\chi}_2^0} = m_{\tilde{\chi}_1^\pm} = 150$ GeV		Simplified $\tilde{\ell}_L$ $m_{\tilde{\chi}_1^0} = 0$ GeV $m_{\tilde{\chi}_2^0} = m_{\tilde{\chi}_1^\pm} = 500$ GeV $m_{\tilde{\nu}} = m_{\tilde{l}_L} = \frac{m_{\tilde{\chi}_1^0}+m_{\tilde{\chi}_1^\pm}}{2}$	
	SRnoZa		SRnoZb		SRnoZc	
Source	ATLAS	C.–MATE	ATLAS	C.–MATE	ATLAS	C.–MATE
Generated	25000	40000	20000	40000	40000	40000
Lepton mult.	537.1 ± 19.3	688.1 ± 17.1	227.3 ± 4.1	278.8 ± 3.2	28.5 ± 0.4	28.1 ± 0.4
SFOS req.	536.3 ± 19.3	615.0 ± 16.2	226.5 ± 4.1	272.5 ± 3.2	28.1 ± 0.4	27.9 ± 0.4
b veto	491.0 ± 18.5	557.4 ± 15.4	211.0 ± 4.0	251.0 ± 3.1	24.9 ± 0.3	24.8 ± 0.4
Z veto/req.	476.3 ± 18.2	537.0 ± 15.1	196.6 ± 3.8	235.0 ± 3.0	24.1 ± 0.3	24.0 ± 0.3
E_T^{miss}	161.2 ± 10.6	181.3 ± 8.8	53.8 ± 2.0	56.2 ± 1.5	22.1 ± 0.3	22.0 ± 0.3
1 m_{SFOS}	141.2 ± 9.9	154.2 ± 8.1	27.1 ± 1.4	26.8 ± 1.0	-	-
m_T	-	-	-	-	19.2 ± 0.3	19.0 ± 0.3
$p_{\text{T}}^{\text{third lepton}}$	-	-	-	-	18.4 ± 0.3	18.0 ± 0.3
SRnoZc veto	141.2 ± 9.9	154.2 ± 8.1	26.3 ± 1.4	26.8 ± 1.0	-	-

Table 1: Cutflow validation for atlas_conf_2013_035, considering signal regions with Z veto. Shown are the number of events after each selection cut, normalised to 20.7 fb^{-1}. Final error is from Monte Carlo statistics for both ATLAS and CheckMATE.

Process	$\tilde{\chi}_2^0 + \tilde{\chi}_1^\pm$ production; decay via W/Z or slepton					
Point	Simplified WZ $m_{\tilde{\chi}_1^0} = 0$ GeV $m_{\tilde{\chi}_2^0} = m_{\tilde{\chi}_1^\pm} = 100$ GeV SRZa		Simplified WZ $m_{\tilde{\chi}_1^0} = 0$ GeV $m_{\tilde{\chi}_2^0} = m_{\tilde{\chi}_1^\pm} = 150$ GeV SRZb		Simplified WZ $m_{\tilde{\chi}_1^0} = 0$ GeV $m_{\tilde{\chi}_2^0} = m_{\tilde{\chi}_1^\pm} = 250$ GeV SRZc	
Source	ATLAS	C.–MATE	ATLAS	C.–MATE	ATLAS	C.–MATE
Generated	15000	40000	20000	40000	20000	40000
Lepton mult.	1071.4 ± 22.3	1118.9 ± 15.1	259.8 ± 4.3	276.9 ± 3.3	40.0 ± 0.62	44.2 ± 0.46
SFOS req.	1067.5 ± 22.3	1109.5 ± 15.0	258.0 ± 4.3	273.9 ± 3.2	39.7 ± 0.62	43.7 ± 0.45
b veto	989.4 ± 21.4	1039.0 ± 14.5	240.0 ± 4.1	254.6 ± 3.1	36.4 ± 0.59	39.8 ± 0.43
Z veto/req.	912.7 ± 20.6	866.5 ± 13.3	227.2 ± 4.0	227.1 ± 3.0	34.4 ± 0.58	34.9 ± 0.41
E_T^{miss}	170.7 ± 8.9	135.9 ± 5.2	67.7 ± 2.2	66.5 ± 1.6	17.7 ± 0.41	17.3 ± 0.29
m_{SFOS}	-	-	-	-	-	-
m_T	159.3 ± 8.6	133 ± 5.2	27.8 ± 1.4	26 ± 1.0	12.0 ± 0.34	11.2 ± 0.23
$p_{\text{T}}^{\text{third lepton}}$	-	-	-	-	-	-
SRnoZc veto	-	-	-	-	-	-

Table 2: Cutflow validation for atlas_conf_2013_035, considering signal regions with Z request. Shown are the number of events after each selection cut, normalised to 20.7 fb^{-1}. Final error is from Monte Carlo statistics for both ATLAS and CheckMATE.

References

[1] Search for direct production of charginos and neutralinos in events with three leptons and missing transverse momentum in $21\,\text{fb}^{-1}$ of pp collisions at $\sqrt{s} = 8\,\text{tev}$ with the atlas detector, Tech. Rep. ATLAS-CONF-2013-035, CERN, Geneva (Mar 2013).

[2] M. Bahr, S. Gieseke, M. Gigg, D. Grellscheid, K. Hamilton, et al., Herwig++ Physics and Manual, Eur.Phys.J. C58 (2008) 639–707. arXiv:0803.0883, doi:10.1140/epjc/s10052-008-0798-9.

[3] W. Beenakker, M. Klasen, M. Kramer, T. Plehn, M. Spira, et al., The Production of charginos / neutralinos and sleptons at hadron colliders, Phys.Rev.Lett. 83 (1999) 3780–3783. arXiv:hep-ph/9906298, doi:10.1103/PhysRevLett.100.029901, 10.1103/PhysRevLett.83.3780.