

Validation of 1803.02762

ATLAS analysis for chargino, NLSP and slepton production at 13 TeV with 36 fb^{-1} Luminosity.

Signal (1): two leptons $0j + E_T^{\text{miss}}$.

Signal (2): two leptons $j + E_T^{\text{miss}}$.

Signal (3): three leptons $+ E_T^{\text{miss}}$.

1 Chargino pair ($\tilde{\chi}_1^\pm \tilde{\chi}_1^\mp$) Production

1.1 $\tilde{\chi}_1^\pm$ decay via $\tilde{l} \rightarrow 2 \text{ leptons} + 0 \text{ jets}$

Selection Cuts	ATLAS Event no.	Event no. from Checkmate
Raw Events	-	76000
Initial Event weighted	6864.7	6866
Trigger passing & SFOS & exact 2 signal leptons	1797	2456 (not SF)
lepton leading $p_T > 25 \text{ GeV}$	1795	2452
Jet veto	1692	1901
$m_{\ell\ell} > 40 \text{ GeV}$	1262	1775
SR2-SF-loose		
Same Flavor	667	894
$m_{\ell\ell} > 111 \text{ GeV}$	405	525
$m_{T2} > 100 \text{ GeV}$	47	57
SR2-DF-100		
Different Flavor	595	880
$m_{\ell\ell} > 111 \text{ GeV}$	364	518
$m_{T2} > 100 \text{ GeV}$	46	59

Table 1: Chargino pair production with $[\tilde{\chi}_1^\pm, \tilde{\chi}_1^0] = [300, 150] \text{ GeV}$.

2 Chargino-NLSP ($\tilde{\chi}_1^\pm \tilde{\chi}_2^0$) Production

2.1 $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ decay via $W/Z \rightarrow 2$ leptons + jets

Selection Cuts	ATLAS Event no.	Event no. from Checkmate
Raw Events	-	400000
Initial Event weighted	70000	70034
Trigger passing & SFOS & exact 2 signal leptons	1000	2125
bjet veto	900	1914
$E_T^{\text{miss}} > 100$ GeV	120	129
SR2-low		
2 signal jets	30	56
2 leading jets $p_T > 30$ GeV	21	35
$m_Z \in (81, 101)$ GeV	19	30
$m_W \in (70, 90)$ GeV	6	8.8
$p_T(Z) > 60$ GeV	5	7.2
$\Delta\phi(E_T^{\text{miss}}, Z) < 0.8$	2.7	2.5
$\Delta\phi(E_T^{\text{miss}}, W) > 1.5$	2.7	2.5
$E_T^{\text{miss}}/p_T(W) < 0.8$	2.6	2.1
$E_T^{\text{miss}}/p_T(Z) \in (0.6, 1.6)$	2.2	1.8
3-5 signal jets	70	68
3 leading jets $p_T > 30$ GeV	50	41
$m_Z \in (81, 101)$ GeV	40	36
$m_W \in (70, 90)$ GeV	9	8
$ \eta_Z < 1.6$	7	5.8
$p_T(Z) > 40$ GeV	7	5.6
$\Delta\phi(E_T^{\text{miss}}, ISR) > 2.4$	6	4.2
$\Delta\phi(E_T^{\text{miss}}, j_1) > 2.6$	5	3.6
$\Delta\phi(E_T^{\text{miss}}, W) < 2.2$	5	2.5
$E_T^{\text{miss}}/ISR \in (0.4, 0.8)$	4	0.8
$\Delta R(W \rightarrow jj) < 2.2$	4	0.5

Table 2: Chargino-NLSP production with $[\tilde{\chi}_1^\pm(\tilde{\chi}_2^0), \tilde{\chi}_1^0] = [200, 100]$ GeV.

2.2 $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ decay via $W/Z \rightarrow 3$ leptons

Selection Cuts	ATLAS Event no.	Event no. from Checkmate
Raw Events	-	400000
Initial Event weighted	65247	64980
Trigger Passing & SFOS & at least 2 leptons	437	14000
Trigger matching	426	-
baseline leptons = 3 & signal leptons =3	425	417
$n_{\text{bjets}} = 0$	414	407
$p_T^{\ell_1} > 25$ GeV	414	402
$p_T^{\ell_3} > 20$ GeV	307	402
$m_{\ell\ell} > 20$ GeV	302	401
$ m_{\ell\ell} - m_Z < 10$	227	295
$n_{\text{non-b-tagged-jets}}=0$	110.3	160
SR3-WZ-0Ja		
$E_T^{\text{miss}} \in (60, 120)$	43.2	68
$m_T^{\text{min}} > 110$	8.9	14
SR3-WZ-0Jb		
$E_T^{\text{miss}} \in (120, 170)$	6.0	7.0
$m_T^{\text{min}} > 110$	1.10	1.1
SR3-WZ-0Jc		
$E_T^{\text{miss}} > 170$	3.1	3.9
$m_T^{\text{min}} > 110$	0.49	0.18
$n_{\text{non-b-tagged-jets}} > 0$	117	135
SR3-WZ-1Ja		
$E_T^{\text{miss}} \in (120, 200)$	18.9	19.8
$m_T^{\text{min}} > 110$	5.8	6.8
$p_T^{\ell\ell} < 120$	4.6	5.6
$p_T^{\text{jet}_1} > 70$	3.2	2.7
SR3-WZ-1Jb		
$E_T^{\text{miss}} > 200$	7.3	3.7
$m_T^{\text{min}} \in (110, 160)$	1.9	0.61
SR3-WZ-1Jc		
$m_T^{\text{min}} > 160$	0.48	0.16
$p_T^{\ell_3} > 35$	0.42	0.01

Table 3: Chargino-NLSP production with $[\tilde{\chi}_1^\pm(\tilde{\chi}_2^0), \tilde{\chi}_1^0] = [200, 100]$ GeV.

3 $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ decay via sleptons \rightarrow 3 leptons

Slepton decay to lepton and neutralino.

Selection Cuts	ATLAS Event no.	Event no. from Checkmate
Raw Events	-	40000
Initial Event weighted	200	200
Trigger passing	30	156
$\ell^+ \ell^- \ell$	30	33
Pass event Cleaning	20	-
$m_T^{min} > 110$	15	38.6
$E_T^{miss} > 130$ GeV	10	12.9
$m_{SFOS} < 81.2$	2.1	2.9
$m_{SFOS} > 101.2$	6.8	9.9
SR3-slep-a		
$20 < p_T^{\ell_3} < 30$ GeV	0.1	0.25
SR3-slep-b		
$p_T^{\ell_3} > 30$ GeV	2.0	2.6
SR3-slep-c		
$20 < p_T^{\ell_3} > 50$ GeV	2.6	3.8
SR3-slep-d		
$50 < p_T^{\ell_3} > 80$ GeV	3.1	4.4
SR3-slep-e		
$p_T^{\ell_3} > 80$ GeV	1.3	1.7

Table 4: Chargino-NLSP production with $[\tilde{\chi}_1^\pm(\tilde{\chi}_2^0), \tilde{\chi}_1^0] = [800, 600]$ GeV.