Search for squarks and gluinos in final states with jets and missing transverse momentum using 36 fb^1 of $\sqrt{s} = 13$ TeV pp collision data with the ATLAS detector, arxiv:1712.02332

1 Validation

Processes:

- $pp \to \tilde{g}\tilde{g} \to jjjj\tilde{\chi}_1^0\tilde{\chi}_1^0$
  $m_g = 2000$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV, squarks decoupled
  Events generated with `MG5_aMC 2.6.0` interfaced to `Pythia8` with up to two extra partons (CKKW-L).
  10000 MC events weighted to 36.1/fb.

- $pp \to \tilde{q}\tilde{q} \to jj\tilde{\chi}_1^0\tilde{\chi}_1^0$
  $m_g = 1200$ GeV, $m_{\tilde{\chi}_1^0} = 600$ GeV, gluinos decoupled
  Events generated with `MG5_aMC 2.6.0` interfaced to `Pythia8` with up to two extra partons (CKKW-L).
  10000 MC events weighted to 36.1/fb.

- $pp \to \tilde{q}\tilde{q} \to jj\tilde{\chi}_1^0\tilde{\chi}_1^0$
  $m_g = 1500$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV, gluinos decoupled
  Events generated with `MG5_aMC 2.6.0` interfaced to `Pythia8` with up to two extra partons (CKKW-L).
  10000 MC events weighted to 36.1/fb.

	Selection	$m_{\tilde{g}} = 2000$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV		$m_{\tilde{q}} = 1200$ GeV, $m_{\tilde{\chi}_1^0} = 600$ GeV		$m_{\tilde{q}} = 1500$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV	
		ATLAS	CM	ATLAS	CM	ATLAS	CM
Common Requirements	Preselection, $E_{\mathrm{T}}^{\mathrm{miss}} > 250$ GeV, $p_T(j_1) > 200$ GeV, $m_{\mathrm{eff}} > 800$ GeV	31.6	31.7	376	376	68.4	67.2
	jet multiplicity ≥ 2	31.6	31.7	373	372	67.9	66.6
	Cleaning cuts	31.1	–	365	–	66.4	–
SR2j-1200	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.8$	19.0	19.4	293	296	51.8	51.2
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	14.3	14.9	279	279	48.9	47.6
	$p_T(j_2) > 250$ GeV	14.1	14.8	180	187	42.4	41.3
	$\lvert\eta(j_{1,2})\rvert < 0.8$	7.51	8.11	83.7	85.1	18.9	18.8
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 14$ GeV$^{1/2}$	5.13	5.16	60.5	59.5	15.7	15.6
	m_{eff}(incl.) > 1200 GeV	5.13	5.16	59.0	58.0	15.7	15.5
SR2j-1600	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.8$	19.0	19.4	293	296	51.8	51.2
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	14.3	14.9	279	279	48.9	47.6
	$p_T(j_2) > 300$ GeV	13.8	14.6	138	144	38.9	38.3
	$\lvert\eta(j_{1,2})\rvert < 1.2$	11.4	12.3	109	114	29.1	29.4
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 18$ GeV$^{1/2}$	5.74	5.68	55.8	55.1	20.6	20.6
	m_{eff}(incl.) > 1600 GeV	5.74	5.68	45.4	44.8	20.4	20.5
SR2j-2000	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.8$	19.0	19.4	293	296	51.8	51.2
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	14.3	14.9	279	279	48.9	47.6
	$p_T(j_2) > 350$ GeV	13.2	14.1	99.7	106	34.9	34.7
	$\lvert\eta(j_{1,2})\rvert < 1.2$	11.1	12.0	81.7	87.1	26.9	27.3
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 18$ GeV$^{1/2}$	5.54	5.45	38.1	37.5	18.8	18.9
	m_{eff}(incl.) > 2000 GeV	5.54	5.44	16.7	14.8	17.6	18.0
SR2j-2100	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	25.2	25.8	331	337	59.5	59.1
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	22.0	22.6	322	326	57.7	56.7
	$p_T(j_1) > 600$ GeV	19.8	20.6	106	122	45.5	47.5
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 26$ GeV$^{1/2}$	3.48	2.94	22.3	20.1	20.7	19.1
	m_{eff}(incl.) > 2100 GeV	3.47	2.94	9.30	9.25	19.2	18.1
SR2j-2400	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.8$	19.0	19.4	293	296	51.8	51.2
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	14.3	14.9	279	279	48.9	47.6
	$p_T(j_2) > 350$ GeV	13.2	14.1	99.7	106	34.9	34.7
	$\lvert\eta(j_{1,2})\rvert < 1.2$	11.1	12.0	81.7	87.1	26.9	27.3
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 18$ GeV$^{1/2}$	5.54	5.45	38.1	37.5	18.8	18.9
	m_{eff}(incl.) > 2400 GeV	5.44	5.34	6.22	5.59	14.3	15.2
SR2j-2800	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.8$	19.0	19.4	293	296	51.8	51.2
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	14.3	14.9	279	279	48.9	47.6
	$p_T(j_2) > 350$ GeV	13.2	14.1	99.7	106	34.9	34.7
	$\lvert\eta(j_{1,2})\rvert < 1.2$	11.1	12.0	81.7	87.1	26.9	27.3
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 18$ GeV$^{1/2}$	5.54	5.45	38.1	37.5	18.8	18.9
	m_{eff}(incl.) > 2800 GeV	4.94	4.80	2.23	1.94	9.22	10.0
SR2j-3600	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.8$	19.0	19.4	293	296	51.8	51.2
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	14.3	14.9	279	279	48.9	47.6
	$p_T(j_2) > 350$ GeV	13.2	14.1	99.7	106	34.9	34.7
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 18$ GeV$^{1/2}$	6.70	6.37	46.2	45.1	24.3	24.0
	m_{eff}(incl.) > 2800 GeV	2.60	2.78	0.35	0.43	2.09	2.06
SR2jB-1600	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.6$	0.308	0.629	7.04	5.09	1.21	2.31
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	0.232	0.502	6.72	4.91	1.18	2.19
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 20$ GeV$^{1/2}$	0.102	0.160	2.97	1.41	0.716	1.23
	m_{eff}(incl.) > 1600 GeV	0.099	0.156	1.77	1.00	0.679	1.22
SR2jB-2400	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.6$	0.308	0.629	7.04	5.09	1.21	2.31
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	0.232	0.502	6.72	4.91	1.18	2.19
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 20$ GeV$^{1/2}$	0.102	0.160	2.97	1.41	0.716	1.23
	m_{eff}(incl.) > 2400 GeV	0.092	0.139	0.296	0.415	0.374	0.932

	Selection	$m_{\tilde{g}} = 2000$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV		$m_{\tilde{q}} = 1200$ GeV, $m_{\tilde{\chi}_1^0} = 600$ GeV		$m_{\tilde{q}} = 1500$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV	
		ATLAS	CM	ATLAS	CM	ATLAS	CM
Common Requirements	Preselection, $E_{\mathrm{T}}^{\mathrm{miss}} > 250$ GeV, $p_T(j_1) > 200$ GeV, $m_{\mathrm{eff}} > 800$ GeV	31.6	31.7	376	376	68.4	67.2
	jet multiplicity ≥ 2	31.6	31.7	373	372	67.9	66.6
	Cleaning cuts	31.1	–	365	–	66.4	–
SR3j-1300	jet multiplicity ≥ 3	31.0	31.6	262	271	50.1	50.8
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	25.1	25.8	231	239	44.0	44.0
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	21.9	22.6	222	229	42.2	41.7
	$p_T(j_1) > 700$ GeV	17.4	18.5	40.2	47.3	26.5	28.2
	$E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_T} > 18$ GeV$^{1/2}$	7.65	8.82	20.3	27.0	18.1	21.3
	m_{eff}(incl.) > 1300 GeV	7.65	8.82	20.3	27.0	18.1	21.3
SR4j-1000	jet multiplicity ≥ 4	29.8	30.4	134	150	28.2	30.6
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	24.1	24.8	119	133	24.9	26.6
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	18.7	102	113	21.5	22.2
	$p_T(j_4) > 100$ GeV	16.3	16.9	39.2	41.7	9.84	9.92
	$\lvert\eta(j_{1,2,3,4})\rvert < 1.2$	7.95	8.04	12.5	11.4	2.95	3.24
	Aplanarity > 0.04	5.52	5.61	8.39	8.05	1.52	1.70
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(4j) > 0.3$	2.02	1.63	5.13	4.72	0.964	1.15
	m_{eff}(incl.) > 1000 GeV	2.02	1.63	5.13	4.72	0.964	1.15
SR4j-1400	jet multiplicity ≥ 4	29.8	30.4	134	150	28.2	30.6
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	24.1	24.8	119	133	24.9	26.6
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	18.7	102	113	21.5	22.2
	$p_T(j_4) > 100$ GeV	16.3	16.9	39.2	41.7	9.84	9.92
	$\lvert\eta(j_{1,2,3,4})\rvert < 2.0$	14.9	15.2	30.6	31.4	7.79	7.84
	Aplanarity > 0.04	10.1	10.5	19.5	20.3	4.00	3.98
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(4j) > 0.25$	5.73	5.27	15.4	16.7	3.25	3.28
	m_{eff}(incl.) > 1400 GeV	5.73	5.27	13.9	15.0	3.23	3.27
SR4j-1800	jet multiplicity ≥ 4	29.8	30.4	134	150	28.2	30.6
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	24.1	24.8	119	133	24.9	26.6
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	18.7	102	113	21.5	22.2
	$p_T(j_4) > 100$ GeV	16.3	16.9	39.2	41.7	9.84	9.92
	$\lvert\eta(j_{1,2,3,4})\rvert < 2.0$	14.9	15.2	30.6	31.4	7.79	7.84
	Aplanarity > 0.04	10.1	10.5	19.5	20.3	4.00	3.98
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(4j) > 0.25$	5.73	5.27	15.4	16.7	3.25	3.28
	m_{eff}(incl.) > 1400 GeV	5.69	5.24	9.17	10.5	3.03	3.10
SR4j-2200	jet multiplicity ≥ 4	29.8	30.4	134	150	28.2	30.6
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	24.1	24.8	119	133	24.9	26.6
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	18.7	102	113	21.5	22.2
	$p_T(j_4) > 100$ GeV	16.3	16.9	39.2	41.7	9.84	9.92
	$\lvert\eta(j_{1,2,3,4})\rvert < 2.0$	14.9	15.2	30.6	31.4	7.79	7.84
	Aplanarity > 0.04	10.1	10.5	19.5	20.3	4.00	3.98
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(4j) > 0.25$	5.73	5.27	15.4	16.7	3.25	3.28
	m_{eff}(incl.) > 2200 GeV	5.55	5.10	4.37	4.84	2.60	2.63
SR4j-2600	jet multiplicity ≥ 4	29.8	30.4	134	150	28.2	30.6
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	24.1	24.8	119	133	24.9	26.6
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	18.7	102	113	21.5	22.2
	$p_T(j_4) > 150$ GeV	13.9	14.3	15.4	15.5	4.70	4.37
	$\lvert\eta(j_{1,2,3,4})\rvert < 2.0$	13.1	13.2	12.8	12.7	3.97	3.64
	Aplanarity > 0.04	9.21	9.44	8.93	8.96	2.43	2.21
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(4j) > 0.2$	6.64	6.38	7.92	7.89	2.16	1.97
	m_{eff}(incl.) > 2600 GeV	6.00	5.81	1.74	1.71	1.46	1.40

	Selection	$m_{\tilde{g}} = 2000$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV		$m_{\tilde{q}} = 1200$ GeV, $m_{\tilde{\chi}_1^0} = 600$ GeV		$m_{\tilde{q}} = 1500$ GeV, $m_{\tilde{\chi}_1^0} = 0$ GeV	
		ATLAS	CM	ATLAS	CM	ATLAS	CM
Common Requirements	Preselection, $E_{\mathrm{T}}^{\mathrm{miss}} > 250$ GeV, $p_T(j_1) > 200$ GeV, $m_{\mathrm{eff}} > 800$ GeV	31.6	31.7	376	376	68.4	67.2
	jet multiplicity ≥ 2	31.6	31.7	373	372	67.9	66.6
	Cleaning cuts	31.1	–	365	–	66.4	–
SR4j-3000	jet multiplicity ≥ 4	29.8	30.4	134	150	28.2	30.6
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	24.1	24.8	119	133	24.9	26.6
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	18.7	102	113	21.5	22.2
	$p_T(j_4) > 150$ GeV	13.9	14.3	15.4	15.5	4.70	4.37
	$\lvert\eta(j_{1,2,3,4})\rvert < 2.0$	13.1	13.2	12.8	12.7	3.97	3.64
	Aplanarity > 0.04	9.21	9.44	8.93	8.96	2.43	2.21
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(4j) > 0.2$	6.64	6.38	7.92	7.89	2.16	1.97
	m_{eff}(incl.) > 3000 GeV	5.01	4.83	0.489	0.493	0.942	0.789
SR5j-1600	jet multiplicity ≥ 5	22.5	23.3	53.3	67.6	12.5	14.5
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	19.0	47.1	59.1	11.0	12.7
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	15.4	16.1	42.1	52.3	9.85	10.9
	Aplanarity > 0.08	6.35	6.61	12.7	16.4	2.67	2.70
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(5j) > 0.15$	5.49	5.49	12.4	16.1	2.59	2.63
	m_{eff}(incl.) > 1600 GeV	5.47	4.47	9.30	11.6	2.45	2.52
SR5j-1700	jet multiplicity ≥ 5	22.5	23.3	53.3	67.6	12.5	14.5
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	18.2	19.0	47.1	59.1	11.0	12.7
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	15.4	16.1	42.1	52.3	9.85	10.9
	$p_T(j_1) > 700$ GeV	12.0	12.9	7.40	9.34	5.48	6.78
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(5j) > 0.3$	3.56	3.54	3.27	4.49	3.31	4.20
	m_{eff}(incl.) > 1700 GeV	3.56	3.54	3.25	4.49	3.30	4.20
SR6j-1200	jet multiplicity ≥ 6	13.3	14.2	17.9	26.0	4.81	6.07
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	10.8	11.6	15.6	22.9	4.24	5.34
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	8.73	9.46	13.1	19.1	3.68	4.41
	$\lvert\eta(j_{1,2,3,4,5,6})\rvert < 2.0$	6.66	6.97	7.34	11.3	2.27	2.65
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(6j) > 0.25$	3.02	2.88	5.21	8.12	1.68	1.97
	m_{eff}(incl.) > 1200 GeV	3.02	2.88	5.08	7.95	1.68	1.97
SR6j-1800	jet multiplicity ≥ 6	13.3	14.2	17.9	26.0	4.81	6.07
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	10.8	11.6	15.6	22.9	4.24	5.34
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	8.73	9.46	13.1	19.1	3.68	4.41
	$p_T(j_6) > 100$ GeV	3.45	3.83	1.65	1.73	0.487	0.614
	$\lvert\eta(j_{1,2,3,4})\rvert < 2.0$	2.81	3.02	1.07	1.12	0.341	0.383
	Aplanarity > 0.04	2.32	2.51	0.916	0.996	0.261	0.347
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(6j) > 0.2$	1.33	1.42	0.652	0.804	0.226	0.311
	m_{eff}(incl.) > 1800 GeV	1.32	1.42	0.513	0.745	0.219	0.302
SR6j-2200	jet multiplicity ≥ 6	13.3	14.2	17.9	26.0	4.81	6.07
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	10.8	11.6	15.6	22.9	4.24	5.34
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	8.73	9.46	13.1	19.1	3.68	4.41
	$p_T(j_6) > 100$ GeV	3.45	3.83	1.65	1.73	0.487	0.614
	Aplanarity > 0.08	1.74	2.07	0.921	0.946	0.215	0.248
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(6j) > 0.2$	1.05	1.23	0.674	0.741	0.190	0.229
	m_{eff}(incl.) > 2200 GeV	1.04	1.23	0.366	0.448	0.167	0.202
SR6j-2600	jet multiplicity ≥ 6	13.3	14.2	17.9	26.0	4.81	6.07
	$\Delta\phi(j_{1,2,(3)}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.4$	10.8	11.6	15.6	22.9	4.24	5.34
	$\Delta\phi(j_{i>3}, E_{\mathrm{T}}^{\mathrm{miss}}) > 0.2$	8.73	9.46	13.1	19.1	3.68	4.41
	$p_T(j_6) > 100$ GeV	3.45	3.83	1.65	1.73	0.487	0.614
	Aplanarity > 0.08	1.74	2.07	0.921	0.946	0.215	0.248
	$E_{\mathrm{T}}^{\mathrm{miss}}/m_{\mathrm{eff}}(6j) > 0.15$	1.39	1.64	0.891	0.875	0.206	0.238
	m_{eff}(incl.) > 2600 GeV	1.29	1.58	0.373	0.253	0.161	0.175