## ATLAS SUSY Searches\* - 95% CL Lower Limits

**ATLAS** Preliminary  $\sqrt{s} = 13 \text{ TeV}$ 

July 2019 **Signature** Model  $\int \mathcal{L} dt \, [fb^{-1}]$ **Mass limit** Reference  $E_T^{ ext{miss}}$   $E_T^{ ext{miss}}$  $\tilde{q}\tilde{q}, \tilde{q} \rightarrow q\tilde{\chi}_1^0$ 1.55  $0e, \mu$ 2-6 jets [2x, 8x Degen.] 0.9  $m(\tilde{\chi}_1^0)$ <100 GeV 1712.02332 mono-jet 1-3 jets 36.1 [1x, 8x Degen.] 0.43 0.71  $m(\tilde{q})-m(\tilde{\chi}_1^0)=5 \text{ GeV}$ 1711.03301 Searches  $E_T^{\text{miss}}$  $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow q\bar{q}\tilde{\chi}_1^0$  $0e, \mu$ 2-6 jets 36.1 2.0  $m(\tilde{\chi}_1^0)$ <200 GeV 1712.02332  $m(\tilde{\chi}_1^0)=900 \text{ GeV}$ Forbidden 0.95-1.6 1712.02332 4 jets  $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow q\bar{q}(\ell\ell)\tilde{\chi}_1^0$  $3e, \mu$ 1.85  $m(\tilde{\chi}_{1}^{0}) < 800 \text{ GeV}$ 36.1 1706.03731  $E_T^{\text{miss}}$ 1.2  $ee, \mu\mu$ 2 jets 36.1  $m(\tilde{g})-m(\tilde{\chi}_1^0)=50 \text{ GeV}$ 1805.11381  $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow qqWZ\tilde{\chi}_1^0$  $0e, \mu$ 7-11 jets 36.1 1.8  $m(\tilde{\chi}_1^0)$  <400 GeV 1708.02794  ${\rm SS}~e,\mu$ 6 jets 139 1.15  $m(\tilde{g})-m(\tilde{\chi}_1^0)=200 \text{ GeV}$ ATLAS-CONF-2019-015  $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow t\bar{t}\tilde{\chi}_1^0$ 2.25 0-1  $e, \mu$  $m(\tilde{\chi}_1^0)$ <200 GeV ATLAS-CONF-2018-041 3 b 79.8  ${\rm SS}~e,\mu$ 6 jets 1.25  $m(\tilde{g})-m(\tilde{\chi}_1^0)=300 \text{ GeV}$ ATLAS-CONF-2019-015 139  $\tilde{b}_1\tilde{b}_1,\,\tilde{b}_1{\rightarrow}b\tilde{\chi}_1^0/t\tilde{\chi}_1^{\pm}$ Multiple  $\tilde{b}_1$ Forbidden  $m(\tilde{\chi}_{1}^{0})=300 \text{ GeV}, BR(b\tilde{\chi}_{1}^{0})=1$ 1708.09266, 1711.03301 36.1 0.9 Multiple 36.1  $\tilde{b}_1$ Forbidden 0.58-0.82  $m(\tilde{\chi}_{1}^{0})=300 \text{ GeV}, BR(b\tilde{\chi}_{1}^{0})=BR(t\tilde{\chi}_{1}^{\pm})=0.5$ 1708.09266 Multiple  $m(\tilde{\chi}_{1}^{0})=200 \text{ GeV}, m(\tilde{\chi}_{1}^{\pm})=300 \text{ GeV}, BR(t\tilde{\chi}_{1}^{\pm})=1$ 139  $\tilde{b}_1$ Forbidden 0.74 ATLAS-CONF-2019-015  $\tilde{b}_1\tilde{b}_1, \tilde{b}_1 \rightarrow b\tilde{\chi}_2^0 \rightarrow bh\tilde{\chi}_1^0$  $0e, \mu$ 6 b 139  $\tilde{b}_1$ Forbidden 0.23-1.35  $\Delta m(\tilde{\chi}_{2}^{0}, \tilde{\chi}_{1}^{0}) = 130 \text{ GeV}, \ m(\tilde{\chi}_{1}^{0}) = 100 \text{ GeV}$ SUSY-2018-31  $\tilde{b}_1$ 0.23-0.48  $\Delta m(\tilde{\chi}_2^0, \tilde{\chi}_1^0) = 130 \text{ GeV}, m(\tilde{\chi}_1^0) = 0 \text{ GeV}$ SUSY-2018-31  $\tilde{t}_1 \tilde{t}_1, \, \tilde{t}_1 {\rightarrow} W b \tilde{\chi}_1^0 \text{ or } t \tilde{\chi}_1^0$ 0-2 e,  $\mu$  0-2 jets/1-2 b  $E_{T}^{miss}$ 36.1 1506.08616, 1709.04183, 1711.11520 1.0  $m(\tilde{\chi}_1^0)=1 \text{ GeV}$  $\tilde{t}_1\tilde{t}_1, \, \tilde{t}_1 {\rightarrow} Wb\tilde{\chi}_1^0$  $1 e, \mu$ 3 jets/1 b  $E_T^{\text{miss}}$  $\tilde{t}_1$ 0.44-0.59 139  $m(\tilde{\chi}_1^0)=400 \text{ GeV}$ ATLAS-CONF-2019-017  $E_T^{\rm miss}$  $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow \tilde{\tau}_1 b \nu, \tilde{\tau}_1 \rightarrow \tau \tilde{G}$  $1 \tau + 1 e, \mu, \tau$  2 jets/1 b  $m(\tilde{\tau}_1)=800 \text{ GeV}$ 36.1 1.16 1803.10178  $\tilde{t}_1\tilde{t}_1, \, \tilde{t}_1 \rightarrow c\tilde{\chi}_1^0 / \, \tilde{c}\tilde{c}, \, \tilde{c} \rightarrow c\tilde{\chi}_1^0$ 0.85  $0e, \mu$  $E_T^{\rm miss}$ 36.1  $m(\tilde{\chi}_1^0)=0 \text{ GeV}$ 1805.01649 2 c  $\tilde{t}_1$ 0.46  $m(\tilde{t}_1,\tilde{c})-m(\tilde{\chi}_1^0)=50 \text{ GeV}$ 1805.01649  $E_T^{\text{miss}}$  $m(\tilde{t}_1,\tilde{c})-m(\tilde{\chi}_1^0)=5 \text{ GeV}$  $0e, \mu$ mono-iet 36.1 0.43 1711.03301  $\tilde{t}_1$ 1-2  $e, \mu$  $\tilde{t}_2$ 0.32-0.88  $\tilde{t}_2\tilde{t}_2, \tilde{t}_2 \rightarrow \tilde{t}_1 + h$ 36.1  $m(\tilde{\chi}_1^0)=0$  GeV,  $m(\tilde{t}_1)-m(\tilde{\chi}_1^0)=180$  GeV 4 b 1706.03986  $E_T^{\rm miss}$  $\tilde{t}_2$  $\tilde{t}_2\tilde{t}_2, \, \tilde{t}_2 \rightarrow \tilde{t}_1 + Z$ 0.86  $m(\tilde{\chi}_{1}^{0})=360 \text{ GeV}, m(\tilde{t}_{1})-m(\tilde{\chi}_{1}^{0})=40 \text{ GeV}$  $3e, \mu$ 1 b 139 Forbidden ATLAS-CONF-2019-016  $\begin{array}{c} \tilde{\chi}_1^{\pm}/\tilde{\chi}_2^0 \\ \tilde{\chi}_1^{\pm}/\tilde{\chi}_2^0 \end{array}$  $\tilde{\chi}_1^{\pm}\tilde{\chi}_2^0$  via WZ2-3  $e, \mu$ 36.1 0.6 1403.5294. 1806.02293 0.205  $ee, \mu\mu$ 139 ≥ 1  $m(\tilde{\chi}_1^{\pm})-m(\tilde{\chi}_1^{0})=5 \text{ GeV}$ ATLAS-CONF-2019-014  $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{1}^{\mp}$  via WW $2e, \mu$ 0.42  $m(\tilde{\chi}_1^0)=0$ 139 ATLAS-CONF-2019-008  $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{2}^{0}$  via Wh0-1  $e, \mu$  $2 b/2 \gamma$  $E_T^{\text{miss}}$ 139  $\tilde{\chi}_{1}^{\pm}/\tilde{\chi}_{2}^{0}$  Forbidden 0.74 ATLAS-CONF-2019-019, ATLAS-CONF-2019-XYZ  $m(\tilde{\chi}_1^0)=70 \text{ GeV}$  $\begin{array}{cccc} \chi_1 \chi_2 & & & & \\ \chi_1 \chi_1^{\pm} & & & & \\ \chi_1^{\pm} \tilde{\chi}_1^{\mp} & & & & \\ \tilde{\chi}_1^{\tau} \tilde{\chi}_1^{\tau} & & & & \\ \tilde{\chi}_1^{\tau} \tilde{\chi}_1^{\tau} & & & & \\ & \tilde{\chi}_1^{\tau} \tilde{\chi}_1^{\tau} \tilde{\chi}_1^{\tau} & & \\ & \tilde{\chi}_1^{\tau} \tilde{\chi}_1^{\tau} & & & \\ & \tilde{\chi}_1^{\tau} \tilde{\chi}_1^{\tau} & & & \\ & \tilde{\chi}$  $2e, \mu$ 139 1.0  $m(\tilde{\ell}, \tilde{\nu}) = 0.5(m(\tilde{\chi}_1^{\pm}) + m(\tilde{\chi}_1^{0}))$ ATLAS-CONF-2019-008  $E_T^{\text{miss}}$  $\tilde{\tau} = [\tilde{\tau}_L, \tilde{\tau}_{R,L}]$ 0.16-0.3 0.12-0.39 139  $m(\tilde{\chi}_1^0)=0$ ATLAS-CONF-2019-018 2 τ 2 *e*, μ  $\tilde{\ell}_{L,R}\tilde{\ell}_{L,R}, \, \tilde{\ell} \rightarrow \ell \tilde{\chi}_1^0$ 0 jets 139 0.7  $m(\tilde{\chi}_1^0)=0$ ATLAS-CONF-2019-008 0.256  $2e, \mu$ 139 ≥ 1  $m(\tilde{\ell})-m(\tilde{\chi}_1^0)=10 \text{ GeV}$ ATLAS-CONF-2019-014  $\tilde{H}\tilde{H}, \tilde{H} \rightarrow h\tilde{G}/Z\tilde{G}$  $0e, \mu$ 36.1 Ĩ 0.13-0.23 0.29-0.88  $BR(\tilde{\chi}_1^0 \to h\tilde{G})=1$ 1806.04030  $\geq 3 b$  $E_T^{\text{miss}}$ 0 jets 36.1 0.3  $BR(\tilde{\chi}_1^0 \to Z\tilde{G})=1$  $4e, \mu$  $\tilde{H}$ 1804.03602  $E_T^{\rm miss}$ Direct  $\tilde{\chi}_1^+ \tilde{\chi}_1^-$  prod., long-lived  $\tilde{\chi}_1^{\pm}$ Disapp. trk 1 jet 36.1 0.46 Pure Wino 1712.02118 0.15 Pure Higgsino ATL-PHYS-PUB-2017-019 Stable  $\tilde{g}$  R-hadron Multiple 36.1 2.0 1902.01636,1808.04095 Metastable  $\tilde{g}$  R-hadron,  $\tilde{g} \rightarrow qq\tilde{\chi}_1^0$ Multiple 36.1  $\tilde{g}$  [ $\tau(\tilde{g})$  =10 ns, 0.2 ns 2.05 2.4  $m(\tilde{\chi}_1^0)=100 \text{ GeV}$ 1710.04901,1808.04095  $\lambda'_{311}$ =0.11,  $\lambda_{132/133/233}$ =0.07 LFV  $pp \rightarrow \tilde{v}_{\tau} + X, \tilde{v}_{\tau} \rightarrow e\mu/e\tau/\mu\tau$ εμ,ετ,μτ 1.9 3.2 1607.08079  $E_T^{\text{miss}}$  $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{1}^{\mp}/\tilde{\chi}_{2}^{0} \rightarrow WW/Z\ell\ell\ell\ell\nu\nu$ 0 jets 0.82 1.33  $4e, \mu$ 36.1  $\tilde{\chi}_1^{\pm}/\tilde{\chi}_2^0$   $[\lambda_{i33} \neq 0, \lambda_{12k} \neq 0]$  $m(\tilde{\chi}_1^0)=100 \text{ GeV}$ 1804.03602  $\tilde{g}\tilde{g}, \tilde{g} \rightarrow qq\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow qqq$ 4-5 large-R jets 1.3 Large  $\lambda_{11}^{"}$ , 36.1  $[m(\tilde{\chi}_1^0)=200 \text{ GeV}, 1100 \text{ GeV}]$ 1.9 1804.03568 Multiple 36.1 1.05 2.0  $m(\tilde{\chi}_1^0)=200$  GeV, bino-like ATLAS-CONF-2018-003  $\tilde{t}\tilde{t}, \tilde{t} \rightarrow t\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow tbs$ Multiple 36.1  $\tilde{g}$  [ $\lambda_{323}^{"}$ =2e-4, 1e-2] 0.55 1.05  $m(\tilde{\chi}_1^0)$ =200 GeV, bino-like ATLAS-CONF-2018-003 2 jets + 2 b  $\tilde{t}_1$  [qq, bs] 0.42 0.61  $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow bs$ 36.7 1710.07171  $\tilde{t}_1\tilde{t}_1, \, \tilde{t}_1 {\rightarrow} q\ell$  $2e, \mu$ 2 b 36.1 0.4-1.45 BR( $\tilde{t}_1 \rightarrow be/b\mu$ )>20% 1710.05544  $\tilde{t}_1$  [1e-10<  $\lambda'_{23k}$  <1e-8, 3e-10<  $\lambda'_{23k}$  <3e-9] DV 136 1.6 BR( $\tilde{t}_1 \rightarrow q\mu$ )=100%, cos $\theta_t$ =1  $1 \mu$ 1.0 ATLAS-CONF-2019-006

<sup>\*</sup>Only a selection of the available mass limits on new states or phenomena is shown. Many of the limits are based on simplified models, c.f. refs. for the assumptions made.