ATLAS SUSY Searches* - 95% CL Lower Limits

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

March 2022 Model Signature $\int \mathcal{L} dt \, [fb^{-1}]$ **Mass limit** Reference $E_T^{
m miss}$ $E_T^{
m miss}$ 1.85 $\tilde{q}\tilde{q}, \, \tilde{q} \rightarrow q\tilde{\chi}_1^0$ $0e, \mu$ 2-6 jets 139 $m(\tilde{\chi}_1^0) < 400 \,\text{GeV}$ 2010.14293 1-3 jets mono-jet 139 0.9 \tilde{q} [8x Degen.] $m(\tilde{q})-m(\tilde{\chi}_1^0)=5 \text{ GeV}$ 2102.10874 Inclusive Searches $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow q\bar{q}\tilde{\chi}_1^0$ 2-6 jets E_T^{miss} 139 2.3 $m(\tilde{\chi}_1^0)=0 \text{ GeV}$ 2010.14293 $0e, \mu$ 1.15-1.95 Forbidden 2010.14293 ğ $m(\tilde{\chi}_{1}^{0})=1000 \text{ GeV}$ $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow q\bar{q}W\tilde{\chi}_1^0$ 2-6 jets $1e, \mu$ 139 2.2 $m(\tilde{\chi}_1^0)$ <600 GeV 2101.01629 $E_T^{
m miss}$ $E_T^{
m miss}$ ee, $\mu\mu$ 2 jets 139 2.2 $m(\tilde{\chi}_1^0)$ <700 GeV CERN-EP-2022-014 $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow q\bar{q}(\ell\ell)\tilde{\chi}^0$ $0e, \mu$ 7-11 jets 139 $\tilde{g}\tilde{g}, \tilde{g} \rightarrow qqWZ\tilde{\chi}_1^0$ 1.97 $m(\tilde{\chi}_1^0)$ <600 GeV 2008.06032 SS e, μ 6 jets 139 1.15 $m(\tilde{g})-m(\tilde{\chi}_1^0)=200 \text{ GeV}$ 1909.08457 $E_T^{
m miss}$ $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow t\bar{t}\tilde{\chi}_1^0$ 0-1 e, μ 3 b 79.8 2.25 $m(\tilde{\chi}_{\perp}^{0})$ <200 GeV ATLAS-CONF-2018-041 SS e, μ 6 jets 1.25 139 $m(\tilde{g})-m(\tilde{\chi}_1^0)=300 \text{ GeV}$ 1909.08457 $\tilde{b}_1\tilde{b}_1$ E_T^{miss} $\begin{array}{c} \mathrm{m}(\tilde{\chi}_{1}^{0}){<}400\,\mathrm{GeV} \\ \mathrm{10\,GeV}{<}\Delta\mathrm{m}(\tilde{b}_{1},\tilde{\chi}_{1}^{0}){<}20\,\mathrm{GeV} \end{array}$ $0e, \mu$ 2b139 1.255 2101.12527 0.68 2101.12527 \tilde{b}_1 $\tilde{b}_1\tilde{b}_1, \, \tilde{b}_1 \rightarrow b\tilde{\chi}_2^0 \rightarrow bh\tilde{\chi}_1^0$ $\tilde{\tilde{b}}_1\\\tilde{\tilde{b}}_1$ $\Delta m(\tilde{\chi}_2^0, \tilde{\chi}_1^0) = 130 \text{ GeV}, \ m(\tilde{\chi}_1^0) = 100 \text{ GeV}$ E_{x}^{miss} $0e, \mu$ 6 b E_T^{miss} 139 Forbidden 0.23-1.35 1908.03122 139 0.13-0.85 $\Delta m(\tilde{\chi}_2^0, \tilde{\chi}_1^0) = 130 \text{ GeV}, m(\tilde{\chi}_1^0) = 0 \text{ GeV}$ 2 τ 2 b 2103.08189 E_T^{miss} 0-1 e, μ ≥ 1 jet 139 1.25 $m(\tilde{\chi}_1^0)=1 \text{ GeV}$ 2004.14060,2012.03799 $\tilde{t}_1 \tilde{t}_1, \, \tilde{t}_1 \rightarrow t \tilde{\chi}_1^0$ 3 jets/1 b E_T^{miss} 139 $\tilde{t}_1\tilde{t}_1, \, \tilde{t}_1 {\rightarrow} Wb\tilde{\chi}_1^0$ $1e, \mu$ Forbidden 0.65 $m(\tilde{\chi}_1^0)=500 \text{ GeV}$ 2012.03799 $E_T^{\rm miss}$ $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow \tilde{\tau}_1 b\nu, \tilde{\tau}_1 \rightarrow \tau \tilde{G}$ 2 jets/1 b 139 $m(\tilde{\tau}_1)=800 \text{ GeV}$ $1-2\tau$ \tilde{t}_1 Forbidden 1.4 2108.07665 $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow c\tilde{\chi}_1^0 / \tilde{c}\tilde{c}, \tilde{c} \rightarrow c\tilde{\chi}_1^0$ $0e, \mu$ 2 c 36.1 0.85 $m(\tilde{\chi}_1^0)=0 \text{ GeV}$ 1805.01649 $0e, \mu$ mono-jet 139 0.55 $m(\tilde{t}_1,\tilde{c})-m(\tilde{\chi}_1^0)=5$ GeV 2102.10874 \tilde{t}_1 $\tilde{t}_1 \tilde{t}_1, \tilde{t}_1 \rightarrow t \tilde{\chi}_2^0, \tilde{\chi}_2^0 \rightarrow Z/h \tilde{\chi}_1^0$ E_T^{miss} \tilde{t}_1 1-2 e, μ 1-4 b 139 0.067-1.18 $m(\tilde{\chi}_2^0)=500 \text{ GeV}$ 2006.05880 E_T^{miss} $\tilde{t}_2\tilde{t}_2, \, \tilde{t}_2 \rightarrow \tilde{t}_1 + Z$ 139 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* \tilde{t}_2 Forbidden 2006.05880 $\begin{array}{c} \tilde{\chi}_1^{\pm}/\tilde{\chi}_2^0 \\ \tilde{\chi}_1^{\pm}/\tilde{\chi}_2^0 \end{array}$ $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{2}^{0}$ via WZMultiple ℓ/jets 0.96 139 $m(\tilde{\chi}_1^0)=0$, wino-bino 2106.01676, 2108.07586 \vec{E}_T^{miss} ee, µµ ≥ 1 jet 139 0.205 $m(\tilde{\chi}_1^{\pm})-m(\tilde{\chi}_1^{0})=5$ GeV, wino-bino 1911.12606 $\tilde{\chi}_1^{\pm}$ $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{1}^{\mp}$ via WW E_T^{miss} 139 0.42 $2e, \mu$ $m(\tilde{\chi}_1^0)=0$, wino-bino 1908.08215 $\tilde{\chi}_{1}^{\pm}/\tilde{\chi}_{2}^{0}$ Forbidden E_T^{miss} $\tilde{\chi}_1^{\pm} \tilde{\chi}_2^0$ via WhMultiple ℓ/jets 139 1.06 2004.10894, 2108.07586 $m(\tilde{\chi}_1^0)=70$ GeV, wino-bino $\tilde{\chi}_1^{\pm} \tilde{\chi}_1^{\mp}$ via $\tilde{\ell}_L/\tilde{\nu}$ E_T^{miss} $\tilde{\chi}_1^{\pm}$ $2e, \mu$ 139 1.0 $m(\tilde{\ell}, \tilde{v}) = 0.5(m(\tilde{\chi}_1^{\pm}) + m(\tilde{\chi}_1^{0}))$ 1908.08215 E_T^{miss} $\tilde{\tau}\tilde{\tau}, \, \tilde{\tau} \rightarrow \tau \tilde{\chi}_1^0$ $\tilde{\tau} \quad [\tilde{\tau}_L, \tilde{\tau}_{R,L}]$ 139 0.16-0.3 0.12-0.39 $m(\tilde{\chi}_1^0)=0$ 2 τ 1911.06660 $E_T^{ ext{miss}}$ $E_T^{ ext{miss}}$ $\tilde{\ell}_{L,R} \tilde{\ell}_{L,R}, \, \tilde{\ell} \rightarrow \ell \tilde{\chi}_1^0$ $2e, \mu$ 139 0.7 $m(\tilde{\chi}_1^0)=0$ 0 jets 1908.08215 $ee, \mu\mu$ ≥ 1 jet 139 0.256 $m(\tilde{\ell})-m(\tilde{\chi}_1^0)=10 \text{ GeV}$ 1911.12606 $\begin{array}{ccc} \geq 3 \ b & E_{T}^{\text{miss}} \\ \text{0 jets} & E_{T}^{\text{miss}} \\ \geq 2 \ \text{large jets} & E_{T}^{\text{miss}} \end{array}$ $\tilde{H}\tilde{H}, \tilde{H} \rightarrow h\tilde{G}/Z\tilde{G}$ $0e, \mu$ 36.1 $ilde{ extbf{ extit{H}}}$ 0.13-0.23 0.29-0.88 $BR(\tilde{\chi}_1^0 \to h\tilde{G})=1$ 1806.04030 $4e, \mu$ 139 0.55 $BR(\tilde{\chi}_1^0 \to Z\tilde{G})=1$ 2103.11684 \tilde{H} 139 \tilde{H} 0.45-0.93 $BR(\tilde{\chi}_1^0 \to Z\tilde{G})=1$ 2108.07586 $E_T^{
m miss}$ Direct $\tilde{\chi}_1^+ \tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^{\pm}$ Disapp. trk 1 jet 139 0.66 Pure Wino 2201.02472 0.21 Pure higgsino 2201.02472 $E_T^{
m miss}$ Stable § R-hadron pixel dE/dx 2.05 139 CERN-EP-2022-029 $E_T^{ ext{miss}}$ $E_T^{ ext{miss}}$ pixel dE/dx \tilde{g} [$\tau(\tilde{g})$ =10 ns] Metastable \tilde{g} R-hadron, $\tilde{g} \rightarrow qq\tilde{\chi}_1^0$ 139 2.2 $m(\tilde{\chi}_1^0)=100 \text{ GeV}$ CERN-EP-2022-029 $\tilde{\ell}\tilde{\ell}, \tilde{\ell} \rightarrow \ell\tilde{G}$ $\tilde{e}, \tilde{\mu}$ Displ. lep 139 0.7 $\tau(\tilde{\ell}) = 0.1 \text{ ns}$ 2011.07812 0.34 $\tau(\tilde{\ell}) = 0.1 \text{ ns}$ 2011.07812 E_{T}^{miss} pixel dE/dx 0.36 139 $\tau(\tilde{\ell}) = 10 \text{ ns}$ CERN-EP-2022-029 $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{1}^{\mp}/\tilde{\chi}_{1}^{0}, \tilde{\chi}_{1}^{\pm} \rightarrow Z\ell \rightarrow \ell\ell\ell$ $3e, \mu$ $[BR(Z\tau)=1, BR(Ze)=1]$ 0.625 1.05 Pure Wino 139 2011.10543 E_{T}^{miss} $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{1}^{\mp}/\tilde{\chi}_{2}^{0} \rightarrow WW/Z\ell\ell\ell\ell\nu\nu$ 0 jets 139 $[\lambda_{i33} \neq 0, \lambda_{12k} \neq 0]$ 0.95 1.55 $m(\tilde{\chi}_1^0)=200 \text{ GeV}$ 2103.11684 $\tilde{g}\tilde{g}, \tilde{g} \rightarrow qq\tilde{\chi}_{1}^{0}, \tilde{\chi}_{1}^{0} \rightarrow qqq$ $\tilde{t}\tilde{t}, \tilde{t} \rightarrow t\tilde{\chi}_{1}^{0}, \tilde{\chi}_{1}^{0} \rightarrow tbs$ Large $\lambda_{112}^{\prime\prime}$ 4-5 large jets 36.1 \tilde{g} [m($\tilde{\chi}_{1}^{0}$)=200 GeV. 1100 GeV] 1.3 1804.03568 1.9 \tilde{t} [λ_{323}'' =2e-4, 1e-2] Multiple 0.55 36.1 1.05 $m(\tilde{\chi}_1^0)$ =200 GeV, bino-like ATLAS-CONF-2018-003 $\tilde{t}\tilde{t}, \tilde{t} \rightarrow b\tilde{\chi}_{1}^{\pm}, \tilde{\chi}_{1}^{\pm} \rightarrow bbs$ $\geq 4b$ 139 Forbidden 0.95 $m(\tilde{\chi}_{1}^{\pm})=500 \text{ GeV}$ 2010.01015 $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow bs$ 2 jets + 2 b \tilde{t}_1 [qq, bs 0.42 0.61 1710.07171 36.7 $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow q\ell$ 2 b 36.1 0.4-1.45 BR($\tilde{t}_1 \rightarrow be/b\mu$)>20% 1710.05544 $2e, \mu$ e-10< λ'_{23k} <1e-8, 3e-10< λ'_{23k} <3e-9] DV \tilde{t}_1 1.0 BR($\tilde{t}_1 \rightarrow q\mu$)=100%, cos θ_t =1 1μ 136 1.6 2003.11956 $\tilde{\chi}_{1}^{\pm}/\tilde{\chi}_{2}^{0}/\tilde{\chi}_{1}^{0}, \tilde{\chi}_{12}^{0} \rightarrow tbs, \tilde{\chi}_{1}^{+} \rightarrow bbs$ $\tilde{\chi}_1^0$ 1-2 e, μ ≥6 jets 139 0.2-0.32 Pure higgsino 2106.09609

^{*}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.