

The search for the electroweak production of supersymmetric particles in events with two leptons and missing energy at ATLAS

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August 15, 2013

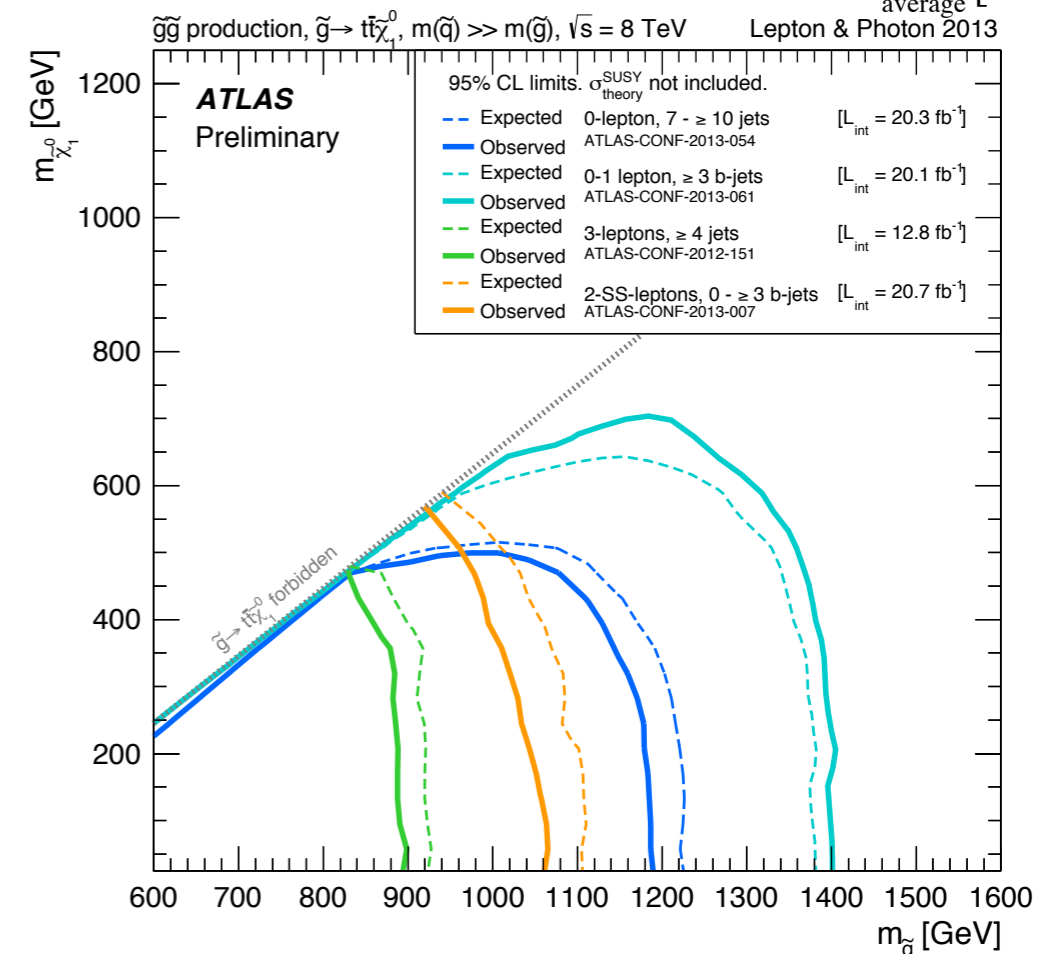
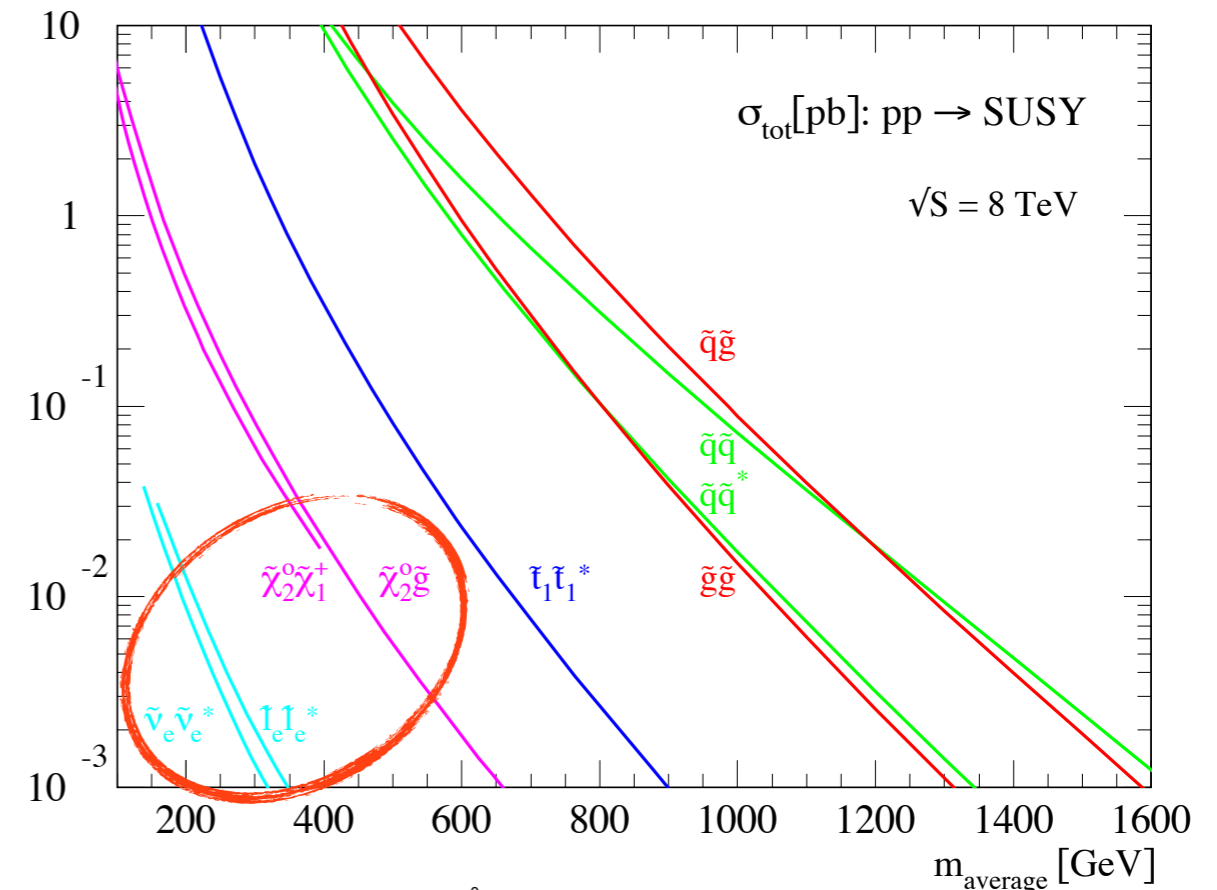


Outline

- Motivation
- Methodology
- Signal regions
- Background estimates
- Results & interpretation
- Conclusions & outlook

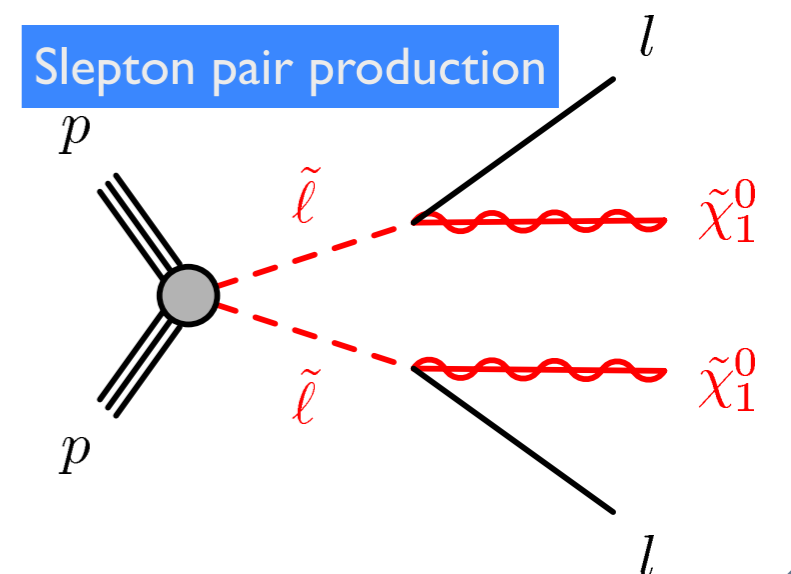
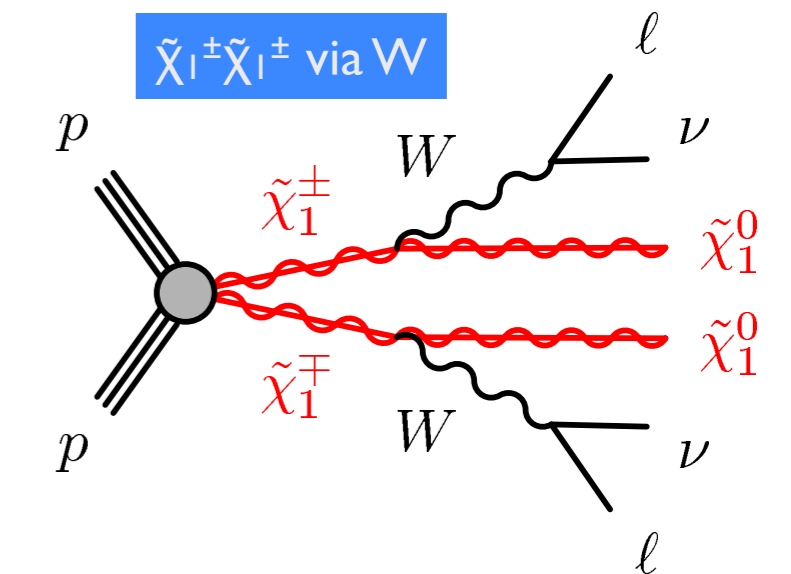
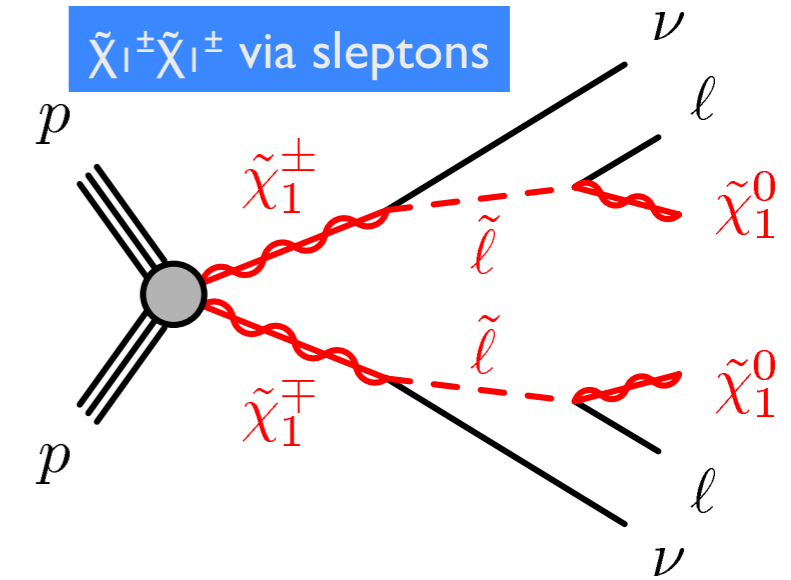
Motivation

- At proton-proton collider, we expect large coupling to squarks and gluinos due to the strong interactions.
 - Searches have not found any sign of these particles, and set strong limits on their masses (at the TeV scale)
 - Naturalness motivates light gauginos
 - Electroweak SUSY production may be favored at LHC energies
- Focusing on two lepton (e,μ) final states
- Latest public result
 - 20.3 fb⁻¹ @ 8 TeV
 - <http://cds.cern.ch/record/1547565>



Methodology

- Considering simplified SUSY models
 - Chargino pair production, decaying via sleptons or W bosons
 - Slepton pair production
- Cut-and-count analysis
 - Five signal regions, each targeting different scenarios
- Dominant backgrounds are measured in Monte Carlo, and scale factors are derived in control regions
- Upper limits on the visible cross section are set using a modified frequentist approach (CL_s)



Object & event selection

Variable	Electrons	Muons
p_T [GeV]	> 10	> 10
$ \eta $	< 2.47	< 2.4
$\left \frac{d_0}{\sigma(d_0)} \right $	< 5	< 3
$z_0 \sin(\theta)$ [mm]	< 0.14 mm	< 1 mm
Track isolation	$< 0.16 \times p_T$	$< 0.12 \times p_T$
Calorimeter isolation	$< 0.18 \times p_T$	-

- **Jets:**
 - $p_T > 20$ GeV
 - $|\eta| < 4.9$
 - Containing tracks which are consistent with the primary vertex
 - b-tagging: 80% efficient operating point
- **Other criteria:**
 - Exactly two leptons (e/ μ)
 - Di-lepton triggers
 - Reject events with $m_{ll} < 20$ GeV (Avoid low mass resonances)

Important variables

- Missing transverse energy (E_T^{miss})

- Sum all the energy deposits in the calorimeters
- Correction based on reconstructed electrons, muons, and jets

- Relative missing transverse energy ($E_T^{\text{miss,rel}}$)

- Used to distinguish missing energy from real process from that from mis-measurement of jets or leptons

$$E_T^{\text{miss,rel}} = \begin{cases} E_T^{\text{miss,rel}} & : \Delta\phi_{\ell,j} \geq \pi/2 \\ E_T^{\text{miss,rel}} \times \sin \Delta\phi_{\ell,j} & : \Delta\phi_{\ell,j} < \pi/2 \end{cases}$$

- Transverse mass (m_{T2})

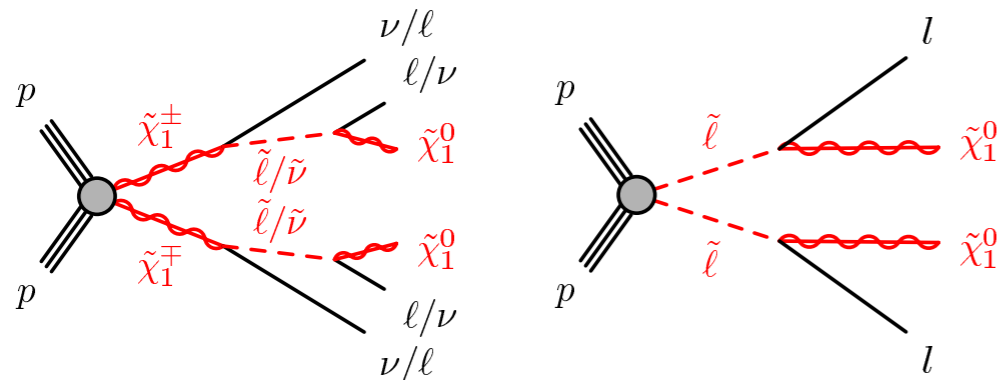
- Used to separate signal and background
- Standard model background have a kinematic edge lower than that of SUSY models

$$m_{T2} = \min_{\mathbf{q}_T} \left[\max \left(m_T \left(\mathbf{p}_T^{\ell 1}, \mathbf{q}_T \right), m_T \left(\mathbf{p}_T^{\ell 2}, \mathbf{p}_T^{\text{miss}} - \mathbf{q}_T \right) \right) \right]$$

Signal regions

SR- m_{T2}

	$SRm_{T2,90}$	$SRm_{T2,110}$
Lepton flavor	$e^-e^+, \mu^-\mu^+, e^\pm\mu^\mp$	
Jets	Full jet veto	
$m_{ }$	Z veto	
$E_T^{\text{miss,rel}}$	$> 40 \text{ GeV}$	
m_{T2}	$> 90 \text{ GeV}$	$> 110 \text{ GeV}$

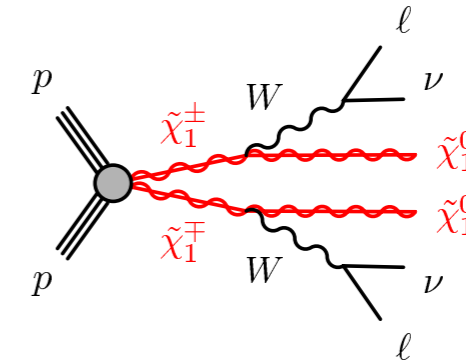


SR- m_{T2}

- Targets $\chi_{1^\pm}\chi_{1^\pm}$ production
 - χ_{1^\pm} decays via sleptons
- Also, direct slepton pair production
- Two signal regions
 - SR- $m_{T2,90}$: Targets low χ_{1^\pm} mass
 - SR- $m_{T2,110}$: Targets high χ_{1^\pm} mass

SR- WW

	$SRWW_a$	$SRWW_b$	$SRWW_c$
Lepton flavor	$e^\pm\mu^\mp$		
Jets	Full jet veto		
$p_T^{\ell 1}$	$> 35 \text{ GeV}$		
$p_T^{\ell 2}$	$> 20 \text{ GeV}$		
$m_{ }$	$< 80 \text{ GeV}$	$< 130 \text{ GeV}$	-
$p_T^ $	$> 70 \text{ GeV}$	$< 170 \text{ GeV}$	$< 190 \text{ GeV}$
$\delta\phi(\ell\ell)$	$> 1.8 \text{ rad}$		
$E_T^{\text{miss,rel}}$	$> 70 \text{ GeV}$	-	-
m_{T2}	-	$> 90 \text{ GeV}$	$> 100 \text{ GeV}$



SR- WW

- Targets $\chi_{1^\pm}\chi_{1^\pm}$ production
 - χ_{1^\pm} decays via W boson
- Three signal regions
 - SR- WW_a : Target models with off shell W's
 - SR- WW_b,c : Target models with increasing $\chi_{1^\pm}-\chi_{1^0}$ mass splitting

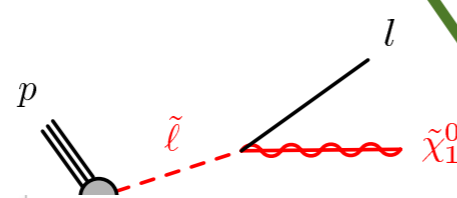
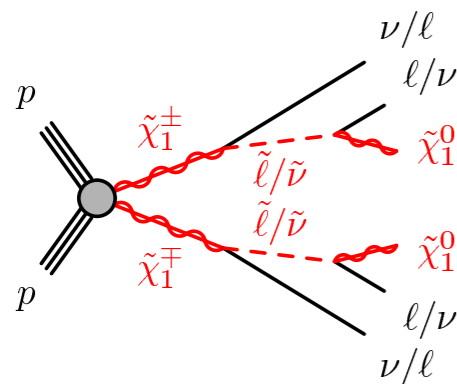
Signal regions

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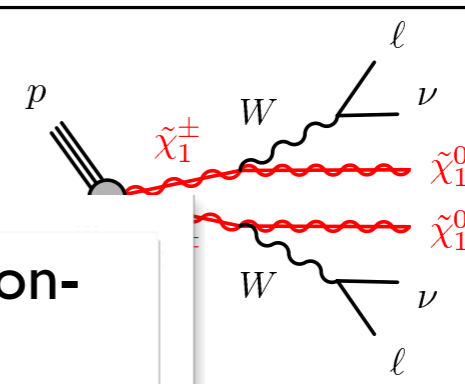
	$SRm_{T2,90}$	$SRm_{T2,110}$
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$E_T^{\text{miss,rel}}$: Reduce background from non-prompt leptons & Z+jets



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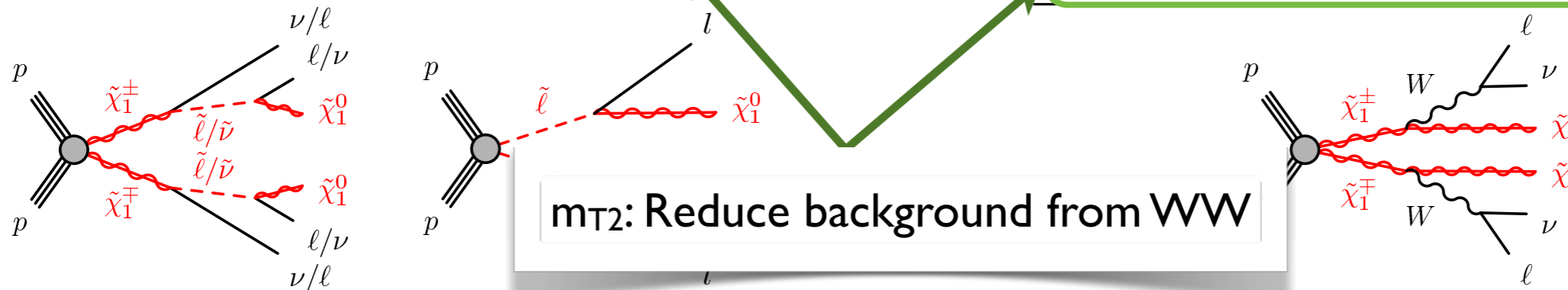
Signal regions

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Backgrounds - I

- Standard model sources of di-lepton final states + fake leptons
 - WW
 - $t\bar{t}$ and single top
 - Z+vector boson
 - Non-prompt leptons ← Estimated with Matrix method (negligible in SRs)
 - Z+jets
 - Higgs
 - Dominant backgrounds prediction is measured in Monte Carlo and corrected using a dedicated control region
 - Other background estimates are taken from Monte Carlo and matrix method
-

Backgrounds - II

- Measure scale factor in control region to account for data/Monte Carlo disagreement

$$\mathcal{S} = \frac{[N_{\text{data}}^{\text{CR}} - N_{\text{MC,other bkgd}}^{\text{CR}}]}{N_{\text{MC,target bkgd}}^{\text{CR}}}$$

- Measure transfer factor from control region to signal region in Monte Carlo

$$\mathcal{T} = \frac{N_{\text{MC,target bkgd}}^{\text{SR}}}{N_{\text{MC,target bkgd}}^{\text{CR}}}$$

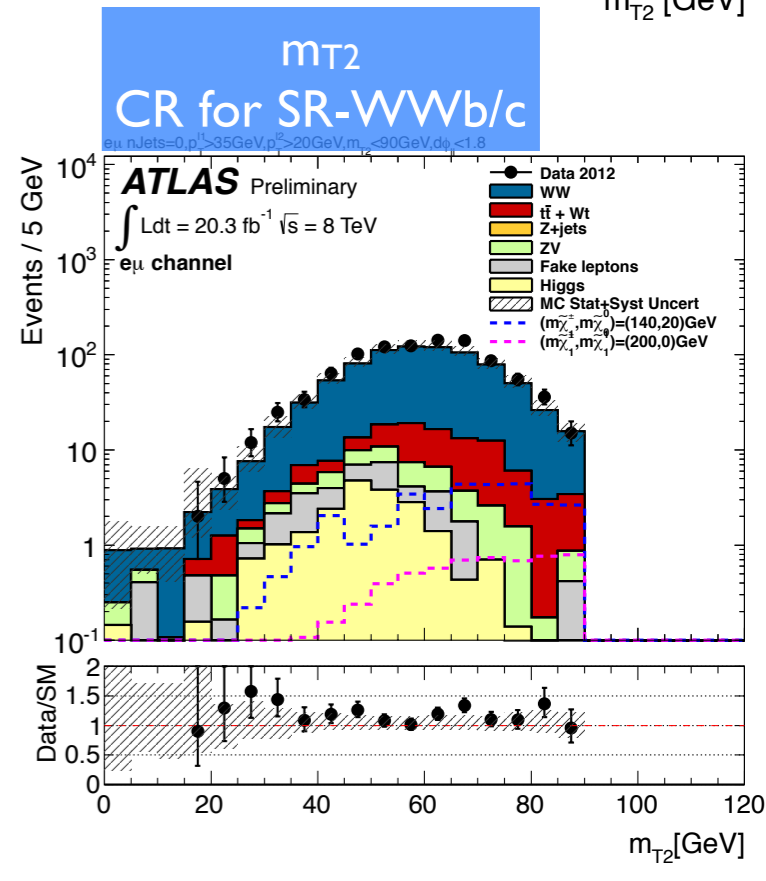
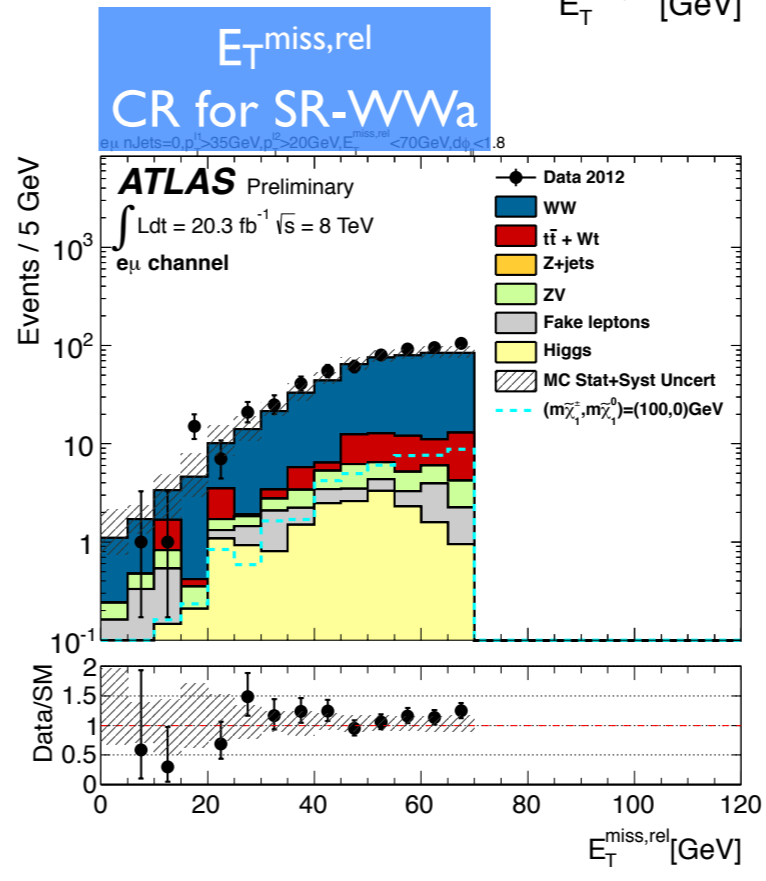
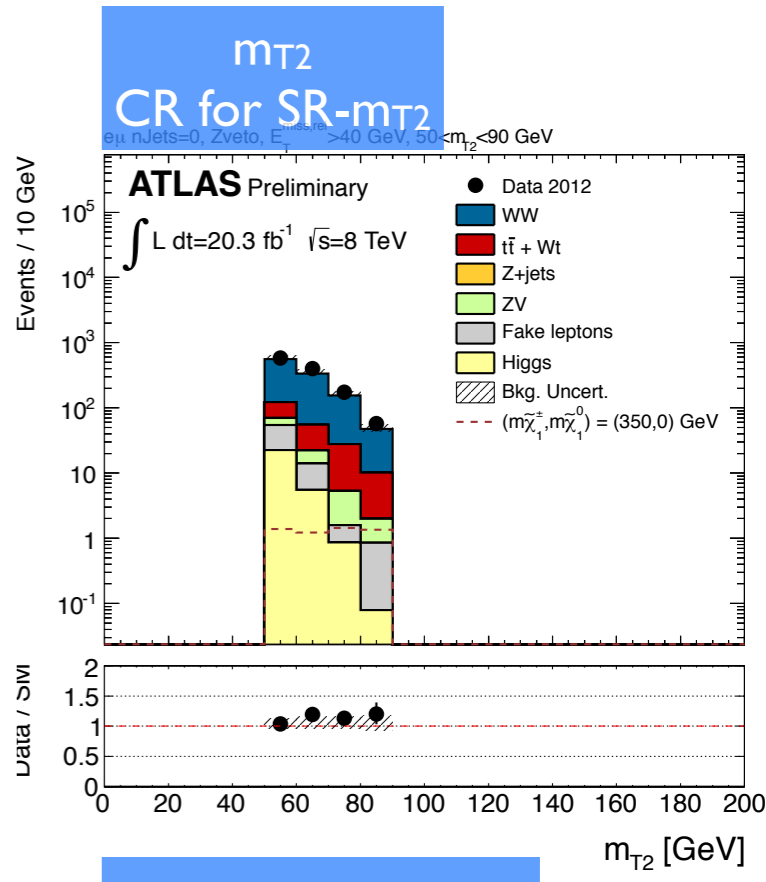
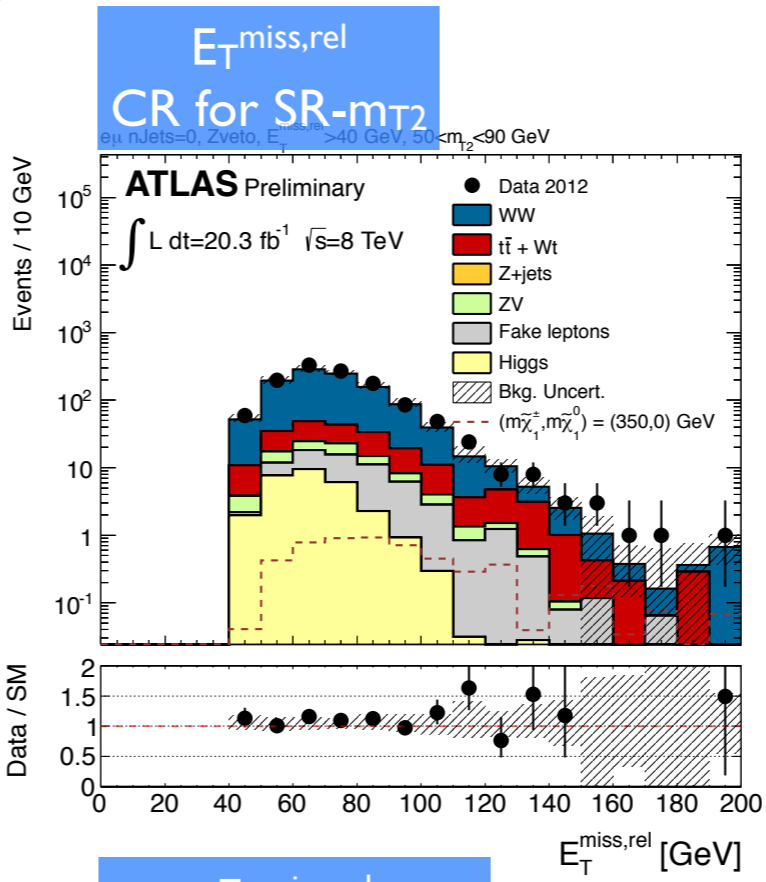
- Compute estimated background contribution to signal region

$$N_{\text{data,target bkgd}}^{\text{SR}} = \mathcal{S} \times \mathcal{T} \times N_{\text{MC,target bkgd}}^{\text{CR}}$$

WW control regions

Signal region	$SRm_{T2,90}$	$SRm_{T2,110}$
Lepton flavor	$e^\pm \mu^\mp$	
Jets	Full jet veto	
m_{ll}	Z veto	
$E_T^{miss,rel}$	> 40 GeV	
m_{T2}	50-90	

Signal region	$SRWW_a$	$SRWW_b$	$SRWW_c$
Lepton flavor	$e^\pm \mu^\mp$		
Jets	Full jet veto		
m_{ll}	-		
$\delta\phi(ll)$	> 1.8 rad		
$E_T^{miss,rel}$	< 70 GeV	-	-
m_{T2}	-	< 90 GeV	-



- Non-WW contamination:
- Top: 13%
- Z+vector boson: 3%
- Scale factors:

SR- m_{T2}	$1.12 \pm 12.5\%$
SR-WW	$1.16-1.19 \pm 6-8\%$

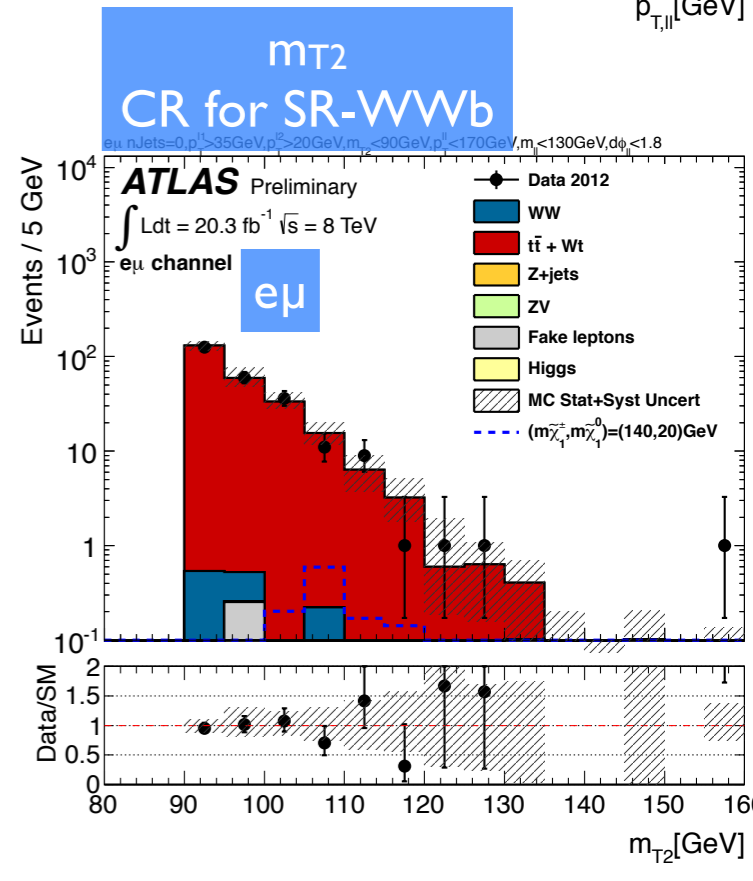
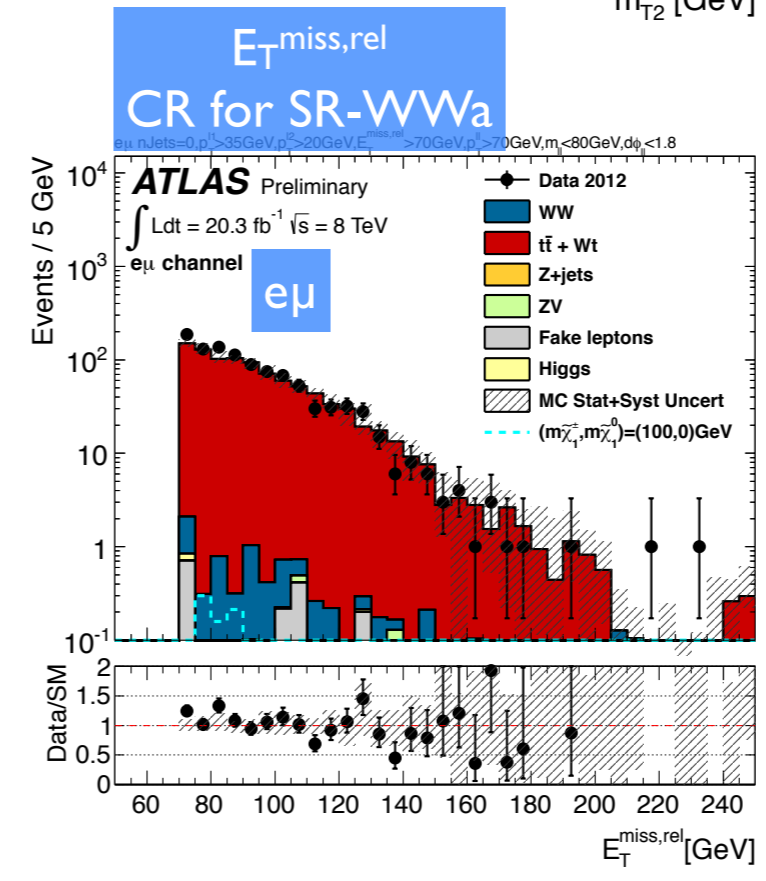
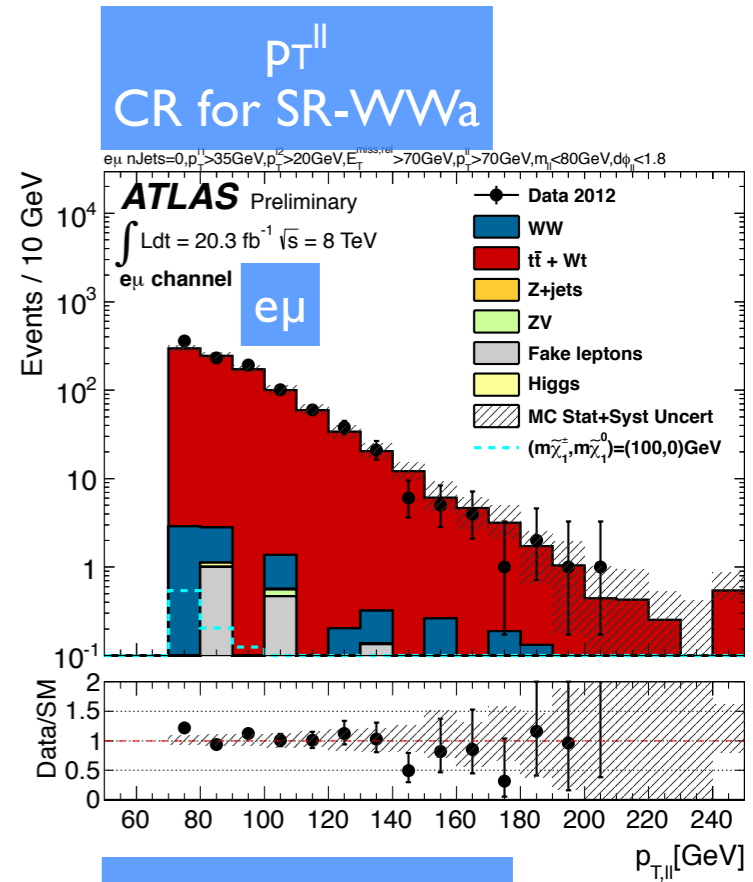
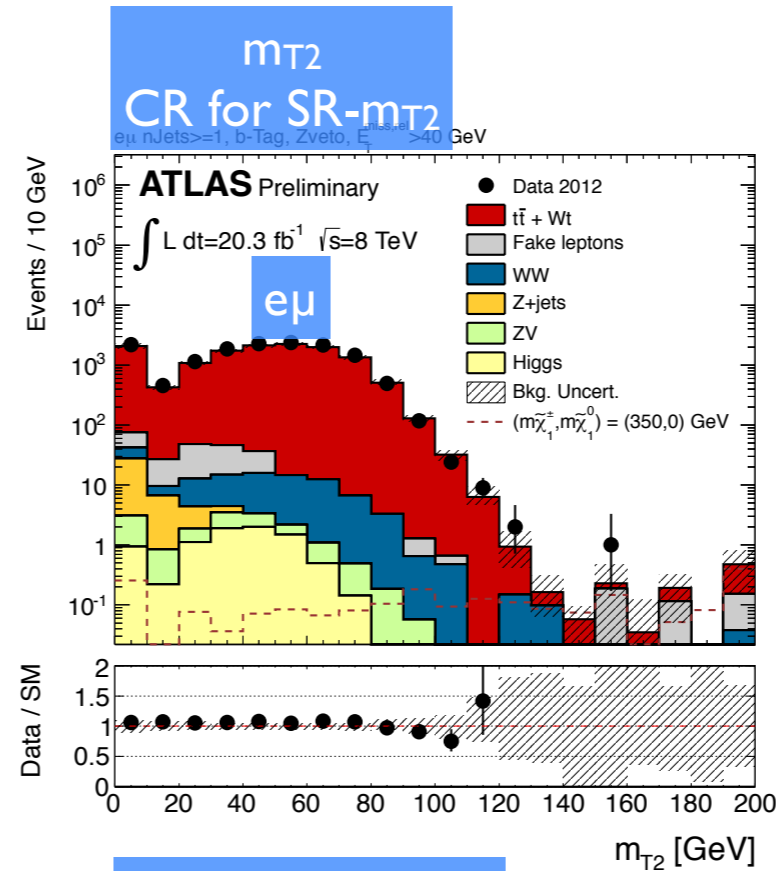
Top control regions

Signal region	$SR_{m_{T2},90}$	$SR_{m_{T2},110}$
Lepton flavor	$e^-e^+, \mu^-\mu^+, e^\pm\mu^\mp$	
B-tagged jets	≥ 1	
Signal jets	≥ 2	
m_{ll}	Z veto	
$E_T^{miss,rel}$	> 40 GeV	
m_{T2}	50-90	

Signal region	SR_{WW_a}	SR_{WW_b}	SR_{WW_c}
Lepton flavor	$e^\pm\mu^\mp$		
B-tagged jets	≥ 1		
Signal jets	≥ 1		
m_{ll}	< 80 GeV	< 130 GeV	-
p_T^{ll}	> 70 GeV	< 170 GeV	< 190 GeV
$\delta\phi(ll)$	> 1.8 rad		
$E_T^{miss,rel}$	> 70 GeV	-	-
m_{T2}	-	< 90 GeV	< 100 GeV

- Non-top contamination:
- SR- m_{T2} : 2%
- SR- WW : $< 1\%$
- Scale factors (derived in $e\mu$)

SR- m_{T2}	$1.05 \pm 4.8\%$
SR- WW	$0.98-1.07 \pm 4-13\%$

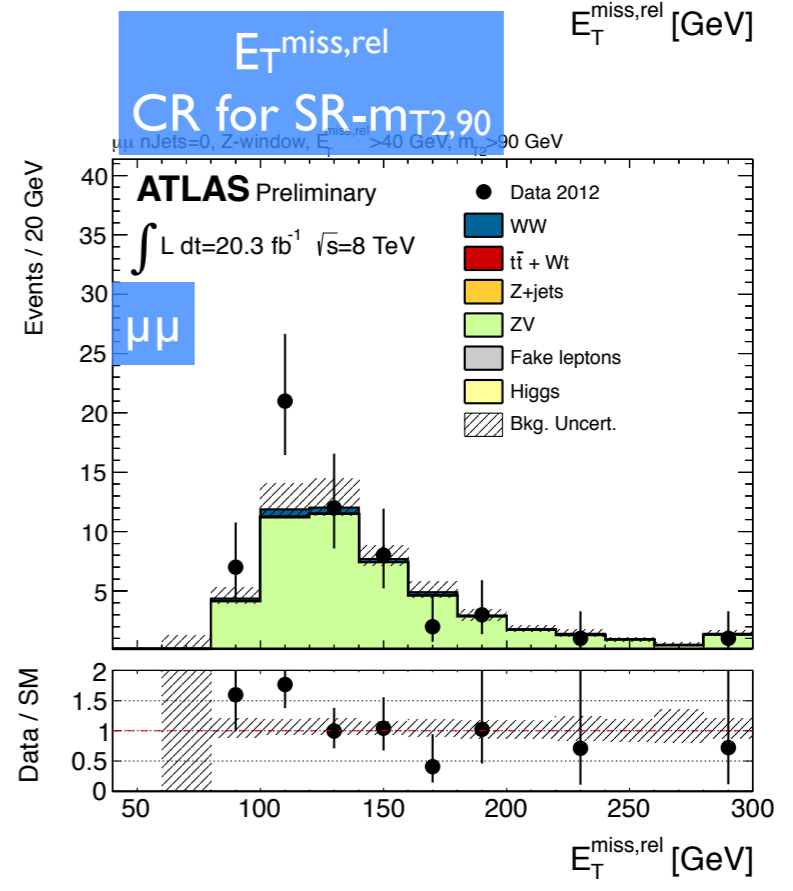
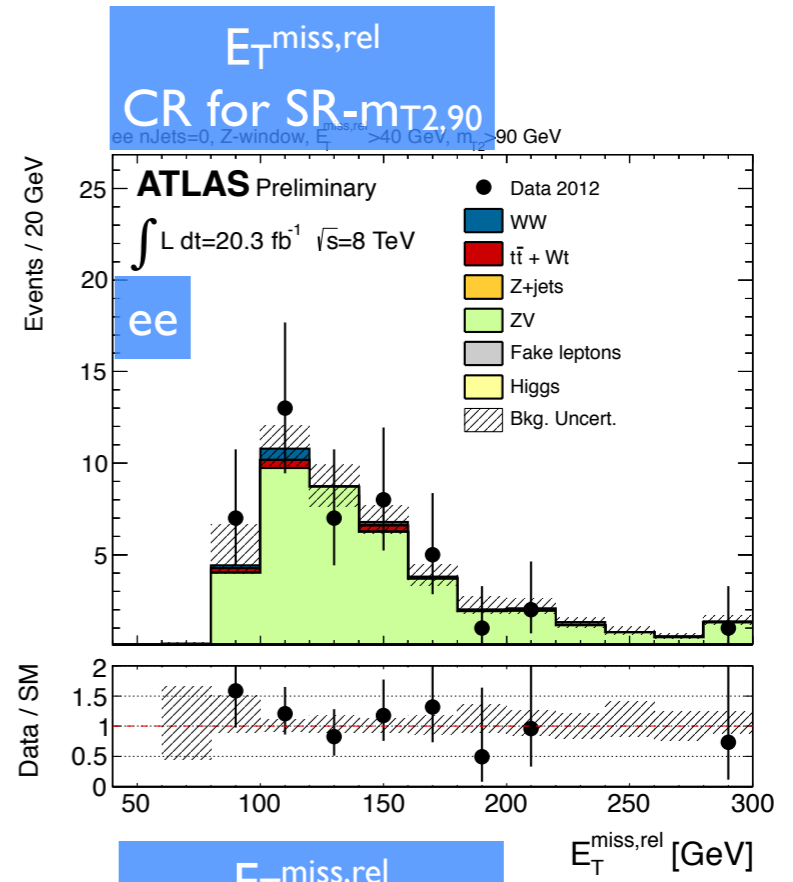


Z+vector control regions

Signal region	$SR_{m_{T2},90}$	$SR_{m_{T2},110}$
Lepton flavor	$e^-e^+, \mu^-\mu^+$	
Jets	Full jet veto	
m_{ll}	Z window	
$E_T^{miss,rel}$	> 40 GeV	
m_{T2}	> 90 GeV	> 110 GeV

- No control region for SR-WWW
- Negligible contribution from non-Z+vector boson sources
 - Z+jets events m_{T2} requirement
 - Confirmation Z+jets contribution is negligible in high- m_{T2} region
- Scale factors

SR- m_{T2}	$0.96-1.06 \pm 15-16\%$
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Results & interpretation - I

 SR-m_{T2,90}

	e^+e^-	$\mu^+\mu^-$	$e^\pm\mu^\pm$	all
Observed	15	19	19	53
Background total	16.6 ± 2.3	20.7 ± 3.2	22.4 ± 3.3	59.7 ± 7.3
WW	9.3 ± 1.6	14.1 ± 2.2	12.6 ± 2.0	36.1 ± 5.1
ZV ($V = W$ or Z)	6.3 ± 1.5	0.8 ± 0.3	7.3 ± 1.7	14.4 ± 3.2
Top	$0.9^{+1.1}_{-0.9}$	5.6 ± 2.1	2.5 ± 1.8	8.9 ± 3.9
Higgs	0.11 ± 0.04	0.19 ± 0.05	0.08 ± 0.04	0.38 ± 0.08
Fake	$0.00^{+0.18}_{-0.00}$	$0.00^{+0.14}_{-0.00}$	$0.00^{+0.15}_{-0.00}$	$0.00^{+0.28}_{-0.00}$
Observed σ_{vis}^{95} [fb]	0.44	0.47	0.51	0.81
Expected σ_{vis}^{95} [fb]	$0.50^{+0.22}_{-0.15}$	$0.58^{+0.25}_{-0.17}$	$0.57^{+0.25}_{-0.17}$	$1.00^{+0.41}_{-0.28}$

 SR-m_{T2,110}

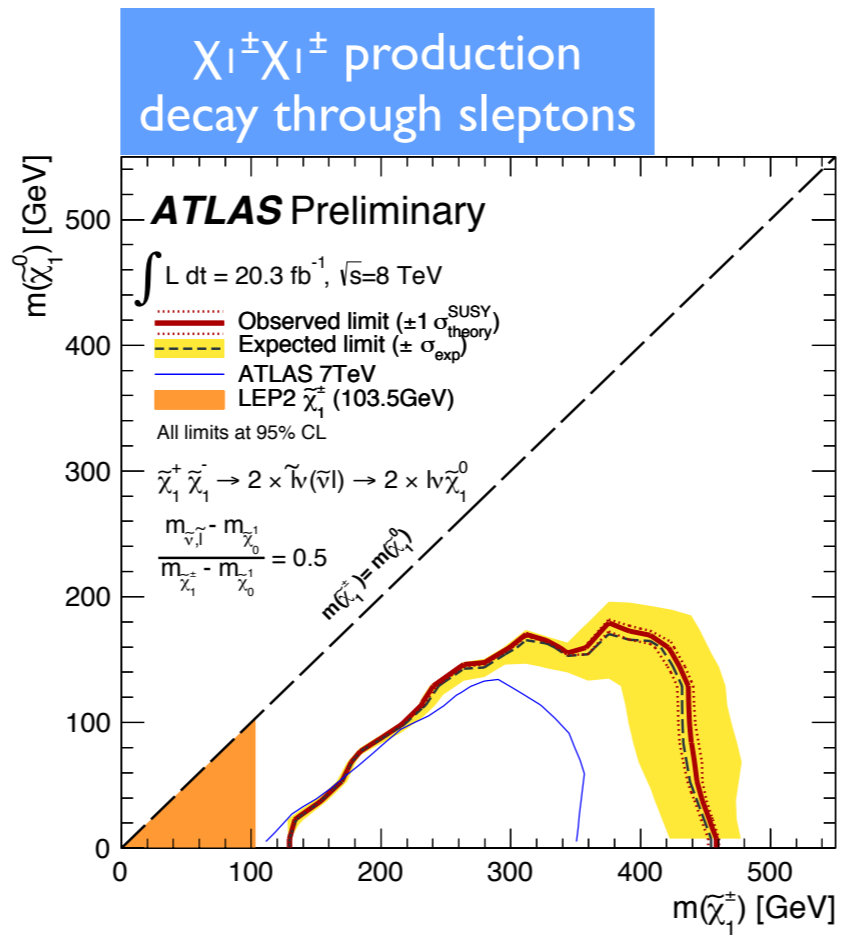
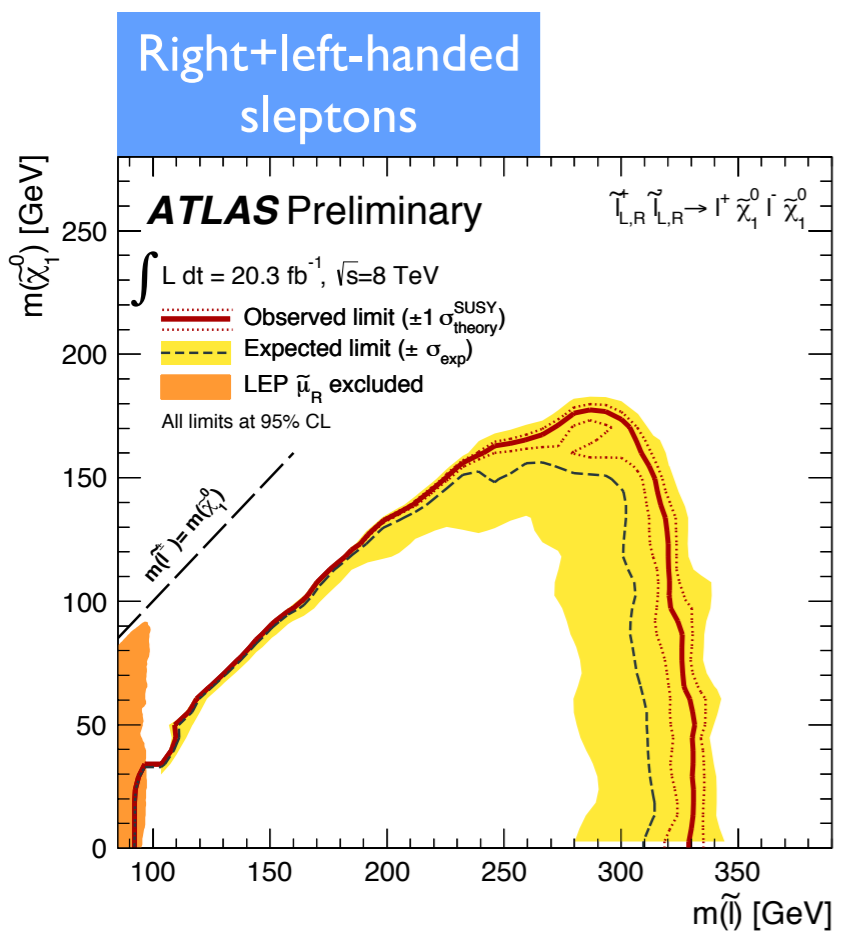
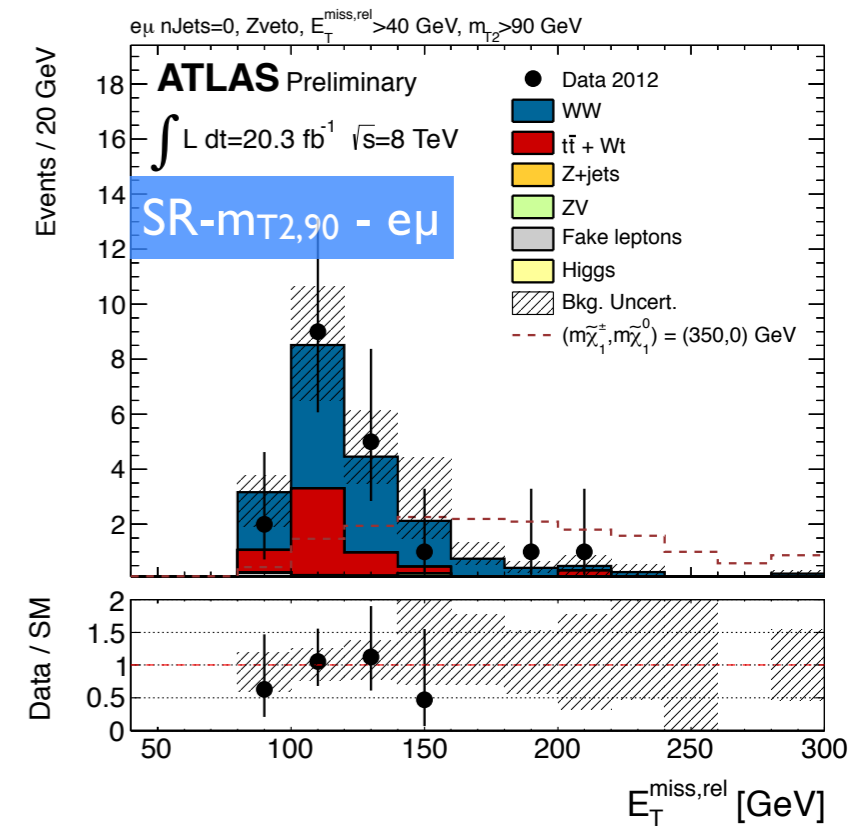
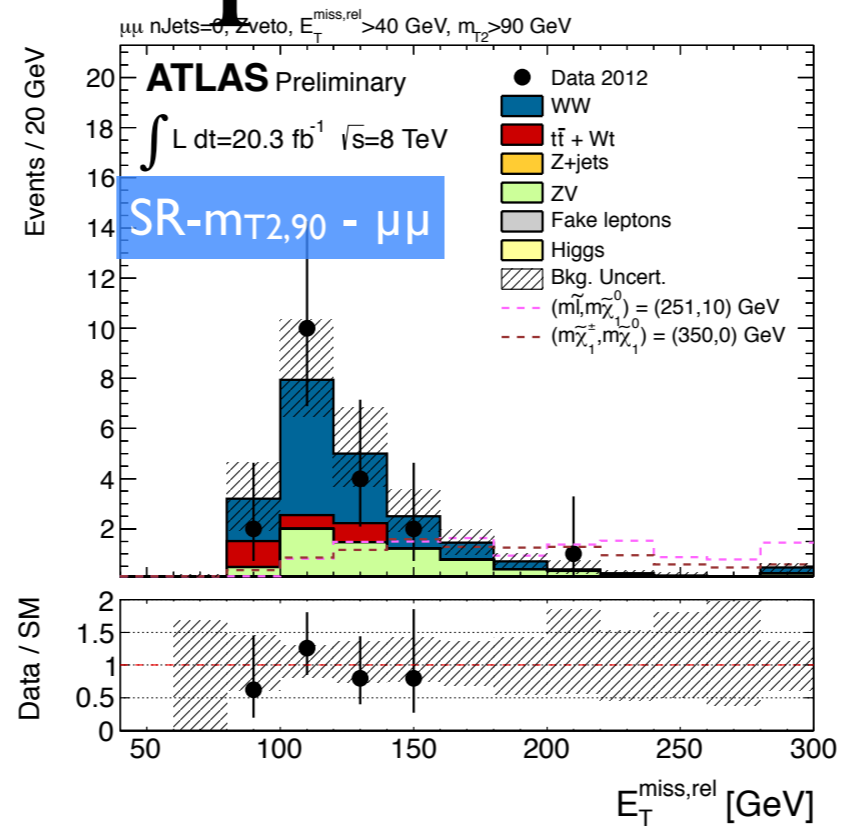
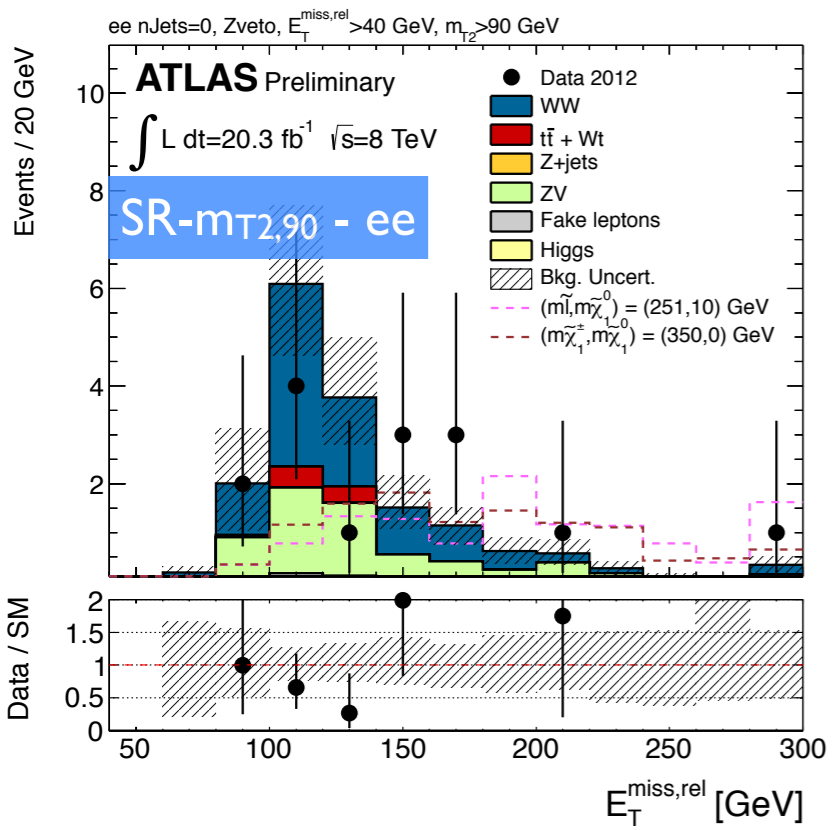
	e^+e^-	$\mu^+\mu^-$	$e^\pm\mu^\pm$	all
Observed	4	5	4	13
Background total	6.1 ± 2.2	4.4 ± 2.0	6.3 ± 2.4	16.9 ± 6.0
WW	2.7 ± 1.5	3.6 ± 2.0	2.9 ± 1.6	9.1 ± 4.9
ZV ($V = W$ or Z)	2.7 ± 1.4	0.2 ± 0.1	3.4 ± 1.8	6.3 ± 3.3
Top	0.7 ± 0.7	0.6 ± 0.4	0.0 ± 0.0	1.3 ± 1.0
Higgs	0.05 ± 0.03	0.12 ± 0.04	0.05 ± 0.02	0.22 ± 0.05
Fake	$0.00^{+0.09}_{-0.00}$	$0.00^{+0.13}_{-0.00}$	$0.00^{+0.12}_{-0.00}$	$0.00^{+0.28}_{-0.00}$
Observed σ_{vis}^{95} [fb]	0.27	0.35	0.28	0.54
Expected σ_{vis}^{95} [fb]	$0.33^{+0.16}_{-0.10}$	$0.33^{+0.16}_{-0.09}$	$0.33^{+0.16}_{-0.10}$	$0.62^{+0.23}_{-0.16}$

SR-WW

	SRWW _a	SRWW _b	SRWW _c
Observed	123	16	9
Background total	117.9 ± 14.6	13.6 ± 2.3	7.4 ± 1.5
Top	15.2 ± 6.6	2.7 ± 1.1	1.0 ± 0.7
WW	98.6 ± 14.6	10.2 ± 2.1	5.9 ± 1.3
ZV ($V = W$ or Z)	3.4 ± 0.8	$0.26^{+0.31}_{-0.26}$	0.29 ± 0.14
Higgs	0.76 ± 0.14	0.21 ± 0.06	0.10 ± 0.04
fake	$0.02^{+0.33}_{-0.02}$	$0.26^{+0.30}_{-0.26}$	$0.12^{+0.17}_{-0.12}$
Observed σ_{vis}^{95} [fb]	1.94	0.58	0.43
Expected σ_{vis}^{95} [fb]	$1.77^{+0.66}_{-0.49}$	$0.51^{+0.21}_{-0.15}$	$0.37^{+0.18}_{-0.11}$

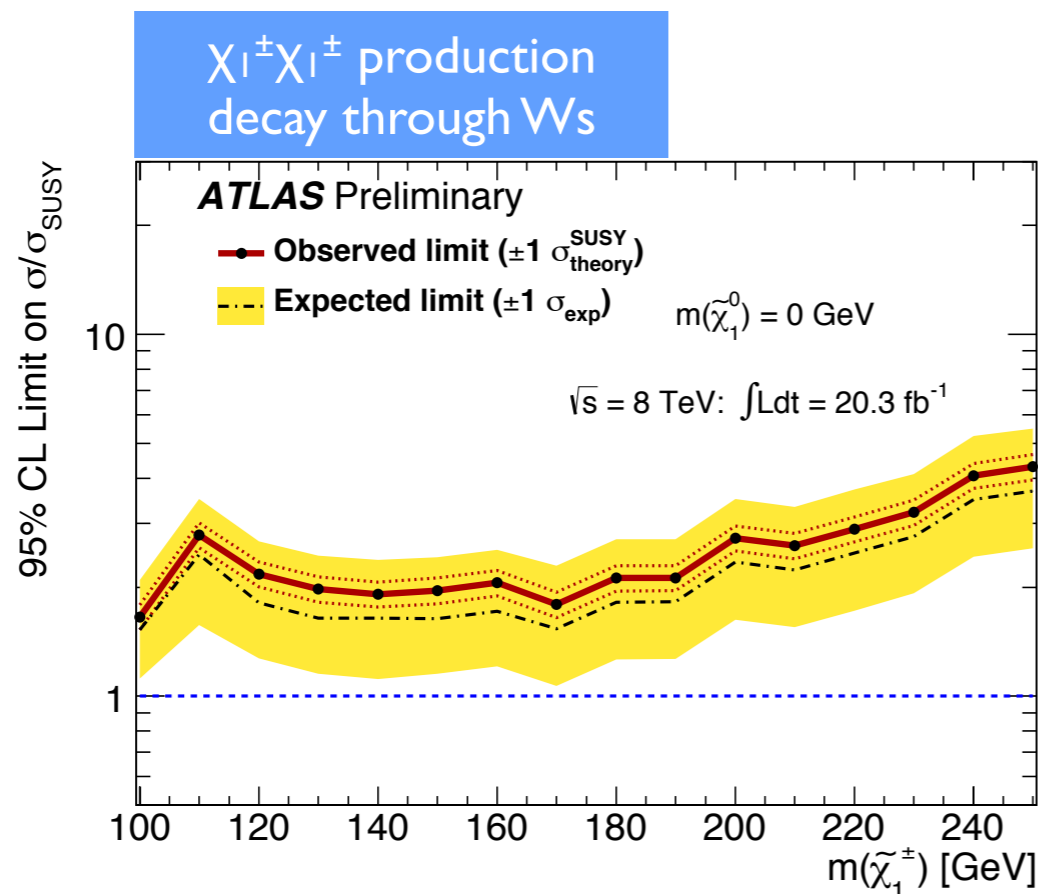
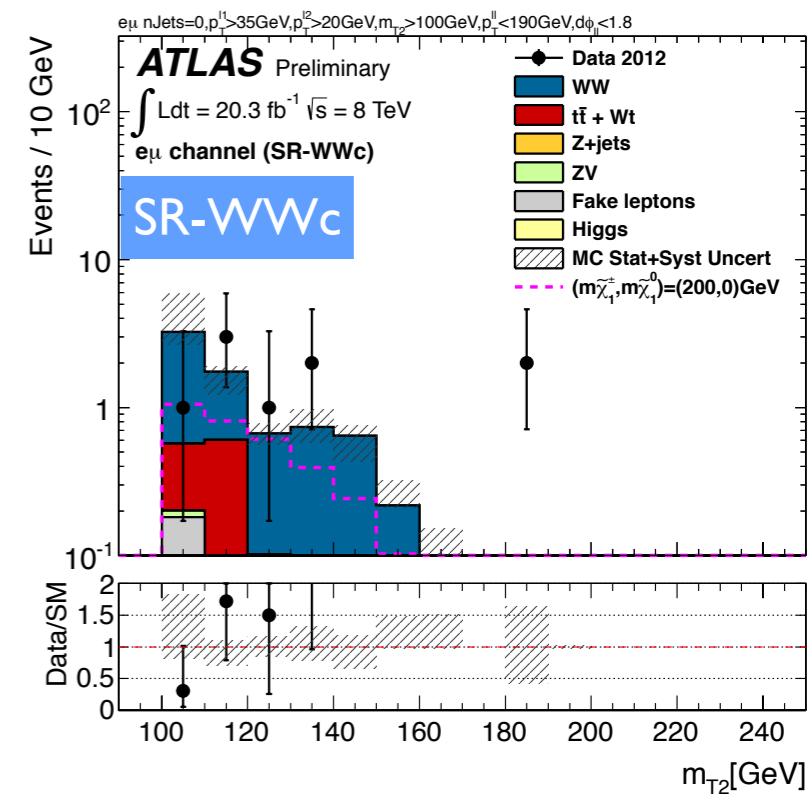
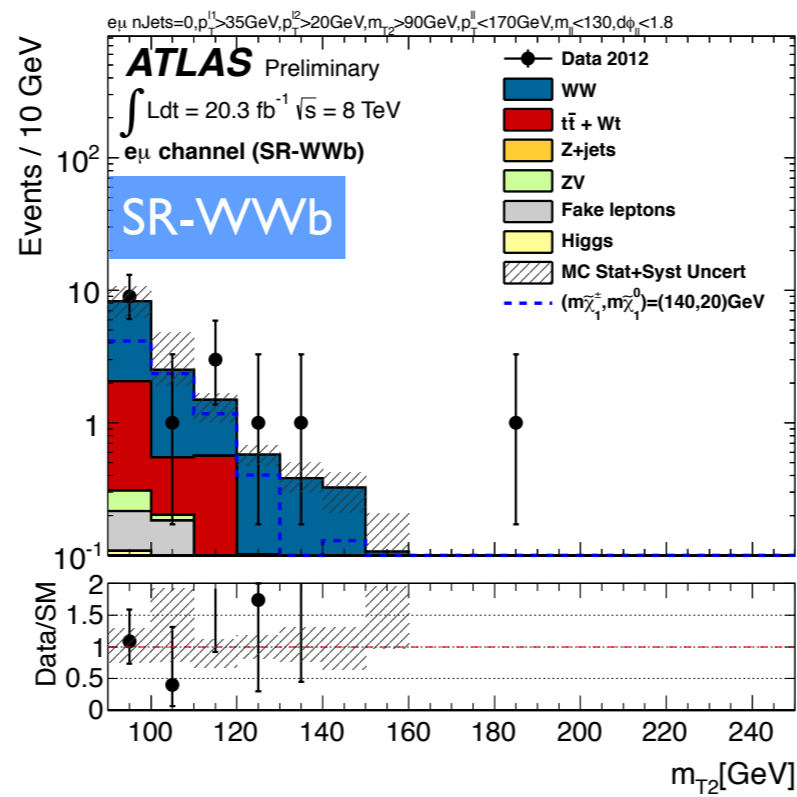
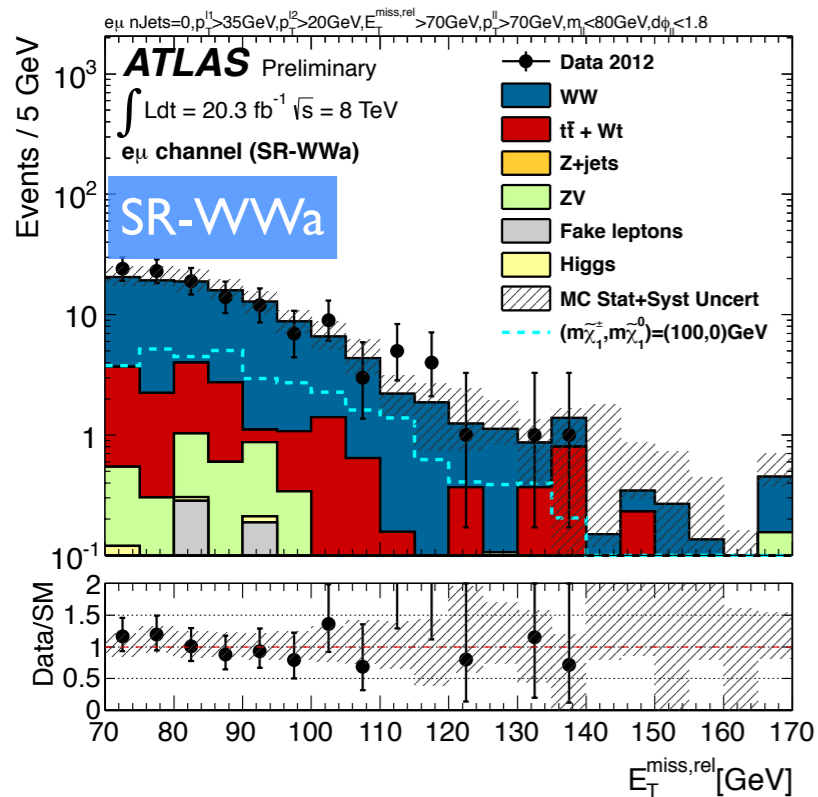
- Observations are consistent with Standard model prediction
- Set limits on the cross section of non-Standard Model processes

Results & interpretation - II



- Combination performed by taking best performing signal region for each model
- Direct slepton production:
 - Slepton masses between 90 GeV and 320 GeV excluded
- χ_1^\pm pair production (decay via slepton):
 - χ_1^\pm masses between 130 GeV and 450 GeV excluded

Results & interpretation - III



- χ_{1^\pm} pair production (decay via W):
- Excluded cross-section above model cross section by factor 1.9-2.8 in χ_{1^\pm} mass range 100-190 GeV

Conclusions

- Latest results for the search for direct production of charginos and sleptons in the two lepton channel have been shown
- Observations are consistent with the Standard Model predictions
- Limits are set on the mass of sleptons and charginos
- Limits are set on the production cross section of charginos which decay via a W boson
- Outlook:
 - We plan to update these results in a summer paper
 - Plan to add new channels targeting $\chi_2^0\chi_1^\pm$
 - Two leptons consistent with a Z -boson
 - Same sign leptons
 - Target scenarios with low mass splitting between χ_2^0/χ_1^\pm and χ_1^0

Thank you for
listening!

Backup

ATLAS SUSY reach

ATLAS SUSY Searches* - 95% CL Lower Limits

Status: EPS 2013

ATLAS Preliminary

$$\int \mathcal{L} dt = (4.4 - 22.9) \text{ fb}^{-1} \quad \sqrt{s} = 7, 8 \text{ TeV}$$

Model	e, μ, τ, γ	Jets	E_T^{miss}	$\int \mathcal{L} dt [\text{fb}^{-1}]$	Mass limit	Reference		
Inclusive Searches	MSUGRA/CMSSM	0	2-6 jets	Yes	20.3	\tilde{q}, \tilde{g} 1.7 TeV	$m(\tilde{q})=m(\tilde{g})$	ATLAS-CONF-2013-047
	MSUGRA/CMSSM	1 e, μ	3-6 jets	Yes	20.3	\tilde{g} 1.2 TeV	any $m(\tilde{q})$	ATLAS-CONF-2013-062
	MSUGRA/CMSSM	0	7-10 jets	Yes	20.3	\tilde{g} 1.1 TeV	any $m(\tilde{q})$	ATLAS-CONF-2013-054
	$\tilde{q}\tilde{q}, \tilde{q}\tilde{q} \rightarrow q\tilde{\chi}_1^0$	0	2-6 jets	Yes	20.3	\tilde{q} 740 GeV	$m(\tilde{\chi}_1^0)=0 \text{ GeV}$	ATLAS-CONF-2013-047
	$\tilde{g}\tilde{g}, \tilde{g}\tilde{g} \rightarrow q\tilde{q}\tilde{\chi}_1^0$	0	2-6 jets	Yes	20.3	\tilde{g} 1.3 TeV	$m(\tilde{\chi}_1^0)=0 \text{ GeV}$	ATLAS-CONF-2013-047
	$\tilde{g}\tilde{g}, \tilde{g}\tilde{g} \rightarrow qq\tilde{\chi}_1^\pm \rightarrow qqW^\pm\tilde{\chi}_1^0$	1 e, μ	3-6 jets	Yes	20.3	\tilde{g} 1.18 TeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}, m(\tilde{\chi}^\pm)=0.5(m(\tilde{\chi}_1^0)+m(\tilde{g}))$	ATLAS-CONF-2013-062
	$\tilde{g}\tilde{g} \rightarrow qq\tilde{q}\tilde{\chi}_1^\pm \rightarrow qq\tilde{\chi}_1^0\tilde{\chi}_1^\pm$	2 e, μ (SS)	3 jets	Yes	20.7	\tilde{g} 1.1 TeV	$m(\tilde{\chi}_1^0) < 650 \text{ GeV}$	ATLAS-CONF-2013-007
	GMSB ($\tilde{\ell}$ NLSP)	2 e, μ	2-4 jets	Yes	4.7	\tilde{g} 1.24 TeV	$\tan\beta < 15$	1208.4688
	GMSB ($\tilde{\nu}$ NLSP)	1-2 τ	0-2 jets	Yes	20.7	\tilde{g} 1.4 TeV	$\tan\beta > 18$	ATLAS-CONF-2013-026
	GGM (bino NLSP)	2 γ	0	Yes	4.8	\tilde{g} 1.07 TeV	$m(\tilde{\chi}_1^0) > 50 \text{ GeV}$	1209.0753
GGM (wino NLSP)	1 $e, \mu + \gamma$	0	Yes	4.8	\tilde{g} 619 GeV	$m(\tilde{\chi}_1^0) > 50 \text{ GeV}$	ATLAS-CONF-2012-144	
GGM (higgsino-bino NLSP)	γ	1 b	Yes	4.8	\tilde{g} 900 GeV	$m(\tilde{\chi}_1^0) > 220 \text{ GeV}$	1211.1167	
GGM (higgsino NLSP)	2 e, μ (Z)	0-3 jets	Yes	5.8	\tilde{g} 690 GeV	$m(\tilde{H}) > 200 \text{ GeV}$	ATLAS-CONF-2012-152	
Gravitino LSP	0	mono-jet	Yes	10.5	$F^{1/2}$ scale 645 GeV	$m(\tilde{g}) > 10^{-4} \text{ eV}$	ATLAS-CONF-2012-147	
3 rd gen. \tilde{g} med.	$\tilde{g} \rightarrow b\tilde{b}\tilde{\chi}_1^0$	0	3 b	Yes	20.1	\tilde{g} 1.2 TeV	$m(\tilde{\chi}_1^0) < 600 \text{ GeV}$	ATLAS-CONF-2013-061
	$\tilde{g} \rightarrow t\tilde{t}\tilde{\chi}_1^0$	0	7-10 jets	Yes	20.3	\tilde{g} 1.14 TeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}$	ATLAS-CONF-2013-054
	$\tilde{g} \rightarrow t\tilde{t}\tilde{\chi}_1^\pm$	0-1 e, μ	3 b	Yes	20.1	\tilde{g} 1.34 TeV	$m(\tilde{\chi}_1^0) < 400 \text{ GeV}$	ATLAS-CONF-2013-061
	$\tilde{g} \rightarrow b\tilde{t}\tilde{\chi}_1^\pm$	0-1 e, μ	3 b	Yes	20.1	\tilde{g} 1.3 TeV	$m(\tilde{\chi}_1^0) < 300 \text{ GeV}$	ATLAS-CONF-2013-061
3 rd gen. squarks direct production	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1 \rightarrow b\tilde{\chi}_1^0$	0	2 b	Yes	20.1	\tilde{b}_1 100-630 GeV	$m(\tilde{\chi}_1^0) < 100 \text{ GeV}$	ATLAS-CONF-2013-053
	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1 \rightarrow t\tilde{\chi}_1^\pm$	2 e, μ (SS)	0-3 b	Yes	20.7	\tilde{b}_1 430 GeV	$m(\tilde{\chi}_1^0) = 2 m(\tilde{\chi}_1^\pm)$	ATLAS-CONF-2013-007
	$\tilde{t}_1\tilde{t}_1$ (light), $\tilde{t}_1 \rightarrow b\tilde{\chi}_1^\pm$	1-2 e, μ	1-2 b	Yes	4.7	\tilde{t}_1 167 GeV	$m(\tilde{\chi}_1^0) = 55 \text{ GeV}$	1208.4305, 1209.2102
	$\tilde{t}_1\tilde{t}_1$ (light), $\tilde{t}_1 \rightarrow Wb\tilde{\chi}_1^0$	2 e, μ	0-2 jets	Yes	20.3	\tilde{t}_1 220 GeV	$m(\tilde{\chi}_1^0) = m(\tilde{t}_1) - m(W) - 50 \text{ GeV}, m(\tilde{t}_1) < m(\tilde{\chi}_1^\pm)$	ATLAS-CONF-2013-048
	$\tilde{t}_1\tilde{t}_1$ (medium), $\tilde{t}_1 \rightarrow t\tilde{\chi}_1^\pm$	2 e, μ	2 jets	Yes	20.3	\tilde{t}_1 225-525 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}$	ATLAS-CONF-2013-065
	$\tilde{t}_1\tilde{t}_1$ (medium), $\tilde{t}_1 \rightarrow b\tilde{\chi}_1^\pm$	0	2 b	Yes	20.1	\tilde{t}_1 150-580 GeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}, m(\tilde{\chi}_1^\pm) - m(\tilde{\chi}_1^0) = 5 \text{ GeV}$	ATLAS-CONF-2013-053
	$\tilde{t}_1\tilde{t}_1$ (heavy), $\tilde{t}_1 \rightarrow t\tilde{\chi}_1^0$	1 e, μ	1 b	Yes	20.7	\tilde{t}_1 200-610 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}$	ATLAS-CONF-2013-037
	$\tilde{t}_1\tilde{t}_1$ (heavy), $\tilde{t}_1 \rightarrow t\tilde{\chi}_1^\pm$	0	2 b	Yes	20.5	\tilde{t}_1 320-660 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}$	ATLAS-CONF-2013-024
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow c\tilde{\chi}_1^0$	0	mono-jet/c-tag	Yes	20.3	\tilde{t}_1 200 GeV	$m(\tilde{t}_1) - m(\tilde{\chi}_1^0) < 85 \text{ GeV}$	ATLAS-CONF-2013-068
	$\tilde{t}_1\tilde{t}_1$ (natural GMSB)	2 e, μ (Z)	1 b	Yes	20.7	\tilde{t}_1 500 GeV	$m(\tilde{\chi}_1^0) > 150 \text{ GeV}$	ATLAS-CONF-2013-025
$\tilde{t}_2\tilde{t}_2, \tilde{t}_2 \rightarrow \tilde{t}_1 + Z$	3 e, μ (Z)	1 b	Yes	20.7	\tilde{t}_2 520 GeV	$m(\tilde{t}_1) = m(\tilde{\chi}_1^0) + 180 \text{ GeV}$	ATLAS-CONF-2013-025	
EW direct	$\tilde{\ell}_{L,R}\tilde{\ell}_{L,R}, \tilde{\ell} \rightarrow \tilde{\chi}_1^0$	2 e, μ	0	Yes	20.3	$\tilde{\ell}$ 85-315 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}$	ATLAS-CONF-2013-049
	$\tilde{\chi}_1^\pm\tilde{\chi}_1^\pm, \tilde{\chi}_1^\pm \rightarrow \tilde{\ell}\nu(\tilde{\ell}\bar{\nu})$	2 e, μ	0	Yes	20.3	$\tilde{\chi}_1^\pm$ 125-450 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}, m(\tilde{\ell}, \bar{\nu}) = 0.5(m(\tilde{\chi}_1^\pm) + m(\tilde{\chi}_1^0))$	ATLAS-CONF-2013-049
	$\tilde{\chi}_1^\pm\tilde{\chi}_1^\pm, \tilde{\chi}_1^\pm \rightarrow \tilde{\tau}\nu(\tilde{\tau}\bar{\nu})$	2 τ	0	Yes	20.7	$\tilde{\chi}_1^\pm$ 180-330 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}, m(\tilde{\tau}, \bar{\nu}) = 0.5(m(\tilde{\chi}_1^\pm) + m(\tilde{\chi}_1^0))$	ATLAS-CONF-2013-028
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0 \rightarrow \tilde{\ell}\nu\tilde{\ell}\nu(\tilde{\ell}\bar{\nu}), \tilde{\ell}\tilde{\nu}\tilde{\ell}\nu(\tilde{\nu}\bar{\nu})$	3 e, μ	0	Yes	20.7	$\tilde{\chi}_1^\pm, \tilde{\chi}_2^0$ 600 GeV	$m(\tilde{\chi}_1^\pm) = m(\tilde{\chi}_2^0), m(\tilde{\chi}_1^0) = 0, m(\tilde{\ell}, \bar{\nu}) = 0.5(m(\tilde{\chi}_1^\pm) + m(\tilde{\chi}_1^0))$	ATLAS-CONF-2013-035
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0 \rightarrow W^*\tilde{\chi}_1^0 Z^*\tilde{\chi}_1^0$	3 e, μ	0	Yes	20.7	$\tilde{\chi}_1^\pm, \tilde{\chi}_2^0$ 315 GeV	$m(\tilde{\chi}_1^\pm) = m(\tilde{\chi}_2^0), m(\tilde{\chi}_1^0) = 0, \text{ sleptons decoupled}$	ATLAS-CONF-2013-035
Long-lived particles	Direct $\tilde{\chi}_1^\pm\tilde{\chi}_1^\pm$ prod., long-lived $\tilde{\chi}_1^\pm$	Disapp. trk	1 jet	Yes	20.3	$\tilde{\chi}_1^\pm$ 270 GeV	$m(\tilde{\chi}_1^\pm) - m(\tilde{\chi}_1^0) = 160 \text{ MeV}, \tau(\tilde{\chi}_1^\pm) = 0.2 \text{ ns}$	ATLAS-CONF-2013-069
	Stable, stopped \tilde{g} R-hadron	0	1-5 jets	Yes	22.9	\tilde{g} 857 GeV	$m(\tilde{\chi}_1^0) = 100 \text{ GeV}, 10 \mu\text{s} < \tau(\tilde{g}) < 1000 \text{ s}$	ATLAS-CONF-2013-057
	GMSB, stable $\tilde{\tau}, \tilde{\chi}_1^0 \rightarrow \tilde{\tau}(\tilde{e}, \tilde{\mu}) + \tau(e, \mu)$	1-2 μ	0	-	15.9	$\tilde{\chi}_1^0$ 475 GeV	$10 < \tan\beta < 50$	ATLAS-CONF-2013-058
	GMSB, $\tilde{\chi}_1^0 \rightarrow \gamma\tilde{G}$, long-lived $\tilde{\chi}_1^0$	2 γ	0	Yes	4.7	$\tilde{\chi}_1^0$ 230 GeV	$0.4 < \tau(\tilde{\chi}_1^0) < 2 \text{ ns}$	1304.6310
	$\tilde{\chi}_1^0 \rightarrow qq\mu$ (RPV)	1 μ	0	Yes	4.4	\tilde{q} 700 GeV	$1 \text{ mm} < c\tau < 1 \text{ m}, \tilde{g} \text{ decoupled}$	1210.7451
RPV	LFV $pp \rightarrow \tilde{\nu}_\tau + X, \tilde{\nu}_\tau \rightarrow e + \mu$	2 e, μ	0	-	4.6	$\tilde{\nu}_\tau$ 1.61 TeV	$\lambda'_{311} = 0.10, \lambda_{132} = 0.05$	1212.1272
	LFV $pp \rightarrow \tilde{\nu}_\tau + X, \tilde{\nu}_\tau \rightarrow e(\mu) + \tau$	1 $e, \mu + \tau$	0	-	4.6	$\tilde{\nu}_\tau$ 1.1 TeV	$\lambda'_{311} = 0.10, \lambda_{1(2)33} = 0.05$	1212.1272
	Bilinear RPV CMSSM	1 e, μ	7 jets	Yes	4.7	\tilde{q}, \tilde{g} 1.2 TeV	$m(\tilde{q}) = m(\tilde{g}), c\tau_{\text{LSP}} < 1 \text{ mm}$	ATLAS-CONF-2012-140
	$\tilde{\chi}_1^\pm\tilde{\chi}_1^\pm, \tilde{\chi}_1^\pm \rightarrow W\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow ee\tilde{\nu}_\mu, e\mu\tilde{\nu}_e$	4 e, μ	0	Yes	20.7	$\tilde{\chi}_1^\pm$ 760 GeV	$m(\tilde{\chi}_1^0) > 300 \text{ GeV}, \lambda_{121} > 0$	ATLAS-CONF-2013-036
	$\tilde{\chi}_1^\pm\tilde{\chi}_1^\pm, \tilde{\chi}_1^\pm \rightarrow W\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow \tau\tau\tilde{\nu}_e, e\tau\tilde{\nu}_\tau$	3 $e, \mu + \tau$	0	Yes	20.7	$\tilde{\chi}_1^\pm$ 350 GeV	$m(\tilde{\chi}_1^0) > 80 \text{ GeV}, \lambda_{133} > 0$	ATLAS-CONF-2013-036
	$\tilde{g} \rightarrow qq\tilde{q}$	0	6 jets	-	4.6	\tilde{g} 666 GeV		1210.4813
$\tilde{g} \rightarrow \tilde{t}_1 t, \tilde{t}_1 \rightarrow bs$	2 e, μ (SS)	0-3 b	Yes	20.7	\tilde{g} 880 GeV		ATLAS-CONF-2013-007	
Other	Scalar gluon	0	4 jets	-	4.6	sgluon 100-287 GeV	incl. limit from 1110.2693	1210.4826
	WIMP interaction (D5, Dirac χ)	0	mono-jet	Yes	10.5	M^* scale 704 GeV	$m(\chi) < 80 \text{ GeV}, \text{ limit of } < 687 \text{ GeV for D8}$	ATLAS-CONF-2012-147

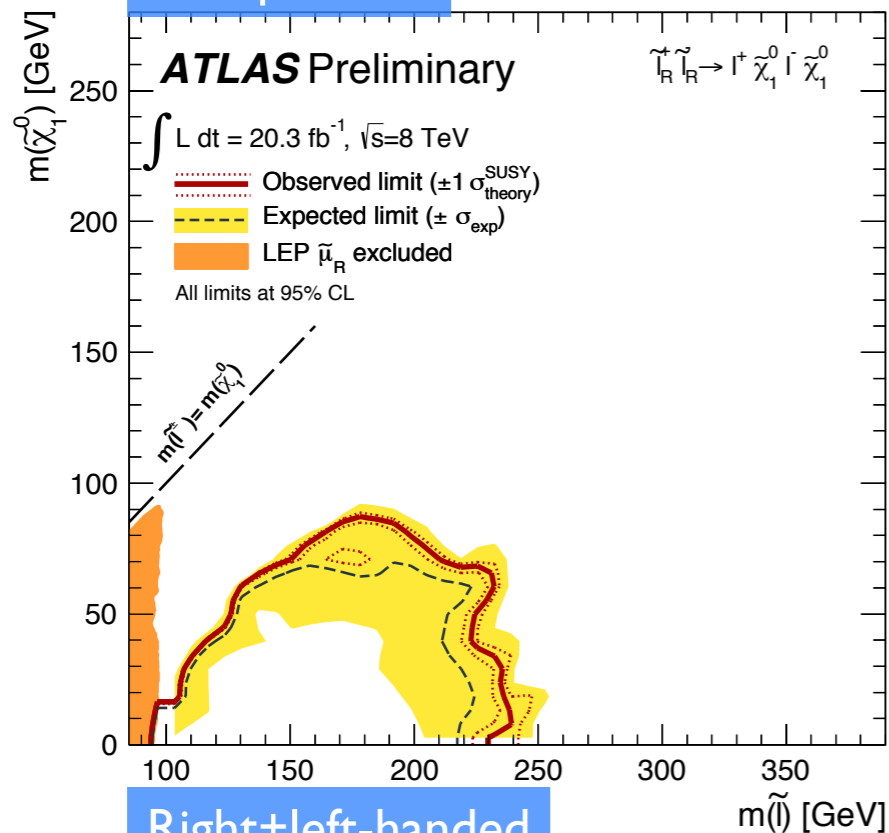
$\sqrt{s} = 7 \text{ TeV}$ full data $\sqrt{s} = 8 \text{ TeV}$ partial data $\sqrt{s} = 8 \text{ TeV}$ full data

10⁻¹ 1 Mass scale [TeV]

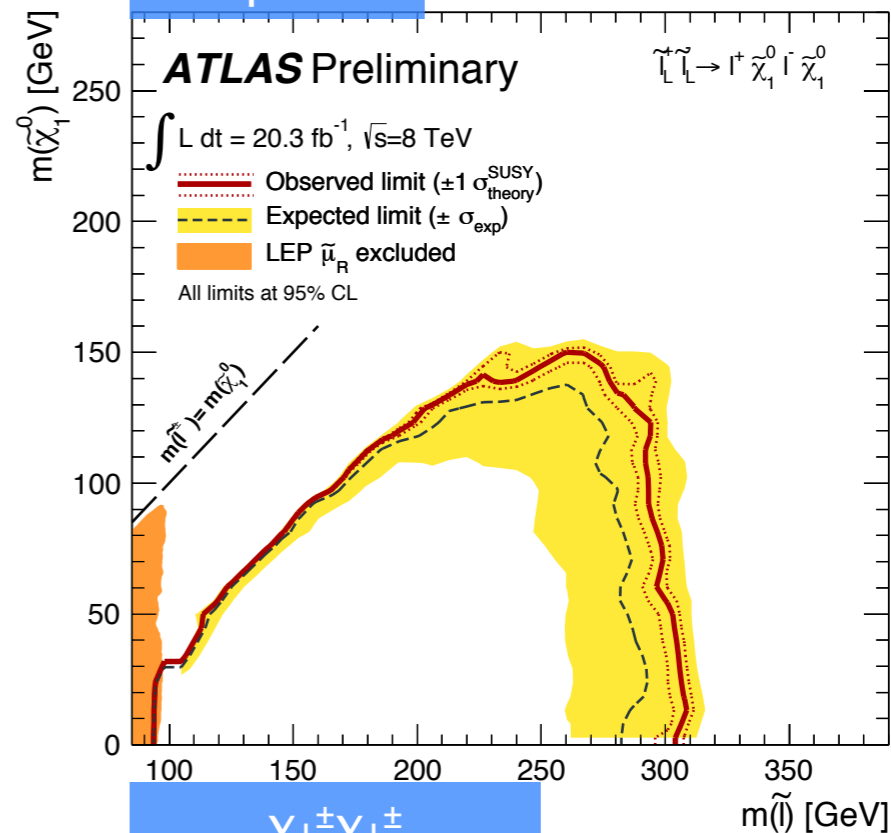
*Only a selection of the available mass limits on new states or phenomena is shown. All limits quoted are observed minus 1 σ theoretical signal cross section uncertainty.

Results & interpretation - II

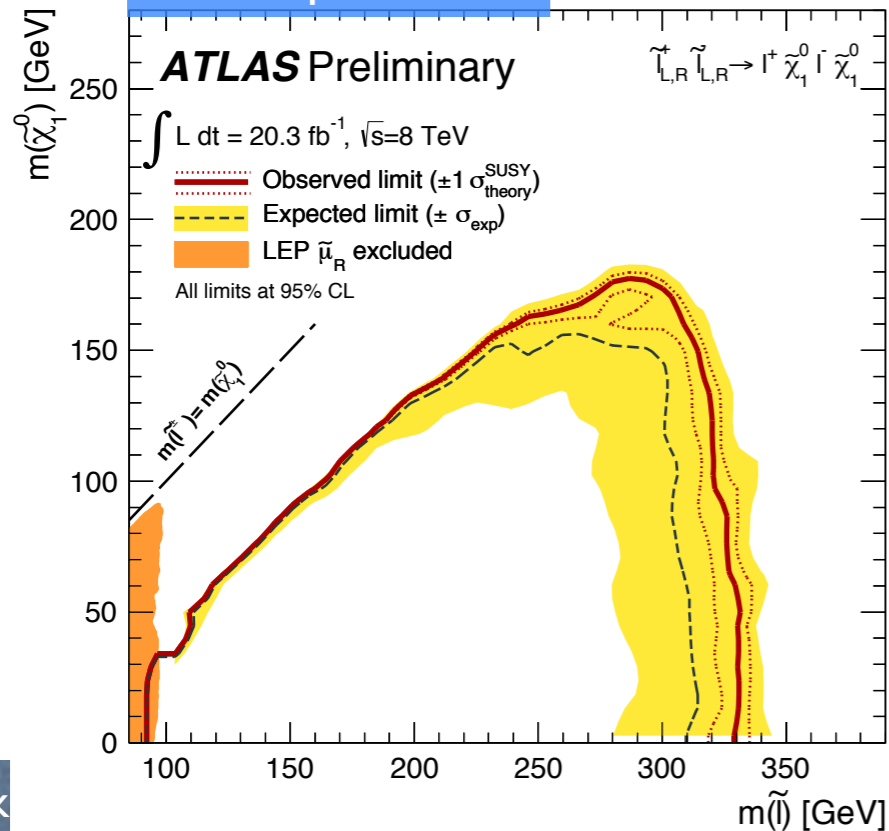
Right-handed sleptons



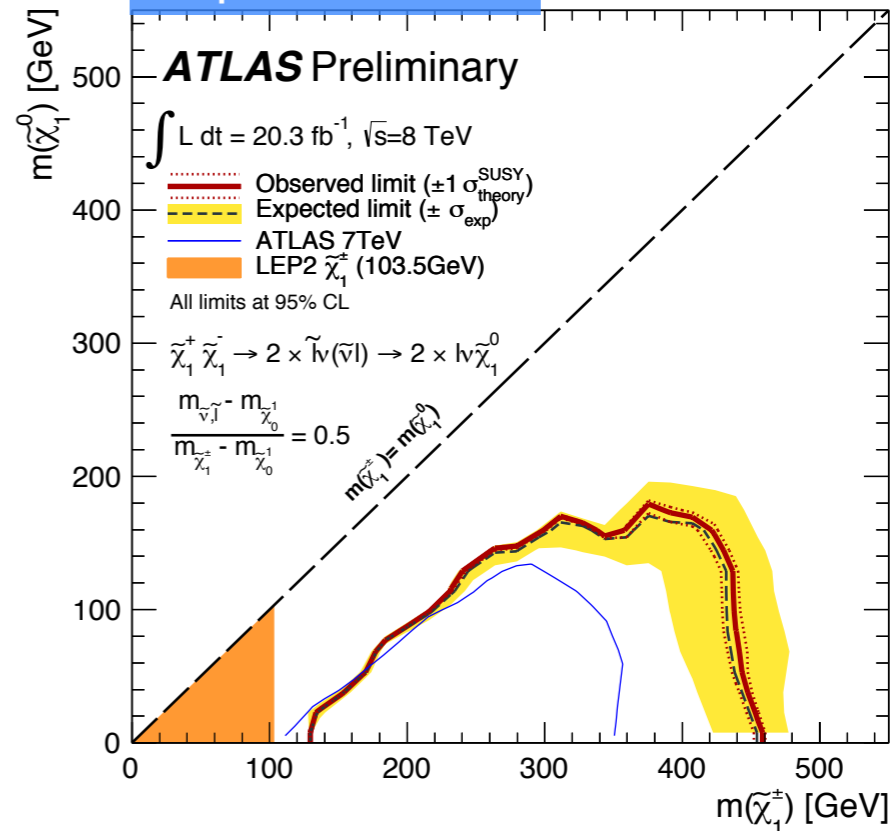
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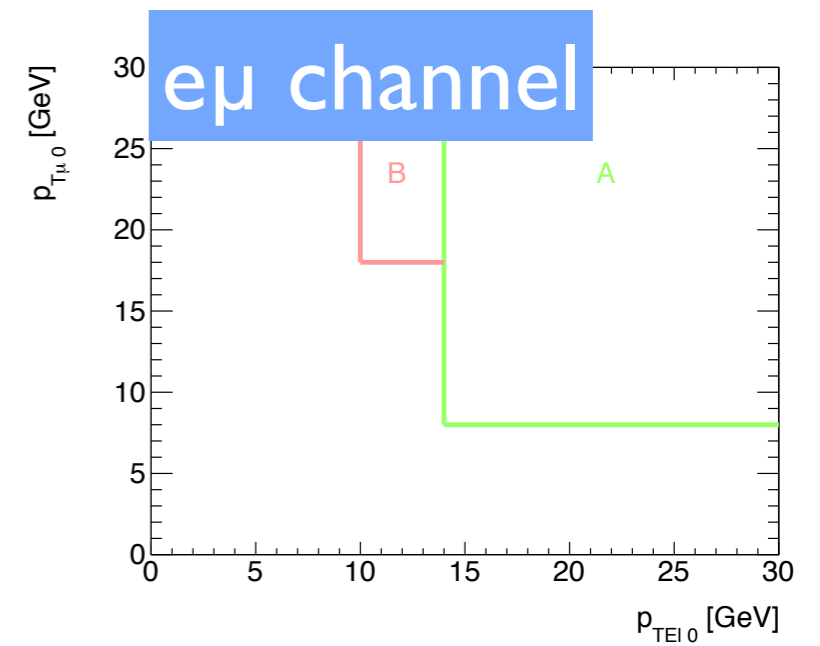
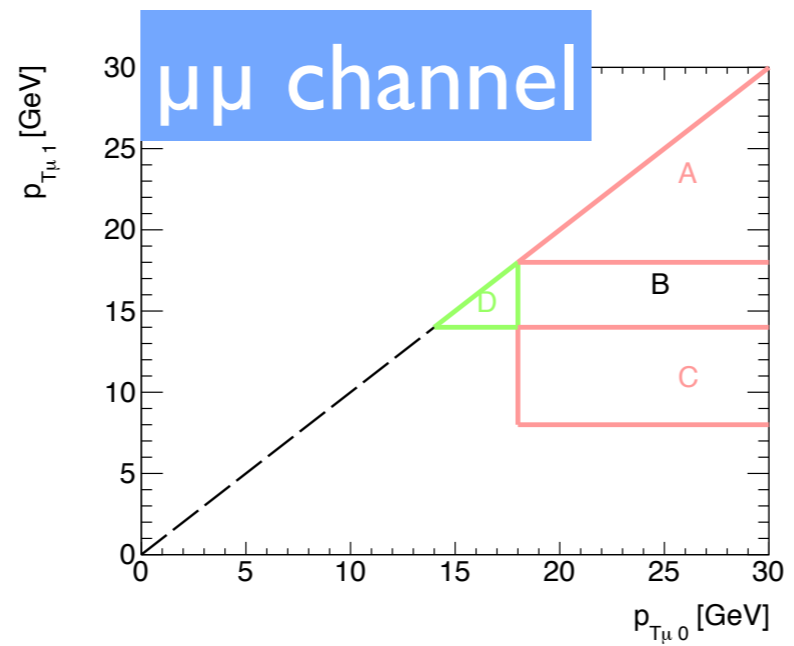
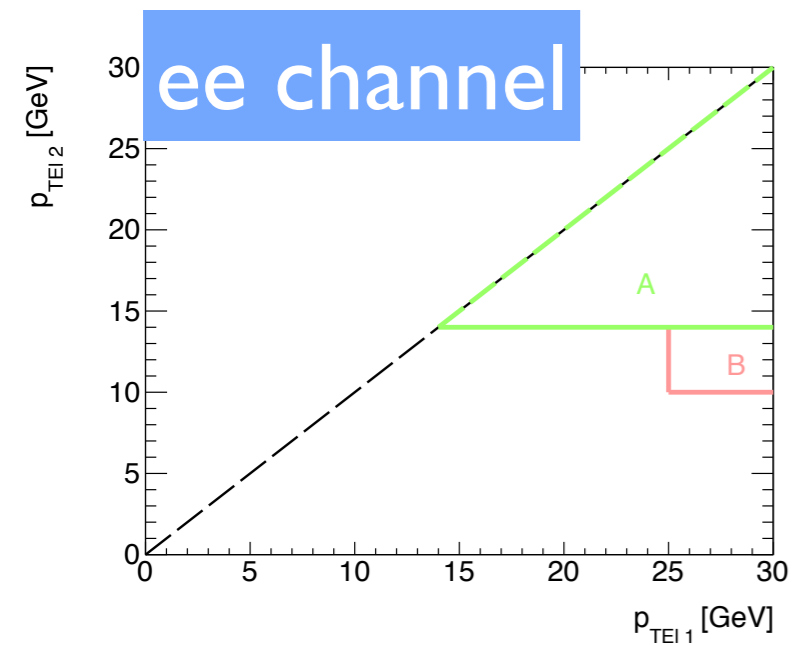
Right+left-handed sleptons



chi_1^± chi_1^± production



Trigger Scheme



ee channel	Leading p_T	Sub-leading p_T
Region A	12	12
Region B	24	7
$\mu\mu$ channel	Leading p_T	Sub-leading p_T
Region A	18	8
Region B	18	8
	13	13
Region C	18	8
Region D	13	13
$e\mu$ channel	Electron p_T	Muon p_T
Region A	12	8
Region B	7	18