

Strongly produced SUSY with two leptons (razor), [1]

Energy: 8 TeV

Luminosity: 20.3 fb<sup>-1</sup>

Validation notes:

- Validation has been performed versus all published cutflows, see Table 1 and fig. 1.
  - The Monte-Carlo generator was Herwig++ 2.5.2 [2] minimal Universal Extra Dimensions (mUED) scan, see Figure 1. In addition, the mUED model generation was also performed by Herwig++ 2.5.2.
  - For all other cutflows and scans, the Monte-Carlo generator was MadGraph5-v1.5.12 [3] and showered with Pythia 6.420 [4] with upto 2 additional QCD partons using the MLM [5] matching algorithm, see Table 1 and fig. 1.
  - Cross-sections calculated with NLL-Fast 2.1 [6, 7, 8, 9, 10].
- WARNING: Discrepancies exist in the final signal regions between ATLAS and CheckMATE. However, we do not believe this shows a systematic failing of CheckMATE. First of all, the statistics from ATLAS are very small and it is therefore hard to draw a definitive conclusion. Moreover, after the trigger has been performed, no cut has an obvious flavour dependence. Consequently it is expected (and confirmed by ATLAS) that the  $e\mu$  channels should contain the largest number of events.
- We see a difference in the exclusion for low squark masses and a heavier LSP. We believe this is due to different settings in the Monte Carlo parton shower (Pythia 6) that gives a harder initial state radiation distribution.
- No trigger details given in paper. However, signal regions require  $M'_R > 400$  GeV which is consistent with a fully efficient trigger. We use the consistency of the CheckMATE trigger cutflow with the ATLAS trigger cutflow to determine that this approach is valid.

Process Point	$\tilde{g}\tilde{g}$ production, $\tilde{g} \rightarrow qq\tilde{\chi}_1^\pm, \tilde{\chi}_1^\pm \rightarrow W\tilde{\chi}_1^0$ $m(\tilde{g}) = 800$ GeV, $m(\tilde{\chi}_1^\pm) = 460$ GeV, $m(\tilde{\chi}_1^0) = 60$ GeV					
Source	ATLAS			CheckMATE		
Generated Events*	59999			50000		
No Cuts	59999			59999		
2 baseline leptons	2073 $\pm$ 46			1880 $\pm$ 10		
Passes trigger	1670 $\pm$ 41			1426 $\pm$ 8		
$m_{\ell\ell} > 20$ GeV	1639 $\pm$ 41			1408 $\pm$ 8		
Lepton flavour Source	$ee$		$\mu\mu$		$e\mu$	
	ATLAS	CheckMATE	ATLAS	CheckMATE	ATLAS	CheckMATE
Lepton separation	576 $\pm$ 24	420 $\pm$ 7	397 $\pm$ 20	397 $\pm$ 7	666 $\pm$ 26	590 $\pm$ 8
Signal leptons	443 $\pm$ 21	377 $\pm$ 7	373 $\pm$ 19	397 $\pm$ 7	549 $\pm$ 23	561 $\pm$ 8
Trigger + dilepton	429 $\pm$ 21	377 $\pm$ 7	358 $\pm$ 19	397 $\pm$ 7	517 $\pm$ 23	561 $\pm$ 8
> 2 jets, $b$ -veto	341 $\pm$ 19	320 $\pm$ 6	297 $\pm$ 17	350 $\pm$ 6	424 $\pm$ 21	480 $\pm$ 7
$Z$ -veto	319 $\pm$ 18	293 $\pm$ 6	276 $\pm$ 17	321 $\pm$ 6	424 $\pm$ 21	480 $\pm$ 7
$R > 0.35$	139 $\pm$ 12	155 $\pm$ 4	137 $\pm$ 12	162 $\pm$ 3	195 $\pm$ 14	252 $\pm$ 5
$M'_R > 800$ GeV	53 $\pm$ 7	55 $\pm$ 2	50 $\pm$ 7	60 $\pm$ 2	63 $\pm$ 8	92 $\pm$ 3
< 3 jets, $b$ -veto	53 $\pm$ 7	44 $\pm$ 2	40 $\pm$ 6	34 $\pm$ 2	54 $\pm$ 7	56 $\pm$ 2
$Z$ -veto	51 $\pm$ 7	41 $\pm$ 2	36 $\pm$ 6	31 $\pm$ 2	54 $\pm$ 7	56 $\pm$ 2
$R > 0.5$	16 $\pm$ 4	14 $\pm$ 1	19 $\pm$ 4	10 $\pm$ 1	12 $\pm$ 4	21 $\pm$ 1
$M'_R > 400$ GeV	14 $\pm$ 4	13 $\pm$ 1	19 $\pm$ 4	10 $\pm$ 1	10 $\pm$ 3	19 $\pm$ 1

Table 1: Cutflow validation for atlas\_conf.2013\_089. The ATLAS column shows the number of Monte Carlo events after each selection cut. The CheckMATE cutflow is normalised to number of events before any selection cuts are applied. The final error is from Monte Carlo statistics for both ATLAS and CheckMATE. *\*For the CheckMATE sample only leptonic decays of the  $W^\pm$  were produced. This increases the effective sample size for this analysis by a factor  $\sim 9.5$ .*

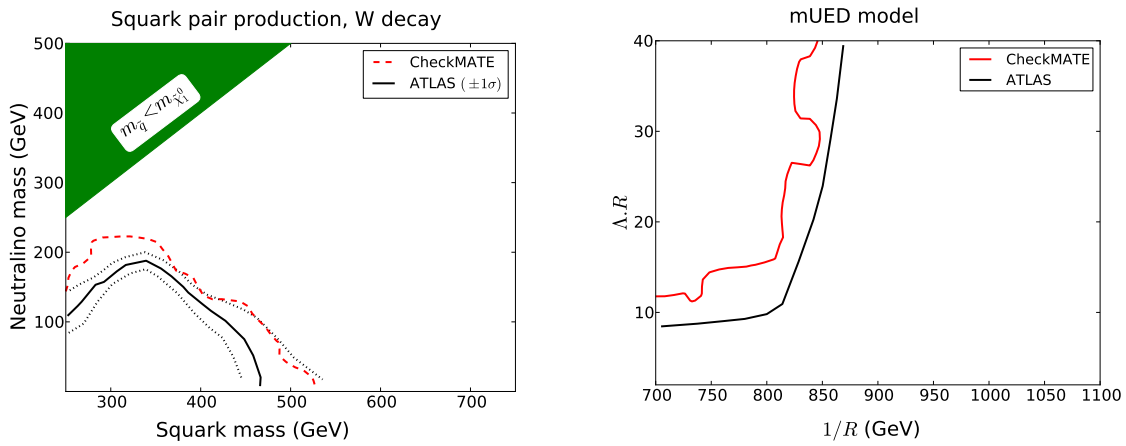


Figure 1: Left: Exclusion curve for a simplified model with squark production followed by decay  $\tilde{q} \rightarrow \tilde{\chi}_1^\pm q, \tilde{\chi}_1^\pm \rightarrow W \tilde{\chi}_1^0$  in atlas\_conf.2013.089. Right: Exclusion curve for a minimal Universal Extra Dimensions (mUED) model in atlas\_conf.2013.089. Jumps in exclusion limit of CheckMATE are due to the change of signal region.

## References

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