

# Validation of ATLAS\_1407\_0350

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We validated our code for all SRs in ATLAS\_1407\_0350 using CheckMATE-1.2.2 . We considered four cases which correspond to  $\tilde{\chi}_1^\pm \tilde{\chi}_1^\mp$  and  $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$  productions with both  $\tilde{\chi}_1^\pm$  and  $\tilde{\chi}_2^0$  being wino-dominated,  $\tilde{\chi}_1^\pm \tilde{\chi}_1^\mp$  production with  $\tilde{\chi}_1^\pm$  being wino-dominated,  $\tilde{\tau}_R \tilde{\tau}_R$  production and  $\tilde{\tau}_L \tilde{\tau}_L$  production respectively. For each validation, we generated 10000 events . Our results are presented in Table 1, 2, 3 and 4 respectively. These tables indicate that we can reproduce the ATLAS results for case 1-3 at 20% level, and case 4 at 30%.

| $(m_{\tilde{\chi}_1^\pm, \tilde{\chi}_2^0}, m_{\tilde{\chi}_1^0}, m_{\tilde{\tau}, \tilde{\nu}})$ [GeV] |              | ATLAS              | CheckMATE |      |          |
|---|--------------|--------------------|-----------|------|----------|
|   |              | $R_{\text{ATLAS}}$ | $SR^*$    | $R$  | Diff [%] |
| P1  | 300,100,200  | 1.0                | SR-C1N2   | 0.90 | -10.0    |
| P2  | 200,75,137.5 | 1.0                | SR-C1N2   | 1.06 | 6.0      |

Table 1: Validation of the  $\tilde{\chi}_1^\pm \tilde{\chi}_1^\mp$  and  $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$  production processes at the 8-TeV LHC by assuming  $m_{\tilde{\chi}_1^\pm} = m_{\tilde{\chi}_2^0}$  and  $m_{\tilde{\tau}} = m_{\tilde{\nu}} = (m_{\tilde{\chi}_1^\pm} + m_{\tilde{\chi}_2^0})/2$ .  $R_{\text{ATLAS}}$  in the table is the result obtained by ATLAS collaboration, which is taken from the exclusion line of Fig.7a in the ATLAS paper.  $SR^*$  stands for the SR with the largest expected sensitivity and R is the corresponding R value and  $\text{Diff} \equiv (R - R_{\text{ATLAS}})/R_{\text{ATLAS}}$ , which parameterizes the deviation of our calculation from its corresponding ATLAS result.

| $(m_{\tilde{\chi}_1^\pm}, m_{\tilde{\chi}_1^0}, m_{\tilde{\nu}, \tilde{\tau}})$ [GeV] |              | ATLAS              | CheckMATE      |      |          |
|---|--------------|--------------------|----------------|------|----------|
|   |              | $R_{\text{ATLAS}}$ | $SR^*$         | $R$  | Diff [%] |
| P1  | 300,80,190   | 1.0                | SR-DS-highMass | 0.81 | -19.0    |
| P2  | 200,75,137.5 | 1.0                | SR-DS-highMass | 0.96 | -4.0     |

Table 2: Similar to Table 1, but for the  $\tilde{\chi}_1^\pm \tilde{\chi}_1^\mp$  production process with the corresponding ATLAS results plotted in Fig.7b in the ATLAS paper.

| $(m_{\tilde{\tau}_R}, m_{\tilde{\chi}_1^0})$ [GeV] |         | ATLAS              | CheckMATE      |      |          |
|--|---------|--------------------|----------------|------|----------|
|  |         | $R_{\text{ATLAS}}$ | $SR^*$         | $R$  | Diff [%] |
| P1   | 300,100 | 1.0                | SR-DS-highMass | 0.96 | -4.0     |
| P2   | 200,100 | 1.0                | SR-DS-highMass | 0.86 | -14.0    |
| P3   | 150,100 | 1.0                | SR-DS-lowMass  | 1.18 | 18.0     |

Table 3: Similar to Table 1, but for the  $\tilde{\tau}_R \tilde{\tau}_R$  production process with the corresponding ATLAS results plotted in Fig.8a in the ATLAS paper.

| $(m_{\tilde{\tau}_L}, m_{\tilde{\chi}_1^0})$ [GeV] |         | ATLAS              | CheckMATE      |      |          |
|--|---------|--------------------|----------------|------|----------|
|  |         | $R_{\text{ATLAS}}$ | $SR^*$         | $R$  | Diff [%] |
| P1   | 300,100 | 1.0                | SR-DS-highMass | 1.15 | 15.0     |
| P2   | 200,100 | 1.0                | SR-C1C1        | 1.27 | 27.0     |
| P3   | 150,100 | 1.0                | SR-DS-lowMass  | 1.11 | 11.0     |

Table 4: Similar to Table 1, but for the  $\tilde{\tau}_L \tilde{\tau}_L$  production process with the corresponding ATLAS results plotted in Fig.8b in the ATLAS paper.