atlas_conf_2016_096 validation

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Experiment: ATLAS

integrated luminosity: $13.3 fb^{-1}$

Energy: $\sqrt{s} = 13$TeV.

Search for: opposite-sign pair of the lightest charginos($\chi_1^+ \chi_1^-$) and pair production of the lightest Chargino with the next-to-the-lightest neutralino($\chi_1^\pm \chi_2^0$).

Link to note: atlas_conf_2016_096

Sometimes, the Experimentalists give the detailed Cutflows, which is not the case here. Therefore we chose as validation procedure to reproduce the following plots showing the allowed and excluded areas in parameterspace of $(m(\chi_2^0) = m(\chi_1^\pm), m(\chi_1^0))$.
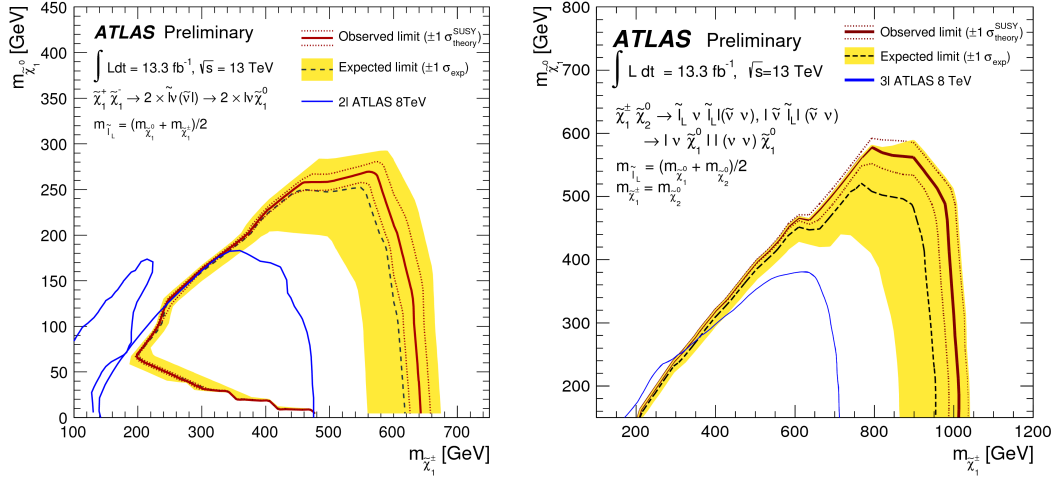

Figure 1: Exclusion Limits from ATLAS for Direct Neutralino/Charginos Production

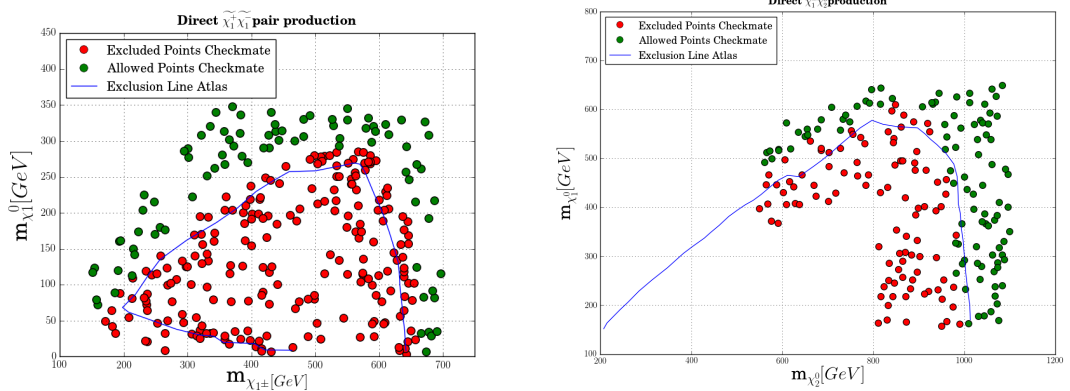This is the Result produced with CheckMATE:

Figure 2: Results obtained with CheckMATE. The Observed Limit from ATLAS is drawn in blue.

Procedure

For the Direct $\chi_1^+ \chi_1^-$ Pair Production 296 Points with 50000 Events/Point were generated via CheckMATE 2 using Madgraph 2.5.1 and pythia8219.

For the Direct $\chi_1^\pm \chi_2^0$ Production 200 Points with 7500 Events/Channel/Point were generated using Madgraph 2.4.3 and pythia6.

The SLHA files used in the Analysis are based on SLHA files from an older similar search done by ATLAS. In both cases Prospino-2.1 generated the NLO-cross sections, which are needed as input into CheckMATE.

Discussion

The CheckMATE Result for the Exclusion line is in general agreement with the corresponding ATLAS Lines within about ± 40GeV.

Striking is that the feature on the bottom left of the Direct $\chi_1^+ \chi_1^-$ Pair Production, where the Exclusion line takes a sharp bend to the bottom middle could not be reproduced at all. These Points are all excluded with high confidence. For instance, the Point $(m(\chi_2^0), m(\chi_1^0)) = (265, 8)$ is excluded with an r value = signal/(95%CL limit on signal) of 13.02.

After consulting with the ATLAS convenors we learned that the apparent non-exclusion of the lower left area in the ATLAS plot is due to not enough signal points generated within run 1, so according to them, this is a plotting artifact.