

Project (1): pp H/A gauginos

In the current LHC program there are, on the one hand, searches for heavy Higgs bosons with SM particles or lighter Higgs bosons in the final state, and on the other hand, searches for SUSY particles that cascade decay into SM particles and the lightest supersymmetric particle (LSP). However, there are no LHC searches that look for both types of undiscovered particles at the same time, although such signatures can easily appear in the MSSM and are thus well motivated. Nevertheless, even though the LHC does not specifically target such signatures, there may be other searches looking for similar final states. These searches may be (indirectly) sensitive to these signatures.

The goal of Project (1) is the study of heavy Higgs boson (either H or A) production in the MSSM, with successive decay into electroweak (EW) gauginos, i.e. neutralinos and charginos. We want to look at

- whether current LHC searches can exclude parameter regions via these signatures
- which final states are the most sensitive one's
- (optional) how LHC searches can be designed or improved to enhance their sensitivity to these signatures

As model input, we will start with the MSSM benchmark scenario *mhmod+* from [this paper](#). An example file for the model point with $M_A = 500$ GeV, $\tan\beta = 10$ can be obtained [here](#).

We will be using the following tools:

- FeynHiggs (calculation of Higgs masses + decays)
- SUSYHIT (calculation of SUSY spectrum + SUSY decays)
- MadGraph + Pythia + Delphes (Monte Carlo simulation of the signal, in three steps (corr. to the three tools): hard process - hadronization - detector simulation)
- CheckMATE (confronts the simulated events with the experimental results from ATLAS / CMS searches)