Toward an efficient test of Supersymmetry using simplified models

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Despite the impressive performance of the LHC and the discovery of the Higgs boson, we do not have yet any hints of physics beyond the Standard Model. Still, there is a reasonable hope to find such new physics in the next LHC runs, specially if the famous “hierarchy problem” is actually a sound case for BSM. In this sense, supersymmetric (SUSY) scenarios, in particular the minimal supersymmetric Standard Model (MSSM), continue to be one of the most well-motivated candidates for BSM. So far, the strategies that LHC collaborations are following is the use of the “simplified models”, which makes more efficient the exploration of general SUSY escenarios. However, the great intricacy of the generic MSSM would demand an enormous plethora of simplified models in order to cover the parameter-space. In the talk I will follow a strategy which is potentially very powerful to optimize SUSY searches considering a Non universal higgs masses and gaugino masses model. Though not completely general, this scenario is well-motivated by a number of theoretical and phenomenological facts and goes far beyond the CMSSM and NUHM in complexity and phenomenological richness. We perform a Bayesian analysis to identify the preferred regions, we examine the typical (i.e. most likely) phenomenology of this parameter, then focusing on the regions that are potentially accessible by experiment allow to identify the most representative simplified models, i.e. those that faithfully describe the phenomenology in the most relevant regions of the parameter-space. As we will see, these simplified models are different from some of the most commonly adopted ones, thus suggesting new approaches to detect SUSY.

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