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Search for chargino and neutralino production in final states with one lepton, a Higgs boson and missing transverse momentum with the ATLAS detector

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Supersymmetry is a promising extension of the Standard Model of Particle Physics (SM) as it provides a solution to some of the open questions of the SM. If squarks and gluinos are beyond the reach of the LHC, the production of charginos and neutralinos could be the dominant production mode of supersymmetric particles in $\sqrt{s}=13$ TeV proton-proton collisions at the LHC. A search for electroweak production of supersymmetric particles, using 139 fb^{-1} of proton-proton collisions recorded from 2015 to 2018 by the ATLAS detector, is presented. In the signal scenario considered, a chargino $\tilde{\chi}_{\pm 1}$ is produced together with a next-to-lightest neutralino $\tilde{\chi}_{02}$. The chargino decays via $\tilde{\chi}_{\pm 1} \rightarrow W^{\pm} \tilde{\chi}_{02}$ while the neutralino decays through $\tilde{\chi}_{02} \rightarrow h \tilde{\chi}_{02}$. The final state of this signal scenario can thus in many cases be characterised by the presence of two b-jets from the Higgs decay, missing transverse momentum and exactly one lepton from $W^{\pm} \rightarrow l^{\pm} \nu$, providing high discrimination against SM background. In this work, the analysis strategy is introduced, exploiting the varying shapes of signal and background distributions in a two-dimensional shape fit and estimating the SM background through semi-data-driven techniques. Finally, the results of the search are presented and discussed.

Author: JUSTE ROZAS, Aurelio (ICREA and IFAE (ES))

Presenter: Mr SCHANET, Eric (Ludwig Maximilians Universitat (DE))

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