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The interplay between Higgs and squark-gluino events at the LHC

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In some extensions of the standard model with extended Higgs sectors, events from new particle production may pass the selection criteria for Higgs search in different channels at the LHC-14 TeV and mimic Higgs signals. This intriguing possibility is illustrated by Pythia based simulations using several representative points in the parameter space of the minimal supersymmetric standard model (MSSM) including a point in the minimal supergravity model consistent with the darkmatter relic density data. Our simulations explore the interplay between the charged Higgs signal and typical squark-gluino events. We argue that the standard selections like the one based on the polarization properties of the τ's from charged Higgs decay, though adequate for handling the SM background, may not be very efficient in the presence of SUSY backgrounds. We then propose an alternative search strategy based on kinematics only which sufficiently controls both the SM and the MSSM backgrounds. For charged Higgs masses in the deep deccoupling regime ($600GeV$ $lsimm_H$ $lsim800GeV$)this method works well and extends the LHC reach close to 8OO GeV for an integrated luminosity of $30fb^{-1}$ with or without the SUSY background. For a lighter charged Higgs a judicious combination of the old selections and some of the cuts proposed by us may disentangle the Higgs signal from the squark-gluino backgrounds quite effectively.

Primary author: Prof. DATTA, Amitava (IISER-Kolkata, India)

Co-authors: Dr MAITY, Manas (Visva-Bharati University, Santiniketan, India); Dr GUCHAIT, Manoranjan (Tata Institue of Fundamental Research, Mumbai, India); Ms BHATTACHARYYA, Nabanita (IISER-Kolkata, India); Mr PODDAR, Sujoy (Netaji Nagar Day College, Kolkata, India)

Presenter: Prof. DATTA, Amitava (IISER-Kolkata, India)

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